OCS Study
MMS 2008-042

History of the Offshore Oil and Gas Industry in Southern Louisiana

Volume I: Papers on the Evolving Offshore Industry

U.S. Department of the Interior
Minerals Management Service
Gulf of Mexico OCS Region

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Volume I: Papers on the Evolving Offshore Industry

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ABOUT THE COVER

Offshore rig, vessels, and barge in the Gulf of Mexico, May 1956, Jesse Grice Collection (photo number 242-16), Morgan City Archives.

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PREFACE

I wish to thank the researchers who brought the Gulf of Mexico Offshore Petroleum Oral History Project to fruition and, particularly, I wish to thank the men and women who shared their testimonies with the researchers, Minerals Management Service (MMS), and the world. The dedication of researchers and participants alike made the History Project into the success that it is. The research team asked me to write this preface because of my work in making this an MMS study. While I am proud of the part that I played, my role was to state the obvious. Everywhere my job took me, people said that the history of offshore oil needed to be known, that its story of inventiveness and entrepreneurship is ageless but its pioneers were aging, and that it would be lost if nothing were done. My one virtue was to be sufficiently naive or hopeful to say "let's try."

Chapter I lists differences between the History Project and most MMS socioeconomic studies—it is larger, more expensive and historical, less assessment-driven, and it stresses the collection and dissemination of new information. However, it also shares this emphasis on systematic data collection and synthesis with many MMS-funded studies in oceanography, biology, and ecology. This similarity is telling. Socioeconomics is the child of social impact assessment; it emerged to address any and all "social" questions raised by environmental assessments. As with other agencies, in the past MMS socioeconomics tended to be narrow, ad hoc, and aimed at filling in blanks in impact assessments. However, MMS research is applied, and as stakeholder concerns have turned toward onshore socioeconomic effects, the agency's science has necessarily followed suit. The History Project reflects this trend, and advances it. The study may be more "history" than "sociology," and have a strong public outreach component, and be unique, but its similarity to other agency science is still striking. The offshore petroleum industry is the source of the onshore socioeconomic concerns. Like other agency sciences, the History Project has focused on assessment-relevant questions. Like them, it has systematically gathered previously nonexistent information related to the industry, its impacts, changes to both, and the processes that drive those changes. As sound research is designed to do, this study advances the state of our knowledge about the offshore industry; its efforts will prove to be invaluable to all who choose to follow.

Harry H. Luton
(Gulf of Mexico Region Senior Social Scientist)

1. INTRODUCTION AND BACKGROUND

The evolution of the oil and gas industry and its movement to the offshore has been one of the fundamental forces shaping Louisiana's culture, geography, society and economy during the twentieth century. In the late 1920's and into the '30's, the lakes, marshes and bayous of southern Louisiana began to rival the famous Spindletop salt dome in neighboring Texas in the production of fossil fuels. Workers flocked in from northern Louisiana, Arkansas, Oklahoma, Texas – all of them "Texians" to the local shrimpers, trappers, and farmers. The locals, for the most part, accommodated the outsiders. And many soon found jobs as roustabouts, roughnecks, and drillers with the big operators - the Texas Company, the California Company, Humble, and Shell. Others put their invaluable knowledge of the waters and the marshes to good advantage. The Texians needed these skills to explore the foreign geography of the coast.

A consortium of companies led by Kerr-McGee and Phillips Petroleum completed the first out-of-sight-of-land well in 1947 off Morgan City, marking a new phase in the evolution of Louisiana's oil and gas industry. Hamlets and towns would be transformed to support the offshore industry, which now is producing oil and gas in water depths of 8,000 feet, 200 miles off the coastlines of Alabama, Mississippi, Louisiana, and Texas.

As a collection of structures, the more than 4,000 offshore platforms represent a significant part of the nation's stock of productive physical capital. As habitat for fish and other sea life, these structures are some of the largest additions to a natural ecosystem ever made as a consequence of human activity. The repercussions on labor markets and local economies of the movement offshore changed communities, institutions and businesses all along the coast of the Gulf of Mexico in fundamental and defining ways. New Orleans, linked to Harvey on the opposite bank of the Mississippi River, became a regional hub of operations for offshore activities, second only to Houston. Morgan City and Houma grew as fabrication centers and staging bases for the offshore rigs and platforms. Humble Oil Company built its headquarters on the barrier island at Grand Isle, as did Freeport at its company town of Port Sulphur along the lower Mississippi River. Lafayette aggressively led as a regional administrative oil center. In the often indeterminate edge between land and water, ports were built to access the Gulf. The envy of these now is Port Fourchon at the end of Highway 1 along Bayou Lafourche, supplying and servicing the newest expanse of deepwater exploration and production.

The history of the offshore oil and gas industry in Louisiana is also a story of national and international diffusion and influence. Corporations and businesses that were born in the Gulf grew and expanded to distant corners of the world. In addition to the oil and gas companies that made their home in the Gulf, regional entrepreneurs found a fertile ground for developing businesses to provide specialty services and supplies to the offshore oil and gas industry. Both the oil and gas companies and the myriad service and supply companies depended on ever-expanding technologies that were imported from, and later exported to, places outside the region.

Yet the story of how this came about -- how the offshore oil and gas industry progressed from humble beginnings to an information-intensive force whose ability to perform in hostile environments is often compared to the manned space program--is not well known or understood.

Even less well documented are the effects that the evolution of the offshore oil and gas industry has had on coastal communities and institutions.

1.1. Project Objectives

The purpose of this project is to study, document and explain this evolution in an objective and comprehensive way. A critical element of the history of the offshore industry resides in the memories of the "old timers." They were there. They remember how things were and how they have changed. Unfortunately, many of the people responsible for this phenomenal growth are passing away and their stories are being lost. There is a long list of innovators and pioneers from fabricators, engineers, geoscientists, roughnecks, roustabouts, tool pushers, welders, port officials, helicopter pilots and catering crews, to divers, truckers, suppliers, boat captains and able-bodied seamen. They are all part of the growth and development of the industry. There are also civic leaders, business owners, spouses and family members who felt firsthand the impacts of this industry. The oral history record that has been built through this study has depended on the active participation of a diverse cross section of people with direct experience with the oil and gas industry and its effects.

1.2. Rationale

The Minerals Management Service (MMS) has sponsored and organized this study, and its motivation is in part internal. Both legally and operationally, the agency is required to evaluate and document how its activities and policies affect the communities and economies within which it functions. A comprehensive and accessible history of the evolution of the industry, and its effects on the people and institutions of the coastal economy, will assist those who are responsible for planning and managing the development of the offshore oil and gas reserves and understanding the consequences of such development on coastal institutions and the economy.

However, the project has value that extends beyond its use to the MMS. It fills a gap in the existing literature by addressing the growth and development of the petroleum industry and the related service industries in Louisiana that took exploration and development into the coastal zone and, then, into deeper and deeper offshore waters. In addition to its published reports and documents, this project is creating an organized archive of materials that can be used efficiently by other scholars and researchers. State agencies and local communities will also be able to use the materials to better understand the historical context of issues and problems of interest to them.

When the project initially was proposed, the Social Science Subcommittee of the Scientific Committee, several MMS Headquarters and GOM staff, members of the business and academic communities, and local civic leaders and educators agreed that the project was timely and supported its funding. Reasons they gave included:

1) The offshore industry and its associated support industries are little known or understood and their dynamic role in the U.S. economy is virtually invisible. Research that gives this industry a "human face" would be a contribution to the OCS program, Louisiana, and the country.

2) The National Environmental Policy Act (NEPA) charges MMS with documenting the social and economic effects of the industry. The National Research Council's (NRC) assessment of the studies program noted that the fifty-year history of offshore oil provides a natural laboratory for studying its effects. To "calibrate" this laboratory, the changing dynamics of the industry (such as its technological evolution, changes in business practices, changes in financing) must be documented and analyzed.

3) MMS is charged by NEPA with assessing the cumulative effects of the industry. This history will provide what in many respects will be the most comprehensive and accessible source for discussing such cumulative effects. The study will help provide MMS a "baseline" for future analysis.

4) Associated with the baseline issue, MMS has been requested by its Science Committee and others to synthesize its research findings about the socioeconomic effects of the program. This study brings together a range of experts knowledgeable about the Gulf to begin synthesizing this material.

5) The project will help distinguish the effects of onshore oil production from offshore oil production, and offshore oil production from the OCS. Currently, the agency does this by dividing effects according to the number of barrels produced. However, onshore barrels have different effects than offshore barrels and this study may help document these differences over time.

6) While MMS must study the social and economic effects of the offshore industry, these effects are often defined abstractly. This study builds on methodologies used in prior studies (e.g., *Social and Economic Impacts of Outer Continental Shelf Activities on Individuals and Families* [USDOI, MMS 2002]) which demonstrated that social and economic effects of the industry could be described and assessed in ways helpful to both industry and the affected communities.

7) This study is designed to serve as a "scoping" vehicle. Affected parties will define the salient social and economic issues in a non-adversarial milieu. Related to this process, the study has been organized to provide the agency with effective outreach to other federal and state institutions as well as communities.

8) Finally, the study could be considered as "mitigation." Knowledge about the industry and its origins are of value to the people of the State of Louisiana. This knowledge will be lost as industry pioneers pass away.

1.3. Organization of the Project

The project was financed through a cooperative agreement between MMS and Louisiana State University (LSU). The Center for Energy Studies at LSU, under Allan Pulsipher, oversaw the administration of the study and was responsible for the final deliverables. Harry Luton at MMS oversaw the project and was the agency liaison.

The execution of the project, however, was decentralized with subcontractors supported via the cooperative agreement responsible for most of the research. The study began with a team of researchers from the Center for Energy Studies at Louisiana State University (LSU), the Department of History, College of Business, and the Center for Public History at the University of Houston (UH), the Program in Public History Studies at the University of Louisiana at Lafayette (ULL), and the Bureau of Applied Research in Anthropology at the University of Arizona (UA). The LSU team was led by Dr. Allan Pulsipher and included Ric Pincomb and Dr. Don Davis. Drs. Tyler Priest and Joseph Pratt led the UH team and were assisted by Jamie Christy, Joseph Stromberg, Tom Lassiter, Jennifer Taylor, Joseph Abel, and Jason Theriot. Suzanne Mascola transcribed the UH interviews. At ULL, Dr. Robert Carriker was assisted by Steven Wiltz and David DiTucci.

Drs. Diane Austin and Thomas McGuire of the UA were assisted by Ari Arand, Emily Bernier, Justin Gaines, Andrew Gardner, Mary Goode, Rylan Higgins, Scott Kennedy, Christina Leza, Karen Morrison, Lauren Penney, Jessica Piekelek, Dr. James Sell, Jeremy Slack, and Joanna Stone. UA researchers were supported by community assistants in Houma, Raceland, and New Iberia: Lois Boutte, Charlene Broussard, Norma Cormier, Nicole Crosby, Carolyn Cummings, Robyn Hargrave, and Debbie Toups. They received tremendous support from local organizations and individuals, especially the Barataria-Terrebonne National Estuary Program, Bayou Native Bed and Breakfast, C.J. Christ, the Desk and Derrick Clubs of Morgan City and New Orleans, the Louisiana Technical College Young Memorial Campus, the Morgan City Archives, the Morgan City Daily Review, the Nicholls State University Archives, Steve and Jean Shirley, and the United Houma Nation.

Over 450 interviews were recorded during this study. The tapes and discs onto which the interviews were recorded and the transcripts of the interviews are available in the archives of the University of Houston, Louisiana State University, University of Louisiana at Lafayette, and Nicholls State University. Each interview provides a unique look at the offshore oil and gas industry and its impacts on workers, their families, and their communities.

In addition to the recorded interviews, six volumes were produced during this project. The first, *Volume 1: Papers of the Evolving Offshore Industry,* is a collection of analytical papers, each of which deals with an important aspect of the evolution of the offshore oil and gas industry. That volume is followed by three more, *Volume 2: Bayou Lafourche – Oral Histories of the Oil and Gas Industry; Volume 3: Morgan City's History in the Era of Oil and Gas – Perspectives of Those Who Were There*, and *Volume 4: Terrebonne Parish*, all of which examine the offshore oil and gas industry through the lens of a particular community or region of southern Louisiana. *Volume 5: Guide to the Interviews* summarizes information about the interviews, including how each interviewee became involved in the study, his or her family and/or occupational history, and

particular highlights of the interview. The final volume, *Volume 6: A Collection of Photographs*, is a compilation of photographs, diagrams, and other visual images that were collected from interviewees during the study.

1.4. Methods

The approach selected for this study was to combine oral history, documentary research, interviews, and historical economic analysis to establish the basis for understanding the history and evolution of the offshore oil and gas industry in southern Louisiana, the birthplace of the industry. The study was designed to gather information from the industry's pioneering engineers, managers and entrepreneurs who created the organizations and technology required to produce oil and gas, sometimes hundreds of miles from land in thousands of feet of water. In addition, oral histories were collected from workers, family members of workers, community leaders, and others whose lives were shaped by the offshore industry. Finally, the researchers sought the perspectives of governmental and political leaders who developed the strategies and laws that were used by MMS to regulate and manage the development of offshore resources.

As the study progressed, the focus on oral histories grew. Beyond the stories of the "winners" and of the technological "firsts," little of this rich history had been written. Due to the size of the onshore area associated with offshore petroleum development and the continuing change and innovation required for the steady march farther and farther offshore, the story developed in many places and involved thousands of entrepreneurs. The researchers recognized and capitalized on the complexity of the industry and its history by reaching into communities across southern Louisiana, as well as into Houston and other locations where pioneers could be found. They worked to encourage the participation of individuals from throughout the region, of both genders, and of diverse socioeconomic backgrounds and racial and ethnic groups. Due to the advanced age of the earliest pioneers and the need to reach as many people as possible in a limited period of time, the researchers worked in teams and utilized various strategies to identify and locate the pioneers. To ensure that information about the earliest days in the development of the offshore petroleum industry was collected, the researchers focused on the years leading up to and including the 1970s, saving the study of the development of the deepwater industry for another time.

Many pioneers had received little recognition for their efforts, so researchers went to their homes and communities to seek them out. To find and gain access to these individuals, the researchers established relationships with community and business leaders and developed mechanisms through which they and the pioneers could develop mutual trust and open channels of communication.

In gathering stories from managerial and scientific ranks of the industry, researchers worked through the alumni networks of many companies, including Shell Oil, Gulf Oil, Mobil Oil, Texaco, and Pennzoil. They attended retiree reunions, placed notices in professional association newsletters, and joined alumni email listserves to identify and contact interview subjects. Researchers also worked closely with the Houston-based Offshore Energy Center, which also collects oral histories of offshore industry pioneers and runs a museum in Galveston displaying exhibits on the history of the industry. Most of the oral histories collected from former managers, engineers, and geoscientists were collected in and around the cities of Houston, New

Orleans, and Dallas, where a large number of industry retirees live, although travel as far as Amarillo and Denver was also required.

In the close-knit communities of southern Louisiana, collecting oral histories presented a special challenge. In addition, the years of the 1930's, 1940's, and 1950's were marked by fierce loyalty to political leaders and companies, even when those were causing harm in the communities. Consequently, researchers and community members exerted considerable effort to assure pioneers that their stories were important and that they could determine what they wanted to share. Throughout the effort, community partners were crucial to project success.

In one effort to gain trust and increase local participation in the Louisiana communities, researchers identified and trained local schoolteachers in New Iberia and Houma to serve as teacher-researchers and to share information about the study in their communities. In Morgan City, researchers worked with the editor of the local paper, *The Daily Review*, to write and publish articles about the pioneers who had been interviewed for the study. They also worked through local groups such as company retirees clubs, the Barataria-Terrebonne National Estuary Program's Management Conference, the Offshore Energy Center's Pioneer Hall of Fame, the local Desk and Derrick Clubs,[1] the United Houma Nation Tribal Council, and local branches of the Louisiana Technical College to inform people about the study and identify people who should be included. They attended meetings and gatherings such as the annual Divers' Reunion in Bush, Louisiana. The researchers also used phone directories and city directories to identify companies that had been in existence for decades and met with company executives and staff to interest them in the study and elicit their support in finding early pioneers. In addition, the researchers networked with local historians, librarians, and archivists to find potential participants. The study would not have succeeded as it did without the knowledge and support of dozens of local contacts.

The goal of the oral history study was to collect and archive as many stories of the early pioneers as possible. However, as the study progressed and researchers observed the local enthusiasm for the project, it became clear that simply archiving the materials would be inadequate. In addition, researchers realized that providing information about the study and sharing some of what had been learned within the communities would help spread the word about the study and identify more potential participants. Several outreach activities were designed to make information available within the communities, increase awareness of the project, and bring in more people. These included a project website, the series of articles in *The Daily Review*, a 15-minute video (later DVD) about the project, inclusion of industry pioneers in the MMS Information Transfer Meeting in New Orleans, and collaboration with the Morgan City Shrimp and Petroleum Festival Board. In 2004, the researchers worked with a Houma-based independent company, Minds Eye Productions, to produce a traveling exhibit, "The Offshore Oil and Gas History Project," which opened first at the Southdown Museum in Houma and has so far traveled to Raceland, Morgan City, and Lockport. Prior to the exhibit openings in Houma, Raceland, and Morgan City, researchers and local supporters hosted receptions for the study participants from the surrounding communities.

[1] The first Desk and Derrick Club was organized in New Orleans in 1949 for women working in the petroleum industry. The clubs reached their height during the early 1980s with 12,750 members nationwide (1982) and 127 clubs (1983).

The value of the oral history collection and other data gathered during this study will only be realized if it is used. To get information out to researchers and others with potential interest in the collection, the researchers organized the collection to be easily accessible to users and participated in several events to inform others of its existence. First, a spreadsheet of all participants was created and a bibliographic database was constructed to include information about how each individual was selected for participation in the study, highlights of the individual's career and personal history, and a summary of the main topics discussed during the interview. Both the spreadsheet and database can be printed into booklets and used electronically. In electronic form, they are readily searched by participant name, occupation, and any keyword of interest to the user. A spreadsheet was also created to organize the thousands of digital photos collected during the study, and digital copies of the photos were organized in folders and stored on compact discs.

All interviews were transcribed and digital copies of the transcripts, as well as the databases and digital photos described above, will be available in the archives at the University of Houston, University of Louisiana at Lafayette, Nicholls State University, Louisiana State University Center for Energy Studies, Morgan City Archives, and Lafourche Parish Library. The study researchers collaborated with researchers from the National D-Day Museum in New Orleans to identify and conduct oral history interviews with offshore pioneers who had also served in World War II. The video tapes of those interviews will also be included in the National D-Day Museum collection. To spread the word about the collection and its potential as a research tool, the researchers organized sessions for the conferences of the American Society for Environmental History, the Southern Historical Association, and the Society for Applied Anthropology.

1.5. Organization of Volume I

The first volume consists of nine analytical papers drawn from the oral histories and other materials collected for the project. In planning the analytical papers to accompany the interviews, it quickly became clear that the industry was too vast and varied to allow a comprehensive treatment of its historical evolution. Consequently, the research teams focused on selected parts of the industry, both in designing their research strategies and analyzing the results.

The UH research team focused on exploration managers, geologists, and geophysicists, as well as the agents of leasing in the federal government. This part of the business history of the offshore industry has been the least studied. Previous studies covered mainly the exploits of drilling companies and platform builders. While recognizing the amazing accomplishments of these businesses, the UH research team determined that the story of offshore Gulf of Mexico has really not been told from the perspective of the managers and geoscientists who pioneered path breaking exploration technologies, took the risks, found the oil, and made the play. Tyler Priest's paper, "The Technology and Strategy of Petroleum Exploration in Coastal and Offshore Gulf of Mexico," thus examines the origins of petroleum exploration on the Gulf Coast, focusing on the close relationship between technological innovation in this field and the particular characteristics of the region's geology and stratigraphy. He finds that there is greater continuity in the story of the oil industry's move from inland south Louisiana to offshore Gulf of Mexico

than is revealed in traditional offshore narratives, which emphasize a fundamental discontinuity in engineering practices.

The offshore petroleum industry had its official beginning in the years immediately following World War II, and the connections between the War and the development of the industry are many. Even before the U.S. entered the war, shipbuilders were adapting designs of vessels used by trappers and oil companies in the swamps and marshes of southern Louisiana. By WWII, petroleum was a key factor in military strength and strategy, and in southern Louisiana, where the developments of the late 1930s and early 1940s indicated that the wetlands and the outer continental shelf promised significant oil and gas deposits, exploration was deemed a critical activity. Then, the end of the war signaled a new era for offshore oil and gas production, stimulated by both the people and equipment returning from the war. Returning veterans shaped the offshore industry, both as managers and laborers, and key technologies and equipment developed during the war jump-started the new offshore industry. Drawing upon oral history interviews, Lauren Penney's paper, "In the Wake of War: World War II and the Development of the Oil and Gas Industry," examines and discusses the links between WWII and the offshore industry.

The technological evolution of exploration and the movement of the industry into ever deeper waters depended on access to state and federal submerged lands. Two other papers by Priest discuss the political and legal factors that determined and shaped access. "Claiming the Coastal Sea: The Battles for the 'Tidelands,'1937-1953" details the jurisdictional battle between the Gulf Coast states and the federal government over control of submerged lands, and "Auctioning the Ocean: The Creation of the Federal Offshore Leasing Program, 1954-1962" analyses the emergence and development of federal jurisdiction and leasing over the outer continental shelf in the Gulf of Mexico.

The purpose of the offshore oil and gas history project was to collect and archive as complete a sample of oral history interviews as possible. These interviews hold vast amounts of information on various aspects of the offshore petroleum industry and of life in southern Louisiana during the period from the 1930s to the 1970s, addressing topics such as attitudes toward work and changing lifestyles. They can serve as the basis for many future studies and analyses. To illustrate the potential of this collection, researchers from UH and UA wrote papers on six additional topics: hurricanes, accidents and safety provision, commercial oilfield diving, women, and World War II, and shipbuilding and fabrication.

The offshore oil and gas industry is a particularly valuable site of study of the intersection among humans, technology, and the environment. The innovation and limitation of humans, both as individuals and in organizations, significantly affected the pace of and direction in which the offshore petroleum industry evolved. One major theme that comes out of the interviews is the multiple kinds of risks offshore development has presented and the ways those risks came to be managed or mismanaged. Joseph Pratt's paper, "The Brave and the Foolhardy: Hurricanes in the Early Offshore Oil Industry," looks at the engineering response of the offshore oil industry to three devastating hurricanes in the 1960s, in which leaders of the industry had to revise they way they accounted for the risks presented by major hurricanes. Priest's paper, "Wake-up Call: Accidents and Safety Provision in the Gulf of Mexico Offshore Industry," examines the risks to

individual workers. It traces the hazards encountered by offshore operations from the early years of development after World War II through the early 1970s when the industry first really got serious about safety questions. Divers also assumed great risks on behalf of the industry. Diane Austin's paper, "Commercial Diving and the Role of People, Technology, and the Organization of Work," describes and analyzes both the technological and social challenges faced by the people and companies responsible for diving and underwater welding in the Gulf of Mexico from the 1940s to the 1970s.

As the offshore petroleum industry grew and expanded in the late 1960s, labor shortages became critical. Coupled with national policies requiring employers to diversity their workforces, the need for workers led companies to hire women in positions offshore, which until that point had been restricted to men. The oral history interviews with women paint a much more complicated picture, illustrating that from the early days of the industry women had provided more than simply household support for its workers. Austin's paper, "Women and the Offshore Oil and Gas Industry in Southern Louisiana," explores the roles of women in the development and maintenance of the offshore oil and gas industry in southern Louisiana.

Joseph Abel's and Jennifer Taylor's paper, "Gulf Coast Shipbuilding and Fabrication for the Offshore Oil Industry," provides a historical survey, up to the 1970s, of shipyards and fabrication centers. These were critical sectors in the offshore industry, but ones that have historically been very fragmented and thus difficult to track. The authors offer detail on the many companies involved in these sectors and discuss avenues for future research.

Finally, Allan Pulsipher's paper, "Cumulative and Transitory Effects of Offshore Oil and Gas Development on Personal Income in Louisiana's Coastal Parishes: 1969 to 2000," examines the coastal parishes from an economic perspective. The objective was to see if the growth of offshore oil and gas development that took place between 1969 and 2000 resulted in cumulative economic effects that differentiate the economic experience and circumstances of residents in Louisiana's coastal parishes from the residents of Louisiana's non-coastal parishes.

2. TECHNOLOGY AND STRATEGY OF PETROLEUM EXPLORATION IN COASTAL AND OFFSHORE GULF OF MEXICO

Tyler Priest
University of Houston

> It takes luck to find oil. Prospecting is like gin rummy. Luck enough will win but not skill alone. Best of all are luck and skill in proper proportion, but don't ask what the proportion should be. In case of doubt, weigh mine with luck (Everette DeGolyer, quoted in Knowles 1978, page 300).

> It is the genius of a people that determines how much oil shall be reduced to possession; the presence of oil in the earth is not enough. Gold is where you find it, according to an old adage, but judging from the record of our experience, oil must be sought first of all in our minds (Wallace Pratt, quoted in Pratt 1943, page 1).

> We usually find oil in new places with new ideas. When we go to a new area we can find oil with an old idea. Sometimes also we find oil in an old place with a new idea, but we seldom find much oil in an old place with an old idea (Parke Dickey 1958, quoted in Dickey 2002, page 36).

> My own view is that it's easy to find oil. It's hell to make money (Marlan Downey 1991, quoted in Steinmetz 1992, back cover).

2.1. Introduction

The quotes from DeGolyer, Pratt, Dickey, and Downey capture the essence and historical evolution of the search for petroleum. They each reveal the preoccupations with risk, failure, innovation and fortune that have always characterized exploration. Taken from different points in time, these observations also demonstrate how exploration has changed from a crapshoot informed by hunches and rewarded largely by luck, to a sophisticated endeavor requiring vision and invention, to a modern science that has nearly become a victim of its own success in finding commercial prospects. With modern industry and indeed whole economies dependent on it, oil is still the greatest prize and exploration still the greatest game.

For decades, the Gulf of Mexico has been one of the most lively and captivating exploration frontiers in the world. The history of the petroleum industry from its early days on the Texas-Louisiana coast to its recent conquests in the "deepwater" Gulf exemplifies, better than anywhere in the world, the transformation of the oil exploration from an unsophisticated prospecting endeavor to a high-tech business. The Gulf Coast was the first area of the world to employ geophysical technology rigorously in a successful hunt for oil. The introduction of the torsion balance and the refraction seismograph in the 1920s enabled the successful search for buried salt domes in the region. In the 1930s, the reflection seismograph transformed the business of petroleum exploration in nearly every oil region in the United States, but its greatest economic

impact was on the Texas-Louisiana Gulf Coast, where it refined the search for salt domes and effected changes in exploration strategy.

Combined with developments in drilling and well logging, geophysical technology pushed the industry from onshore marine environments into offshore waters of the Gulf of Mexico. In the 1940s and 1950s, the move from onshore leasing conducted by private and public landowners to offshore leasing by competitive bid conducted by state and federal governments placed an even greater premium on geologic and geophysical capabilities, as incentives for speculative leasing were fewer offshore. Oil firms and their companion service companies faced unprecedented challenges and made rapid strides in learning how to drill and produce hydrocarbons from increasing water depths offshore, but not without steep rises in the costs of development, which mandated greater accuracy and effectiveness in exploration.

While recognizing the amazing accomplishments and steep learning curves of production engineers, construction and shipbuilding companies, and all the mechanics and tinkerers along the Gulf Coast who helped make offshore a going proposition, it must be understood that the primary challenge was not figuring out how to build and service offshore platforms, but figuring out *where exactly to build* them and *how much to pay* for them. Often, when production engineers were asked the question, "how deep can you build a platform," their typical reply was, "tell us how much you are willing to pay for a platform, and we'll tell you how deep we can build it." So a key historical question in understanding the evolution of this industry, it seems, is "how did oil companies determine how much money they were willing to pay for a platform?"

The answer to this question, of course, depended on the costs of finding new reserves, which in turn depended on two things: 1) the terms of access; and 2) the costs and accuracy of exploration. Finding commercial quantities of oil in a risky, high-cost environment was the name of the game. Yet the story of offshore Gulf of Mexico has really not been told from the perspective of the managers, geoscientists, and surveyors who pioneered path-breaking exploration technologies, took the risks, found the oil, and made the play. The drillers and platform builders, so far, have stolen the limelight (Pratt *et al*. 1997; Burleson 1999; Gramling 1996; Kreidler 1997). The narrative needs to be placed in the context of evolving geophysical technology, with attention to how such technology shaped exploration strategy, and how the economics of leasing and exploration, in turn, drove technological innovation. It needs to include the contributions of local residents and entrepreneurs in helping oil companies get into the swamps, marshes, and open waters, as well as the disappearance of this local support niche as operations and sources of technological innovation became more sophisticated and distant from onshore support centers. Most importantly, it needs to include the role of geophysical contractors in pioneering a string of innovations in seismic surveying and the associated changes in research and development at the major oil companies to keep up with and accommodate the growing importance of geophysics.

While exploration geophysicists and geologists have studiously documented the history of geophysics, they have underemphasized the Gulf Coast origins of commercial geophysical surveying and the close relationship between technological innovation in this field and the particular characteristics of the region's geology and stratigraphy (Sweet 1966; Lawyer *et al*. 2001). The deep-seated salt domes and sedimentary strata along the coast and on the continental shelf in the Gulf of Mexico hold vast amounts of petroleum, but they are geologically complex,

with massive salt sheets and extrusions, steep-dipping and highly faulted beds, and numerous but thin and often indistinguishable sands in which hydrocarbons are difficult to pinpoint. Early on, exploration in this region came to depend on continuous improvements in geophysical techniques. The development of marine geophysical operations in the 1950s enabled leaders in the industry to realize economies of scale in gathering seismic information. The introduction of magnetic tape recording and "common-depth-point" shooting in the late 1950s, closely followed by digital processing and recording in the early 1960s, provided for a quantum leap in the amount of data that could be handled and manipulated. This led to an almost continuous innovation in seismic processing and interpretation, with the "deconvolution" of signals caused by reverberations in water in the early 1960s, the direct detection ("bright spots") of hydrocarbons in the late 1960s, three-dimensional seismic in the late 1970s, and 4-D or "time-lapse" seismic today. All of these innovations saw their greatest application offshore and especially in the Gulf of Mexico. Advances in digital seismic technology in the 1980s and 1990s initiated a shift in continental shelf/deepwater plays, as majors upgraded to deepwater tracts and sold off shelf tracts to smaller independents who used the technology to extend the life of older fields.

From the standpoint of exploration, there is greater continuity in the story of the oil industry's move from inland south Louisiana to offshore Gulf of Mexico than is revealed in traditional offshore narratives, which emphasize a fundamental discontinuity in engineering practices. The offshore environment certainly presented unique and daunting challenges, but we must piece together the threads of continuity to appreciate the industry's willingness and ability to confront great uncertainty and risk in the open Gulf.

2.2. Grand Entrance of Geophysics

The discovery of the giant oil field on the Spindletop salt dome in January 1901 ushered in the modern age of oil exploration. It vaulted the Gulf Coast of the United States to prominence in the world petroleum industry. This region also became the first big oil province not dominated by the Standard Oil colossus. The soon-to-be majors Gulf Oil Corporation and The Texas Company among other firms would establish a strong foothold there. At Spindletop, one well produced 100,000 barrels/day (b/d), capable of producing one-fourth of the entire world's annual production at the time. Spindletop also created the legend of the wildcatter, whose swashbuckling spirit and penchant for risk-taking would define the image and stereotype of the Southwestern oilman.

As legendary geologist Michel Halbouty has explained, science played no role in this discovery. Humans did not even begin scientifically to study the earth until the eighteenth century. By the end of the nineteenth century, the science of geology was still in its infancy, and the few geologists at work in the United States were most concerned with the origin and age of the earth, the mechanics of mountain formation, or the classification of rocks. Prospectors employed doodlebugs, divining rods, or other instruments of metaphysical prognostication in the search for oil, and they often adhered to superstitions which held that drilling sites be kept close to cemeteries or on the right-hand forks of creeks. Leading geoscientists of the day believed that the unconsolidated sands underlying the Gulf Coast area could not contain oil and that drilling anywhere in the region was a waste of time. Beaumont trader Patillo Higgins, who persevered in

drilling at Spindletop, “had the faith and the determination to pursue his belief in face of lay and scientific criticism, and he proved to all, especially those geologists who called him “fool,” that the so-called “oil experts” were not looking ahead, much less keeping up with current developments” (Halbouty 1957, p. 19). Or, as oil historian Edgar Wesley Owen writes, “the story is of astute geological hunches by nonprofessionals and lack of intuition on the part of more expert scientists” (Owen 1975, p. 195).

Higgins had read enough geology to believe that the prominent hill seeping gas a few miles from Beaumont might be a favorable structure for the presence of petroleum. His partner, Captain Anthony Lucas, had witnessed oil showings from salt drilling operations at Avery Island and Jefferson Island, Louisiana. But they were still operating on a hunch. In 1871, Rumanian geologist Franz Pošepný had observed that petroleum in Rumanian Moldavia was associated with salt domes, but his contribution and other European literature on salt were largely unknown in the United States, even thirty years later when oilmen and geologists observed that the gushing Spindletop hill was similar to mounds bearing salt, sulfur, and shows of oil at many locations in Louisiana and Texas. After Higgins and Lucas struck “black gold,” leasing and exploration soon commenced in a feverish pace east and west of Spindletop on every low groundswell that seemed to indicate the existence of a salt dome.

The entire Gulf Coast was pocked by these features, a vast field of oil reservoirs in the imagination of many oil men. New oil fields indeed were proven by the end of 1901, at Jennings, Louisiana, most notably, and elsewhere. They were discovered mainly on the basis of simple surface observations of oil or gas seeps (“paraffin dirt”), sulfur-water springs, asphalt beds, and distinct topographic features. Yet, despite the stunning success of early drilling, the notion that every salt dome sat atop a huge pool of oil proved to be fanciful. Not all salt domes yielded oil, and some not until after several years of development, as major reserves tended to be restricted to a single flank or segment of the structure. Drillers were handicapped by the lack of subsurface knowledge and crude rotary drilling methods. By 1911, oil companies had verified the existence of 36 salt domes; 22 of them were discovered before the end of 1901. Almost all the 36 domes eventually produced oil, especially after 1913 when drilling moved off the tops of the structures to explore the flanks, where the sands turned out to be much more productive. Many drilling failures, however, accompanied each discovery. Only 12 more domes were discovered before 1924, when geophysical methods of prospecting were introduced in the region. Meanwhile, Gulf Coast geologists focused on developing theories to explain the origins of salt domes, correlating surface indicators with well data (Owen 1975, pp. 191-203).

The northern Gulf of Mexico, geologists later pieced together, is a great geosyncline, a giant downwarp of the earth’s crust filled with tens of thousands of feet of ancient river sediment deposited over 100 million years. Except for the extensive carbonate parts of the Florida and Yucatan shelf platforms, deposition during the Tertiary period (2 to 65 million years ago), which represents the largest sedimentary section, was predominantly clastic, composed of non-marine sands and shales. The landward extent of the Gulf Coast geosyncline is the outcropping Cretaceous and basal Tertiary sediments approximately 200 miles north of the shoreline. The southern extent is located beyond 400 miles into the deepest water (12,000 feet) of the Gulf near the Sigsbee Scarp. Drill down 20,000 feet under the shallow seafloor off Louisiana and one is still in the Miocene epoch sands deposited 5 to 24 million years ago. Some places contain more

than 60,000 feet of sediment above the Upper Cretaceous. The crust can only take about 40,000 feet of sediment, however, before heaving it upward. Ancient subsidence and heaving created complex fold and fault systems in the northern Gulf. At great depths, the sediment was heated and melted, releasing water, oil, and gas from the rock, which eventually found their way into the structural traps created by folding and faulting (Atwater 1959, pp. 131-32; Antoine and Gilmore 1970, pp. 37-38).

Sodium chloride, or rock salt, also migrated up through the strata. The shrinking of ancient oceans once stranded bays that gradually dried up and left plains of salt which were later buried deep under layers of sediment deposited by returning waters. The action of salt under these extensive layers is eloquently described by essayist John McPhee:

> Salt has a low specific gravity and is very plastic. Pile eight thousand feet of sediment on it and it starts to move. Slowly, blobularly, it collects itself and moves. It shoves apart layers of rock. It mounds upon itself, and, breaking its way upward, rises in mushroom shape – a salt dome. Still rising into more shales and sandstones, it bends them into graceful arches and then bursts through them like a bullet shooting upward through a splintering floor. The shape becomes a reverse teardrop. Generally, after the breakthrough, there will be some big layers of sandstone leaning on the salt dome like boards leaning up against a wall. The sandstone is permeable and probably has a layer of shale above it, which is not permeable. Any fluid in the sandstone will not only be trapped under the shale but will also be trapped by the impermeable salt. Enter the strange companionship between oil and salt (McPhee 1981, pp. 75-76).

Geologists eventually classified three different kinds of salt domes: "piercement-type" domes, in which the salt remained near the surface throughout their history, piercing sediments shortly after their deposition; "deep-seated" domes buried beneath thousands of feet of sediment; and "intermediate-type" domes falling in between. By the 1960s, more than 400 salt domes had been identified in the Gulf Coast province through drilling alone, and thousands more indicated by geophysical measurements (Antoine and Gilmore 1970, p. 37; Halbouty 1967).

In the 1920s, knowledge of the "strange companionship" between oil and salt was still in its infancy, although it had begun to move out of the realm of divination and into the realm of science. Prior hypotheses about the origin of salt domes claimed that they were a by-product of volcanic action or a result of the expansive force of growing salt crystals. Everette Lee DeGolyer, a founder of the American Association of Petroleum Geologists and the man many people regard as the founder of modern geophysics (see below), was the first American to recognize and develop the idea of "plastic flow." "De," as he was affectionately known among friends and colleagues, published dozens of geological and geophysical papers during his career, but in the early years he was most interested in the origin of salt domes. After extensive reading about the concept in European geology, DeGolyer wrote influential articles beginning in 1918 that changed the thinking of American geologists about how salt domes developed. Still, geologists had few tools for understanding the subsurface. Outcrops could not be found in the region, and drillers' logs were unreliable. According to Halbouty: "the only real tools that were available for scientific study were the bit, the few honest drillers' logs and micropaleontology"

(Halbouty 1957, p. 19). Furthermore, the discovery of the huge Caddo Lake field in 1904 shifted the attention of geologists in this region to northern Louisiana. By the early 1920s, no important new fields were being developed in southern Louisiana, and low crude prices tempered the enthusiasm of oil operators to hunt for more (Steinmayer 1957).

The introduction of new geophysical techniques rejuvenated exploration for buried Gulf Coast salt domes. In fact, geophysical exploration with the torsion balance and refraction seismograph achieved its first notable success on the Gulf Coast in the mid-1920s, after previously demonstrating the capability to map subsurface structures in Europe. The first geophysical contracting firm in the United States actually appeared in 1921, when four talented scientists who had studied reflected blast waves to detect the location of enemy artillery for the U.S. Bureau of Standards during World War I – William P. Haseman, John C. Karcher, E.A. Eckhardt, and Burton McCollum – organized the Geophysical Engineering Company (GEC). GEC did experimental work, underwritten by Marland Oil Company, employing reflection seismology (see below) to search for petroleum in Oklahoma. However, their results were inconclusive, and geophysical prospecting in the United States soon turned to the Gulf Coast and to other equipment and methods, though the principals in GEC would go on to shape the evolution of geophysical technology in profound ways. In July 1924, Amerada Petroleum Corporation and its affiliate, Rycade Oil Corporation, used the Eötvös torsion balance, named after Baron Roland Eötvös, a professor of experimental physics at the University of Budapest, to locate the Nash dome in Brazoria County, Texas. This is generally acknowledged as the first discovery of oil using geophysical instruments.

The Eötvös torsion balance essentially measured changes in the earth's gravity field at different points over a given area by light metal beams suspended from a hair-like torsion wire. Everette DeGolyer, who in 1919 became vice president and general manager of the newly created Amerada and who had been diligently searching for a practical geophysical instrument, sought out and obtained the first device for the United States. "If DeGolyer was spending a goodly portion of his time writing and thinking about how salt domes were formed," writes George Elliott Sweet, "you can be sure that he was also thinking long and hard about how best to find those buried domes that had no surface expression or surface seepage indication" (Sweet 1966, p. 99). The new instrument proved more precise than pendulum devices, which had been used to measure gravity since the 18th century, although improved pendulums were applied with some success along the Gulf Coast in the early 1930s. Royal Dutch-Shell and the Gulf Production Company (an affiliate of the Pittsburgh-based Gulf Oil) began experimenting with the torsion balance about the same time as Amerada-Rycade, and each had success locating salt domes. Unfortunately, many of the domes showed little or no oil and the torsion balance fell into disrepute until 1929, when the discoveries of deeper domes confirmed the theory behind early torsion-balance surveys and the seismograph refined discredited prospects. More efficient and lightweight gravity meters or "gravimeters" soon replaced the torsion balance and eventually found widespread use in the search for salt domes in marine areas (Owen 1975, pp. 755-757).

Gravity instruments were most effective in structural reconnaissance work. Also at this time, magnetometers, which measured changes in the vertical component of the earth's magnetic field, demonstrated capabilities for reconnaissance, especially where crystalline basement rocks were part of large local uplifts. For detailed prospecting and mapping, on the other hand, the

seismograph was the answer. Whereas gravity and magnetic methods showed only average properties of all subsurface rocks, the seismic method distinguished rocks of different properties at particular depths. Scientists for years had suggested using seismology – the measurement of acoustic wave velocities through elastic layers in the earth's crust – for determining geologic structure, and the Germans had adapted the technology for locating enemy artillery during World War I. Only after the war, however, did companies deploy the seismograph in the hunt for oil (Sweet 1966; Lawyer *et al*. 2001, pp. 1-12). In 1923, Royal Dutch-Shell made the first large-scale seismograph trial in Mexico. Soon after, Marland Oil Company introduced it into the United States, first in Oklahoma and then later in East Texas and the Gulf Coast. Both oil companies contracted with a German firm, Seismos Gesellschaft, founded by Dr. Ludger Mintrop, to conduct the seismic surveying (Sweet 1966, pp. 89-92).

Mintrop had obtained a German patent on a seismic technique that came to be known as refraction. In a refraction survey, a charge of dynamite set off near the surface created a shock wave which traveled through the earth and was picked up by a series of seismometers or "geophones." Connected by wires to a central recording point, these devices detected the first of the acoustic waves and thus allowed for an accurate determination of the travel time from the point of explosion. These waves traveled through soft formations, such as sand and shale, in underground arcs at a known velocity. A hard or more compact formation, such as a salt dome, would transmit the waves at a much faster rate, in effect refracting them like a prism. Refracted waves would arrive at the geophone abnormally fast, often indicating the presence of salt.

The early tests turned in disappointing results, mainly because they were performed in areas with no shallow salt domes, and amplification of the sound signals on the Seismos mechanical seismographs was too low to detect deeper structures. But in June 1924, a Seismos crew working for Gulf made the first ever seismic discovery of a buried salt dome – the Orchard dome in coastal Texas – which contained commercial amounts of oil. During the next year, this crew mapped three more Texas domes by seismic refraction. The success of the new method truly marked a breakthrough in the art and science of petroleum exploration. News traveled fast, and by the end of 1926, refraction crews had combed large parts of coastal southeast Texas and southwest Louisiana for shallow salt domes (Beaton 1957, p. 203; Owen 1975, pp. 504-505). "The years 1924 to 1927 saw the wildest competition between oil companies in the history of the Gulf Coast," remembered O. Scott Petty, who in 1925 co-founded Petty Geophysical. "Suddenly, almost overnight, there appeared a way to find shallow domes fast and with certainty" (Petty 1976, p. 21).

Seismos supplied the instruments and outfitted most of the crews for this burst of exploration, and improvements to the method allowed for more rapid surveying. One weakness of the early work by Seismos was that the profiles taken by shooting along a straight line yielded inconclusive observations unless that line happened to cross a shallow salt plug directly. Velocity contrasts were not distinct enough in some places to be recognized by the instruments. L.P. Garrett, Gulf Oil's chief geologist, suggested placing several geophones in a fan-shaped pattern radiating from a single shot point, which would allow for a more detectable "time lead" on any line whose waves were refracted through a salt mass. In addition, a smaller number of shots would be required to search for domes over a large area. Although it provided better and cheaper coverage than profile shooting, fan-shooting could still miss salt domes. And despite the

acceptance of the revolutionary new technology and the improvements made by fan-shooting, Seismos had only proven that it could find shallow domes. Slow to refine its instruments and field techniques, the German company soon lost ground to more aggressive innovators and in 1930 discontinued operations in the United States (Sweet 1966, p. 92; Owen 1975, p. 505).

The strongest competition came from the Tulsa-based Geophysical Research Corporation (GRC), an Amerada Petroleum affiliate established in 1925 by Everette DeGolyer. Under the direction of John C. Karcher, who had done pioneering work on seismic technology at the Bureau of Standards, GRC acquired a patent held by Reginald Fessenden (chief physicist for the Submarine Signaling Company of Boston) for recording both refraction and reflection waves in search of "ore bodies" and quickly made vital enhancements to refraction seismology. DeGolyer and Karcher realized that shallow salt domes were not that hard to find in a region which abounded with similar structures and producing domes. They wanted to see if exploration technology could be improved to allow for greater accuracy as well as insight into more deeply buried structures. Working under contract with Gulf Oil in the spring of 1926, GRC introduced newly designed electrical seismometers and a vacuum tube amplifier that made its seismograph much more sensitive than the German mechanical seismographs. The unit also contained a single trace recording camera modified from an old hand-cranked 35-mm movie camera. By shining a light through slits attached to the prongs of a large tuning fork, timing lines could be projected onto the 35-mm film. Radio signals from shot point to detector point communicated the instant of explosion, whereas Seismos had estimated this instant from the arrival time of the air wave and the surveyed distance (Owen 1975, pp. 505-506 and 760; Lawyer *et al*. 2001, pp. 15-17).

The system greatly increased the speed and accuracy of shooting, and all at a reduced cost. Distances between shot point and recorder could also be lengthened to about 5 miles (and later to 9 miles) allowing for the detection of more deeply buried salt domes. In June 1926, GRC discovered two salt domes for Gulf at Moss Bluff, Texas and Port Barre, Louisiana. During the next three years, another GRC crew found ten domes for Gulf in Mississippi River delta region of southern Louisiana. Trudging equipment through the hot, fetid, and mucky swamps was no picnic for the crew led by Eugene McDermott. They had to contend with aggressive cottonmouth moccasins, leeches, and alligators. But the work of GRC party No. 2 revealed the hitherto virgin territory of Plaquemines, LaFourche, and St. Charles Parishes to be fertile hunting ground for seismograph operations. Gulf promptly drilled some of these prospects, many of which became major fields aggregating over 1.5 billion barrels of oil, but major development on most of them was postponed until after the depression (Owen 1975, p. 760).

Expanding rapidly and spreading its crews far and wide, Amerada's GRC firmly established itself as *the* seismic contractor in the United States, and especially on the Gulf Coast. In addition to its work for Gulf, GRC made its mark with another "water job" for the Louisiana Land and Exploration Company (LLE). This company was created in 1927 when Colonel E.F. Simms, a shrewd, independent oilman from Houston who had purchased from the State of Louisiana oil and gas leases on over 1 million acres of the coastal plain, joined forces with H.H. Timken, who controlled some 700,000 acres of fee land foreclosed from failed agricultural ventures. Shortly after its formation, LLE hired GRC for a seismograph survey of its vast holdings. Everette DeGolyer and Alfred Jacobson of Amerada joined the LLE board, making the interlocking

directorates of Amerada, GRC, and LLE, in the words of oil historian Edgar Wesley Owen, "an effective managerial mechanism for the venture" (Owen 1975, p. 761).

It was an ambitious venture, undertaken across swamps, lakes, and open bays. For the first time in the history of seismic exploration, surveying was conducted almost entirely from boats, with equipment adapted for underwater work. GRC crews mounted the recording apparatus in fishing luggers and at each of three recording boat locations pushed a single geophone into the soft mud with a pole. The explosive charge was lowered to the water bottom on similar boats or buried in a hole on shore. The results were astoundingly successful. Two GRC crews, surveying as much as 15,000 acres a day, discovered 9 salt domes (seven in Terrebonne Parish) in 16 months for LLE, culminating with the giant Caillou Island dome in April 1928. This feat was unequaled, before or since, in the history of geophysical prospecting in the United States (Sweet 1966, pp. 135-138; Dobrin 1952, p. 125).

LLE eagerly followed up its seismic exploration with drilling. But dry holes in Calcasieu Lake, Vermillion Bay, and East Hackberry placed the company in financial straits and left it unable to complete its planned drilling program. LLE board member Alfred Jacobson came to the rescue by negotiating a deal – the famous "28 Contract" – whereby the Texas Company subleased about 1.5 million acres of LLE holdings in return for cash, royalties, a percentage of future profits, and a promise to drill 4 wells on each of the 9 geophysical structures. The Texas Company proceeded to fulfill its drilling commitment, with moderate success in 1929-1930, especially at East Hackberry. It took at least another decade, however, after improved drilling and exploration technologies helped locate reserves, for the Texas Company and LLE to realize the vast amount of oil underlaying their leases. By the mid-1960s, the four most productive fields discovered in the deal – Caillou Island, Lake Barre, Bay Ste. Elaine, and Lake Pelto – had a combined cumulative production and remaining reserves of more than 1 billion barrels, "a rich return from 16 months of work by a few men trying out novel methods with rather crude equipment" (Owen 1975, p. 762).

After 1929, the technology and strategy of geophysical exploration in the Gulf Coast salt dome region moved into a new phase. The industry began to search for and discover more deep-seated salt domes, beyond 2,000 feet and ranging to 10,000 feet. Beginning in 1927, almost the entire Gulf Coast salt dome region was reshot with the torsion balance and refraction seismograph, but the drill did not achieve high rates of success until 1929, after Humble Oil and Refining Company's discovery of the Sugarland Field in Fort Bend County, Texas, which confirmed the importance of both exploration tools for mapping at depths around 3,500 feet. More new oil and gas fields were opened in 1929 than in any previous year, and the industry was even contemplating the use of geophysics to search for oil and gas bearing structures other than salt domes.

Geophysics as both a science and commercial enterprise was beginning to come into its own. In the mid- to late-1920s, several major oil companies established geophysical departments. Marland Oil had the strongest organization, led by William Haseman and E.A. Eckhardt, who had left the Geophysical Engineering Company. This, however, did not guarantee financial rewards for Marland, which was taken over by Continental Oil Company in 1928. Eckhardt then moved on to head a new geophysical division at Gulf Refining, another early adopter of

geophysical technology. The other notable geophysical group to emerge at this time was at Humble Oil. Organized in 1924 by the company's chief geologist and legendary oil finder, Wallace Pratt, Humble's group was unique in developing its own instruments and techniques rather than relying on outside contractors. This delayed Humble's progress but eventually made the company a major force in seismic exploration. In 1926, the Colorado School of Mines, with help from some oil companies, established the first department of geophysics to provide research and training for a new generation of petroleum explorationists (Owen 1975, pp. 506-510).

The new phase of geophysical exploration on the Gulf Coast was characterized, most significantly, by the commercialization of reflection seismology. After the war, the Geophysical Engineering Company had experimented with this technology in Oklahoma. GEC's founders – Haseman, Eckhardt, Karcher, and McCollum – along with their associates continued to build on this work in the 1920s. Developing a reflection technique was a main objective of the Geophysical Research Corporation, directed by Karcher, when it was created by Amerada in 1925. The reflection method offered much more seductive possibilities than refraction. Whereas refraction measured the differences in the velocity of energy waves through different rock strata, reflection measured the time it took for a wave to travel from the sound source at the surface to a hard underground layer and back to the surface again. An acoustic wave would be reflected or bounced back toward the surface, much like an echo, from any place where there was a change in the elastic properties of the medium through which the wave traveled. It was harder to interpret data from the refraction method because refraction waves travel in three distinct paths, in contrast to reflection waves which travel in only two paths. Moreover, the angle of refraction is governed by the relative velocity of sound at the interface of two different kinds of rocks, whereas the angle of reflection is geometrically determined. Using a series of recordings and a knowledge of wave velocities through various formations, the reflection method made it possible to plot the contour and depth of reflecting layers (Klotz 1952, p. 20).

Early reflection seismology had its flaws. Verifying reflections required correlating events from two or more seismic traces on separate paper records, cranked at different speeds. Equipment was too primitive to allow for easy discrimination between the desired reflections and undesired ones. When dynamite was exploded in a shot hole, the waves recorded by the geophones traveled along a variety of paths, the undesired ones creating what geophysicists called "noise." Acoustic waves were created by dynamite detonated in shallow holes dug by hand, and thus the effectiveness of the shot depended on near-surface soil conditions. Nevertheless, in the summer of 1928, GRC crews working for Amerada began obtaining strong reflections in the Seminole area of Oklahoma. As work continued into 1929, GRC rapidly improved its techniques, introducing better geophones, a new amplifier that rejected low frequencies, including surface waves or "ground roll," and drilling machines that dug shot holes to the water table. A second galvanometer on each camera simplified interpretation by providing for two traces on each record; later cameras recorded multiple traces. In 1930, Amerada discovered three substantial oil fields in the Seminole area based on structures mapped from GRC's reflection surveys (Owen 1975, pp. 510-511).

The reflection method had so proved its worth that Amerada's president, Alfred Jacobsen, wanted to limit GRC's reflection parties for the exclusive benefit of Amerada. The company's chairman, Everette DeGolyer, strongly disagreed. DeGolyer argued that GRC could not hope to

keep this powerful technology from competitors for long and that the best way for GRC to maintain its virtual monopoly on the seismograph business was to offer reflection crews to other firms, thus continuing to bring in substantial revenues for the parent company. This policy would prevent, at least in the short term, rivals to GRC, which employed approximately 70 percent of all seismic exploration scientists in the world. Jacobsen prevailed, and GRC placed its seismic crews exclusively at the service of Amerada. This provoked DeGolyer's eventual resignation from the company, but not before he secretly financed the creation of a new independent contracting company, Geophysical Service, Inc. (GSI), headed by Karcher and McDermott, both of whom resigned from GRC in early 1930. Many other GRC men joined GSI, which became an instant player in seismic exploration. On the eve of World War II, GSI fielded 28 crews working on several continents. By the 1950s, GSI had become the largest geophysical company in the world and the leading innovator in seismic technology. In addition, the company's research into transistors and electronics spawned the renowned technology giant, Texas Instruments, Inc., which would grow to overshadow and become the parent of GSI (Sweet 1966, pp. 122-125; Lawyer *et al*. 2001, pp. 17-18).

Still other GRC employees left to start new geophysical companies. During the 1930s, more than thirty U.S. seismic contracting firms appeared, many of which could trace their lineage to GRC or GSI. In 1933, Henry Salvatori left GSI to form Western Geophysical Company, which would become GSI's chief competitor and even eclipse it in size by the 1970s. The main exceptions to the GRC-GSI ancestry included United Geophysical Company, GSI's largest competitor in the 1930s and headed by Herbert Hoover, Jr., and the San Antonio-based Petty Geophysical Engineering Company. Established in 1925 by Dabney Petty, associate state geologist for the Texas Bureau of Economic Geology, and his brother, Olive Scott, Petty Geophysical developed its own seismic instruments and became a technical innovator in the industry.

Reflection seismic transformed the business of petroleum exploration in nearly every oil region in the United States. Its greatest economic impact, however, was on the Texas-Louisiana Gulf Coast, especially after the development of "dip-shooting."[2] First carried out by a GRC crew on the Darrow field in 1928, dip shooting involved placing geophones in opposite directions of the shot point and measuring the differences in arrival times. The presence of steep dips in sedimentary beds thus could be detected. "A new vista of the petroleum potentialities of the Gulf Coast petroleum province of Texas and Louisiana has been opened by the developments of the past few years," wrote Donald C. Barton, in a 1930 appraisal for the American Association of Petroleum Geologists. A pioneer in Gulf Coast geology and geophysics with Amerada and Humble before striking out on his own as a consultant, Barton described the expansion of the salt-dome and Tertiary producing area southward and eastward, venturing a radical upward revision of recoverable reserves from only two years earlier when he had estimated them to be 2.3 billion barrels. "The ultimate production of oil in the area," he now wrote, "surely will be at least 3.5 billion barrels; probably at least 5.5 billion barrels; and possibly at least 10 billion

[2]In the 1930s, the courts sorted out the question of patent rights to the reflection seismograph. In 1933, the Texas Company, having purchased the McCollum and Mintrop patents, invited all users of seismic technology to pay royalties and a year later sued the Sun Oil Company for infringement. Litigation was settled out of court in 1937 and cross-licensing agreements involving other patents helped further commercialize the technology.

barrels." This proved to be a discerning guess. Although for some years Barton appeared to have placed too much faith in the impact of geophysical technology, by 1965 cumulative production plus proved reserves along the upper Gulf Coast, excluding offshore, was 15 billion barrels (Barton 1930, p. 1,380).

In the early 1930s, reflection surveying slowly but steadily demonstrated its effectiveness in detailing deep Gulf Coast prospects which the refraction seismograph and torsion balance had indicated with less precision, such as the Iowa field in Louisiana (Vacuum, Shell) and the Tomball (Magnolia-Vacuum, Humble) and Anahuac (Humble) fields in Texas. On the heels of these discoveries, oil companies set out to reevaluate one dome after another with reflection seismic. Even during the great depression, with the price of oil plummeting, reflecting crews and leasing agents were busy throughout the region. Detailed mapping with the reflection seismograph required much closer spacing of shots and detectors. But improvements to equipment and technique – most notably "continuous profiling," which recorded a continuous set of reflection points along a profile line, as opposed to "correlation shooting" or "spot shooting" – increased the speed and decreased the cost of surveying, making the reflection method economical for wider-ranging reconnaissance. California inventor and geophysicist Frank Rieber developed the "sonograph," based on the technology used in early talking motion pictures, which recorded the seismic traces as reproducible sound tracks and subsequently reproduced them in phased combinations and through filters that reduced interference noises. Along with the discovery of the great East Texas field, reflection seismic work in south Texas and Louisiana turned the decade of the 1930s into the most prolific period for oil discoveries in U.S. history. In 1940, GSI geophysicist E. Eugene Rosaire estimated that the reflection seismograph had found 131 fields on the Gulf Coast, many of them major ones, at an average geophysical cost of $164,000 per discovery (Owen 1975, pp. 511-514 and 794-797; Lawyer *et al*. 2001, pp. 21-24).

The technology was not foolproof. It yielded many dry holes, and success rates in some places were no better than other methods of prospecting. Some geologic areas simply did not lend themselves easily to reflection. Soft, unconsolidated sands in many places on the Gulf Coast did not generally provide strong reflections. Most crucially, early reflection techniques had problems detecting faults, which became a serious concern as evidence by the late 1930s was showing that fault blocks were more productive than salt domes. However, ongoing innovation and refinements to the technology, especially in continuous profiling, which enabled more accurate mapping of faulted horizons, would ultimately give the reflection seismic method much broader range along the Gulf Coast and into the Gulf of Mexico.

The revolution in technology brought about by the reflection seismograph also effected a striking change in exploration strategy along the Gulf Coast. New capabilities for detailed geophysical prospecting accelerated the pace of wildcat leasing. Rival companies who could not afford or obtain seismic crews, which were limited in number, deployed large numbers of scouts to monitor the crews working for the companies who could – namely, Gulf, Humble, Shell, Pure, and LLE/Texaco. "Seis scouts" looked for any signs of unusual activity that might suggest the existence of a dome. Remembered O. Scott Petty: "If, for example, a crew should shoot a cross fan at an angle to one they had already made, that was fatal. The first scout to learn that would phone his company and within hours they might have lease men trying to lease the area where

the fans crossed." Crews tried various kinds of evasive maneuvers to shake the scouts, such as changing their working hours, making decoy shots, and spreading false rumors. "Of course there was lots of bribery going on too," added Petty. "Sometimes the company that found the dome got less acreage then their competitors. So – anything went in those days. You had just better be smart enough to outwit the other fellow" (Petty 1976, p. 21).

To prevent cherry-picking by watchful competitors, larger companies increasingly found that they needed a lease on the land instead of a mere permit before they began a survey. In 1927, Humble Oil adopted a new policy of leasing large blocks of land as a strategy of conservation and as a remedy to the problem of competitive drilling. With fast-improving seismic technology and the growing influence of geologists in its organization, the company extended this policy during the depression and broadened its leasing. It obtained large semi-proven and wildcat leases all along the Gulf Coast. In 1933, most notably, Humble took a 20-year lease on the million-acre King ranch in south Texas. "A ranch of over a million acres was bound to contain at least a few oilfields," explained John Bonner to fellow Humble Oil directors who were skeptical about the deal. It contained more than a few. During the next several decades, the world's most famous cattle ranch also yielded an abundance of oil and gas fields. Humble Oil's aggressive leasing strategy, combined with the company's increasing sophistication in reflection seismology, allowed it to reach, in the words of Everette DeGolyer, a "paramount position as a holder of domestic oil reserves." Humble's record of acquisitions and discoveries along the Gulf Coast during the 1930s remains one of the most impressive achievements in the history of American oil exploration (Sweet 1966, pp. 174-175).

As the reflection seismograph revealed the great oil and gas potential of the Gulf Coast, the race to acquire geophysical information and leases intensified, even as economic conditions in the nation worsened. The center of gravity in Louisiana's oil industry shifted decisively to the southern region of the state. By the early 1930s, southern Louisiana's prorationing allotment (a limit on aggregate production established by an interstate compact in 1933) was double that of northern Louisiana. (More often produced - "hot oil" schemes of Long machine) As one newspaper account described the scene, "trucks rumble through the streets, restaurants are crowded, hotels are filled and business houses are busy. Out in the network of navigable streams, barges and boats of all descriptions are traveling to and from the marshland fields and seaplanes dot the skies" (quoted in Franks and Lambert 1982, p. 184).

Oil companies were not the only ones who aimed to profit from this oil potential. The most brazen bid was made by "Judge" Leander Perez, long-time district attorney and ruthless political boss of the deep-delta Louisiana parish of Plaquemines, which embraces the mouth of the Mississippi River. "A stubby, 125-mile-long thumb of lushly green, creamy delta earth, Plaquemines pokes out into the Gulf of Mexico, spurting out the Mississippi as from the nozzle of a hose," wrote a *Collier's* feature in 1949. "Plaquemines contains fabulous riches of oil, sulphur and natural gas, much of it on public lands. But most important for Plaquemines' fame: it is the bailiwick of Leander H. Perez" (Velie 1949, p. 10). In 1929, shortly after oil had been discovered in Plaquemines by GRC Party No. 2 for Gulf Oil, Perez helped Governor Huey Long defeat an impeachment attempt in Baton Rouge by devising a filibuster strategy and arranging "rewards" to local legislators. In return, Long assisted Perez's attempt to seize the potential oil wealth of Plaquemines Parish.

This required complex legal and financial machinations. The public lands in question had been deeded by the state in the late nineteenth century to levee boards organized into statewide districts. The levee boards, somewhat of an anachronism since the Army Corps of Engineers had taken over levee work elsewhere, used revenues from leasing and taxing the deeded land to finance the construction of levees. The problem for Perez was that the Governor's office controlled the levee boards through appointments. Huey Long was understanding, however, and helped Perez push through a harmless seeming piece of legislation at the state house in Baton Rouge which amended Louisiana's constitution to permit local police juries to assume the bonded indebtedness, and consequently the assets, of levee districts within the parish. This amendment opened the way for Perez, who controlled the police juries. As oil companies came calling for permission to lease and drill on levee board lands and as financial control of those lands passed to police juries, Perez frantically organized numerous land corporations, technically owned by friends, family members, and cronies. All chartered out-of-state, thus making them difficult to trace, with anonymous officers and stockholders, these dummy corporations developed a remarkable knack for obtaining leases from the local boards for nominal fees. Perez acted as legal advisor to the boards and also earned "legal fees" from representing the land corporations, which would then sublease the land to oil companies for a price much higher than the original lease plus an overriding royalty of typically 1/16 or 1/32 of all production if oil were discovered. And it was discovered. By the late 1940s, Plaquemines was producing ten percent more oil than any other parish in Louisiana (Smith 1958, p. 152; Sherrill 1968, pp. 12-13; Jeansonne 1977, pp. 74-77; Velie 1949, p. 11).

Thus did Perez, nicknamed the "Swampland Caesar" or "Delta Dictator," amass his legendary fortune and expand his political power. The judge would subsequently wield his power not only locally over almost every aspect of life in the so-called "rotten boroughs" of Plaquemines and neighboring St. Bernard parishes, but statewide and nationally on behalf of segregationist organizations such as the Dixiecrats and White Citizens' Councils. After World War II, he would lead the fight against federal control over submerged lands offshore. Beginning in the early 1930s, all oil companies operating in the deep delta, including prominently Shell, Texas, Humble, Gulf, and the California Company, became beholden to Perez. They "handled him like a demijohn of nitroglycerin," wrote *Fortune* magazine in 1958. "If they want to lay a pipeline or put up a terminal in Plaquemines, Perez has the power to block them. If their leaseholds are being challenged, as consistently a hazard of life in Plaquemines as the cottonmouth moccasin, then Perez may be behind it – and what they can save of their holdings lies substantially in his hands" (Smith 1958, p. 144).

Rather than discouraging the hunt for oil, the proliferation of leases along the Gulf Coast held by the more aggressive and deep-pocketed oil companies or by opportunistic, if not boldly corrupt, political barons like Leander Perez, provided new inspiration to enterprising companies and wildcatters who were either lease poor or aggressive explorers. In the mid-1930s, some paused and cast their sights over the unexplored and unclaimed waters of the Gulf of Mexico. After all, no evidence suggested that the subsurface offshore would be radically different than onshore; fields producing in the delta were further out on the continental shelf than a good part of the marine area. In 1927, David White of the U.S. Geological Survey predicted that exploration of the salt domes underlying the continental shelf would yield large oil fields. Drilling was already

underway in bays, swamps, and lakes, and the shelf sloped so gradually in the Gulf that a person could wade out as far as the eye could see and still keep a head above water. In 1937, F.P. Shepard delivered a paper to the Geological Society of America, calling attention to 26 topographical features that protruded prominently on the ocean floor of the shelf. It did not take a large leap in imagination to see them as salt domes.

"A lot of people were thinking about it in the 1930s," remembered Tom Barrow, a pioneer in offshore exploration for Humble and Exxon. "My father was head of Humble's exploration group, and I can remember trips down along the coast from Galveston to Beaumont, and his talking about the fact that you could see some of the effect of the salt domes onshore. And he made the comment that the present shoreline is a temporary phenomenon . . . He said, 'There have to be salt domes out there'" (Shepard 1937; Barrow, personal communication, 2001, pp. 10-11).

2.3. Pirogues, "Pack Mules," and Marsh Buggies

In truth, oilmen began addressing the challenges of marine environments long before they began to think seriously about drilling offshore in the Gulf of Mexico. Exploring such environments tended to be a gradual and incremental process, involving the adaptation of land-based equipment and technologies to particular locations. As early as 1896, companies had drilled in ocean waters from piers extending off the beach at Summerland, California. In 1911, Gulf Oil drilled the world's first oil well in inland waters at Caddo Lake, Louisiana -- the first truly "offshore" well, detached from the shore -- and subsequently built numerous structures on wood pilings there using a fleet of tugboats, barges, and floating pile-drivers. Following on these precedents in the late 1920s, the Soviet Union constructed extensive trestle systems offshore from Baku for drilling in the Caspian Sea, and oil firms found a solution to Venezuela's teredo-infested Lake Maracaibo by installing platforms on reinforced concrete pilings (Lankford 1971).

Southern Louisiana added another level of difficulty for even the most intrepid oilmen. Swamps, marshes, and shallow open water, all difficult to classify strictly as land or water in many places, posed frustrating transportation and operating problems. In his survey of the history of marine drilling, Raymond Lankford explains the problem:

> There were no roads in the marshes, no bridges over the bayous, no bases from which to move out into the bays. That whole expanse from Calcasieu Lake to Breton Sound was a sort of nature's no-man's land, neither land nor sea. A steamboat ran from Lake Charles to Cameron; the road would not be built until the mid-1930s. . . . Even the largest oil companies regarded the cost of building roads and bridges prohibitive. Transportation of personnel by boat and barge was difficult (Lankford 1971).

Even if exploration and drilling crews could survey, test and get to a location, the costs of moving in equipment, rigging up, and tearing down was so high that in the 1920s southern Louisiana discouraged all but a few companies.

Two in particular, Texas and Gulf, braved the challenges. But they and the companies that followed them into the region had to make fundamental adjustments not demanded of previous marine work. To a greater extent than elsewhere, they had to tap into local knowledge of the confusing and forbidding terrain. And they had to develop new and innovative means of transportation to enable surveying and drilling in wetlands where it was too hard or too expensive to establish fixed foundations.

Geophysical explorations did much of the advance work in defining the problems. Although a few salt domes had been discovered and developed prior to the 1920s, serious and sustained exploration of the wetlands surrounding those and other domes did not get under way until the geophysical campaign of 1925-1930 initiated by GRC crews for Gulf Oil and LLE/Texaco (see above). A crew would typically rent boats and hire laborers and guides in the small Cajun communities where people traditionally made their living variously by fishing, shrimping, crabbing, frog hunting, muskrat trapping, salt mining, or harvesting sugar, rice, tobacco, moss, or oysters. A typical Shell Oil seismic crew in the 1930s included ten specially trained seismologists and technicians and 6 to 30 helpers or laborers hired from the community. Typically, crews would live on quarter boats for 10 days while they were on a job and then have four days off. Residents of these insular communities initially looked with understandable suspicion upon the outsiders hauling strange geophysical equipment and large magazines of explosives into their midst. But party chiefs offered relatively good money, which was difficult for available hands to pass up as hardship hit rural economies such as southern Louisiana beginning in the late 1920s.

Where waters were deep and open enough, the outsiders rented boats and mud scows to transport their equipment to desired locations. But in the wooded swamps and thick marsh of the Bayou country, geophysical crews turned to methods and equipment used by muskrat trappers. The trappers relied on flat-bottomed *pirogues* (pronounced pea-rogue) to navigate *trainasses* (French, meaning "to drag"), tiny canals often carved out of the swamps and marshes by hand with the aid of a pirogue paddle. A French adaptation of the canoe, a pirogue was constructed by scooping out a tree log, 6 to 20 feet long, which yielded a boat light enough to ride "on a heavy dew." They were generally propelled by men standing in the stern and bow pushing against the bottom with long poles. Equipment was loaded onto the pirogues and pushed or towed along the trainasses and winding, narrow water courses maintained by trappers. "You know, we benefitted from the trappers," remembered Pete Rogers, a long-time Shell hand who joined the company in 1935 (Rogers, personal communication, 2002, p. 9). Often, however, thick vegetation prohibited boat traffic, and everything had to be carried by foot after parking the boats in a nearby inlet. With their pant legs tied tightly to protect against snakes and leeches, laborers would trudge along waist-deep in swamp water dodging cypress roots and saw-toothed palmetto leaves. "Instruments, explosives, pumps and pipe for drilling, cables, and all the other paraphernalia of the seismologist's art must be carried distances often of miles, and at a rate rarely exceeding one mile per hour," wrote a *Shell News* feature from 1939. "These are the longest miles in the U.S.A.! The number of helpers in a crew is generally measured by the difficulties to be overcome in local transportation" (*Shell News* 1939, p. 15).

This was suffocating, back-breaking, and dangerous work, especially as exploration techniques changed from the torsion balance to the seismograph and all the heavy instrumentation and

equipment it entailed. "In the mountains, they used these pack mules; well, that's what we were in the swamps," recalled Nelson Constant, who worked on survey and geophysical crews for several companies. "We had motors and pipes that we had to carry on our backs. We had all these instruments" (Constant, personal communication, 2001, p. 6). Not to mention cases and cases of dynamite. When they reached a location, still submerged up to their armpits, a crew would set out the geophones, or the "jugs," very sensitive equipment that had to be handled with great care. "Every 200 feet we'd put a yellow flag, and that is where we'd put one of these jugs," said Constant. "Then we'd go 1,200 feet and we'd put out a red flag and that would be a shot point" (Constant, personal communication, 2001, p. 5).

With the jugs planted and cables rolled out at the recording locations, the next job was to wrench a heavy section of casing into the muddy floor at the shot location and pump water at high pressure into the casing to make a shot hole for the dynamite. Then, anywhere from 5 to 50 pounds of dynamite were set and detonated in the hole, the explosion creating a tall geyser of water, mud, and plant particles. "No job would be complete without its own peculiar assets and liabilities," wrote *Shell News*. "'Dynamite's' job has in its favor a lack of monotony and a constantly changing scene; but ask anyone who has contracted a dynamite headache through breathing too freely the fumes of an explosion and he will have no difficulty in naming at least one liability"(*Shell News* 1939, p. 15). Dynamite posed ever-present risks for the hearty crews, and not just from being too close to an immediate blast. Explosions could leave large craters in the mud floor, often 30 to 50 feet wide in diameter. "If you didn't know about it, and you walked across it, you'd go right on down," explained Constant. "And if you had a load on your back, it was pretty doggone hard to get up again out of the water" (Constant, personal communication, 2001, p. 25).

The rewards of this work outweighed the risks for many young men in the Bayou communities. It offered decent pay and opportunities for advancement and the acquisition of new technical skills. When asked why he did not immediately return to easier work at his father's store, Nelson Constant replied: "Once I got in there, I liked it. I really did. Maybe after a year, I don't believe they could have kicked me out if they wanted to" (Constant, personal communication, 2001, p. 6). Men like Constant developed a new sense of self-worth, as this dynamic enterprise of geophysical exploration drew on their knowledge and talents. The companies hired them as surveyors and permit men as well as "pack mules." They applied their familiarity of the local terrain and people to determine lease lines and help the companies acquire permits to explore outside the leases. Constant had experience cutting property lines in the swamps and he spoke Cajun French. So when he went to work for a Humble crew, he was soon assigned as a guide and translator to the company surveyor/permit man, and quickly succeeded to this position. Obtaining permits to survey from local landowners was much easier from a fellow rural, French-speaking Cajun than it was from an English-speaking company man from Texas. "In some cases," Constant recalled, "contract companies had come out and busted up their roads and fences and one thing or another." Other residents were worried about protecting their oyster beds. "Some guys would say, 'I'm not going to let you have it [the permit].' So I just stayed and talked with them and just kept talking and let them get it all out. First thing you know, they almost asked you to go ahead and do it" (Constant, personal communication, 2001, p. 3). Constant's facility with the land and people was such that within a year or two he had acquired

wide-ranging responsibilities, which included hiring local laborers, arranging locations for boat landings, and drafting maps of bayous, property lines, and oyster leases.

The average cost of operating a seismograph party in the Louisiana low country was substantially higher than on dry land. In 1939, Shell Oil estimated the difference to be $350/day versus $250/day. Moreover, the acquisition of data was much slower in the swamps and marshes. Increased mobility, therefore, was the key to cheaper and more efficient operations. As was often the case in oil and gas operations in coastal and offshore Louisiana, homegrown innovation offered the needed solution. One of the most notable contributions made by Southern Louisianans to increasing the mobility of petroleum exploration in the wetlands was the "marsh buggy." Although it is not clear who originated the idea, in the 1930s, trappers in the Mermentau Basin first deployed a motorized, large-wheeled contraption, called a "slat-wheel buggy" (the name marsh buggy was applied later), to travel over Chenier Plain marshes dominated by heavy grass cover. A lightweight Model A Ford truck with extended axles and wagon wheels fitted with four- to five-feet wide wooden slats, the first buggies functioned well in mashing a trail across marsh grass, but lost traction and bogged down in wetter and muckier areas. "They sure saved us a lot of leg work," remembered Pete Rogers. But they "could go underwater and we'd have to dig them out" (Detro 1978, p. 8; Rogers, personal communication, 2002, p. 8).

It did not take long, however, for enterprising souls to find modifications that provided buoyancy and expanded the use of marsh buggies into the Deltaic Plain. In the mid-1930s, Gulf Oil designed a model with rubber tires 10 feet in diameter and 3 feet thick, known as the "Gulf Marsh Buggy" or "balloon buggy-boat." Used mainly by geophysical crews, the Gulf buggy achieved widespread notoriety for its ability to function in a variety of wetland environments. Gulf chose not to manufacture and offer the vehicle commercially, but other pioneers continued the process of innovation. During World War II, Higgins Shipyards in New Orleans developed three different models and the McCollum Exploration Company in Houston produced a propeller-driven version. Oil and gas companies, such as Shell Oil, Stanolind Gas, and United Gas, all designed their own buggies. One of the most successful designs was by Andrew Cheramie, who after World War II patented a marsh buggy design which consisted of a tractor mounted on giant pontoon wheels. With ribbed and troughed treads, these wheels propelled the buggy as fast as 10 mph in marsh and water and up to 30 mph on land. Others introduced models with caterpillar track revolving around flotation pontoons. "Within a few years," writes Randall Detro, "the coastal wetlands were being crisscrossed regularly by seismograph crews on marsh buggies, towing their equipment on sledges" (Detro 1978, p. 97).

Marsh buggies facilitated the penetration of geophysical crews, and behind them drilling and pipeline operations, into the marshes of southern Louisiana. This advance force of the oil and gas industry managed to conquer some of the forbidding elements of the wetlands, but not without environmental consequences. Trappers complained that buggy wheels damaged habitat and destroyed "sets" (traps). The marsh was resilient and often grew back. "We once went back to these areas that we had torn up," recalled Willy "Dub" Noble, a longtime Humble seismograph crewman, "and it was in 3-4 times better condition than the surrounding marsh because we had stirred up this floating marsh stuff. When it grew back, it was a beautiful pad. You could walk all over that" (Noble, personal communication, 2001). Still, trails that received

repeated use left deep and lasting incisions. Over time, as tracks, canals, and pipelines spread throughout the marsh, open water areas expanded, breaking up natural barriers and leading to tidal scouring and increased water salinity. The transition to less-destructive track-type buggies by 1960 helped minimize some of the damage from exploration. Still, marsh buggies, drilling rigs, and pipelines were there to stay, and the development of oil and gas on a large scale in this region permanently altered the environment of southern Louisiana, contributing to the increasing submergence and disappearance of vast areas of marshland which greatly threatens the survival of Cajun communities today (Detro 1978, pp. 97-98; Tidwell 2003).

2.4. Exploratory Drilling from Wetlands to Open Water

Geologists and geophysicists were responsible for finding structures and potential oil-bearing formations, but, as the old adage goes, the driller was the one who found the oil and gas. And the environment of southern Louisiana was no more inviting or yielding to the driller than it was to the geoscientist. "It is natural to assume that oil men chiefly know oil, but the type of worker engaged on the water locations of The Texas Company in Southern Louisiana is guilty of no such limitations," wrote the *Texaco Star* in 1930. "He not only has to know oil, but he must be reasonably conversant with the higher forms of construction engineering and have a workable appreciation of what it means to be a sailor" (*Texaco Star* 1930b, p. 27).

In the late 1920s, drillers faced a host of new challenges as they tried to move rigs from dry land to marshes and bays. Soft, mucky silt in these areas could not tolerate the same kinds of loads that hard-ground soils could. "In these coastal marshes," wrote F.C. Embshoff of the *Shell News*, "where the land is scarcely more than a series of floating dirt rafts insecurely anchored by vegetation, there is nothing solid upon which to build a derrick" (Embshoff 1938, p. 4). Compounding this problem was the fact that drilling objectives in southern Louisiana were located at greater depths, thus requiring more drilling pipe, casing, and heavier equipment. In the marsh, drillers resorted to constructing huge "mats" made out of timber upon which to place derricks, tanks, and boilers. In the open waters of bays and lakes, drawing on experience from places like Lake Caddo and Lake Maracaibo, drillers placed their equipment on planks supported by a foundation of numerous piles driven deep into the silt bottom. At Dog Lake, where in 1929 Texaco brought in the first commercial production from its 28 Contract sublease and the first production in Terrebonne Parish for the industry, the company built a foundation of 52 cypress piles, each sixty feet long, to support the drilling of its first well (*Texaco Star* 1930a, p. 5). Large expenditures of time and money were required to prepare the location and foundation, construct heavy board roads, move in, rig up and tear down the derricks and associated equipment, and then haul them to a new location. For all but a few companies, these expenditures were prohibitive for exploratory drilling.

After a couple years of drilling prospects in this costly manner, G.I. McBride, an engineer in Texaco's Shreveport division, envisioned the possibility of achieving mobility in wetland drilling using a barge, equipped with a derrick and drilling equipment, that could be floated and submerged as a stable drilling base, thus eliminating the time and expense of fixed foundations. In pursuing this concept, Texaco discovered with amazement that it had been patented four years earlier by Louis Giliasso, a native of Italy and captain in the merchant marine. Giliasso conceived of a "practical apparatus for drilling oil wells in lake bottoms and other submerged

lands" after having observed the difficulties encountered by oil companies in establishing foundations for drilling operations in Lake Maracaibo, Venezuela. A months-long search eventually found Giliasso operating a saloon in Colon, Panama. In 1933, Texaco coaxed Giliasso back to the United States and obtained an agreement whereby the company acquired an exclusive license to use the submersible barge and the right to license it to other companies. Soon, a barge christened the *Giliasso* was floated from a shipyard at Leesdale, Pennsylvania, down the Ohio and Mississippi Rivers to Lake Pelto in Terrebonne Parish, Louisiana (Lankford 1971).

The *Giliasso* was constructed by fastening together the twin steel hulls of two standard transportation barges, leaving space in the middle for drilling. Concerned about the risk attendant upon use of the first unit, Texaco decided to use two barges which could be salvaged in case of failure, rather than design an odd-shaped barge for this single purpose. Towed to location, the lower compartments of the hulls were flooded, sinking the barge to the bottom. The upper compartments remained above the water and provided a platform to hold the drilling structures, equipment, and power plant. The *Giliasso* demonstrated its drilling capabilities immediately in Lake Pelto, reducing by 20 percent the time spent on a well not related to drilling or completing, and afterward proved its ease of mobility in being towed to Lake Barre. By 1935, Texaco had built and deployed a fleet of seven such barges along the Louisiana coast, each drilling 6 wells per year. G.I. McBride estimated that the barges provided an annual total saving over ordinary pile-supported structures of $600,000 (McBride 1935).

Other companies followed Texaco's pioneering example, and by the late 1930s dozens of "floating derricks" could be seen moving through the bayous and newly constructed canals of south Louisiana. By 1938, the industry had drilled 3,300 wells in parishes adjacent to the Gulf, 700 of which were surrounded by water. The most active areas were in the Lake Barre, Terrebonne Bay, Pelto Bay, and Timbalier Bay areas of Terrebonne Parish (Flood 1939, p. 98). Success with mobile drilling led oilmen to ponder cautiously the utility of submersible barges in the open waters of the Gulf. "The present design is adequate for territory inside and in water up to 10 feet deep out in the Gulf," claimed McBride in 1935. "We feel that, for drilling a well beyond the last sand bars, drilling barges offer the only satisfactory protection to equipment exposed to Coastal storms. We prefer for the present, at least, not to try to predict the size and shape of barges which might venture well out into the Gulf" (McBride 1935, p. 45).

Nobody as yet, however, was willing to tempt fate in the Gulf by trying to drill from a barge. But in the late-1930s companies did begin to experiment with drilling in open water using "land operations." In 1932, the Indian Oil Company, drilling off Rincon, California, became the first company to drill in the ocean from an independent platform supported on pilings. A few years later, a joint operation by Pure Oil and Superior Oil placed a similar structure in the Louisiana Gulf. The project began in 1934 when geologists from the Pure Oil Company discovered evidence of salt domes west of the little town of Creole, Louisiana. Further surveying with reflection seismic along the shore suggested that the prospect extended out into the Gulf. In 1936, Pure and Superior persuaded the State of Louisiana to lease the combine 7,000 acres on land and 33,000 acres offshore. In 1937, the companies hired Brown & Root, an engineering and construction firm out of Houston, to construct a relatively massive (180 feet by 300 feet) wooden

platform for the Creole field in about 15 feet of water -- one mile from shore, thirteen miles from nearest supply point at Cameron (Lankford 1971; *Offshore* 1963, pp. 17-19).

As an exercise in "stickbuilding" – that is, using work barges to piece together a wooden structure out in the ocean, this project was only a distant cousin to the metal structures of later eras, but it helped oil men identify the key problems that would have to be overcome to operate in the Gulf. The most obvious of these was the impact of hurricanes. Lacking any reliable data on wave heights in the Gulf, the designer of the Creole platform settled for an interesting compromise made possible by the fact that the work force commuted daily to the platform and did not live there. He simply placed the deck at fifteen feet above water and sought to design it so that high waves would wash it away while leaving the remainder of the structure in tact. In March 1938, the Superior-Pure State No. 1 well brought in the first oil from "offshore" Gulf of Mexico. For an initial investment of $150,000, the Creole platform produced more than 4 million barrels of oil over the next 30 years. Money could be made offshore despite the many difficulties to be confronted (Alcorn 1938).

In view of the difficulties in loading and unloading crews at a free-standing platform, Humble Oil in 1938 constructed a pier more than a thousand feet out into the Gulf off High Island's McFadden Beach on the upper Texas Gulf Coast and drilled wells from separate platforms built off the end of the pier**.** Such piers, however, had a limited range and proved inadequate in the soft sands of the Gulf. So companies continued to experiment with free-standing platforms. In 1938, Standard Oil Company of Texas (a subsidiary of Socal) completed Texas' first offshore well a mile off Cedar Point in Galveston Bay. Three years later, British American Oil Company discovered oil two miles offshore near Sabine Pass in 17 feet of water. The same year, Texaco had a gas blowout off Coon Point, Terrebonne Parish, Louisiana. All these ventures were extremely tentative moves "offshore." They emerged from the exploration of coastal prospects and retained close operational ties to land. Only the Pure-Superior's Creole platform achieved production. Despite the costly failures of the other wells and resulting leeriness about offshore endeavors among some operators, others in the industry began to contemplate jumping in with both feet and extending their exploration activities into the open water horizon.

Progress in drilling technology and in developing inland fields in Southern Louisiana increased the allure of the ocean. In the late 1930s, the industry made revolutionary strides in improving rotary-drilling technologies, which allowed for the drilling of deeper wells with savings of cost and time. Improvements came cascading in all facets of drilling, including balanced rigs, internal-combustion-engine power, straight-hole drilling, drilling-rig instruments, mud control, retarded cements, electric logs, radioactive logs, side-wall coring, gun perforating, and drillstem testing. Electric logging was especially important to revealing subsurface details unobtainable by any other method. Developed in France in the late 1920s and introduced in the Gulf Coast in 1933, electric well logging tools lowered into a well hole measured the difference in electrical conductivity of oil, gas and water. Since oil and gas have different conductivity properties than water, this method was useful in locating hydrocarbons. Electric logs were also used to determine the permeability and porosity of formations. "Perhaps in no other region were they so indispensable as here [the Gulf Coast]," writes Owen, "distinguishing the otherwise indistinguishable sands, measuring the displacement of otherwise unsuspected faults, defining

structural attitude, and pointing out local facies variations and regional environments of deposition" (Owen 1975, p. 798).

Electric logs were crucial in providing the stratigraphic details and correlations of cross sections in the upper Miocene sands of coastal Louisiana. In the late 1930s, these sands yielded prolific oil production in the lower Mississippi delta region. Later called "one of the great deltaic accumulations in the world," these sands, thousands of feet thick, grew thicker toward the Gulf. Electric-log correlations and paleontologic and lithographic markers in the Miocene also improved as exploration moved Gulfward (Limes and Stipe 1959). Technical advances in drilling and logging helped make 70 new discoveries during 1936-1940 in southern Louisiana. However, the new finds did not add to the region's reserves as much as extensions and new producing sands in known major fields. Discoveries of large new structures slowed and drilling costs rose as a growing percentage of wells (36.5 percent by 1946) were drilled in water locations. The convergence of all these factors pointed in one direction – into the open waters of the Gulf.

In early 1941, consulting geologist O.L. Brace wrote: "It may be tentatively assumed that the Gulf of Mexico is a potential source of salt-dome oil . . . Whether or not it will ever be economically feasible to explore these waters for the domes that must exist is a question for the future to answer" (Brace, 1941, page 1,007). The future was not long off. Even though World War II and federal restrictions on new reservoir development, before the war was over oil companies would start sending seismic crews offshore in shrimp boats.

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3. IN THE WAKE OF WAR: WORLD WAR II AND THE OFFSHORE OIL AND GAS INDUSTRY

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Struggles for control over natural resources have been linked to many armed conflicts. In the 20th century, oil was a site of intersection for many competing economic and national interests (Harding 1995) and a domain for international relations (for a recent example, see Victor 2003). Particularly in the United States, where predictions and fears about oil resource exhaustion have helped to drive national policy since after World War I, oil has become a key element in wars, national security, and interest in oil-producing regions (Maugeri 2004; for example, see Le Billon & El Khatib 2004). Researchers often link the United States' preoccupation with oil back to World War II. As one of the first heavily mechanized wars, World War II demanded huge quantities of oil and the postwar period that followed saw large increases in consumer demand for petroleum-based products. However, researchers have yet to explore how the infrastructure, technologies, and materials produced during the war effort later contributed to oil production by providing the capacity for expansion into offshore waters. This paper examines the relationship between World War II and offshore oil and gas development particularly as it took place within the context of southern Louisiana.

3.1. Method

Connections between World War II and offshore development were made during a long-term project involving the collection of narratives from people associated with the oil and gas industry in southern Louisiana (see Austin *et al*. 2004). Throughout these interviews many references were made to the use of surplus World War II materials within the industry and to the critical and contentious period following the war concerning offshore waters.

To explore these links in more detail, 20 interviews were conducted by research team members from the University of Arizona in collaboration with the National D-Day Museum[3]; interviewees were identified because of their connection to both the oil industry and World War II, and most had been interviewed previously. Funding for the endeavor was provided by the United States Minerals Management Service; the National D-Day Museum provided personnel and equipment.

The 20 interviews were conducted at various locations (e.g. interviewees' homes, a VFW hall, a public library) in southern Louisiana during January 2005. The interviews followed a general format and were audio and video recorded. Generally the interviews were facilitated by a museum staff member and one or two University of Arizona team members. The museum staff member began the interviews with questions about the interviewee's childhood and experiences

[3] The National D-Day Museum was founded in New Orleans in 1991 and opened its doors in 2000. The museum pays tribute to the men and women who participated in World War II invasions. The museum is home to "Leave Your Legacy," a registry of stories and pictures left by individuals who experienced the war; they also collect full-length oral histories.

during and just following the war. A University of Arizona team member then asked questions concerning the connections between the interviewee's experiences in the war, war surplus materials, and offshore oil and gas.

The following sections explore the interviewees' narratives of their life experiences and the evolution of the oil and gas industry as they are grounded in a specific historical and sociocultural period. The account emphasizes the complex, yet explicit ways in which the war effort helped the oil and gas industry to make its first significant steps offshore in the immediate postwar years. It also discusses the individuals who provided the manpower for this effort and how these events fit into their lives.

3.2. The Setting before the War

By the time the French founded Louisiana in the late seventeenth century, the land had been populated by an array of Native American populations since at least 10,000 B.C. (Neuman & Hawkins 1993). Spanish and Acadian (French exiles from eastern Canada) settlers followed the original French colonists into the region (Ancelot *et al*. 1991). German-speakers from Alsace and Germany, along with English-speakers from Britain and the United States also arrived during the eighteenth century. Since the early colonization of Louisiana, the region has become home to an amazing collection of cultural groups, a virtual "cultural gumbo" (White 1997). Although there has been much intermixing, specific ethnic identities are still recognized.

Uniquely emblematic of rural southern Louisiana, the adaptive and resourceful Cajun culture was born during the post-Civil War economic depression (Rushton 1979). At this time, the region's agriculture was devastated by the postbellum depression, neglect, loss of capital, flooding, infestations, and changing labor markets (Brasseaux 1992). Some small farmers, particularly in areas of recurrent flooding, sought new occupations in fishing and lumbering; others found jobs as agricultural laborers. Although the concentration of landholding had been unequal prior to the war, the area increasingly became characterized by a small upper-middle and upper class and "the impoverished, poorly educated, but culturally steadfast masses" (Brasseaux 1992, p. 88). It was this latter class that would become known as the Cajuns and to which many of the men in this study identified (Jacques 1998).

In the few decades prior to World War II, southern Louisiana's economy was primarily based on agriculture, fisheries, and logging (Sanson 1999). Some also trapped fur-bearing animals such as muskrats, raccoons, and nutria (Ancelot *et al*. 1991). As elsewhere in the country, the region was affected by the Great Depression (Sanson 1999). Many of the men who grew up during this period shared stories of difficult childhoods that required they assume responsibilities for their families at an early age. For many, education was of low priority in the face of daily struggles for survival.

The following summaries illustrate the connections between family economic conditions and the educational and occupational opportunities available to the young men and their families.

Wenceslaus Billiot was born in 1926 on Isle de Jean Charles. His mother died when he was nine and he had to quit school after fifth grade in order to go to work with his father. When he was 15,

he went to work at Delta Farm in Larose and picked cotton and cut sugarcane by hand, after which he began trawling and fishing for oysters out of Grand Isle.

Laurie Vining was born in Morgan City in 1924. As a child he would go out with his father to trap and float timber. His father moved the family around as he gained employment doing a variety of things (e.g., trapping, carpentry, and fishing). Because of the constant moving, it took Laurie a long time to pass grades in school and he quit after the seventh grade. He then went into shrimping and eventually ironworks at Chicago Bridge and Iron.

In 1924, Charles Wallace was born in Kinder, near the Texas border and Lake Charles. His father worked for the railroad and his mother worked for some time as a teacher. His father died when he was 11, forcing him to grow up quickly: "I had to do everything that needed to be done. Just like I was a grown man." Nevertheless, he was able to graduate from high school in 1942.

Born in 1923, Antoine Francis was one of 11 siblings. While in the fourth grade, his father fell ill and he was forced to drop out of school:

> AF: I went to school up to the [pause] I was promoted to the fourth grade. That's the highest I've been.
>
> INT: Did you want to go more?
>
> AF: Yeah, but we couldn't go any longer, 'cause we had to work. My daddy was sick and I had another brother who's older than me and he also had to work. We had to fish and sell the fish or sell the crab so we can get some money so we can live on it. (Antoine Francis, 01-19-05)

Harold Dugas grew up on a sugarcane farm 10 miles northeast of New Iberia and recounted the poverty that was so prevalent during his childhood:

> When I was growing up as a young boy, you know, in the 1930's, things weren't like they were in the cities. Of course, everybody was poor at that time. I mean, we were poor. I mean, we just didn't have anything. My daddy got wounded in WWI, so he had a little pension—a government pension—and he was a sugarcane farmer. Not big, small—they're all small—and they didn't have tractors at that time. All they had were mules, you know? Mule power. (Harold Dugas, 05-03-01)

During Dugas' junior and senior years his dad had to pull him out of high school for six weeks so that he could help with the harvest. They didn't have electricity, so studying at night was difficult. Despite the challenges, Dugas did the best he could and ended up valedictorian of his class.

One of 10 children, Cecile Grow was born just west of Morgan City in Patterson, in 1933. She grew up on a houseboat, with no running water, gas, or electricity: "it was tough, but we were lucky because we all were happy" (07-18-00). Like Dugas' father, her father had been wounded in World War I, leaving him with a "bad heart" and difficulty breathing. Until her father got a

job with Chicago Bridge and Iron during World War II, the family's sole income was her father's monthly 30 dollar pension.

Growing up near Houma in Bourg in his grandfather's "old Cajun house," Ed Henry recalled the dearth of employment opportunities during the Great Depression. Luckily for men like his father and men before him, southern Louisiana's rich natural resources provided material for making a living.

> Well, my father was a trapper. There were no jobs in the area at that time and you had to create something for yourself, more or less. And there was sugarcane planting, [you] had the, you know, deliveries whatever, you could work the fields. But in the winter time they were out in the marshes for a couple of months and caught muskrats, and mink and opossum and cougars and whatever. (Ed Henry, 01-24-05)

3.3. The Beginnings of the Oil Industry in Louisiana

The pioneering era of the oil industry in the United States South has been popularly remembered as "rough and tumble," and a time of possibility and exploration (Jones 1981). Louisiana's first oil well was drilled in Jennings in 1901 (Jones 1981). While the petroleum industry's presence was not as omnipresent within the region as it would become in the post World War II years, it provided new job and career opportunities, and perhaps a new adventure, for locals. At the same time, it brought in experienced drilling crews from other areas of the country.

Men from Texas, Arkansas, Oklahoma, and northern Louisiana were collectively labeled "Texians" and outsiders by locals. While the Texians generally assumed jobs directly concerned with drilling operations, locals were recruited to help navigate and negotiate area waterways (Austin *et al*. 2004).

In 1936, Shell Oil Company was exploring the swamps around Morgan City. Although born northwest of Houma in Gibson in 1911, Jake Giroir moved to Morgan City when he was in the eighth grade and knew the areas swamps well because of his hunting excursions and work in the sawmills. A Shell employee asked Giroir about several of the swamps and hired him onto one of their crews.

Ed Henry recalled that his father, who had been involved in trapping, first went to work for The Texas Company (later Texaco) as a deckhand in roughly 1930:

> EH: [W]hen Texaco first came, they would not hire locals. You know, those drillers would come with their own crews and they would not hire locals because, 'Man, them Cajuns don't know what to do,' you know. I am saying that I was too young, but I can remember there was talk among the olders who would apply and get turned down. So there were no jobs.
>
> INT: So really the only job was being on the boats?

> EH: Well, there was farming and you could do day labor and that paid very little. Of course this didn't pay very much either, but you didn't have to wait for your money, the money was there. If you did day labor the farmer didn't have no money, you had to wait for your money and him to pay. (Ed Henry, 01-24-05)

The oil companies started moving into the area en masse in the 1930s and 1940s. During this period, leasing of land, drilling, and building-up of equipment increased as the companies attempted to create the infrastructure necessary to support the new industry. People were attracted to these jobs in part because they tended to pay better and were steadier than farming, trapping, and fishing.

> [O]il industry began in the early [19]30's and more, the price of the daily wage of a oil worker was so much better than people could earn in the fields or fooling with string beans and potatoes that just about everybody who was strong enough got a job in oil fields. (Christian Olivier, 11-7-02)

> Now, I'm talking Depression here, I'm talking you go work in the oyster business all month, a month for 15 dollars. That was the Depression. Sell 200 pounds of shrimp for 4 dollars. […] Well, the income wasn't much more than 2, 400 dollars a year, annually, annual income and that's for the fisherman. Here comes these people in this oil company started giving six, seven, eight dollars a day. That's a fortune! (Loulan Pitre, 09-24-01)

For some of the men entering the oil field in the late 1930s, their career path had been forged by previous generations of oilmen. Bob Cockerham was raised in Texas and followed his father into the industry: "Of course I was born and raised in oil fields. My daddy owned some of these drilling rigs back in them days out there in Texas. And in the summer I would work on one of these rigs" (12-13-00). Others, such as Arles Doss who went to work for Texaco immediately after high school in 1938, were more immediately attracted by the money.

As wells went up in the swamps, marshes, and lakes around southern Louisiana, new drilling techniques were applied; these would later be used in the first offshore wells. Harold Dugas described the techniques Shell used and the supply issues they encountered in the Weeks Island Field in the late 1930s:

> INT: But, what kind of things—technology or techniques you were developing on Weeks Island—were eventually applied to drilling offshore?

> HD: As far as drilling, it was the same technique, you know? Same kind of pipe. The only thing is the mobility of the rig, you know, setting the rigs. You know, at the beginning, the depths of the water wasn't that bad, you know, it wasn't as deep, it was just as deep as Weeks Island—8, 10, 15 feet. Something like that, you know?

> INT: So whatever you were doing offshore on Weeks Island, that carried the oil industry out into the bay?

> HD: Yeah, the thing about being offshore, it was the supplying the rigs with dependable boats. Barges, you had to have barges, you had to have boats, you have to have personnel for that, you had places like that where you had to tie up the barges and the boats. That created a problem at the beginning, you know. […] The supply was the roughest thing, supplying the things. (Harold Dugas, 05-03-01)

As the land and inland waters filled up with oil wells, companies looked offshore as the next frontier in oil and gas development. The first offshore platform was built in 1937-38 through a joint effort by Pure Oil Company and Superior Oil Company (see Alcorn 1938 for more information). Because things were just starting offshore, standard procedures and regulations had not yet been set. Going to work in the late 1940s for Pure Oil Company, Charles Wallace recalled that "everything was brand new, nobody knew anything about... the Coast Guard wasn't involved then in it, the MMS wasn't involved in it, there wasn't nobody ridin' hard on 'em. If… you just went out there and did what it took, anything it took to drill a oil well, that's what you did" (01-20-05).

In moving offshore, however, companies met with many technological and environmental challenges. Although there had been oil and gas production in inland waters for many years, there were questions about how to adapt this technology to deeper and more turbulent offshore waters. In addition, there were hurricanes to contend with and supply issues to solve. As stated above, the biggest challenge was supplying the rigs offshore; oil companies needed dependable boats and barges to ferry equipment, personnel, and other supplies from shore to the rigs. The coming of the Second World War, however, would put these issues on hold as the country channeled its focus on activities directly related to the war effort. Importantly, while the war halted movement offshore, it would prove vital in providing the tools and mindsets needed to address the issues already hampering this transition.

3.4. The Oil and Gas Industry during World War II

Even before the United States entered World War II in December 1941, German submarines, called U-boats, were proving troublesome to United States convoys as the U-boats attempted to cut off Britain from maritime supply routes (Jordan 2002). Just one month after Germany declared war on the United States, U-boats entered American waters. Early on, this activity was limited to the Atlantic Coast; however, by April 1942, as defenses improved in the Atlantic, U-boats began making their way into the Caribbean and the Gulf of Mexico (Wiggins 1995). From this time until the last U-boat left the Gulf of Mexico in December 1943, U-boats sank 56 ships and damaged 14. Of the 24 U-boats that were sent to the Gulf of Mexico, only one (U-166) was sunk; it was sunk after it torpedoed a passenger freighter south of New Orleans. (For more information, see native southern Louisianan Charles J. Christ's unpublished book on this subject.)

The presence of U-boats in the Gulf of Mexico created concerns about safety and produced restrictions on offshore movement. Charles Wallace related how offshore oil and gas activity was stifled by the presence of U-boats:

> Pure [Oil Company] built the first offshore platform virtually in the whole world. […] This was before the war that that was built. Before World War II. Right after it was built, there were German submarines rolling out around there in the Gulf and they did not want them to talk together. So, they shut all the wells down, they put a blanket plug in the hole on every well and abandoned the platform until after the war […] And the platform was about two or three miles offshore from Creole in Cameron Parish […] Now, that platform was a Pure-joint-Superior account. Pure Oil Company and Superior Oil Company got together and did that. Pure had done the offshore seismograph work and everything offshore was like pioneer. Nobody had done it before. So, they had to try something. (Charles Wallace, 07-16-01)

U-boats were one of several factors connected to the war that limited oil industry-related pursuits. According to Griff Lee, executives at McDermott, a marine construction company, saw offshore development as an opportunity to market the company's capabilities, but were stalled in their efforts by material shortages brought about by the war:

> McDermott got into offshore by building one of the first platforms when they were in the marine construction business. [Before World War II, the oil companies started] looking at what might be sensitive and interesting seismic areas that were up in the marsh lands and ran out into the water. And there's no way to get out into the water. World War II came along, and of course there was no steel or anything else for anything like that. So it was over. (Griff Lee, 06-26-01)

Pipelines became important links in the complex transportation of oil and gas because "German submarines began taking a terrific toll on tankers" and railroads were overburdened with their loads of supplies and men (Eaton 1950, p. 701). In this period of crisis, the Big Inch and Little Inch pipelines were built to transport crude oil and petroleum from Texas to the East Coast. Charles Wallace explained:

> During the war, in order to get fuel and oil and stuff to Europe, they sent it from pipelines to New York. One of 'em was called the 'Big Inch' and the other one was called the 'Little Inch.' Well the Little Inch Pipeline was a 24-inch round pipeline and the Big Inch was a 36-inch pipeline. They went all the way from the gathering system down here in south Louisiana and Texas, went all the way up there to deliver that fuel in all these refineries. (Charles Wallace, 01-20-05)

While the war brought a halt to offshore exploration and hindered distribution, it also placed oil and gas within the realm of national security. The war effort produced a high demand for oil and petroleum-based products. These were needed for laying runways, making toluene (a component of TNT), producing synthetic rubber and gasoline, and lubricating guns and machinery (Miller 2001).

Even before the United States became directly involved in the war, there seems to have been an awareness that such involvement would bring with it shortages in petroleum products. In a 1941

article in the *Annals of the Association of American Geographers*, John Frey argued that petroleum in war industries should be viewed as "a vital fluid for the energizing and the integration of American industry and life" (Frey 1941, p. 116). He warned that areas utilizing petroleum might encounter "tightness" (i.e., problems with supply). That same year, prompted by national defense efforts, 200 oil wells were drilled and 29 new fields were discovered. However, to meet the high demand, the petroleum industry had to confront labor and material resource shortages once the United States became involved in the war and these were difficult to overcome. In 1942, for example, only 137 wells were drilled (Sanson 1999).

On December 2, 1942, the Petroleum Administration for War (PAW) was created to ensure the supply of petroleum based products was adequate to meet the needs of the war, defense industries, and civilians and established a program for rationing oil supplies (Miller 2001). The agency was headed by Secretary of the Interior Harold L. Ickes, with the vice-president of Standard Oil of California, Ralph K. Davies, as Deputy Petroleum Coordinator. Ickes and Davies established a number of industry committees that helped to ensure effective coordination of petroleum supplies. Two of these committees were the nine-member Foreign Operations Committee and the more than seventy-member Petroleum Industry War Council (PIWC). Ickes' approach to petroleum policy throughout the war was to "ensure an adequate supply of petroleum for American security" (Randall 1983, p. 368).

Charles Wallace explained how war activities, particularly the Air Corps, required vast amounts of fuel:

> [I]t took a convoy of trucks just to haul the [aircraft fuel] for us to fly to Germany and fight that war. It took fuel for the boats to get over there. It took fuel for the trucks to haul it to where we were. And then each day, when we took off, it was 100 airplanes. And each one of [the planes] burned 1,000 gallons of gas, so that was 100,000 gallons of gas everyday, just for our base. Not for everybody, just at our base. Sometimes we went twice, that meant 200,000 gallons of gas used up. So that kind of depleted... I don't say it depleted, but it worked on our reserves here in this country. (Charles Wallace, 01-20-05)

Bill Bailey, who worked for Humble Oil Company until 1956, said that steel shortages, rather than U-boats, impeded companies from building offshore drilling operations during the war. Hubert Chesson suggested that the scarcity of diesel and natural gas during the war prompted companies to begin building and using electric rigs. John Dilsaver reported McDermott provided buses to transport its employees to and from work to conserve gasoline and minimize tire wear.

Problems meeting demands for resources such as oil were compounded by scarcity of labor. Although the government granted deferments to some individuals occupying defense-related jobs (and those pursuing higher education in a defense-related field), several of the participants mentioned problems finding laborers because so many men were going off to serve in the military or to work in other war-related industries (e.g., the shipyards). Hubert Chesson, who worked for Chicago Bridge and Iron, explained that oil companies filled some of the vacancies with older men:

> And they was in bad need of people. You know. They would hire like older people, which they never did do that after the war. But during the war, they'd hire a man that was already 60 years old. Because they needed one so bad, you know, just to continue. Because when the war first started, they didn't defer anybody. (Hubert Chesson, 05-11-01)

Some companies also hired African Americans. A native of Lafourche Parish, Nelson Constant was working for Humble Oil Company when the war began. He said that approximately 16 African Americans were hired onto crews; by the end of the war only three of the original 16 had not been drafted. Constant and five of his white counterparts were also drafted during the war, but then received a deferment because their work in the oil fields was considered "essential for the war."

Jerry Cunningham's father was working as a seismologist during the war and also received a deferment after joining the Army. He said that the companies were so desperate for workers, they hired disabled war veterans:

> Daddy had an interesting story about the war. As I told you, he was a seismologist, and he went and joined the Army to go fight in World War II. Well they found out he was a seismologist, geophysicist, and they sent him home. They said they need the oil more than they needed him. But he couldn't find crews to work. All the manpower was in the military. So it got to the point where he was hiring guys with one leg that was coming home from Iwo Jima and everything else, you know. If they could lift one arm up, you know, he'd put 'em on a boat, 'cause it was critical. You couldn't find anybody to work, and they needed oil to run the tanks and planes. So it was a bad situation. (Jerry Cunningham, 06-08-01)

The demand for petroleum during the war also brought attention to the nation's reliance on foreign oil and elicited concerns over national security (Baxter 1997). While the PIWC wanted to increase crude oil prices to facilitate domestic drilling, Ickes looked overseas. Davies urged that America consider certain foreign petroleum resources as United States reserves (Randall 1983). Foreign oil sources were of concern both to secure the Allied countries' needs and also to deny Axis powers access to petroleum; for example, in 1941 President Roosevelt ordered the destruction of Axis oil refineries in Eastern Europe and Indonesia (O'Brien 1997).

On May 8, 1946, President Truman wrote a letter to the Secretary of the Interior calling for the termination of the PAW. At the same time, Truman called for proposals for the peace-time federal coordination and administration of government activities related to petroleum. He asked that the Secretary of the Interior serve as a liaison between the government and the oil and gas industry, saying, "I have been impressed with the great contribution of government-industry cooperation to the success of the war petroleum program, and feel that the values of such close and harmonious relations between Government and industry should be continued." This suggestion would lead to the National Petroleum Council.

3.5. Joining Up

The war in Europe and Asia not only affected offshore oil and gas development, it touched the lives of the people in southern Louisiana in many ways. Many men found their life courses disrupted or put on hold when they either enlisted or were drafted into the military, and civilians found themselves being asked to make sacrifices for the war effort. United States involvement in the war also brought new industries and military training activities to the region. As difficult as this period was, it provided the activity needed to lift the country out of the Great Depression and the technology, materials, and skills that would drive offshore development.

Even before United States engagement in the war, preparations were being made to mobilize United States forces. These early activities and the continued training and mobilization that occurred during the war brought federal money into many communities around the country. The Louisiana Maneuvers, an extensive simulated combat training exercise, was conducted annually from 1940 until 1943. It brought war training into many southern Louisiana communities. In 1940, it involved more than 70,000 troops and spread into Rapides, Natchitoches, Sabine, and Vernon Parishes (Sanson 1999). Charles Wallace remembered how the maneuvers caused his school year to run late and his own participation in it:

> Louisiana Maneuvers was being [held] in that area. And Kinder High School was the headquarters for the Red Army. Red or Blue... I believe it was the Red Army that had their headquarters in the school house. […] The maneuvers were held in the woods out there around Kinder. And at that time, I had the paper route for the *Times Picayune*. And [seeing] how I was always interested in pickin' up a new customer, I talked to a guy in there. And it happens, he had a car and I didn't, and we went out... I ordered an extra 100 papers. And we went out there and found where these soldiers were all bivouacked and their mess halls and all. And in a few minutes, we sold that 100 papers. So I kept orderin' newspapers and newspapers till the car couldn't hold anymore. And everyday we'd come back empty. 'Cause in those days everybody don't have portable radios. (Charles Wallace, 01-20-05)

Men found their way into military service through a variety of paths. Some men entered the military before the war began, seeing it as a challenge and as something different from their previous experience. Others enlisted when the war began through a sense of duty or commitment to what they saw as an important cause. Still others volunteered because of few other options or a desire to choose the branch of service (perhaps one in which a father or brother had served) before they were inevitably drafted. And some were drafted into the service. The following summaries illustrate the diverse ways in which men became involved in the military.

Alden J. Laborde graduated from Annapolis in 1934 and was well versed in military culture by the time the war began. In discussing the need for discipline and respect for authority that the military attempted to exact from its members, he said, "[T]hey have to get these people in shape to be willing to die for one another. You can't stop and take a vote when the captain orders that you do something, or go into battle, or what have you" (01-13-05). When he left active duty in 1940 and entered the Reserves, he had a hard time finding work both because the Great

Depression was still hanging on and his engineering training was too general for the type of work available. He opened a bonded warehouse with a partner and was in business for about a year, when the Japanese attacked Pearl Harbor. He was called up for active duty in 1942.

Arthur Lee was getting his degree in Economics and Business Administration at Southwestern Louisiana Institute (later the University of Louisiana at Lafayette) when the war began. He had moved to Louisiana from Texas in the late 1930s for a job his brother had gotten for him in a restaurant in Lafayette. Although he reported that college was "the furthest thing from my mind," his boss insisted he go, providing him room and board, and paying his tuition instead of a salary (01-11-05). He enlisted in the Army Reserves and was granted a deferment until he graduated in 1943.

In 1941, Selwyn Gilmore was working for the Army Corps of Engineers doing survey work for levee construction. When he did not get an expected and needed raise in salary, he resigned and attempted to enlist in the military. A recruiter told him that he would be called up soon, but when a few months went by without him hearing anything, he went to work for the Texas Pipeline Company in January 1943. That job paid 60 cents an hour and required him to work in the cold, rain, and mud. He had been doing that work for about a month when the company found out he had finished high school and asked him to go work in the company's office. He was transferred to several different pipeline stations. He worked for the Texas Pipeline Company for about eight months (after four months he became a permanent employee). In August he was drafted by the Army Air Corps and his boss allowed him to take off from work immediately so he could spend some time with his family before leaving for training camp.

When Charles Wallace graduated high school in 1942, he went to Louisiana State University (LSU) where he joined the Reserve Officers' Training Corps (ROTC). He described the quickness with which men would be drafted into the service and the sense of fatalism this generated in those left behind:

> I didn't go home until Thanksgiving holidays. Well when I got back to LSU, the roommates I had... I was livin' in the stadium, in a room with three other fellas. Well, when I got back I was in a room by myself, the other three had been drafted or they had enlisted in the service, and I was in a room by myself. So I figured that I was gonna suffer the same fate pretty soon. So what I did, I just resigned and went back home, and went to work in Lake Charles as a iron worker, where they were building some defense [structures] down there. (Charles Wallace, 01-20-05)

One night back home and "gallivanting" with his friends at the Kinder Beer Garden, Wallace and his friends discussed a full-page ad in the *Lake Charles American Press*: "'Are you between the ages of 17 and 26, inclusive? If you are, don't walk, run to the nearest recruiting station. Join the Army Air Corps.' Well we kicked that around for a while and the four of us, we were gonna go down to Lake Charles the next Monday mornin' and enlist. And all four of us did" (01-20-05).

3.6. The Home Front

As many of the young, able-bodied men were called into military service, industrial activity in southern Louisiana expanded with increased federal funding for war mobilization (Sanson 1999). Many of those interviewed described a culture change spurred by the war effort that produced an enhanced orientation towards a national identity rather than a regional or local identity. War mobilization also helped establish facilities and skill sets that have persisted into present day offshore oil and gas activities.

In Morgan City, Chicago Bridge and Iron leased land from the Young Fund in 1942 to establish facilities for building dry docks. (Community lore holds that the Young Brothers sold the land to the government for a dollar.) Company employees produced Advanced Base Sectional Docks (ABSDs) that were used in Africa and in the Pacific during the war. Their operations required numerous employees and they provided training in welding to some of their laborers and carpenters. Welding would become a useful trade in offshore fabrication activities after the war:

> [S]kills that the Cajuns have learned over years—how to fabricate a rig; how to weld it to cut it. That's a trade that they learned and it might have begun in World War II when Chicago Bridge and Iron built some barges here in World War II and they hired the people here as carpenters and laborers and they started welding these barges and putting them together. So that might have been the beginning of the trade that keeps the McDermott companies going today. (Earl Herbert, 12-05-02)

While Chicago Bridge and Iron would leave at the end of the war, the skills they fostered stayed in the community and benefited the petroleum industry.

Blimps were used along much of the United States coastline; along with armed convoys, blimps provided a line of defense against U-boats. The United States Naval Air Station, commonly referred to as the "blimp base," in Houma was built in response to U-boat activity in the Gulf of Mexico.

> It was first a field that Texaco… just a field. I am talking about a grass meadow that Texaco and two other people had their planes stationed there and then during World War II the German submarines were down in the Gulf […] And they quickly constructed pads and built a mammoth building to house blimps. (Hartwell Lewis, 10-04-02)

Part of community lore is that when the Navy left at the end of the war, the community bought the land from the Navy for a dollar. What is true, though, is that a commission was established and the airfield was built up to maintain commercial ventures, some of which included support services for the oil and gas industry.

Concern about U-boats put coastal communities on alert. Moreover, it significantly slowed offshore movement; offshore activity did not fully resume until after the war. Wenceslaus Billiot discussed hearing blimps flying overhead in Grand Isle where he was trawling and the regulations put in place by the Coast Guard:

> When we go out, we had to stop and the Coast Guard check you, because we had to have a channel passport. Check the food and how [much] gas we had on there, the boat, and how much food we had. Then come back, had to stop back again. Check again. In other words, they was doin' that because maybe you go... [chuckles] they go over there and meet some submarine and give them food. That's why they was checkin' on that. (Wenceslaus Billiot, 01-19-05)

Melvin Bernard's father worked in Timbalier Bay for Gulf Oil during World War II. He related how German U-boats would use two tall derricks in the field as landmarks to meet other ships in order to get fuel and dump trash. His father and his coworkers did not have any way to immediately communicate what they were witnessing to the Coast Guard, so they would include it in their work reports.

The Coast Guard also patrolled coastal communities. Clovis Rigaud was born in Grand Isle in 1932 and recalled that the Coast Guard would enforce curfews during the war:

> CR: [Y]ou had your Coast Guard goin' down there all the lanes, no street lights, it was dark. They either had a German Shepard or a Doberman on a leash and they'd patrol all the lanes. […] And they'd walk the beach, up and down, all night long in case something would come to shore and it wasn't supposed to. Things like that.
>
> INT: And was there an official curfew time or something like that?
>
> CR: Well it wasn't too much of a curfew. As long as you didn't use no light. So you don't need much of a curfew with no light. (Clovis Rigaud, 01-20-05)

Despite the show of security, Rigaud said that people were not worried about their safety; they figured the U-boats and spies were after "more important" people.

Beyond these changes, the war fostered a sense of patriotism that called for sacrifice in multiple sectors and among multiple groups of people. Larry Tucker recalled that "Everybody was patriotic in them days" (03-02-03). Roy Parr explained that people accepted hard times because they were behind the war effort. It probably helped that many were used to the difficult conditions that the Great Depression had wrought (Sanson 1999).

Women were also enlisted to help in a variety of ways to support the country during the war. Many women helped maintain morale amongst the troops by sending soldiers letters (Litoff & Smith 1995), while others discontinued life plans in order to take up occupations viewed as more immediately necessary for the war effort. With men heading off to war and industrial production increasing, approximately 6.5 million women entered the workforce to fill the jobs that men left behind or that were created to support war material production (Litoff & Smith 1995). Two million women, known as "Rosie the Riveters" or "Winnie the Welders," took jobs that were traditionally male, such as in the manufacture of engines and artillery (Scrivener 1999). Catherine Dilsaver had completed a year at Southwestern Louisiana Institute when she decided to drop out in order to take a typist job at Chicago Bridge and Iron:

> Those days, they were asking people to volunteer your time, do something. Don't be idle. My daddy would not let me idle, either. Believe me. Everybody had to do their part for the war effort. And I lost, [partly because] I didn't finish any college, because you did other things during the war. (Catherine Dilsaver, 07-25-03)

More than 275,000 women enlisted in female branches of the armed forces during the war. The purpose of having women in the military was to free men to fight in combat (Scrivener 1999). Stella Rousso was working at a department store in Morgan City when she learned about the Women's Auxiliary and enlisted in 1942; nine months later she was sworn into the Army Air Corps. When she left for the service, she said that people in the community seemed to think that women were just entering the military to take care of the men; however, by the end of the war, people had a higher opinion of the women who had served and understood that they had fulfilled many different, important functions. In discussing her basic training at Camp Polk, west of Alexandria, she said that although they were not trained in weapons, the women had to do everything the men did. She served for three years in the aircraft warning service in Portland, Maine and as a base operations specialist in Westover Field, Massachusetts. She never volunteered to serve overseas because her mother "would've worried herself sick" and because she had heard that it was a difficult journey. However, being in the military gave her the opportunity to travel to and meet people from many different parts of the country. In reflecting on her overall experience she said, "I think the time I spent in the Army Corps, I enjoyed every bit of it. […] I think of this often, I wouldn't give that three years of my life for nothing. 'Cause I enjoyed it; I made friends all over and we had fun in the barracks" (01-12-05).

Although grammar and high school students were encouraged to aid the war effort by doing well in math and science (Sanson 1999), it was clearly difficult for some people to concentrate on doing well when the draft loomed in the future. Charles Wallace's story of how he decided to leave college after seeing his roommates drafted over Thanksgiving Break reflects this sense. However, the prospects of war also affected younger people nearing the draft age. Burt Ross was in high school during the war and said that because of the draft, many of the young men assumed they would be going into the service as soon as they were old enough and consequently did not take school very seriously. He said they could not think any further than the war. However, when the war ended, they all had to "bunker down." Following the war, education seemed to take on greater significance than it had before.

3.7. In the Service

Serving in the military, men and women experienced both familiar and unfamiliar circumstances. Often these experiences were influenced by prior ones (e.g., education, technical knowledge), the theater in which the men were fighting, branch of the military they were serving, and military rank. Many were stationed in unfamiliar climates and with people from different regions of the country. For some, their wartime service was the first time they had spent a significant amount of time away from their homes and families. Charles Wallace recalled that everything was new to him when he enlisted in the Army Air Corps; prior to that, Kinder (his home town) had been the "hub" of his universe. Service in the war also provided one of the only opportunities for people to move outside the confines of southern Louisiana and to see the world.

Years of hunting in the marshes prepared some for bivouacking, while experience on fishing boats helped acclimate others to the sometimes turbulent conditions on long boat rides. Regimented living also reinforced values of self-sufficiency, discipline, and listening to one's superiors. Some also found their French language skills opened up possibilities for new roles. For example, after serving in the Pacific during the war, Wenceslaus Billiot completed 14 months of border control in Europe where his language skills helped him converse with Europeans, as well as Canadians and other Americans, who spoke French. Lloyd ("Pete") Rogers got his nickname "Frenchie" while serving as an interpreter in northern Africa during the war.

Besides these experiences, service in the military provided men with specific forms of training. Several men reported being trained in communications, mechanics, and flying. Others gained experience in leadership through the positions in which they were placed during their service. Many men had to adapt their technical knowledge to new forms of equipment and novel situations.

Most of the participants, however, seemed to view their experience in the service more pragmatically, as a job that they had to do. Laurie Vining, who was drafted into the Navy in 1943, illustrated this sense of nonchalance when recalling his training: "[The other seamen and I] just kind of went along and did what we were told to do and that was the extent of it, you know. [They] try to teach us, told us what we had to do and how to do it and what it was for, and then, other than that ah, that was about it" (01-21-05). Charles Wallace, a bombardier pilot during the war, echoed this sentiment when comparing his work in the military and the oil field: "I just did the job. If they sent me to do a job, I did it" (01-20-05).

3.8. After the War

As the war came to a close, veterans returned to their homes and families. Arthur Lee said that during his war service he did not think about what he was going to do when he got back; he had no particular ambitions or goals but was just happy to be alive. It was with this sort of mindset that many veterans returned to southern Louisiana. Peacetime required that adjustments be made in all areas of life.

Some men described the adjustments they had to make after leaving the service. Alden Laborde recalled that his boss, Sid Richardson, called him in one day to remind him that he was not in the Navy anymore. Some of Laborde's employees had complained that he was being too structured and heavy handed with them. His boss reminded him, "'These guys can walk off anytime they want to. It's a little different from the Navy'" (01-13-05).

For some men, adjustment was particularly difficult because of the saturated job market. John Ryan recalled how he handled his return to domestic life:

> Bad. [Pause] Bad. 'Cause it's just like job huntin'. There just wasn't any jobs. And it just seemed like everywhere you went things was bad. I almost went back in the [service]. I'd been talkin' to a recruiter, 'bout goin' back in. 'Til I went to work for Shell Oil Company. […]There just wasn't any work at all. I know I went and ah, after the war was over I went to England, at Wharton, England. There by

> the United Kingdom base. And they had a heavy equipment school—draglines and bulldozers and everything. And I went to that school. Well, I had pretty well learned how to operate most of that equipment, so when I got back home, I thought well surely I'd find me a job. A dragline, or dozer operator or something. I mean, there just wasn't nothing! There wasn't a thing. And that was disappointing. Sittin' around [bored me to death]. (John Ryan, 01-06-05)

Alden Laborde also commented on the tight job market. After commanding a ship of approximately 500, and with a wife and child to support, he said that he felt lucky to have gotten a job as a helper on a seismic crew.

While many men found themselves looking for work, others found that their previous employers were willing to reinstate them to their previous positions. Selwyn Gilmore had worked for the Texas Pipeline Company for eight months before going into the Army Air Corps. When he returned home, after some negotiation, he was given back his seniority, along with some war bonds, and put back to work. Lloyd Rogers eagerly went back to work for Shell Oil Company immediately after he was discharged:

> LR: I got out in September 1945 and went right back to work for Shell Oil Company. I had worked for Shell in exploration, when I came back I went into production, and I retired from Shell Oil Company with 35 years in 1976.
>
> INT1: So you didn't have any difficulty readjusting from...
>
> LR: Oh no! The man that hired me, I still had on my uniform, I was on my way to get discharged at Hattiesburg, Camp Shelby, and I got the job before I got discharged. And he told me to take a couple of months off and get reoriented and come see him, I'd have a job. The following Monday after I went to Camp Shelby, that following Monday I was back at his office. I said, "I'm ready to go to work." No two months reorientation, uh uh. […]
>
> INT2: Why did you go back to Shell and not go do something different?
>
> LR: [Laughs] Well I had worked for them before and there was so much oil activity at the time, and I figured that was the best place for me. Not having a college education and they paid good money, so, back to Shell. (Lloyd Rogers, 01-05-05)

Possibly, veterans who were able to resume previous work had an easier time adjusting to life outside of the military.

For those who had to seek new work opportunities, many utilized social networks. After graduating with a degree in business from college in Florida, with the help of his brother, Ed Dilsaver was hired on as an oil buyer with Shell:

> [My brother] was in a crew boat business, and he had a crew boat that would work for Shell, and I would run that crew boat. And I had an opportunity to meet some people within Shell, and [then] my experience as a boat operator. And with my educational background, I made an application with Shell, and they hired me right way, and worked with Shell... I worked in what they called the Oil Shipping Division. (Ed Dilsaver, 01-05-05)

Ed Henry also used his father's connections to get a job in the Texaco shipyard after the war:

> My Dad knew a few people and he was talking and he had a couple of friends who went to their office and, he didn't write or anything, he just told them he said, 'Well, his father has been working so long and he just come out the military.' […] So, I went and talked to the old man who ran the shipyard. And he knew my daddy, my daddy used to bring the boat they used to dry dock and were out in there. Then after awhile he said 'Well, you see, I got all your cousins over here. I just as soon hire you!' So I went to work. (Ed Henry, 01-24-05)

John Ryan was contemplating reenlisting in the Army when he ran into a neighbor whose father was renting a room to Paul Duplantis. An employee of Shell Oil Company, Duplantis had just mentioned to the father that he was looking to fill a position. Later that evening Ryan talked to Duplantis and was hired.

To help veterans adjust, the government passed the Servicemen's Readjustment Act of 1944 (better known as the GI Bill of Rights). Among other things, this act provided funding for college or vocational education, as well as for one year of unemployment compensation (the 52/50 clause, or 20 dollars a week for 52 weeks). These benefits provided some veterans with relief from the competitive job market. They also provided some of the younger veterans an opportunity to further their education. Completing a degree allowed men to obtain higher and better paying positions when they entered the job market.

Coming out of the service, Harold Dugas did not feel that he knew anything and so decided to utilize the GI Bill to go to school at the University of Louisiana. However, because he was married and had a family to support, he felt pressure to get his degree as quickly as possible. When he graduated in 1950, jobs were still difficult to find, but through the help of a family friend, he was able to hire on as a training engineer with Texaco.

R. J. Cheramie was only 19 years old when he left the Marine Corps. He found that his age barred him from many jobs. He used the GI Bill to go to LSU for three and a half years before dropping out in order to make money:

> RC: Going under the GI Bill of Rights, it was a little bit... it wasn't paying much. So started bumming around, trying to get jobs and then that's when I started in the oil field. […]
>
> INT: Well how come you didn't go shrimpin' or trappin' or…

RC: I tried it for a while.

INT: You didn't like it?

RC: I tried. It just wasn't my cup of tea, I'll put it that way. For the simple reason I didn't think it was payin' enough. (R.J. Cheramie, 07-19-01)

While some found the benefits insufficient, others found them difficult to access. Loulan Pitre served in the Marine Corps during the war; when he returned home to southern Louisiana, he applied for unemployment compensation:

> I went over there to check in for my 20 bucks a week. To me that was a fortune, 'cause we had no salaries, not like today in the service. I was a staff sergeant getting 80 to 90 dollars a month. By the time they took the insurance out, you didn't get much left. […] I went to this place to check in for my 20-52 they used to call them, 20-52 program. That girl says, 'What are you qualified to do?' I says, 'What?' Oh, I was bitter, 'What are you asking me that for?' She says, 'Well, you've got to tell me what you're qualified to do.' Lining me up for a job. Says, 'All I'm qualified to do right now is kill people.' Which I was, that was all I was qualified to do. Kill people. I says, 'I'm only qualified to kill people.' Well, she was insulted, she called the man in. I said, 'Sir,' I said, 'The blood's still dripping on my hands from Japan. You want me to tell you what I'm qualified to do? I told the girl...' 'Oh,' he says, 'you just got out of the service last week. Came home, last week.' "Oh, well,' he said, 'We don't know if we can put you on the...' He said, 'What work do you want to do?' I said, 'Right now I want to take a month off,' I said. Which wasn't long. I said, "I don't want to do any work.' He said, 'Well, we can't put you on the [52/20].' So I never got a nickel. All the other guys had lied that way, they were getting their 20 bucks a week, which was nice. You know, sit down at home and buy beer with your 20 bucks, and maybe somebody would feed you. (Loulan Pitre, 09-24-01)

Although Pitre never received 52/20 benefits, because he was an uncommissioned officer, the government paid for his wife's hospitalization when she gave birth to their first child. He said that had the government not paid for it, his wife probably would have had to give birth at home, which could have been dangerous.

The oil field appeared attractive to many veterans. Some found the relatively high wages hard to pass up, others felt drawn to the fields because of family connections; for many, the oil field appealed to both their financial and family interests. Leon Burcalow had contemplated utilizing his military training in communications by seeking a job with the telephone company, but instead decided to seek a job in the oil field where they were paying approximately 20 cents more per hour. In addition, his father had worked in the oil field, so the work seemed routine to him. Hubert Chesson's father had also worked in the oil field; when Chesson got out of the service, he set his mind on following his father by working for Texaco: "I was brought up by Texaco. My dad worked for Texaco. […] And that's all I've considered, is work for Texaco, when I got out of the World War II" (05-11-01). Although Bob Cockerham attempted many

different jobs after returning from the war, eventually he too found that his family's history of working in the oil fields was too great to overcome: "I was born into it and it is kinda in my blood" (12-13-00).

For those without a family connection to the oil field, the wages seemed to be the primary motivation to seek employment within it. Harold Dugas explained:

> Most of my reason [for going to work offshore] was because of the finances, you know? The monies. The salaries were better in the oil field than anywheres else. You know, say, I had offers to work for a lumber industry in the north. I had offers to work for NASA at that time, but the pay was, a roustabout with the Shell Oil Company would make more than an engineer with the government, at that time. (Harold Dugas, 05-03-01)

As before the war, the industry's good wages and secure jobs allowed men to support their families. When asked what he liked about his job, Lloyd Gaudet, who went to work for the Texas Company after he left the service, said, "[I]t was a living, making a living for my family. That's what I liked about it. And it was a secure job in those days. You didn't have to worry about getting laid off or anything like the other ones" (07-10-01).

As the industry expanded in the postwar years and labor demands increased, many fishermen and shrimp trawlers also decided to enter the oil industry by providing support services. Antoine Francis got into the oil field by running a tugboat. In 1945, Parker Conrad rented out a shrimp trawler to Pure Oil Company for seismograph work in the Gulf. Before this time his company, Conrad Industries, built shrimp boats, but with this venture it began to build and repair vessels (including the first crew speedboat) for the oil field.

3.9. Moving Offshore

Demand for oil-based products shifted to domestic customers after the war due to mass production of "pleasure cars" and homes whose appliances were fueled by oil and gas (Eaton 1950). European countries also increased demand by transitioning from coal to petroleum as their primary energy source. Increased demands and postwar anxiety created tensions "between economic incentives to develop cheaper foreign oil, strategic political concerns about national security, and fears of domestic independent oil producers that they would be driven to bankruptcy in a flood of imported oil" (Baxter 1997, p. 243).

The increased demand led the United States to look for new sources of oil, particularly in the Middle East (Maugeri 2003). Prior to the war, the United States had provided 90 percent of Europe's oil, whereas in 1948 the United States became a net importer of oil. Expansion of offshore development might be attributable at least in part to this increased demand and a concern about having an oil store in the name of national security.

When the war ended, the United States government was left with numerous properties, crafts, and equipment that had been acquired and built for the war. The Surplus Property Act of 1944 established the Surplus Property Administration—which later subsumed and took the name of

the War Assets Administration—and charged it with disposal of surplus property. The expansion offshore, which had been riddled with supply issues and vessel shortages prior to the war, took advantage of the plethora of crafts and technologies available as surplus war assets. Surplus boats and engines were especially attractive to oil-related companies because they gave the companies the capacity to extend operations in Gulf. New technologies in detection (e.g., radar and sonar) and communications were also introduced into the oil field.

Ed Dilsaver credited the surplus vessels with providing the basis for offshore oil field vessels:

> [T]he equipment in World War II really started this Gulf of Mexico thing. Because the boats they used in World War II, they converted it to offshore use for carrying supplies. […] The boats we have today was the results of the World War II, […] a result of how they started after World War II. I really believe so. (Ed Dilsaver, 01-05-05)

In 1947, using a platform built by Brown and Root Construction Company, Kerr-McGee Corporation drilled the first commercial offshore wells in the Gulf of Mexico (approximately 11 miles off the coast of Louisiana). California Oil, Humble Oil, Superior and Barnsdall Oil made subsequent discoveries, effectively launching the Louisiana offshore industry (Baxter 1997).

While converted fishing boats were still used in the oil field to transport crews and supplies, surplus war vessels, such as Attack Crafts (ACs), were also adapted for this use. Some of the bigger boats were also converted to support rigs, while others were sunk offshore to act as breakers to protect drilling operations from wave action: "[S]ome kind of landing crafts we used for buffers, close inshore, to keep the waves from interfering with the drilling operations. We'd sink them and make like a levee to keep the wave action from interfering" (Lloyd Rogers, 01-05-05).

Although many of these boats were more technologically up-to-date because they had been used in the war, they were not perfectly fit for work offshore. Longtime Shell employee John Ryan noted problems with the configuration of the landing crafts:

> Some of the original cargo boats was those old landing crafts; moved the troops or machinery. Most of 'em, the pilothouse and everything was in the back. And they'd run up on the beach and had those gates to let the troops [off] when they [landed]. That was bad, because a lot of times they'd get offshore and it'd get rough, and particularly if they were haulin' pipe. And that pipe would break loose, and it would rupture the bulkhead. And you'd start taking water. And they lost several of 'em out there; flipped after they took on so much water. But then later on most of the cargo boats, you notice the pilothouse and everything's up front, don't see 'em in the back. (John Ryan, 01-06-05)

While the military crafts were deficient in terms of offshore needs, they provided the basis for innovation. Kerr-McGee began with many surplus Navy vessels; Laurie Vining reported that when he went to work for them in 1949, "everything that we used [was] surplus" (01-22-05). The

company was headed by Oklahoma Senator Kerr, who was described by several participants as having connections and expertise in getting paperwork through to buy surplus equipment.

Alden Laborde went to work for Kerr-McGee in 1948 as a marine superintendent and was one of the early innovators. He remarked that Kerr-McGee initially had trouble moving offshore because of their "Oklahoma" mindset: "[T]he marine aspect of it was really eating their lunch. You can't fight back. You have to learn how roll with the sea and the weather, and what have you" (01-13-05). His years in the Navy put him in a position to better understand the challenges of working offshore. He described in detail how Kerr-McGee converted surplus Landing Craft Tanks (LCTs) into supply boats, a design still used, so that they would be functional in the oil field:

> There was a Navy boat we called an LCT, Landing Craft Tank, which was the forerunner of the present offshore supply boats. It had a bow gate, and it had a flat deck, and it had all the controls aft, on the stern or the back end of the vessel. And, it would haul tanks and take 'em ashore, and then drop that ramp, and it'd run up on the beach. At the end of the war, those were surplus and were available. At McGee we had acquired several of those and used them very successfully in supplying these offshore rigs with the drill pipe, the mud, and the fuel, and what have you. But it was apparent to me that you could build a much better one than that. The main thing about it was that on a boat like that, your propellers, and your propulsion, and your rudders and all that are on the aft end. And you can control that pretty well. But the bow, the front end, it kinda freewheels. And still that's the end that you wanted to get up to rig and unload and load. And so it occurred to me that we could move all of this thing up forward. Move the pilothouse, and the living quarters, and all that, up forward, and then just have the whole rest of this vessel clear, and the stern clear. So then you could back up toward a rig and hold that stern in rough weather especially, and could unload with the cranes. (Alden J. ("Doc") Laborde, 01-13-05)

Several participants observed that many of the companies, such as Kerr-McGee, had the faster, but high fuel burning gasoline engines replaced with surplus diesel engines. Mechanical and electrical engineers were hired to help modify and redesign the boats so that they could be used offshore. Landing Ship Tanks (LSTs) were often taken out to the rigs and used for storage. Robert Looper, an engineer with Chevron, explained how they converted LSTs:

> [The LSTs] were about 300 feet long and actually it was just a long hole with a deckhouse at the rear. It wasn't anything else in the equipment on the deck itself. So they converted by putting flight deck up over the deckhouse. But the rear of the ship, the stern of the ship and on the floor deck they put masts and winches and derricks so that they could move equipment from the ship itself up to the rig. The ship itself was used as the storage place for drill pipe and all the equipment that was used on the rig. […] all that had to be moved by the derricks from the ship up through the rig itself. […] The ship was tied up to the rig. It was sort of a unique system. They had three huge anchor chains at the stern, going out. And four up in the (ball) going out to (spear) the ships. They would move back and

> forth in heavy weather or even moderate weather. And there was a bridge going from the bow of the LST to the structure itself. And that was portable. Raise it up if they had to when we moved out. (Robert Looper, 02-22-03)

Charles Wallace explained how Pure Oil Company made use of several different types of surplus vessels, particularly LSTs:

> [Pure Oil Company] bought four minesweepers and this LST and they had welded up this front end of it, and they'd use it just for storage and for the hotel. See, they had livin' quarters on it. […] [O]n the *Machavane* they had a captain, and a mate, and the engineer; just like a regular sea goin' vessel, because they didn't know any better. […] [W]hen they started to take the *Machavane* from here, behind Eugene Island Lighthouse to Cameron, they had to build a living quarters, a structure and put a barracks on it, for the people that was gonna take care of that field. (Charles Wallace, 01-20-05)

Adapting vessels to the offshore environment and the particular tasks for which they were needed often involved trial and error. Laborde described the difficulties Kerr-McGee faced in adapting their two Range Tender (YF) barges for use as tender vessels:

> [Navy YF barges] were not propelled, but they had a deckhouse and cargo space. And Kerr-McGee had used those. Their approach to it was to build a platform, but a small platform, just enough for the derrick and the draw works, and then bring this YF barge, converted to what they called a tender vessel, and had the pumps and the drill pipe, and the mud, and the living quarters moored alongside. And that's kind of where I got into the picture. [They were having trouble] trying to hold 'em in place and anchor 'em, and move 'em […] And we developed some schemes to moor 'em and keep 'em away from the rig with some moveable platforms and all. They were trying to hold 'em up there tight, and you just [laughing] can't do that. And tearing stuff up. (Alden J. ("Doc") Laborde, 01-13-05)

One advantage that the surplus vessels had over new vessels is that they could be operated without a license and were not inspected. Notably, it was not until the 1960s that boats were specifically built, rather than converted, for offshore oil field work. The ship building industry, which had experienced a dramatic drop in business after surplus World War II vessels became available, strengthened its market with specialized crafts.

Electric motors from submarines also were available after the war and sped the transition away from steam engines. Charles Wallace explained how some of these were adapted for use in drilling operations:

Table 1

Surplus Materials Use

Companies reportedly using surplus materials**
Exxon was working offshore by 1947 and "started off with a lot of these surplus military ships" (Roy Parr, 06-08-01). It had ACs, used its "fleet" of LSTs as living quarters, and rigged up a subchaser with radar to do surveying work. *Gulf Oil Company* used LSTs as platforms; this was similar to the way that Kerr-McGee was using the slightly bigger YF barges. *Halliburton* purchased surplus trucks and some landing crafts. *Kerr-McGee* started its business with surplus vessels such as LCTs, YF barges, and tugboats. *Pure Oil Company* built platforms using an LST rigged up with a crane. It also used four minesweepers first for seismograph work, and later to transport crews. Another LST was used for storage and housing crews. Although *Shell Oil Company* was foreign owned and unable to own boats or communications equipment during the immediate post-World War II era, it leased some surplus vessels, such as infantry landing crafts (LCIs), LSTs, and Patrol Torpedo (PT) boats. **NOTE: This list includes only a few examples of companies that used surplus war materials and is not intended to be a comprehensive list.

Some of the drilling contractors bought electric motors off of submarines. […] and they run drillin' rigs with 'em. In other words, it was diesel-electric rig; it wasn't just straight diesel. Most of the engines in the oil field were... well, when I went to work in the oil field, a lot of 'em were steam engines. […] But they used those electric motors. They turned 'em over with diesel. And the diesel generator that they would run the electric motor, you know. (Charles Wallace, 01-20-05)

The radio technology developed during the war was also utilized in the oil field. Over time, companies utilized smaller radios because the early ones took up too much room on the boats. Merrill Utley, Sr. began working for Chevron as a radio technician and noted that they encountered communication problems as they moved offshore because the radios they were using would not transmit as far as they needed them. He solved the problem by building a bigger radio tower: "[Y]ou did what you had to do. That's just the way it was" (01-24-05).

As is evident from these descriptions, although the petroleum industry's movement into offshore waters relied heavily upon surplus war craft and equipment, it was dependent upon the innovation of the individuals working in the field. Those individuals who used the materials, practical experiences, and technical knowledge they had to invent new processes and to modify existing vessels provided the basis for offshore expansion.

Although improvements in drilling technology during the 1950s, such as the jack-up and semi-submersible drilling rigs and the reusable floating barge, were critical in offshore development (Baxter 1997), offshore growth also slowed during this time. The slowdown stemmed in part from increasing attempts from federal authorities, especially during the Truman Administration, to establish authority over offshore waters. These attempts met with resistance from states who argued that they should have control of leasing offshore lands for private use. In 1947 the Supreme Court issued a ruling that, due to issues of national security, the federal government had authority over submerged lands. In 1953 Congress passed the Outer Continental Shelf Lands Act (OCSLA) which gave the Department of the Interior management of mineral extraction three or more miles from shore and allocated to states "27.5% of all mineral royalties from leases between three and six miles of the high water mark" (Baxter 1997, p. 245).

3.10. Comparing Experiences in the War and the Oilfield

As indicated in previous sections, expertise gained during the war was also applied during postwar offshore expansion. Participants reflected on how they felt their war service and their oil field work were related. From their answers and analysis of their narratives, three main areas of overlap emerged. The first was use of similar technology and equipment. Secondly, there was a similar mindset in both domains (military service and oil field work) wherein servicemen and workers were expected to accept rough and dangerous conditions as part of their duty, to be able to do multiple jobs and learn on the job, and to be ready to deal with the unexpected. Lastly, both environments were restrictive, with time and movement heavily controlled and relationships determined by hierarchy. It is important to note that many of the participants did not see a connection between their two experiences; they reported that in both domains they did what they were instructed to do. The following summaries illustrate the connections between participants' war and oil field experiences.

Lloyd Geist was trained as a fighter pilot during the war. Part of his training consisted of learning to fly by feel, rather than by mechanical indicators. This probably helped him to teach himself how to fly amphibious aircraft after he left the military. He then applied this knowledge to doing service work for the oil field with his company Geist Seaplane Service. This work generally involved transporting personnel and drill pipe for the oil companies.

Santo Rousso learned how to read diagrams and handle communications equipment during his service in the Army Air Corps. This experience aided him later when he worked for Magnolia/Mobil.

In 1944, at the age of 16, Dewey Wilson followed in his father's footsteps by enlisting in the Merchant Marines. After serving in the Pacific during the war, he went through a Merchant Marine cadet school in New Orleans and Mississippi where he received his Third Mates License and studied navigation. The license gave him the capability to captain boats outside the Gulf of Mexico, which was unique and attractive to companies as they looked to expand outside the Gulf.

Willy Noble volunteered for the Navy when he turned 18. There he went to auxiliary/motor machinist school, after which he got into submarines because he heard that they paid almost

double (one and a half times his other pay). He then went to submarine school and then telephone communications training. He found that his almost constant training was very useful for his later work in the oil industry:

> Every time I turned around they sent me to a different school. I didn't mind. And I have used almost every bit of it since I have been out of school. Everything that I learned in those at those schools I have used. And I appreciate it, and thank them for training me that much. [Laughing] (Willy Noble, 01-04-05)

His training came in particularly handy when he took a job doing surveying work for Exxon in 1947 on a surplus subchaser. The subchaser's diesel engines and sonar were familiar from his work on the Navy submarines.

Doing maintenance work on aircrafts for the Army Air Corps also provided Lloyd Rogers with technical experience that he would use later. He was able to apply the mechanical knowledge he gained during the war to his work as a maintenance lead man for Shell Oil Company. His leadership role in the war—he was a crew chief—also helped him when he was put in charge of 15 welders in putting up oil platforms.

Alden Laborde discussed how he was involved in helping to get one of his crafts ready for service during the war, similar to how he later manipulated vessels to work in offshore oil fields. His Naval experience also instilled within him a certain mindset when it came to work:

> I think you got to be willing to work pretty hard and pretty long, and, you know, give up a lot of things maybe, family-wise and otherwise. […] I think integrity and straight shooting and all is terribly important with your own employees and with the world in general. When bad things happen, face 'em. (Alden J. ("Doc") Laborde, 01-13-05)

Ed Dilsaver related how his experience during the war helped to prepare him for his later work in the oil industry:

> ED: I was a Third Class storekeeper when I was discharged. […] [I]t had to do with management money, and management time, and doing some construction, and managing inventory, and getting things done on time, and just generally working with people and moving equipment, what it amounted to.
>
> INT: […] Did [your job in the oil field] work at all like the Navy did? Or...
>
> ED: Well, not exactly like the Navy did, but when you're working with people, regardless of if it's a civilian or military, they're still human beings. And you have to work with him to get things done, to get 'em motivated, you know. (Ed Dilsaver, 01-05-05)

He went on to say that in the oil field, military men made better leaders; during the war, somebody had to lead and sometimes people were designated the leader or just inherited a

leadership position. John Ryan found his experience as a squad leader in the Army during the war helped him with his work as both a maintenance foreman and a production foreman for Shell.

When asked to compare his work in the military with his work in the oil fields, Arles Doss said that oil field work was physically more demanding and had an objective (do your job and earn money). In the military, however, you could "drag around" and people would "fuss," but there were really no repercussions for not working hard. In both places he had bosses. In the war men learned to take orders without questioning their superiors and to rely upon their superiors to look after their safety. This is something that laborers also had to do in the oil fields.

Although none of the participants mentioned this, one of the things that stood out when listening to their narratives was that both engagement in the war and work in the oil fields contained an ever-present element of danger. One had to remain vigilant to his surroundings because of the risk of sneak attacks or blowouts. In describing his military life in the Pacific, Arthur Lee said, "[I]t was always somethin' goin' on, you know. You never never did feel comfortable, feel at ease" (01-11-05). The same sense of uncertainty and danger, as well as the need to remain alert of the surroundings, is reflected in a quote from R.J. Cheramie describing his wildcatting experience: "You've got, you've got to be on your toes all the time" (07-19-01). Both jobs required a certain ability to remain cool under pressure, as well as trust in superiors and co-workers.

Military service and oil field work also both regularly involved working under harsh conditions and frequent movement from one location to the next, often without much prior notice. The common phrase that "It never rains in the oil field," was most certainly true in the military. Both also frequently took men away from their families for extended periods of time. Alden Laborde explained how work in the oil field required some similar types of organization and technologies as the military:

> These [oil field] people were going out on a ship, on the rigs for, you know, two weeks at a time, and then a week off later. It was a week on and a week off they were out there. You had to have an organization. You had to have a head guy. And they had to take care of the support and logistics. There was a lot of similarity [to the service]. And then in the actual service operation of the boats, there was, again, similarity. (Alden J. ("Doc") Laborde, 01-13-05)

Although there was some direct training during the war and for early oil field workers, most of what the men did they had to learn through experience and observing others. When asked how he learned how to do all the things he did during his military service, Willy Noble—who had been through many different training programs—said:

> WN: Most of it I just watched somebody do and I'll do it. And if I couldn't see somebody do it, I'd figure it out and do it.
>
> INT: Once you got in the oil field were you able to do same thing?

> WN: Oh yeah. Man, many times. Even surveying. I never was formally schooled on surveying. But I'd keep up with any of the best out there on seismic operation. No problem at all. (Willy Noble, 01-04-05)

Noble later said that in both the war and the oil fields it was essential that men be able to learn by observing other people and have the capacity to do any number of jobs. According to him, "[T]hat's just part of job."

John Ryan said that working on a gravity meter crew for Shell was similar to his military lifestyle because the men were living together (on a quarter boat) for periods of time (one week on, one off). One major difference, however, was that the conditions were better in the oil field than the military. As many people mentioned, the food provided in the oil field greatly surpassed what they were given in the military.

3.11. Conclusion

Fueled by demands for oil and gas and new technologies that spilled out of the war effort, the petroleum industry was able to take its first significant steps offshore in the immediate postwar years. In southern Louisiana, the industry also became a more prominent part of local and state economies and the lives and environment of the people living there. Outside of filling an economic need for people, the early offshore oil industry in many ways reinforced and reflected local values of independence, adventure, and hard work.

Frances Cockerham made this point when reflecting on the Cajun culture:

> I think that it's part of the Cajun mentality is this sense of adventure, sense of surviving that exists in the oil field. It's... Although we had influx of people from Texas and other states, especially during the '70s, there was I think people from every state in the Union here at that point. Essentially 'cause they saw dollar signs. But if you go back and listen to these old people that more or less fell into the oil field, it was typical of the Cajuns when they came down here. The adaptations. The willingness to accept change and to fight for survival […] It's an accepted way of life. We understand the dangers. We even understand the dangers to an extent of the refineries and the other end of it. And we choose to live here for the most part. But it's risks we're willing to take I guess. (Frances Cockerham, 07-29-03)

Cockerham seems to say that people kind of "fell into" working in the oil industry perhaps because they saw it as a new adventure and a new, more stable way in which to make a living. The sense of fortitude and survival that she ascribes to the Cajuns is reflected in the ways in which people discussed bearing with the challenges they encountered before and during the war, and in the oil fields. People discussed adapting to conditions and working through difficult times with a sense of determination.

Wenceslaus Billiot illustrated this when he related his military training. While admitting the training was rough, he laughingly said, "[W]asn't rough for me because I was raised rough"

(Wenceslaus Billiot, 01-19-05). He noted that people in the town where he did his training would marvel at the 25-mile hikes they sometimes took. They would ask him how he did it and he would reply, "'Well,' say, 'when you get used to it, it's not bad.'"

However, a word of caution is needed on this account. Although many of the interviewees described the ways in which people quietly dealt with the situations they encountered, others recounted times in which they resisted authority and were uncomfortable with and tried to avoid their circumstances. It is important to keep in mind too that these narratives were constructed between the interviewees and their interviewers (partially based upon what questions were asked), and, particularly the discussions of World War II, were impacted by the pervading social narratives about this particular generation of individuals. (for more on the construction of narratives, see for example Ochs & Capps 1996).

The heterogeneity of people's war experiences is reflected in a variety of factors. People's training, living conditions, and what they gained from the war were highly variable and depended upon their prior experiences, rank, branch in the service, theater in which they participated, when they entered the service, and a host of other factors. While part of the purpose of this study was to examine how men's experiences during the war carried over to their work experiences in the oil field, one of the most common replies during interviews was that the two experiences were unrelated. Upon deeper probing, some did acknowledge that they later used some of the training they had received during the war. There were men like Lloyd Geist who began their professions using the training they received during the war. For the most part, however, men seemed to carry experiential knowledge from the war into their oil field work; the mindsets, orientations toward and ways of doing work, and leadership skills that this included were difficult for the men to articulate.

One thing that the men were eager to discuss was the plethora of war craft used in the oil fields. Like the aviation industry, offshore oil and gas industry expansion was fueled by surplus World War II materials. The utilization of these crafts was essential in solving supply issues that had hounded the industry as it began to explore potential offshore development before the war. The availability of these vessels, as well as the increasing demand for oil and gas, helped to make this a rapid expansion. From the interviews, though, it is apparent that expanding into offshore waters was not without its problems; without the creative and pragmatic modifications made to the vessels, as well as the development of new processes and apparatus, offshore operations would not have been as successful as they were. In this way, it is important to remember that many World War II veterans were driving the dynamic forces during these early years of expansion.

Based on ethnographic research, this report has provided a new perspective on one of the many relationships between World War II and oil. Particularly it has shown how the infrastructure, technologies, and materials produced during the war effort provided the capacity for expansion into offshore waters. Importantly, it has grounded these events within the particular context of southern Louisiana, providing insight into how this industry became an important part of this region and the people who live in it, and how the context in turn affected the industry.

NOTE: Quotes have been edited for purposes of readability. Most repetitions, hesitations, and discontinuities have been extracted. Words in brackets designate such things as laughter, pauses, and inaudible utterances; they also contain added words to aid in the readability of the quote. In extracts of dialogues, "INT" designates the interviewer.

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4. CLAIMING THE COASTAL SEA: THE BATTLES FOR THE "TIDELANDS," 1937-1953

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4.1. Introduction

The ocean is the last earth-bound frontier. For all of human history, it has beguiled those who ventured across or beneath it, from Christopher Columbus to Chester Nimitz, from Captain Ahab to Captain Nemo. Traditional discourses on the ocean focus on its mysteries, its alien allure. These discourses see the open sea as undeveloped and lawless. It yields bounty and resources, but remains distinctly outside the realm of state territory or human institutions. It is a space *across* which trade is conducted and power is projected, void of social processes and antithetical to terrestrial land-space. The ocean, in the words of Philip Steinberg, lies "outside the rational organization of the world, an external space to be feared, used, crossed, or conquered, but not a space *of* society" (Steinberg 2001, p. 35).

Just as historians of the American West have challenged Frederick Jackson Turner's conception of the landed "frontier" as an empty place existing outside of society, geographers such as Steinberg have begun to revise our understanding of the ocean frontier, demonstrating that the dynamic processes of the global political economy have historically and socially constructed ocean space. The development of offshore oil and gas provides a prime example of how human political/legal institutions have incorporated marine territory adjacent to littoral states. Oil and gas development involves large fixed investments, which require strong territorial regimes capable of guaranteeing the security of those investments. To enable oil companies to extract hydrocarbons from beneath the seafloor in a rational manner, ocean-space and submerged lands had to be defined, claimed, governed, and managed. They had to be made part of society.

Bringing ocean space and submerged lands into society was a difficult and contentious process, in the first place because legal jurisdiction was not clear cut. Did states own or merely assert territorial rights to submerged lands of the continental margin? How far did ownership or rights extend? In the case of the United States, divided sovereignty between the central government and individual states further complicated the territorial definition of the sea. For many years, from the mid-1930s to the mid-1950s, the showdown between the states and the federal government in the United States over control of submerged lands adjacent to the states dominated all questions about leasing offshore lands for the exploitation of oil and gas. This showdown had three interrelated processes: executive action by the federal government, legal action in the federal court system, and legislation action by Congress. Complex issues and multiple interests involved made it very difficult to establish jurisdiction and a workable framework for leasing submerged lands. By the mid-1950s, the warring sides had roughed out a general division of territory and constructed a statutory regime that allowed leasing to go forward, although conflict and litigation would continue for years.

4.2. Executive Action

The United States was the first nation to begin constructing the ocean, legally and politically, for the exploitation of petroleum. The first well drilled "offshore" in ocean waters was from a wooden platform off Santa Barbara county, California in 1896. After 1921, California offered leases to operate in "state-owned" tide and submerged lands, spawning a boom marked by the development of an extensive pier system to tap the portion of the onshore Summerland field that extended out under the ocean. In 1938, a year after North Dakota Senator Gerald P. Nye introduced the first congressional resolution to declare lands under the marginal seas of all the coastal states to be part of the national public domain, the Pure Oil and Superior Oil companies produced the first oil in open waters of the Gulf of Mexico on a lease obtained from the State of Louisiana. That discovery, in the Creole field, was made in 26 feet of water a mile and half from the city of Cameron. In November 1947, Kerr-McGee drilled the first well "out-of-sight-of-land" from a tender-supported platform about 12 miles off the coast of Louisiana. Earlier that year, in June, the U.S. Supreme Court handed down a decision in the case of *The United States v. California*, ruling that the federal government had "paramount rights" in the marginal sea and dominion over submerged lands and its resources. Similar decisions in the cases of *The United States v. Texas* and *The United States v. Louisiana*, both issued three years later on June 5, 1950, set the stage for a dramatic political battle between the states and the federal government over control of the "tidelands" (Bartley 1953, pp. 89-99).

Neither side in the tidelands controversy could rest their case on unambiguous legal precedent. The territorial concept of the coastal or marginal sea – the submerged part of the continental margin or continental shelf – was not well developed. The early Romans viewed the sea as open to all people (*res communes*) and therefore owned or controlled by nobody (*res nullius*). Engaged in long-distance trade and colonization, the maritime nations of medieval Europe eventually claimed unequaled rights to the sea. The most famous of these claims was the 1494 Treaty of Tordesillas in which Spain and Portugal divided the oceans and territories of the New World into spheres of influence between them. England and Holland challenged such division, continuing to trade with Asia and using naval power to render the Iberian decrees unenforceable. In 1608, Dutch legal philosopher Hugo Grotius, the reputed founder of international law, formulated the doctrine of *mare liberum*, or "freedom of the seas," by asserting the existence of a community of sovereign, territorial states and declaring that the space between these states was *res extra commercium* and thus should be open to universal access and free transit. Yet, at the same time Holland's ally England championed freedom of the seas across much of the globe, the English declared dominion over the seas adjacent their coast. Self-defense required an exclusive zone of protection, argued the English legal scholar John Selden in 1635, and nations could effectively possess a portion of the ocean. By the eighteenth century, many scholars of international law accepted that a nation's control over the coastal sea extended to three miles, which was believed to be the maximum range of a smooth bore cannon (Bartley 1953, pp. 7-10).

Nevertheless, questions still remained about the three-mile marginal sea. Did a littoral state "own" these submerged lands or did it merely have certain rights, privileges, and jurisdiction in the area? British common law after 1776 adapted the concept of the three-mile limit into a doctrine of Crown ownership, granting public rights of navigation and fishing. Although largely recognized in international law, it was not universally accepted. The federal division of power in

the United States added another wrinkle. Given acceptance of British territorial theory, who assumed ownership and the rights of the Crown after independence, the central government or the states? Evidence and early legal precedent seems to indicate that each of the thirteen states was a sovereign entity and therefore succeeded to the rights or title of the Crown at the time of the American Revolution. These rights or title would also be assumed by states admitted later to the Union through the constitutional provision that they enter on an "equal footing" with the original states. Gulf Coast states even asserted title that went beyond the three-mile zone. Texas, a truly independent republic before joining the Union, claimed that its boundary, based on Spanish claims and title, extended three leagues, or approximately 10.35 miles, into the Gulf of Mexico. In 1938, Louisiana declared the three-mile limit to be outmoded, because of the greater range of modern artillery, and passed legislation, Act No. 55, fixing a new boundary twenty-seven nautical miles into the Gulf, which the state claimed was coextensive with U.S. territorial waters under international law (Bartley 1953, pp. 27-57, 75-94).

A conflicting line of argument regarded sovereignty over the marginal sea as an aspect of international law, and the rights and powers attached to it belonged to the national government through the theory of "implied powers." At least until 1937, however, congressional and executive policy in the United States assumed that littoral states held property title out to three miles. In 1918, the State Department responded to a private request about acquiring property rights to petroleum beneath the waters of the Gulf of Mexico by stating that "the United States has no jurisdiction over the ocean bottom of the Gulf of Mexico beyond the territorial waters adjacent to the coast" (Juda 1975, p. 13). In a widely reported letter to Olin S. Proctor of Long Beach, California in December 1933, Secretary of Interior Harold Ickes declined to issue a lease under the Mineral Leasing Act of 1920 based on the argument that "title to the soil under the ocean within the 3-mile limit is in the state of California, and the land may not be appropriated except by the authority of the state" (Committee on the Judiciary 1948, p. 788). In October 1934, Ickes rejected an application for a mineral prospecting permit off Huntington Beach, California from Joseph Cunningham, holding more generally that the states retained title as laid down by common law and the Supreme Court and that any challenge to such title should be tried in the federal courts. During the next several years, other offshore leases filed with the General Land Office of the Interior Department were denied, further emphasizing the government's acceptance of state ownership of submerged lands (Hollick 1981, pp. 28-29).

In the summer of 1937, however, Ickes formally reversed his earlier opinion, as he stepped up his campaign to assert greater national control over the oil industry. It is not clear when or exactly why Ickes changed his mind. He himself later claimed that the applicants for federal leases placed mounting pressure on the department, insisting that the United States owned the lands and the Department of Interior had the power to lease them. "So, we began to have doubts," said Ickes (Quoted in Bartley 1953, p. 133). But the secretary's conversion must also be seen in the larger context of oil regulation in the United States in the mid-1930s. During that time, he became increasingly possessed by his mission to bring order to the American petroleum market through controlling production, or "conservation," and that such control could best be achieved by the national government. "It is no coincidence," writes Juan Carlos Boué, "that, by the time Ickes' *volte face* came about, Congress had passed the Connally Hot Oil Act, the Interstate Oil Compact had been ratified and the Texas Railroad Commission had to a considerable extent succeeded in imposing its will on producers in that state, especially the

mavericks in the East Texas field" (Boue and Luyando 2002, p. 130). Moreover, between 1934 and 1936, a significant shift took place in the U.S. political economy, as the Great Depression deepened, labor and political unrest rose, and the sputtering, corporatist initiatives of the early New Deal gave way to reforms leading to the creation of an incipient regulatory state. Giving states free reign to lease submerged lands off their coasts for petroleum development, Ickes grew to believe, would be inimical to his drive to restructure the industry. The corrupt state leasing practices in South Louisiana during the late 1920s and early 1930s, in which millions of acres were leased through Huey Long's political machine, might also have worried Ickes about the potential for similar abuses offshore by Louisiana and other states.

In 1937, Ickes initiated a shift in executive policy by encouraging North Dakota Senator Gerald Nye to introduce his resolution (S.2164) proclaiming national dominion over the marginal sea. Nye was selected because he represented a state without oil deposits and would therefore not be beholden to local interest-groups. A joint resolution (S.J. Res. 208) substituted by Nye for the original Senate resolution, passed in the Senate but died in the House, which had amended the resolution to remove any declaration of "title," and where oil state representatives, led by the Texas speaker Sam Rayburn, raised objections. In the Seventy-sixth Congress, beginning in 1939, Nye resumed the fight, but changed his measure to resemble the House-amended version of the previous session. In debate, Representative Sam Hobbs, whose name would become attached to the House version, advanced a novel theory of "non-ownership" over the bed of the ocean. He maintained that neither the federal government nor the states could claim title to submerged lands. Rather, they belonged to the family of nations and were subject only to the right of the United States to take and use it in the exercise of its constitutional powers. The Nye and Hobbs resolutions met stiff and diversified opposition, which dismissed Hobbs's doctrine as theoretical nonsense and asserted that title to submerged lands belonged to the littoral states. The resolutions died in committee, but they were important in advancing a new argument about dominion over submerged lands founded on a concept of national security which one scholar argues was only "incidentally legal" (Bartley 1953, pp. 101-121).

Hobbs developed his theory of non-ownership during a period when international crises and belligerency around the world encouraged the forceful advancement of U.S. national claims to the continental shelf. Alarmed at the prospect of Japanese vessels fishing for salmon in certain international areas of Bristol Bay, despite scant evidence of it, Alaskan and Pacific Coast fishing interests lobbied the U.S. government to limit the right of foreign nationals to fish in the continental shelf waters of Alaska. In mid-1937, Senator Homer T. Bone of Washington introduced a bill giving the president authority to extend U.S. jurisdiction over salmon fishing up to four leagues (12 miles) from shore and to depths of 100 fathoms. The State Department feared for the international implications of the bill, which was without legal precedent, and preferred a negotiated solution. In 1938, the United States and Japan reached a temporary agreement banning Japanese vessels from Alaskan salmon fisheries, and the bill died in committee. Nevertheless, the dispute injected national security considerations into the discussion over the continental shelf (Juda 1975, pp. 11-12; Hollick 1981, pp. 22-28).

Oil soon overtook fisheries as the prime national security consideration on the submerged lands issue. Discussion moved to take up the question of the outer limits to U.S. territorial jurisdiction. In 1938, the Independent Exploration Company sought a contract from the Department of

Interior to perform geophysical exploration for oil beyond the three-mile territorial limit in the Gulf of Mexico. In response to this request, the solicitor of the Department of Interior decided that the government did not have the legal right to approve such action. However, the question soon came to the attention of President Franklin Roosevelt, who suggested issuing an "Executive order setting up naval oil reserves on the coast beginning with the shore line and extending halfway across the oceans" (Hollick 1981, p. 29). When the DOI solicitor reiterated that the United States did not have the authority to designate offshore territory as public land beyond three miles, Roosevelt replied with a July 1, 1939 memorandum to the attorney general and secretaries of state, navy, and interior ordering the creation of an interdepartmental committee to study the matter. With characteristic verve, Roosevelt stated in his memo: "I recognize that new principles of international law might have to be asserted but such principles would not in effect be wholly new, because they would be based on the consideration that inventive genius has moved jurisdiction out to sea to the limit of inventive genius" (Hollick 1981, p. 30). By transforming sovereignty over the marginal sea into an international issue, Roosevelt "inventively" expanded the problem beyond the division of powers between the federal and state governments to one regarding the limit of national jurisdiction.

As he consolidated power in Interior by colonizing other executive agencies, Harold Ickes pressed for legal and legislative action asserting broad national control over submerged lands. In March 1940, the Interdepartmental Committee to Study Title to Submerged Oil Lands reported its findings to the president, endorsing the assertion of federal rights to offshore terrain and recommending that the matter be referred "to the Attorney General with instructions to take all steps by way of judicial proceedings, or legislation, or both" (Hollick 1981, p. 30). Armed with this recommendation, Ickes repeatedly asked Acting Attorney General Francis Biddle in 1940 to file suit to assert these rights. Biddle insisted, however, that enabling legislation would be necessary to advance the government's case, and Roosevelt stalled on approving such a bill. Apparently, when administration plans were leaked to the press, Wendell Wilkie, the president's Republican opponent in the 1940 election, embraced a politically popular "states' rights" position on the issue, forcing Roosevelt to shelve the idea of legal proceedings (Hollick 1981, pp. 30-31).

Along with the election of 1940, the U.S. entry into the Second World War quieted discussion of submerged lands for nearly two years. In 1943, emboldened by his growing power base as Petroleum Administrator for War, which included the authority to devise conservation measures relating to offshore deposits, Ickes renewed his campaign to expand U.S. jurisdiction. In May 1943, the Interior Department's General Land Office (GLO) submitted a memorandum to the secretary, pointing out the wartime opportunity to eliminate "from our thinking and international law the shackles of the three-mile limit for territorial waters," and advising that the United States adopt a "line of 100 or 150 miles from our shores" extending U.S. territory "beyond the continental shelf and reserving this valuable asset for the United States" (Quoted in Hollick 1981, p. 33). The GLO cited the economic importance of petroleum and fisheries, as well as national vulnerability to attacks from submarines hiding continental shelf waters. Ickes forwarded the memo to Roosevelt, who responded favorably, expressing his foremost concern that a European nation might otherwise try exploiting the Gulf of Mexico for oil. The president then approved the creation of yet another interdepartmental study group, consisting of State, Justice, and Interior representatives, to revisit the problem (Hollick 1981, pp. 34-37; Juda 1975).

Although Roosevelt only focused on the international dimension of this problem, Ickes was more concerned with securing federal versus state ownership of the shelf. In his approach to the study group, he separated the two sides of the problem, preferring to work with State on the "international phases" and with Justice on the "domestic phases." "Such a separation," as Ann Hollick writes, "maintained a pivotal role for the Interior Department" (Hollick 1981, p. 36). In both phases, however, Ickes encountered resistance. Economic affairs officials in the State Department, unlike Ickes, were mainly concerned about fisheries, and they worried that expanding federal offshore jurisdiction ran contrary to "internationalist" policies being pursued on security (United Nations) and trade (Bretton Woods agreements) arrangements. Without providing for "equality of treatment" for foreign nationals, such action might encourage other nations to expand their jurisdiction over submerged lands to the exclusion of U.S. business interests. At the same time, Attorney General Biddle once again resisted Ickes's requests to undertake legal action to advance U.S. claims at the expense of the states, reiterating his view that the government lacked statutory authority and adding it was imprudent at that time "to inflame California, Louisiana, Texas and the other oil states" (Juda 1975, pp. 15-16; Hollick 1981, pp. 36-42, quote on p. 38). As the work of the study group progressed, Ickes's tactical views on the subject hardened from a willingness to await a legal or legislative resolution to support for an executive pronouncement claiming national control over the continental shelf.

Disarray at the highest levels of the State Department led foreign policy officials to acquiesce in an offshore resources policy inconsistent with the internationalist thrust of U.S. foreign policy, and allowed Ickes to win approval for such an executive pronouncement. During 1944-1945, U.S. foreign policymakers were preoccupied with wartime diplomacy and postwar planning, and with the position of secretary of state turning over three times during this period, the department did not always speak with a unified voice. This led to ambivalent policy directives, both conceding the need to extend jurisdiction and demanding that foreign governments be "consulted." This ambivalence and disarray, in addition to the new supremacy of the executive branch over the legislative branch in foreign policy brought about by the war, also accounted for the exclusion of congressional officials from the deliberations. The Department of Interior, however, did not have these excuses, and the lack of consultation with Congress on its end was more likely deliberate, to keep senators and representatives from asserting coastal states' interests in the subject of offshore resources (Hollick 1981, pp. 39-56). All the relevant offices in the Interior Department strongly agreed on the need for federal control and the unilateral extension of U.S. claims beyond the three-mile limit. They had concluded from prior experience in leasing other minerals, as well as private leasing of oil lands, that coastal states would not manage offshore oil with conservationist goals in mind, but instead would accelerate leasing in order to increase their fiscal revenues. The Navy Department, although not included in the interdepartmental study group, continued to urge the conservation of petroleum reserves for national defense and could be counted on to support DOI's positions. Everette DeGolyer, the world famous oil geologist and geophysicist who as assistant deputy petroleum administrator during the war helped construct arguments for claiming the tidelands, championed the idea of holding offshore lands as an undeveloped reserve or as a federally regulated province in order to make room for large imports of Middle Eastern oil, which he believed were essential to long-term national security. DeGolyer feared reckless leasing by the states and declared that he "preferred federal development of the tidelands if that meant a more gradual development" (Quoted in Kreidler 1997, p. 99).

By early 1945, State and Interior had agreed to a joint memorandum, approved by Acting Secretary of State Joseph Grew and Interior Secretary Ickes, committing the United States to a policy of unilaterally expanding offshore jurisdiction. Through all the bureaucratic maneuvering in drafting the memorandum, Ickes had made a few concessions to State Department factions who were troubled by unilateral action. First, the pronouncement would in fact be two separate proclamations, one on fisheries and one on the resources and subsoil of the Continental Shelf. Second, and most importantly, the State Department's Legal Advisor's Office softened language in early drafts claiming "absolute sovereignty" sought by Ickes. The term "sovereignty," the lawyers pointed out, was not necessary for making limited claims to oil resources, and might be interpreted as affecting the character of what was acknowledged to be international airspace and waters. And third, officials agreed to allow at least two months between the formal approval of the policy and its public announcement, so that foreign governments could be consulted, a superficial modification considering that these governments would essentially be presented with a *fait accompli*. Although the proclamations would not be as strong, immediate, and all-encompassing as Ickes would have liked, they nevertheless represented a policy victory for Interior and an important step toward acquiring offshore territory at the expense of the states. On March 31, 1945, from his deathbed in Warm Springs, Georgia, Franklin Roosevelt approved the Grew-Ickes memorandum. Less than two weeks later, the president died (Juda 1975, pp. 14-18, 22-23).

Roosevelt's death delayed the proclamations for six months, as the State Department felt out foreign reaction, which at the time was largely noncommittal, and as President Harry Truman and his administration was brought up to speed while they attended to much more serious and pressing developments overseas in bringing the Pacific War to an end and negotiating a postwar settlement in Europe. Truman was less attuned than Roosevelt to the international ramifications of the problem. But his ten years in the Senate had made him quite aware of the federal-state jurisdictional aspect, and he believed that "federal control should exist, beyond low tide" (Quoted in Hollick 1981, p. 52). On September 28, 1945, Truman finally issued the proclamations. They were short and carefully worded to create as few international repercussions as possible, but clearly designed to advance U.S. national claims. The key section of Proclamation 2667 stated that the "Government of the United States regards the natural resources of the subsoil and sea bed of the continental shelf beneath the high seas but contiguous to the coasts of the United States as appertaining to the United States, subject to its jurisdiction and control." The same day, Truman signed Executive Order 9633 reserving and placing certain resources of the continental shelf under management of the secretary of the interior (Truman 1945a and b).

4.3. Judicial Action

Although overshadowed at the time by the dramatic excitement surrounding the conclusion of World War II, the Truman proclamations were historic events, politically, legally, and diplomatically. Representing the boldest step so far in the construction of marine territory as national territory, they were the culmination of Harold Ickes's efforts beginning in the late 1930s to assert U.S. national jurisdiction and control over submerged lands off U.S. coasts (Elkind 2000). Ickes's primary concern was with U.S. rights in the context of federal-state relations, but considerations of international law significantly shaped the language contained in the

proclamations and the political maneuvering that preceded them. The territorial claims announced by Truman would have major implications for both international and domestic law for many years to come. Internationally, they triggered an "ocean enclosure" movement, as other nations moved to claim their coastal seas (Alexander 1983; Juda 1996). Domestically, they set the stage for a legal showdown between the federal governments and coastal states over control of submerged lands. Crucially, efforts to make Proclamation 2667 acceptable in the realm of international law, by stopping short of claiming sovereignty or title, greatly complicated the resolution of federal versus state control. The United States as a nation did not claim to "own" or possess title to submerged lands, while several individual states already did.

The next step in the federal strategy for asserting control over offshore lands and resources, therefore, was to overturn state claims in the courts, something Secretary Ickes had been pressing Roosevelt's Department of Justice to do for years. After intense prodding, U.S. Attorney General Tom Clark finally committed the government to this course of action. Clark at first refused to take such action, due to pressure from oil interests in the attorney general's home state of Texas, according to Ickes. But Truman then ordered Clark to file, on October 19, 1945, an original action against the State of California in the U.S. Supreme Court, challenging the state's right and title in submerged lands below the low-water mark. In that case, California countered that its ownership of submerged lands out to three miles was based on an 1845 Supreme Court decision in *Pollard's Lessee v. Hagan*, which ruled that states controlled lands beneath navigable waters within their boundaries, inheriting the sovereign rights of the English crown. Under the "equal footing" doctrine, states subsequently admitted to the Union, such as California, possessed similar rights. As the case was pending, Congress attempted to legislate a return of "right, title, interest, or claim" in submerged lands in the three-mile limit to the states. Truman vetoed the "quitclaim" resolution in August 1946, stating that it would disturb the issue under consideration before the Supreme Court (Bartley 1953, p. 138).

In June 1947, the court finally rendered its landmark decision, by a six-to-two margin (Justice Robert Jackson, former attorney general under Franklin Roosevelt, removed himself from the case), sidestepping the question of who had the best legal claim to title in the submerged lands, California or the federal government. Written by Justice Hugo Black, the majority opinion focused on the question of rights and jurisdiction, rather than ownership or title. Appearing to follow Representative Sam Hobbs's theory of non-ownership, first advanced in the 1939 congressional hearings, Black argued that the federal government had "paramount rights" in and over the submerged lands below the low water mark, out to and beyond the three mile belt, off the coast of California. He conceded that the language of earlier court decisions accepted that "states not only owned tidelands and soil under navigable inland waters, but also owned soils under navigable waters within their territorial jurisdiction, whether inland or not." But because oil and property involved might be necessary for preserving national security and conducting international affairs, the justice argued that the case should not be judged on the question of "bare legal title." The United States had rights "transcending those of a mere property owner" (Quoted in Bartley 1953, pp. 175, 169).

As Black admitted, the decision reversed a trend of 150 years during which states exercised jurisdiction and ownership over the beds of their navigable waters. The language and reasoning of the majority opinion shocked state officials and constitutional lawyers and became one of the

most widely criticized opinions in the history of the court. Texas State Land Commissioner Bascom Giles called the decision "claim jumping." Giles would favor secession, he said, before giving up Texas's claims to its offshore lands. Texas Attorney General Price Daniel called it the largest "blow against property rights of the states since the Civil War" (Quoted in Bartley 1953, p. 195). In his dissenting opinion, Justice Felix Frankfurter argued that the case was not about jurisdictional rights, but about ownership, and that the United States never proved that it had acquired ownership. In his dissent, Justice Stanley Reed maintained that California had proven its ownership of the marginal sea, and that such ownership "would not interfere in any way with the needs or rights of the United States in war or peace" (Quoted in Bartley 1953, p. 181). Many organizations, including the American Bar Association, the Council of State Governments, the Governors Conference, and the National Association of Attorneys General, immediately urged Congress to overturn the result. California's attorney general appeal for a rehearing, charging that the court overlooked six basic propositions of law, but to no avail. On October 27, 1947, the Supreme Court handed down its order and decree, giving the United States paramount rights in the submerged lands off California. Interestingly, though, the court still refused to declare that the United States had rights of property or title. That was an issue, as Justice Black recognized, to be settled by political negotiation (Texas Historical Association; Bartley 1953, pp. 213-214).

The decision in *United States v. California* vindicated Harold Ickes, who had fought so tenaciously for federal control. By the time of the ruling, however, Ickes already had abandoned the administration in frustration. He believed that Attorney General Clark preferred to have the United States lose the case against California, and the self-styled "Old Curmudgeon" seethed in early 1946 when Truman nominated California oilman and Democratic Party moneyman, Edwin Pauley, to the post of undersecretary of the navy. From this post, Ickes feared, Pauley would be able to influence administration policy on submerged lands issues. Pauley's Petrol Oil Corporation and other California oil money had backed the quitclaim resolution, as the *St. Louis Post Dispatch* reported in its lengthy series on the tidelands' question, by partly paying the salary of William Clary, who helped draft the bill and argue California's Supreme Court case as special assistant attorney general of California (Solberg 1976, p. 171). Ickes testified at Pauley's confirmation hearings that the oilman was unfit for the job. Producing past memorandums of conversation, he alleged that in 1944 Pauley had offered to raise three hundred thousand dollars for the Democratic campaign coffers if Ickes, in return, promised to drop U.S. efforts to extend its authority over submerged lands. Calling the proposition the "rawest" he had ever received, Ickes added that Pauley had even tried to lobby for offshore oil interests in a railroad car following the burial of President Roosevelt at Hyde Park, New York. Pauley replied that the secretary "must be mistaken," although he admitted discussing campaign funds with Ickes in 1944, but not in return for favors on the submerged lands issue. Pauley also submitted Democratic National Committee records that showed only $25,000 in contributions from California oil interests in the past four years, mostly from Pauley's family (Bartley 1953, pp. 138-141; Solberg 1976, p. 172). Truman was incensed by the "vicious and unwarranted attacks" on his nominee. Ickes, announcing he did "not care to stay in an administration where I am expected to commit perjury for the sake of the party," submitted a six-page, single-spaced resignation letter to protest Truman's continued support of the nominee (Solberg 1976, p. 172). "It was the kind of letter sent by a man who is sure that he can have his way if he threatens to quit," Truman later said. Truman accepted the letter and gave Ickes two days to clean out his desk, instead of the six weeks requested by the secretary (Yergin 1991, p. 406). But the

president eventually withdrew Pauley's nomination amidst the ongoing rancor and controversy of the hearings. Thus even before arguments were heard in *United States v. California*, the submerged lands issue had burst across newspaper headlines, reviving images of oilmen and elected officials in bed together, igniting a vitriolic intra-party squabble among Democrats, and forcing the resignation of the man who had shaped the federal government's quest to claim the marginal sea and one of the most powerful cabinet secretaries in U.S. history.

The drama of the tidelands would remain front-page news for years. In December 1948, the United States filed motions, similar to the one against California, in separate Supreme Court cases against Louisiana and Texas, both of which claimed a more extensive offshore boundary than California – three leagues in the case of Texas and twenty-seven miles in the case of Louisiana. Basing its argument squarely on the new doctrine of paramount powers formulated in the *United States v. California* decision, in both cases the government asserted that the United States "was and now is the owner in fee simple of, or possessed of paramount rights in, and full dominion and power over, the lands, minerals, and other things underlying the Gulf of Mexico" off the coasts of Texas and Louisiana to the edge of the continental shelf. Insisting that the *United States v. California* rule applied to the area beyond three miles and that boundary extensions passed by both states could not take precedence, the United States asked the court for "injunction against trespass and for accounting." Louisiana presented multiple defenses, arguing that the Supreme Court did not have jurisdiction in the issue, that the United States did not have fee-simple title to the submerged lands, that the paramount rights of the United States did not cover proprietary interests in minerals within the territorial limits of Louisiana, and that no legislative action had extended the power and authority of the United States over the resources of the Gulf of Mexico. Texas made a much stronger plea. As an independent state which owned submerged lands out to three leagues from shore before its annexation, the state's attorneys claimed "exceptional status" for Texas and exemption from the rule in *United States v. California.* Many authorities on international law submitted briefs attesting to Texas's title to property as an independent nation prior to statehood and its retention of land under the international agreement by which it joined the union (Bartley 1953, pp. 195-202; Texas Historical Association).

The states' pleadings did not sway the majority on the bench. On June 5, 1950, the Supreme Court ruled six-to-one in favor of the federal government in the Louisiana case, and by a narrow four-to-three against Texas (Justices Robert Jackson and Tom Clark, who had represented the United States in the suit against California, disqualified themselves). "Protection and control of the area are indeed functions of national external sovereignty" and "the marginal sea is a national, not a state concern," wrote Justice William O. Douglas in the *United States v. Louisiana* majority opinion (Supreme Court of the United States 1950). Douglas also wrote the majority opinion in the Texas case, which recognized Texas's ownership of submerged lands as a republic, but held that the transfer of national sovereignty to the United State and admission on an "equal footing" with other states effectively transferred the lands to the United States. The court later withdrew its erroneous citation of "equal footing," for such a provision was not made as far as other lands and debts were concerned in Texas's admission, but did not change the ruling. On December 11, 1950, the Supreme Court issued a supplemental decree prohibiting further offshore operations without the authority of the United States. The decree prompted the

Department of the Interior to ban new explorations but permit wells being drilled to continue to completion.

The "Tidelands Cases" involving California, Louisiana, and Texas together firmly established the legal rights of the federal government over submerged lands off the nation's coasts. But they provoked widespread outrage, especially in Louisiana and Texas, and special condemnation, in a memorandum attached to a petition for rehearing in the case of Texas, from ten eminent scholars of international law who reiterated the legal validity of Texas's claims to the three-league band. The court refused to rehear the case, further infuriating Texans who were already scandalized by the federal land "steal." Public resentment ran highest in Texas due to the fact that offshore land had been dedicated as a source of revenue for the state public school fund.

The decisions still did not settle the question of who, if anyone, held title to submerged lands, and thus the Texas and Louisiana decisions were merely a prelude to new political conflicts and inventive legal challenges to the activation of the federal government's paramount rights. Florida's political leaders took Texas's cue and asserted their state's "historic boundary," based on previous Spanish claims, out to three leagues in the Gulf of Mexico. Nobody at the time seemed to foresee the complexity of new problems that would arise, such as physically determining the location of the shoreline if and when boundaries were established a certain distance "from shore." These conflicts, challenges, and complexities would collectively be known as the "tideland's controversy."

4.4. Failed Compromises

The so-called "tidelands" controversy was a misnomer, because nobody disputed the state's claim to lands lying between low and high tide. The issue was control over the marginal sea below the low-water mark. But the tidelands conflict was also about much more than this. It symbolized and resonated with larger conflicts being played out in American politics at the time. The rallying cry of states' rights had as an obvious subtext the brewing struggle over black civil rights, especially with staunchly segregationist Texas and Louisiana as the leading protagonists and the most desirable oil in question lying off the Mississippi Delta, the most racially oppressive region in the segregated South. The tidelands conflict also reflected renewed fears about oil conspiracies and the influence of oil interests in politics, as the nomination of Edwin Pauley had demonstrated. While the State Department under Truman promoted the great Middle Eastern oil deals of the late 1940s such as Aramco, the Federal Trade Commission in 1949 published a report denouncing the "international petroleum cartel," which led to a criminal anti-trust investigation by the Department of Justice. For many oilmen and conservatives in business and politics, the tidelands conflict was not just about oil under submerged lands but about an expanding assault by the federal government on free enterprise and private property. It is interesting to note that private property in this sense was equated with state government control, perhaps an unconscious admission that state government was much easier to mold and influence than a federal government emboldened with expanded powers by the New Deal. Had the tidelands controversy been strictly about offshore oil, it is possible that compromises could have been reached that would have averted prolonged legal and political battles down the road. Paradoxically, the fact that it was about oil, a politicized subject already in the United States, meant that it could easily become something more than oil, a proxy for larger and tangential

political confrontations and an issue that lent itself to symbolic politics and demagoguery. An early resolution of the tidelands controversy would have prevented the manufacturing of valuable political capital. Thus the struggle dragged on.

In the late 1940s, the issue moved back to the congressional arena, where hostility to federal control burned. After the Supreme Court's California ruling, the federal government received applications to lease land offshore California under the Mineral Leasing Act of 1920. In August 1947, however, the solicitor general of the Department of Interior and the U.S. attorney general concluded that the act did not apply to mining on the continental shelf, and so the applications were denied. The government had gained paramount rights to lease, but not statutory authority. And only Congress could grant such statutory authority. By the time of the California decision, more than fifty bills had been introduced precluding federal control of submerged lands. In February 1948, the Truman administration countered by submitting legislation to authorize federal leasing. But this and other proposals for federal management were drowned out by a new wave of quitclaim bills to return the submerged lands to the status they held prior to the California decision. Still, the sponsors of these bills could not muster a two-thirds majority to override a presidential veto. By the fall, a standoff between the administration and congress had hardened on tidelands legislation, and Truman officials prepared their legal cases against Louisiana and Texas.

At the same time, political leaders mounted efforts behind the scenes to reach a compromise that would head off the suits. Speaker of the House Sam Rayburn brokered the negotiations. As his biographers describe him, the Speaker from Texas was "a powerful behind-the-scenes guardian of petroleum interests," but "never the industry's pawn, as critics often alleged" (Hardeman and Bacon 1987, p. 351). For years, Rayburn was instrumental in killing legislation that would have reduced the industry's sacred depletion allowance, and in 1935 he had worked closely with Texas independent oilmen James Abercrombie, J. R. Parten, and Sid Richardson to defeat Harold Ickes's plan to establish federal controls over oil production and pricing. Retaining full state ownership of the tidelands was a top postwar priority for many members of the oil fraternity (see below) and winning political issue in Texas, but Rayburn resisted pressure from Texas political representatives, especially attorney general Price Daniel, to wage a crusade on the issue. Although in 1948 Rayburn claimed to be "for Texas ownership of the tidelands out ten and a half miles," he had misgivings (Quoted in Kreidler 1997, p. 110). As Speaker, he had a broader responsibility to look after the nation's interests and did not have the time to command what would be a long and controversial campaign. Furthermore, his friend Tom Clark, a fellow Texan and U.S. attorney general, had convinced him that Texas might fare better in a compromise. Few reserves had been found inside the three-league line offshore Texas, and reliable geologic opinion held that the bulk of discoveries would be made beyond the line. In late 1948, with the blessing of President Truman, Rayburn and Clark hatched a plan to settle the tideland's stalemate with Texas by offering the state two-thirds of all revenues from mineral lease bonuses, rentals, and royalties within the state's claimed three-league zone. The plan also allowed the federal government to give the state 37.5 percent of all revenues *outside* the three-league zone, an amount equal to the proceeds individual states received from mineral production on inland federal lands within their borders. Leasing and regulatory authority would be vested in a board staffed jointly by federal and state appointees (*New York Times* 1949; Hardeman and Bacon 1987, pp. 353-353).

Given the lack of discoveries in shallow water offshore Texas, Rayburn's compromise would have been a sensible deal for the state. Using his formidable political skills, Rayburn convinced Texas Governor Beauford Jester and Land Commissioner Bascom Giles on the plan's merits. However, Jester died in June 1949, before the deal could be consummated. In the state-level political jockeying that followed, the compromise could not gain traction. The new governor, Allan Shivers, appeared undecided, but leaned toward compromise. Bascom Giles reconsidered his earlier support. Crucially, Price Daniel called the offer "half a loaf" and committed himself to a "last ditch" fight in both the Supreme Court and Congress to retain Texas's control out to three leagues. As the attorney general who would argue the Texas case in 1950 and an ambitious politician with designs on higher office, Daniel had nothing to gain personally from the compromise. The Texas congressional delegation in Washington would most likely take credit for it. According to Creekmore Fath, a Democratic party leader in the Texas legislature at the time, Daniel "wanted to win Texas' Tidelands Claim in the Supreme Court and get all the glory for himself as the lawyer who had saved the Texas Tidelands for the school children of Texas" (Quoted in Kreidler 1997, p. 95). Rayburn similarly remarked: "Shivers and Giles were inclined to accept the plan as a good deal for Texas. But after watching Daniel a few times, I realized he didn't want a settlement – he wanted the issue to run for office on. He wanted to demagogue it" (Quoted in Hardeman and Bacon 1987, p. 353). And he did, skillfully. Fanning the flames of Texas independence and chauvinism, Daniel sold the idea of full sovereignty within the three-league boundary as a Texas birthright. In 1949, an opinion poll of Texans reported that the tidelands were the most important issue facing the state. With Daniel vocally opposed to the compromise, Shivers had to come out against it as well. State Representative Maury Maverick later charged that "Shivers had previously said he thought a compromise could be worked out. But Daniel scared him, since both were potential candidates for governor and senator" (*Corpus Christi Caller* 1952). Thus ended hopes for the "Rayburn compromise" for Texas prior to the 1950 Supreme Court decision.

Daniel went to Washington in 1950 to argue before the Supreme Court not only the state's tidelands case, but the state's defense in the *Sweatt vs. Painter* case. In 1946, the University of Texas Law School had denied admission to African-American Heman Marion Sweatt on the basis of race, and his appeal, led by lawyer and future Supreme Court justice Thurgood Marshall, had made it to the Supreme Court. Armed with these two cases, Daniel carried on the "two-pronged 'march on Washington'" initiated in 1948 by the Texas Regulars faction of the state Democratic party against federal control of the tidelands and Truman's civil rights program (*Austin-American Statesman* 1948a).[4] When the Court ruled in both cases against Texas, on the very same day in June 1950, the two-pronged cause was joined into a single, states-rights saber wielded by Price Daniel (Murph 2002, pp. 74-122; Shabazz 1996, pp. 221-222). After the decisions, letters of gratitude for his service and defiance against the Supreme Court and federal government poured into Daniel's office. The "unjust and diabolical decisions in the Tidelands case and our segregation laws are against God's and highest human laws," wrote one. "High tide low tide Tidelands notwithstanding black lawyers or white day or night I am a Daniel man,"

[4] Truman's civil rights program included the abolition of the poll tax, the enactment of a federal anti-lynching law, the establishment of a permanent Fair Employment Practices Commission, and the elimination of Jim Crow laws in interstate transportation.

telegrammed another (Harker 1950; Skiles 1960). Daniel created a perfect storm to carry him to the Senate in 1952, where he made quitclaim of the tidelands his signature issue.

Meanwhile, Sam Rayburn discovered even more devious forces at work against a deal between the federal government and the state of Louisiana. In the spring of 1948, Earl Long, the Kingfish's younger brother, who had just taken the oath of Louisiana governor, dispatched his attorney general, Bolivar Kemp, and his lieutenant governor, William Dodd, to Washington to seek out a deal with the Truman administration. As Dodd tells it, Long and his emissaries agreed that, given the 1947 *United States v. California* precedent, Louisiana was bound to lose the impending suit against it in the Supreme Court (the suits against Texas and Louisiana had not yet been filed, but state officials knew that they were in preparation), and therefore they found it wise to seek a negotiated political settlement before this eventuality. They thought the best concession the state might be able to obtain would be jurisdiction out to three leagues from the coast or, more likely, three miles. Earl Long admonished Kemp and Dodd to "go up there [Washington] and do the best you can. Get us something, for we can sure use the money" (Dodd 1991, pp. 83-84).

Once in Washington, Kemp and Dodd fell in with Wade Thompson, an influential lobbyist for Tennessee Gas & Transmission Company (later called Tenneco). Thompson kept a large suite in the historic Willard Hotel, near the White House, where he held weekly parties, or so-called "prayer meetings," to entertain elected officials, cabinet members, Capitol Hill staffers and secretaries. "I met everything from good-looking chambermaids to wives of cabinet officers at Thompson's parties," remembers Dodd. Tennessee Gas and other big natural gas transmission companies strongly desired state control over oil and gas production in offshore areas, and Wade was involved in maneuvers to stave off litigation and cut a deal for the states. After several weeks of parties and lobbying, Kemp and Dodd obtained a summit meeting with House Speaker Sam Rayburn to discuss a possible settlement (Dodd 1991, pp. 84-86).

Also at the meeting, among others, were Leander Perez, the district attorney for Plaquemines and St. Bernard parishes an infamous political boss of southern Louisiana who had made millions from oil and gas leasing schemes in the Delta; the Texas and California attorneys general; the secretary of the National Attorney General's Association; and several Department of Interior officials. Rayburn informed the group that President Truman had authorized him to settle the dispute with Louisiana by making an offer similar to the one Truman was preparing to make Texas, giving Louisiana two-thirds of revenue within the three-mile boundary offshore (Louisiana's claims to a line beyond it were much shakier than Texas's), and 37.5 percent of revenue beyond it. The Department of Interior officials went on to explain that Louisiana's State Mineral Board would take charge of all the leasing and regulation of production, and that the state's Department of Revenue could collect state taxes on all the petroleum produced. Furthermore, Louisiana would be allowed to keep all bonuses and royalties already collected, something the federal suit against the state would seek to acquire. If Louisiana accepted the compromise, then the Truman administration promised not to go forward with the suit against the state. "The president was offering us far more than we hoped to get," recalls Dodd. "If we could have settled the case right there, Bolivar and I would have sewed it up at that meeting. But we had to call Governor Long and get his okay, for he alone could make the final decision" (Dodd 1991, pp. 86-87; Gremillion 1996; Jeansonne 1977, pp. 166-167).

Dodd and Kemp, however, did not count on "the cunning and lust for power and money of Leander Perez." "Judge" Perez spoke up at the meeting to say he would recommend that Long reject the offer. A zealous segregationist and a leader the "Dixiecrat" movement that had just nominated South Carolina governor, Strom Thurmond, for president on the States' Rights party ticket, Perez argued that the deal would constitute a sellout to the feds and would lead to federal intervention in Louisiana's offshore oil operations. The feds might even break the agreement at a later date. Louisiana, he maintained, would do better for itself by litigating the matter. But whereas Texas had unique historical claims to the three-league band of its marginal sea, Louisiana's case was nearly identical to the one that had failed for California in the Supreme Court, and therefore did not seem to stand a chance. "This is no compromise," Rayburn responded angrily to Perez's objections, "it's a gift, and you better take it while the president is in the mood to give it to you" (Dodd 1991, pp. 88-89).

Shortly after the meeting in Rayburn's office, ranking Louisiana officials and legal experts, including Dodd, Kemp, Perez and others, gathered at the state capitol in Baton Rouge to discuss the matter with Governor Long. In that meeting, they appeared to arrive at a consensus that Long ought to accept the "gift," and quickly, for the state needed the money and the president might soon withdraw the offer as the Department of Justice advanced its preparations for legal action. Only Leander Perez disagreed. His position, which only later became clear to Dodd and others, was not so much a principled one based on states rights as a self-interested one based on his determination to preserve his own power and wealth, which rested on a foundation of oppressive racial segregation and oil. As attorney for the various levee boards of Plaquemines parish, Perez had ensured that leases on oil-rich levee board properties were awarded to an assortment of companies owned by his friends and family, which by many accounts helped him compile a massive personal fortune and consolidate his political machine in the delta parishes. Many of such leases covered submerged lands in numerous bays and inlets of Plaquemines and could have been construed as property of the federal government under the Truman proclamation and the 1947 Supreme Court decision. "His support of Thurmond and the championing of states' rights, as I see from hindsight and many years of government experience, were sincere" writes Bill Dodd, "but only because he wanted no federal interference with his dictatorial operation of the mineral production in Plaquemines Parish, onshore and offshore" (Dodd 1991, p. 84).

A few days after the meeting in Baton Rouge, Earl Long astonished Kemp and Dodd by telling them of his intention not to accept Truman's offer. The reason was Leander Perez. Long was too politically beholden to the judge. Earlier in 1948, Perez had supported Long's successful bid for governor, and in August Perez's tightly controlled parishes had turned out crucial votes to secure the razor-thin margin (2 percent) of victory for Earl's nephew Russell (Huey Long's son) over Robert Kennon in the Democratic primary election for U.S. senator. No hard evidence exists to prove that Long and Perez fraudulently manipulated the voting, but it seemed blatantly obvious to observers at the time. Kennon disputed the "phony and baloney" totals from St. Bernard and Plaquemines, which went for Russell Long by overwhelming margins of 96 percent and 84 percent, respectively (Kurtz and Peoples 1990, pp. 145-146; Mann 1991, pp. 91-92).

Not only that, but Perez still held the key to victory in the general election for U.S. senator, and he vowed to sabotage Russell Long's candidacy if "Uncle Earl" accepted Truman's compromise

on the tidelands. On the ballot for the primary and general election, Russell Long's name had been listed under both the Democratic and States' Rights parties. As a leader of the Democratic State Central Committee, Perez had seized control of the party for the Dixiecrats and transferred the state's traditional Democratic ballot symbol, the rooster, to States' Rights presidential candidate, Strom Thurmond, and other candidates endorsed by the Dixiecrats. Democratic voters in Louisiana, many of whom were illiterate, usually voted the straight ticket under the rooster emblem, and their votes this time would go to the Dixiecrats. Perez even intended to deny President Truman a place on the ballot until Earl Long called a special legislative session to create a special Truman column and persuaded lawmakers to place the names of all Democratic candidates under both Truman (signified by the national party's donkey emblem) and Thurmond (rooster). However, in the run up to the general election, Perez explicitly threatened to remove Russell Long from the States' Rights ticket and substitute the Republican nominee, Clem Clarke, if Earl Long committed Louisiana to tidelands compromise. In heavily Democratic Louisiana, the election normally would have been a mere formality in favor of Long. But if Perez carried out his threat, Clarke would then receive all the votes cast for the Republican ticket headed by Tom Dewey plus those cast for the stealth Dixiecrat ticket disguised under the Democratic rooster emblem. In such case, Clarke had a very real chance of winning. This was no idle threat or bluff. If Earl Long accepted the deal, "we all knew Perez would do it," claims Bill Dodd. Despite advice from Dodd and others to accept the compromise in the best interest of the state, Earl was determined to have his nephew in the senate to help fuel the revival of the Long political machine. Although he did not formally reject the offer, he refused to accept it. "Well, at least we won't have to steal little Russell any votes in this election," Dodd quipped after Earl made his decision (Dodd 1991, p. 91; Gremillion 1996; Jeansonne 1977, pp. 166-167 and 178-186; Mann 1992, pp. 82-93).

In both Texas and Louisiana, political intrigue thwarted compromises that would have headed off federal suits against these states. The decisions by local political leaders enlarged their own power in the short run, but sacrificed their respective states financially in the long run.

As leasing and development expanded into progressively deeper water in subsequent decades, billions of dollars poured into the federal treasury, and the states came to wish they had at least some claim on this lucrative federal acreage (the greatest source of federal revenue after income taxes). Most discoveries were made offshore Louisiana, and officials from that state felt the pain of "what could have been" more than their neighbors in Texas. As it turned out, the refusals to accept the settlements offer effectively denied Texas and Louisiana, as of 2000, tens of billions of dollars, and still counting.[5] Including the state severance tax, Bill Dodd claims that as of 1986, Long's decision had already cost the state somewhere in the "ballpark" of $100 billion (Dodd 1991, p. 90). Dodd's estimate appears high, and it assumes the tax would have been

[5] Between 1953 and 2000, the federal government collected a total of $133 billion in bonuses, rents, royalties, and other revenue from offshore leasing. From the Louisiana OCS from 1953 to 1995, when the last aggregate figures for each state were issued, the government had collected a total of $73.68 billion. From the Texas OCS during the same period, the government had collected $19 billion. Therefore, at 37.5 percent, Louisiana could have collected $27.63 billion from federal leasing, and Texas $7.1 billion, had the compromises been accepted. This does not count the 1/3 revenue the states would have shared with the federal government within their litigated tideland's boundary, but nor does it include state taxes Texas and Louisiana could have levied on their portion of production in federal waters. And it does not count revenue from deepwater Gulf of Mexico since 1995. (MMS 1997).

applied on top of royalties without any negative effect on drilling and production. But whether $50 billion, $75 billion, or $100 billion, this is still a lot of revenue for an individual state.

With little knowledge of the compromises declined by an earlier generation of political leaders – for whatever reason, Truman never made his offer to Louisiana public – the federal government's increasing take from offshore leasing and production fomented resentment from the citizens of these states toward what they perceived as the federal government's illegitimate seizure of the submerged lands. Recent controversy over the lack of federal-state "revenue sharing" and the uncompensated burden of development borne by the states, especially Louisiana, however, would have been greatly muted, and years of legal wrangling avoided, had state leaders not scuttled the deals offered by Truman. Hindsight can be crystal clear, and at the time people like Leander Perez, Earl Long, and Price Daniel could hardly have foreseen the magnitude of their miscalculations – if indeed that is what they were – Perez's and Long's much greater than Daniel's. But forward-looking politicians at the time, such as Sam Rayburn and Bill Dodd, recognized that miscalculations were being made, at least by Louisiana, in not accepting the "gift" offered by Truman.

As talks with Louisiana and Texas failed, the Truman administration tried to redirect efforts at compromise through more formal channels in Congress, pushing legislation to allow for interim offshore operations that incorporated concessions less generous than those directly offered to Louisiana and Texas, but concessions nevertheless. In February 1949, at the request of the attorney general and secretaries of defense and interior, Senator Joseph O'Mahoney of Wyoming introduced a bill (S.J. Res. 195) vesting control over new leases with the Department of Interior, but legalizing all leases granted by the states prior to the Supreme Court decisions and giving the states 37.5 percent of revenues inside the sea boundaries they claimed. The remaining royalties would be placed in escrow until a final settlement by Congress. Later that year, O'Mahoney's Interior and Insular Affairs Committee held hearings on S.J. Res. 195 and other quitclaim measures, but neither proponents of federal control nor quitclaim altered their positions before the Supreme Court decided on the Texas and Louisiana cases.

4.5. Legislative Action

The Supreme Court's June 1950 rulings and December decree injected a new sense of crisis and urgency into the battle for the tidelands. As rental payments and royalties from offshore leases were impounded awaiting final disposition and the establishment of statutory authority for the federal leasing of submerged lands, offshore development came to a virtual standstill. Geophysical crews and drilling vessels working in the Gulf of Mexico dwindled from dozens to a mere handful. This happened just as the industry desperately needed production from all available sources. War on the Korean peninsula and postwar reconstruction in Europe and Japan placed pressure on oil supplies, even as the great Middle Eastern oil fields came on stream, and crisis in Iran slowed exports from that nation to a trickle. U.S. oilmen grew increasingly impatient with the tidelands' stalemate and demanded some resolution.

A contributing factor to the stalemate was the fact that the position of the U.S. oil industry on the tidelands issue was never distinctly clear or uniform. Politicians on both sides of the debate accused the other of an unholy alliance with oil interests. Drew Pearson, the Washington

journalist and notorious gossip monger, accused Price Daniel of sidling up to oil companies with "Arabian" ties after the Texas attorney general balked on Truman's compromise offer, and Truman justified his second veto of quitclaim legislation 1952 (see below) by asserting it was a product of the "oil lobby." Daniel and other states' rights champions, for their part, charged that the federal government and the integrated oil companies, as co-conspirators in the development of petroleum in the Middle East, together intended to hold submerged lands as an undeveloped reserve while encouraging major imports of Middle Eastern crude. Everette DeGolyer, the famous geophysicist with links to major oil companies, indeed expressed support for such a policy and a preference for federal control of submerged lands (Kreidler 1997, pp. 97-98).

For other oilmen and conservatives in business and politics, however, any compromise of state control was not an option. Independents and smaller integrated companies, through the Independent Petroleum Association of America and the newly formed Texas Independent Producers and Royalty Association of America (TIPRO), vocally opposed a federal role in the tidelands and lobbied intensely for quitclaim legislation. For these groups, the tidelands conflict was not just about oil under submerged lands but about an expanding assault by the federal government on free enterprise and "private property." "If we sacrifice a fundamental principle in this manner there will be nothing to stop the federal government from taking over the oil business and all other businesses just as they are doing in England," Texas wildcatter Hugh Roy Cullen telegrammed Price Daniel in May 1949. "We must stop here if we are to turn off the road to a socialistic state."(Cullen 1949) Daniel repeatedly insisted that oilmen were not behind his crusade for the "return" of the tidelands (Daniel 1948), but his papers prove otherwise, revealing many letters and telegrams from oilmen discussing strategy and offering support. In Texas, according to historian George Norris Green, the "oil-and-ranch Texas Regular-Dixiecrat faction" of the state party were actively behind the "return" of the tidelands (Green 1979, p. 143).[6] What these men wanted was to roll back the power of the federal government to regulate the oil industry, just as they were attempting to undermine federal power in other areas, especially labor rights and civil rights. Their greatest fear perhaps was a federal precedent for overriding state law and authority that would challenge white privilege. For many of these men, and for many citizens of Texas, the defense of their oil interests fused powerfully with their defense of segregation.

It seems plausible that the major oil companies, or at least some executives in those companies, shared DeGolyer's views. Their vision and economic interests were less parochial than the independents. Whatever their preference, the major oil firms tried to stay above the political fray and maintain a neutral stance. Still, by various accounts, they appear to have rooted privately for the states. For example, Rex Baker, a director and general counsel of Humble Oil & Refining (the Texas affiliate of Jersey Standard), worked diligently in 1947 for quitclaim legislation (Baker 1947). Many majors already held offshore leases issued by California, Texas, and Louisiana, the latter two having leased almost 5 million acres of offshore lands, with 300 leases more than three miles offshore, most in Louisiana's deltaic plain. Oil companies, mainly the major integrated ones, had made some astounding oil finds on those leases, discovering an average of nearly 38 million barrels for every wildcat well, far above the discovery rate for

[6]The most powerful figures in this faction included Palmer Bradley, Lamar Fleming, Jr., and Hugh Roy Cullen of Houston, Clint Small of Austin, Clint Murchison of Dallas, Curtis Douglass of Amarillo, and Arch Rowan of Fort Worth.

onshore fields in the United States (Attanasi and Drew 1984, p. 438). Giant oil fields had been discovered on Shell Oil's leases on South Pass Blocks 24 and Eugene Island 18, The California Company's (Socal) Bay Marchand 2 and Main Pass 69 leases, and Humble Oil's (Jersey Standard) Grand Isle 18 lease. All except Eugene Island 18 straddled or lay beyond the three-mile line. Offshore operators were not excited about the possibility of undergoing a regulatory transition as they were developing these leases. Accustomed to dealing with friendly and often pliable state regulators, they were also not eager to answer to officials in Washington who might be less accommodating. It also appeared, initially, that federal ownership might mean higher royalty payments for the companies (*Austin-American Statesman* 1948b). But just as crucially, the companies mentioned above all had important operations in Plaquemines Parish, Louisiana and thus intimate relations with one of the most outspoken leaders of the states' fight for offshore lands, Leander Perez, who, as *Fortune* magazine wrote in 1958, "holds the power to blow any business enterprise in his rich bailiwick sky high" (Smith 1958, p. 143). They handled Perez with great care and would not have wanted to antagonize him on an issue so dear to his heart. Attorney General Tom Clark's announcement in early 1949 that the Truman administration would recognize prior state leases somewhat allayed the industry's concerns about federal control, to the point where the *Austin Report* observed in July 1949 that the "oil companies have long since abandoned the States' side in this fight" (Quoted in Kreidler 1997, p. 107). Evidence suggests, however, that those companies, both large and small, continued to encourage state challenges to federal jurisdiction at least into the mid-1950s (see Gremillion 1996). Furthermore, supporters of quitclaim enjoyed solid majorities in both houses of Congress, even from legislators representing inland states which would have benefited from revenue generated under federal control, no doubt due in good measure to lobbying by oil companies large and small.

Because of their established offshore operations, however, the major oil firms also were more willing to support some kind of compromise. They felt increasingly uneasy with the lack of a permanent settlement and, after the Supreme Court decisions in 1950, worried about the suspension of leasing in the Gulf of Mexico, which delayed development and called into question the security of existing leases. In 1949, oil companies for the first time began sending their own spokesmen to testify on proposed legislation before O'Mahoney's committee, where they urged a quick resolution to the conflict. Walter Hallanan, president of Plymouth Oil and chairman of the newly formed National Petroleum Council, asked that "some authority be vested somewhere so that we can continue our operations during this national emergency." Hallanan supported S.J. Res. 195, the interim operation bill, as the "only way out." So did William Clary, the attorney who had argued California defense before the Supreme Court and who was appearing on behalf of oil companies. He feared the admirable but stubborn pursuit of quitclaim "may result in a stalemate which will drag this whole controversy along for perhaps another session of Congress" (Quoted in Laendner 1988, p. 48).

Clary's fears were confirmed. States' rights and quitclaim advocates refused to budge. The indomitable Leander Perez was a prime example of the tenacity and passion that the tidelands controversy had incited in opponents of federal control. His rooster gambit in the 1948 election was just the beginning of his commandeering of Louisiana's tideland's fight. In 1949, Earl Long paid another installment of his political debt to Perez by appointing the judge to the post of unpaid special assistant attorney general to help prepare the state's legal arguments before the

Supreme Court. Perez worked with Louisiana's attorney general and the State Mineral Board in drafting the state's 1950 brief. However, his name did not appear on it for fear of unnecessarily provoking the bench. According to a December 1949 profile in *Collier's*, Perez "rummaged through Washington bookshops for contemporary works on colonial history. He reread Benjamin Franklin's autobiography and poured over the proceedings of the Constitutional Convention." Seeking to find out who had original title to the tidelands, Perez uncovered that the 1783 Treaty between the British crown and the independent states transferred "territorial and proprietary" rights to the individual states. He concluded that sovereign powers of the states over these lands had never been granted to the federal government. Although this argument was not fundamentally different from that of California's and did not persuade the justices, the otherwise unflattering *Colliers* piece noted that "Perez has turned out to be a brilliant and lucidly plausible antagonist" (Velie 1949, p. 44). Dedicating himself to the cause with unflagging zeal, he became the state's unofficial spokesman on the tideland's question. He eventually broke with Earl Long over the governor's continued support for Truman and lost his special position, but launched a one-man crusade to retrieve what he felt the federal government had unlawfully seized.

Quitclaim supporters retained their majority in the Eighty-second Congress and were determined to force Truman's hand by sending him another bill. One of the leading proponents of quitclaim in the Senate included, not surprisingly, Russell Long, who owed his seat to Leander Perez, but whose moderate liberalism had by 1950 already alienated the judge. The two men agreed on the tidelands issue, however, and along with Senator Spessard Holland of Florida, Senator Long directed the quitclaim forces through extensive debate and parliamentary maneuvering, during which charges and countercharges of pressure from oil interests flew. Intense debate also raged over a similar measure introduced by Texas congressman Ed Gossett in the House, but quitclaim enjoyed a more solid majority in the lower chamber. In a final effort at compromise in the Senate by the anti-quitclaim forces, Senator Lister Hill (D-Ala.) introduced an amendment to assign royalties from offshore petroleum for defense needs during the Korean War and, afterwards, for grants-in-aid to education (100 percent from outer continental shelf beyond three miles, and 62.5 percent from the inner shelf). The amendment was defeated in a roll-call vote, and in the end, Congress passed legislation that quitclaimed submerged lands out to a state's constitutionally defined boundaries, or three miles in a case where a state's constitution set no boundary (Bartley 1953, pp. 224-227).

As anticipated, Truman vetoed the bill on May 29, 1952, explaining that he "could not approve the measure because it would turn over to certain states as a free gift very valuable lands and mineral resources of the United States as a whole; that is, all of the people of the country" (*New York Times* 1952). In a speech to the national convention of the Americans for Democratic Action a day after he received the quitclaim resolution from Congress, the president revealed his position in even stronger language and turned accusations of the federal government stealing offshore property back on the coastal states. "They want us to turn the vast treasure over to a handful of states, where the powerful private oil interests hope to exploit it to suit themselves," he said. "Talk about corruption. Talk about stealing from the people. That would be robbery in broad daylight – and on a colossal scale. It would make Teapot Dome look like small change" (United States Congress 1952). In his veto message, however, Truman struck a conciliatory note. He explained he was still willing to compromise, referring to O'Mahoney's interm control

measure and the "oil for education" measure proposed by Senator Hill. By this point, though, supporters of quitclaim were long past compromising. After once again failing to collect enough votes to overturn the veto, they thrust the tidelands into the spotlight as a campaign issue in the 1952 contest for the presidency.

The parties and candidates in the 1952 presidential election postured around the issue – Republican Dwight Eisenhower favoring quitclaim and Democrat Adlai Stevenson supporting Truman's position. It is difficult tell how large an impact the tidelands issue had on the national election results. However, Eisenhower's position certainly brought the Democratic political leadership in Texas behind him. After Stevenson announced he would continue Truman's policies in the face of hostile crowds of Texans on the campaign trail flashing signs exclaiming "Remember the Alamo and the Tidelands Oil Steal," Texas governor Allan Shivers threw his support to Ike. Texas oilmen had been famously behind the drafting and promoting of the general for president. Independent oilman Sid Richardson and his close associate, Robert B. Anderson, president of the Texas Mid-Continent Oil and Gas Association, began courting Eisenhower when the general was still the supreme commander of NATO, promising and delivering the backing of Texas oil money in the Republican nomination fight against Senator Robert Taft, who was supported by Oklahoma oil money. Hugh Roy Cullen endorsed Eisenhower, as did Alton Jones of Cities Service, who became the general's golfing buddy. The tidelands controversy did not sway the outcome in California and Louisiana, where Eisenhower still polled unusually high numbers thanks to support from the Democratic governor Robert Kennon, but did not carry the state. Yet for Texans, who crucially went for Ike in the general election, "the oil of the tidelands had much to do with detaching Texas from its historic allegiance to the Democratic party" (Sherrill 1983, pp. 512-513; Solberg 1976, p. 174).

Cheered by Eisenhower's victory, the quitclaim forces recommenced the drive for quitclaim the minute the 83rd Congress went into session. As in the past, the House was expected to pass the measure relatively easily, while the Senate would provide stronger resistance. Advocates of federal control did not surrender meekly. As an early indication of this, in one of his last acts as president, Truman issued an executive order declaring submerged lands to be a naval reserve. The order was essentially nullified when Eisenhower's attorney general, Herbert Brownell, interpreted it very narrowly to mean the offshore deposits merely passed to secretary of navy as custodian, leaving the issue of title unaffected. Meanwhile, in January 1953, Senator Spessard Holland and thirty-nine cosponsors introduced legislation similar to the one Truman vetoed a year earlier. The newly seated junior senator from Texas, Price Daniel, also introduced a bill that went even further, giving coastal states 37.5 percent of the oil and gas revenue from beyond their claimed historic borders offshore. This had been the key concession, interestingly enough, in Truman's earlier offer to Texas which had been scornfully rejected by Daniel in holding out for full control out to three leagues (*New York Times* 1953a).

The White House and congressional leaders placed the Holland bill, S.J. Res. 13, on a fast-track for approval in the Senate. The leading proponents of quitclaim were unwilling to depart significantly from the measure vetoed by Truman, and thus the Daniel bill did not make it out of committee. It was politically and tactically safer to send Eisenhower a bill such as Holland's which conformed to what the president specifically endorsed in the presidential campaign (Hollick 1981, p. 115). Plus, the proponents anticipated strong opposition from inland-state

senators, and the Daniel bill might have only increased that opposition. Objections to the bill also were raised within the new administration. To avert constitutional challenges, Attorney General Brownell suggested that the states be allowed to remove oil and other natural resources from submerged lands without actually receiving title as provided for in the pending legislation. State Department officials weighed in with even more serious concerns, telling Congress that recognition of state claims beyond the three-mile limit would threaten international law and force the United States to abandon a policy maintained for 150 years. These announcements sent Price Daniel and other interested lawmakers scurrying to the White House to obtain reassurances from Eisenhower (*New York Times* 1953b and c).

Emboldened by the conflicting views coming from the administration, the opponents of quitclaim committed to one last heroic fight in the Senate. Beginning on April 8, led by a group of liberal Democrats largely from inland and northern states, they kept debate going on the Holland bill for twenty-five days, the longest filibuster in Senate history to that point, although the opponents of the bill refused to call their tactics a filibuster, since they were not trying to prevent a vote on the measure. The Senators leading the delay included Herbert Lehman (D-NY), Paul Douglas (D-Ill), Hubert Humphrey (D-MN), Henry "Scoop" Jackson (D-WA), Wayne Morse (IND-OR), and Clinton Anderson (D-NM). Supporters waited out debate, and with help from President Eisenhower, who sent a message in late April urging "prompt approval" of legislation, the Holland bill finally came to a floor vote, easily passing 56-35 (*New York Times* 1953d).

On May 22, 1953, the House and Senate passed a reconciled bill, and President Eisenhower signed the Submerged Lands Act. "Where's Texas," Eisenhower called out mirthfully as he signed the act, beckoning Sam Rayburn to step forward to accept a ceremonial pen (Hardeman and Bacon 1987, p. 381). While the act did not recognize specific state claims, it nevertheless quitclaimed to the states all lands permanently covered by tidal waters seaward three geographical miles from the coast line of each state as this boundary existed when the state became a member of the Union. The act preserved federal rights and control over the submerged lands lying seaward of the belt granted the coast states, but invited each of the states bordering the Gulf of Mexico the opportunity to prove entitlement in judicial proceedings to a larger grant up to a maximum of three marine leagues by showing it had a boundary extending more than three miles when it joined the Union or that such a boundary previously had been approved by Congress. The act also validated each lease issued by a coastal state and maintained in force until June 5, 1950, the date of the Supreme Court rulings in the Texas and Louisiana cases. The Submerged Lands Act essentially divided the continental shelf into two areas, one belonging to the coastal states and the remaining area set aside for the United States. But for whatever reason, political, legal, diplomatic or otherwise, it left two major questions unanswered with respect to state ownership: 1) which states bordering the Gulf of Mexico were entitled to a historical boundary of three leagues; and 2) how would the coastlines of the states be determined.

On August 7, 1953, Eisenhower signed the Outer Continental Shelf Lands Act (OCSLA), authorizing the Secretary of the Interior to grant mineral leases on the "outer continental shelf," the name given to the U.S. area, and to prescribe regulations that might be necessary to carry out the provisions of the act. As in the Truman proclamations of 1945, the official U.S. foreign policy position on these acts was that the United States did not claim vis-a-vis other nations that

its territorial sovereignty extended beyond three miles, but that the United States did declare a right to lease and manage the resources of the seabed to the outer edge of the continental shelf. (Orn 1954, p. 81).

These landmark pieces of legislation established a new foundation for offshore oil and gas leasing, but they by no means ended the controversy. In subsequent years, state-federal conflict over offshore leasing continued to take place on two basic issues: developmental impact and territorial jurisdiction. On the development impact issue, the submerged lands legislation granted broad discretionary authority to the federal government for leasing beyond the designated boundaries and made no provision for sharing the revenues collected from leasing between the federal government and coastal states. The quitclaim forces in Congress and in the relevant states had fixated so intensely on retaining full control of submerged lands adjacent to their coasts that they forfeited opportunities to negotiate for a share of the revenue from the federal zone. Nobody could have predicted the tremendous number of discoveries in progressively deeper water over time. Nevertheless, political opportunism and greed were as much to blame for this shortsightedness. Over the years, the risks and costs of offshore development would be borne solely by the states and coastal communities, yet they would receive no share of the revenues generated by leasing in return. In the 1980s, the inequity of this arrangement would erupt in what one observer has called "The Seaweed Rebellion" (Fitzgerald 2001).

Although it took decades for the development impact issue to flare, the territorial jurisdiction issue exploded immediately and burned brightly for many years. First, the ambiguity about historical boundaries in the Gulf of Mexico set off another round of litigation between the federal governments and the states. Second, the submerged lands legislation left open to interpretation questions the exact location of the coastline. Many millions of dollars were at stake in revenues from existing or future leases to be divided depending on where these lines were drawn. Congress did not explicitly determine the boundary between state and federal waters, three miles from the coastline, other than to define the "coastline" under Section 2 (c) of the Submerged Lands Act as "the line of ordinary low water along that portion of the coast which is in direct contact with the open sea and the line marking the seaward limit of inland waters." Where the coast was in direct contact with the open sea, the coastline would follow the line of low tide. But where the coast was interrupted by rivers, bays, estuaries, inlets – most notably in Louisiana – establishing the location of the base line separating inland waters from the open sea would be the subject of contentious legal and engineering problems (Orn 1954, p. 81).

The Submerged Lands Act was seen as a victory for the states at the time, but in hindsight, it was clearly a victory for proponents of federal control. The federal government retained paramount rights over most of the continental shelf, and offshore leasing in the Gulf would become a major source of revenue for the federal government. Ironically, the legislation had greatest consequence for Louisiana, rather than Texas, where it was such a hot button issue but where offshore discoveries paled in comparison to those further eastward off its neighboring state. Louisiana kept its lucrative leases in shallow water, enough to buoy the state budget for years to come. Yet Louisiana officials ultimately would fail in their effort to expand jurisdiction beyond three miles, which has caused lingering resentment mostly directed at the federal government. Those who witnessed what had happened first hand, however, also direct their ire at the self-

interested politicians from their state who refused to accept compromise. "*Tidelands* in Louisiana should be a synonym for *disaster*," writes Bill Dodd. "For no political decision has ever cost the citizens of Louisiana what saying 'no' to the Tidelands compromise cost and is costing us" (Dodd 1991).

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5. AUCTIONING THE OCEAN: THE CREATION OF THE FEDERAL OFFSHORE LEASING PROGRAM, 1954-1962

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5.1. Introduction

In temporarily resolving the long-running Tideland's controversy through court decisions and Congressional action, the states and the federal government finally established in 1953 a working administrative framework for leasing offshore territory for oil and gas development. Sorting out jurisdiction was a first step toward bringing ocean space and its hydrocarbon resources into society, but their integration still required ongoing negotiation and trade-offs. The policy of the United States governed both by law and practical politics was to maintain a balance between the demands of various segments of industry, which generally desired greater and more open access to offshore lands, and those of environmentalists, states, coastal communities, fishermen, and even competing oil interests who for one reason or another desired to limit or constrain access to submerged lands for oil and gas development. From the inception of federal leasing, officials in the Bureau of Land Management and the USGS Conservation Division (whose leasing and regulatory functions merged in 1982 with the creation of the Minerals Management Service) faced the challenge of managing the trade-offs over leasing submerged lands with much less information, personnel, and financial resources than the interest groups with an economic and political stake in the outcome of policy and leasing decisions, especially the oil and gas companies. Neither oppressors of the oil business nor its captive instruments, federal regulators weathered many controversies, managing to give the industry enough access to make offshore development viable while attempting in with varying degrees of success to protect the interests of many other groups.

In the ideal world of oil companies, all federal lands would be open for lease. Access to land or property is the single most important factor to survival and profitability in the business, and it is the arena in which the companies compete most fiercely. Oilmen are like-minded and have common interests, but contrary to myth of the oil industry as one big trust setup or conspiratorial club, oil exploration is fiercely competitive. The key to success is figuring out where the oil is and getting to it before your competitors. Offshore exploration is a game of high risks as well as high rewards, spectacular failures and enviable triumphs. Overall, the federal Outer Continental Shelf leasing program has created a vibrant marketplace and shepherded into being a profitable segment of the industry. From 1953 through 2000, the leasing of federal lands in the U.S. Outer Continental Shelf, primarily in the Gulf of Mexico, led to a total commercial production of 13.1 billion barrels of oil and 140.5 billion Mcf of natural gas. The program has also been a major source of revenue for the United States, the second largest behind taxes. From 1954 to 2002, the federal government collected a total of $49.5 billion in cash bonuses and $67.3 billion in royalties – not adjusted for inflation – from offshore oil and gas leases (USDOI, MMS 2006). In constant dollars, the U.S. offshore program has been the "largest non-financial auction in the world" (West 2002).

5.2. Early Federal OCS Leasing and the "Interim Agreement"

After Congress passed the Submerged Lands and Outer Continental Shelf Land Acts and applications for lease validations started pouring in, the Department of the Interior suddenly had to create from scratch a federal offshore leasing and regulatory program. Its mandate from Congress, as stated in the policy declaration Section 3 of the OCSLA, was broad: "the Outer Continental Shelf is a vital national resource reserve held by the Federal Government for the republic, which should be made available for expeditious and orderly development, subject to environmental safeguards, in a manner which is consistent with the maintenance of competition and other national needs." In view of the dire warnings from Gulf states politicians and oilmen during the Tidelands political drama about the menace of big government to offshore operations, it is surprising how ill-prepared the federal government actually was to assume the large responsibilities of managing offshore oil and gas exploration and development. It had no specialized bureaucracy, regulations, or models to follow, other than what the states and companies were already doing offshore.

The first order of business was to account for the new federal leases inherited from the states of Texas and Louisiana. To sort out state from federal leases, the government had to decide where to draw the line demarcating state and federal waters along the Gulf Coast. The Department of Interior used the "Chapman Line," named after Secretary of the Interior Oscar Chapman (1949-1953), as a baseline. Developed in the summer of 1950 for the Department of Justice for use in the Submerged Lands case before the Supreme Court, the Chapman Line was drawn along the "natural shoreline," or line of low tide, on coast charts issued by the U.S. Coast Guard and Geodetic Survey. State waters were then determined to be inside a line drawn three miles from the Chapman Line into the sea. To determine the point of contact between inland waters and the open sea where the shoreline was interrupted, the survey employed the so-called "Boggs Theory," devised by geographer S. Whittemore Boggs, which essentially marked a straight line across headlands entrances no more than ten miles wide or across a span nearest the entrance which did not exceed ten miles.[7] The department awarded exclusive jurisdiction to the State of Louisiana on leases lying inside the three miles line, and section 6 of the OCSLA provided for the federal recognition and validation of leases issued by states outside the line. In 1954, Interior received 404 applications for continuance or validation of leases under section 6, and close to 270 were continued or validated, consisting of approximately 1 million acres (many of the leases, approximately 50 of the 300 leases off Louisiana for example, straddled the three miles line and thus the portion on the OCS side had to be given a separate and distinct lease). So when the federal leasing program began in 1954, it had an instant inventory of leases.[8] "Interesting to note that 204 of these leases are still producing," observed John Rankin, former regional director of the BLM OCS office in New Orleans, in 1986. "Would that success ratio be maintained!" (Rankin 2000).

[7]Donald Clemens, assistant chief, Division of Cadastral Engineering, Bureau of Land Management, memorandum for the record, June 23, 1954, Box 513, Office of the Secretary of the Interior, Central Classified Files (CCF), 1954-1958, Record Group (RG) 48, Records of the Secretary of the Interior, National Archives and Records Administration, College Park, MD. On the Boggs theory, see Boggs 1930; and Boggs 1951.

[8]Acting Solicitor, Memorandum to Director, BLM, February 18, 1955, box 513, CCF, 1954-1958, RG 48.

The second order of business called for establishing the regulations to govern leasing. The Bureau of Land Management and the Conservation Division of the U.S. Geological Survey were the two federal agencies responsible for conducting minerals leasing on federal lands in the Department of the Interior (Clawson 1971, pp. 139-141). The BLM handled the issuance of leases and pipeline rights of way, as well as all title matters relating to such leases, and prepared the official leasing maps. The Conservation Division managed all operational matters, collecting rentals and royalties and policing the operations. With the passage of the OCSLA, the two agencies extended their jurisdiction to mineral leasing offshore. In the spring of 1954, the directors of the BLM and USGS, Edward Woozley and Dr. W. E. Wrather, conducted extensive conversations with industry and held a series of government meetings and conferences to draw up the regulations. The BLM and USGS adopted most the industry's suggestions, according to the directors, "in whole or in substance, since to a great degree they are based on a knowledge of conditions which we do not have . . . ."[9] In fact, George Schoenberger, an attorney in New Orleans for Shell Oil, one of the most active companies in the Gulf, performed much of the preliminary work (Rankin 1986).

Section 8 of the OCSLA stipulated that tracts be auctioned by competitive, sealed bidding. "I came to the OCS with a background in oral auctions on federal lands," remembered John Rankin, "and when I think about the difficulty of executing bids, I shudder to think of how long it might have taken to auction one offshore tract" (Rankin 1986). Section 8 also stipulated the issuance of leases based on a "cash bonus" bid (simply a price to obtain the lease) with a fixed royalty on oil and gas production paid to the government of not less than 12 ½ percent per annum, or a royalty bid of not less than 12 ½ percent with a fixed cash bonus. The early leases issued by the State of Louisiana were obtained by cash bonus/fixed royalty bids, which were overwhelmingly favored by the industry. Cash bonuses/fixed royalties thus became the bidding practice for federal leases as well. The lease areas offered could not exceed 5,760 acres and would last for a period of not less than five years for oil and gas (ten years for sulphur) or as long as oil and gas was being commercially produced or drilling operations were underway as approved by the secretary of the Interior. Before the auction, the department would conduct a resource evaluation of a broad area and then invite industry to "nominate" tracts within that area. The nominations would be published in the *Federal Register* and the department would then select tracts for auction based on the indication of interest by industry in the nomination process and the resource assessment conducted by the USGS. On June 14, 1954, the department put out to industry a call for the nomination of tracts for bidding on the first federal lease sale set for October 13 offshore Louisiana and for a second one November 9 offshore Texas. On July 1, in preparation for the sales, the Conservation Division of the USGS opened a new regional Oil and Gas Leasing Branch office in New Orleans, at 1503 Masonic Temple Building, with a staff numbering 10 people. Not until the next year did the BLM open its own regional OCS office in New Orleans (USGS 1954b).

OCS conference meetings in July and August, 1954, presided over by Assistant Secretary for Mineral Resources Felix Wormser and Assistant Secretary for Public Land Management Orme Lewis, decided specific procedures and issues for that first sale which would become the norm in the federal leasing program. Conferees agreed that the first leases would offer a 16 2/3 percent royalty rate and a $3/acre annual rental fee. After years of offering leases based on this rate and

[9]Directors, BLM and USGS, to Secretary of the Interior, April 27, 1954, box 513, CCF, 1954-1958, RG 48.

fee, officials in the program later lost track of how they had been initially established. It appears that the 16 2/3 percent royalty was the sum of the mandated 12 ½ percent royalty plus an amount equal to the severance tax that had been levied by the State of Louisiana. "Never have I known where the $3 per acre came from," confessed John Rankin (Rankin 1986). Early Louisiana leases charged a rental fee of one-half of the cash bonus. Many of these bids went for around $7,500 per block, which meant a $3,750 annual rental or less than $1/acre for a 5,000 acre block. Texas, meanwhile, charged a $2/acre rental fee. A figure of $3-5/acre was suggested in the early meetings in Interior, and $3/acre was agreed on because $5/acre simply seemed "too high" for leases that had a shut-in gas well. Another figure arrived at somewhat arbitrarily, as least for the first sale, was that of the "minimum bid." Although Interior had the discretionary authority to reject any and all bids, some department officials expressed concern that unnecessary administrative time would be spent rejecting "token" or low-ball bids. At a July meeting of the assistant secretaries and directors, the figure of $15/acre was proposed and accepted as "unobjectionable."[10]

The other major issues for the first sale were the size of the blocks and the number and location of acres to be opened for leasing. The first OCS leasing maps were extensions of the leasing maps of Texas and Louisiana as authorized by the OCSLA. These states had adopted the Lambert Grid Coordinate System, developed by a Frenchman in the late 18th century for artillery firing. A regular block offshore Louisiana consisted of 5,000 acres and those offshore Texas were sized at 5,760 acres, the maximum allowed by the OCSLA. After drawing the maps, which blocked off acreage extending out to 120 feet water depths, questions arose as to where should the department accept nominations. Should it accept nominations or put up blocks for lease in the "twilight zone," the area between three miles and three leagues that was still disputed by Louisiana and Texas? The Supreme Court had conveniently sidestepped the question of who held title to offshore lands, and because Congress had only quitclaimed land out to three miles back to the states, both Louisiana and Texas still disputed the legal determination of lands beyond three miles (see below). Another question for the department was should it focus on areas adjacent to existing production or merely on areas adjacent to state-owned leases? The department received nominations from 14 companies and decided to offer most of the acreage nominated beyond the three leagues or 10 ½ mile line (many companies in fact notified the department that they would not bid inside the line because of the uncertainty as to the claims of the State of Louisiana). This acreage ranged out as far as 50 miles. On August 10, Assistant Secretary Orme Lewis approved the offering of 748,000 acres (and 520,000 acres for sulphur leases), consisting of 199 tracts ranging in area from 1,250 acres (partial blocks) to 5,000 acres (full blocks) (*World Petroleum* 1954).[11]

Just as the list of tracts to be offered was announced on August 18, the dispute between the state and federal government over jurisdiction entered into a new phase, as the State of Louisiana enacted a statute redefining Louisiana's seaward boundary even further beyond its earlier claim (see below). The Interior department briefly lost its nerve. It withdrew the offshore Louisiana

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[10]Director, Geological Survey, to Assistant Secretary Lewis and Assistant Secretary Wormser, memo, May 24, 1954, box 513, CCF, 1954-1959, RG 48; and Minutes, Outer Continental Self Conference, July 20, 21, 1954, box 513, CCF, 1954-1958, RG 48.

[11]Director, Geological Survey, to Lewis and Wormser, May 24, 1954; and Harry J. Donohue, special assistant to Lewis, August 16, 1954, box 513, CCF, 1954-1958, RG 48.

offering just a few hours after announcing it, explaining that Louisiana's claim to an extended boundary deserved further study. Then, in early September, department heads changed their minds and reissued the offering, exactly the same as before including the tracts inside Louisiana's newly claimed border. Withdrawing the tracts would have implicitly conceded that the state had a valid claim, which upon closer examination seemed dubious, before the courts or Congress ruled on the question (Linz 1954).

The first federal OCS sale, held as planned at the BLM in Washington on October 13, 1954, surpassed Interior's expectations and gave exceptional promise to the new federal offshore leasing program. The BLM collected $129.5 million on bids submitted by 23 companies for 417,221 of the 748,000 acres offered for oil and gas. Although unimpressive compared to later sales in the 1970s where that much could be laid out for a *single* tract, this represented a significant new source of revenue for the federal government. The Forest Oil Company of San Antonio, Texas made the highest cash bid – $6.1 million or $1,220 per acre for a tract in the Eugene Island area. Gulf Refining ($35.7 million for 22 tracts) and Shell Oil ($18.7 million for 13 tracts) offered the highest total winning bids. Phillips Petroleum, Kerr-McGee and Humble Oil rounded out the list of the top five successful bidders. The money exposed by the companies, at an average high bonus of $310 per acre, signaled that they were serious about the prospects of offshore oil and gas in the Gulf (*World Petroleum* 1954).

Kerr-McGee, however, did not stay in the top five for long. As the winning bids were read at the auction, the company's exploration managers sitting in the audience realized with horror that they had submitted bids on the wrong tracts. Leases were offered by tract number, which was not the same as the block number. For example, where the sale notice read "LA-41, Block 92, Vermillion Area, 5000 acres," with LA-1 designating the tract number, Kerr-McGee bid on tract LA-92, mistakenly substituting the block number. They had no competition on nine tracts in which they bid this way. Kerr-McGee's attorney and Democratic Party insider, Clark Clifford, wrote in a petition to the director of the BLM immediately after the sale that the company's written bids "did not in truth and in fact express the intention of Kerr-McGee to be tracts desired by them, but instead constituted bids on tracts in which Kerr-McGee had no geological information or interest whatsoever." He asked that the company's bids be withdrawn and submitted on the desired blocks. After this was refused, Clifford asked the Department to reject all bids on the blocks in question, so that Kerr-McGee could bid on them in the next sale. At the very least, he wanted returned the $3 million Kerr-McGee had deposited as earnest money. This being the first federal sale, and considering that the acceptance of the bids under the circumstances would not have constituted a binding contract, the U.S. Comptroller General forgave Kerr-McGee, disregarded the bids and returned the company's deposits. But the company still lost the tracts it had originally wanted. The incident nevertheless caused a bit of a commotion for several weeks. As the Gulf Coast Region of the Conservation Division reported sardonically to the USGS in Washington: "The New Orleans office received numerous inquiries for information whether the money submitted with the bids would be retained or refunded and some very positive opinions as to what should be done" (USGS 1954a; Ezell 1979).[12]

The next two federal lease sales further demonstrated oil operators resolve to push forward with offshore exploration. On November 9, 1954, the Washington office of the BLM opened the bids

[12]Clark Clifford to Director, BLM, October 14, 1954, box 513, CCF, 1954-1958, RG 48.

for leases off the coast of Texas. Only four companies had nominated tracts, as most were preoccupied with action off of Louisiana. Nevertheless, the department took in high bids of $23.4 million on 19 of the 38 tracts offered, all outside the three league line. The Magnolia Petroleum Company paid $3.18 million for a single tract, or $2,209 per acre, the highest per acre price paid for a state or federal lease in the Gulf of Mexico up to that point (Wahl 1955). The third sale, offering lands offshore both Louisiana and Texas, took place for the first time in New Orleans, in the Main Post Office Building on July 12, 1955. By this time, the BLM had opened a regional OCS office in New Orleans managed by Sidney Groom as basically a one person operation. The 1955 sale collected total high bids of $100 million on 94 tracts off Louisiana and $8.4 million for 27 tracts off Texas. Combined, the first three sales of OCS lands held by Interior brought the Federal Treasury more than $252 million in bonuses and first-year rentals on oil, gas, and sulfur leases (USGS 1955a and b).

Even before the third OCS sale, the conflict between the federal government and the states over offshore jurisdiction was becoming intractable. On May 18, 1955, the State of Louisiana held a lease sale in which 9 of the 22 tracts offered lay over three miles seaward of the Chapman line. Despite official protest from Secretary of the Interior Douglas McKay in a telegram to the State Mineral Board, three of the blocks were leased. The State Mineral Board retaliated by protesting Interior's July offering, in the form of a Resolution dated May 19, demanding that the United States rescind and abandon its call for bids and warning prospective bidders that the state would take legal action to protect its "property rights" in the contested area of submerged lands (USGS 1954a).

The year before, in August 1954, Louisiana's state legislature had asserted those rights by passing a statute, Act No. 33, which redefined the state's seaward boundary as a minimum of three leagues beyond the coastline, as described in the act of admission of Louisiana to statehood and union. The act of admission stated that the state's southern boundary extended "to the Gulf of Mexico; thence bounded by the said gulf, to the place of beginning, including all islands within three leagues of the coast" (*United States v. Louisiana et al.* 1960). The novel aspect of Act 33 was the definition of the coastline, which the state argued was the dividing line between inland waters and the open sea as determined by the Coast Guard and authorized by acts of Congress in 1807 and 1895. The Coast Guard fixed lighthouses and buoys along this line, as the U.S. Department of Justice pointed out, for navigational purposes, to determine where ships changed from rules for the open sea and to rules for inland waters. Act 33, however, tenuously claimed this boundary as the state's historical coastline and asserted Louisiana rights to submerged lands three leagues beyond it. Because of the many sandbars and islands in these coastal waters, this line in some places reached 37 miles into the Gulf from the Chapman Line (*Offshore Drilling* 1957).[13]

The Act 33 Line came to be known as the "Perez Line" or the "Leander Meander," after Leander Perez, district attorney for Plaquemines and St. Bernard parishes an infamous political boss of southern Louisiana. Perez used a very loose interpretation of the coastline to enlarge Louisiana's claim as far as conceivably possible into the Gulf. Prior to the passage of Act 33 establishing the Leander Meander coastline and the three-league state boundary, he once even asserted that the

[13]Leander H. Perez to Judge Simon Sobeloff, Solicitor General of the United States, September 2, 1954, box 513, CCF, 1954-1958, RG 48.

state's jurisdiction extended sixty or seventy miles offshore. Perez doggedly pursued every scrap of evidence he could find to support his claims, even purchasing from the Library of Congress a copy of every Louisiana coastal chart in their files (Jeansonne 1977, p. 166). He concluded from his research that Louisiana's original territorial waters and submerged lands, based on the 1682 proclamation of LaSalle, discoverer of Louisiana, and the 1762 Treaty of Paris, which ceded the territory to Spain, extended to the 27th parallel, which in places is more than 150 miles into the Gulf of Mexico from land. Neither the act creating the U.S. Territory of Orleans, acquired by the Louisiana Purchase in 1803, nor the 1811 act admitting Louisiana to the union made any declaration regarding the territorial and submerged lands in the Gulf; the three-leagues seaward boundary specified in the 1811 act, he stressed, was only a *minimum*. Thus, by Act 55 of 1938, had the State of Louisiana fixed its outer boundary at 27 miles, the extent of maritime nation-state boundaries under international law, under the tenuous assertion that this was the range of modern artillery (Gremillion 1957; Bartley 1953, pp. 53-58). After the Supreme Court decisions and Submerged Lands Act, Perez narrowed his goal to asserting the state's property rights claim to three leagues in the Gulf and establishing an expansive definition of the coastline. Meanwhile, he ridiculed the Chapman Line, arguing that it ran so far inland that Russian submarines could navigate miles up the Mississippi River and still be in international waters. "The Chapman Line goes to Shreveport and the Perez Line goes to Venezuela," one observer wryly commented (Jeansonne 1977, pp. 166-167, quote on p. 167).

Perez resisted the assertion of federal jurisdiction as fervently as he pressed the cause of racial segregation as one of the organizers of the Dixiecrat movement. The battle cry of states' rights served equally well, if not more plausibly, to assert Louisiana's claim to the lion's share of the offshore bounty. But it would be misleading to say that only ideology informed Perez's position. His personal fortune and political machine were funded by leases and overrides on oil lands, and Perez potentially stood to profit and augment his power from the retention of state jurisdiction over as much offshore terrain as possible. In 1956, he instructed his puppet in the Louisiana legislature, Representative E.W. Gravolet, Jr., to introduce legislation to give Plaquemines Parish levee districts control over adjacent submerged lands in the Gulf belonging to the State (the amended bill engineered by Governor Long, however, emerged as an anti-Perez measure giving the governor control over the Plaquemines police jury, and was challenged by Perez after it became law) (Jeansonne 1977, pp. 200-201). Rather than looking out for the state's best interests, Perez was determined to keep the feds out of his bailiwick in Plaquemines and St. Barnard parishes and enlarge his personal fortune and power.

Louisiana's challenge to federal jurisdiction on the continental shelf – in the May 18, 1955 state lease sale and May 19 Resolution by the State Mineral Board – set off a new round of court action. Just before the Louisiana sale, the U.S. Attorney General Herbert Brownell, Jr., filed a motion in the U.S. Supreme Court asking for a modification of the court's December 11, 1950 decree (see previous chapter) to state explicitly whether Louisiana's seaward boundary extended three miles or three leagues from the coastline. In October, the Supreme Court denied the motion, casting a pall over offshore operations in the Gulf. Many offshore operators had hoped the court would intervene to fix the boundary and relieve them of the burden of making dual royalty payments and complying with two sets of regulations. Others, who had accepted only federal ownership outside the three-mile line and were not paying royalties to the state, pessimistically interpreted the court's denial of the motion as reluctance to limit the state's

claims. In December, Brownell responded by filing an original complaint in Federal Court in New Orleans requesting that the Supreme Court determine the right of ownership, as distinct from "paramount rights," in the submerged lands and over resources lying more than three miles seaward from the ordinary low water mark along the coast of Louisiana (USGS 1955c and d). The table was set for another big, legal showdown. "It seems like both of them are so far out on the limb that unless both of them backed down, neither could," observed a spokesman for on the major oil companies at the time (*Oil & Gas Journal* 1955).

The showdown came in the run up to the fourth OCS sale planned for June 1956 in which large new acreage – the West Addition to the West Cameron area and the East Addition to the High Island area – had been plotted on the leasing maps. A month before the sale, the State of Louisiana followed through with its legal threat from a year earlier and filed a petition in the State District Court in the Parish of Calcasieu successfully seeking a temporary restraining order preventing the BLM and 25 oil companies from "disturbing the plaintiff's possession, enjoyment, use and administration of the submerged lands and natural resources or from slandering the plaintiff's title and from offering for lease or accepting or receiving or awarding bids for leases, and from bidding or offering to bid on mineral leases on the land described in the petition which is the Act 33 boundary."[14]

A new attorney general for the state of Louisiana seized the initiative with this legal strategy, and in the process challenged Leander Perez for leadership of the state's efforts to wrest control from the federal government over submerged lands in the Gulf. A young, diminutive but charismatic district attorney in Baton Rouge, Jack Gremillion, had been a last minute addition to Earl Long's gubernatorial ticket. After his inauguration as the state attorney general in May 1956, Gremillion suddenly found himself thrust into the titanic Tidelands struggle about which he knew very little. "I thought I was going to go up there and write opinions and defend cases and regular, routine duties that an attorney general would perform," he remembered. Then "the first thing that hit me was the Tidelands. I was shocked . . . shocked with the enormity of it." Leander Perez, who had become an implacable foe of Earl Long, moved immediately to shape and control Gremillion's approach to the federal government's new original complaint. "He tried to tell me what to do and he wanted to do this and do this," said Gremillion. "I soon began to realize that Mr. Perez was a threat, that I had the federal government to fight and I had Perez to fight" (Gremillion 1996).

Gremillion slowly distanced himself from Perez, whose history of controversy and strident confrontation was becoming a liability to the state and to the offshore industry itself. The new attorney general looked elsewhere for help. He relied on the State Mineral Board staff, especially the board's chairman, William Helis, and an attorney named John Madden, who specialized in oil and gas litigation. He received full cooperation from the staff of Senator Russell Long. Austin Lewis, a founder of the well-known Lafayette law firm, Liskow & Lewis, and a pioneer in Louisiana mineral law, volunteered his firm's services. Most importantly, Gremillion sought counsel from the oil companies themselves on how to address the new suit. George Schoenberger of Shell Oil and Scott Wilkinson, representing Texaco, led an industry brain trust recruited by the attorney general. Officially neutral on the submerged lands conflict,

[14]J. Reuel Armstrong, Solicitor, Department of the Interior, memorandum for the files, May 17, 1956, box 514, CCF, 1954-1958, RG 48.

the major oil companies secretly supported the state. They knew they could obtain better deals at the state level. "You see, all the oil and gas people were local," explained Gremillion. "They were familiar with the situation. They all knew they could do better legally" (Gremillion 1996). Gremillion claimed the companies' preference for working with the state was simply a matter of law, but given the history of Louisiana's corrupt leasing practices, it was also no doubt a matter of politics and influence.

After many meetings and discussions, Gremillion's legal team decided on a clever strategy. They could not sue the government in an original action such as this, but they could file an injunction against the oil companies preparing to bid in the June 1956 federal lease sale. Nearly all the oil companies planning to bid in the sale, it turned out, were domiciled in the parish of Calcasieu. So the State of Louisiana filed the injunctive suits in the parish seat of Lake Charles against the BLM and 25 companies based there, seeking an order restraining their participation in the sale because they would be leasing property owned by Louisiana. Although their names did not appear on the pleadings in the case, the leading oil attorneys essentially helped the state sue their own companies. It was an ingenious move by the companies in lending legal support to the state of Louisiana while maintaining the cover of neutrality and thus protecting their relationship with the federal government. Why would anyone suspect the companies of participating in a suit against themselves? (Gremillion 1996).

The "Lake Charles Case" moved the stalemated legal process forward to some resolution. Judge Mark Pickerel of the state district court in Lake Charles issued injunctions against all the companies included in the state's petition, forcing the postponement of the June 1956 federal sale. The U.S. attorney in Shreveport removed the case from the state to the federal district court, which released the corporate defendants from the temporary restraining order for the upcoming state sale, but held all other aspects of the order in effect. Upon appeal, the U.S. Supreme Court, in a June 11 decision, enjoined both the state of Louisiana and the federal government from leasing and operations in the disputed zone until the court had made a determination in the case of the United States' original complaint and the Louisiana coastline or until the parties had reached a working agreement. Then the court took a three-and-one-half month recess, after which it would consider the jurisdiction and shoreline issues.[15]

The state of Louisiana achieved what they had set out to do, but the Supreme Court's order effectively halted exploration and development in much of the Gulf at a very inopportune time. During 1954-56, the offshore industry had come alive again in both state and federal waters off Louisiana. Oil and gas companies discovered 34 new fields in 1954, 57 fields in 1955, and 72 fields in 1956. The success rate for wildcat exploratory wells was exceptionally high (34 percent in 1956), much higher than onshore. New-fangled drilling and construction vessels were being designed and launched to support exploration and production. Construction yards were ramping up the assembly of steel jacket platforms and beginning to lay marine pipelines. All kinds of new companies, from helicopter services to geophysical contractors to offshore caterers, were emerging as part of this rapidly expanding industry. The injunction now disrupted drilling plans, forced the abandonment of attractive leases and the movement of drilling rigs to new locations, and provoked the cancellation of orders for other drilling vessels and services (Meier and Kerlin

[15]Armstrong, memorandum for the files, May 17, 1956.

1955; Waters and Duncan 1956; Waters and Beu 1957).[16] The offshore slowdown generated a lot of political heat for Jack Gremillion. "I had shut down the oil industry in the Gulf of Mexico trying to protect the interests of the State of Louisiana," said Gremillion. "If you don't think my fanny didn't see red on many an occasion because of that . . . But all the oil companies, the people that were involved, were satisfied even though we were walking on thin rope" (Gremillion 1996). The major offshore operators, it appears, were willing to accept these short-term disruptions in hope of advancing Louisiana's claims.

Still, all parties had a pressing interest in reaching a working agreement to avoid a protracted and costly hiatus in offshore development. After the Supreme Court's June 11 order, Louisiana acted swiftly. In late June, Governor Earl Long signed into law an emergency bill, drafted by the attorney general with help from oil-company representatives, permitting Louisiana officials to negotiate with the federal government on an agreement to allow drilling and development to go forward with lease and royalty money from the disputed areas to be deposited in escrow until the boundary issue was resolved. In early July, a Louisiana mission headed by Gremillion and William Helis initiated meetings in Washington, D.C. with federal officials. U.S. Attorney General Herbert Brownell and Department of Interior Solicitor J. Reuel Armstrong expressed support for an escrow arrangement, but insisted on Interior's right to continue leasing in the disputed zone. This insistence, along with federal officials' refusal to impound federal revenue from past lease sales in the disputed zone, proved to be a major sticking point as negotiations dragged on through the end of the summer (*Oil & Gas Journal* 1956a, b, and c).

Meanwhile, oil companies, who publicly criticized the legal delay even though many of them had helped craft the initial state petition for an injunction behind the scenes, assumed a more formal role as mediators in the conflict. Represented by Austin Lewis, these companies were growing increasingly restless over the prospect of prolonged negotiations. Their drilling vessels were beginning to run out of work in the disputed zone. More importantly, a major disruption in international oil supply in early August, caused by Egypt's nationalization of the Suez Canal, underscored the growing importance of oil supplies close to tidewater ports for U.S. oil security. In other words, the Gulf of Mexico took on new strategic importance for both the United States and the major oil companies at the very moment that the renewed Tidelands conflict suspended leasing and development. In late August, offshore operators grew pessimistic about the prospects of a working agreement (*Oil & Gas Journal* 1956e).

They sweated through another steamy, New Orleans month before federal-state negotiators finally broke through the deadlock and signed, on October 12, an "Interim Agreement" enabling the resumption of operations and leasing in the contested area pending final resolution of the controversy. In the end, the Interior and Justice Departments made a major concession in agreeing to allow for the impounding of federal revenue from past sales in the disputed zone and not to require the state to impound its past revenue. In a compromise on future leasing in the disputed zone, which had been the greatest stumbling block, the two sides arrived at a complex arrangement. First, they agreed to create four offshore zones. Zone 1 comprised the area out to three geographical miles seaward of the Chapman Line. Zone 2 embraced the area between Zone 1 and a line three leagues seaward of the Chapman Line. Zone 3 spanned the area seaward

[16]Activity did not come to a complete halt, however, as the Supreme Court allowed operators to complete wells already started in the disputed zone.

from the outer edge of Zone 2 up to the juridical boundary claimed by the State of Louisiana, that is, up to three leagues seaward of the so-called Coast Guard Line, or variously known as the Perez Line or Leander Meander. And Zone 4 covered all submerged lands seaward of Zone 3 to the limits of the Outer Continental Shelf. The Interim Agreement awarded the State of Louisiana exclusive jurisdiction over Zone 1, designated Zones 2 and 3 as disputed areas to be administered jointly, and defined Zone 4 as an area of exclusive federal jurisdiction (Rankin 1986; *Oil & Gas Journal* 1956f).

In the jointly administered zones, the parties erected a cumbersome but workable framework for holding leases and collecting revenues. In Zone 2, sales would be held under federal jurisdiction, lease forms, and regulations, but only if the tracts proposed for leasing were being "drained" by an adjoining tract. In other words, only if the hydrocarbons under the tract were being siphoned off by a nearby producing lease could that tract be put up for lease. The state of Louisiana reserved the right to agree that the proposed tract for offering was indeed being drained. The state also had to agree, after the sale, that the cash bonus received for a tract was adequate. To consider the matter of drainage, officials from the BLM and the state would meet in an ad hoc session. But to determine the adequacy of bids, the Interim Agreement established a procedure whereby the director of the BLM presented to a six person committee, composed of three representatives from the federal government and three from the state, a report on the bids he proposed to accept or reject. The committee's majority vote would be the last word. In the case of a three-to-three tie, the federal position would prevail.[17] In Zone 3, the federal government did not need to justify drainage or obtain the state's agreement to hold a lease sale, but the same procedures as in Zone 2 governed the consideration of cash bonus bids. The revenues derived from leases, rentals, and royalties in Zones 2 and 3 would go into a special account that would be held in escrow until the federal-state boundary question was settled (Rankin 1986; *Oil & Gas Journal* 1956f).

The Interim Agreement offered a temporary spatial reconciliation between the State of Louisiana and the federal government over offshore leasing in the Gulf of Mexico. Offshore oil and gas development, which was strongly desired by both parties, could not go forward without at least a provisional territorial regime to guarantee the security of the massive fixed investments that such development would require. The Interim Agreement advanced the political and legal process to a point where conflicting claims to submerged lands would no longer limit the pace and scope of offshore leasing.

The Tidelands Controversy, however, was by no means over. In fact, it would endure another thirty years before all issues were finally resolved. But leasing and operations would not be affected by what happened in the courts. Interestingly enough, just hours before the interim agreement was reached, the Supreme Court ruled that it had jurisdiction in the pending boundary dispute. This decision might have given federal negotiators the confidence to make concessions, believing that the court would ultimately decide in favor of the federal government as it had in earlier decisions. The court then gave Louisiana 30 days to answer the federal government's suit and in April 1957 formally accepted the case (*Oil & Gas Journal* 1958).

[17]This formula was agreed to when Secretary of Interior Fred Seaton backed down on his previous insistence that his department had the right to reject any bid.

The presentation of Louisiana's initial petition before the Supreme Court at this time marked the last stand of Leander Perez as Louisiana's representative on the Tideland's issue. Perez despised Jack Gremillion, who not only had hijacked the Judge's pet crusade, but had committed the unforgivable sin of cutting a deal with the "federals." Perez considered Gremillion incompetent, and he tried to threaten and intimidate the attorney general at every turn. Gremillion excluded Perez from the case, maintaining that the Judge was "a diabolical enemy of the Supreme Court" who would only undermine the state's position. Always a creative legal tactician, Perez organized an association of district attorneys from Louisiana's Gulf Coast and filed a motion on its behalf arguing that the money to be recovered for the State of Louisiana should be distributed not to the state but to the parishes along the Gulf (Jeansonne 1977, p. 167; Gremillion 1996).

The final drama was played out in the Supreme Court chamber. When the clerk called up the case, Leander Perez jumped up to the speaker's microphone and asked the justices to consider his motion first. Justice Hugo Black, who was presiding in place of Chief Justice Earl Warren (Warren recused himself because of his previous involvement in Tideland's litigation as attorney general of California) and who had written the majority opinion in the 1947 decision in *United States v. California*, allowed Perez to go on for a few minutes, all the while turning "green with irritation," as witnessed by Jack Gremillion. Soon enough, Justice Black raised his hand and declared: "Mr. Perez, we have you motion and we want to tell you that it has been denied." Perez, however, refused to be silenced and protested the denial of the motion. When Gremillion informed the bench that Perez had no official role in the state's presentation, Black told the Judge, "You have no position. Take a seat." Perez continued to protest until Justice Black asked the Sergeant at Arms to escort him out of the courtroom. At that point, Perez finally packed up his materials and walked out (Gremillion 1996; Jeansonne 1977, p. 167).

The indomitable Perez still did not give up. He even persuaded his close political ally, Governor Jimmie Davis (elected for the second time in 1959 thanks to big returns from Plaquemines and St. Bernard parishes) to dismiss Gremillion as Louisiana's chief negotiator and appoint himself to a five-member legislative tideland's committee.[18] By this time, however, the process had moved beyond Perez's ability to influence the outcome. On May 31, 1960, by a majority opinion written by Justice John Marshall Harlan, the Supreme Court ruled that Louisiana, as well as Mississippi and Alabama, could claim jurisdiction only over submerged lands out to three geographical miles from the coastline.[19] The Court also validated the three-league boundary claimed by Texas when it entered the Union, as well as the extension of Florida's Gulf Coast boundary to three leagues by virtue of Congressional approval of a boundary asserted in Florida's constitution upon its readmission to the Union after the Civil War. The Court accepted the federal government's argument that Louisiana's boundary, by the 1811 act of admission, included only the islands within three leagues mentioned, and did not include all of the submerged lands out to three marine leagues. Interestingly, Justice Hugo Black, who had written

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[18]This move prompted Bill Helis and others to resign from the Mineral Board, although the new chairman, Hal Phillips ended up retaining Gremillion and his staff as attorneys for the board (Gremillion 1996).

[19]In April 1957, the State of Texas sought permission to file a brief as *amicus curiae* asking the Court to decide the case in a way that would not prejudice its own offshore claim. Then Court then allowed all the Gulf Coast states to enter the case, with only Alabama accepting. The United States, however, brought in Texas, Mississippi, and Florida. Hearings began on the case of *United States of America v. States of Louisiana, Texas, Mississippi, Alabama, and Florida* on October 13, 1958.

the original tidelands decisions, dissented. He argued that all of the Gulf of Mexico states should be granted a three-marine-league seaward boundary according to "broad principles of equity." These decisions, however, did not determine the location of the coastline along these states, and Zones 2 and 3 offshore Louisiana continued to be administered under the Interim Agreement. Although final determination of Louisiana's coastline would consume many more years of litigation, the state was forced to drop its liberal territorial claims, placing the federal leasing program on firmer legal footing (*United States v. Louisiana et al*. 1960).

Thus also ended, for practical purposes, the crusade of Leander Perez on the Tideland's question, although he refused to relinquish the fight. In 1962, he even included in the Plaquemines Parish budget a $10,000 appropriation for "expenses in defense of parish interest in tidelands" (Jeansonne 1977, p. 168).

5.3. The Sales that Revived the Gulf

Just when the Interim Agreement of 1956 removed the legal impediments to leasing, the industry's enthusiasm for leases evaporated. During 1957-1958, economic recession, an oversupply of crude, a series of hurricanes, and declining oil finds in deeper waters forced a slowdown in offshore exploration. Both dry holes and capital costs increased in water depths beyond 60 feet. The percentage of available drilling rigs working dropped from 100 percent in 1957 to 37 percent in 1958 (Frederick 1959). "The rapid rise and correspondingly rapid decline in offshore drilling operations in the Gulf of Mexico," wrote the president of the American Association of Oil well Drilling Contractors in 1959, "is one of the most surprising phenomena which has occurred in the oil business in many years" (Zeppa 1959).

Oil companies definitely had not given up on the Gulf, however. They just needed time to reassess the situation. Waiting for the return of better market conditions, managers focused on bringing in production from their many offshore discoveries and improving their exploration technologies. By 1959, the industry was ready to get moving again. The U.S. economy was back in a growth mode. The high success rate of those offshore drilling operations that continued during the recession gave cause for new optimism. In March 1959, President Eisenhower imposed mandatory quotas on oil imported into the United States, expanding the market for domestic oil. And innovations in seismic prospecting – especially the introduction of magnetic tape for recording and the improvements in data processing it afforded – stimulated renewed offshore exploration. Even though the federal-state dispute over the submerged lands still awaited a Supreme Court decision, both Louisiana and the federal government were also ready and willing to implement the Interim Agreement.

In May 1959, the BLM held a small sale offshore Florida (23 tracts leased for $1.7 million), but the big action came on an August 11th drainage sale held for Zone 2 offshore Louisiana. John Rankin, who had taken over as regional manager of the BLM's New Orleans OCS office in January 1959, remembered the sale very well. "First, it was held on my birthday," he said. "Second, and probably first, my youngest daughter was born the night before. And third, to my consternation, I opened a bid from Shell Oil Company and didn't know whether I could handle such a figure." Shell Oil had bid *$26 million* for a single, half-block tract adjoining the company's producing leases in the South Pass area. "I gulped twice and read that historic bid

which was the record high price per acre bid [$10,442] for many a year [until 1964]" (Rankin 1986). In all, the BLM leased 19 tracts (39,000 acres) for $88 million. The average bid per acre, $2,267, shattered previous average bids. Combined with the $141 million paid by operators for Zone 1 leases in three sales held by the State of Louisiana in 1959, the August 1959 drainage sale sent a clear message that the offshore play was on again.

Immediately after the sale, oil companies indicated that the time was right for a general lease sale with nominations in Zones 3 and 4. This would be the first general sale since 1955. Some government officials, however, did not appreciate just *how* eager the companies were to expand the offshore horizon. The director of the USGS cautioned against offering too much acreage, especially in the deeper waters of Zone 4. Operators were not ready to drill much beyond 100-foot depths, he insisted, and thus bonus bids for deeper acreage would be reduced. "Any leases acquired at this time in water depths exceeding 100 feet will probably be for speculative reasons."[20] But as the nominations came in for an announced February 1960 sale, John Rankin compared the tracts nominated in the ill-fated 1956 lease sale with those nominated for the proposed sale. He found that there was very little overlap, which demonstrated to him how much the industry had learned in the intervening three years. The move into deeper waters might not be so speculative after all (Rankin 1986).

Indeed, Shell Oil, which was emerging as the undisputed leader in the Gulf of Mexico, had secretly designed a floating drilling vessel that could take exploratory drilling into 300-feet plus water depths. Upon publication of the initial Call for Nominations for the 1960 sale, the company's representatives convinced the Department of Interior to withdraw the call and issue a new set of leasing maps with deeper acreage beyond the 300-foot depth contour. With Shell's assistance, the BLM redrew the maps with "south additions" to all the old original blocks off Louisiana and issued a new call for nominations. On February 26, 1960, the BLM offered 1.17 million acres offshore Louisiana and 437,000 acres offshore Texas. Once again, offshore operators spent big – $285 million in high bids ($249 million for the tracts off Louisiana) – more than double the amount spent in any previous sale. Shell Oil leased a number of tracts in the Grand Isle Area South Addition, which the company eventually drilled, starting in January 1962, with its revolutionary *Bluewater 1* semi-submersible drilling vessel. The 1960 sale truly reopened the Gulf for business and charted a new path into what people began referring to as "deepwater" (*Offshore* 1960). "The February lease sale is proof that major oil companies currently prefer the Gulf offshore area to anywhere else in the world," said Alden J. LaBorde, president of Ocean Drilling & Exploration Company (ODECO), at the time. "The advantages are obvious: A favorable political climate and sanctity of contracts – something you can't count on overseas; proximity to markets; and large enough tracts so you don't have to worry about offsetting rival wells or haggling over royalties and titles with a lot of small landowners" (Benedict 1960, p. 1).

The 1960 sale also marked the beginning of a more systematic approach taken by the federal government to offshore oil and gas leasing. The BLM invited all bidders at the 1960 sale to visit the OCS office while they were in New Orleans to discuss future lease sales, and then followed up those meetings with a more formal solicitation of industry's views on OCS leasing

[20]Director, USGS, to Director, BLM, September 18, 1959, folder: Oil & Gas Rates, 1959-1962, 3-1, box 211, Central Classified Files (CCF), 1953-1968, RG 57, Records of the U.S. Geological Survey.

procedures. BLM officials asked company representatives a series of questions: How often should lease sales be held? How large should lease offerings be (should blocks be offered in less than 5,000 acres)? Should minimum bids be eliminated? Should bids be taken on a sliding royalty rather than on a bonus, or a combination of both? Should bonus bids be financed through installment payments? Should the government waive its inherent right to reject any or all bids? (Rankin 1986).[21]

"Certainly, we got diverse answers," remembered Rankin (Rankin 2000). The only real consensus was that the BLM should establish a regular schedule for lease sales and forget about installment plans or royalty bidding. The apathy for royalty bidding by the smaller companies was surprising, considering the arguments advanced in some trade journals that cash bonuses created a barrier to entry in offshore leasing. Beyond the issues of agreement, the recommendations for the frequency of sales ranged from once a month to once a year. Opinions on the size of tracts split between offering whole blocks of 5,000 acres and half blocks of 2,500 acres. Seismic information, the companies agreed, was still not accurate enough to allow them to bid large bonuses on unproved areas in smaller tracts of 1,250 acres. Recommendations as to size of sales ranged from specific acreage amounts to offering the whole Gulf of Mexico at each lease sale.[22] "I wanted to offer all unleased blocks in a particular and different map area on a month-by-month basis," said Rankin, who had just come from a program where there was as sale every week. "Fortunately no one listened to me" (Rankin 1986). For the most part, the discussions with industry convinced the BLM to maintain its leasing procedures but eventually to move the sales onto a more regular schedule.

One of the most controversial issues was the rejection of bids, which had happened for the first time in the 1959 drainage sale. Then in the 1960 sale, the BLM-State of Louisiana committee rejected 10 bids in Zone 3 and the BLM rejected 16 bids in Zone 4, all of which met the minimum bid requirement. However, as explained above, the minimum bid figure was quite arbitrary and was not an accurate estimation of prospective value for any given tract. The rejections created sore feelings and many companies appealed the decisions. Upon reviewing the appeals, as George Abbott, the departmental solicitor, pointed out, some people in the department realized that the BLM "does not have – and perhaps cannot have – precise yardsticks for determining adequacy of bids."[23] But the BLM had a duty to try to insure that the government received fair value for its leases. The OCS office had better information on resources and structures in Zones 2 and 3 than in Zone 4. The federal-state committee that considered the recommendations of the director in Zones 2 and 3 used information furnished by Louisiana's state geologist. Louisiana had been leasing submerged lands for many years and possessed well logs and geologic data which greatly aided the evaluation of bids. For the deeper areas of Zone 3 and for all of Zone 4, however, the government had very little information. The

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[21]Under Secretary Elmer Bennett to Assistant Secretary Ernst and Assistant Secretary Hardy, April 22, 1960, box 283, CCF, 1959-1963, RG 48; Assistant Director, BLM, to Under Secretary Bennett, July 28, 1960, box 283, CCF, 1959-1963, RG 48.

[22]Assistant Director, BLM, to Under Secretary Bennett.

[23]George Abbott, departmental solicitor, to Secretary of the Interior, April 7, 1960, box 283, CCF, 1959-1963, RG 48; USGS Oil and Gas Supervisor, Gulf Coast Region, to Chief, Conservation Division, April 21, 1961, box 284, CCF, 1959-1963, RG 48.

number of people in the Department of Interior with OCS responsibilities, both in Washington and New Orleans, only totaled about 35. The entire regional BLM office in New Orleans consisted of John Rankin, his assistant regional director, Bill Grant, and two support staff. As Abbott implied, the government simply did not have the manpower, resources, and information to analyze the bids rigorously and scientifically (Rankin 1986).

So Interior officials subjected the deeper tracts to the scrutiny of what came to be known as the "Bierne Eyeball" method. Jim Bierne, the assistant director for administration in the BLM, at the time had responsibility for the BLM's share of OCS administration. Bierne used a simple association method to rule on the adequacy of bids. "Eyeballing" the leasing map, he rejected bids that were unusually low when compared to bids offered for offsetting tracts or that were in close proximity to proven acreage (Rankin 1986). For example, hypothetically, if a tract brought a high bid per acre of $100, and all surrounding tracts, both adjacent and cornering, brought high bids of $1,000 or more, the $100 per acre bid would be rejected. On the other hand, relatively low bids would sometimes be accepted in very deep, rank wildcat areas. The flaws in the Bierne Eyeball method were obvious to the government geologists involved in OCS work. A particular tract covering the crest of a salt dome, where oil and gas was likely to be found, would invite much higher bids than for nearby or adjoining tracts on the flanks of the same salt dome, where the probability of a discovery was much lower. Even for those tracts on the crests, bonus bids could vary greatly between bidders who all had staffs using sophisticated seismic and geological data unavailable to the Department of Interior. In reviewing the 1960 sale, E.W. Henderson, oil and gas supervisor for the USGS Gulf Coast region, observed that "It would be difficult for Departmental representatives to determine with any degree of accuracy a reasonable minimum bid for each offshore tract offered for leasing since most of the tracts are considerably removed from developed areas and on salt domes proximity is not a dependable indication of prospective value."[24]

The Bierne Eyeball method nevertheless prevailed until the Conservation Division acquired a larger staff and developed analytical methods for pre-sale tract evaluation in the late 1960s. The secretary of the interior denied all appeals of rejected bids from the 1960 sale, respecting the collective sense of department OCS officials that the BLM could not waive its right to reject bids and that they did not have enough information on which to base an acceptance of the appeals. In reviewing leasing procedures, it was proposed at one point that the BLM solicit geophysical data from the companies in support of their appeals on rejected bids. Very protective of this data, the industry strongly opposed the idea. By and large, industry representatives accepted the BLM's right to reject bids, but worried about the basis for exercising this right. George Schoenberger, the Shell Oil attorney in New Orleans, remarked to John Rankin, "I would not deprive the Secretary of the discretion to either issue or not issue a lease, but I would not want acceptance or rejection to be made upon a like or a dislike of the color of my hair" (Rankin 1986).

Despite tensions between government and industry caused by the rejection of bids, the 1960 sale was by most accounts a tremendous success. Further encouraging news for the federal OCS program came in late May, when the U.S. Supreme Court issued its ruling limiting Louisiana's jurisdiction in the Gulf at three miles. Backed by the outcome of the 1960 sale, the response

[24]Henderson to Chief, Conservation Division, April 21, 1961, box 284, CCF, 1959-1963, RG 48.

from industry to its queries, and the 1960 Supreme Court decision, the BLM prepared for another general sale in March 1962. This sale would actually take place on two separate days, two days apart. The response from industry to the call for nominations in October 1961 was so overwhelming that there was no way the New Orleans OCS office could handle a sale large enough to accommodate the demand for leases in one day. Some twenty operators nominated 3.67 million acres, 6,000 square miles, most of which was off the coast of Louisiana (some 30 tracts were nominated off Texas) in Zone 4 and in water depths beyond 100 feet. Not all of this was prospective acreage, of course. A company typically nominated three tracts for every one on which it planned to bid, in order to conceal their true desires and misdirect competitors. Nevertheless, offshore operators clearly signaled their collective intention to raise the ante on the multi-billion dollar offshore gamble (*Wall Street Journal* 1962).

Pathbreaking advances in drilling and exploration technology had primed oil companies to explore in ever deeper waters and whetted their appetite for offshore leases. Shell Oil was preparing to test its revolutionary *Bluewater 1* "semi-subermsible" drilling vessel in 300 feet of water on Block 110 in the Grand Isle area, a lease Shell acquired in the 1960 sale. Between 1960 and 1962, the most technologically advanced companies in the industry had adopted the seismic exploration technique known as common-depth-point (CDP) data stacking, invented by Harry Mayne of Petty-Ray Geophysical in the late 1950s. CDP stacking greatly enhanced seismic signals by filtering out unwanted "noise," revolutionizing the processing and interpretation of geophysical data (Mayne 1989). Conoco's development of the "Vibroseis," which substituted manmade vibrations or waves for those caused by dynamite-generated explosions in seismic prospecting, made feasible the multiplicity of source points necessary for CDP stacking without the associated increase in cost if dynamite were the only energy source. On top of these developments, digital seismic recording and processing neared the point of commercial application. The 1960-1962 interval, therefore, was truly a watershed in the technological development of offshore oil and gas exploration, which was reflected in the surging interest in offshore leases for the March 1962 sale.

Aware of the increasingly pent-up demand for leases, the BLM believed it was time to give the companies a chance to really prove what they could do. Leasing officials decided to open up the sale and auction everything that industry nominated. This was a bit of a tough sell to Secretary of the Interior Stewart Udall. It also generated protests from some smaller independents, who felt they could not compete offshore and who feared increased production in an industry they claimed already had an excess or "shut-down" capacity of 3 to 4.5 million barrels a day. They also anticipated a shortage of equipment for drilling such a large inventory of leases. [25] Still, those companies had no choice but to participate in the sale to protect their competitive positions. One industry official compared the interest of companies in offshore Louisiana to a "middle-aged man having his last fling." He was making desperate bids for offshore acreage, even though several years might pass before he realizes a payout, or even makes a successful hit (*Oil & Gas Journal* 1962b, p. 83).

John Rankin remembered writing pages of "justifications" for such a large sale. With decreasing oil finds onshore in the United States, combined with rising foreign production, he argued it was

[25]U.S. Representative Jim Wright to Stewart Udall, March 2, 1962, box 284, CCF, 1959-1963, RG 48; John Kelly, assistant secretary of the Interior, to Representative Jim Wright, March 9, 1962, box 284, CCF, 1959-1963, RG 48.

increasingly imperative that U.S. companies develop the technology required to explore, drill, and produce oil from the deeper waters of the Outer Continental Shelf. Unless the government provided some incentive in the form of acreage held under lease, it was doubtful that the oil companies could continue with the research and expense necessary to perfect the technology. Rankin made a strong enough case for the big sale. In fact, he anticipated more bureaucratic opposition than what actually materialized. At a meeting in Washington to discuss the upcoming sale, Rankin and E.W. Henderson, the oil and gas supervisor the USGS Gulf Coast region, unrolled a large map with all the nominated tracts shaded in bold colors. Expecting an argument about the offering, they were surprised to find that the only comments from their superiors were: "boy, that sure is a pretty map!" The meeting room was soon vacated, and Rankin and Henderson were left to draw up the sale as they had planned (Rankin 2000).

The March 13 and March 16, 1962 lease sales became legendary in the industry. Everyone from that era remembers the "the sale so large it took two days to read the bids." It was in reality one large sale split over two days. On the first day, the BLM offered 401 tracts, of which 212 received bids and 206 were leased. Cash bonuses for the leased tracts totaled over $177 million. On the second day, 410 tracts were offered, 210 received bids, and 195 were leased for cash bonuses of $269 million. Looking at the difference in the average per acre bids – $186 on the first day and $281 on the second – many analysts claimed that bidders took the money exposed in their unsuccessful bids on the first day and upped their bids for the second day. Although this theory was never proved, a study conducted by Rankin in 1984 showed that the difference in production of both oil and gas from the tracts leased on different days was negligible, fueling arguments for sequential or split sales as a way to increase government revenue, which in the end were never put into practice (USGS 1962; USDOI 1969).

Many stories about the March 1962 sale, imagined or real, evolved from this theory of how companies approached the split sale. Oilmen were so secretive about their bids and their methods of attaching dollar figures to tracts that nobody will ever really know what their strategies were. A penny could theoretically decide who won or lost a particular tract. The fewer people involved in making the final decision, the fewer chances for leaks. On the morning of March 16, just before the second day's sale, a land man took John Rankin into a conference room rented in the old Roosevelt Hotel in New Orleans for a bidding meeting for the second day, and Rankin recalled seeing large pieces of paper with the word "HUSH" written on them taped over each vent in the room to prevent whispers of the strategy meeting from escaping (Rankin 1986). Joe Foster, a drilling engineer who was responsible for computing reserve estimates and economic calculations for Tennessee Gas (Tenneco) at the time, remembered keeping the company's deposit checks, which were to be submitted with the bids, under his mattress the night before the sale. "The land man did not want to keep them in his room because he was afraid somebody might break in and discover the value of our bids on those checks," said Foster. "That is how paranoid we were!" (Foster 2002).

The March 1962 sale was a landmark in the history of offshore development in the Gulf of Mexico, for several reasons. First, it pried open the Gulf of Mexico to a broader range of players. Forty companies or combinations of companies bid successfully in the sale. Although independents like Kerr-McGee and Pure Oil had been early pioneers in the Gulf, the major integrated companies, especially Shell Oil and The California Company, had quickly overtaken

them as the dominant players. During the 1951-1960 period, the majors drilled over 90 percent of the wildcat wells in federal waters (beyond three miles) and over 75 percent of the wells in state waters. The majors also accounted for nearly 100 percent of the discoveries in federal waters and over 80 percent in state waters. By the late 1960s, however, non-majors were drilling nearly 30 percent of wildcat wells in federal waters with a corresponding rise in their share of discoveries. Putting so much acreage up for sale, first in 1960 and then really opening up in 1962, not only provided more leases for a larger number of companies to choose from, but it also drove down the price of cash bonuses, allowing smaller companies to acquire a piece of the action (Attanasi and Drew 1984, p. 440).

Still, the majors retained a commanding lead in exploration, especially in the deeper waters. The big spenders on cash bonuses in the sale were Humble ($63.1 million), Gulf ($46.6 million), and Shell ($45.5 million). Not far behind was Tennessee Gas ($43.3 million), a very well-managed natural gas company that was betting heavily on the Gulf for future gas supplies. Although the California Company spent only $17.8 million in bonuses, it acquired 50 tracts, second only to Shell's 57. What separated some of the majors from all the rest was not only capital, but science and technology. Humble, Gulf, Shell, and Chevron had the most sophisticated exploration and production research organizations in the industry. In the 1962 sale, it appears they all began to develop their bids, for the first time really, with rigorous and quantitative studies of reserve estimates, risk discounting, rates of return, and bidding tendencies of competitors. In previous sales, a lot of guesswork and hunches had gone into formulating "back-of-the-elbow" bids. But by 1962, the more advanced companies began to arrive at bids that contained more concrete numbers (USGS 1962).

In 1959-1960, for example, Shell Oil geologists undertook a major quantitative study of all the known salt dome fields of southern and offshore Louisiana and tried to discover why some were better than others. According to Shell geologist Jerry O'Brien, "the idea was how can we look at a huge sample and arrive at some sort of a value which is not based on hysterics, or whim, or some old theory that someone had?" They discovered that the better fields had certain characteristics in common, such as a good balance between sand and shale in the section, a minimum area of uplift, and certain kinds of geologic closure and quality of objectives. Then they plotted out correlations on a chart to help them evaluate the huge number of prospects that were going to be put up for sale in 1962. Shell also had paleontologists estimating the age and environment of deposition in order to help predict the kind of sand-shale section in the prospects (O'Brien 2000). Once all the geological work was done and advanced geophysical data collected and processed, the next step was determining how much oil and gas from a prospective field would be in a particular block, which was very tricky. Gene Bankston, who was with Shell Oil's E&P economics department at the time, explained: "a typical block would have some part of a potential oil field underlying it, and we would have to look at the probability of certain amounts of oil or gas, or both; and then, we had to provide a development scheme that showed how they would be developed and produced, and based on this calculate a value we could afford to bid, with the proper discounting for risk" (Bankston 1999). The other major players were developing similar quantitative approaches to bidding, allowing them to put their money where their mouth was in the sale. They were able to risk such large sums of money, not simply because they could afford it, but because they could back it up.

From the oil industry's perspective, the 1962 sale turned the Gulf of Mexico into the major focus of oil and gas exploration in the United States. "One could speculate," wrote Shell Oil's production manager in New Orleans in 1963, "that perhaps this area or province offers the best place to find large oil and gas reserves in this country, and maybe one of the last places" (Pittman 1963). Oil companies acquired almost 2 million acres of new leases, much of them in unprecedented water depths (the average water depth of leases in the 1962 sale was 125 feet, compared to 67 feet in 1954-1955 and 89 feet in 1960). The sale also opened up larger areas in the Western part of the central Gulf – Eugene Island, South Marsh Island, Ship Shoal areas – in addition to the delta regions which had been the scene of the hottest activity until then. This inventory of leases would keep the industry busy for the next five years. Indeed, the BLM did not hold another general sale until 1967. Meanwhile, all phases of exploration and development offshore Louisiana enjoyed boom times. Oil companies wasted no time drilling their leases. By September 1963, there were nearly 90 drilling operations in progress. According to one estimate, the industry was spending $1 million per day on drilling alone (Pittman 1963).

The 1962 sale, it should be noted, did not reward everyone. The success rate of exploratory drilling offshore Louisiana in the immediate years after 1962 could not match the extraordinary record of the late 1950s in combined state and federal waters. Dry holes were drilled on a large number of leases, and not all large bids were recouped. Socony-Mobil's expensive $5 million lease on Block 280 in the Ship Shoal area turned up dry. The BLM had not weaned down the tracts in the auction, so there was no apparent consensus on prospective acreage. Still, the overall drilling success in the Gulf after 1962 approached the U.S. average of 60 percent. The real impressive numbers were in the drilling success on federal leases (excluding state leases) issued in 1962 compared to earlier sales, and the reserve finding rate per exploratory well. Out of 420 leases issued in the1962 sale, 252 or 60 percent were productive as of 1969, compared to 178 productive leases out of 410 for the four previous federal sales. Most significant was the number of exploratory wells per giant field (100 million barrels) discovery: 155 for offshore Louisiana versus 3,773 for the United States as a whole. As of 1968, 14 of the 62 giant fields discovered in the United States were offshore Louisiana, and 11 of those 14 lay either wholly or partially within federally administered areas. Total offshore production from the Gulf of Mexico rose from 127.6 million barrels in 1962 (4.8 percent of total U.S. production) to 334.6 million barrels in 1968 (8.6 percent of the U.S. total), all but about 30 million barrels of this increase coming from federal areas, and most of it from acreage leased in 1960 and especially 1962 (USDOI 1969).

The 1962 sale had another important, long-range effect on the offshore industry. It fostered greater technological cooperation among firms and the standardization of practices. With only five years to establish oil and gas production on 420 leases, companies in the industry had to work together to find ways to operate safely and economically in increasingly precarious depths. Shell Oil set things in motion in January-February 1963 when the company held its famous and unprecedented three-week "million-dollar school" on offshore technology for representatives from industry and government. Paying "tuition" of $100,000, seven companies along with the USGS signed up for a series of courses on all aspects of Shell's innovative deepwater drilling and production program, from floating drilling to subsea well completions. Shell offered its technology to the industry, according to Ron Geer, a top engineer in the deepwater program, because in the 1962 sale the BLM had not honored the company's bids on six 5,000 acres tracts

located just east of the company's 300-foot-depth Grand Isle test site. Shell had no opposition on these tracts and the company's bids were only slightly above the $15 per acre minimum (*Oil & Gas Journal* 1962a, p. 88). Senior management concluded that there had to be greater competition, both to enable Shell to continue acquiring deepwater acreage and to stimulate the commercialization of the technology. The costs and risks were so high that no one company could venture alone into deepwater. Other oil companies, as well as suppliers, manufacturers, and construction firms could only progress deeper together. "We realized that the only way we could ever have access to those frontier areas was to share our knowledge with the rest of the industry, to give them a base of technology from which they could expand," said Geer (Quoted in Abbott 1984, p. 10). The 1962 sale, in other words, sparked the diffusion of drilling and production technology and created a greater sense of technological purpose that eventually culminated in 1969 with the organization of the Offshore Technology Conference (OTC).

Finally, the 1962 sale had major implications for federal offshore leasing. The $445 million dollars collected in bonus bids opened people's eyes to the importance of the program. Government analysts, particularly in Interior, were awakened to the fact that this program, with only about 30 people total, part of whom did not even devote full time to it, took in more money in a single sale (and in later years a single tract) than all the timber sales in Oregon and California and onshore mineral leasing for the year *combined*. "My office began receiving daily attention rather than only on sale day," said John Rankin (Rankin 2000). The 1962 sale, of course, was an anomaly. It brought an end to lease sales where most tracts nominated, with a few exceptions, were offered. In future sales, the BLM and the USGS Conservation Division, like industry, would become more rigorous and scientific in its approach to evaluating and leasing tracts. Offshore leasing was now big business, and the federal government had large and expanding responsibilities for regulating it.

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6. THE BRAVE AND THE FOOLHARDY: HURRICANES AND THE EARLY OFFSHORE OIL INDUSTRY

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6.1. Introduction

When the oil industry moved offshore into the Gulf of Mexico after World War II, it plunged into an ocean of ignorance. Little was known about conditions in the Gulf. As the industry sought to adapt technologies developed onshore to the challenges of operations in the open sea, it also had to collect basic data about wind, waves, and soil offshore. Every-day operations offshore required engineering adjustments in the design of drilling rigs, pipelines, and construction equipment. And out there beyond the horizon loomed an engineer's nightmare, the extreme, unpredictable conditions generated by hurricanes (Veldman and Lagers 1997; Pratt *et al.* 1997).

Those seeking to develop a technological system capable of finding and retrieving oil and natural gas from underneath the ocean faced formidable challenges in defining basic design criteria. Traditional engineering calculations could estimate the environmental forces that would come to bear on the equipment and structures needed to produce oil, but such calculations could be made only after the collection of data about these forces of nature. How strong would the winds blow? How high could hurricane-driven waves be expected to crest? How solid was the foundation provided by the soft, sandy bottom of the Gulf of Mexico, and how would this soil be affected by hurricanes? Underlying these questions was another, more practical one: How much were oil companies willing to spend in order to develop safe, durable offshore structures?

It was at yet unclear if offshore oil could be developed in a way that made it competitive in price with oil produced onshore in the United States and with growing imports from Venezuela and the Middle East. Numerous companies stood ready to explore the risks and rewards of offshore operations in the late 1940s, in part because of the scarcity of good leases onshore, where large oil companies had locked up giant acreage at low costs in the depressed 1930s. Seismic surveys in the 1930s had revealed numerous large salt domes in the Gulf of Mexico. It made good geological sense that the excellent oil fields discovered in the early twentieth century along the Texas-Louisiana coasts did not stop at the water's edge.

At war's end, several major oil companies eagerly extended their on-going quest for large oil fields out into the Gulf. A handful of smaller companies looked out in the same direction seeking "break-through" discoveries that could vault them up the ranks of the independent oil producers. These companies faced an uphill battle offshore. If they could not develop a technological system capable of getting offshore oil to markets onshore at a price competitive with other sources, they could not sustain operations in the Gulf of Mexico.

History was kind to the pioneers of the offshore industry in the Gulf of Mexico. They arrived at the right shore at the right time. The Gulf sloped very gently out, stretching for a hundred miles in places along the continental slope before reaching water depths of 300 feet. Companies thus

could walk gradually, step-by-step into deeper waters as they developed new technologies. As they moved out, they could draw on the workforces and expertise of clusters of oil-related manufacturers and service companies that had grown previously to meet the needs of a booming onshore industry in the region. Best of all, significant discoveries in the Gulf quickly rewarded their initial efforts, encouraging them to make larger investments.

In developing new, the offshore industry could draw on previous experiences gained near the shore in California and in a variety of inland waters around the world. Before the 1930s, oil had been developed off the southern California coast near Summerland using a system of trestles that reached out into the edge of the Pacific Ocean to tap oilfields that extended from known onshore deposits. But this region lacked the threat of the extreme weather produced by hurricanes. Extensive development of oil in the protected waters of Caddo Lake in Louisiana, Venezuela's Lake Maracaibo, and the Caspian Sea generated knowledge useful in every-day operations offshore. Finally, work in the marshy areas of "inshore" Louisiana in the 1930s helped prepare the way for operations in nearby areas offshore. None of these previous projects, however, had to be designed to stand up to hurricanes in the open sea (Veldman and Lagers 1997).

Griff Lee, a design engineer for Humble Oil and then for offshore construction giant McDermott, aptly summarized the situation facing the industry in 1945: "There had been no construction of open frame structures in open water before." Designers could look at data on the wave and wind forces exerted on seawalls or on ships at sea, but such data could not predict the forces that would come to bear during a hurricane on structures permanently fixed to the ocean's floor (Lee, personal communication 1996). Given this void of knowledge about conditions offshore, those eager to explore for oil in the Gulf of Mexico would have to take calculated risks while they learned by doing.

This was not unusual in the oil industry or, indeed, in any innovative industry in America in this era. Oilmen lived by the oft-repeated adage: "Fortune favors the brave." With great confidence born of past technical successes and fed by the profits promised to first movers into the Gulf, the oil industry used very rough "best estimates" of wind and wave forces in the initial design of offshore facilities. When problems arose, engineers and construction specialists within the individual oil companies joined forces with their counterparts in offshore construction and service companies to solve them "on the run." Meanwhile research went forward by all involved--including consultants and academics-- to generate the data needed to improve the best estimates. This "entrepreneurial" approach was possible in a largely unregulated environment in which the companies enjoyed great freedom to make their own choices (Pratt *et al*. 1997).[26]

If fortune favored the brave in the formative years of offshore development, unusually good weather favored the foolhardy. Until 1964, no major hurricanes swept through areas with high concentrations of offshore operations. Thus for almost twenty years, the offshore industry amassed the data and the experience needed to improve the design of its equipment in the

[26] Government regulation of offshore activity before the 1970s came from a variety of agencies, none of which exercised strong control. Both the state and federal government had authority to lease offshore lands. The Army Corps of Engineers held the power to issue construction permits for projects in navigable waters, and it required offshore companies to clearly mark their platforms and to dismantle them once they were no longer in use. The Coast Guard had authority over safety and limited powers over oil pollution.

relative calm before major storms returned to the region in the mid-1960s. Three major storms, Hilda (1964), Betsy (1965), and Camille (1969) severely tested the technical system that had evolved in the Gulf of Mexico (Tait 1995). The industry received a gentleman's "C" on these tests. The brave and the foolhardy had demonstrated admirable ability to make engineering adjustments on the run, but they had gravely underestimated the risks presented by major hurricanes.

6.2. Early Platforms

The oil industry first stuck its toe into the Gulf of Mexico to test the waters before World War II, and the results of these early forays identified several key problems presented by storms. In the late 1930s, Humble Oil (then a Houston-based, majority-owned subsidiary of Standard Oil of New Jersey) constructed one of the first drilling sites in the Gulf at McFadden Beach, south of the giant refineries at Port Arthur, Texas. Borrowing from the approach that had proved successful in southern California, the company extended a trestle more than a mile out from shore, with drilling rigs at the end of the line supported by men and materials brought out on a train track over the trestles. The drillers struck no commercial deposits of oil, and after a small hurricane in August of 1938 ripped apart the entire facility, Humble abandoned this venture. The industry subsequently ratified Humble's decision: trestles could not be built high enough or strong enough to withstand hurricane-driven waves in the Gulf (Larson and Porter 1959, pp. 422 and 433; *Oil and Gas Journal* 1938, p. 113).

The first real test of offshore construction came up the coast about 50 miles near Cameron, Louisiana. In 1937 and 1938, Pure Oil and Superior Oil together built a large wooden platform about a mile offshore in approximately 14 feet of water. This Creole field became the first producing property in the Gulf. It proved that profits could be made offshore while also revealing the severe challenges posed by hurricanes and the limitations of applying onshore technology in an offshore environment.

The companies constructed a giant platform measuring 320 feet by 180 feet from which to drill the exploratory well and then to produce any oil found. The primary task was to drive some 300 treated yellow pine piles 14 feet into the sandy bottom using pile drivers mounted on barges. This "stick-building" approach sought safety and strength through the clustering of many wooden piles; it sought stability against wave forces by driving the piles as far as possible into the sand. It sought protection from hurricane winds by using design criteria developed for onshore buildings to construct a structure that could survive winds of up to 150 miles per hour (Alcorn 1938a, pp. 33-37).

Hurricane-generated waves were another thing entirely. With no available data on wave heights or wave forces, I. W. Alcorn, the designing engineer from Pure Oil, chose to build the deck 15 feet out of the water. He figured that such height would provide sufficient protection from normal high waves. He could not calculate the strength and height needed to survive a major hurricane; nor did he have the capacity to build such a structure with existing tools. So he struck upon a reasonable compromise. He designed the deck so that it would be swept off the piles by very high waves, thus limiting the damage done by a severe hurricane to the extensive system of piles. The wooden deck could then be replaced after the storm (Alcorn 1938b).

The Creole platform completed the first successful well in the Gulf on March 18, 1938.[27] Once production began, the problems of transportation and communication became more pronounced, foreshadowing similar problems in the post-World War II offshore industry. Workers lived in houseboats at Cameron, the closest town. But the platform itself was some ten miles along the coast from Cameron, meaning that all men and supplies came to the platform via a long and often rough ride out in shrimp boats leased for this purpose. A one-way ride might take up to an hour and a half. Without communication between the supply point, the boats, and the platforms, the shrimp boats often arrived at the platform only to find seas at the site too rough to allow workers to transfer from the boat to the platform. Rope ladders hanging from the platform could be lowered down to the deck of the shrimp boats in relatively calm waters, but not in rough seas. In the thick fog that often hovered over the platform, boat captains would at times simply cut their engines and listen for noise from the platform in order to find this man-made island. From the start, it was understood that in the event of a major storm, the men would be evacuated after the equipment on the deck had been secured.

The Creole platform proved quite successful in finding and producing oil. Using directional drilling to tap the field at several surrounding locations, it produced over four million barrels of oil over the next thirty years, during which time it was constantly upgraded as the offshore industry became more experienced at construction. Alcorn proved farsighted on one key point. In 1940 a small hurricane moved through the region, sweeping the deck into the ocean and badly damaging the piles. Crews drove some new piles, quickly rebuilt the deck, and the platform returned to production, the first offshore structure in the Gulf to survive a hurricane (*Offshore* 1963, pp. 17-19).

World War II halted development in the Gulf. Workers on several small platforms being built offshore in 1942 remember scanning the horizon nervously in search of the periscopes of German submarines. But the war set in motion several processes that proved quite helpful to the offshore industry when peace returned. First and foremost was the work of the U.S. Army's oceanography and weather service, which created a corps of well-trained specialists who forecast wind, wave, and soil conditions for use in the amphibious landings in northern Africa, Normandy, and the Pacific. These "weather officers" accumulated data on the behavior of waves and soils in different storm conditions. From such information they sought to predict whether conditions at a specified place and time might be appropriate for an amphibious landing. Several of the weather officers led the industry's post-war efforts to collect and interpret better data on winds, waves, and soil in the Gulf of Mexico. Their methodology—using observations of past conditions to help forecast current and future conditions—evolved into much more sophisticated methods of "hindcasting" hurricanes as a way to more fully understand and predict the probabilities for severe weather at a given location out in the Gulf.[28]

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[27] March 18, 1938 was a momentous day in oil history. As the first offshore well came in, the Mexican government was proclaiming the expropriation of U.S. and British oil properties in Mexico. Half way around the world, the discovery well for the first oil found in Saudi Arabia also came in on March 18, 1938.

[28] For profiles of several of these weather officers, see (Offshore Energy Center 1998). This booklet was published as a part of the induction of individuals into the OEC Offshore Hall of Fame. In conjunction with this event, the inductees are interviewed and the interviews are transcribed and placed on file at the OEC in Houston. See, for example, Interview of R. Reid by M. Sharples, 10/17/1998; Interview of C. Cooke by T. Priest, 10/6/2001; Interview of J. A. Focht by T. Priest, 10/6/2001; Interview of B. McClelland by T. Priest, 10/6/2001.

6.3. Postwar Developments in Platform Technology

The war paved the way for post-war developments in many other ways. Much improved communications at sea could be adapted for use offshore. War-surplus vessels produced in great numbers to support amphibious landings could be purchased and converted for offshore uses at bargain basement prices after the war. Perhaps the most important impact of the war, however, was on attitudes, not equipment. Veterans who had postponed their lives for four or five years returned eager to get back to normal work and family lives. They came back with a sense of urgency and a sense of adventure, two characteristics required of those who leaped out into the Gulf in search of oil after World War II.

The race offshore was on in the late 1940s. Despite uncertainties between coastal states and the federal government over the ownership of offshore lands, despite economic uncertainties, despite technical uncertainties, numerous oil companies headed out into the Gulf in search of big, virgin fields. Economics shaped their technical choices. One young Shell engineer, C.H. Siebenhausen, recalls asking an old hand at Brown & Root (one of the two dominant offshore construction companies in these early years): "In just how deep of water do you think Brown & Root could build an offshore platform?" The simple answer was: "First, young man, you will have to tell me how much money Shell is prepared to spend on such a platform" (Siebenhausen 2000). The economics of offshore construction included considerations of severe weather in the design and construction of new facilities.

In these formative years, two basic approaches to offshore exploration and production emerged. The first was the Creole approach writ large. Humble, Superior (a large independent), and Magnolia (a Dallas-based majority-owned subsidiary of Standard of New York) chose to build permanent platforms to find and develop oil in the Gulf. These platforms could hold crews of up to 50 workers, as well as all needed equipment and supplies. They were sturdy enough to last the life of the field and to survive harsh weather. They were also expensive to build and fixed in place once constructed, attributes that greatly magnified the risk of building them for use in drilling wildcat wells (McGee 1949, pp. 50-53 and 117-120; *World Petroleum* 1947, pp. 60-61; *The Humble Way* 1948a, pp. 15-17).

A smaller company, Kerr-McGee, developed a less expensive approach, using refurbished war-surplus LSTs to house men and supplies and a small platform to support the drilling rig needed to find and produce oil. The LSTs were more than 300 feet long; once most of their insides, including their engines, had been removed, they could be converted into a sort of giant floating storage bin. This small platform with tender approach had obvious economic attractions, at least while war-surplus vessels remained plentiful and inexpensive. In the event of a dry hole, the tender--unlike the large fixed platforms--could be towed to a new location and at least a portion of the cost of the small platform could be salvaged (Pratt *et al*. 1997, pp. 21-30; *The Humble Way* 1948b, pp. 6-7).

Severe weather had implications for both systems. Large platforms could be designed and built to withstand hurricane level storms much more easily than the small platforms with tenders. High decks--at least in the context of the prevailing wisdom at that time--and safe procedures for transferring workers could be incorporated in their designs. The first generation of fixed platforms constructed from 1946-1948 placed decks from 20 feet to 40 feet above the mean level

of the Gulf, reflecting the broad range of opinion on what was the most likely wave height in a severe hurricane (*Shell News* 1949, pp. 4-9).

In contrast, the tenders posed serious problems in high wind and waves. These vessels were not self-propelled, and they could become heavy floating sledgehammers in rough seas. After the success of the Kerr-McGee's small platform with tender, Humble invested millions of dollars in buying surplus LSTs and converting them for use as tenders. It developed a mooring system using chain two inches in diameter to hold these large vessels alongside small platforms. Company engineers designed the ship's anchoring system to withstand 100 mile per hour winds. To accommodate the height of the tender, decks on the small platforms were as high as 34 to 44 feet above the ocean. Men and equipment moved from the tender to the platform over a bridge that could be raised from the vessel to the deck. So difficult was passage over this bridge in rough seas that workers came to call it "the widow maker." If a hurricane seemed likely to affect a tender operation, the company would move the tender away from the platform so that it could ride out the storm at anchor while posing less danger of pulling off of its moorings and smashing into the platform. Humble maintained large vessels near its offshore locations to evacuate workers in the event of severe weather (*The Humble Way* 1948b; Kolodzey 1954).

Problems with the tenders in rough weather did not, however, outweigh the economic advantages the small platform with tender had over the large fixed platforms. The huge downside of permanent platforms remained: a dry hole meant that literally "sunk costs" could not be recovered. Until the development of dependable, cost-effective mobile drilling rigs that could stand up to rough conditions in the open sea, the "semi-mobile" small platform with tender remained the dominant approach to offshore exploration and production.

Oil companies active in the Gulf went forward using both approaches until the late 1940s, when the "tidelands" controversy temporarily halted leasing while the federal government and state governments turned to Congress and the courts to resolve questions of ownership of offshore lands. This controversy became quite heated, particularly in the 1952 presidential campaign. But the pause in leasing gave the industry a short breathing space in which to reexamine assumptions about design criteria for offshore structures and to begin a generation of basic research about waves and soil conditions in the Gulf.

This research proceeded on a number of loosely coordinated fronts. The major oil companies created their own research groups, which worked closely with leading research institutes such as Scripps and the University of California-Berkeley. Consultants also provided much input into the studies of basic conditions. In the 1950s, the American Petroleum Institute (API), the industry's primary trade association, became more active in the collection of improved data about waves and soil, and the API gradually emerged as the focal point of much of the industry's interpretation of the data collected from research.

One key area of concern was the composition and load-bearing capacity of the soft soil in the Gulf. The leading authorities on soil conditions were the founders of McClelland Engineers, a consulting firm based in New Orleans that extended the work of the weather officers into the Gulf of Mexico. Bramlette McClelland, John Focht, and Robert Perkins pioneered the applications of soil mechanics to the problems of the offshore industry. To do this, they had to

have data on conditions in the Gulf. With industry funding and cooperation, in 1947 they began boring soil samples offshore, building a data base for use in offshore construction. At times they worked just ahead of the contractors busy designing and installing structures; at other times, they investigated general conditions in areas likely to be explored in the future. Their analysis of the results of oil company-sponsored tests also led the way in applied research on the load-bearing capacity of the piles used to support offshore platforms (Offshore Energy Center n.d., pp. 34-36).

The API took the lead in the collection of other sorts of data on the soil in and along the Gulf. In 1951 the Institute launched what came to be known as Project 51, which spent four years undertaking basic work on conditions in the Gulf, using core drillings, serial mapping, and seismic surveys. This work, as well as that of McClelland Engineers, provided fundamental information vital to the safe construction of offshore structures. It did not, however, directly address a question that was later revealed as important: what would be the reaction of soil in various parts of the Gulf to the extreme conditions generated by severe hurricanes.

Other research studied the force of waves on offshore structures, both in normal times and in times of extreme weather. Here the oceanography department at Texas A & M University led the way. C.L. Bretschneider and Robert Reid, two more former weather officers, cooperated with several major oil companies to conduct field measurements to determine the wave forces exerted on vertical cylinders placed in the ocean. J. R. Morison later added considerations of inertial components to this work (Reid, personal communication 1998).

Other primary research was much more directly tied to hurricanes. From 1947 into the 1970s, extreme wave heights remained a critical question on the minds of offshore engineers. This question was attacked from two directions. The first sought to develop better means to track storms and to predict where they would hit; the second sought better information about the maximum height of waves that could be expected in different parts of the Gulf. Weather forecasting in general had advanced steadily over the decades before World War II, but the offshore industry needed more detailed and more frequent forecasts than the U.S. Weather Service could make available to them. To meet this demand, A.H.Glenn, a former weather officer with graduate training at the Scripps Institute of Oceanography and U.C.L.A., mustered out of the U.S. Air Force and created Glenn and Associates, a New Orleans-based weather forecasting agency designed to meet the special needs of operators of offshore facilities. Glenn and others made great strides in using historical data about past hurricanes to “hindcast” the path and the intensity of future hurricanes. By analyzing all available information about past hurricanes with sophisticated theoretical models of the behavior of winds and waves, Glenn and a growing group of hindcasters gave platform designers a much-improved understanding of potential wave forces while beginning the process of categorizing hurricanes according to their intensity (Ward, personal communication 1998).[29]

But forecasting storms was not quite the same as forecasting maximum wave heights; the particular organization, timing, and location of a hurricane could influence wave heights in localized areas near the eye wall. How could a designer improve his estimate of the maximum wave height and wave force that might challenge the structural integrity of a platform over its life in a specific place in the ocean? With no trustworthy measured data on extreme wave

[29] A.H. Glenn folder, OEC Archives, n.d.

heights, different companies placed their bets using the best guesses of dueling consultants, many with connections to prestigious universities or research institutes. Highly publicized reports by two such consultants, retired naval officers F.R.Harris and H.G. Knox, stated authoritatively that "in 100 feet of water waves will probably seldom, if ever, exceed 20 feet in height." Decks thus should be placed "20 feet above the still water line" (Harris and Knox 1947, p. 131).

The king of the wave consultants in this era was W. H. Munk, a former weather officer who had forecast weather conditions for the Normandy invasion. After analyzing existing data with theoretical models of wave formation and behavior, Munk settled on a maximum wave height of about 25 feet and a recommended deck height of 32 feet above the water. With a wide range of "expert" opinions from which to choose, companies designed their platforms based on their willingness to take risks and their sense of the odds against a 25-year storm hitting their particular location during the life of their particular field. The safe consensus in these early years hovered around a maximum wave height of about 29 feet in the shallow waters of the Gulf, with a frequency of perhaps once every 40 to 50 years.

6.4. Reevaluating Wave Forces and Heights

A series of relatively weak, small hurricanes in 1947-1952 quickly called this consensus into question. A small but intense hurricane offshore Freeport, Texas, in October 1949 severely damaged a platform; the post-mortem suggested waves as high as 40 feet had buffeted the platform. The observed wave damage to several platforms in these years led to estimates of waves in the 22-29 foot range in each case. Once every 50 years, indeed. Observations also showed more clearly than had been previously understood that the key problem was to keep these mammoth waves from cresting on the deck. During the Freeport storm, a platform with a deck 26 feet above the ocean suffered damages that cost its owner more than $200,000 in losses while a nearby platform with a 33-foot deck showed no damage (Farley 1950, pp. 85-92; Willey 1953, pp. B-38-47). The owner of the damaged platform came away convinced that a relatively small investment to build a slightly higher deck would have been justified to avoid the very high costs of cleaning up a damaged platform and the loss of production and revenues from shut-down time when oil could not be produced.

The California Company (Calco, a subsidiary of Standard Oil of California) had a particularly dangerous encounter with the first hurricane of this era, and its leaders responded by greatly improving safety standards. In early September 1948, a hurricane rose quickly offshore Louisiana, without sufficient warning for the evacuation of all offshore workers. The hurricane hit Calco's operations off Grand Isle, Louisiana, placing more than 50 men in harm's way. 25 of them huddled aboard a converted LST tender placed undertow to try to reach safe harbor. Unable to make much headway, the captain of the tug towing the LST decided to cut his lines, leave the LST adrift, and take his tug to safety. Meanwhile a derrick barge with 30 men aboard also bounced about in the rough seas after a rescue boat sent for it ran aground. Hours later tugs finally managed to control both vessels and bring them to safety, with the men aboard "wet, but unhurt." Those involved in this incident came away determined to make changes to avoid risks to workers and to minimize the damages that the hurricane had done to Calco's platforms (Besse interview by Offshore Energy Center 2000; *The Calco News* 1948, p. 1).

With such concerns in mind, Calco went back to the drawing board, applying significantly higher estimates of maximum wave heights and forces in its designs. In the words of Paul Besse, one of the engineers at Calco who took the lead in redesigning its offshore facilities, "That certainly elevated every platform that Chevron put in from that day forward." The company also elevated the decks of two platforms already installed in the Gulf, staking claim to leadership in the offshore industry in moving decks up higher to avoid wave damage in severe storms. Seeking better information with which to design platforms, Besse found little, since "there had never been a time when anyone was crazy enough to try to build a platform in the open ocean and place men and equipment on it…We had to go on theory, and the hurricane…caused Chevron to start thinking about placing wave measuring equipment on a platform offshore" (Besse interview by Offshore Energy Center 2000).

Others agreed that it was time to obtain better measurements of wave heights. After Chevron installed three separate pilings in the Gulf with devices to measure wave heights in 1954, Humble Oil helped analyze the data obtained. The companies then calculated new design criteria for severe hurricanes in Texas and Louisiana. A.H.Glenn used these calculations along with wind and wave measurements from onshore and from ships to generate for the industry a new estimate of projected hundred-year storm conditions in the Gulf and other locations around the world. Calco and Humble, later joined by Shell, became the offshore industry's leading advocates for using such data to adopt higher, safer standards for platform construction and deck placement. Humble's leading offshore engineer, Arthur Guy, expressed the philosophy behind this new attitude with a simple sentence: "Error is cheap." These large companies took the view that the costs of potential for damage far outweighed the relatively small costs of building safer platforms. Better safe than sorry—and less expensive in the long run (Dunn interview by Joseph Pratt 1996).

6.5. The "Gulf of Mexico System"

The election of Dwight Eisenhower and the end of the stalemate in offshore leasing in 1953 unleashed a burst of activity in the Gulf. At that time, there were already approximately 70 separate platforms in waters up to 70 feet in the Gulf (Toler 1953). Both numbers increased dramatically from 1953 until the economic downturn in the Gulf in the late 1950s. In this building boom, the offshore industry created a fully developed "Gulf of Mexico system" for exploring and producing oil.

At the heart of this approach was the development of mobile drilling rigs that could explore for oil in different locations, leaving production of oil for permanent platforms. The mobile drilling industry evolved quickly and in several competing directions at once, as entrepreneurs created companies to develop and exploit various technologies for drilling at sea. Submersible rigs, jack-up rigs, drilling ships, and semi-submersible drilling rigs evolved side-by-side in the 1950s and 1960s. Each type rig had characteristics that made it attractive for certain water depths and locations, and all were used to find oil in the Gulf and in other regions from the 1950s forward. These drilling rigs had one common characteristic that made them vulnerable to severe storms: they were designed to drill oil wells, not to move gracefully through the ocean. Most proved awkward to control and use in the open sea, and numerous accidents resulted (Veldman and Lagers 1997, pp. 49-58).

Such accidents highlighted a key problem facing offshore operators in these early years, uncertainty over insurance. Hedging risks with insurance made good business sense, but underwriters shied away given the "perils beyond their (the offshore operators) reasonable control and not heretofore encountered in their land operations." Yet after deciding that risky offshore work might not yet be insurable, insurance companies examined more closely their existing policies and found that they were already liable for hundred of millions of dollars under policies covering such things as damage to vessels, explosions, and injuries to workers. The lull in activity during the tidelands controversy afforded these companies the opportunity to begin to sort out the key questions facing them? Were mobile drilling rigs vessels or drilling rigs? Should their workers be considered seamen or drillers? Was a blow-out of an oil well in the ocean the same as an explosion at sea? Providing legally binding answers to such questions was the first step in providing adequate coverage for offshore operations (Pike 1949, pp. 49 and 108-109).

In comparison to the mobile drilling rigs, underwriters had less trouble in insuring the permanent platforms most companies built to provide a safe, sturdy foundation for long-term development. By the mid-1950s, these platforms were much-improved versions of those first built by Magnolia, Superior, and Humble in the late 1940s. The Gulf of Mexico system of this era came to be dominated by "piled jackets," large metal structures constructed in specialized fabrication yards onshore, transported by purpose-built barges, installed using specialized equipment, and then pinned to the ocean floor by piles driven down through the jacket into the ocean floor. Once the piles had been driven, prefabricated decks could be welded onto the jacket. Fabrication onshore produced a stronger, more uniformly built frame; the time spent on construction in the rough, unpredictable conditions out in the open sea could be minimized. The completed structure was self-contained, including quarters for work crews (Willey 1953, pp. B-43-47).

Transportation and communication improvements allowed these platforms to be supplied more easily, while also assuring that the crews could be evacuated in the event of a storm. Fleets of purpose-built supply boats owned and operated by emerging firms such as ODECO quickly replaced the shrimp boats and war-surplus boats that had provided much offshore transportation in the earliest years in the Gulf. These boats were faster, stronger, and more comfortable, and they were equipped with modern communications. But they still required long hours in the water to ferry men and supplies back and forth from platform to shore (LaBorde, personal communication 1998).

For safety and convenience, it was only a matter of time before local entrepreneurs developed helicopter service out to the rigs. By the early 1950s, Humble had contracted with a local company to lease helicopter service to platforms far out in the Gulf. The first entrant into this new business was PHI (Petroleum Helicopters Incorporated), which grew quickly in the 1950s and operated a fleet of 33 helicopters as on 1958. Once oil companies made the investment in helicopter landing pads out on the platforms and drilling rigs, the industry had a greatly improved capacity to respond to emergency. When a hurricane threatened, the skies filled with helicopters ferrying men to safety onshore (Persinos 1999, p. 39; *The Humble Way* 1957a, pp. 14-21; *Petroleum Week* 1960). Such transportation improvements became the offshore industry's first line of defense against hurricanes. If loss of life could be avoided, then the industry could learn to live with property damage as it gained a greater understanding of how to protect its facilities from major storms.

Effective evacuations, however, required more accurate and more up-to-date weather forecasting. To monitor the path of hurricanes, many companies subscribed to a well-developed forecasting service that kept in touch with their offshore facilities via advanced communications equipment. The U.S. Weather Service simply could not deliver the quality of forecast information available through New Orleans-based Glenn and Associates, which provided frequent detailed reports on wind, weather, and waves in areas of the Gulf containing offshore operations. This private weather service supplemented government data with its own long-range radar system and with the four daily observations submitted from the rigs of subscriber companies. The companies could have personal consultations with meteorologists if in doubt about storms. In this era before satellite observations, the offshore industry had far superior information about storms than was available to others; its special needs gradually led to the improvement of forecasting in general (*The Calco News* 1949, pp. 3-4).

An overview of the response of this system of operations when faced with a hurricane comes from an article in the *Humble Way*, the employee magazine of Humble Oil. In this case, the weather forecasting service warned the company of a gathering storm that might ultimately pass over one of its major facilities. Careful monitoring of the storm convinced management to prepare for the worst. Workers then cleared the decks of the small platform in use at the site, storing some materials in the tender vessel, which was then battened down and moved away from the platform using winches on the mooring system. After anchoring the tender, workers evacuated in ships. Once the storm had passed with little damage, the workers returned and the platform was back in production the next day (*The Humble News* 1956, pp. 18-21).

Humble was, of course, a major company with well-built platforms and well-developed safety procedures. The storm that threatened its facility was relatively small and did not score a direct hit. In 1956 and 1957, Humble and the rest of the companies in the Gulf had a more demanding test, as two fairly large hurricanes passed through areas with numerous offshore platforms.

The first was Hurricane Flossie, which moved through clusters of facilities offshore near the western edge of Louisiana in September of 1956. Labeled the “first real hurricane test” for offshore operators since drilling activity began in 1947, Flossie unleashed 110 mile per hour winds and 15 to 20-foot waves that caused the shutdown of several hundred offshore producing wells and many drilling rigs for two to three days. Although costs from downtime exceeded actual damages, this minimal hurricane did teach operators several valuable lessons.

The first lesson reflected the attitudes produced by a decade of relatively mild weather. Again, as in 1948, nearly 50 men “rode out” the storm on tenders and other vessels. After a Calco tender vessel had been torn from its anchor, 25 crewmen fighting to survive in the high seas floated serenely in the eye of the storm for a while before 100 mile per hour winds returned from the opposite direction and their struggle began anew. The companies and the men involved took a calculated risk that they would be safe. After noting that Flossie was only half as forceful as hurricanes that could hit the area, one trade journal, *World Oil*, echoed the arguments of operators who “say more attention should be given to complete evacuation, doing away entirely with the calculated risk.” The industry took justifiable pride in its lack of fatalities in hurricanes, a record not exactly guaranteed by asking workers to ride out storms in clumsy converted LSTs (*The Calco News* 1956, p. 3; Lambert 1956, pp. 73-75).

Numerous tenders broke their mooring chains or moved off their anchors during Flossie. One of Humble's tenders suffered breaks in six of eight mooring chains and swung around into the adjoining platform, causing some $200,000 in damage. Other companies reported problems with damaged risers, the conduits for the pipe from the platform to the ocean bottom. Yet despite such problems, all in all, the reports on Flossie stressed the effectiveness of existing designs and safety procedures, with the oft-repeated caveat that this was not a major storm. One respected trade magazine writer gave an optimistic interpretation of the lesson of Flossie: "The greatest fears of the offshore oil operators have been dispelled by the arrival of Hurricane Flossie." This "full-blown hurricane" had shown conclusively that the industry's "engineering estimates were correct" (Bailey 1958; Calvert 1957b, pp. 48-51).

Nine months later, Hurricane Audrey, the first major hurricane to skirt Louisiana's "offshore alley," inflicted expensive damage, reminding the industry that it still had not experienced the effects of the direct hit of a major storm. In June of 1957, this storm arose quickly in the Bay of Campeche, took a straight path up toward the Texas-Louisiana state line, and slammed ashore at Cameron killing 400 to 500 people. It is remembered in the region as the deadliest hurricane since the Galveston storm of 1900, and it remains the sixth deadliest hurricane in U.S. history. Yet damage offshore was relatively minor. One mobile drilling rig sank in the storm and four tenders suffered damage when they pulled loose from their moorings and ran aground. Estimated damage to all offshore facilities reached about $16 million (*Offshore Drilling* 1957; *Offshore* 1957).

What registered most clearly in the harsh aftermath of the storm was that the offshore industry had fared dramatically better than the communities along the coast. After helping clean up the carnage in Cameron, the industry reflected that "forethought minimized hurricane damage to offshore installations." On the key issue, the industry's record remained spotless: not a single life was lost offshore in Audrey. Two offshore workers reportedly died, but only after they had been evacuated from a platform to an interior location and then chose to return to Cameron to try to protect their homes. In its overview of the "scars" left by Audrey, one of the major offshore trade journals concluded that the "the industry has scored an overwhelming though costly victory" (*Offshore Drilling* 1957, p. 25; *The Humble Way* 1957b, pp. 8-9).

The industry could not be quite so optimistic concerning the performance of mobile drilling rigs. In quick succession in 1956 and 1957, five mobile rigs capsized--four in the Gulf of Mexico and one off Qatar in the Middle East. Some were in rough waters; one was at dock being readied for sea. These five disasters caused more than $7 million in damages, with 13 fatalities in the four accidents in the Gulf of Mexico. The first imperative of mobile drilling rig design was the effective drilling of oil wells once on locations, but all had to be seaworthy enough to be towed in calm conditions. Although these "ungainly monsters of the sea" had been designed "to float within a reasonable degree of safety," they continued to experience difficulties from rough seas and high winds (Calvert 1957b, pp. 30-33).

In September of 1957 still another hurricane, Bertha, moved up the Gulf and inland near Cameron, sinking one drilling tender and driving another aground. The industry had been put on notice by nature, not once, but three times in a single year. It responded by raising new questions

about the origins and properties of hurricanes. The focal point of investigations was a newly formed API committee, the Advisory Committee on Fundamental Research on Weather Forecasting. Staffed by industry experts who had the resources to fund research by academics and consultants, this new committee tackled fundamental issues that had long eluded explanation. What caused hurricanes to form and could their paths and intensity be forecast with greater certainty?

To address such issues, the API committee engaged the services of Herbert Riehl, a professor of meteorology at the University of Chicago, to prepare a "think piece" on what was known about hurricanes and what sorts of research were needed to advance knowledge. In the years from 1956 through 1962, the committee explored these issues with the best available theoretical ideas about hurricane formation and motion and the creative use of data supplied by A.H. Glenn on past hurricanes and potential hurricanes that did not develop. The committee, like the oil industry as a whole in these years, made use of rudimentary computers. Computer analysis helped the committee improve the art and science of hindcasting, giving the designers of offshore equipment useful information on which to base design criteria. In 1962 the API decided to sponsor no more research on hurricanes and the committee went out of existence. Its last publication reminded the reader of the great economic value of research that could predict the path of hurricanes, but apparently those who funded the work of the API could not see concrete results coming from the work of this advisory committee (Riehl 1957, pp. 65-69; Parks and Riehl 1963).

The offshore industry had its hands full with many other things. The push out to produce oil in the deeper waters of the Gulf reached the 100 foot mark in 1957 and then quickly moved on out to 225 feet in 1965 and more than 300 feet in 1969. More than a thousand platforms had been built in the Gulf by the mid-1960s. The technology of exploration and production, as well as that of deep water pipelines, moved forward by leaps and bounds, enabling the industry to increase offshore production in the Gulf of Mexico to more than 2 million barrels a day by the late 1960s. At the same time, the Gulf of Mexico system was being improved to operate effectively in deeper water in the Gulf, it was also being adapted for work offshore in the Middle East, in earthquake-prone California, and the in the powerful ice floes of the Cook Inlet in Alaska (Pratt *et al*. 1997, pp. 95-179). As the offshore industry tackled this array of challenging technical problems, there was a sense that the hurricane problem had been contained, if not solved, by research, measurements, and experience. In these heady years, the stakes grew higher for those working offshore, since the costs of development tended sharply upward as water depths increased. Yet despite this growing economic incentive to build sturdier platforms, many companies refused to depart from traditional practices. Despite a growing consensus on the basic oceanographic issues--wave, wind, and soil mechanics—the "design criteria used by various major oil companies differed by more than 200 percent for the same wave height considerations" (Lee 1963, p. 384). On the key issue of deck height, common practices ranged from the use of the 1950s standard of 28-32 feet above mean Gulf level all the way up past the 50-foot range by safety-conscious companies such as Calco. Higher meant safer and more expensive, and each company placed a bet on the right combination of safety and cost for the particular location and water depth of each particular project.

6.6. Monster Hurricanes of the 1960s

In 1964 through 1969, a series of devastating hurricanes called these bets. Hilda (October 1964) and Betsy (1965) both measured as "100-year" storms; then four years later in August 1969, Hurricane Camille, labeled a "four-hundred year storm," roared through the western Gulf. These three major storms in rapid succession showed conclusively that hindcasters had underestimated the potential frequency and power of severe hurricanes.

Hilda was not the largest hurricane to hit the Gulf of Mexico in the post-war years, but it did more damage to the offshore industry than any previous storm. In late September of 1964 Hilda spun into the Gulf and grew into a very scary storm, with winds estimated as high as 150 miles per hour. As it moved over cooler waters toward landfall in central Louisiana, the storm lost force while slowly moving through offshore facilities valued at more than $350 million. In the words of one executive from a company that suffered severe damage, "Instead of spreading out over a big area…, she seemed to gather her energy into one tight mass and moved in and really tore things up."[30] When the sun came out after the storm, clean-up crews returning to the evacuated platforms found stunning devastation. Losses reached more than $100 million, with 13 platforms destroyed and 5 more damaged beyond repair. Hilda had delivered a jolt of reality to an industry grown complacent about the power of major hurricanes (*Offshore* 1965, pp. 26-28).

One response was a meeting of concerned offshore operators at the Roosevelt Hotel in New Orleans in November of 1964. 64 people attended, including representatives of most of the major oil companies active in the Gulf, the major contractors, gas transmission companies with pipelines in the Gulf, oceanographic consultants, and several university researchers. No organization called the conference; it came about because Hilda scared individuals into action. Those who had previously been satisfied to go it alone in designing offshore platforms now looked about for help in understanding what had happened and what needed to be done to avoid future catastrophes. Griff Lee, who had been active in offshore design and construction with a major oil company (Humble) and a major contractor (McDermott) since World War II, described the meeting as "a turning point for the industry. Before then, it had almost been every man for himself. This put together a cooperative spirit."[31] In some ways, the meeting resembled an old-fashioned Southern Baptist revival meeting, with admissions of sin followed by a call to accept a higher calling—and higher decks.

The meeting began with a somewhat apologetic speech by A.H. Glenn, the leading weather forecaster and hindcaster employed by the offshore industry. After reviewing the history of Hilda's development, Glenn addressed a question on everyone's mind: what was the practical meaning of the phrase "25-year storm?" Hilda, labeled a 100-year storm, differed from previous post-war hurricanes more because of its path and its slow lateral speed than because of the force of its winds or waves. As Glenn lectured the audience about the problems of defining a 25-year or a 100-year wave and the distinctions between a 100-year storm and a 100-year wave, many in

[30] Transcript of Hurricane Hilda Damage Conference, New Orleans, November 23-24, 1964, pages 3-4. Copy provided by Griff Lee.

[31] Hilda Transcript, pages 75-78; Transcript Hurricane Andrew Structural Performance Information Exchange, API Meeting, October 29, 1992, pages 5-7. Copy provided by Griff Lee.

the room must have wondered why they had paid so much for so long for forecasts and hindcasts and why they had ever been so confident that hurricane conditions could be accurately predicted.[32]

When Glenn sat down, the group confessional began. Representatives of individual companies summarized the amount of damage they had suffered and then described in great engineering detail how the damage had affected the various parts of their platforms. These reports had a somber tone, as those who had ordered platforms and those who had built them traded notes about how Hilda had mangled their handiwork.

Near the end of the meeting Griff Lee took the floor to review "the complete failure" of a major platform that his company, McDermott, had recently built for Union Oil. Lee included a pointed reminder that McDermott had used A.H. Glenn's predictions of the forces generated by a 25-year storm in designing the platform. An examination of the wreckage made it clear that Glenn's estimates had been much too low. Working from severely flawed design data, the company had produced a severely flawed design with a lower deck that, at least in retrospect, had no realistic chance of surviving the fury of Hilda's waves.

The analysis of the problems with the design of this destroyed platform had a hard practical edge, since its twin had been loaded on a barge awaiting installation at a nearby site when Hilda hit. Lee gave the audience a classic account of engineering on the run, relating how McDermott had carefully studied the destroyed platform to make "some reasonable modifications of the (twin) structure," which it then installed. This was the ultimate wave tank test, using a real hurricane in the real Gulf of Mexico to test design assumptions. With strengthening near the ocean floor, stronger deck legs, and a higher deck, the one-time twin took its place as an only child out in the Gulf, near where the destroyed platform had once stood.[33]

After summarizing the overall destruction of Hilda, Lee concluded with a call for those gathered to admit their sins and change their ways. He noted that all but one of the platforms destroyed by Hilda had been designed to meet the projected forces of a 25-year storm. This meant, in effect, that they had been "designed with the owner accepting a risk." The prevailing attitude was "that the 25-year storm was only going to occur once in the whole Gulf of Mexico every 25 years, and if I'm lucky it will be over by your platform, not by mine."[34] In a speech subsequently repeated many times at industry gatherings, he admonished the group to cut through the uncertainty about wind and wave forces by moving toward design criteria based on the forces generated by a 100-year storm. This meant strengthening platforms, with emphasis on raising the decks, since Hilda had provided striking evidence of the dangers to platforms when crashing waves "get into the decks." Two practical incentives pushed those present to heed Lee's call for action. The first was economic; the costs of clean-ups and repairs were quite high compared to the incremental costs of building stronger platforms. The second was a matter of engineering pride; good engineers did

[32] Hilda Transcript, pages 5-8.

[33] Hilda Transcript, page 75.

[34] Andrew Transcript, page 6.

not like waste and inefficiency, and the images of platforms crumpled over into the Gulf were not ones they cared to see again.[35]

Unfortunately, many more were seen less than a year later in September of 1965, when Hurricane Betsy emerged in the Atlantic, crossed Florida, and moved through the eastern coast of Louisiana in an area with more than $2 billion in offshore investments. The storm destroyed eight more platforms and damaged others. In the massive damage caused by Betsy, one event came to symbolize the dangers of hurricanes. "Maverick," a state-of-the art jack-up drilling rig owned by George H.W. Bush's Zapata Corporation and at work on a project for Calco when Betsy struck, simply disappeared. So did a platform previously installed by Shell in the waters off the mouth of the Mississippi River. The future president received a check for $5.7 million from a New Orleans underwriter who had placed the insurance for the rig with Lloyd's of London. The offshore industry as a whole received another unmistakable warning that it had not correctly understood the risks posed by major hurricanes (*Drilling* 1965, pp. 46-48).

Insurance could ease the financial pain only if insurers continued to accept the extreme risks of providing coverage for moble drilling rigs. "Maverick's" destruction was only the latest in a line of accidents involving such rigs, and underwriters had begun to revisit the question of whether this segment of the offshore industry might be uninsurable. A representative of John L. Wortham & Son, a major Houston-based insurance company, acknowledged that the "tremendous risks" required "extra efforts" from insurers. Others in the underwriting business continued to debate the basic issue of whether a mobile drilling rig should be insured as a vessel or as a drilling rig, its workers as "landlubbers or seamen." The compromise gradually struck was to take greater care for making the rigs safer as they were towed to the drilling site by having inspections of them by experienced naval architects while they were under construction and then having qualified naval engineers aboard while they were under tow. This compromise satisfied Lloyd's and others, and an insurance crisis was avoided (Kuhlmann 1956, pp. 74-75; *Drilling* 1957; Griffin 1959, pp. 57 and 131).

Insurance covered some of the losses from accidents, but better design and construction that prevented accidents was obviously cheaper and more efficient. The devastation of Hilda and Betsy finally convinced the offshore industry to reevaluate its traditional approach to the threats posed by hurricanes. Greater cooperation was needed to define better design standards. The conference after Hurricane Hilda was followed by another conference after Hurricane Betsy, which had dramatically reinforced the calls of Griff Lee and others for change. At Houston's Rice Hotel in November of 1966, representatives of the offshore industry met to create what became the API's Offshore Committee. Under the auspices of the industry's major trade association, this committee gradually became a permanent focal point of efforts to define uniform standards that would limit future damage from hurricanes (Lee, personal communication 1996, pp. 27-29).

Basic research and measurement of wind, waves, and soil continued, at times in cooperative efforts and at times within individual companies. Shell Oil led the way in the gathering of data on wave heights with a project that placed sophisticated measuring devices on a string of large

[35] Hilda Transcript, page 76.

platforms in the Gulf. These devices could provide real measures to confirm the theoretical models of maximum wave heights during severe storms.

Or, as it happened, they could show finally and conclusively that the maximum waves from hurricanes had been consistently and grossly underestimated. During Hurricane Camille in August of 1969 Shell measured waves 70 to 75-feet high. These figures stunned offshore veterans who remembered early predictions by "experts" that waves in the Gulf would "seldom if ever, exceed 20 feet." Of course, twenty years of experience and the movement into deeper water had replaced such early guesses with higher and higher figures. But 70 feet made a mockery of the common wisdom about wave heights.

Before Camille ripped apart the region around Biloxi, Mississippi, this monstrous Category 5 hurricane passed through a heavily developed offshore region south of New Orleans. Initial estimates of $100 million in property damages raised questions about what the toll might have been had the storm taken a track 100 miles to the west through the heart of offshore alley. But the "quality," as well as the quantity, of damage drew as much attention as the astonishing reality of a 70-foot wave in the Gulf. Included in the platforms destroyed were three modern ones installed by Shell, the generally acknowledged leader in offshore design. One of these was only five months old and was at the time the world's record deepwater platform (*Offshore* 1969).

Suddenly, more than thirty years after the first successful offshore venture in the Gulf of Mexico, Camille had washed up a new design problem. The giant new platform lost by Shell had been designed to withstand 100-year waves, but a mudslide caused by the storm, not wave forces alone, had toppled the structure, which had come to rest on its side some 100 feet away from its original site. Before 1969, shifting ocean sediments caused by earthquakes had been known to break telephone cables on the ocean floor, and as early as 1950, oceanographic consultants had studied the possibility that unburied offshore pipelines might move during hurricanes. But before Camille, platform designers had not appreciated that, under certain conditions, mudslides might pose catastrophic threats to platforms. The soil analysis routinely conducted for platform construction simply had not examined this possibility (Reid 1951, pp. 1-6; Bea 1971, pp. 88-91; Focht, personal communication 2001, pp. 10-11).

Shell's failed platform was in 300 feet of water in "South Block 70," located offshore from the mouth of the Mississippi River. In retrospect, it was not surprising that the ocean bottom in a region covered by sediments deposited by a large river would be soft and relatively unsettled. Under extreme hurricane conditions—Camille had 200 mile per hour winds to go with its 70-foot waves—such sands could behave almost like a liquid. Shell's studies of the failed platform's site revealed a phenomenon not previously observed by the offshore industry. Camille had dramatically altered the contours of the Gulf of Mexico in South Block 70, lowering the ocean floor and, in effect, placing standing platforms into deeper water. While this was perhaps the most cost efficient way imaginable to establish a new world's record for platform water depth, it was not easily absorbed into the design criteria for new platforms (Bea 1971, p. 89).

6.7. A New Consensus

The process for finding ways to design platforms to withstand mudslides now began, taking a somewhat accelerated form of the process previously used to try to design for maximum wave forces without a full understanding of the maximum height of waves. First came the careful post-mortem of the platform that had been swept away in Camille and another one nearby that had been displaced. The information from these studies was placed in the context of the scant existing scientific literature on the frequency and intensity of mudslides. From this starting point, research was undertaken to fill in the wide gaps in information about mudslides. As this research moved forward, preliminary engineering analysis of the forces exerted by mudslides could begin. Design criteria gradually emerged from this analysis, as did the realization that in extreme hurricanes some areas of the Gulf simply might not support platforms built with existing technology.

By 1970 the process of adaptation to hurricanes had reached a turning point. The offshore industry had pushed ahead for a quarter of a century, solving engineering problems on the run when necessary by using the best available estimates of hurricane-generated forces and then adapting these standards after they were called into question by additional research or by damage caused by hurricanes. Three major hurricanes in the 1960s removed much of the uncertainty about the power of severe storms in the Gulf, and the offshore industry responded by taking a hard, collective look at its traditional assumptions.

They did so within two important new venues for cooperation among oil companies, construction companies, and consultants. After its establishment in 1966, the API's Offshore Committee quickly grew into an effective instrument for defining, publicizing, and modifying the best possible standards for offshore operations. The definition of industry standards had been an important part of the work of the API, which was ideally suited to bring together experts from various areas of the industry to share information about best practices. The Offshore Committee simply extended this tradition to matters concerning standards of safety and design offshore. The sharing of basic research on various aspects of offshore operations went forward after 1969 at the Offshore Technology Conference (OTC), an annual meeting where industry specialists gathered to present papers about their research. Both researchers and standard-setters could take advantage of the growing power and availability of better computers.

Peter Marshall, a Shell engineer who entered the offshore industry in 1962, summarized the difference between the early days and the years after the coming of computer-assisted design: "Intuitive design and an entrepreneurial spirit gave way to computers and an era of no surprises." Marshall summarized the key change in attitude with the simple declaration that "we were less afraid of failure then." He lamented the passing of the days when offshore engineers had been given greater latitude to do their jobs more creatively while accepting more risk.

Marshall was even able to joke about his own strange experience with failure. He designed a platform installed in 1965 in 283 feet of water, earning the record for water depth. Two days after its installation, almost before he could brag about his efforts, the platform suffered severe damage during Hurricane Betsy. Examination of the platform revealed pieces of the "Bluewater 1." When built by Shell in the early 1960s, this semi-submersible had been an epoch-defining

technological break-through in offshore drilling. Hurricane Flossie had capsized the vessel in 1964. As a new owner readied it to return to work the next year, Hurricane Betsy displayed a stormy sense of irony by sending it careening into its former company's record-holding platform (Marshall, personal communication 2002).

Such events make good stories, at least after the passage of a few decades. But do they also illustrate the folly of "entrepreneurial engineering"? Looking back at the formative years in the Gulf of Mexico, several things stand out. Fortunately, the emphasis on good forecasting and early evacuation meant that few people died or were seriously injured offshore in hurricanes.[36] The scanty accounts that exist suggest pollution from storm-related damage was not extreme. With risks managed through insurance and improvements in designs, property damages were not high enough to stop the movement into deeper waters. All in all, taking "calculated risks" and then fixing mistakes exposed by hurricanes on the run allowed the offshore industry to push through its ignorance and develop much needed domestic oil and natural gas reserves.

Looking back on this process from the perspective of fifty years of work on offshore structures, Griff Lee offers a sobering appraisal that suggests how little the industry knew as it plunged into the Gulf of Mexico: "In light of today's data, the early load estimates were off (too low) by a factor of ten." A factor of ten would seem to be well past the threshold where the brave become the foolhardy. But in the American offshore oil industry of the post-World War II era, this distinction was blurred by a combination of unusually good weather, extraordinary technical innovations, and the systematic efforts of good engineers and work forces to recognize and fix problems exposed by one of the strongest, most unpredictable forces in nature, the hurricane.

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[36] Overall, the offshore industry had more serious safety problems in such areas as the development of deep water diving and blow-outs of offshore wells, especially in the early years, when mobile drilling rigs also presented problems in rough seas.

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7. WAKE-UP CALL: ACCIDENTS AND SAFETY PROVISION IN THE GULF OF MEXICO OFFSHORE INDUSTRY

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> "I retired with a little over 30 years of service and I have still got all of my fingers and all of my toes. And if you look at a lot of old oil field hands, people that have worked in the oil field back in the old days, you look and they do not have all of their fingers and all their toes, particularly the people who worked on drilling rigs. The people who worked on drilling rigs, fingers and toes and hands and feet, they were just a commodity that you had to learn to live without because you were not going to keep them very long" (Written 2004).

7.1. Introduction

The quote from Mr. J.H. Written testifies to the fact that offshore oil is and has long been a very dangerous business. The oil business in general has long been dangerous. In any business or occupation that involves people working with extremely heavy equipment, such as drill pipe, highly pressurized and combustible materials, such as oil and natural gas, and imperfect technology, there are going to be accidents and, unfortunately, fatalities. Oil operations offshore, of course, faced added challenges from the marine environment. Essentially, modern offshore platforms are factories built on top of skyscraper-sized structures standing in the open waters of the ocean. Just figuring out how to build and operate such structures, in a part of the ocean that was exposed to hurricane-force wind and waves no less, called for untested designs in drilling vessels, platforms, and wells. These conditions led to a host of problems that engineers and oil-rig workers had never encountered before World War II. In addition the to the awful physics of the machinery itself, they had to contend with bad weather, dangerous boarding procedures, drilling mishaps, fires, and explosions far from land.

It might be too easy, however, to explain the dangers of offshore work as simply the product of complex technology and environmental conditions. In looking at accidents and injuries in the offshore industry, it is useful to revisit an analysis of the British offshore oil industry offered by sociologist Chris Wright nearly 20 years ago. In an essay entitled "Routine Deaths," Wright argued that fatal accidents offshore were not deviations from routine procedures and practices caused by liminal and unpredictable environmental conditions. Rather, they were all-too-normal events rooted in the deficiencies in the official structure of work, largely due to widespread sub-contracting and the time pressures to complete projects and accelerate production (Wright 1986). The same argument can be applied to the Gulf of Mexico offshore industry through much of its history. Before the late 1960s, the imperative to contract out and speed up production sacrificed the safety of workers. Safety improved significantly with post-Santa Barbara changes in practices and regulations in the 1970s. But many offshore occupations remained relatively hazardous, with continuing time pressures and increased sub-contracting. The root problem, identified by McEvoy, remained; that is, the ongoing drive by offshore operators to socialize costs and risks in the expensive and challenging marine environment.

It is difficult to measure trends in accident frequency, injury rates, fatalities, etc. on the Outer Continental Shelf (OCS) from easily accessible data. Individual company statistics are confidential, and neither the MMS nor the Offshore Operators Committee historically have required the reporting of incidents in a consistent manner which would allow calculations of injury frequencies. Furthermore, statistics have not been compiled in a way that offers easy comparisons with other occupations and industries. Records of course are much worse for the early years, before 1970. The U.S.G.S. did produce a series of monthly engineering reports during the years 1954-1966, housed in the National Archives. These reports contain some information not found in press accounts. However, they are incomplete and unsystematic. They list 90 reported fatalities during these years, which is probably a low number, and there was virtually no reporting on non-fatal accidents. The MMS also maintained an "events file" on injuries and accidents. After 1985, however, the events file lists only those injuries directly associated with blowouts, explosions, fires, significant pollution incidents or major accidents. Routine or "minor" injuries and accidents went mostly unreported. Many of the oral histories we have collected in the MMS offshore history project fill in some of the gaps in the data with first-hand and anecdotal perspectives on the risks and dangers of working offshore, but analyzing the history of safety in the offshore industry is still hampered by lack of data.

7.2. The Dangers of Offshore Work

Hazards presented themselves in different forms in different phases of operation in the early offshore industry. Early marine seismic work proved to be dangerous business. Before the introduction of Vibroseis pulsing systems, the sound source came from dynamite, and deaths and injuries from on-board explosions did occur, especially when crews tried to speed up operations by making up more than one charge at a time. "When the boats are moving along at, say, six or seven knots, and you are trying to do all of this, you do not have a lot of time," remembered Aubrey Bassett, who worked on some of Shell Oil's earliest offshore seismic crews. "Two hundred feet goes by in a hurry and you are just back there wildly putting all of this stuff together." Sometimes this meant that the wrong charge was detonated (Bassett 2003).

From the late 1940s through the mid-1950s, one of the biggest safety issues was personnel transfer from crew boats to platforms during rough weather. This could be an exciting, if not terrifying, experience. One of the first methods tried and used with "moderate success," in the words of John Donhaiser, a Pure Oil official, was the use of an overhanging ramp extending out from the platform deck with a Jacob's ladder hanging down to the water level. Numerous accidents, resulting from the Jacob's ladder becoming fouled in the ship's rigging, led companies to experiment with the so-called "swinging-rope boarding method," in which a person was hatched by hooks to a rope which would be swung by a cantilevered beam from the boat to a landing platform (Donhaiser 1954). Other companies had employees throw their gear into a cargo net and hang on to the outside, "jumping on it like a bunch of monkeys," as one witness described it (Pugh 2001). Back injuries, often contracting in transferring from crew boat to platform, were among the most common afflictions from working offshore. "Getting off those platforms in rough weather onto a boat was an interesting experience," said Sam Paine, a Shell production executive. "You would swing out on this rope, try to catch the boat at its peak and then drop off on it. I wouldn't do it again! But I was young in those days." Paine witnessed two

Halliburton employees get killed this way trying to board the jack-up vessel, *Mr. Gus*, when the crew boat drifted and the rope pulled them up through the mast and rigging, knocking them off about 20 or 30 feet above the boat (Paine 1999). Indeed, falling from height, either in crew transfer or working above platforms, appears to have been one of the major, if not leading, causes of serious injury and death over time offshore. Said J.H. Written: "If you fall out there, you know, and you do not fall in the water, you fall down on that hard iron 30 or 40 or 50 feet, and you are dead. It is just that simple. You are dead" (Written 2004).

First introduced in 1948, but not widely adopted until the mid-1950s, helicopters provided greater economies of speed and safety in transferring crews, saving workers from the sickness-inducing 8- to 12-hour rides that often left them in no shape to work for an entire day after they arrived on board. On the other hand, helicopters posed their own risks. The U.S.G.S. monthly engineering reports from the late 1950s and 1960s are littered with deadly helicopter crashes. In 1958 alone, there were 14 reported fatalities from helicopter accidents in the Gulf of Mexico OCS. Over time, Gulf helicopter travel appears to have been less safe than commercial airliners, but more safe than private civilian aircraft. Although not common relative to the number of man-hours flown, helicopter accidents in bad weather and during night travel happened regularly[37] (there were 12 fatalities in 2003, the deadliest year in last two decades; *Houston Chronicle* 2004).

The early years of offshore development also saw some spectacular mobile drilling vessel disasters. During 1955-1957, four major vessels overturned with the loss of 13 lives. The worst was the capsizing the Golden Meadow Drilling company's *Mister K* off the South Pass of the Mississippi River in April 1957, in which nine lives were lost. Operators blamed human error for the disasters, but it was clear that these mobile drilling vessels, especially jack-ups like *Mr. Gus*, which capsized two weeks before the *Mister K* off of Texas's Padre Island, had design flaws (Calvert 1957). Billy Pugh, a young boat captain hired to ferry crews to *Mr. Gus* was not convinced of that vessel's seaworthiness when he attended its christening. He said: "The thing was built in two pieces. It was latched together with some 2-inch cables and 20-inch pipe. I had been at sea long enough to know that it wouldn't even get out of the mouth of the Sabine Pass. . . .The president of Bethlehem Steel got up and made a speech that night, saying 'we have conquered the sea with this jack-up barge.' I said, 'Oh man, he hadn't been to sea much." After the death of the two Halliburton employees, Jimmy Storm, a partner in Glasscock Drilling, called Pugh up in the middle of the night to design a better solution. This led to the development of the Billy Pugh Personnel Transfer Net, which became standard in offshore operations in the Gulf and around the world (Pugh 2001).

Drilling was the most dangerous work offshore, and the most fearsome problem for drilling operations was the blowout. Unlike on land, blowouts could mean complete disaster on isolated offshore barges and platforms. Modern blowout prevention systems received special attention early on from offshore operators, but the loss of well control was still an inevitable fact of life in the Gulf, leading to fires, explosions, casualties, property damage, and pollution. "A lot of it, you could not help," recalled Harry LeBoeuf, who worked for Texaco. "There were pieces of

[37]U.S.G.S., "Monthly Engineering Reports," Gulf Coast Region, Volumes 109-160,1954-1966, Record Group 57, Records of the U.S. Geological Survey, Conservation Division, Oil and Gas Leasing Branch, National Archives and Records Administration (NARA), College Park, MD.

equipment that were overpressurized or something like that. When you are fooling with oil and gas, sometimes you have tremendous pressures . . . and also tremendous temperatures, hot and cold. A lot of times, something can happen that is unforeseen" (LeBoeuf 2004). Indeed, the most common incidence of blowouts in the Gulf was in exploratory drilling that encountered high-pressured and undetected shallow natural gas. In 1959-1960, following the mobile rig disasters, were many dramatic blowouts in both the shallow and deeper waters of the Gulf. The most tragic one occurred on a CATC group (Continental, Atlantic Refining, Tidewater, and Cities Service) platform in the West Delta, which exploded in October 1958, killing seven and seriously injuring the remaining 29 workers who had to escape the flame-engulfed structure by jumping 50 to 60-feet into the water (Calvert 1959).

Less reported on, but more common, were minor injuries and accidents. "There were so many minor accidents that it was almost a daily routine," recalled Terry Mayon, who was a long-time safety specialist with Kerr-McGee. "People were constantly smashing fingers, abrasions of every kind. Broken bones every now and then. . . . A lot of it was macho problems, guys doing things just to prove that they were bigger and tougher than the guy next to them" (Mayon 2004). "Pipe falling. Ropes breaking. Cables breaking. Just normal run of the mill stuff that happens around machinery," explained Written. Compared to recent years, when many offshore operations became automated, more of the work performed offshore in the early days was manual. Modern platform workers do not have to fight manually the spinning chain used to turn the drill pipe, as their predecessors did. "You had a lot of pressure on there and if a guy did not know what he was doing, he would get hurt," explained Joe Young. "You do not have that anymore. You put those tongs on there and automatically, the tongs spin it up" (Young 2004). Or, as Lou Trosclair put it, "when you are drilling 18,000, 20,000 feet and you are picking up pipe and making it up, with big heavy tongs, if you do it too fast, a man might have his hand crushed" (Trosclair 2004). Whereas today all the drilling mud, cement, and chemicals are delivered in bulk and transferred automatically using lift pallets and forklifts, years earlier these materials came aboard in sacks and had to be handled using brute strength. "It took 500 to 1,000 sacks to cement a well casting, so it was a pretty hard job," remembered Red Adams, a former roustabout and roughneck (Adams 2004). As already noted, back injuries were one of the most common offshore, often the result of lifting and handling heavy sacks of mud and cement.

Another extremely hazardous area of offshore work was diving, which, by the late 1950s, had become an essential adjunct to offshore petroleum operations. Divers assisted in constructing, installing, repairing, and salvaging offshore platforms and pipelines. It is difficult to ascertain the cause or frequencies of injuries and fatalities to divers because over time there has been no systematic collection or analysis of diving safety information and the investigation of accidents (Committee on Assessment of Safety of OCS Activities 1981, p. 153). Anecdotal information from interviews with numerous divers, however, testifies to the ever-present perils and horrors of working under water. Unusual and extreme environmental conditions presented unfamiliar challenges for even the more experienced divers. Many new recruits were often placed in the water with very little training. Diving was often not even their primary occupation. For example, Taylor Diving, one of the industry pioneers, found it easier to train welders to be divers than to train divers to become welders (Pratt *et. al*. 1997, p. 154). As divers were asked to go deeper and stay down longer, they became guinea pigs in experiments with decompression, breathing-gas mixtures, and "saturation" techniques. Communication between divers and

topside tenders was imperfect. Working in the Mississippi River or its mouth, where swift currents and low visibility, was especially treacherous. "The river is so strong that sometimes you had to tie yourself down to where you're working," remembered Bill Fullerton. "Plus, you can't see very well, very little visibility; even with a light there's no visibility because it's so muddy. . . . In the early days I heard about . . . a lot of divers getting hit by logs coming down the river" (Fullerton 2002). In contrast to diving on the West Coast or in the Navy, where many of the technologies and practices were developed, the largely informal, non-union, and small-scale diving business in the Gulf took a more lax approach to decompression, equipment safety, and the like. George Taylor explained:

> As compared to Navy diving where you always have a chamber setting topside, here you are doing it with nothing. You got your tender, you got a little old compressor, your face mask, your wet suit, your gear, and you are pretty much on your own. If you have a diving accident then it is shame on you, especially if it requires decompression because there were no chambers. Even if there were, nobody would know how in the hell to use them….it was a horrendously nightmarish thing psychologically. … The hardest part was just getting used to the danger. It was such a relief when I finally got to the west coast where decompression tables and chambers were the norm (Taylor 2002).

As much as the diving itself, however, the nature of the work and the equipment, often poorly designed, posed risks to divers. Remembered Dale Fackler:

> The thing that causes most injuries to divers is not the diving, it's the industrial equipment. We use high pressure water blasters. Many people have been injured with high pressure water blasters. And we have people who are redoing the same accident over and over. A tender will pull the grinder up off the bottom, the next diver goes to get in the water and he will test the grinder to see that it's operating properly, and the grinding disk will be one that cannot take much water, when he hits the trigger, it blows up and pieces get in your leg. We've had accidents where people have been burning pipe or burning into a rise or pipeline and suddenly there's an explosion. Where it wasn't properly vented, it can be a hydrogen explosion from the fact that you're burning, can be an explosion from hydrocarbons, can be a lot of different things (Fackler 2002).

Furthermore, divers were under incredible pressure to perform and take risks, even more so than other offshore occupations. Pride and competition with other divers led to unusual risk-taking. Topside work often awaited the completion of both emergency and routine diving operations. "You have to keep the barge captain happy," Walt Daspit recalled. "The main thing in keeping the barge captain happy is getting the job accomplished" (Daspit 2002). Divers also received monetary incentives to dive deeper, stay down longer, and finish jobs sooner. "People took uncalled for risks to get a job done because we can get out of here today, we'll make money," said Fackler. "I recall putting on anodes years and years ago when they said, 'If you can get these anodes on in less than 21 days, we'll bonus you so much'" (Fackler 2002). Diving companies, most of whom did not even carry insurance in the 1960s, operated at the margin of safety in the expanding offshore oil business.

7.3. Status Quo in the 1960s

One can make the case that the relatively dangerous and hazardous nature of offshore operations (although we still lack good comparisons with other industries) was inherent in the adjustment from taking land-based technologies, equipment, and practices into the marine environment, or, as in the case of diving, by inventing technologies using humans as laboratory subjects. Almost everything had to be redesigned and rethought. Marine engineering and construction advanced by improvisation and trial-and-error, and error could be harmful to the environment and debilitating or fatal to workers. Death and injury were viewed as the unfortunate prices to pay for technological progress. Workers were trained and drilled about safe operating practices, but they were really not trained to manage safety or manage change in safe ways. Said one retiree: "older guys could tell you, you know, 'watch this' or 'watch that' but there was nobody watching you and telling you, 'you had better do this,' or 'you had better do that (Viater 2001).

Still, it appears that safety was compromised not only by the sheer technological challenges, but by the necessity to complete work as quickly as possible. Offshore installations were expensive to build and operate. The profitability of projects often depended on how soon production could be brought online. Drilling vessels were contracted on day-rates, increasing time-cost pressures. Production processes were highly interdependent, and delay in one section could cause delays elsewhere. And delays cost money. So there was incredible time pressure to drill the wells, install the platforms, and get the oil and gas flowing. "You did not dog it because the other guys would knock you in the head in the early days," said R.D. Pitre, a former employee with Sun Oil. "You dog him, and he would knock you in the head with something" (Pitre 2004). Operators, and especially contractors, like the owners of mobile drilling vessels, did not overly concern themselves with safety. At times, they even cut corners. Safe processes and designs either did not exist or remained untested ideas in the minds of researchers. Facilities engineering on production platforms was a novel concept. Platforms were often stick-built with equipment squeezed or slapped together on the deck with little concern or foresight for worker safety. Crew quarters, for example, could be placed right next to a compressor building (Arnold 2004).

The result was that safety took a back seat to growth and productivity. "We talked safety but we were really not that much into safety," said Lou Trosclair, longtime Shell Oil employee and manager. "Of course, we tried not to hurt anybody, don't get me wrong – I mean, we were not barbaric or anything – but it seemed like the work had to be done and you did it as fast as you could" (Trosclair 2004). Cliff Hernandez, another Shell veteran, had a more frank assessment: "When I first started working, they didn't care whether they killed you or not! In other words, 'we are going to get it done regardless.' There was no suing like people are suing now. Back then, if you got hurt, they just pushed you to the side and put somebody else in. I mean, a lot of people got hurt and did not get paid for it. Crippled" (Hernandez 2000).

Oil, drilling, and service companies did not completely disregard safety and environmental protection, but they had near autonomy in defining what words like "safe" and "clean" meant. Companies learned from the series of mishaps, blowouts and fatalities of the late 1950s, and they continued to improve drilling, blowout prevention, and production technology.[38] Overall,

[38] The CATC disaster led to safety precautions when welding was done on OCS platforms.

however, little really changed in the industry's approach to safety, or in government regulation or oversight to insure greater safety or protection of the environment. OCS orders were worded very generally, and thus did not encourage the standardization of safe procedures. In July 1959, the U.S.G.S. issued an order requiring facility inspectors, for the first time, to make a report for the files of what facility they inspected and what deficiency they noted or action taken. "To keep such reports realistic, an inspection is defined as an official, critical, close examination *at the wellhead or lease facility* (emphasis in original)," said the order (USGS 1959). Between 1958 and 1960, the U.S.G.S. issued OCS orders 2 through 5, requiring procedures for drilling, plugging and abandoning wells, determining well producibility, and the installation of subsurface safety devices, or "storm chokes." The Offshore Operators Committee, however, was able to dilute Order 5 to permit waivers on requirements for storm chokes (USGS, 1958 and 1960). Most significantly, the orders did not have any test requirements. Companies had to have certain equipment, but they did not have to test them to see if they worked (Arnold 2004).

Furthermore, enforcement was lax. The U.S.G.S. did not inspect installations on a regular basis. State and federal regulatory bodies were too underfunded and understaffed. Some supervisors were political appointees, and even those with the appropriate training and competence often did not have the requisite experience in the oil business and grasp of its changing technological capabilities. As one consulting geologist observed in the late 1960s, "Each oil well has its own personality, is completely different than the next and has its own problems. . . . It takes good experienced personnel to understand the situation and to cope with it. If an "employee doesn't know a 'cat-head' from a 'bull-plug,'" he continued, "how can they be expected to enforce these rules and regulations?" Too often on drilling structures, he complained, one found inexperienced supervisors, employees who overlooked rules and regulations, the purpose of which they did not understand, and sometimes orders from bosses to cut corners, all of which created conditions for an "explosive situation." "Disaster might not strike the first time, but it will come![39]

Disaster struck often in the 1960s. The Gulf continued to witness blowouts (22 deaths on the *C.P. Baker* catamaran drilling vessel in 1964), helicopter crashes (eleven in one crash in 1966), and freighters colliding into platforms, among other accidents. In September 1966, the U.S.G.S. reported that a Louisiana Air National Guard jet narrowly missed an *ODECO* rig before it crashed in the West Delta area. "Add another hazard to the Pandora's box of problems associated with offshore operations!" wrote the U.S.G.S. Monthly Engineering Report from the Gulf Coast region (USGS 1966). The major accident rate (loss exceeding $1 million) for mobile drilling vessels soared from 1-2 percent of the total rigs operating during 1958-1964 to 7 percent in 1965, although still much lower than the 14 percent ratio of 1955. This caused Lloyd's of London to raise insurance rates on most types of vessels to almost 10 percent of equipment value per year (not including liability coverages and costs of uninsured exposures such as downtime and lost production). The major accident rate declined back to 2 percent in the late 1960s, but remained unacceptably high, especially for jackups.[40] During 1950-1968, there were 30 major

[38]Neil R. Etson to President Nixon, March 18, 1970, RG 57, Central Classified Files, 1968-1974, Box 71.

[40]However, the casualty rates of the jack-up and semi-submersible were not that far apart when compared to the number units built. During 1955-1974, jack-ups suffered 47 casualties out of 143 vessels built, with an estimated total value of damages at $122 million. By comparison, semi-submersibles suffered 12 casualties out of 72 vessels built, with $50 million in total damages. One of out every 3 jack-up units experienced a casualty, compared to one out of every 5 semi-submersibles (McTaggart 1976, pp. 24-29).

rig mishaps and an equal number of minor accidents (less than $1 million in damage) out of approximately 150 working mobile units worldwide (Howe 1968, pp. 51-52). Still, by the late 1960s, there were virtually no legal requirements anywhere in the world on the overall performance and safety of mobile units. In 1970, Frank Biewer and Homer Wallin of the Offshore Technology Corporation singled out the offshore drilling industry for lax standards in the design, construction, operation and maintenance of offshore vessels. The American Bureau of Shipping and Lloyd's register had programs for classifying offshore vessels, they noted, but the industry needed to establish certification criteria, systematize operating procedures, and introduce inspections by naval architects and marine engineers. "Present loss rates of mobile offshore drilling rigs are unacceptable from the standpoint of personnel casualties, rig down time and outright rig loss," wrote Biewer and Wallin. "Loss rates, as reflected in ever-rising insurance premiums, are not improving. Unfortunately, the concerted effort which is required to reduce the offshore risks to a reasonable and realistic level does not yet appear to be forthcoming from within industry" (Biewer and Wallin 1970).

7.4. Wake-up Calls

In 1969-1970, industry and government finally started to get serious about safety. This resulted from ongoing trouble with mobile drilling worldwide and several major disasters on production platforms in the United States that drew media attention and widespread public indignation. In December 1967, the tragic loss of the *Sea Gem* jack-up drilling vessel in the British sector of the North Sea, killing 13 people, spurred the first real government interest in the safety of offshore units. Although this interest was mainly in Europe, the *Sea Gem* incident set in motion a general reevaluation of mobile drilling that would eventually affect operations in the United States. The big wake-up call for the U.S. offshore industry was the January 1969 blowout at Union Oil's Platform A-21 in the Santa Barbara Channel, which spilled 50,000 to 70,000 barrels of oil. Although the blowout happened off California, the fallout reverberated nationally. Santa Barbara catalyzed the national environmental movement and set the stage for the passage of the National Environmental Policy Act (NEPA). Gulf Coast operators, whose practices in the past had rarely been examined or challenged, suddenly faced a potentially hostile political and regulatory climate.

As the industry protested and resisted a new stringent set of OCS regulations handed down by Interior Secretary Walter Hickel in August 1969, calamities in the Gulf undermined their case. In February 1970, Chevron's Platform C in Main Pass block 41 blew out and caught fire. Oil pollution from that blowout postponed a federal lease sale, damaged wildlife, and drew a $31.5 million suit against the company by Louisiana oyster fisherman and a $70 million suit from the shrimp fishermen. A U.S. District Court also fined Chevron $1 million for failing to maintain storm chokes and other required safety, the first prosecution under the 1953 Outer Continental Shelf Lands Act. The Justice Department proceeded to obtain judgments against other major oil and gas companies for similar violations (Reifel 1976, pp. 239-257). Then in December, Shell Oil Company suffered a major blowout on a giant platform in the Bay Marchand area, killing four men and seriously burning and injuring 37 others. It took 136 days to bring eleven wild wells under control, at a cost of $30 million (*Shell News* 1971).

Meanwhile, personal injury lawsuits also had forced heightened attention to safety in offshore operations. Initially, most offshore workers were covered by the Longshoreman and Harbor Workers' Compensation Act (LHWC) of 1927. This act was designed to fill a gap between the Jones Act (1920), which protects seaman, and state workers' compensation, which covers injuries incurred in a particular state. LHWC provides medical and disability benefits, rehabilitation services, and wrongful death benefits to survivors for injuries, illness, or death sustained during maritime employment on navigable waters of the United States. Maritime employment includes loading/unloading, building, and repairing vessels and offshore structures. In 1959, however, the United States Fifth Circuit Court of Appeals ruled (Offshore Co., v. Robison, 266 F.2d) that workers regularly assigned to "special purpose vessels" such as mobile offshore drilling units could be treated as seamen under the Jones Act. The significance of this decision was that the Jones Act not only entitled seaman to "transportation, wages maintenance and cure," which was equivalent to workers' compensation for seaman, but allowed injured seaman to obtain damages for pain and suffering from their employers if it could be determined that the injuries resulted from negligence by the shipowner, captain, or crew. After the Robison decision, a steady stream of personal injury lawsuits hit offshore operators, drillers, and construction companies. In earlier years, remembered Lou Trosclair, "we could hurt somebody and the poor guy would be hurt and that would be it. But then, the lawsuits started and paperwork really started because you had to document everything" (Trosclair 2004). Many companies also found themselves paying workers' compensation and getting sued as well (The Steinberg Law Firm 2005).

7.5. The New Religion of Safety

High-profile blowout disasters on top of growing injury lawsuits finally changed industry and government mindsets on safety issues and committed to industry to improving safety technologies and designs. Public expectations on safety and the environment had already shifted massively, and the catastrophic blowouts of 1969-1970, with all the national media attention and legal and political fallout from them, forced the most radical changes to operating practices in the U.S. offshore industry's history.

The government expanded and strengthened its regulatory program. Most OCS orders and leasing and operating regulations were rewritten. The new orders required additional safety features on platforms and pipelines, including the first time requirement that subsurface safety valves be installed on all producing wells (OCS Order No. 5-3). Although subsurface valves were commercially introduced in 1954, problems and costs associated with them prevented their universal application. The new order issued in 1973, however, led to the rapid improvement and refinement of the technology. Other orders mandated the testing of safety devices prior to and when in use; more careful control of drilling and casing operations; prior approval of plans and equipment for exploration and development drilling; and new practices and procedures for installing and operating platforms. To enforce the new regulations, the U.S.G.S. tripled its number of inspectors and engineers, introduced a more systematic inspection program, and stopped using industry furnished transportation for inspection purposes (Krahl and Moody 1972; Solanas 1973).[41]

[41] E.W. Standley, Interior Liaison , to Jack W. Boller, Assistant Executive Secretary, Marine Board, NAE, February 15, 1972, RG 48, Records of the Secretary of Interior, Central Classified Files, 1969-1972, Box 136, Part 13.

The industry finally embraced the new approach to safety. In fact, the Offshore Operators Committee and the API Offshore Safety and Anti-Pollution Equipment Committee worked closely with the U.S.G.S. not only in advising changes in the OCS orders but in drafting, in a short period of about six months, a new set of API "recommended practice documents" for the selection, installation, and testing of various kinds of safety devices, as well as for platform design (Arnold *et al*. 1989). As Ken Arnold, a former facilities engineer for Shell and founder of Paragon Engineering, put it: "We changed in a period of very few years and got most people to buy into it. Then, the operating people had to maintain them, which was important, and the suppliers started to supply better gizmos, better three-way valves, better sensors, and we learned how to incorporate these sensors into designs in ways that they actually worked and did not give false signals" (Arnold 2004). In addition, the major offshore operators revamped personnel training for offshore operations with the aid of the API, universities, and suppliers. Shell Oil, for example, found that its offshore division had been experiencing a high attrition rate as its offshore workforce requirements expanded during 1970-1971, which "contributed substantially to the failure of the apprenticeship method to provide training, especially basic training." The new training program increased worker retention, boosted morale, and contributed to an improved safety record (Pace and Turner 1974).

On the mobile drilling front, certifying agencies issued new standards and guidelines. In 1972, Lloyd's Register of Shipping published for the first time its "Rules for the Construction and Classification of Mobile Offshore Units." In 1973, the American Bureau of Shipping revised its "Rules for Building and Classing Offshore Mobile Drilling Units," first published in 1968 after the *Sea Gem* disaster, based on studies that subjected the wide range of mobile drilling designs to more rigorous tests. These rules were then incorporated into the Coast Guard's regulatory requirements for mobile offshore drilling units (MODUs) and the OCS Order No. 2 pertaining to "Drilling from Fixed Platforms and Mobile Drilling Units," enforced by the U.S.G.S. (Lovie 1976). The Coast Guard and the U.S.G.S. also assumed responsibility for enforcing new regulations issued by the Occupational Health and Safety Administration (OSHA), created in 1970.

The diving sector also became more safety driven. Pressure came from several directions. By the early 1970s, mounting injuries and fatalities forced oil companies to require proof of insurance from their diving contractors. The extension of depth limits (beyond 600 feet under saturation by 1967) and the consequent need for great technological sophistication and capital resources led to company consolidation and a joint industry financial program. Moreover, by the late 1960s, diver safety groups and union organizing efforts forced diving contractors to take notice and form the Association of Diving Contractors, both to head off the union drive and force collective action on safety. The leaders of the safety movement were divers who had been injured, including one in a wheelchair and another who had lost part of his intestines in a freak, high-pressure, toilet-chamber accident inside a deck decompression unit (Pratt *et al*. 1997, p. 146; Fackler 2002). Although several union drives ultimately failed to organize divers in the Gulf of Mexico, their efforts did help improve safety standards and technologies in the 1970s and gave impetus to the drafting of new Coast Guard regulations.

The offshore oil industry's safety record in the Gulf improved significantly after the introduction of new regulations and practices. Both the reported incidence and rate of fatalities and injuries in

the OCS declined. Although the total number of drilling man-hours reported for the OCS increased from 26 million to 105 million between 1962 and 1977, the reported accident frequency for the same period declined from 14.9 to 9.3 accidents per 100 man-years. In other words, there was a fourfold increase in exposure-hours, but a 38 percent decrease in accident frequency (Committee on Assessment of Safety of OCS Activities 1981, p. 134). The rate of fatalities in the Gulf of Mexico was also much lower than in the North Sea. During the 1970s, there were 187 fatalities in OCS activities. This averaged about .05 fatalities per 100 man-years, whereas the North Sea average was closer to .2. According to a 1981 National Research Council study, the frequency of injuries in oil and gas operations in the OCS was comparable to other industries. The injury and illness rates per 100 full-time workers in all oil and gas extraction activities totaled 13.9 in 1978, only slightly higher than general manufacturing (Committee on Assessment of Safety of OCS Activities 1981, p. 136). During the 1970s and 1980s, the industry did not achieve a significant reduction in blowout frequency, largely because of serious limitations in methods for controlling shallow gas influxes. However, there was a sharp decline in the number of catastrophic blowouts and a significantly lower number of casualties and fatalities (Danenberger 1993). The rate of fires and explosions increased steady during the 1970s, from about 12 in 1970 to more than 30 in 1978, but the number of wells completed rose from 5,584 in 1970 to 9,140 in 1979. So the rate of fires and explosions showed a slight decline (McTaggert 1976, pp. 24-25).

We must be careful, however, about placing too much stock in official injury statistics. Data was not consistently reported, and accidents were most likely greatly underreported. Requirements for reporting injuries were vague and subject to interpretation by operators and leaseholders. The government required the reporting of serious injuries, but the term "serious" was never defined. Data since the 1970s is also unreliable. The MMS, like the U.S.G.S. before it, for years did not even require the submission of written incident reports. This makes it difficult to gather consistent information about each incident. OSHA only investigated fatalities, not non-fatal injuries. Said former rig welder, Charles Pearce, about Shell Oil:

> They are going to tell you they never had an accident. Never. But they do not report them is what they do. Unless it is something that they have to . . . if it is real bad that you have got to go to the hospital, then they have to report it but if it is anything else . . . if you break a leg, send you to the doctor and he will put a splint on it or whatever, and you go back to work. You may sit there for three or four weeks until that leg gets to where you can walk on it but they are going to bring you out there. That is not lost time. It has to be a lost time accident for them to report it. As long as they keep you on the job, it is not a lost time accident. There is a lot of that that goes on in these companies (Pearce 2004).

In 1985, the MMS revised its files to report only injuries directly associated with blowouts, explosions, fires, significant pollution incidents, or major accidents, which gave a downward bias to the number of injuries reported (Arnold *et al*. 1989). In subsequent years, companies often did not deem "lost workday" cases serious enough to report to the MMS. A voluntary MMS/U.S. Coast Guard Industry Performance study indicated that there were 507 lost workday cases in 1997. That same year, however, the MMS received reports for 83 injuries, or only about 16 percent of the lost workday cases reported in the voluntary survey (*Federal Register* 2003).

In the late 1980s, several industry accidents increased scrutiny of safety in the industry. The most tragic occurred on the oldest and one of the largest platforms in the North Sea. On July 6, 1988, an explosion and fire, caused by a leakage of natural gas condensate, on Occidental Petroleum's Piper Alpha platform killed 167 people and left the remaining 62 people to be pulled from the sea. Again, although this disaster took place in the North Sea, it affected the offshore industry everywhere and provoked soul-searching about ensuring safety. As Chris Wright observed in his study of North Sea operations in the 1980s, it was necessary to probe deeper behind the so-called "non-technological" causes of these accidents. Were they deviations from routine, external anomalies to the structure of work, or were they part of all too normal and routine deficiencies in the structure of work? By most accounts, Piper Alpha and other events did not reflect a problem with technology or noncompliance with industry safety standards, but had more to do with human error stemming from inadequate training and supervision, rote reliance on regulations, and generally poor operating practices. According to Peter Velez, manager of regulatory affairs for Shell Offshore in 1998, during the first 40 years of the offshore industry, "80 percent of the efforts to improve safety and the environment were focused on equipment design, operational considerations, and prescriptive regulations," whereas today "80 percent of the accidents and injuries are due to human error" (Velez 1998, p. 5).

Part of the problem was that offshore work remained hard and stressful, or was becoming increasingly so. Adverse conditions such as darkness, excessive heat, cold, or noise, and the long shifts associated with the seven days on, seven days off work schedule offshore will stress human performance. When workers become tired, inattentive, or irrational they become vulnerable to accidents and injury. As had always been the case, most accidents involved entry-level workers. Likely contributing to this problem was the increasing turnover rate in the offshore labor market, the growing use of contract personnel, and the emergence of smaller, independent operators without the necessary organizational structure for managing safety. A1998 study of workers in the North Sea found that contract employees worked longer hours and weeks to protect their income and employment. A painter revealed the dangers of such practices: "I often work thirteen hours a day, it's like being drunk. You get tired and that's when mistakes happen" (Collinson 1998, p. 312). No doubt, contract employees in the Gulf experienced many of the same pressures and risks. Between 1986 and 1994, sixty-six percent of surveyed offshore operators in the Gulf reported an increase in the use of contractors (Seydlitz *et al*. 1995, p. 65).

To address these new concerns, the MMS developed a "performance-based approach" to regulating safety that emphasized corporate and human responsibility. Introduced in 1991, the Safety and Environment Management Program (SEMP) promoted "public safety and environmental protection objectives by shifting away from a compliance mentality to a proactive approach that makes offshore safety an integral part of corporate culture." The objective was to encourage industry to focus on the effects of human error and the organizational influences in accidents and incorporate continuous improvement principles in safety management. The key to the SEMP initiative was an industry standard, API's Recommended Practice 75, developed by representatives from industry and the MMS, which stated that management was responsible for the success of safety and environmental management programs (Francois and Bonora 1998).

The MMS advertised in the Federal Register that they were going to promulgate an order with requirements for safety management based on RP 75, but then backed off and made it a voluntary standard. Many companies lobbied for making it voluntary, because it gave them a way out, if needed, from expending time and money to implement the recommendations. "It was unfortunate, in my way of thinking, that they did that," said Ken Arnold, who worked on drafting RP 75. In Arnold's view, instead of changing the way they trained and managed people, companies hired specialists to update their piping and instrument diagrams. The MMS has continued to pressure operators to implement SEMP, and in 2003 changed its incident reporting requirements to make them more consistent with the Coast Guard's requirements and to establish more detailed reporting thresholds and definitions. But almost 15 years after the initiative was launched, it is still in the process of being implemented, leading Arnold to conclude that it has been hard getting operators "to adopt SEMP other than a byword" (Arnold 2004).

Safety remains a pressing issue for the offshore industry in the Gulf of Mexico with the divestment of more safety conscious major companies from large areas of the Gulf of Mexico, and growth of smaller, independent operators. These companies have an overriding interest in getting oil producing quickly, thus increasing the time pressure on construction and development. They often inherit from the majors older producing properties, rigs, and equipment, which are more prone to accidents, injuries, and fatalities. The greater use of contracting by majors but especially independents has created uncertainty over the location of legitimate authority and decision-making, and bred ignorance about work conditions and the responsibilities of personnel and confusion over safety procedures. Moreover, smaller independents do not have the same kind of systems and overhead in place for managing and reporting incidents. A study by the MMS in 1995 revealed that during 1986-1990 independents reported twice as many fatalities as the majors, although they reported half as many total incidents as the majors (Seydlitz *et al*. 1995, p. 148).

Because of the deficiency of data, it is still difficult to verify the historical safety record of companies working offshore and make conclusive comparisons between the majors and the independents. A 1997 study by the Louisiana State University Center for Energy Studies concluded that during 1987-1993 independents had a much higher accident rate while drilling, but a lower accident rate while producing. Estimating from the ratio of accidents reported to the number of platforms operated per year, the LSU study weighted the incidents according to degrees of severity and number of fatalities and found that independents had a marginally better overall safety record than the majors (Iledare and Pulsipher 1997). However, this study still offers no way to account for the highly probable underreporting of accidents and injuries. Furthermore, to the extent that we can draw meaningful statistical conclusions, a more revealing correlation might focus on the frequency and severity of accidents and the use of outside contractors, rather than on the accident rate and firm size.

The marine environment has presented unique dangers and challenges to oil and gas operations offshore. It took longer than perhaps it could have or should have, but the industry, and especially the major oil companies, by the early 1970s overcame some of the most daunting challenges and found and installed better safety technologies and designs. By most accounts, there has been a significant industry wide improvement in overall safety. However, the pressures to socialize the costs and risks of offshore development remain, and appear to have once again

intensified. Accidents, injuries, and fatalities, although not as frequent as in the early years of the industry, unfortunately are still a routine aspect of working offshore.

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8. COMMERCIAL DIVING AND THE ROLE OF PEOPLE, TECHNOLOGY, AND THE ORGANIZATION OF WORK

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8.1. Introduction

The history and evolution of the offshore oil and gas industry in southern Louisiana is one of dramatic breakthroughs and steady modifications. Amid the vast array of people, businesses, and communities that are responsible for this industry, the story of oilfield diving illustrates very well the complex interplay between human and technical achievements and shows the importance of understanding the relationships between technology – both artifacts and knowledge of how to use them – and work organization. Though supported with data from elsewhere, the information in this paper comes from workers who experienced this history firsthand.[42]

The offshore oil and gas industry is an extension of the vast U.S. petroleum industry, and it has been and is influenced by the operational, technological, economic, political, and moral issues that characterize that industry (see Yergin 1993; Olien and Olien 2000). Still, the move offshore produced its own unique contests (see Freudenberg and Gramling 1994; Gramling 1996).

The oil and gas industry benefited from national and international demand for its products – it, in turn, has provided sufficient economic, social, and political support for the development of specialized sectors such as commercial oilfield diving. Capturing the history of the offshore industry presents special challenges; development and production do not occur in factories where the artifacts can be catalogued and the activities of workers and managers are regulated and can be readily investigated. Instead, the industry is a vast configuration of individuals and organizations working in numerous sectors responsible for exploration, drilling, fabrication, transportation, and production. It comprises small, specialized companies and large, integrated corporations. As the industry has moved from solid land to encounter swamp, lake, marsh, shallow waters over the outer continental shelf, and now depths greater than two miles, the companies and sectors have evolved and changed. Consequently, the industry provides an excellent case for examining the interplay of technology and work organization.

8.2. Construction Diving

Underwater construction played an important role in the early industrialization of Europe, and divers borrowed equipment and techniques from sponge and salvage divers who had been

[42] The author conducted interviews with divers, engineers, office personnel, physicians, and company owners between December 2001 and May 2005. Special thanks go to Tom Angel, Buddy Ayers, William Brown, Jim Burgess, Mitch Cancienne, Walter Daspit,Jr., Dale Fackler, Bill Fullerton, André Galerne, Mary Ann Galletti, C.E. "Whitey" Grubbs, Tom Hynson, Johnny Johnson, Verdie Laws, Robert Merriman, Drew Michel, Doris Mullendore, Don Murphy, Scott Naughton, Joe Sanford, Joseph Schouest, Joyce Savoie, Roy Smith, Oran Tarleton, George Taylor, Keith Van Meter, Al Warriner, Dean Whitaker, Wayne Willet, and Paul Woodhall. The author also obtained transcripts of several additional interviews, conducted between 1996 and 1999 for a history of Brown & Root. Thanks to Mark Banjavitch, Anthony Gaudiano, and Ken Wallace. Quotes from interviews are set off from the text by indentation and followed by brackets indicating the speaker and year of the interview.

practicing their craft for hundreds and even thousands of years on several continents. By the late 1800's, large commercial diving projects, such as deepening shipping lanes and constructing bridges and ports, were undertaken, and divers were hired to place concrete, cut and weld metals, and lay pipelines. The first wooden piers built to support oil drilling operations over seawater were constructed by pile driving crews in 1896 off the coast of California.

Within the early years of the 20th century, the U.S. oil economy developed, and by WWII oil was recognized as being so important to national security that young men who worked on the seismic and drilling crews active in the swamps and shallow waters of southern Louisiana were kept home to continue their work. When the war ended, vast numbers of people and new technologies were poised for action. Many men returned to the communities from which they had joined the service to find that jobs were scarce. Their wartime knowledge and experiences made them particularly well suited to the oilfield. They brought with them technologies for transporting goods, fabricating large metal structures, and working underwater. And they had become accustomed to working in harsh, dangerous environments. The rapid development of the offshore industry off the coast of Louisiana meant that the Gulf of Mexico soon became the "place divers went to earn their stripes" (Austin *et al*. 2002). For many companies and workers, offshore oil and gas work came to occupy the vast majority of their time, attention, and resources.

8.2.1. Diving as a Factor in Offshore Oil and Gas Development: The first diving operations in the Gulf of Mexico were little more than topside jobs completed underwater. Men recall jumping off of boats, barges, and platforms to retrieve dropped objects, install clamps, or check for oyster beds. They did not have, nor perceive a need for, any formal training as divers.

However, the progress into deeper water was rapid, and keeping the rigs, platforms, pipelines, and vessels operating called for modification and innovation. Underwater jobs required longer than the time a man could hold his breath and expanded to include inspection, installation of anodes for protection against corrosion, and salvage. Those already working in the industry began to look outward for new technologies developed elsewhere, and those with the interest and training in underwater work saw the industry as a new opportunity.

Working from within the industry, local workers used the air compressors available on boats and acquired war surplus equipment to create systems that would allow them to breathe while underwater. The early jobs were in depths under 100 feet, and divers could stay down as long as they wanted without suffering ill effects, so there were ample opportunities for them to learn how to manipulate tools and perform tasks underwater. Through magazines and trade publications individuals acquired information and ideas. Each diver had to come to the job with his own mask, hose, and compressor, and anyone who acquired the equipment was likely to form his own company. Technological diffusion was rapid, facilitated by the loose organization of diving companies and their propensity to join together when more than one or two divers were needed on a job.

SCUBA (self-contained underwater breathing apparatus) was developed in 1947 but was not readily adapted for offshore work. Specialized tanks and compressors were not available in New Orleans until the mid-1950's, and even then they were rare. Roy Smith, a diver who introduced SCUBA gear to the offshore industry in the Gulf described the early days:

> In the early ‘50’s, around ’53 or ’54, work was slow, so my friend and I said, “Why don’t we go to Grand Isle?”… I was in the U.S. Coast Guard during the war, so I went and got my operator’s license and started working on boats. After awhile, the platforms grew in number, and I got more interested in diving. I wanted to dive. There was no SCUBA diving at that time. Since I was the captain of a boat, I got me a gas mask and a hose and would dive around the boat. A friend of mine and I had heard about them diving with SCUBA gear in Florida, so we said, “Let’s go see it.” … Rowland’s Sporting and Army Goods Store in New Orleans ordered an aqualung. They didn’t know what to do with it, so they called me. We threw it overboard and all took a dive with the tank. I bought the aqualung from him. They found a surplus compressor from a submarine and put it in their store and started filling tanks (Smith, personal communication 2002).

A few years later, in 1957, Ronald and Walter Daspit, natives of Lafayette, Louisiana, developed a “bailout bottle” that could be worn on a diver’s belt and provide a short-term, emergency air supply for a diver whose surface air supply had been cut off.

Outside the industry, the U.S. Navy was the principal source of technology and personnel. As early as the 1930’s, the Navy began experimenting with gas mixtures that would allow divers to go deeper and stay underwater longer. Diving was an important responsibility of the Navy in WWII, and divers conducted salvage operations, helped construct ships, cleared ship channels, and performed numerous other tasks. During the war, new techniques of underwater welding, burning, and the use of explosives were advanced, and new tools and equipment were developed for undersea construction and other work. Though Navy divers started several Gulf Coast diving companies during the 1950’s, the attitudes, tasks, technologies, and forms of work organization in the oilfield were markedly different from those of the Navy. The transition was difficult for some divers. The following two career divers describe the same situation from two different points of view:

> After the war was over… life got boring. For some reason or other I decided it would become more interesting if I would become a Navy diver. … I graduated from the Navy Deep Sea Diving School…in 1946. I went on from there and was a Navy Deep Sea Diver up until the time I retired from the Navy … in 1960… Then, immediately, if I had never tasted boredom before, I got a hell of a taste of it after retiring. I was not finding myself being very well adapted to most civilian occupations so I quickly found myself down at the Gulf Coast - New Orleans - and became a commercial, professional diver in the offshore oil fields… Most divers on the Gulf Coast were not highly trained or highly experienced, either one. They were just people who knew how to put on the diving gear and make an effort. Yet, the Navy training had value because I knew a lot about decompression and treating the bends that others did not know. On the other hand… even though I was highly experienced, 15 years in the Navy, I began immediately a heavy-duty learning curve figuring out how to do things in lightweight gear. The thing that sticks in my mind as heavy duty is how hairy it was. As compared to Navy diving where you always have a chamber setting topside, here you are doing it with

> nothing. You got your tender, you got a little old compressor, your face mask, your wet suit, your gear, and you are pretty much on your own. If you have a diving accident then it is shame on you, especially if it requires decompression because no chambers. Even if there were, nobody who knows how in the hell to use it….Once I saw that I could do it, it was a horrendously nightmarish thing psychologically. … But it was the hardest part, just getting used to the danger. It was such a relief when I finally got to the west coast where decompression tables and chambers were the norm (Taylor, G., personal communication 2002).
>
> I used to do a lot of experimental diving for the Navy, checking out different equipment, showing them how it can work. The Navy divers wouldn't do some things, so we'd do it. …The Navy master divers would come out and see what we were doing, shake their heads, and say, "No way we'd do this in the Navy." That's what you had to do to get the job done. There were some innovations, like the frying pan shaped O ring to use in the flange groove and help keep divers from losing fingers. We got new wrenches. I was concerned about safety, but in commercial diving if you are going to think about safety you are not going to get anything done. Offshore, everything around you is dangerous; you've got to take your chances there (Schouest, J., personal communication 2002).

When the U.S. Merchant Marine began to decline (Gibson and Donovan 2000), some mariners turned to the offshore oil and gas industry for work. The wages paid to offshore mariners were far below those to which seamen had become accustomed, so some took up commercial diving because it required many of the skills they had developed on ships and offered more lucrative financial opportunities than work on oilfield vessels. Though some of the early divers enrolled in commercial diving schools, formal training was not considered a necessity and some even argued they could better prepare divers themselves. Walt Daspit, a career diver, describes his path through the Merchant Marine:

> I graduated from high school in '45 and I joined the merchant marine when I was 17. In 1946, there was a general seaman's strike. All seamen went out on strike… When the seaman's strike was over after about three or four months, I went back to sea again. Somewhere around 1950, I was about to get drafted during the Korean War so I joined the Air Force. Right before getting discharged I came across a magazine that had schools for higher occupations and one was Spalding School of Deep Sea Diving. It showed a picture of a diver wearing heavy gear and it said that divers make as much as $200 a day. I said, "Well, that is for me." After I got out of the service about '52, I went back to sea and got enough money to go to diving school. I began diving school in the fall of '53 and got out in January of '54 (Daspit, personal communication 2002).

Communication problems between divers and those on the surface were significant. In most early underwater jobs, especially those performed under conditions of no or low visibility, a single diver worked alone. Many early divers argue that more than one diver would have increased the danger because divers would then have had to worry about one another. Divers communicated with the surface via hand signals on a rope, and they and their tenders worked out complicated systems known only to themselves. Communication was necessary when a diver

required tools, wanted the people on the barge to raise or lower cables and equipment, and needed to inform the tender that he was trapped or could not breathe. Loss of communication required aborting the dive.

Though radios were customary within the Navy by WWII, they were large and bulky, and commercial divers did not commonly use them. Diving helmets were equipped with telephones, but hearing was often disrupted by the noise of breathing gas entering and exiting the helmet. Fixing communication devices to masks proved a significant challenge. Divers experimented with earphones, transceivers, and devices they could purchase at electronics stores, but they did not forego the use of ropes and hand signals. William Brown began diving for his uncle in California at age 16 during WWII when older divers were scarce:

> We had what they called sound powered phones at that time [1945]. You didn't have any magnification or anything. It had two sticks and you wore a skull cap and you put these things on each ear and you would tape it up. It was very uncomfortable. [The diver] had a bull horn on his chest that you could talk into. It was sound powered. We worked with hand signals most of the time (Brown, personal communication 2002).

While maintaining communication with the surface was vital to a diver, controlling that communication was a key point at which the diver could assert his autonomy, control the work setting, and enhance his status. In the early days, everyone depended on the diver to report conditions at the bottom, the time the job would require, and the progress he was making. To regain some of the control, companies began hiring inspection divers to assess initial damage and report on work completed. By the mid-1950's, underwater photography was recognized as a valuable means of augmenting a diver's description of the situation, but it was rare in the Gulf of Mexico. Its widespread use in the 1960's was another feature that marked the maturation of the oilfield diving industry.

Though technologies were borrowed and adapted from commercial diving operations elsewhere, rigid forms of work organization were actively resisted. In the early days, a diver needed only his equipment and a trustworthy "tender," someone who would stand at the surface to monitor his hose and compressor and pass him tools. Numerous small companies, comprised of one or two divers and their tenders, formed in southern Louisiana and east Texas. A particularly successful job gave the company a boost. Each successive achievement maintained a diver's reputation; a single failure could damage it. Maintaining relationships with those who hired divers sometimes required being willing to do things other than dive.

Commercial diving schools on the west coast provided a tenuous link between Gulf Coast divers and others, but though the interaction led to sharing of technology, it had little impact on ideas about and approaches to work organization. Staunch individualists, a fervent anti-union mentality, and an industry structure within which oil companies contracted simultaneously to drilling companies, fabricators, and boat companies and established an environment within which time meant money – huge sums of it – all contributed to the highly competitive and dispersed nature of the workforce. As the industry moved into deeper waters new challenges

emerged and had to be overcome. Divers were rewarded for taking increased risks with a pay structure that included a baseline daily rate and depth pay.

In addition, a nation enamored with individualists and innovation and already lamenting the tedium accompanying factory and office work was captivated by the freedom and excitement associated with nontraditional careers such as diving. In general, underwater achievements were trendy topics for periodicals such as *Popular Mechanics* and *Popular Science* (Heyn 1972), and, in the Gulf region, newspaper coverage was frequent.

Throughout the early period, to the end of the 1950's, commercial diving and underwater construction were necessary for the construction and maintenance of harbors, ports, piers, and power plants throughout the United States. During those years, diving companies were still working to demonstrate their value to the offshore industry (e.g., *Offshore Drilling* 1957; Taylor 1958). Soon, though, diving became an integral part of offshore operations, and the oil and gas industry, due to its size and financial strength, eclipsed other applications. Both technology and ideas about work began to flow outward from the Gulf.

8.3. Innovation and Adaptation

As both the depths and the level of offshore activity increased, the largely informal and small-scale diving sector matured. From the perspective of the companies paying the bills, the primary goal was to increase the time divers could stay on the bottom and minimize the time spent in decompression. Numerous changes and innovations made it possible for a person to advance from jumping into ten feet of water for a few minutes to staying at depths greater than one thousand feet for several weeks to complete a job. Gas mixtures allowed divers to achieve greater depths but also withdrew the heat from their bodies and made their speech unintelligible; their use required new masks and the development of hot water suits and new communication devices fitted with unscramblers. Pneumofathometers and decompression chambers and tables removed some of the uncertainty from the return to the surface and reduced injury and death so that underwater operations could continue and saturation diving could develop.

8.3.1. Getting Divers and Keeping Them at Work: To meet the goal of increased bottom time and more rapid ascent, both mechanical and biochemical problems had to be overcome. Under pressure, the density of air increases and impairs breathing by reducing the mechanical efficiency of the lungs. Divers' bodies absorb more air under pressure than at the surface. Atmospheric pressure doubles with each 33 feet of depth, and with each doubling the volume of gas is reduced by half. The longer the diver is down, the more compressed air circulates through his system. When the pressure decreases upon ascent, the gas expands. The diver must rise in stages to allow the blood to circulate and air escape slowly in a process known as decompression. Rapid decompression leads to the dangerous condition known as the "bends." Decompression tables established safe rates of ascent. Then, decompression chambers allowed divers to be brought up quickly, repressurized, and decompressed slowly while at the surface. Other divers could continue the job during the process. Consequently, the ability to function in confined quarters became an important requirement for divers.

The fundamental physiological concern was to provide divers' bodies with levels of oxygen that would sustain life while reducing gases whose volume underwent significant changes with changes in air pressure. By altering the gas mixtures divers breathed, both depth and bottom time could be increased, so various gas mixtures were tried. Oxygen is toxic at high levels and results in convulsions and death; as the pressure of the gas goes up the percentage of oxygen must decrease. Divers with high oxygen tolerance have a distinct advantage. Carbon dioxide is also toxic, and materials to absorb the excess gas were inserted in helmets. Nitrogen has a narcotic effect at depths beyond 100 feet, so a replacement carrier for oxygen was sought. Helium tempers the taste buds, causes dehydration of the sinus cavities, and, because its thermal conductivity is greater than that of air, carries heat away from the diver's body. It also comes out of the system more slowly than nitrogen and affects the vocal cords resulting in the "Donald Duck effect." Nevertheless, the problems associated with helium proved to be the most amenable to solutions, and helium-oxygen mixtures that had been developed by the Navy decades earlier were widely used in oilfield diving by the late 1960's. The high cost of helium led to efforts in the 1970's to develop rebreathers that would recycle the gas and to efforts to replace helium with nitrogen.

Divers worked in confined spaces at high pressure, lived for up to several weeks at a time in close quarters, and took risks relying only on the word of supervisors and company doctors that new methods were safe. Every new invention required additional human capacities and experimentation on divers, and many innovations were motivated by injuries and deaths. Still, as each new innovation came along, divers could be found to try it out. Macho pride, the desire to be the first, prospects for higher pay, and a love of diving all played a role:

> I like the gas work. I quit doing anything above 150 feet of water. Greed overcame my fear. You could go down and work an hour or two and you would get paid more than you spent working a week in some waters (Daspit, personal communication 2002).
>
> [Being in diving] a long time starts to define who you are almost (Taylor, G., personal communication 2002).

Problems with heat were addressed through the use of suits that were heated either by surface-supplied hot water or electric wire. Hot water suits were preferred even though they initially scalded the divers; divers reported that they would leave the front of their suits open to allow cold water to mix with the heated water coming from the surface.

The introduction of new gas mixtures meant new mechanisms for generating and then delivering those gases to the divers; standard air compressors were no longer adequate and gas mixtures had to be purchased from elsewhere. Significant invention and innovation accompanied the development of diving masks and helmets. One of the first Navy artifacts to be modified for oilfield work was the Mark V helmet, which had been developed prior to WWI and remained in use until the 1980's. The helmet and full diving suit with which it was used weighed as much as 200 pounds. Working in the Gulf of Mexico around rigs and platforms, divers needed flexibility and the ability to climb up and down, in and out among platform legs and tangled pipes. In addition, divers were frequently given a small area on the barge from which to work; in this

space they had to cram their air compressor, tanks, radio, and everything else they brought along. Masks that were originally designed for SCUBA were adapted for use with hoses and compressors because they were smaller and used less air; however, the lack of any head protection was a disadvantage in construction work. Beginning with the end of WWII, Gulf Coast divers acquired access to Japanese helmets, and these became popular among some divers.

By the 1960's, several Gulf coast divers had designed and built their own hats. Walt Daspit, who was motivated by Joe Savoie to design and construct his own hat, describes why:

> The first guy that came out with a lightweight diving helmet was Joe Savoie. We were working on one of McDermott's barges with Chuck Gage and we saw Joe. Joe was explaining to us what he was going to build. He was going to use an aqualung, which was a sterile diving dress that was used at the time. It was a front entry and you would wrap up tight and you would stay dry. Joe was going to put a neck ring on it… He wanted to build a helmet out of a race car crash helmet. Then he was going to the faceplate visor and a neck ring and tie it. He was explaining that to us and drawing it. I said, "Joe, you can't do that because having that half opening of the dress, when you lean over air is going to go to the highest point. It is going to flip you upside down and you are going to come floating up to the surface upside down." That was one of the things about diving with heavy gear. You had to be careful. If you leaned over too far, the air went to your feet. You were out of control then. You couldn't exhaust it… I am trying to explain this to Joe who has never had any formal diving training. When you argued with Joe, all he did was talk louder. Once he gets something in his head that is where it stayed. He was a hard-headed coonass and I was a hard-headed coonass. I tried explaining to him that he couldn't do that. He said that he was going to put valves on the feet and relieve the air through the feet. I told him he couldn't do that because it wasn't going to work. You have to have a seal around the neck. Joe just kept getting louder. Joe eventually found out that I was right so he made a neck ring for his hats. He made a very good helmet but it took him a while to evolve it into something. What he first had in mind just wasn't going to work (Daspit, personal communication 2002).

Though Joe sold a dozen helmets and Walt and a couple of other local divers sold a few more, Kirby Morgan of California achieved the greatest success. He visited Gulf Coast divers and convinced some of them to try his helmets. Soon Kirby Morgan hats were in widespread use.

Introduction of new gas mixtures required changes to communication devices. Though divers and their tenders learned to understand each other even with the distortions caused by breathing helium, barge superintendents and others at the surface did not. Unscramblers were employed to facilitate communication.

As jobs began to require many divers, supervisors were hired to manage both the work and the divers. Some supervisors managed all communication with the divers, both to maintain control over the job and to ensure diver safety. During the development of new procedures, the highly competitive environment of offshore construction and the huge profits to be made from

substantial breakthroughs made secrecy paramount. One supervisor recalls a time he wrote down instructions for a welder inside the chamber:

> I have always been of the opinion that you like to keep information confidential, but in order to gain information you've got to tell the welder what he's doing, why he's doing it, and what you're looking for. So I had written down for a welder and he was in the tank welding. And [the CEO's] got a stool pigeon works for him, that found my note, and he took it to [him]. And [the CEO] called me in his office, and [the CEO] was setting holding his head like this and he goes to screaming at me about confidential information.

Gas mixtures and helmets continued to be developed and modified, and so did the search for efficiency and ways to keep divers underwater for longer periods of time and maintain continuous operation. Throughout the 1960's as the industry matured, diving companies showed uneven rates of adoption of new technologies and forms of work. Even after diving bells, chambers within which divers can descend to depths of thousands of feet, and decompression chambers were common in the Gulf, divers reported being on jobs where either no chamber was present or no one knew how to use the chamber correctly.

The diving bell provides physical protection for the diver and a more comfortable environment within which to undergo decompression. However, though it enables the diver to descend to deeper depths and facilitates the return to the surface, it does not significantly alter the time on the bottom. The major breakthrough in that area came in 1957 when the director of the Navy's Submarine Medical Center demonstrated that the body's tissues would become completely saturated with inert gas within 24 hours so that the period required for decompression for any dive of that duration or longer would be the same (Zinkowski 1976). In the 1960's when the concept was applied widely, the limits of both depth and time expanded exponentially. Military, scientific, and commercial interests converged in a period of rapid research and development of equipment, gas mixtures, and forms of work organization. According to the general superintendent of one of the industry leaders at the time, "No industry today can boast of more rapid technological development than commercial diving" (Morrissey 1966, p. 88).

Saturation diving systems are themselves complex environments, and their development required parallel development of analyzers to read partial pressure of oxygen (systems were developed to include both galvanic and polarographic types of analyzers); controllers to maintain oxygen levels; and analyzers for carbon dioxide (infrared); carbon monoxide (infrared); helium (thermal conductivity); nitrogen (computation of difference); and relative humidity (electric hygrometric) (UST 1968, p. 41). Within the diving bell, scrubbers kept the moist atmosphere ventilated; rack operators monitored readouts to safeguard against carbon dioxide and oxygen poisoning; and emergency gas bottles were installed to offer a few minutes of air in an emergency (Seib 1976).

These technological achievements introduced a host of changes in work organization and the social environment within which diving took place. The expense of constructing, operating, and maintaining saturation systems increased the capital needed to remain at the forefront of the industry. Small companies were either absorbed by larger ones or had to restrict their work to

shallow environments. They had a hard time attracting divers when the innovation and record-setting was occurring elsewhere.

Companies gained greater control over the divers and their pay. Prior to saturation diving, with decompression time tied to depth and time spent under pressure, deep work was done via bounce dives wherein divers stayed on the bottom only a short period of time. Pay was tied to depth, so divers could make huge sums of money in relatively little time. Both physiological and financial factors limited the depths to which divers could go and the time they would remain there. Saturation diving removed many of the constraints and set up new dynamics between divers and their employers. "With saturation diving and almost unlimited working time at depth, diving performance is now being judged on how long a period of time divers are in the water – that is, 20 hours a day in the water is somehow 'better' than 16 hours a day, even when less actual work has been performed…(O)perators of lockout submersibles welcome a more accurate, qualitative evaluation of work performed, and they are motivated to provide the performance that this approach demands" (Duggar and Majendie 1979, pp. 92 and 94).

Saturation diving also changed the nature of the relationships among divers and between divers and their supervisors. Instead of one diver working alone, as many as six divers and a tender would work from a diving bell. Communication was managed via unscramblers on the radio and took place between the divers and the topside supervisor and not with tenders in the bell. Tenders were excluded from decisions about the work to discourage them from taking charge of the operations; if the tender entered the water to aid the diver no one would be tending and two could be lost (Seib 1976).

Despite, and perhaps because of, the continued experimentation and ongoing danger of the early years, divers continued to dive. Long hours in a diving bell could be excruciatingly dull, so divers sought distraction. Some divers became avid readers while others worked longer than their allotted time to avoid getting back into the deck chamber.

The continued advance of exploration and drilling toward deeper waters provided the stimulus for invention, innovation, and dissemination in commercial diving. These technological advances that made it possible for humans to work at great depths below the water's surface also made way for new technologies associated with the construction, maintenance, and operation of oil and gas platforms and pipelines. In the following section, a brief overview of the history and development of underwater welding illustrates the links.

8.4. Underwater Welding: An Example of Technological Change in the Offshore Oilfields

The development of underwater welding was preceded by several alternative approaches to the construction and repair of offshore structures and pipelines. When wooden derricks and platforms gave way to steel ones, installation, repair, and removal required men to work with metal. Platforms were fabricated onshore and transported offshore via barges. Pipelines were joined on the decks of barges and then lowered to the seafloor; repairs were initially made by hauling the lines to the surface. Then, successful divers demonstrated the advantages of performing the work on the bottom, installing clamps and mechanical devices where needed. Soon, cutting, burning, patching, cementing, pipelaying, welding, and inspecting were all done

underwater. Both the tasks to be done and the people to do them had to be modified for this new environment.

Even prior to WWII, underwater welding had proven an effective temporary means of joining pieces of metal, but the inferiority of wet welds to those performed at the surface limited its use. By the mid-to-late 1960's, however, the idea of welding underwater had captured the attention of a number of key construction companies and personnel. Saturation diving provided the context within which underwater welding could develop. Though not the only source of need, the offshore oil and gas industry was by far the largest and had the most capital. Research and development moved in two directions: creating dry environments within which welding could occur and developing wet welding techniques. In 1967, Taylor Diving and Salvage began developing an underwater welding habitat and alignment frame to facilitate welding underwater in a dry environment; it was used successfully on the St. Lawrence River in 1968. In 1969, under the direction of C.E. "Whitey" Grubbs, Chicago Bridge and Iron began an underwater welding research program focused primarily on wet welding.

Dry habitat welding progressed through several stages, beginning with the gas tungsten arc. This process was considered too slow, so alternatives were tried until the shielded manual arc became the accepted standard. Under pressure, the welding arc becomes constricted. In addition, weld metal chemistry, weld notch toughness, and hardness all are affected by pressure. Different gas mixtures were tried. At increased pressure, hydrogen's solubility increases and leads to cracking. Helium's conductivity is six times that of air, and rapid heat loss from the weld area increased hardness and the risk of cracking. Nitrogen leads to nitrides in the weld deposit and destroys the properties of the weld because molten metal will preferentially absorb nitrogen and form nitrides. To complicate matters, as the welding process was evolving to respond to increased depth, so, too, was the type of metal being used in pipes and structures.

At each stage, both weld procedures and diver/welders had to be qualified to perform to specific standards under specific conditions. The use of x-ray technologies to inspect welds required that some divers be qualified as radiographers. Anthony Gaudiano, who worked as an engineer for Taylor Diving and Salvage from the late 1960's until 1984, describes the environment of the time:

> And you have to understand that when all this was going on, and people were working like 11-12 hours a day, we didn't have meetings where we sat down and made presentations. We didn't do all of that planning and all of that critical path charts, none of that stuff. You just did it. You got it done… People did some very impressive things, really very impressive things. Innovative things. And I would think that the habitat welding was one of those innovative things (Gaudiano, personal communication 1996).

The OPEC increase in oil and gas prices spurred U.S. interest in developing offshore oil and gas fields and increased interest in underwater welding (Cotton 1977). The 1970's were a period of new development and innovation. Though the first remotely operated vehicles (ROVs) were constructed and used by the Navy in the early 1970's, it was several years before they were available commercially.

8.5. Work Organization and Labor Issues

As the processes and techniques associated with underwater construction evolved, a very specialized labor force was required. Though some jobs, such as pipeline installation and platform removal, had fairly standard procedures, no two jobs were ever the same. Accidents, hurricanes, and general wear and tear presented unfamiliar circumstances for even experienced divers. Pride and the fear that one diver would outdo another and win over a customer kept divers attempting new feats:

> When [the barge] capsized, they had about a 130 foot derrick standing. It capsized and the derrick bent out to the middle of the river. They couldn't do anything. They couldn't move it because the derrick had the barge anchored. It was upside down and you had this derrick bent out towards the middle of the river. I went down and burnt and cut it loose to where it dropped. That was kind of scary and I don't know if I would do that today. The other divers flat out refused to do it. I said that I would do it (Daspit, personal communication 2002).

Maryann Galletti, wife of John Galletti and co-owner of J&J Diving, describes how the company evolved:

> We started working out of a garage with two sets of diving equipment and no vehicle. We gradually acquired equipment, property, a building. Within a span of ten years, we had also bought a tractor trailer truck. John informed me he was going to buy this tractor trailer truck for $12,000 and I liked to have a heart attack. He had the sights to see the work that was out there and all I could see was more money, more money. It was like you would pay for one thing before you moved onto another (Galletti, personal communication 2002).

The era of the small companies was short lived. The rapid advance to deeper waters required specialized equipment and knowledge to enable divers to work safely at ever-increasing depths. Thus, during the 1950's and early 1960's the diving companies went through the process of getting organized (Batteau 2001). A steady increase in offshore activity during the 1960's drove up demand for divers and meant that existing companies expanded and new ones formed. "The explosive growth of offshore oil exploration and development brought round-the-clock overtime and deep diving premiums. There was a lot of money being made by the younger divers, though it was often at great risk" (Parker 1997, p. 115). Divers were put into the water with little, if any, training, and the greater depths substantially increased the risks associated with inexperience.

In addition, divers were under tremendous pressure to perform. The hierarchical nature of the industry and separation of those with the ultimate authority over decisions from those on the barges, rigs, platforms, and vessels led to circumstances within which divers were pushed to dive even when conditions would dictate otherwise. Both when divers were called out in an emergency and when they performed routine tasks such as laying pipelines, the work of people at the surface was halted until the diver was out of the water. Entire crews were held captive on barges and platforms while divers completed their work. Though the situation gave divers a

certain amount of autonomy, it also resulted in significant peer pressure to get the job done quickly. Walt Daspit captures the sentiments expressed by most of the early divers:

> [The barge captain] can't say [to a diving company] you have to put this man in the water. But, the next time they call for divers, he can say that he doesn't want whoever out here. So, you have to keep the barge captain happy. The main thing in keeping the barge captain happy is getting the job accomplished….The barge was surging. It was going up and down. The water was picking up. They wanted me to go down and cut the pulling head loose. When I went down, the barge surged down and I had my hand on the top of the handrail. A huge block, about 7 or 8 feet tall, came down and side-swiped my hand. My hand just went numb. I unshackled the block and I was going back up to the surface….When I got to the surface, I pulled the glove off and my finger was just hanging by a string (Daspit, personal communication 2002).

Nevertheless, diving was attractive to many young males looking for an exciting career, and would-be divers were not hard to find. Andre Galerne, a company owner and early member of the Association for Diving Contractors, commented on the problems associated with low diver pay and benefits in the Gulf of Mexico:

> The price we were paying the divers was in my book much too low, and if a guy can make the same amount of money by selling hamburgers to Big Mac, than to be a diver, I think it's exploiting the fact that the guy likes diving. [If we advertised this as something other than diving], then the people will not be doing that for the pleasure, so they will demand money. Diving is a different thing. The guy is ready to dive at any price, because they want to dive (Galerne, personal communication 2001).

Joe Schouest (personal communication 2002) confirmed this, "I love diving. I'd dive for nothing. Sometimes I've done it. I like the challenge."

Though divers and welders were easy to find, engineers were not. Several companies struggled to find people to enter the industry. According to Anthony Gaudiano,

> Of course, you have to understand in those days, nobody wanted to be associated with us. We were kind of wild outlaws and anybody who had any smarts would look at this little two by four organization and say, 'I can go to work for General Motors. Why should I be associated with this little bitty place?' There were a few who saw the potential but not very many. We didn't get the experts until quite a number of years later when the revenue and the reputation were worldwide (Gaudiano, personal communication 1996).

Due to the high costs of specialized equipment such as decompression chambers and a pool of divers who would work under almost any conditions, the organizational culture of diving was at first slow to change.

Many companies continued to operate at the margins of safety, but injuries, deaths, and expanding liability caught the attention of the oil companies. In the early 1960's, Joe and Tom Sanford came to Louisiana as outsiders and were able to establish a clientele and obtain work because at that time they were one of the only diving companies working in the oilfield with insurance. Soon the largest companies were requiring proof of insurance, and by the mid-1970's the substantial extension of depth limits proved to be too expensive to be undertaken by individual companies and required a joint industry financial program (Jones 1977, p. 70). Rapidly rising insurance costs and fear of government intervention and of unionization among the divers led companies to organize the Association for Diving Contractors to develop industry standards and address safety concerns.

The move from land to water affected the organization, or lack thereof, of the labor force. Divers were engaged in underwater survey work beginning in 1929, about the same time that the first efforts to organize divers began on the east coast (Parker 1997). Near shore, divers worked alongside unionized construction crews but remained independent until pile drivers unions successfully claimed submarine divers among their numbers. The unions are credited with establishing better working conditions for divers on the west and east coasts. However, the move offshore undermined union activity and influence over the offshore oil industry because oil companies and drilling contractors operating drilling vessels were not signatory to pile driving and diving union agreements. "Other than establishing the fledgling oil divers with standards of safe work rules and pay scales precedent, the union had little influence over the offshore oil diving industry" (Parker 1997, p. 115). Despite significant efforts in the 1970's, the unions were never able to organize the labor force working in the Gulf of Mexico.

The push into deeper water drove technological development, and the larger companies responded by establishing research divisions. J&J Marine Services, one of the few early Texas companies that also worked out of south Louisiana, was among the few small companies that invested substantially in research. The company owners hired an independent scientist in the early 1960's to help develop decompression tables. At that time, the company employed only a few divers, but the owners recognized the critical role that science and technology would play in the diving industry.

8.6. Discussion and Conclusions

Divers and companies in oilfield diving and underwater construction began by adapting technologies and patterns of work developed elsewhere and have continued to maintain links to the U.S. Navy and to commercial diving and construction interests operating outside the oil and gas industry. The steady march from shallow to deep water supported a continual process of innovation and change in both the equipment and methods required to put and keep divers underwater and those required for constructing, installing, repairing, and salvaging offshore structures. Within this regular evolution several events, such as the adoption of mixed gas breathing mixtures and of saturation diving, marked discontinuities that led to periods of rapid research, development, and change. The particular nature of the offshore industry – distributed networks of innovation and implementation, the continued reworking of nearshore fields in the Gulf of Mexico, and expansion worldwide – nevertheless made it possible for companies to continue using old technologies as they developed new ones.

Technological challenges – welding and burning underwater, for example – matched challenges of getting workers to the work site and keeping them there. The challenges of transporting and maintaining workers hundreds of feet below the surface proved to be both physical and psychological. The industry was able to play into key tenets of American culture and society – freedom, individualism, and competition – to attract and hold divers. Divers and the companies they formed fought hard to maintain a significant level of autonomy and defy both larger companies and unions who sought to organize them. Yet, through time, in the face of economic pressures to manage liability, the oilfield diving enterprise became organized. By the 1970's, the technological and social milieu and forms of work organization of oilfield diving were substantially different from those which marked its beginning. Small companies of one or two divers and their tenders had given way to large enterprises. Though several unionization attempts ultimately failed, the organizing drives provide another sign of maturation within the industry. The late 1970's and beyond would bring further changes.

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9. WOMEN AND THE OFFSHORE OIL AND GAS INDUSTRY IN SOUTHERN LOUISIANA

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9.1. Introduction

The offshore oil fields of the Gulf of Mexico have long been depicted as a man's environment; even among people involved in the offshore oil and gas industry, the Gulf of Mexico has been distinguished by its "cowboy" culture.[43] Reliable figures on the offshore workforce are hard to obtain – though oil companies fill some positions themselves, they rely on a large array of contract companies to supply seismograph crews, drillers, cooks, truckers, divers, mechanics, and a multitude of other people necessary for finding, reaching, and producing oil and gas from the U.S. outer continental shelf (OCS). Throughout this vast industrial landscape, and largely invisible, are substantial numbers of women. These women support the industry in their roles as blue, pink, and white collar workers, as wives and mothers, and as community leaders.

The stories of oilfield wives have been told; researchers have examined life in boomtowns, in the North Sea, and in the Gulf of Mexico. Researchers have also studied women who work offshore in the North Sea and Canada. Yet, despite its centrality as the standard against which all other offshore work sites are compared, women who work in the male-dominated work culture of the Gulf of Mexico have received little attention. Drawing upon interviews with both men and women who worked and lived in the midst of this massive industrial activity, this paper examines the role of women in the offshore oil and gas industry in southern Louisiana. The principal story is told by the women who talked about their lives, work, families, and communities. That story is enriched by the perspectives of the men who were their husbands, bosses, co-workers, and employees.

9.2. The Region: Southern Louisiana

Southern Louisiana is a region dominated by swamps, marshes, bayous, and, for the past 75 years, the oil and gas industry. Though now influenced by a regional "Cajun" culture, the area is home to a diverse population. The region has undergone dramatic physical change in the past 100 years – massive deforestation of cypress forests, establishment of thousands of canals for transportation and pipelines, development of oil and gas and a vast infrastructure to support it, and huge alterations in patterns of erosion and sedimentation. Socially and culturally as well, the region has been transformed. No longer defined by isolated communities dependent on hunting, trapping, fishing, or small-scale farming, the region is now populated by people from across the United States and the world. Political changes have occurred also; with the rise of oil and gas, regional economic and political power shifted from the plantation to the oil field.

[43] Movies like *Giant*, *Hell Fighter* or *Thunder Bay*, and books like *Louisiana Blue*, characterize the oil field as the new wild west. Scholars have added to this portrayal of the oil field by highlighting the boomtown model of the oil field or focusing on its most "exotic" parts, such as the famed oilfield cowboy culture. The 1999 edition of *The Job Ratings Almanac* ranked oilfield roustabouts in the category of overall worst job to hold in the United States in terms of income, stress, physical demands, potential growth, job security, and work environment.

The region has long been a part of a global economy due its agricultural (particularly sugarcane) base and the presence of large port cities such as New Orleans, but the process of globalization took on new forms when the Gulf of Mexico became a leader in offshore oil and gas production. In that process, the region became recognized for technological innovation and adaptation to the oil and gas industry and the import and export of capital, technology, and labor to places as far flung as Nigeria, Venezuela, and the North Sea. Yet, despite the powerful influence of globalization, the Gulf of Mexico offshore oil and gas industry remains unique – and women are a major factor in that distinction.

9.3. Women in the Oil Fields

Between the late 1800s and the 1930s, with the advent of the U.S. petroleum industry, a distinctive oilfield culture and social order evolved and played out in hundreds of boomtowns across America (see Lambert and Franks 1984). Thousands of people, in search of wealth and work, created and passed along this culture as they moved from place to place. Though government controls and WWII dampened the frenzy of the early decades, the patterns of migration among oilfield workers continued through the next decades, reaching a new peak during the boom of the mid-70s to the early 80s. In addition, with the successful establishment of a producing well out of sight of land off the coast of Morgan City, Louisiana, a new offshore oilfield frontier, with its own colorful history and characters, was established in the Gulf of Mexico, with its nexus in southern Louisiana.

The early oil fields have been characterized as a prototypical man's world. Men controlled the capital that funded exploration, took the physical and financial risks needed for finding and developing oil fields, and provided the labor for building the infrastructure to support those fields and the communities that sprang up around them. Though stories of the former groups are legendary, it is the large, mostly undistinguished latter group that defined the role of women – no stories exist of the lives of the wives of the venture capitalists, for example. Two ideal types of women emerge from the stories of the onshore oil fields; the isolated wife and mother trying to create a home in a camp or trailer park nearby and the prostitute providing service to the lonely and unattached. Portrayed as strong and tough, wives have been admired for their ability to set up a home in a temporary setting and to establish social networks to support home and family (Dobler 1987; Walsh and Simonelli 1986; Walsh 1989). Prostitutes have figured only in men's stories (Boatright and Owens 1982 [1970]; Barfield 1952).

With the industry's advancement into the Gulf of Mexico came a significant change in the lifestyle patterns of oilfield workers. No longer were workers required to physically move their homes and families to the sites of exploration and production. Within a couple of decades, the oilfield camps that had been established in southern Louisiana were disbanded. For the first time, some oilfield families could settle down in one community while the worker commuted to and from ports and docks from which transportation out to rigs and platforms was provided. In addition, people already living in the Gulf region could and did take jobs that would enable them to remain in their native communities. Under these circumstances, two groups of women came together – migrants with a history of oilfield life and locals exposed to the industry for the first time. The concentrated scheduling of offshore work (7 days on and 7 days off, 14 and 14, or combinations such as 21 and 7) meant that workers were absent from home for long periods of

time. Thus, women continued to have significant responsibility for managing nearly all aspects of the household and to face potential isolation; social networks played a major role in their success (see Schrag-James 2002).

Women were to do more than manage households in the new industry. The industry received a significant boost at the end of WWII when men and equipment became available in southern Louisiana. Women, too, who had gained skills in wartime employment in factories and shipyards could put those to work. Many filled clerical and secretarial positions for oil companies and others that provided service to them. As the onshore infrastructure for the offshore industry grew and developed, many small businesses were formed, and women played a critical role in creating and maintaining many of these as well. Thus, long before the mid- to late- 1970s when oil and gas companies were forced to begin hiring women in offshore jobs, women were intimately involved with the industry.

When the doors to offshore employment were finally opened, some women took the chance to earn higher pay. Many of these women pioneers met resistance and even hostility. Those who persevered watched many others come and go. During the downturn of the 1980s, both men and women workers with little seniority were laid off or had their hours reduced. By the mid-1990s, when activity picked up again, there were still few women working on rigs and platforms.

The circumstances of the Gulf of Mexico established the pattern for the offshore industry across the globe, with a key aspect being opposition to female offshore workers (Lewis *et al*. 1988).[1] However, in some regions where governments and organized labor have intervened to require companies to hire their own citizens, work programs have been included in the terms of concessions granted to the petroleum companies (Anderson 1993), and national work cultures have transformed even offshore work. For example, the Canada-Newfoundland Offshore Development Fund was organized to work with industry and government to develop strategies to increase the recruitment and retention of women in oil and gas occupations and to incorporate effective gender equity policy in all initiatives (WRDC 2004). In the 1980s, as a growing number of Norwegian industrial workers moved into the North Sea offshore oil and gas industry, professional workers began to have trouble with American bosses who were perceived as being high handed and inconsistent, operating from what has been termed a "hire and fire mentality" (Wybrow 1988, p. 44). "There was an almost continuous revolt from 1978 until the lock-out in 1986, when North Sea industry came to a complete standstill for three weeks… Today [the oil workers'] agitational and obstinate culture traits have been completely assimilated into well-regulated, social-democratic Norwegian working life" (Røyrvik 2000, pp. 3-4). Nevertheless, most women working offshore in the North Sea are performing what is deemed to be traditional women's work as production managers, computer and radio operators, electricians, administrative assistants, and nurses (Mearns and Wagstaff 1996, p. 249).

9.4. Women in the Offshore Industry

The central image of an offshore worker is that of a man in a hardhat and steel-toed boots, covered with mud and grease, and working on a drilling rig or production platform. That image

[1] The pattern persists onshore as well. See Miller (2004) for a discussion of women's adaptation to the masculine culture of the oilfields in Alberta, Canada.

fails to represent most of the men and women whose work makes the offshore oil and gas industry possible; widening the lens to take in all aspects of the industry reveals how misleading it is. Exploration and production of oil and gas on the outer continental shelf also requires oil company geologists, engineers, and secretaries, as well as fully staffed fabrication yards, machine shops, maritime vessels, trucks, and myriad large and small offices and warehouses.

Women have fulfilled various roles in the industry. This section focuses on those who have (1) done clerical and office work for petroleum companies; (2) worked onshore in the support sector; and (3) and worked offshore on rigs, platforms, and boats. Several women moved between these categories of work. This analysis focuses on working and middle class women; that the women in this sample or their family members gained entry into the oil and gas industry meant they were not among the poorest in their communities. Likewise, the women in this sample differ markedly from wealthy women whose families prospered in this industry, some of whom assumed leadership positions in family-run businesses. Unless otherwise noted, the women who are quoted here are white.

9.4.1. Clerical and Office Work for Petroleum Companies: The move offshore began when rigs were erected first on pilings and then on barges in the marshes and lakes of southern Louisiana. For many oil companies, the initial transition from land to water was gradual. Strict gender divisions meant that the visible "workers" out on the rigs and platforms were men. Yet, work on rigs and platforms depended on an office from which orders and supplies were issued and to which information was transmitted. Smaller companies got by with skeleton crews while larger ones were staffed by offices full of people, often many of them women. From the 1940s, just as getting a job with an oil company was a prize for young men who started out as roustabouts and roughnecks, landing a clerical or secretarial position with an oil company was a goal for many young women. Though some women fit the stereotype of the young woman working only until she would marry and have children, others looked at their jobs as opportunities to learn new skills and advance in their careers. Some who thought they would work only until marriage never left the workforce or found themselves back following a divorce or the death, injury or layoff of their working spouse.

Mrs. Marcelle Ordogne, a native of East Texas, began working for Shell Oil Company in its New Orleans office in 1947. Her responsibilities included pasting up drilling reports, taking dictation, and typing.

"We had the Drafting Department, the Filing Department and the [Production] Department, you know. They were all combined… They only had about five men working in the Drafting Department, the rest of us were women. We did everything." [Marcelle Ordogne, 2003]

Two years later when she moved with her new husband to Morgan City, Marcelle joined the business professional women's club and was soon elected president. Many of the club's members were secretaries, and most were in oil-related jobs.

Beverly Cowart, a native of New Orleans, began working as a secretary for an attorney and then worked at Lever Brothers before taking a job with the production manager of Southern Natural Gas in 1953. In that capacity she typed letters, kept regulatory records and permits, and did other

secretarial work. She was the only female in an office with about six men. In 1957, she went to work for Alden "Doc" Laborde, the president of Ocean Drilling and Exploration Company (ODECO).

"But I really did a lot of everything. I guess that at the time, [Mr. Laborde] was in a lot of associated industries… He was called on a lot of times to [give] speeches. Of course, there were not any computers or anything, so I do not know how many times I would type the same speech… In fact, as I can remember, I used to order supplies, stationary. I can remember a couple of times I even swept the floor. Occasionally, something would happen and I would sit at the switchboard. We had a switchboard like the ones people would not even remember now. It was one of those that you plug in. I even ordered pipe for a rig. I guess I did everything. I kind of felt like I did not have enough to do, so I went and worked for some of the production engineers. I was really a person that liked to work." [Beverly George Cowart, 2002]

Moye Boudreaux was born in Palestine, Texas and grew up in a Tidewater Oil Company camp in Venice, Louisiana. She took her first job with an oilfield supply company in 1957 right out of high school when she decided to get married rather than go to college. Her marriage lasted only a couple of years, and Moye held jobs with several other companies before getting hired by Humble Oil Company in 1970.

"When I interviewed for the Exxon job (it was Humble Oil Company at the time), the first man that interviewed me, I told him I'd always wanted to work for Humble. My boss always told me they didn't pay anything, and I took a cut in pay to start… I was hired as a clerk steno, 500 dollars a month, which at that time probably I should have been making about 700 a month. That's what would have been a proper salary for someone with my experience…. They hired me to be a clerk steno for a group of engineers and accountants…and I don't remember, I went back and forth, and eventually was promoted to secretary to the engineering manager. But during the time I was working for all those engineers, that's when I really took the bull by the horns and tried to increase my…value…by anything that I could do that could take [work] away from them, I would do it, and I got where I was doing all the bid packages, preparing them, sending them out, awarding the contract – stuff that the engineers had to do – I was doing. They just had to sign off on it…and I think that's probably kind of where I built my reputation and gained the notice of the people that were doing the promoting. I also worked a lot of overtime that a lot of other people wouldn't do… Sometimes we would do a bid package a week…and the bid packages would be two big brown envelopes FULL of drawings and things, very complicated. So we were working nights and weekends getting those things out… Maybe because I was coming from an area where I kind of knew my place, and I was still enough of '50s generation to be a little bit subservient, I don't think I was ever a real threat to the men. I never aspired to be a manager. If there was jealousy, it was with the women. Now the women almost unanimously resented me because I think I made them look bad myself. I worked harder than they worked." [Moye Boudreaux, 2002]

9.4.2. Working in the Support Sectors: Moving rigs and platforms over water required more than special structures upon which to place the workers and machines. People and equipment had to be transported to and from the structures and tasks had to be completed underwater, These needs led to the development and growth of the sectors such as offshore marine transportation,

oilfield trucking, and oilfield diving. Early on, the oil companies determined it was in their best interests to contract these services. Consequently, these support sectors originated in the yards and garages of local entrepreneurs who converted shrimp boats to supply vessels, altered pickup trucks and flatbeds to haul offshore oilfield equipment, and modified compressors to supply air to divers working below the water's surface. Here again, though men held the most visible jobs, women – often their wives, mothers, and sisters – were critical for keeping the companies operating.

Elaine Naquin joined the Civil Service during her junior year in high school and then enlisted with the Navy as soon as she was old enough to do so. During WWII she was sent to Corpus Christi, Texas to pack parachutes. She met her future husband after returning home to Oregon after the service and got married less than a year later. She and her husband lived in California and began raising a family there. They returned to Louisiana in 1957, and Elaine got a job with an oilfield supply company in 1959 because they needed extra income.

"I was in National Supply and first off I just went to work in the office doing the typing and different things like that that had to be done. I would get through with my work and I would be sitting at the desk there and the boss would come in and say, 'You finished?' 'Yeah' 'Go on home.' So I would go home. Well, there was one man there that resented the fact I was getting off early like that, so I went to the manager and I told him, 'Look, there's a bit of resentment about my getting off early like this. Is there any way I can take and learn something else?' And he said, 'Well, yeah, I'll put you on the card deck to learn that.' I said, 'Well, fine.' So I learned that and when the guy come in he was aggravated because I was working on the card deck. When the boss came in, [he said], 'I told her she could do it.' So I went in and learned how to do that and eventually ended up being office manager and training all other personnel that come through so they would know how to take and handle their jobs and so on and so forth in the oilfield business." [Elaine Naquin, 2002]

In the mid-1950s, when she was 18 years old and working for an insurance company, Mary Ann Galletti married John, co-founder of J&J Marine Services, a diving company based in Galveston, Texas that also operated out of Morgan City. Mary Ann gave up her job to move to Pasadena, Texas with John so he would be closer to diving jobs; within a year of marriage she gave birth to the first of five children.

"After the first year of marriage, John was gone, I would say, on and off fifty percent of the time. You would not know when he was going and when he was coming back. He may tell you he would be gone for a day or two and a day or two might turn out to be two or three weeks. Other times he might be telling you he was going to be gone for two or three weeks and he would be back in a day or two. It was not a life you could live that you could plan on anything because in the last minute they could change…. You kept your clothes and your gear always packed and ready to go. After awhile, I guess after the first year, I quit working. I stayed home. I had my first child and started staying home then full time. No work anymore, but I worked with John and helped him with the billings, whatever could be done. I would help him repair gear even. Life was fairly simple back then… When he was home, he would be working on his diving equipment. I was taking care of something, contacting customers, trying to build up the business. I was either working on gear or talking to people about new equipment because back then that

was probably about the time that there was more demand and people were being more creative…. The business was in our home for the first 10 years. I always did the billings, payroll, correspondence, and paper bills. When he would be gone for long lengths of time or whatever I would sit up at night after the kids went to bed and take care of the business. Jobs came in while he was going offshore. He would leave me a list of names and I would know whom to call to go out on a job..." [Mary Ann Galletti, 2002]

The early decades of the offshore oil and gas industry were times of experimentation and expansion, both in technology and in the organization of work. Women such as Mary Ann were forced to innovate to keep their businesses operating.

"And so, with the business starting to grow and all the kids, when he would be gone I would just take care of everything. He would not have to worry about it. I cannot remember what year it was in there, but [it was] somewhere during those early ten years that the government decided to step in and we had to pay payroll taxes. Up until then everyone was treated as a subcontractor. They each operated on their own basis. But I do not know how the government got involved or what even caused the problem, but we had to start paying and taking out payroll taxes. If someone owned their own company, if they advertised in the yellow pages, or had their own company then they could be a subcontractor. If [you] were just an individual and did not own your own company or anything then you went ahead and started paying out payroll taxes. That became an added expense at that time because they had to start paying a percent… it was just an added expense that you did not count. Also that's when in those years insurance came up. No one that I talked to was familiar with diving insurance or insurance on diving. Finally, I just went through the yellow pages and came across a man… and called him up and asked him if he could write insurance on a diving company. He said well he did not know, but he would see. And so, I met him and he worked with us and he stayed our insurance agent from that day. We went through a learning curve together in there." [Mary Ann Galletti, 2002]

The perception that the oil and gas industry was a man's world was so strong that in many companies men filled positions typically filled by women in other industries. Many women – or their parents and husbands – considered working in a mostly-male environment inappropriate or undesirable. In the 1970s, when Verdie Laws, a native of Eunice, Louisiana, began her career working for a diving company out of Morgan City, women were in the minority.

"I started out as the Secretary to the Bell and Saturation Manager. His territory included all of North America and all of South America. From that, I was promoted to Secretary to the Vice President of the Division which was the Gulf Coast Division, which I think is still in existence. Then I became Executive Secretary to the General Manager and then I became the Personnel Manager for the whole Division. And in an industry that is ninety-nine point nine percent male, I was very much the odd duck, but I was always accepted. I would go to staff meetings and there were 23 men and me… [As far as the benefits of working in the oil industry,] the first thing that comes to mind is pay. The oil field traditionally paid better than anybody else. Now I am not saying diving paid better than the boat industry. I am talking about the oil field in general. And you got to meet a heck of a lot of interesting people from everywhere, and I am a people person so that was right up my alley." [Verdie Laws, 2002].

Within the support sectors, there were clear divisions between "men's" and "women's" work. In 1974, Carolyn Branch[45] was one of the first women to cross over into men's work. Already in her mid-30s in the early 1970's when companies came under pressure to break down the barriers to women, Carolyn tried for four years before she was hired to work in a construction yard. Neither the men nor the women readily accepted her in the position. In general, the women who broke out of women's work faced criticism from both men and women; in the offshore oil and gas industry the blatant challenge to the ideal of a woman, and especially a southern woman, was not well received. As Carolyn and several other women noted, women's entry into some of the more lucrative but nontraditional jobs came only a few years after companies had begun hiring blacks; several of the women pioneers noted that blacks had paved the way for them and helped them through their initial trial period.

"I went to the interview with a suntan because I wanted to look outdoorsy. I wore jeans and was in good physical shape. After the interview, the guy called back and said I was hired. I had to take the physical. I found a place to live. There were no women's work clothes, so I went and bought bib overalls, heavy jeans, and blue work shirts. The worst thing of all were the steel-toed boots. The smallest kind I could find were size 7. I found out that I wore a size 5. I had to stuff socks in the boots to wear them. They were so heavy I could hardly pick my feet up…[On my first day of work,] I was directed to the back. All these heads came out of their little cubbyholes. Everyone came in to see this strange working woman in baggy overalls, an oversized work shirt, a hard hat, and large boots. Nobody said hi to me. They tapped my hard hat and then bent and tapped my boots. Everybody laughed, so I laughed, too. I expected it. I had been through a lifetime of discrimination. I wasn't hostile. I had a good attitude. After they laughed, the only black person in the office came up and shook my hand and said, "I know how you feel." He stepped back, and the foreman came and said he was going to take me out to the yard. I saw that fence and felt like I was entering Dante's inferno – Abandon all hope ye who enter here… The men were all standing there waiting for me. They had heard. Here was our first little female. Another group was on the pipe rack. They were like a pack of vultures. My first job was already lined up. The foreman took me out and told me to pick up the stuff that was sitting there. There were three rock bits lying there… I had come from a lifetime of office work, high heel shoes, air conditioning. No safety anything. He said, 'Get over and pick up those rock bits, put them on the truck, and take them to the chopper pad.' I stooped over to pick up the first one, and I couldn't budge it. I willed that part up. It weighed 122 pounds; I weighed 115. I got them in and drove out to the chopper pad. I had to take them out. I couldn't just drop it. I did it. Then I had to go roll some pipe. They put me through the rigors. I had to offload a drum from a workboat. I had never been on a workboat before. The drum went one way, and I went another. I slid. But, that's okay. I got up and then I had to go down the gangplank. Nothing surprised me. I survived everything. Toward the end of the day, the crane operator dropped a bundle of pipe right at my feet – little bitty spaghetti pipe. That's when I [finally said no and] cleared the air. At the end of the day, the foreman called me up to the front office. He wanted to know how I liked my work. I told him I liked my job and was planning on staying. That night, I got home and everything hurt, and my feet had blisters on them. I soaked in the tub and slept on heating pads. From then on, I wrapped my feet in moleskin. I kept trudging on. Eventually I became an overseer to all male crews. I could offload rail cars, I learned a little firefighting. I learned how to run in steel-toed boots like they were ballet slippers. I had to run from pipe." [Carolyn Branch, 2002]

[45] A pseudonym.

During their careers, many women held jobs with several companies, often leaving a position to take care of family responsibilities and then picking up another one when they could. They were also affected by the downturns of the industry and moved in and out of oilfield-related jobs. Many preferred the oil and gas industry to others.

As a young teenager in 1946, Doris Mullendore moved with her mother and father to Amelia, Louisiana. She graduated from Morgan City High School and took a job as a bookkeeper for a local Buick agency. When the company's owner bought a crew boat, Doris began what was to become a career in the offshore oil and gas industry. She left the car company to work for a pipe and supply company, worked for a short time for a hardware store, and then in 1976 got into the diving business with a couple of friends. That company folded in 1986 during the downturn, and Doris worked for a few different companies until she got a job with a company that rented oilfield, where she stayed until her retirement.

"I left the first boat company because they moved out to Amelia right behind my house and I didn't want no part of that. So I got into the supply store and then I got offered so much more money to go to work for the Port Hardware and then the same thing – more or less money and benefits – is when I got into the diving industry…. I guess I really liked the diving industry 'cause there was nothin' consistent. You just didn't know what each day was going to bring…. I enjoyed working there, I really did. A good group of people. Now, I miss the people. I don't miss the work, but I miss the people. It's just like I say, when you go from the supply store to the hardware store and then you get into the diving, you know who to tell 'em to call to get what and you know who's got what they need. It's just unbeknownst to me [why, but] my jobs sequence more or less fell in to where it was needed…. I consider myself real fortunate for the fact that I have always been able to hold a good job, got paid good money for it, had good people to work for, and have been able to stay right here… [Doris Mullendore, 2003]

9.4.3. Working Offshore: Though women were involved throughout the offshore industry by the mid-1970s, and in smaller companies they worked alongside men in yards and warehouses, they were banned from the highest-paying jobs, those on the rigs and platforms. Following national trends and policies, by the mid-1970s companies were forced to begin employing women in all positions for which they could perform the work. Translating new policies to the men working in the industry was not an easy task. Richard Carline was raised on a houseboat in the Louisiana swamps. After finishing high school, he spent three years in the Army and then returned to Morgan City and took a job with Tidewater Marine. He worked his way up from deckhand to captain and then moved into the office in 1968.

"I was in Personnel when we started [hiring women in the 1970s] and they sent [a guy] to explain that we had this [new policy] from the government. The guy walked into the office. He looked like Rosie Greer, the football player. I was sitting back at my desk. He was so big, and all I could say was, 'Well, they sent the right guy, I guess, to explain it to me.' He just bust out laughin' too. Ain't nothing else you could say. He was like the biggest guy I ever saw in my life." [Richard Carline, 2003].

Despite the new rules, getting a job offshore was not easy, even for those who had connections. Lillian Miller was recognized in ODECO's company magazine as the first woman operator in the Gulf of Mexico. Like many other women, her first offshore job was in catering.

"I started with Offshore Foods and Services in 1973, probably late November, '73. I had moved back from college in Texas to try to make some money to go back to college. I was trying to find a job as a waitress, applied for the post office, as a nurse's aide, but it was a really hard time to get a job. Finally my Dad came home from McDermott (a fabrication company) one night and he said, 'You know, they ARE going to start hiring women offshore.' I said, 'What kind of woman would do that?' And he said, 'Well, it depends on what kind of women; women go out there.' And I was so devastated, well, I said, 'Well, I could do that,' 'cause I wanted Mom and Dad to know I was really trying. But I cried myself to sleep that night because I couldn't believe my life had come to such a point where my Dad would send me offshore. However, the next day, you know, I dressed up in a skirted suit and jacket-like a business executive-and went out there to Offshore Foods and Services… I said, 'I came for a job.' They said, 'You're not the right type. Leave.' I went every day for a month. They wouldn't even let me fill out the application. So finally the superintendent had a heart attack, and he was a deacon with Dad, and so Dad went to the hospital and said, 'Could you ask them to give Lillian a one-hitch chance?' And so, I got this phone call and they said, 'Get out here right now.' And I went out there and they said, 'Ok, we're sending you out there, but you won't even two days. Go buy some blue jeans, some tennis shoes, a duffle bag.' [Lillian Miller, 2004]

In contrast to Lillian, Carolyn Branch had personal goal of getting a job offshore. Eventually she, too, achieved her goal.

"This outfit [that first hired me] would never let me go offshore. They said they wanted me to learn the equipment before going offshore. I stuck it out for the experience.… I started making phone calls again. I got this black receptionist. She didn't hang up. She listened and said to come down. I had such a good rapport with the blacks. They understood. I went down to see what my chances were. This lady made an appointment for me with the offshore director. I was interviewed by three different men at different levels of authority. I had to go to the top man for offshore. Then I had a group interview with all three. They were asking me everything under the sun. I really called it an interrogation. The last question was, 'Would it bother you if some of the men didn't use the correct fork?' I told him it would not bother me if they ate with their hands. The main thing [they were thinking] was – she doesn't belong out here. She should stay home where she belongs." [Carolyn Branch, 2002]

Following in the footsteps of those who entered the industry in the 1970's, Karen Gray began working offshore in 1981 as a young woman in her early 20s. Even then, there were few women working offshore and they faced continued challenges.

"I was working for the phone company but worked in their fleet service, so [I was] getting a mechanical background. And then, I think it was in the late '70s the EEOC (Equal Employment Opportunity Commission) mandated that the oil companies had to allow women and minorities equal access to the offshore jobs. And because of that, they had incentive, and in the early '80s during the boom, they had a lot of job openings. So I was interested in it. It was good money for

a woman at the time and, with my background, I did pretty well. We had to take the same test that everybody had to take and everybody was just ranked blindly off of that test, from what I understand. So I did real well on the testing and eventually was hired in January of 1981; by that time women had been working for Exxon since, I want to say, the late '70s. It hadn't been that long, maybe 3 to 5 years at the most. So I was one of the first, not *the* first. A woman by the name of Carol Pearl was our first, Exxon's first. So I went out in January working 7 and 7. They had built some separate quarters for the women that were offshore at the time I went out; it was just myself and another woman on our hitch and two other women on the other hitch. So we had our own quarters which the men were kind of envious of 'cause it was like having our own little apartment. We had a private bathroom… The first week was mainly kind of a whirlwind of oh, goodness gracious it's [another] world and getting used to being in a total marine environment as well, but it was January, really bad weather the whole week, and they just knew that that was going to get rid of this little girly girl. But one thing, I was in my early 20s, I was pretty green. The women that they had had apply were a lot bigger, muscular, heavier women than I was. I was pretty slight to be going out there, but they figure, this weather and the hard work, the first week she'll be gone…. The job title was Maintenance Specialist, which basically was a production roustabout, you know, do everything, do anything, relieve the operator, relieve the mechanic, relieve the instrument technician, whatever needed to be done…. You worked with the mechanics when they were overhauling some of the large engines, compressors, generators. You would work with an operator one hitch. You had several schools that you had to go to to get certified on. You had to go to fire-fighting school; probably the hardest thing to this day that I have ever done in my life, go through industrial fire-fighting school. That was another thing they figured, 'Oh, we will get rid of them now. They can't make it through fire-fighting school.' Boots and Coots School. It was tough… and then marine survival school. That was another one. It was almost like pilot training when they stick you in pods, stick you upside down and throw you in swimming pools. Of course, I had been a lifeguard and scuba diver, [so] that wasn't a problem for me either, but all these things…. It was hard work, it was heavy work, but I was young at the time. But the main problem that I encountered and that I saw other women encounter was the discrimination and harassment which was rampant, awful and was institutionalized. It was everybody from the superintendents on down. They didn't want us there. They thought we were taking jobs away from husbands and fathers that needed the work, so we were given a pretty good hard time. Most of [the women] quit, even a lot of the hardier women you would think would put up with it or give them "what for" right back. Most of them just quit, which was exactly what they wanted. So the way I responded to it was I filed two formal complaints that were loosely investigated. Men were told, 'Don't do it anymore,' and that was it. Everything from slipping pornography under your door to leaving pornographic notes, physical harassment. Later you would find out that a lot of it was political anyway. The job positions were very competitive for promotions, for rankings, that sort of thing, so we would find out later, I found out later that a lot of – I guess the only word to use is lying – was going on, especially against minorities and women. Minorities would get the same treatment because they hadn't been working in these job positions either, but for 5-10 years. Consistently, 'the good old boys' would get the highest rankings and everybody else would get the lower rankings." [Karen Gray, 2002]

Women who could no longer work offshore due to injuries were brought inshore and reassigned clerical positions.

"I only worked out about two and a half years and the reason I went inside was I hurt my ankles seriously walking on the creosote boards. I turned my ankle really bad, tore all the ligaments in my foot, and it never healed properly, so I was given the option to go to work in the office, but in a clerical position… I went into a clerical position that was in an accounting group and started out doing very low level, clerical work. I kind of argued a lot that, 'Hey, I've got all of this other experience that I really could be putting to use other places.' … I decided nothing was going to happen with this [position], so I went back to college, took a lot of geology courses, got transferred to geology as a geology technician, so that was a lot better. My last assignment was in regulatory, after I got my degree, but they still wouldn't promote me into the professional positions, so that was why I left… [When you came back in], then the clerical assistants didn't like you either, because it was like, 'Well, what were you doing up there in the first place?' And, 'It serves you right for getting hurt. That's what's going to happen. All the women are going to get hurt.' It doesn't matter that there were several men also working inside that had been hurt, that they offered positions to. [Karen Gray, 2002]

9.5. Negotiating in a Man's World

Workers are advantaged or disadvantaged by the preparation they have received to fill the positions they acquire/accept. At points of transition, when new groups are entering established occupations, the earliest pioneers must take on roles for which they have not been prepared. They apply knowledge and experiences gained elsewhere to their new positions. Carolyn and Karen used experiences of childhood as base from which to approach new tasks in construction.

"I was eight years old when I started my first jobs. I was selling magazines to people in town. I sold cokes in a wash bucket in front of the courthouse so I could take my younger sister to the picture show. When I was 16, my mother died; when I was 18 my father died. I lived with my relatives for a couple of years and then went to New Orleans to get a job. I worked for the telephone company. Then I went to California and spent 15 years there. Then I went back to New Orleans and worked for a computer company. All of those jobs were office jobs. At the end of 1970 I started calling the oil companies to try to get a job. I got an interview at the end of April 1974. That's how long it took to get an interview…. When I started in the oil field I didn't know the difference between a pipe wrench and a crescent wrench. I taught myself everything. I got the blueprints out and studied them. When people were making repairs, I paid close attention. I had master electricians and others [show me what they were doing]. I got the stuff out and studied. It's just studying it and blind flying and a lot of luck. Because I just kept up with everything. When I saw the pressure wasn't quite right, I was right on it. Everyone came from the oil fields. They had names for the newcomers. The people from the cotton fields were called boll weevils. The people from the sugarcane fields were called cutworms. I stayed an operator out there for a little over four years. I was out there 13 months the first time. I said to myself, why am I here?" [Carolyn Branch, 2002].

"Both [my] parents worked in the oil and gas industry. My grandfather worked in the oil and gas industry. He was an old wildcatter from East Texas. So were my parents… It was kind of in my blood. I was always kind of a tomboy, too, so I [have] always been interested in the industry. My grandfather, when I was a little girl, would take me to his drilling sites all the time – which now

they would die if they saw a six year-old running around – but he took me to drilling sites all the time. My dad took me to drilling sites all the time… You know the first week, I remember on 'going home' day, we had gotten on our boat that morning and gone to an offline platform and were lucky to get everybody off on the platform. That was when we used swing ropes to transfer from the boat to the platform. Mainly they used helicopters and baskets for the drilling rigs, but they used swing ropes [for the platforms] which I was really good at because I had grown up at my grandmother's in Mississippi swinging on, over creeks and I mean that is what we did. We played on swing ropes, so you know, they thought that would be really good, in 10 foot seas trying to [see me] get on the boat. It was well below freezing. The wind was blowing probably 40-50 miles per hour. Helicopters couldn't fly. Half the men ended up staying on the platform. I got on the boat. I was going home that day, that's all there was to it." [Karen Gray, 2002]

Though women faced numerous challenges, most of those who stayed for more than a few months found support and eventually earned the respect of co-workers and bosses. The women who succeeded in crossing the gender divide – whether as production operators, truck drivers, or divers, did so because they established a particular identity, demonstrating they were capable of doing the work men did while refusing to relinquish their femininity.

"But you know, I never did get a lack of respect. They were always gentlemen. Some of the language you heard was not very nice. I always used to say, 'As long as it's not directed at me, I don't care. Do your thing.' Of course, don't get me wrong, we had some rotten eggs in the barrel too, but I mean, overall, it was a good atmosphere. [Doris Mullendore, 2003]

Sharon Moore is a helicopter pilot who was raised near Dallas, TX, not far from Love Field. She got to know many pilots and stewardesses when she was growing up, joined the National Guard after high school, and remained there for 13 years. In 1990, she began flying civilian helicopters where she worked in the Pacific Northwest, Hawaii, and the Grand Canyon before taking a job with TexAir Helicopters in the Gulf of Mexico in 1996.

"[The men] like seeing a female out there. It brings some sanity to this machine world and nothing but a bunch of guys out there. It brings a humanity, a gentleness back to their spirit, and that's quoting one of the young men that I worked with out there… I try to be like my mama taught me – feminine without being prissy about it. I make an effort to adapt my clothes to that work environment, but people still recognize that I'm female about it. And they have become very comfortable with it." [Sharon Moore, 2003]

Clubs and associations have played a significant role in connecting participants and defining the dominant ideologies of the oil and gas industry. As their numbers grew, women working in the industry recognized the value of coming together to share knowledge and experiences. Following the model of professional women's clubs, in 1949 twelve women, all secretaries for oil companies, started the Desk and Derrick Club in New Orleans. Three new chapters, in Jackson, Mississippi, Los Angeles, and Houston, were quickly added, and soon there were chapters across the United States (see Figure 1). The club's formation coincided with the development of the offshore oil and gas industry, and several southern Louisiana chapters emerged by the late 1960s.

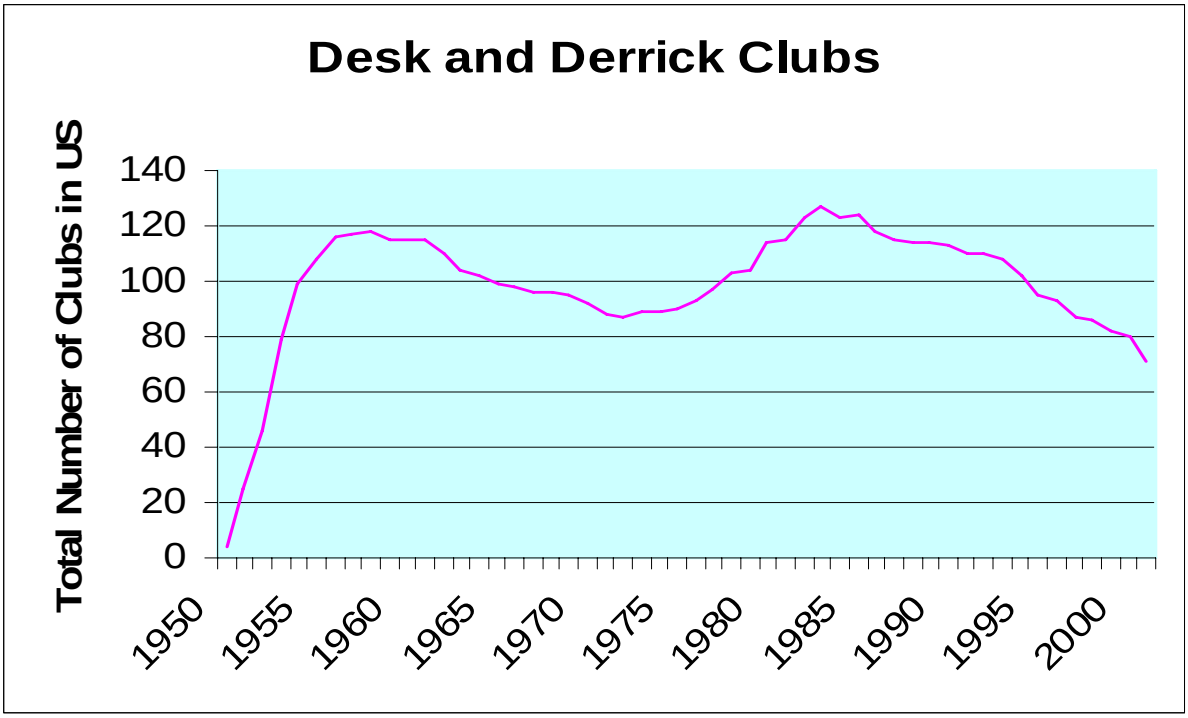

Figure 1. Growth and Change in the Number of Desk and Derrick Clubs in the United States since 1949.

"Really we started the Desk and Derrick Club here [in Morgan City] in 1966 in an effort to try to educate the females. At that time, it was strictly a female club. Educate them into what the industry was, what made it work, how maybe just better knowledge of the people that they do business with all the time would actually better them in their jobs… In the 60's you had a large, large variety of companies in the area and they were all very supportive of us. They thought it was a good idea to have their people know what was goin' on offshore. When they took the drilling reports and stuff like that that they would at least know what they were talking about… I guess one of the best things that I have learned out of all of it is the members that you meet especially, if you happen to be in the collection part of your company, you learn you've got a girl to call at this company and she can get you to where you need to go if she is not the person. So the contact has meant a lot. And like I said, you form some lasting friendships, but also you have got people that's in different positions with companies. They also have seminars that will teach you maybe a better way to do you job, a different way of getting the same thing done with a minimum amount of effort, especially now that everybody's downsized. Everybody's doing two or three jobs and the more you know about a job, the easier it is to do." [Doris Mullendore, 2003]

The clubs reached peak numbers at almost 10,000 in 1957 and then at 12,750 in 1982. Ironically, in 1985, in the wake of pressure on oilfield employers to include women, the Desk and Derrick Clubs were targeted as discriminatory.

"I am trying to think what year it was that finally Mobil and Shell forced us to open our membership to men or they would not support the girls and I mean, you know, a bunch of us really said, "This is not fair. You have API (American Petroleum Institute). You don't let women in. You pay for the golf tournaments. You pay for everything else, but hey, this is our organization." But it didn't work. But really we have not seen an influx of male members, 'cause first of all, the majority of them that would join us, their technical level in the industry is a whole lot higher than ours. Now we do at this point after a period of years, we do have land managers and everything else, you know that's in the Clubs, not necessarily here, but throughout the whole organization. But I think a lot of them, too, has probably gotten these [jobs] by some of the background that they've learned through Desk and Derrick." [Doris Mullendore, 2003]

9.6. Holding It All Together

Regardless of their official positions, and even as they tried to reject stereotypes, most women told similar stories of assuming the role of nurturer or caretaker at the worksite.

"You also deal with the emergencies of the other families of the men that were working for you, too. They would naturally all call. They would be broke and borrow money. There were some in there that when their husbands were gone they would just kind of go bezerk, call you up and tell them that their husbands really were not working, that they were running around on them. Just all kinds of things. You just listened to them… You always had someone calling wanting to borrow money, just someone to tell their problems to or whatever. Another boy had come and picked up his check on Friday, we were in the building then. He had come up to me with his paycheck and I had gone to have my hair done. As I was coming back to work I could see that there was some sort of accident up on the corner. I noticed that a motorcycle was up under a car, but I did not stop. I thought it best to get straight to the shop and see whether it was someone from there. Sure enough, one of the guys had just left. So John and one of the other guys went up to the corner to find out who it was. The ambulance had gotten there by then so they rode with him in the ambulance to the hospital. It turned out that his leg had been broken. Well, after they just found out what was wrong with him they came back to the shop and sent me back to the hospital. It turned out that the orthopedist that was working on him also had worked on my children before. They were very busy at the hospital and he asked me whether I could help take the guys' pants off because of the break and all and he could not get to him right away. So I had to help him cut and remove the side of his pants. I ended up staying with him until he had gone through the surgery and was back in his room. I think, finally, someone got hold of one of his girlfriends or something and she came up later… We had another boy that was diagnosed with cancer. He had testicular cancer and it had gotten into his lymph systems. When he was kind of at his worst – none of these guys were married – I would go over occasionally and bring him a milkshake or ice cream and sit with him for a little while. Then, when he ended up back in [the hospital] I got hold of his family, his sister and his father. I picked them up at the airport and they stayed with me until he died. Then they took his body back to California. So, you were kind of like a little family to them." [Mary Ann Galletti, 2002]

"The blowout was from a workover unit. I was right under it. There were three of us. You'd never heard a sound like that in your life. Three men caught fire. One jumped overboard in pain

and flames. The whole platform didn't shut down or catch fire. We rescued that man out of the Gulf. He hit that water from ten feet up. The waves came together and made a nest, like it embraced him. We finally got him out of the Gulf. He was the biggest mess. We got the helicopter and put him down there. Nobody thought to send someone with him. On the way he attacked the pilot. The pilot was by himself. They finally made it…. After that blowout, I had three new good friends because they knew they could depend on me. I didn't' just crumble and stand there and shake like a leaf like a couple of those guys who went downstairs. One guy thought I was his mother. The crew members were picking on him for some God-knows reason. He'd follow me around. His fiancée would send me a box of candles. I was invited to his wedding. I said, 'Mike, I didn't have any children and I don't want any, but I do love you.' He was always trying to prove something to his daddy. His daddy worked offshore. He looked like a little rich boy. He didn't put on but he was dressed neat… We'd go down to the bus stop and talk. He needed that protection. He was about 24… All the sharks and Bermudas weren't in the water. Some were walking around on two legs up there." [Carolyn Branch, 2002]

"The purpose of the telephones, the reason I got them, was because [the guys working in the field] were isolated and frequently they worked alone, and I wanted them to be able to call for help if they got in trouble…and with the radio, they could only reach another Exxon person, and if that Exxon person wasn't available or didn't hear them, you would not have the opportunity to call the Coast Guard or somebody else. But here [with the telephones] they could – they didn't know so much about calling into their repeater, but they did know they could dial out, and they could. They could take their hand held, and just dial a phone number and get a phone." [Moye Boudreaux, 2002]

"With the boats. I ended up, I always said 'Unofficial Port Captain' 'cause I was the only one they could ever catch home. I say at one time I could give you every barroom's phone number from Galveston, I mean from Corpus Christi to New Orleans. 'Cause every time the guys wanted in and they didn't have the relief or it wasn't time for them to be relieved, they would run the boat aground, tear up the wheel and guess who got called. But in the diving business, I've done the accounting, the billing, doing a lot of the analysis of the cost… I did a lot of their banking for them and everything. I said, 'As long as they're single, I'll do it. The married ones, they've got a wife.' I drew the line. 'Cause you see what happens, you might have say six tenders living in one house, three of them would be offshore, three would be in and when you would just get mail put in a box, paychecks would get lost. Then you would have to void them and you know, stop payment and all that. I says, 'I'll take your checks to the bank rather than have to go through all this other stuff that it's going to take if something happens to them.'" [Doris Mullendore, 2003]

"I learned many, many years later that where I thought I depended on John (my husband) so much I think that it was just a way to avoid knowing that I had to depend on myself. So it was easier to say that I depended on him. [Mary Ann Galletti, 2002]

9.7. Discussion

Though their presence has been often overlooked, women have worked in the offshore oil and gas industry in the Gulf of Mexico in many capacities. Many lasted only a short time while others remained for decades. Though women were not hired to work on platforms and rigs until

the early 1970s, they were present throughout the industry long before then. Frequently, women held what appeared to be standard clerical office jobs, but the tasks they performed were varied and often required specialized knowledge. The importance of specific oilfield knowledge was affirmed with the creation of the New Orleans chapter of the Desk and Derrick Club in 1949. As southern Louisiana became the center for offshore oil and gas activity, new club chapters began forming and catering to the needs of women working for offshore petroleum and service companies.

The routes by which women arrived at the industry and their experiences in it are many. They have been motivated by good wages, familiarity, confronting stereotypes, and the pursuit of challenging and interesting work. Married women who became the primary breadwinner, either due to death or injury of a spouse or to divorce, were attracted to oil industry jobs for higher pay and greater security. For some women, the work provided freedom and opportunities not otherwise available. For others, it was simply a mechanism for survival.

For most women, their integration in and reaction to the offshore oil and gas industry was dependent on their family history and circumstances, expectations of work and gender roles, and the time and place when they were attempting to enter the industry. By the time oil was being produced offshore, women had direct experience growing up in company camps, working in the offices of both petroleum and service companies, and managing households while their husbands were out in the fields. Despite the successes of some individuals, the numbers and position of women in the industry have changed little over the past 30 years. Through this period, the U.S. trend toward greater workforce participation by women has been thwarted by stereotypes of both southern women and oilfield workers.

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10. GULF COAST SHIPBUILDING AND FABRICATION FOR THE OFFSHORE OIL INDUSTRY

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10.1. Introduction

Beginning with the installation of the first fixed platform in the waters off Louisiana in 1947, the Gulf Coast of the United States has played an integral role in the worldwide search for offshore oil. Besides playing host to the headquarters of many of the world's major oil corporations, the cities and towns along the Gulf of Mexico have also been heavily involved in the construction and installation of the rigs and platforms that make offshore exploration possible. For the better part of three decades following the end of World War II, nearly all worldwide demand for offshore exploration and production facilities was met by the shipyards and fabricators of the Gulf Coastal states of Texas, Louisiana, and Mississippi.

10.2. Overview of Mobile Offshore Drilling Vessel Technology

Offshore oil production units can be divided into two categories: fixed platforms and mobile rigs. During the first years of offshore exploration (1947-1954), it was the former that dominated the industry. Two companies in particular—Brown & Root of Houston and J. Ray McDermott of New Orleans—became synonymous with the fabrication and installation of fixed offshore production platforms. These facilities, whose massive steel jackets rested on the seabed and supported decks and buildings containing drilling equipment, were prefabricated at yards onshore and then erected onsite in the open water. Crews and drilling equipment for such rigs were usually kept on one or more barge tenders that accompanied them. The major drawback to such platforms was their relative immobility—should a drilled hole prove to be dry, a fixed rig would either have to be scrapped where it stood or else taken apart then transported to and reconstructed at another site, a process that was both costly and time-consuming. (Pratt 1997). For these reasons, fixed platforms were much better suited to production than exploration. It was not long after the advent of offshore drilling that industry leaders were calling for greater mobility to lower costs (Payne 1954).

The first successful incarnation in mobile offshore exploration was the submersible drill barge introduced in 1949. Towed onsite, these barges were flooded so that their hulls would rest upon the seabed and provide a sturdy foundation for the drilling equipment stored on deck. Modeled after similar barges used in the exploration of inland marshes, submersibles such as *Breton Rig 20*, the first offshore drill barge, were limited to relatively shallow waters (usually less than 50-ft) close to shore. The number of submersible drilling units increased steadily until 1958, when the numbers stabilized due to the drilling companies' need to explore deeper waters (Gramling 1996, pp. 54-55; Howe 1968, pp. 38-42; Howe 1954).

The next important innovation in mobile offshore exploration arrived in 1954 with the introduction of the jackup oil rig. Towed onto site by tugboats and other vessels, these odd-looking rigs would then use a series of jacks to extend their steel legs downward into the seabed

and lift the drilling platform above the waterline. Although early jackups were little more than barges, mobile rigs such as Glasscock Drilling's *Mr. Gus* could operate in water depths up to 100-ft, giving them a decided advantage over submersible platforms (*Offshore Operations* 1954). With the introduction of Zapata Offshore's *Rig No. 1* (better known as the *Scorpion*) in 1955, these cumbersome initial jackup designs evolved into the much more graceful (and sturdy) tripod arrangement still in use today. After proving itself in the 100-mph winds of Hurricane Autry in 1957, the three-legged jackup became an industry favorite—by 1968, there were approximately seventy of these mobile units in operation, many with operational depths up to 300-ft (Gramling 1996, pp. 56-57; Howe 1968, pp. 42-47).

At the same time that the mobile jackup was proving itself in the Gulf of Mexico, two other important technological innovations were also on the drawing boards. In 1953, the self-contained drillship was introduced in seismic and geologic exploration off the coast of California and quickly became an important weapon in the offshore driller's arsenal (Howe 1968, pp. 47-51; Mosby 1963a, pp. 21-24; Mosby 1963b, pp. 29-30). The third major innovation in mobile exploration came in 1956 with the introduction of Kerr-McGee's "bottle" type semisubmersible. When empty, the inverted bottle-shaped pontoons attached to the platform floated it above the waterline; once in position and flooded, these bottles then sank to the seabed, providing a stable base on which to drill. With the introduction of the modern semisubmersible—a platform supported by two horizontal, submarine-shaped pontoons—in 1962, the three basic designs of the mobile offshore exploration industry were in place (Howe 1968, pp. 47-51; and Gramling 1996, pp. 56-59).

None of these technical innovations, of course, arose spontaneously. Each was the product of years' worth of research and developmental cooperation between petroleum corporations, drilling and exploration firms, and shipbuilding companies. The first two of these partners have already received extensive treatment in both scholarly histories of the petroleum industry and more celebratory works about individual firms. The Gulf Coast shipbuilding industry, however, has failed to receive the treatment it is due. This is an especially surprising oversight considering the integral role that Gulf Coast shipbuilders, both large and small, have played in the development and construction of mobile offshore technology. It is to these firms and the communities hosting them that our attention must now turn.

10.3. Historical Development of the Mobile Offshore Drilling Vessel Construction Industry

10.3.1. The 1950s: From the installation of the first platform in 1947 through at least the mid-1980s, the Gulf Coast was the single most important region in the world for the construction of offshore oil production and exploration rigs. According to one calculation, of the 379 drilling rigs built in the U.S. since the beginning of the offshore industry, 361 were launched in shipyards on or with direct access to the Gulf of Mexico (Maritime Business Strategies 2006a). Although the fortunes of the companies and communities associated with these figures have risen and fallen over the years, there is no denying the importance of Gulf Coast shipbuilding to the overall success of mobile exploration in the offshore oil industry.

As noted above, throughout much of the 1950s stationary fixed platforms assisted by barge tenders were the primary tools in the search for offshore oil. Due in large part to their pioneering

efforts in the field of offshore production, orders for the construction of such rigs quickly concentrated in the fabrication yards of two firms—Brown & Root and J. Ray McDermott. Well into the 1970s, these industry giants dominated the business of fixed platform fabrication on the Gulf Coast as well as abroad. For those drillers interested in the emerging technology of mobile offshore exploration, however, the 1950s offered many more companies from which to choose. Unlike the situation that would soon emerge in the next decade, during the 1950s there was a great deal of decentralization in the offshore shipbuilding industry. This business climate provided ample opportunities for smaller companies to become involved in the industry. Through the end of the decade, the pages of the newly-formed *Offshore* journal were peppered with announcements of contracts and projects by such builders as Arnold V. Walker Shipyard in Pascagoula, Mississippi, Bludworth Shipyard and Platzer Boatworks in Houston, and Burton Shipbuilding & Construction Co. in Port Arthur, Texas. Most of these smaller companies were primarily engaged in the construction of crewboats and cargo vessels; some, however, also worked on mobile rigs. Besides cargo vessels, Port Houston Iron Works in Houston built or converted several drilling barges (*Offshore* 1956a, 1957c, 1957h, 1958a).

In this early period of mobile offshore building, two categories of shipbuilders began to coalesce in the offshore industry: those who constructed the mobile rigs themselves, or primary builders, and those who built and maintained the vast fleet of service vessels (OSVs) used by the offshore industry, or secondary builders. All of the smaller companies mentioned above fell into the second category, but as the Port Houston Iron Works example demonstrates, it was not at all uncommon for companies to be involved in the business of both categories. Larger shipbuilding firms such as Ingalls Shipbuilding in Pascagoula, Mississippi used this situation to break into both categories of mobile offshore construction. In June of 1955, *Offshore* reported that Ingalls was converting a shallow water drill barge for use by Kerr-McGee as a deepwater submersible unit; three months later in August, the same journal reported that Ingalls had won a contract to build two 135-ft offshore cargo vessels for Sea Service, Inc. (*Offshore* 1955b and d). In fact, from 1954 through 1957 the Pascagoula yard built at least seventeen units for the offshore industry: seven of these were submersible drilling rigs while the remainder were all OSVs (Maritime Business Strategies 2006f). Although neither Ingalls nor Port Houston Iron Works can be called representative of mobile offshore construction, their diversified business interests adequately demonstrate the fluid nature of the industry in its early days.

Ingalls Shipbuilding

Although it is by far the largest and the most important shipbuilding operation on the Gulf Coast as well as Mississippi's number one employer, Ingalls Shipbuilding in Pascagoula has only been sporadically involved in the offshore industry. A subsidiary of Ingalls Iron Works in Birmingham, Alabama, Ingalls Shipbuilding moved onto the site of a former-World War I repair yard in 1938. Throughout its history Ingalls has owed its existence and continued success to one thing: local, state, and federal monies (Couch 1964; Ziglar 1974). Since the company's initial move to Jackson County, which was funded through a program allowing the state and municipalities to issue public bonds for private construction, Ingalls has subsisted largely upon contracts with the U.S. Navy and, to a lesser extent, the Merchant Marine. Even so, between 1950 and 1961, the same year that the yard was acquired by Litton Industries of Beverly Hills,

California, Ingalls constructed approximately eighteen submersibles, semisubmersibles, and OSVs for use in the offshore oil fields (Maritime Business Strategies 2006f; *WSJ* 1961).[46]

As far as construction for the offshore industry is concerned, Ingalls was relatively quiet throughout the 1960s and 1970s. With multimillion dollar defense orders to fill, the yard had little time to spare building drilling rigs and exploratory vessels. The only apparent exception occurred in 1964-65 when Ingalls constructed the $7 million semisubmersible *SEDCO-135*. Capable of drilling in 600-ft of water, the acre-sized rig was the largest in the world at that time (*Offshore* 1964a, 1965c). This notable milestone, however, was not to be repeated in the Ingalls yard until the early 1980s—for the remainder of the decade and on through the next, Pascagoula built destroyers, submarines, and assault ships, but no offshore vessels. The yard's reemergence as a supplier of this industry occurred in 1981 when, perhaps as a result of waning federal subsidies for shipbuilders, the yard began to produce jackups and semisubmersibles in earnest. This construction boom continued through the end of 1982 and then ceased until the late 1990s when the company once more began producing OSVs. In 2001, Litton was purchased by Northrop Grumman and Ingalls became formally known as "Northrop Grumman Ship Systems Ingalls Operations"(Maritime Business Strategies 2006f).

Todd Shipyards

The Todd Shipyard Corporation first moved to the Texas Gulf Coast in 1944 with its purchase of Gray's Iron Works on Galveston Island. Five years later, the company announced its purchase of Brown & Root's World War II shipbuilding facilities on the Houston Ship Channel (Pratt 1999, p. 92; Maritime Business Strategies 2006i and j). This yard, and to a lesser extent the yard in Galveston, was to play a fairly minor role in the offshore industry over the next three decades. The first mention of Todd in connection to offshore oil came in February 1957 with the announcement that the Houston yard had received a contract to build nine barges for Creole Petroleum's Venezuela operations. Later in the year, the yard also began work on a self-stabilizing submersible drilling unit as well as a unique hinged barge for the placement of offshore platforms (*Offshore* 1957b, i, and l). The construction of tank and decks barges, as well as some scattered workover rigs and pipelayng barges, was to sustain the Houston yard into the 1960s and 1970s. The yard operated until 1987 when it was taken over by Brown & Root who subsequently sold it off in pieces in 2004(Maritime Business Strategies 2006i).[47]

The Galveston yard, meanwhile, caused a minor splash as a producer of drilling ships for Global Marine during the 1960s. In March 1965, the 380-ft *Glomar Sirte*, a vessel capable of drilling below 20,000-ft, was nearing completion Todd's facilities in Galveston. By the end of the year, the yard had commissioned yet another such vessel, the *Glomar Tasman*, and reports indicate that it was slated to build yet another (*Offshore* 1965a, d, and g). The only other event of any import discovered for Todd's Galveston operations occurred in 1972, when the yard announced it was building the world's largest floating drydock, a massive $16 million, 922-ft long facility capable of accommodating any ship that could enter the port. The company also announced that

[46] Also see *Offshore* (June 1955): 12, (Sept. 1955): 42-44, (Sept. 1956): 56, (Nov. 1956): 51, (Dec. 1956): 27-29, (Mar. 1957): 63, (Oct. 1957): 23-25, 41, and (July 1958): 45-46.

[47] *Offshore* (Nov. 1962): 49-50, (Nov. 1964): 27-28, (Aug. 1965): 83, (March 1969): 60, (Oct. 1970): 102, (May 1971): 11, and (Sept. 1971): 9.

it intended to expand its operations onto an adjacent 200-acre property in order to build LNG carriers—no evidence has been found indicating that this expansion ever occurred (*Offshore* 1972c). After building a few tanks and deck barges in the late-1970s, the record of Todd's activity in the offshore industry trails off. In 1990, Todd closed the yard; three years later, the company sold the facility to the Port of Galveston and it has remained idle ever since (Maritime Business Strategies 2006j).

Arnold V. Walker Shipbuilding

Located in Pascagoula, Mississippi, Arnold V. Walker Shipbuilding appears to have been most active in the construction of supply and crewboats during the early years of the offshore oil industry. The September 1954 issue of the journal *Offshore Operations* stated that in addition to two boats it was currently building for exploration work in Venezuela, there were over two hundred "Walkerbuilt" boats already in service in the offshore industry (*Offshore Operations* 1954a). Between this date and October 1956, the journal reported six boats being built by the yard ranging in size from 86 to 136-ft.[48] In June 1957, an advertisement for the company in Offshore announced that it had been acquired by its main competitor in Pascagoula, Ingalls Shipbuilding (*Offshore* 1957f). According to one commentator, Arnold V. Walker was responsible for the construction of the first all steel utility boats built expressly for the offshore industry (Ziglar 1974, p. 11). The company apparently continued to construct crewboats through mid-1958—after this date, however, no more information about the company has been found.[49]

Gulfport Shipbuilding Corporation

When it was first established, this Port Arthur, Texas company was known as Gulfport Marine and Boiler Works. Along with Levingston Shipbuilding in nearby Orange, Gulfport was apparently a major supplier of tugboats to the U.S. Navy during the war. The yard continued in this business following the war, constructing oceangoing tugboats as well as barges for such companies as Brown & Root, J. Ray McDermott, and Ingram Contractors sporadically throughout the 1950s through the 1970s.[50] In October 1970 Levingston purchased Gulfport for an undisclosed sum of money (*WSJ* 1970b). Sometime during the 1980s, the company facilities were leased to the Kansas City & Southern Railroad and they have since been absorbed into the Port of Port Arthur (Maritime Business Strategies 2006h).

Bludworth Shipyard

Originally based in Houston and now stationed in Corpus Christi, little information had been found about this company. From the early 1950s until the mid-1970s, Bludworth constructed a variety of vessels for the offshore industry, including tugboats, crewboats, and pipelaying barges (Maritime Business Strategies 2006d).[51] In 1956, the company moved it facilities in Houston to Brady Island, a quarter mile off the Ship Channel, and added a new marine railway and building ways to capable of accommodating larger equipment than before (*Offshore* 1956b). After a brief

[48] See *Offshore* (May 1955), (Sept. 1955): 42-44, and (Oct. 1956): 70.

[49] See *Offshore* (Apr. 1958): 80, and (May 1958): 55.

[50] See *Offshore* (May 1955): 31, (Oct. 1956): 69-70, (June 1958): 59-60, (May 1969): 5-6, and (Dec. 1970): 40.

[51] See *Offshore* (May 1955), (May 1957): 75, (Oct. 1957): 61, (March 1958): 60.

stay in Pasadena, Texas during the 1990s, Bludworth moved its facilities to Corpus Christi sometime late in the decade, where it is still active building towboats.

Platzer Boat Works, Inc.
Originally stationed in Galveston, Platzer Boast Works relocated to Houston in 1925. During World War II the company was primarily engaged in the construction of subchasers and barges. During the 1950s its facilities in Houston maintained a machine shop with one hundred welding machines, two 100-ft ways for launching crew boats, and an 1,100 ton way for barges up to 300-ft. The company also handled sandblasting and coasting, construction of offshore production platforms, and shipbuilding. The first mention of Platzer in relation to the offshore industry came in the May 1955 issue of Offshore, which reported that the company had delivered a 30-ft gauger's boat. Only two other Platzer-built offshore vessels, both crewboats, have thus far been discovered in historical records.[52]

One interesting note: during the late 1940s, Platzer found itself in dire financial straits as it owed approximately $99,000 to various creditors, one of whom was Brown Shipbuilding, a subsidiary of Brown & Root. Through an agreement reached in 1947 pledging immediate payment on 50% of their debt and another agreement reached in 1949 pledging cash payment of 10% followed by payments of 1% over the next five years, Platzer was apparently able to extricate itself from these financial difficulties.[53]

Port Houston Iron Works
Established in 1935 and located along the Houston Ship Channel (it is unclear whether the company is within the boundaries of Houston or Pasadena), Port Houston Iron Works made its first appearance in *Offshore* in Sept. 1956 with the completion of a vessel designed to transport drilling mud. The first Houston shipyard to be awarded a contract for naval construction, the company also appears to have built three mobile drilling barges worth approximately $9 million dollars between March 1957 and February 1958. The company operated two separate yards, both capable of building and repairing vessels up to 400-ft.[54] After completing two more barges in 1960 and 1963, no further record has been found.[55]

Sprague Welding & Machine Works / Marine Fabricating & Engineering Co.
At its Greens Bayou facilities on the Houston Ship Channel, Sprague Welding & Machine Works built one mobile drilling unit, the Carter Mart, in late 1956. At some point in 1957 (unclear when), Sprague acquired another local firm, Marine Fabricating & Engineering, which

[52] *Offshore* (May 1955), (July 1955): 35-36, (Sept. 1956): 53, 55, (Aug. 1957): 87-88, and (Sept. 1958): 59-60.

[53] See Box 43, folder 2 and Box 44, folder 1 in Brown & Root/George R. Brown Executive Files, MS488, Woodson Research Center, Fondren Library, Rice University.

[54] *Offshore* (Sept. 1956): 34-36, (March 1957): 33-34, (Aug. 1957): 121, (Feb. 1958): 15, 17-18, and (Apr. 1958) 69.

[55] *Offshore* (Apr. 1960): 21, and (Nov. 1963): 32.

built four lay barges and drilling tenders between March 1957 and June 1958.[56] After this, no further record of the companies has been found.

Burton Construction & Shipbuilding Co., Inc.
This Port Arthur, Texas Company has maintained a fairly significant presence in the mobile offshore industry over the years as a supplier of OSVs to various exploration and boat rental companies. The first mention of Burton in Offshore occurred in December 1954 when the company completed a 110-ft utility craft named the *Spindletop* (*Offshore Operations* 1954c). In an indication of its success, Burton moved into a new 60-acre facility occupying 2,000-ft of frontage on Port Arthur's Intracoastal Canal in early 1957. Besides six ways and a 1,000-ton marine railway, the new yard also boasted separate shops for propeller reconditioning, plate manufacture, machining, and carpentry (*Offshore* 1957d). It appears that this move served the company well—between 1957 and 1983, Burton built at least 235 boats, the majority of which appear to have entered into offshore service (Maritime Business Strategies, 2006e). Most of these vessels were standard OSVs—mud ships, crewboats, cargo barges—but Burton also constructed at least one mobile drilling barge, Gulf Marine's *Rig. No. 1*, which it delivered in 1957 (*Offshore* 1957k). At this point in the research it is unclear what happened to Burton after the mid-1970s, but it is currently listed as inactive (Maritime Business Strategies 2006e).

10.3.2. The 1960s and 1970s: By the start of the 1960s, the situation in Gulf Coast shipyards had begun to change as mobile rig construction became concentrated in the hands of a smaller number of firms. This growing centralization of production seems to have been tied to two causes: the increased complexity and technological sophistication of mobile rigs and their cost. Many of the smaller companies mentioned above began to disappear from the historical record; this does not, however, necessarily mean that they went out of business. Some, such as Arnold V. Walker, were acquired by larger firms (*Offshore* 1957f). Presumably many others continued as secondary builders of OSVs and crewboats—unfortunately, the industry journal *Offshore* began devoting less attention to such small-scale activities, choosing instead to focus on the more cutting-edge industry of mobile rig design. During the 1960s, it was this booming section that had the greatest impact on the search for offshore oil. Spurred on by a huge demand for their rigs, both at home and abroad, four companies stationed on or near the Gulf Coast—Bethlehem Shipbuilding in Beaumont, Texas; Levingston Shipbuilding in Orange, Tex; R.G. LeTourneau in Vicksburg, Mississippi; and Avondale in New Orleans, La —dominated the worldwide market for mobile offshore drilling equipment. The technology developed by these companies set the standard for the industry, a fact which created a huge backlog of orders and served to keep their yards operating at full capacity throughout the next decade and a half. Unlike the much smaller companies of the preceding decade, the strength of these multi-million dollar firms did in fact provide a litmus test for the health of the entire offshore construction industry on the Gulf Coast. Because of this, it is necessary to examine each of their individual histories in greater detail.

[56] *Offshore* (Sept. 1956): 61-62, (Oct. 1956): 29, (Mar. 1957): 57, (July 1957): 67, (Oct. 1957): 61, and (June 1958): 48-49.

Bethlehem Shipbuilding—Beaumont, Texas
Acquired in 1947 from Pennsylvania Shipyards, Bethlehem's yard in Beaumont, Texas joined several other well-established shipbuilding ventures owned by the steel manufacturer along the East Coast. In 1950, the yard completed its first expansion program, adding a 15,000-ton floating drydock, a large berthing basin, a 600-ft steel and concrete pier, and a 1,100-ft steel bulkhead. These capital improvements allowed the yard to construct seagoing vessels up to 415-ft in length. Although it does not appear to have been started with the intention of building vessels for the offshore industry, the yard's proximity to the oil fields off Louisiana and its early ventures into tank barge construction marked it as a natural ally (Maritime Business Strategies 2006c; *NYT* 1950). Bethlehem's first venture into mobile rig construction was the *Mr. Gus*, a $3.5 million, twin-hull drill barge built in 1954 for the C.G. Glasscock Co. of Corpus Christi. Indeed, Bethlehem's entry into the offshore industry was the first of many milestones for the company: *Mr. Gus* was the first mobile drilling platform capable of operations in depths up to 100-ft (*Offshore Operations* 1954b; *NYT* 1954b; *WSJ* 1954). Despite this rather auspicious beginning, the Beaumont yard moved slowly into the industry, constructing only three other offshore rigs—*Humble DB-1* (derrick barge, 1956), *Mr. Gus II* (jackup, 1957), and *Jim Woodruff* (jackup, 1957)—and a 20,000-bbls underwater oil storage unit over the next decade (Maritime Business Strategies 2006c; *Offshore* 1960; *NYT* 1959). Throughout the 1950s, much more attention was focused upon Bethlehem's yards on the East Coast, which were experiencing a great of labor turmoil and declining business due to postwar cuts in shipbuilding.

With the construction of the jackup *Stormdrill I* for the Storm Drilling Co. in 1964, the Beaumont yard began its sustained involvement in the mobile rig construction business. Over the next twenty years, Bethlehem constructed no fewer than 68 rigs at its facilities in Beaumont. Although the yard built several semisubmersibles during this time, it specialized mainly in the construction of jackups with operation depths ranging from 70-ft to 377-ft (Maritime Business Strategies 2006c). The company also developed ongoing business relationships with several offshore drilling firms, most importantly Storm Drilling, for whom it constructed at least another six *Stormdrill* jackups, and Marine Drilling, who received a total of thirteen units.

Coupled with the boom in offshore oil exploration during the late 1960s, such relationships forced the yard to operate at full capacity and often led to delays in construction. To ease the burden placed on its overworked Beaumont yard, Bethlehem began sending out recruiters in search of skilled welders in the early 1970s. In 1974, it even shifted work on a semisubmersible to its Sparrows Point yard in Maryland, the first offshore construction business on the East Coast (*Offshore* 1972e, 1974a). This last, however, was only a temporary measure, for in September of 1970 *Offshore* contained an advertisement from Bethlehem announcing the construction of a new 79-acre shipyard in Southeast Asia. Incorporated as Bethlehem Singapore Private Limited, Bethlehem held a 70% interest in the facility, which was built on a tract of British naval property. The Beaumont yard would act as the new facility's engineering consultant and U.S. sales representative. In addition, Bethlehem expanded its Gulf Coast facilities by lengthening the yard's fabricating shop, adding a new roll shop, and automating parts of the production process with a new burning machine and flame planer (*Offshore* 1970a, 1971d; *WSJ* 1970a).

In July 1980, Bethlehem Shipbuilding received a black eye when their parent company pleaded guilty to charges that it had paid more than $400,000 in bribes to agents of U.S. and foreign

shipowners during the 1970s in order to secure contracts for its yards. The company also admitted having evaded federal currency laws by smuggling $115,000 into the country illegally to finance its bribery scheme. Ultimately, a federal judge fined the company $325,000 (*NYT* 1980; *WSJ* 1980a and b). Although offshore construction continued at a brisk pace in the first two years of the decade, the Beaumont yard gradually witnessed a slowdown in its production of offshore rigs during the 1980s, apparently building its last jackup sometime in 1983. In 1989, after several apparently unproductive years, Bethlehem sold the Beaumont yard to Trinity Marine, who ceased using the facilities to build ships in 1994 (Maritime Business Strategies 2006c).

Levingston Shipbuilding—Orange, Texas

The Levingston shipyard on the banks of the Sabine River in Orange, Texas was founded in 1933 by George Levingston. During World War II, the yard was a principle builder of tugboats for the U.S. Navy, a market it continued in during the years immediately following. Unlike the Bethlehem yard in Beaumont, Levingston became heavily engaged in the construction of mobile drilling and exploration equipment when the offshore industry was still in its infancy (Maritime Business Strategies 2006h; *NYT* 1981).[57] Its first ventures were in the fixed platform industry, constructing tenders such as the $1.5 million *F.A. Cleverly* in June of 1955 (*Offshore* 1955a). By the end of the decade, Levingston had constructed approximately 21 such vessels for service offshore (Maritime Business Strategies 2006h).[58] Such projects quickly led to others: Levingston constructed its first self-contained drill barge in August 1955, its first fixed platform in January 1957, and its first pipelaying barge in June 1958 (*Offshore* 1955c, 1957a, 1958b).

Throughout the 1960s Levingston's ways were filled with an amazing variety of offshore drilling units, beginning with barges, tenders and submersibles. On eof the ways Levingston apparently distinguished itself from its competition on the Gulf Coast was to offer construction services for all types of offshore drilling vessels, a strategy that placed the company in a position to become an important technical innovator. In 1962, for example, the Orange yard delivered the world's first drilling catamaran, the $1.5 million *C.P. Baker*, to Reading & Bates Offshore Drilling (*Offshore* 1962a). Shortly after building C.P. Baker's sister vessel, Levingston launched the enormous *Blue Water No. 3* in 1966, a combination rig that could be used either as a submersible in up to 45-ft of water or as a semisubmersible in 1,000-ft of water (*Offshore* 1965f, 1966a). Next, the company began dabbling in the design of self-propelled drilling ships, constructing its first, the 205-foot *Offshore Salvador*, in June 1966 (*Offshore* 1966b). This new venture helped initiate an important business partnership with Global Marine Drilling, which purchased eight of Levingston's multimillion dollar drill ships over the next two decades. In keeping with the tradition of its diversified order book, Levingston even accepted a contract to build ferry boats for New York City's Staten Island service in 1962 (*NYT* 1962; *WSJ* 1966). The company was also a pioneer in offshore construction techniques: in 1967, it completed a new dry dock capable of lifting rigs out of the water entirely. This facility, which displaced nearly twice as much as Levingston's other dry docks, made it possible to repair the bottom sections of rigs without titling them to one side, a process that often led to damage (*Offshore* 1967).

[57] "Sun to Sell Assetts of Ship Unit," *NYT* (Nov. 24, 1981): D1.

[58] *Offshore* (May 1955), (July 1955): 17-18, (Aug. 1955): 29, (Oct. 1956): 38, 70, (Jan. 1957): 71-72, and (Nov. 1957): 73.

Levingston's success carried over into the next decade and its order books remained backlogged well into the 1970s. In early 1971, the company received a $20 million contract for the construction of the X-700, a semisubmersible said to be capable of operations in depths up to 2,000-ft (*Offshore* 1971a). Riding high on its success, the company began expanding, purchasing Gulfport Shipbuilding Corp. of Port Arthur, Tex. for an undisclosed sum of money in October 1970 (*WSJ* 1970b). Shortly thereafter Levingston also ventured overseas—in June 1971, *Offshore* reported that the company was building a tender/platform at its Singapore yard (*Offshore* 1971b, 1974b). Ironically, Levingston's success appears to have gotten it into some financial trouble. In mid-1972, the company announced that it would have to report a net loss on its investments for the previous year, a fact which it attributed to cost overruns on several major contracts (*WSJ* 1972). Whether the two events are connected or not is unclear, but in 1974 Levingston and Ashland Oil Co. of Ashland, Kentucky announced plans for the acquisition of the former by the latter. Following over a year of negotiations, the stockholders of each company agreed and Levingston became a subsidiary of Ashland Oil (*WSJ* 1974, 1975).

As it turned out, the merger with Ashland was a mistake. According to one observer, the oil company never had a clear plan for Levingston. Although the Orange yard continued building rigs, completing a total of sixteen between 1975 and 1982, and even expanded its interests onto the East Coast with the acquisition of Sun Company's shipbuilding facilities in Chester, Pennsylvania, Ashland relinquished control of Levingston to its president, George Paden, in 1982. Three years later in 1985, as a result of the collapse in the offshore oil market, the troubled Levingston closed its yard in Orange, which has remained unused ever since (Maritime Business Strategies 2006h; *NYT* 1981, 1984).

LeTourneau, Inc.—Vicksburg, Mississippi

Perhaps more than any of the other companies so far discussed, LeTourneau has left an indelible imprint on the mobile offshore oil industry from its main yard in Vicksburg, Mississippi. Named after its founder and long time president R.G. LeTourneau, the company began as a manufacturer of earth-moving equipment. LeTourneau himself was a prolific inventor and engineer, designing many of the firm's products and holding over three hundred patents. During World War II, he and his company provided nearly 70% of all the earthmoving equipment used by American armed forces **(**LeTourneau 1960**).** It is unclear why, but in 1954 LeTourneau sold this rather successful earth-moving business and its manufacturing plants in Toccoa, Georgia and Peoria, Illinois to Westinghouse (*WSJ* 1953; *NYT* 1954a). Whatever the reason, the sale apparently proved propitious—in late 1955, LeTourneau completed the first of approximately 179 jackup rigs it would build for the mobile offshore oil industry over the next fifty years (LeTourneau Technologies 2006; Maritime Business Strategies 2006g). Built for Zapata Offshore, the *Scorpion* (also known as *Rig. No. 1*) boasted a triangular platform raised above the water by three-legs situated at the corners. After proving itself in the fury of Hurricane Autry in 1957, the three-legged jackup design and the company that originated it became industry favorites (Gramling 1996, pp. 56-57; Howe 1968, pp. 42-47). By the end of the decade, LeTourneau had completed nine more of these triangular jackups for such concerns as Dixilyn Drilling, Barnwell Offshore, Reading & Bates, and even the Italian government, and could boast a backlog on its order books of more than $6.5 million. The company even developed a "compact" jackup, available at the modest price of $2 million (*Offshore* 1957e, j, and m, 1958c; *WSJ* 1960).

LeTourneau's yard in Vicksburg witnessed more of the same throughout the 1960s, constructing approximately 33 more jackups by the end of the decade. As the offshore industry boomed, these units became larger and more expensive. In 1963, LeTourneau announced a contract for the first rig capable of drilling in 250-ft of water—the *Dixilyn 250* was completed later that year at a price of $5.5 million (*Offshore* 1963b and d). Less than a year later, LeTourneau received a contract from Penrod Drilling for the construction of the first jackup capable of operations in 300-ft of water (*Offshore* 1964b). During this time, LeTourneau also acted as an outside engineering consultant on several rigs constructed overseas in France and Italy (Maritime Business Strategies 2006g).

The 1970s marked several important milestones in LeTourneau's history. In October 1970, *Offshore* carried an announcement of a new rig to be built for Field International Drilling. Although there was nothing unusual about its design, what was new was where the unit would be built—Singapore. The same issue of *Offshore* also carried an article by president Richard H. LeTourneau explaining his company's decision to build construction facilities in Southeast Asia. "Our business is like most in that we have to anticipate what our customer wants," he said. "We have had to research potential oil production areas to make certain our product will work. In 1968, our sales and marketing people determined the Indian Ocean and Southwest Pacific had strong oil potentials." Citing the Singaporan government's progressive stance toward business and its generous subsidies to industry, LeTourneau also revealed his company's real motive: cheap labor (*Offshore* 1970b and c). Although this expansion would help in easing the backlog for offshore equipment that grew throughout the decade, it also foretold major structural changes in the worldwide industry. The next big announcement came less than a month later in November 1970 when Marathon Manufacturing, a producer of electro-chemical, leisure-time, and fabricated metal products, completed its bid to acquire a controlling interest in LeTourneau's stock (*Offshore* 1970d).

Neither of these announcements slowed the company's activity down one bit. Although the Vicksburg yard only completed 27 rigs during the decade, this was more than made up for by the 47 rigs built in LeTourneau's other yards in Singapore, Brownsville, Texas, and Scotland (Maritime Business Strategies 2006g). The first mention of the Brownsville yard occurred in the June 1971 issue of Offshore, which reported a semisubmersible under construction there. Acquired sometime in the 1950s, LeTourneau's Brownsville facility was specifically designed for such projects; however, the yard soon turned to jackup construction in order to supplement production in the Vicksburg yard. In 1972, the company began an $18 million expansion of the Brownsville facilities, citing a $200 million backlog in orders (Maritime Business Strategies 2006g; *Offshore* 1971b, 1972a). As for the yard in Scotland, at this point in the research it is unclear when it was acquired.

Judging from its list of completed rigs, LeTourneau was able to weather the offshore bust in the mid-1980s fairly well: although construction fell off significantly after 1983, the company delivered 55 rigs before this date. The company's history after this is still somewhat hazy. Acquired sometime in either the 1970s or 1980s by Rowan Companies, Inc., LeTourneau divested itself of its Brownsville yard in the early 1990s, which was subsequently resold and became part of Keppel AMFELS, which is still in the rig-building business. LeTourneau also

remains an important builder of rigs, but today its facilities are limited to Vicksburg (Maritime Business Strategies 2006g).

Avondale—New Orleans

Although much less dependent on the offshore oil industry than any of the other three companies discussed above, Avondale Shipyards in New Orleans, Louisiana was still an important player in the mobile rig building business. Diversification was at the center of Avondale's shipbuilding strategy following World War II. The company built a vast array of vessels in its yard, ranging from tank and drill barges to shrimp boats and passenger lighters. The sheer number of vessels constructed by the yard was staggering: in 1953, in addition to building 23 civilian vessels, the company delivered approximately 150 landing craft to the Navy and Army. This amazing productivity attracted many customers from the oil industry, and by the early 1950s, Avondale found itself constructing a growing number of tank, drill, and deck barges for offshore exploration and construction (Maritime Business Strategies 2006b). In 1957, for example, Avondale began construction on the self-elevating *Lloyd Noble S-66*, a drill barge capable of operations in 100-ft of water, for the California Company. Such barges would become the mainstay of Avondale's orderbooks well into the 1960s (Maritime Business Strategies 2006b; *Offshore* 1957g).

Perhaps as a result of its tremendous productivity, Avondale was acquired by the Ogden Corporation, a diversified holding company with interests in steel scrap and stock quotation boards, for an undisclosed sum of money in early 1959. The merger apparently caused little pause in the busy yard—less than a week after the announcement, Avondale received a $9.5 million contract to construct three vessels for a U.S. shipping line (*WSJ* 1959a and b). The acquisition also failed to weaken Avondale's niche within the offshore barge building industry, an area where it managed to achieve some notable technical innovations. The year 1963 proved to be important in this regard—within six months, Avondale completed two record-breaking vessels for the offshore industry. In January, the yard launched Kerr McGee's *Rig 54*, the world's largest (and, at $6.25 million, the most expensive to that date) submersible drilling barge, capable of operations in waters up to 175-ft deep (*Offshore* 1962c and d, 1963a). Six months later, the offshore industry's first floating steel drilling island, a $5 million V-shaped rig measuring built by Avondale, was placed on location in the Gulf of Mexico by ODECO (*Offshore* 1962b, 1963c, 1965b and e). Even while setting these milestones in the offshore industry, Avondale continued as a leading producer of all types of ocean-going vessels—the result of this was that in mid-1964, the company could boast of a $238 million backlog in its order books (*NYT* 1964).

Avondale's success carried over into the 1970s with its ventures into the construction of semisubmersibles. In 1972 the yard earned praise as the builder of the world's first self-propelled semisubmersible, the $20 million *Ocean Victory* built for ODECO, who had become an important customer for Avondale (*Offshore* 1971c and e, 1972b and d). During the 1970s and on into the 1980s, Avondale also became an important producer of supertankers and liquefied natural gas (LNG) carriers. In 1973, the yard received a $310 million contract for the construction of three LNG carriers from El Paso Natural Gas Co. Ironically, this multimillion dollar tanker business brought Avondale a great deal of unwanted media attention—after several

years of costly delays, one of the LNG carriers developed a mysterious and potentially dangerous crack in its hull insulation during sea trials in 1979 (*WSJ* 1973, 1979, 1981).[59]

In the mid-1980s, the company received even more negative press when a federal investigation into allegations of fraud among several employees revealed widespread corruption within the company and among its officers. Although the penalties Avondale paid for its employees' fraud were fairly insignificant, the entire episode served to damage the company's reputation (*WSJ* 1984a and b). Another dark spot on the company's reputation, at least for its workers, was Avondale's apparent disregard for federal workplace safety regulations and its trenchant opposition to unions. In 1964, for example, the yard was enjoined by a federal judge from violating shipbuilding safety regulations after explosions killed one employee and wounded another earlier in the year (*WSJ* 1964). In this same year, an article in the *Wall Street Journal* reported that the key to Avondale's success was a highly-paid, non-union labor force and cited several failed attempts at the organization of the yard (*NYT* 1964). Over twenty years later in 1998, the same paper reported that in spite of overwhelming support among its workers unionization of the yard, Avondale was resorting to illegal stall tactics in order to prevent such representation. Workers maintained that a union was absolutely necessary to counter Avondale's low wages, which were $2 less than the prevailing rate, and lack of concern for safety, citing an employee death toll more than double that of its competitors. Although it is unclear at this point whether these practices were the norm throughout the company's history, the prevalence of hostility toward organized labor in the South makes it is quite likely that earlier reports of worker contentment at Avondale were simply useful covers for anti-union company policies (*WSJ* 1998).

None of this, however, has prevented Avondale from maintaining its success or huge profits as a shipbuilder. Since the mid-1980s, Avondale has been sold and resold to three different companies, including Connell Partnership in 1985, Litton Industries in 1999 (a move which finally allowed the unionization of the yard), and finally Northrop Grumman in 2001, of which it is still a part (*NYT* 1999).

10.3.3. Beyond the 1970s: Ironically the boom in offshore oil production during these decades also contained the seeds of future problems for the Gulf Coast regional industry. Facing the same increased demands for energy and oil exploration as American industry leaders, foreign companies, many of them subsidized by their national governments and capable of paying much lower wages to their employees, began to invest heavily in the construction of mobile offshore rigs. Firms in Norway and Japan quickly became important competitors to those Gulf Coast companies in the lucrative offshore construction business. At the same time, domestic mobile rig builders found themselves unable to meet the soaring demand for their products and services, forcing them to expand their construction facilities and acquire new yards overseas, especially in Southeast Asia. For the Gulf Coast communities housing these construction companies, what seemed like a boon at the time would later prove to be a curse in the 1980s and 1990s. Although they had managed to avoid the instabilities of the shipbuilding market, these companies and communities had less success navigating the financial hazards of the oil industry.

[59] "Two Concerns Order $630 Million of Ships," *WSJ* (May 30, 1973): 24; "New LNG Tankers Develops a Crack During Sea Trials," *WSJ* (July 19, 1979): 16; and "Exxon Unit Orders 3 Ocean Tankers For $300 Million," *WSJ* (Apr. 17, 1981): 6.

10.4. Fabrication

In order to examine the effects of the offshore oil industry on coastal communities, it is necessary to research at the history of some of the companies based in those communities. There are many types of businesses who are tied to the oil industry beyond the big oil companies; offshore rigs require many service contractors to support their creation and functionality. In addition to shipbuilders and fabricators, small firms providing divers, helicopter and airplane pilots, and food service are tied to the maintenance of offshore oil. Small firms, however, can be difficult to study because there are many of them, they are likely to be privately held, and they may be around only a few years. Large companies, such as fabricators Brown & Root and McDermott, follow the fortunes of the oil industry but are more directly tied to the fortunes of coastal communities than oil companies, which may be based elsewhere.

10.5. McDermott and Brown & Root

Although oil companies like Shell, Exxon, Texaco, and others are the driving force behind the oil wells drilled in the Gulf of Mexico, from the earliest years these producers have contracted out much of the work of drilling and equipment design to other companies. Although in the earliest years of the industry there were more small firms involved in the fabrication of rigs and platforms, two companies have been of central importance in the field. Brown & Root, now part of KBR and a subsidiary of Halliburton, and J. Ray McDermott, now a subsidiary of McDermott International. The two fabrication companies are also important in their impact on coastal communities because of their locations and the nature of the work requires proximity to the fields. Brown & Root has been based in Houston for most of its history. McDermott is based in New Orleans, with yards in Morgan City, Louisiana, Harbor Island, Texas (near Corpus Christi), and Houston (J. Ray McDermott 2006a).

Brown & Root began in 1914 as a construction firm in central Texas. Herman Brown, later joined by his brother George, initially focused on road and bridge construction. However, the Great Depression forced the brothers to diversify into building dams, paving streets, and other government projects (Pratt and Castaneda 1999). As part of the same diversification strategy, the Brown & Root began contracting with oil companies involved in offshore drilling in the late 1930s, just as the offshore industry was beginning to develop.

J. Ray McDermott was founded in 1923, only a few years after Brown & Root, by father and son team J. Ray and R. Thomas McDermott. The company started as a contractor for building drilling rigs for wells in East Texas. Unlike the Brown brothers, McDermott stayed focused on the oil industry in the early years, and expanded instead geographically across Texas and Louisiana. Mc Dermott's experience working in the swamplands of Louisiana allowed them to move into the emerging offshore oil drilling field (McDermott International 1996). In 1937, the company began constructing fixed platforms in the marshes, supplied by plank roadways supported by piles, similar to the early offshore attempts (J. Ray McDermott *Today's Pipeline*).

Brown & Root's first project was for Humble Oil (now ExxonMobil) in Galveston Bay. In the initial years, the industry was confined to quite shallow and protected waters. As a result, fabrication contractors created land-like structures from which to drill, including drilling barges

and platforms supported by piles. In 1938, Brown & Root constructed their first project in the open ocean, building a trestle out to a platform a mile from shore. The first few platforms were supported by many wooden piles, but problems with corrosion, stability, and hurricane-resistance would lead to changes in post-war design (Pratt *et al*. 1997).

During World War II, the Browns focused most of their attention on shipbuilding and other wartime contracts. The wartime boom in government spending helped the brothers' business grow, although it also delayed further attempts at drilling offshore oil. Although the shipbuilding was done by a separate company also owned by the Browns, the experience enabled the brothers to more easily adapt surplus boats to the needs of the industry when it began to expand again. Brown & Root grew larger and larger in the post-war years because of the effects of wartime contracting work and the booming economy. The oil business expanded drastically as soldiers came home and industry began to reconvert to peacetime usage. The brothers founded Texas Eastern to transport oil products to the Northeast, and this profitable enterprise provided the capital for even more growth (Pratt *et al*. 1997).

Offshore development, however, was slowed by the tidelands controversy. The federal government and the coastal states were involved in litigation and congressional maneuverings until 1953 over which would control access to offshore drilling sites (Gramling 1996). Despite the confusion over mineral rights, exploration and drilling continued (Laendner 1993).

In addition to the issues of jurisdiction over the underwater wells, the problems of wooden pile-supported platforms led to changes in design. Although the wells drilled in the 1940s and 50s were still in relatively protected and shallow water, they were vulnerable to hurricanes in a way that wells on inland bodies of water were not. In addition, the effects of waves and varied types of sediments in the Gulf were problematic for early platforms. Fabricators like Brown & Root and McDermott needed to experiment with platforms, and oil companies needed scientists to study the types of forces facing the offshore structures in order to come up with the best structure at the lowest cost (Pratt *et al*. 1997).

In 1947, McDermott entered the offshore oil business when they constructed a wood-piled platform in 20 feet of water in the Gulf. By 1948, however, the company had determined that using a "steel template type," or jacket, would make the structure much stronger. The company also built its first derrick barge in 1949, from refurbished World War II materials (J. Ray McDermott, *Today's Pipeline*). McDermott continued to experiment, also producing an all-concrete platform, bigger and bigger jackets, and in Morgan City in 1956 the first fabrication yard devoted entirely to the offshore industry (J. Ray McDermott 2006). The company had incorporated in 1946 and began being publicly traded in 1954 (McDermott International 1996b).

Brown & Root also continued to experiment. The company built Kermac 16 with Kerr-McGee in 1947. The project replaced one large, expensive platform with a much smaller permanent platform and a moveable tender barge with most of the equipment. Kermac 16 made drilling offshore much more economical and allowed its early expansion by reducing the economic risk in the case of a dry hole. The platform and tender system was complicated by vulnerability to storms and bad weather, but was crucial to the early development of the industry (Pratt *et al*. 1997).

Scientific study of the conditions which effect offshore platforms was one of the important developments in the field. Although in the early years engineers were working with little more than guesses about the types of wind, waves, and other forces the structures would face, hurricanes Hilda and Betsy in 1954 and 1955 proved that the initial guesses were did not match up with actual conditions (Lee 1998). After the hurricanes destroyed several platforms, the industry realized that larger, sturdier structures were needed to withstand the wind and waves. In addition, as demand for oil grew, oil companies became interested in drilling further and further from the shore, in increasingly deeper water. This expansion presented problems with supplying and supporting rigs, as well as increasing challenges in enabling them to withstand harsher conditions. During the post-War period, demand for oil continued to increase, although the price remained low, constraining development to some extent. President Eisenhower's 1959 quota on foreign oil created some space for increased domestic development, however, despite global oversupply (Gramling 1996).

Although McDermott continued to be involved in fabricating platforms and rigs, the company contributed some important designs in the field of marine pipelines. The corporation made the first barge designed specifically for laying pipelines in 1961. The company continued to advance in this field of technology gradually (McDermott International, *Today's Pipeline*). In the same year, McDermott installed the first "stacking" jacket, an important step towards multi-piece jackets (J. Ray McDermott 2006b). As drilling moved into deeper waters and jackets grew larger and larger, they needed to be made of more than one piece for the purposes of weight and transport.

Similarly, Brown & Root developed new pipelines technology while continuing to be involved in other types of fabrication. Brown & Root was the first company to use a ramp to ease pipeline to the ocean floor, and continued to refine the process for assembling and laying pipe throughout the 1950s and 1960s (Pratt *et al*. 1997). George Brown sold Brown & Root to Halliburton after the death of his brother Herman in 1962. Halliburton was another company that contracted for services with oil companies, but was not involved in fabrication. However, Brown and Root continued to operate largely independently, despite the sale (Pratt and Castaneda 1999).

As the companies worked to drill further and further from the shoreline, design problems increased. Not only were waves bigger and stronger, but since platforms needed to be larger, jackets also became increasingly heavy. Engineers had to transition from using cranes to install jackets to new methods like floating the structure out to location and using controlled flooding of the case-on to position it (McDermott, Inc., *Offshore Construction*). At the same time, new technology like computer modeling made design problems easier (Pratt *et al*. 1997).

In 1973 and again in 1979, the members of OPEC (the Organization of Petroleum Exporting Countries) instituted embargoes against selling oil to the United States as a result of disputes over profits and foreign policy. The price of oil shot upwards as the supply diminished. The increased profits from the shortage made previously uneconomical exploration and drilling viable, and allowed oil companies to move into even deeper waters. The oil business boomed, as did that of its contractors. McDermott acquired Babcock & Wilcox, a firm involved in the electrical power industry, in 1978 (McDermott International 1996). Brown & Root established its Harbor Island field in 1975 (Pratt *et al*. 1997).

In 1978, McDermott built Shell's Cognac platform for a water depth of over 1000 feet, made of three pieces (J. Ray McDermott 2006b). In 1980, McDermott constructed Union Oil's Cerveza platform in similarly deep water out of only one piece, drastically reducing costs. Brown & Root were involved in the design of Cerveza as well (Pratt *et al*. 1997).

Cognac and Cerveza were built at the depth limits of conventional platforms. As wells were planned in ever-deeper waters, fabrication companies tried out new design ideas to accommodate the harsh conditions. In 1981, Brown & Root built the Lena platform for Exxon in about 1000 feet of water. Exxon's design used a "guyed tower" concept, with a narrow tower anchored by cables, so that the oscillation of the structure was slower than the movement of the waves. However, further research suggested that other types of platforms were more efficient in even deeper waters, such as "tension-leg platforms, compliant towers, and subsea systems" and the Lena design was not recreated (Pratt *et al*. 1997).

After the boom of the 1970s, the oil industry experienced a severe bust in the 1980s. Prices declined from 1982 on, and dropped precipitously in 1985. When prices dropped, deepwater oil drilling was no longer economical. Expensive technology and high labor costs meant that production in the U.S. was drastically curtailed. Oil related businesses had to downsize to survive the slump. Not only oil companies themselves, but also contractors and support companies had to layoff large numbers of employees. In oil-dominated local economies, unemployment rose to as much as 20% (Gramling 1996). Oil companies had continued to purchase large areas of leases into the early 1980s, when areawide leases were instituted in 1983, and new yards opened to build for them. These large purchases in combination with the crash two years later increased the damages to companies who had not predicted an end to the boom (Pratt *et al*. 1997).

Brown & Root and McDermott also had to cut back to survive the slump. Both companies had to lay off employees, sell off assets, and abandon or cut back on the new technology they had been pressing ahead towards in the era of high oil prices. For example, Brown & Root had to reduce the engineering staff by 2/3 and sell its ships, as well as changing the function of the Harbor Island yard (Pratt *et al*. 1997).

Although oil prices rebounded somewhat in the 1990s, they remained too low for the same type of aggressive and expensive technological development that had occurred in the 1970s and early 1980s. The designs needed to be more cost-conscious to stay profitable, and even the increased prices of the 21st century have not produced a full return to the boom time of the oil shocks.

In the 1990s also Brown & Root worked to develop 3 dimensional computer modeling as a more efficient and accurate method of designing platform structures. In addition, the company worked to find new ways of looking at the development of oil fields, such as the "life-cycle approach." Under this method, firms attempt to minimize costs and maximize profits over the entire life span of the project, rather than designing for the short term. In view of concerns about conservation and the low price of oil, the life-cycle approach became increasingly important (Pratt *et al*. 1997).

It seems amazing that offshore platforms could evolve from 1937's hundreds of wooden piles in 15 feet of water, supported by a long pier, to the complex steel structures in over 1000 feet of water in the 1970s, reached by ship and plane, in such a short time. However, the men who lived through the development of the industry argued that

> there has been a fairly steady progression [into deeper water]. There is not a steady progression because as soon as you move from 700, and 700 to 1,000, you hit bumps along the way . . . there has been no breakthrough technology that lets us do something. It was an accumulation of a lot of things by a lot of people. We can't point to one Lindbergh that flew the Atlantic by himself the first time. This industry, there has been a lot of people. There have been many contributors, (Lee 1996).

Problems arose and were solved as the industry moved incrementally deeper and deeper into the Gulf, with each solution seeming simply the next logical step. Old ideas were reworked and reinvented to produce workable solutions for the harsh conditions that structures face in the ocean.

Both Brown & Root and McDermott have extensively diversified their operations to reduce risk and provide better services. McDermott designs plans for energy plants, contracts with various governments, as well as the traditional offshore well contracting (J. Ray McDermott 2006a). Brown & Root, now KBR, has abandoned road building for designing refineries, gas production facilities and pipelines, and petrochemical plants, as well as oil production equipment (KBR, Inc. 2006). In addition, both are part of large multinational corporations. McDermott is part of McDermott International, chartered in Panama and operating worldwide. Brown & Root is a subsidiary of Halliburton and is currently running operations in, for example, Brazil, Iraq, and Nigeria (KBR, Inc. 2006).

In addition to projects unrelated to oil, the reduction of contracts in the Gulf of Mexico has been compensated for in the contractors' business by projects located elsewhere, like the North Sea, South America, and Africa, where labor costs are less and oil may be more cost-effective to access. Drilling in the Gulf continues to be important, especially in terms of domestic production in the United States, and the extensive operations abroad have not eliminated the jobs in the fabrication industry from Gulf Coast communities. Some aspects of Brown & Root and McDermott's business can be completed from their headquarters in Houston and New Orleans. Professional positions, especially engineering, are not location sensitive and some fabrication still occurs in the United States. However, as with other industries, unskilled positions have been increasingly moved abroad to countries with lower labor costs.

10.6. Sources

There are several ways to approach the study of the effects of offshore oil drilling on coastal communities along the Gulf of Mexico. One way to examine trends in offshore oil would be to look at patterns in the various businesses related to the industry, especially the businesses located in the communities. Another way to research the topic is to examine trends in the local history of the relevant communities. Each approach has strengths and limitations, and some combination of both will provide the best information.

There are several possible sources of information about the history of a specific business or industry. Secondary historical accounts of the growth and development of some corporations are one important source. Business history books are useful resources for history as well as for the types of other sources from which information might be gleaned. They are especially helpful because of the information they provide about the larger trends occurring concurrently with various business events and for the information they contain from sources that may not be readily available to every historian. However, the development of business history as a major field of study has been relatively recent in the historiography. Even up until recently, historical studies of large corporations often have been focused on the lives and personalities of their founders and leaders rather than on the businesses themselves. As a result, the secondary literature on offshore oil and its subsidiaries is somewhat sparse. *Builders: Herman and George Brown* (Pratt and Castaneda 1999) and *Offshore Pioneers: Brown & Root and the History of Offshore Oil (*Pratt *et al*. 1997) are good examples of books in this vein, but not every company, especially not smaller businesses, is the subject of scholarly study. However, they provide important information about changes in the business structures, functions, and other strategies.

Other sources of information about the oil-related businesses include company newsletters, industry trade journals, and a few dissertations. The dissertations date from the 1960s and cover the early history of some fabrication and shipbuilding firms, but are limited in scope. Trade journals such as the *Oil and Gas Journal* and *Offshore* discuss new technological developments in the oil and gas industry as they happen and can provide useful information about downturns and upturns in business and especially the concerns of business leaders. However, they often provide few details about projects beyond technical specifications, and are often more focused on the activities of oil companies than on their contractors. Finally, company newsletters may provide information about the day-to-day activities of the business, and also information about the types of programs and benefits employees might expect to receive, but these publications, intended for employees, have a definite slant to their coverage. In addition, in-house papers, such as the Alabama Dry Dock and Shipbuilding Company's *Fore and Aft*, are not widely available in libraries or databases because their preservation was not always considered important.

The second way to approach the effects of the offshore oil industry on coastal communities is to focus on the local, rather than on the business, aspects of the topic. There are several types of sources which focus on the development of a specific community. Book-length studies of a particular city, regional histories, local newspapers, historical society journals, and interviews all fall into this category. Like business history, the field of urban studies remains less popular, and book-length histories of smaller cities often remain to be collected and written. It can be especially difficult to find scholarly studies of the recent history of a city. Some books are available covering larger cities, such as Houston and New Orleans, as in *Free Enterprise City* (Feagin 1988) and *Houston: A Profile of its Business, Industry, and Port* (Abrams *et al*. 1982). These books can be especially helpful in sorting out the general business climate and economy of the city in question, as well as the intersections of politics with industry.

Although there is limited scholarly research on specific cities, in more recent years the historiography has begun to focus more on regional history and trends. Significant historical

literature about the economic development of the South as a whole, or the South and globalization, is available, including some articles in historical journals. Books such as *The Selling of the South* (Cobb 1982) and *From Cotton Belt to Sunbelt* (Schulman 1991) cover the change in the Southern economy from agriculture to manufactures and other more modern industries. *The Selling of the South* in particular includes useful information about the types of strategies used by Southern politicians to attract business to their constituency. These types of books are especially valuable for the depictions of the social climate of the region, and for comparative information about other industries. However, the studies of regional development generally focus more on manufactures and apparel factories than on the more specialized industries related to the development of the offshore oil industry. Although oil companies and the associated contractor and support firms form important parts of the economy in the South, most academic attention has been focused on garment construction factories and on scientific and research industries.

Another possible source of information on coastal areas is local newspapers from the communities themselves. These local newspapers may cover stories not picked up by the more national press, and are good sources of information about local reaction to economic events, as well as the general social climate of the area. However, because the local papers of small communities are almost never indexed, the researcher must already have an idea of key significant dates and periods in order to begin examining the papers. In addition, the level of coverage given to business events varies, and newspapers may not specify a source for their information, making it difficult to find more details. Local newspapers, such as *The Corpus Christi Caller-Times*, are often not available by database or at sites outside of the immediate area of the community for the majority of the relevant time period. In spite of these difficulties, local newspapers may be one of the more important sources of information about the industry's effects on Gulf communities.

The journals of local or regional historical societies are another possible place to research. Many historical organizations publish collections of articles for their members at intervals. These articles generally focus on the city, county, or state in question, and because of the limited geography in question can provide more detailed or more location specific information than more generalized historical overviews. *The Gulf South Historical Review* and the *Journal of Mississippi History* are examples of this type of journal. Several problems arise in relation to the examination of these resources, however. The quality of the publications varies, because the journals are often put together by local volunteers. Frequently, they are neither indexed nor available by database, but instead can be difficult to search and gain access to. In addition, most local historical society journals focus on an earlier era as regards the typical time period of their articles. Many publications focus on the nineteenth century and contain little coverage of very recent history, and still fewer articles focusing on specific industries or businesses.

Oral history interviews are the final source of information about the coastal communities affected by the offshore drilling industry. Talking with people who lived through historical events can be invaluable, because they may be able to point the researcher in the direction of new avenues of research, in terms of both sources and of events and influences which may have been overlooked in other accounts. Interviews are certainly an excellent way to explore the social effects on communities. However, information from interviews, especially relating to events that

occurred many years ago, may not be fully reliable due to faulty memory and the way perceptions are filtered through the lens of subsequent events.

Although there has been limited historical interest in documenting business history, there are many sources available which will help to provide a complete picture of the effects of the offshore oil industry on Gulf coast communities. With additional research, most especially involving travel to local archives within the communities, a clearer picture of the influence offshore drilling had on the region will be formed. Although each of the avenues of research has flaws or difficulties associated with it on its own, in combination the advantages and disadvantages of each method should balance each other out.

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Offshore. 1956a. New mud delivery vessel: Baroid's 'Mr. George.' September, 1956. Pages 34-36.

Offshore. 1956b. Bludworth Shipyard, Inc. moves to Brady Island. December, 1956. Page 65.

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Offshore. 1957b. Todd to build barges. February, 1957. Page 56.

Offshore. 1957c. Trans-Gulf single hull unit. March, 1957. Pages 33-34.

Offshore. 1957d. Burton's new Port Arthur location. April, 1957. Page 81.

Offshore. 1957e. LeTourneau units ordered. April, 1957. Pages 51, 58.

Offshore. 1957f. Ingalls' acquisition of Arnold V. Walker Shipyard, Inc. June, 1957. Page 9.

Offshore. 1957g. Avondale Marine Ways builds new giant drill barge. July, 1957. Page 68.

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Offshore. 1957i. Todd will build mobile unit for Union Producing Co. September, 1957. Page 60.

Offshore. 1957j. ‘Mr. Cap’ is commissioned. November, 1957. Page 47.

Offshore. 1957k. Gulf Marine’s rig no. 1. December, 1957. Pages 47-49.

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Offshore. 1957m. New triangular drill barge. December, 1957. Pages 21-22, 25.

Offshore. 1958a. Trans-Gulf’s rig no. 10. February, 1958. Pages 15, 17-18.

Offshore. 1958b. Brown and Root’s new giant pipelaying barge. June, 1958. Pages 33-34.

Offshore. 1958c. New economy mobile unit. July, 1958. Pages 15, 17-18, 20.

Offshore. 1960. Mobile underwater oil storage unit. October, 1960. Pages 21-22.

Offshore. 1962a. First floating catamaran drilling unit. March, 1962. Pages 15-16.

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Offshore. 1962c. Kermac’s mammoth sea rig taking shape. May, 1962. Pages 17-18.

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Offshore. 1965d. Big drilling ship under construction. July, 1965. Page 36.

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Offshore. 1967. Huge dry dock can handle largest offshore drilling rigs. March, 1967. Pages 46-47.

Offshore. 1970a. Bethlehem Shipbuilding advertisement. September, 1970. Page 135.

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Offshore. 1972c. Todd drylock to construct world's largest drydock at Texas port. May, 1972. Pages 141, 143, 145.

Offshore. 1972d. ODECO takes delivery on new rig, a semisubmersible *Ocean Victory*. December, 1972. Page 92.

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11. CUMULATIVE AND TRANSITORY EFFECTS OF OFFSHORE OIL AND GAS DEVELOPMENT ON PERSONAL INCOME IN LOUISIANA'S COASTAL PARISHES: 1969 to 2000

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11.1. Introduction

The vicissitudes of the oil and gas industry usually are seen as the driving if not dominating force in the evolution and performance of the economy spread along the Gulf of Mexico (GOM)—especially in Louisiana and Texas. Some give oil and gas much of the credit for these states' economic successes, for others the cumulative effect of the industry's activity has been to create not only environmental but also economic and social problems.[60]

As exploration and production in the region have shifted to the petroleum resources located offshore on the outer continental shelf (OCS) under federal rather than state jurisdiction, the socioeconomic effects of OCS development on coastal economies and communities have become a relevant incarnation of this controversy. The Minerals Management Service, which manages OCS development for the federal government, includes such effects in the periodic assessments it is required to make of the consequences of its major policies, plans, and actions.

To understand the magnitude and duration of the effects that OCS development may have had on the Gulf Coast economy, other changes in the national and regional economy affecting the region need to be accounted for and made comparable. Without a comprehensive perspective that accounts for changes in the wider regional and national economy, the relationship between changes in the offshore energy sector and changes in the economies of coastal states and communities can be distorted. Further, in capital-intensive industries populated by large companies substantial portions of the returns generated go to non-resident individuals and institutions. A narrow, two-sided comparison of trends and events on the OCS and trends and events in coastal states and communities can result in an illusion of causality inconsistent with either economics, history, or, occasionally, common sense.

Finding consistent patterns by objectively comparing the experiences of a wide range of localities and jurisdictions is the method used in this study. The method is not theoretically or statistically complex. However, applying it to data from the last third of the past century gives results at variance with conventional wisdom, namely, that the energy sector's economic importance to, or dominance of, coastal communities on the Gulf Coast has been exaggerated.

[60] The term "cumulative effects" has several dimensions. As pointed out by Richard Hildreth at a Minerals Management Socioeconomic Workshop (Hildreth 2004), the relevant legal requirement is that "an EIS cumulative-effects study must identify (1) the area in which the effects of the proposed project are felt; (2) the impacts that are expected in that area; (3) other actions—past, proposed, and reasonably foreseeable—that have or had been expected; (4) the impacts or expected impacts [that] are allowed to accumulate; and (5) the overall impact that can be expected if the individual impacts are allowed to accumulate; (Fritiofson v. Alexander, 772 F.2d 1225 (5th Cir. 1985) p. 52."

The energy perturbations set off by the Arab oil embargo of 1974, and the collapse of global oil prices and expectations in the mid 1980s, disproportionately affected coastal economies in oil and gas producing states like Louisiana and Texas, but probably not by as much as is generally believed. Since that time, however, long-term or cumulative effects of energy development seem weak or non-existent even in localities closely tied to the development of offshore oil and gas resources.

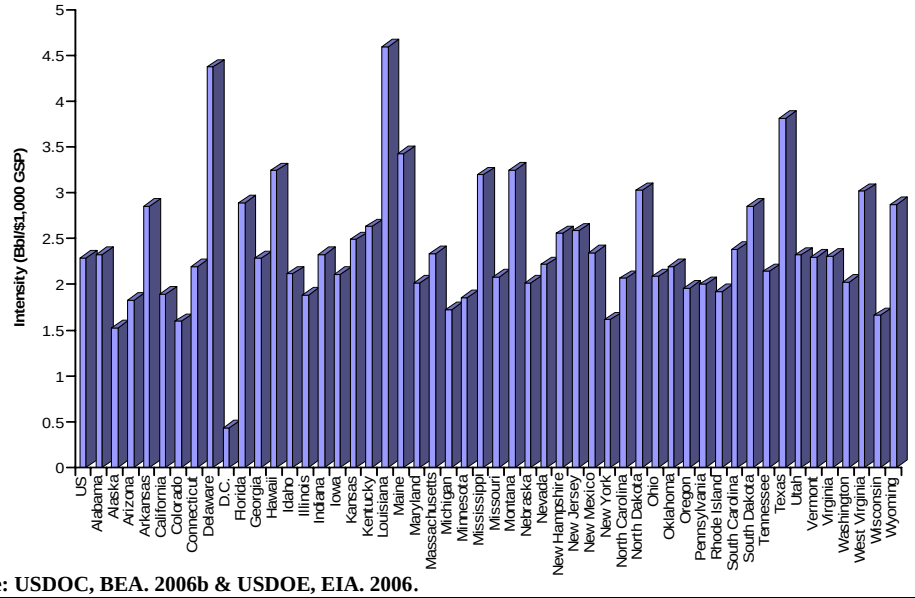
Evaluating the performance of the national economy over roughly the same period we consider here, William Nordhaus (2004) concluded:

> But the past is not prologue, and the 1970s productivity slowdown has over the last decade been overcome by a productivity growth rebound originating primarily in the new-economy sectors. As the economy made the transition from the oil age to the electronic age, the aftershocks of the energy crises have died off and productivity growth has attained a rate close to its historic norm.

The application or implication of Nordhaus' conclusion for the Gulf Coast economy is that the repercussions of the energy boom and collapse of the 1970s and 1980s should not be confused with the cumulative economic effects of the exploration and production of oil and gas from the federal OCS. Louisiana is the nation's most energy intensive state and although it may still be closer to the oil than to the electronic age, twenty years later the coastal parishes of Louisiana don't seem to be any worse off or any better off than the rest of the state now that the energy adjustments have been made. Louisiana's economy lags the rest of the country in economic and social improvement, but offshore oil and gas development clearly has mitigated rather than reinforced this unfortunate trend.

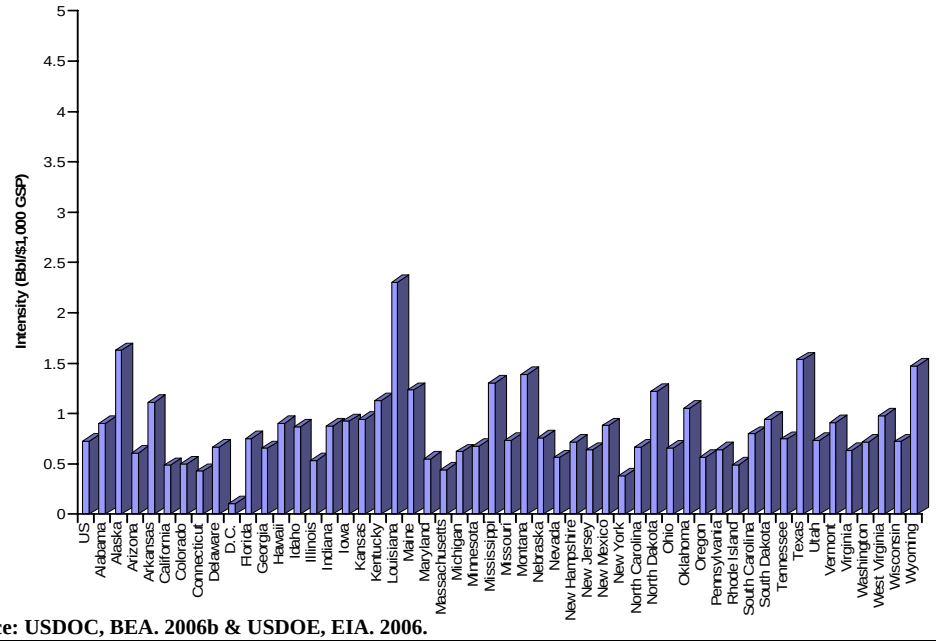
11.2. Energy and the Gulf Coast Economy

There is little doubt that the energy sector is very important on the Gulf Coast. As Figures 2a and 2b illustrate, the "energy intensity," measured as units of oil or gas consumed per $1,000 of Gross State Product (GSP), is higher for the five GOM states—Texas, Louisiana, Mississippi, Alabama and Florida—than for any other contiguous regional configuration of states. Figures 2a and 2b compare the oil intensity of the states in 1980 and 2000. Oil intensity in each of GOM states exceeded the national average in both years. Louisiana was more "oil intense" than any other state. Comparing 1980 to 2000 shows intensity has declined substantially in all states, but less so in Louisiana. Relative to the other states, Louisiana's oil intensity has increased.



Source: USDOC, BEA. 2006b & USDOE, EIA. 2006.

Figure 2a. Oil Intensity in 1980: Barrels Consumed/$1,000 GSP.



Source: USDOC, BEA. 2006b & USDOE, EIA. 2006.

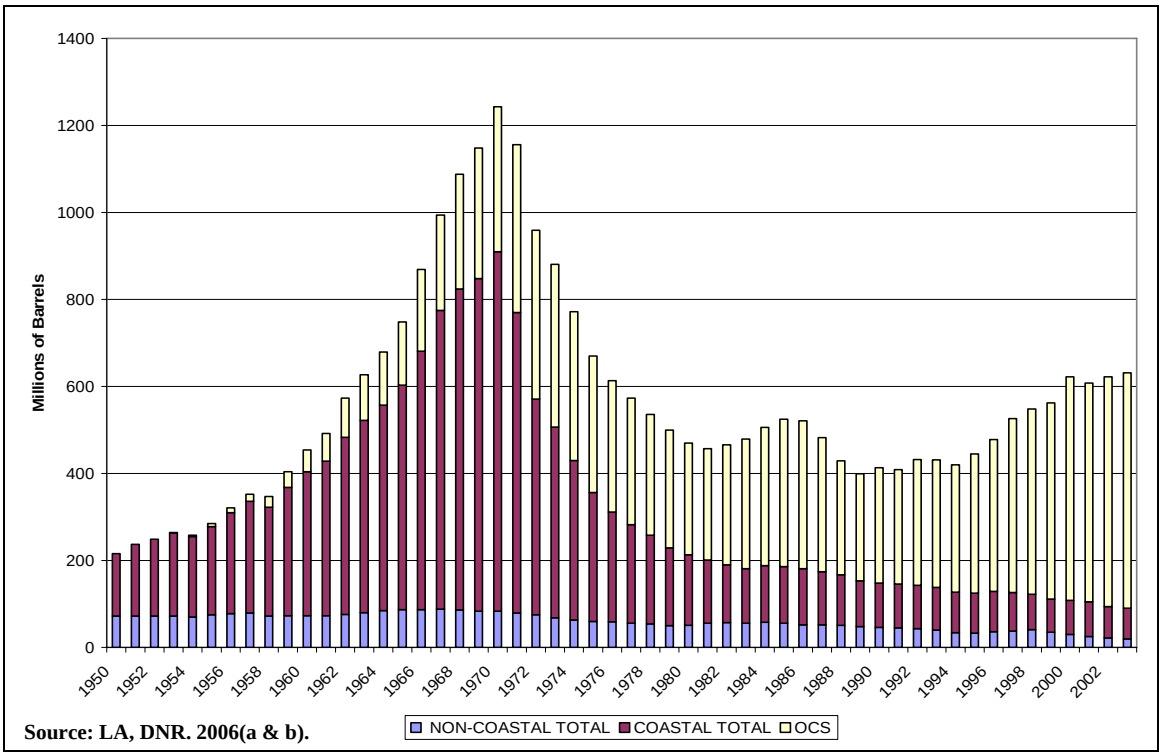
Figure 2b. Oil Intensity in 2000: Barrels Consumed/$1,000 GSP.

Despite their energy intensity, the economic effects of the development of oil and gas resources from the federal OCS on GOM states are difficult to isolate. First, as Figures 3a and 3b depict, the production of oil and gas from "on-shore" fields—including those located offshore but in the "state waters" that extend roughly three-miles out from Louisiana's eroding coast, peaked in 1970. The figures divide the state's on-shore production between 19 coastal parishes and 45 non-coastal parishes and then compare them to OCS production. Production of oil and gas in non-coastal parishes declined slowly but steadily throughout the 53-year period shown, while production from the coastal parishes rose rapidly from 1950 to 1970 and then declined even more rapidly. Figures 4a and 4b show the same data but on a disaggregated, rather than combined or "stacked" basis, a format that makes it easier to compare production from the three regions shown.

There is a common misperception that oil and gas production from the federal offshore and the state onshore jurisdiction boomed throughout the 1970s and early 1980s and then collapsed when the price of oil fell off its widely presumed path to $50 dollars a barrel in the mid-1980s.

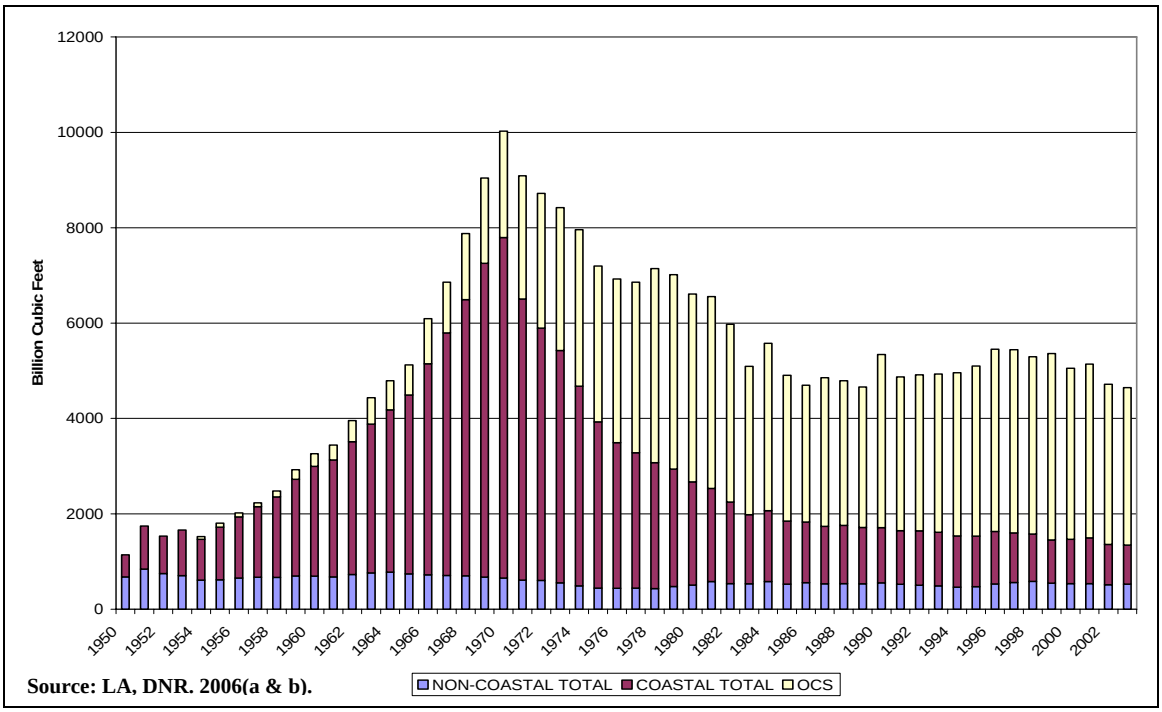
As Figures 4a and 4b show, the state and OCS production behaved differently during the period. The rapidity of the drop in oil produced in the coastal parishes is exemplified by the fact that 10 years after its 1970 peak production, it had fallen back almost to its 1950 level—a rise and fall of approximately 600 percent. Policy changes as well as geologic factors are reflected in these oscillations, but as Figure 4a shows, although production of oil from the federal OCS also declined, it did so much more slowly. Further, as can be seen in Figure 4b, gas produced on the OCS continued to increase at a healthy rate, without pausing—in contrast to declining onshore gas production that fell almost as rapidly as oil.

Tyler Priest (2004) provides a concise explanation of the principal forces driving offshore production, many of which were different than those affecting on-shore production.



Source: LA, DNR. 2006(a & b).

Figure 3a. Total Oil Production in Louisiana, 1950-2003, Bar Graph.



Source: LA, DNR. 2006(a & b).

Figure 3b. Total Gas Production in Louisiana, 1950-2003, Bar Graph.

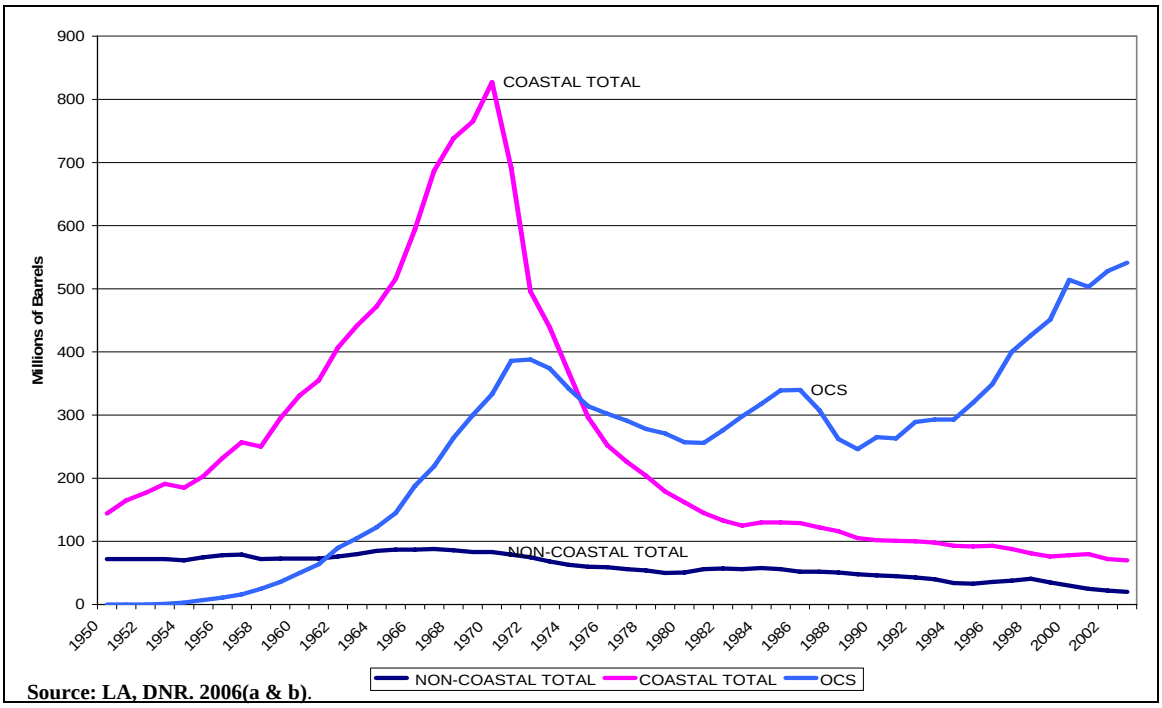


Figure 4a. Total Oil Production in Louisiana, 1950-2003, Line Graph.

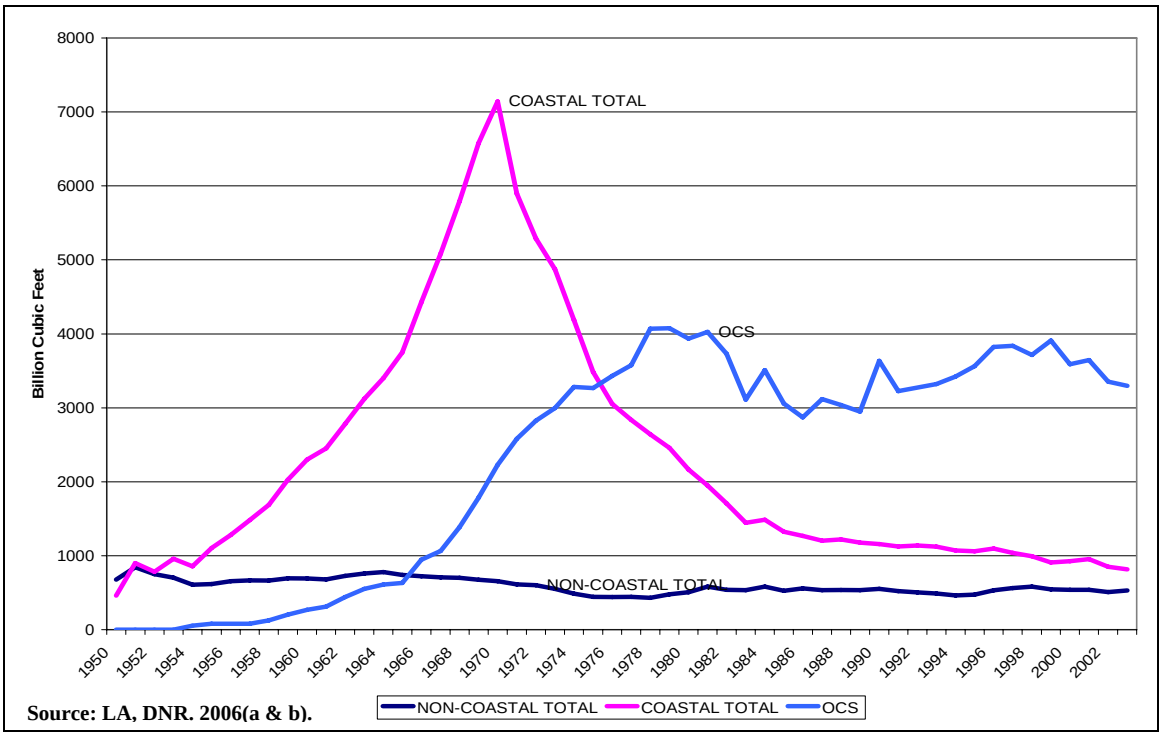


Figure 4b. Total Gas Production in Louisiana, 1950-2003, Line Graph.

Oil and gas produced on the OCS each exceeded their corresponding coastal counterparts in 1976 and since then have accounted for a steadily increasing share. In 1997, oil produced on the OCS exceeded its previous 1970 peak and has continued to increase through 2003. This pattern of steady increase in production from the federal offshore since well before the drastic decline in world oil markets in 1985, in the case of gas, and a much less precipitous decline following the 1970 peak and then a subsequent renewal of growth in 1982, in the case of oil, suggests that economic activity attributable to development of the federal offshore has been a steady source of stability for the Gulf Coast economy for the past two decades.

The apparent disconnect between production, as shown in Figures 4a and 4b and measures of oil and gas activity, such as energy sector employment depicted in Figure 5 (and the rig count illustrated later in Figures 13a and 13b), underscores the importance of perceptions and expectations in explaining oil and gas activity on the Gulf Coast.

On-shore peak production occurred when oil was selling for a little more than $2 per barrel—as it had been doing for the preceding two decades, but as uncertainty spread and prices rose with the 1974 oil embargo, activity on the Gulf continued unabated in the face of a historically steep and sudden decline in production. This phenomenon is illustrated in Figure 5, showing employment in mining (which in Louisiana is almost exclusively to oil and gas exploration and production) in both coastal and non-coastal parishes over the 1969 to 2000 period. Employment peaked in 1980 and fell steeply in 1985--after marching through the 1970 peak in production and subsequent historically steep decline without even a discernable pause.

Similarly, Figure 6 shows net migration for Louisiana on an annual basis from 1970 to 2000. The state gained from migration from 1969 to 1983 with the exception of a small loss in 1973. Starting in 1983, however, migrants left the state at an increasing rate that exceeded 100,000 in 1987. The negative net migration diminished thereafter, nearly becoming positive in 1992, but since then remaining modestly but consistently negative.

A contributing factor that may be partly responsible for this misperception is the public awareness of the importance of oil and gas revenues, such as severance taxes and royalties, to the state's budget. In 1970, about 50 percent of Louisiana's undedicated state revenues came from special taxes levied on the petroleum industry (Richardson and Scott 1988, page 128). Special taxes means paid only by them, i.e., it does not include general taxes like sales or corporate income taxes. The negative effects of the post 1970 production slide on public revenues were to some extent offset when prices began to rise in 1974. The effect was at first muted by the conglomeration of price regulations classifying oil as "old" or "new," but this effect weakened as the decade progressed.

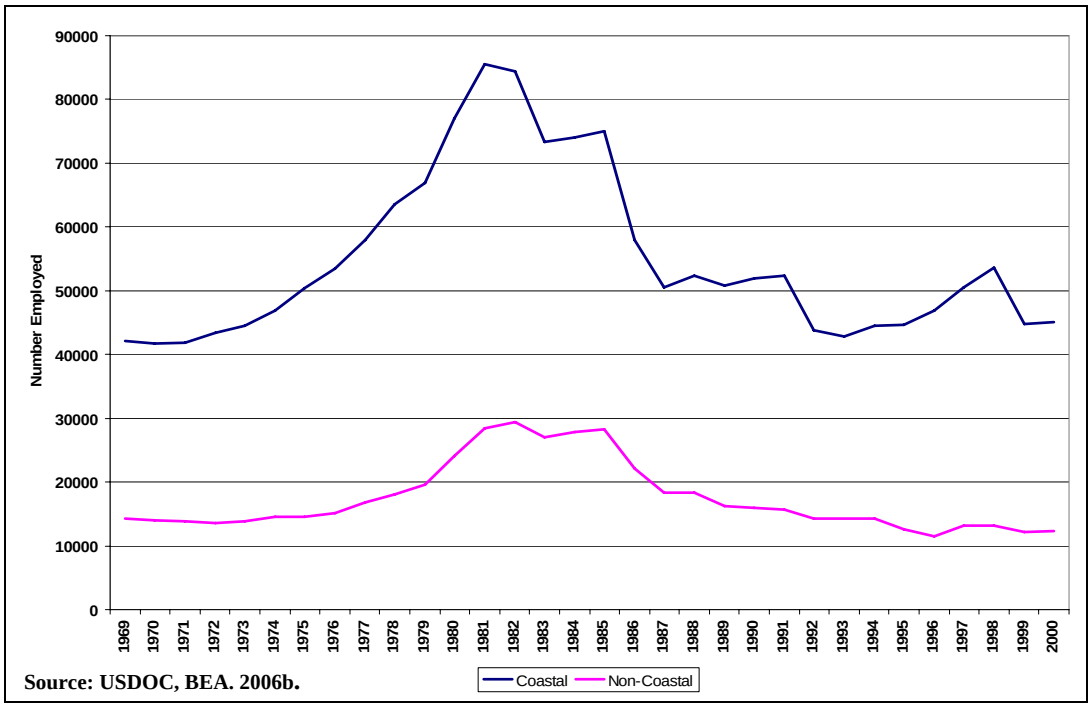


Figure 5. Employment in Mining in Coastal and Non-Coastal Parishes in Louisiana, 1969-2000.

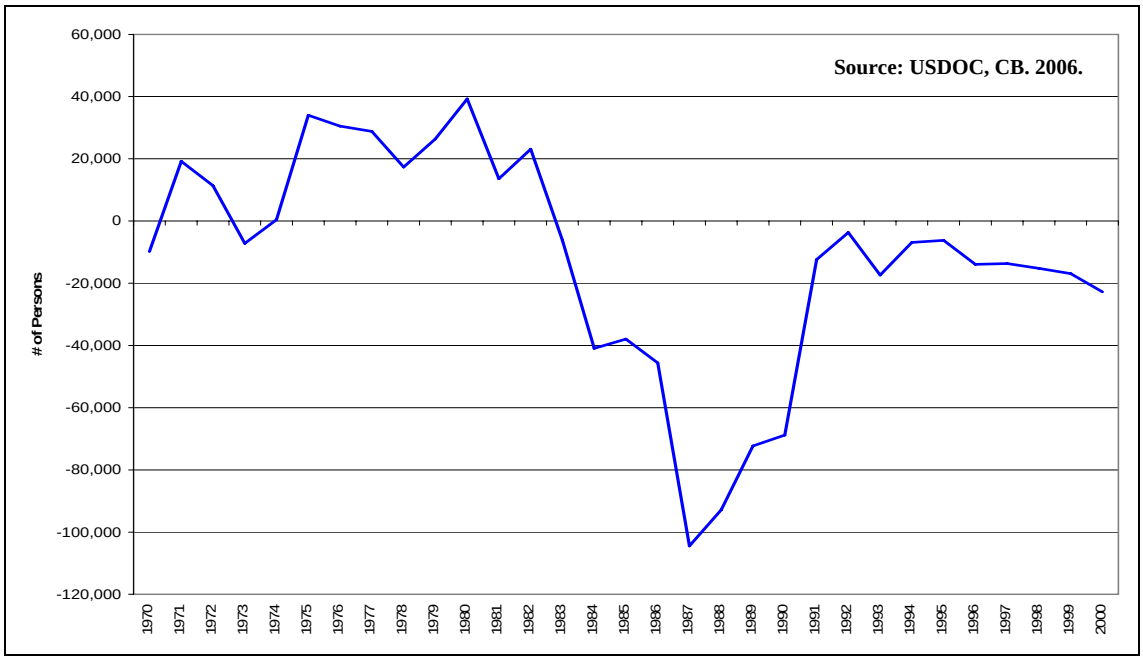
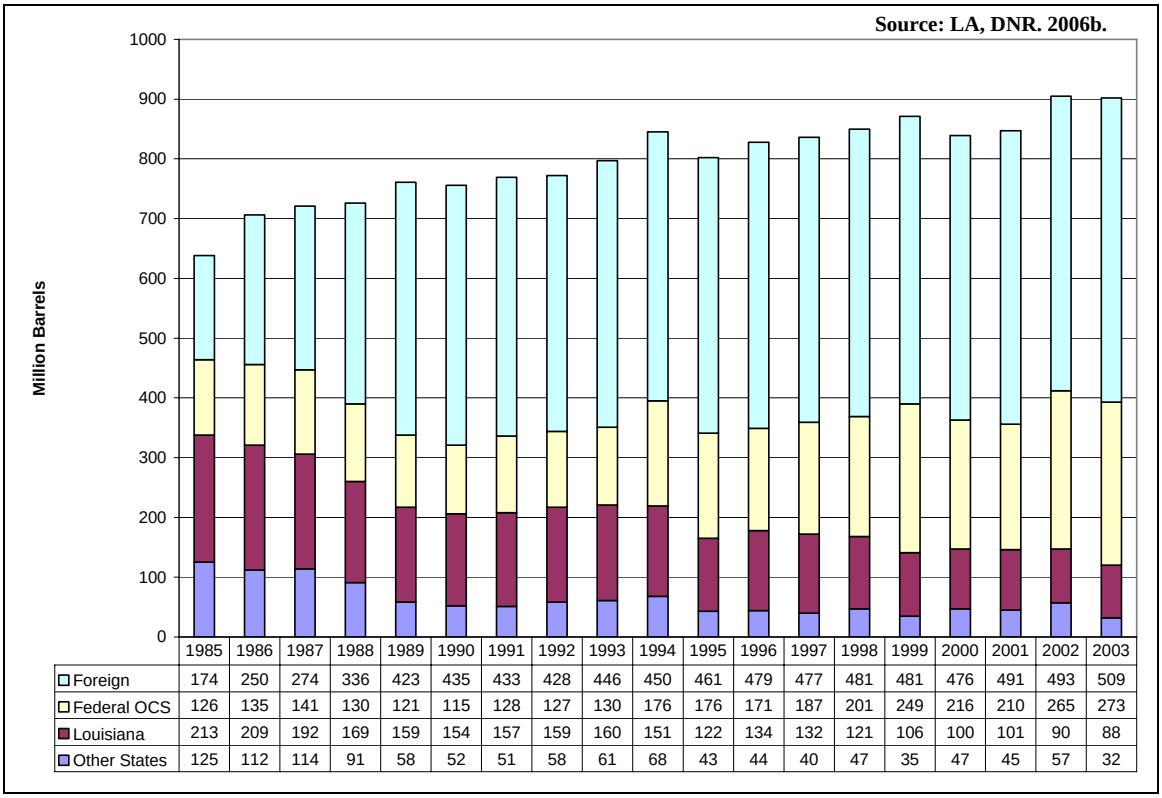


Figure 6. Net Migration for the State of Louisiana, 1970-2000.

Another major shift that complicates the analysis is the greatly increased reliance on imported crude oil by Louisiana's refineries, as illustrated in Figure 7. Today only about 8 percent of the state's refinery input is produced within its own jurisdiction, with 17 percent coming from the federal offshore and 41 percent imported from other countries. Presumably, oil produced within its own jurisdiction or on the federal OCS could have been replaced by imported oil but at a somewhat higher cost. If imports were to have replaced OCS production, the consequence would have been many fewer jobs in petroleum exploration, production, and service sectors as well as in their support industries. Higher input and feedstock prices similarly would have resulted in fewer refineries and chemical plants. Estimating more precisely the impact of using imports rather than developing the OCS on coastal economies and communities, however, would be a substantial analytical undertaking.

Similar conceptual complications are created by structural shifts with the oil and gas industry such as increased centralization of technical, research, and managerial functions in Houston—with a shift of personnel from New Orleans and other locations along the coast; increased use of migratory contractors for construction, maintenance, and operation of offshore facilities—globally as well as in the GOM; and the ability to control many offshore operations and facilities by remote control and management.



	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Foreign	174	250	274	336	423	435	433	428	446	450	461	479	477	481	481	476	491	493	509
Federal OCS	126	135	141	130	121	115	128	127	130	176	176	171	187	201	249	216	210	265	273
Louisiana	213	209	192	169	159	154	157	159	160	151	122	134	132	121	106	100	101	90	88
Other States	125	112	114	91	58	52	51	58	61	68	43	44	40	47	35	47	45	57	32

Figure 7. Louisiana Refinery Crude Oil Input by Source.

Rather than try to disentangle 40 or 50 years of such trends, discontinuities and what-might-have-beens, the approach followed here is a simpler one of comparing economic activity in coastal areas associated, both historically and geographically, with the development of the federal offshore, with areas further removed and presumably less affected. By making these comparisons over an extended time period during which there were major perturbations within the oil and gas sector, the goal is to identify and understand how the response by the industry has affected coastal economies, whether any effects were cumulative or transitory, as well as how coastal economies were affected by changes in public policy and the larger economy.

11.3. The Study Area

Nineteen coastal parishes and 45 non-coastal parishes in Louisiana and the Metropolitan Statistical Areas they contain are the primary geographic units most closely studied and compared. The two groupings are shown in Figure 8 and production of oil and gas from them is shown in Figures 3a, 3b, 4a, and 4b previously discussed. Both include urban, suburban, and rural communities. The coastal parishes include the urban areas centered on New Orleans[61], Lafayette, and Lake Charles. The non-coastal parishes include urban areas centered on Alexandria, Baton Rouge, Monroe, and Shreveport.

[61] Over the study period, the parishes located on the northern shore of Lake Pontchartrain, especially St. Tammany parish, became more like suburban extensions of New Orleans and popular residences for many oil and gas executives. St. Tammany and the other north shore parishes, however, are regarded as non-coastal here. The New Orleans metropolitan area is the only one that is split between the two groups.

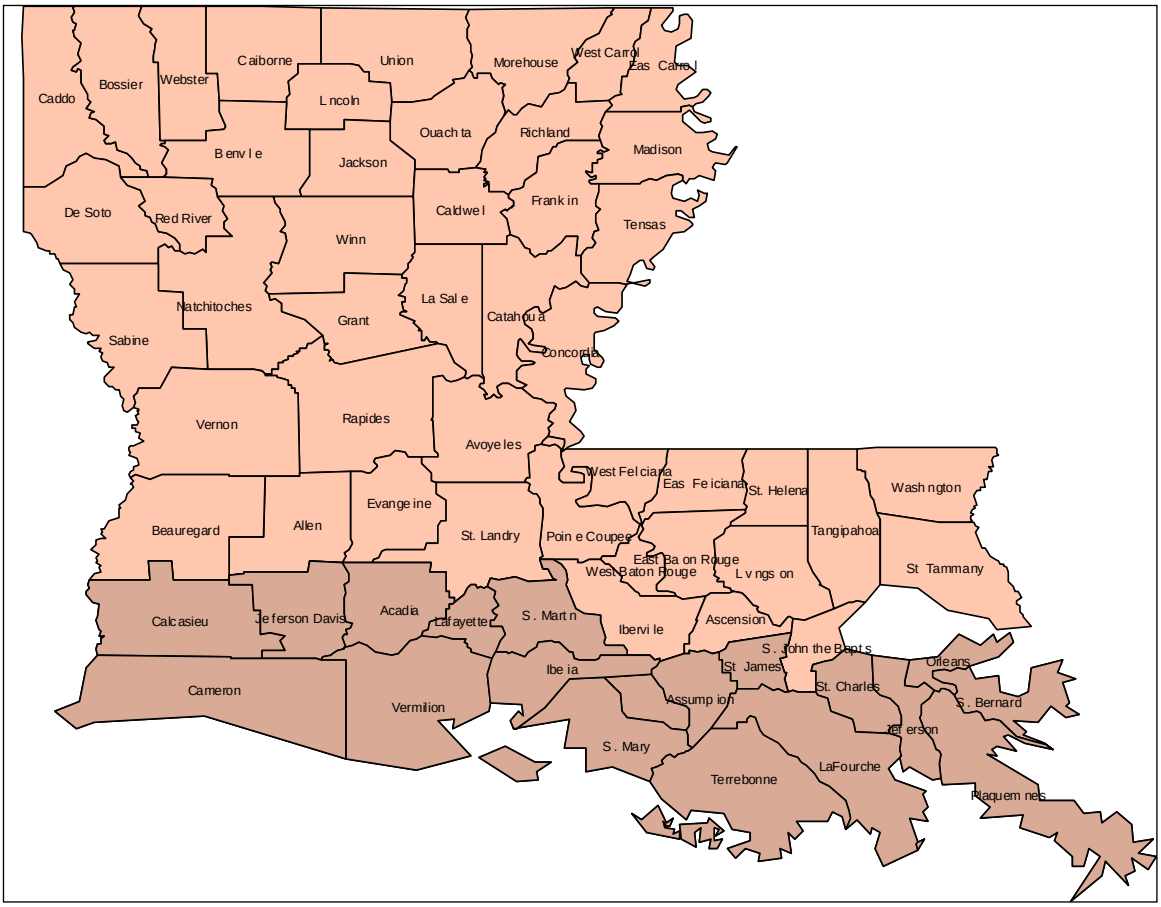


Figure 8. Study Area - Coastal and Non-Coastal Parishes.

The 19 coastal parishes as defined here differ from the 19 Louisiana parishes designated as in the "coastal zone" for the purposes of coastal zone management (CZM). The CZM designation is based largely on geographic and ecological criteria unrelated to petroleum reserves or activity. The classification we use is intended to reflect economic activity related to oil and gas development. The principal differences are that the CZM classification includes three parishes on the north shore of Lake Pontchartrain that are not included in our group of coastal parishes, and our group includes Jefferson Davis, Acadia, and Lafayette parishes.[62] Lafayette is a major regional management center for offshore oil, and in our view clearly should be included in the group hypothesized to be affected by offshore activity.

Figure 9 depicts total personal income for the coastal and non-coastal parishes over the study period. The land area and number of non-coastal parishes is considerably larger than the coastal parishes, but the proportion of total personal income received by Louisiana residents in the

[62] A pioneering effort to delineate and analyze the coastal economy by Lamar Jones and J. Randolph Rice (1972) for the purposes of coastal zone management reasoned that the coastal economy should extend up the Mississippi River to Baton Rouge, and the Highway 190 bridge that marks the limit of navigation for ocean going ships.

coastal and non-coastal parishes has been roughly equal over the study period, with a modest increase in the proportion received in non-coastal parishes over time. The share received by non-coastal parishes increased from 48 percent in 1969 to 52 percent in 2000, with the share of coastal parishes, of course, dropping from 52 percent to 48 percent over the same period. The trend was relatively steady with each group of parishes accounting for approximately 50 percent of the state's personal income in 1985.

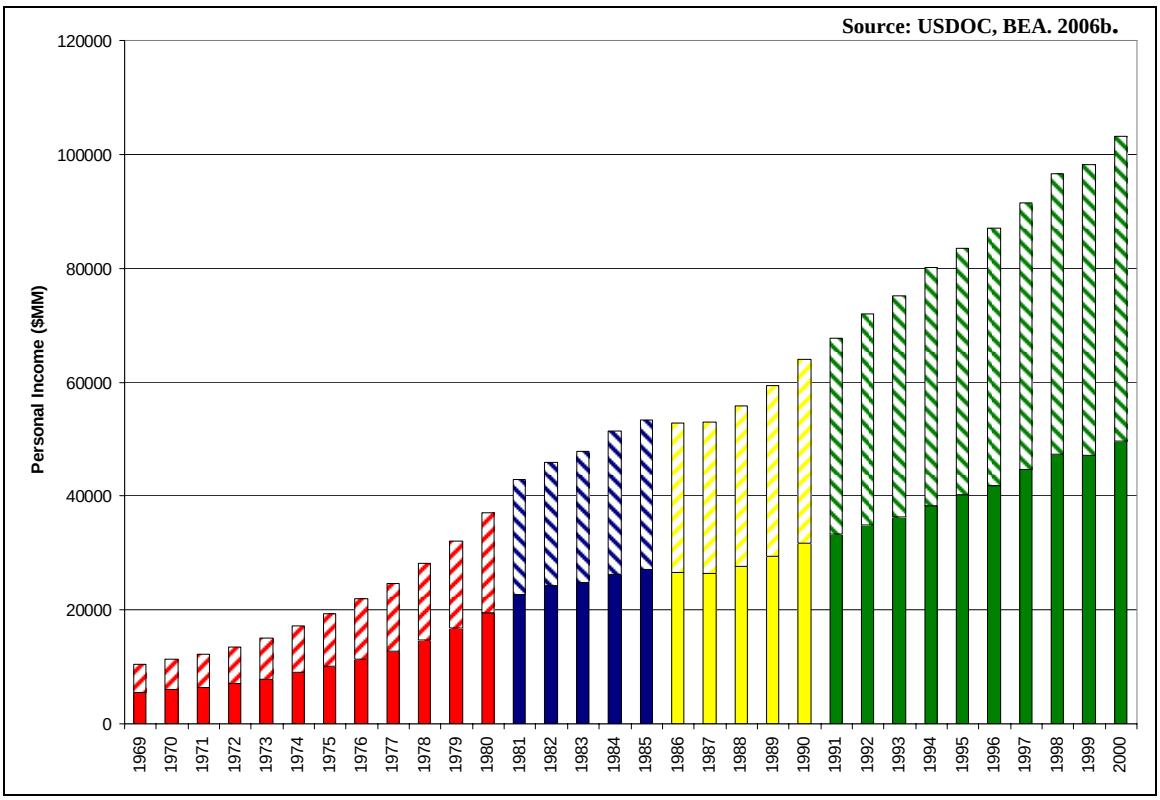


Figure 9. Personal Income for Coastal (solid) and Non-Coastal (striped) Parishes, 1969-2000.

The bulk of the analysis starts in 1969 and ends with the year 2000. The beginning date was decided partly by data availability. Detailed data for parishes is limited prior to that date. Although shorter than historians might prefer, this period includes the major perturbations of the petroleum market and includes more than enough variation in oil and gas activity to explore the economic response to it. The period is divided into four sub-periods, 1969 to 1980, 1981 to 1985, 1986 to 1990, and 1990 to 2000, delineated by the regional business cycle.

11.4. Changes in Per Capita Personal Income

Income per person is a good measurement of an economy's performance for regional analysis. Conceptually, it reflects more directly than production or employment measures how the fruits of economic activity change through time in a given area or jurisdiction. Personal income includes all residents' wages, salaries, proprietors' and partners' earnings but excludes corporate profits and business taxes. Personal income is more comprehensive and more indicative of changes in individual economic well being than employment and earnings measures. It includes dividends and interest paid to individuals residing in the region of tabulation and it also includes income individuals receive from transfer payments, such as social insurance or public assistance, that are unrelated to participation in the labor force. Corporate profits and taxes, which are not included in personal income data, are not necessarily or usually received or paid in areas where the activity generating them occurs.

For capital-intensive industries such as oil and gas, measures based on personal income can be significantly different than measures based on production or employment. Robert Barro and Xavier Sala-I-Martin (1991, pages 140-141), for example, found that:

> The correlation of the log of per capita GSP with the share of GSP originating in crude oil and natural gas rises because of the oil shocks from 0.1 in 1973 to 0.4 in 1975 and 0.7 in 1981 and then falls with the decline in oil prices to 0.1 in 1986. In contrast, the correlation of the log of per capita personal income with the share of personal income originating in oil and natural gas is −0.3 in 1970 and 0.0 in 1980. These divergent patterns reflect the distinction between the location of oil and gas facilities and the ownership of these facilities.

Personal income is especially useful for local or regional analysis because it is available by residency but is not as subject to omissions to prevent disclosure of proprietary information within smaller areas, as frequently is the case with production and employment data.[63] Since location of residence and location of employment may differ considerably, ambiguities and anomalies occur with respect to individual parish jurisdictions, but the use of comparisons within and among multi-county or parish groups and metropolitan areas can identify or avoid many of them.

[63] Disclosure problems do, however, affect the measurement of some of the components of the change in per capita personal income, which are used in the analysis. See, (Garnick and Friedenberg 1982; Perloff 1957; Latzko 2001; Carlino and Mills 1987; Terkla 1991) for discussion of the concept and its use in regional analysis.

Table 2

Average Annual Percentage Change in Per Capita Personal Income for GOM States, Louisiana Parishes and SMSAs, 1950 to 2000, for Selected Periods

Parish/ SMSA Parish	**1959/ 1950[a]**	**1968/ 1959**	**1980/ 1969**	**1985/ 1981**	**1990/ 1986**	**2000/ 1991**	**2000/ 1969**	**2000/ 1950**
U.S.[b]	3.8	4.7	8.1	5.3	4.8	4.0	6.4	5.8
Louisiana	4.1	4.9	9.3	3.8	4.7	3.7	6.5	5.9
Texas	3.6	4.7	9.0	4.6	4.1	4.6	6.7	5.9
Mississippi	4.8	5.7	9.0	4.6	5.0	4.3	6.8	6.5
Alabama	5.2	5.0	8.8	5.7	5.1	3.7	6.8	6.4
Florida	4.3	4.8	8.3	5.5	4.7	3.7	6.4	6.0
Coastal Par & SMSAs[c d]	4.7	5.1	10.0	2.4	4.6	3.6	6.5	6.2
Non-Coast Par & SMSAs	4.2	5.2	9.0	4.7	4.7	3.6	6.6	6.3
Coastal Parishes								
Acadia	3.4	5.2	9.9	4.0	4.2	4.1	6.7	6.2
Assumption	5.1	3.5	10.7	2.2	4.7	4.2	6.8	6.4
Cameron	6.7	6.7	10.1	3.2	5.0	3.0	6.1	6.1
Iberia	4.1	5.1	10.9	0.8	4.4	3.6	6.6	6.0
Jefferson Davis	3.3	5.4	9.6	4.1	4.4	3.2	6.2	5.4
LaFourche	6.1	3.1	10.5	1.2	4.3	5.0	6.7	6.5
St. Charles	5.0	6.2	10.4	0.9	5.5	2.9	6.5	6.1
St. James	5.8	6.8	10.2	4.4	6.0	2.3	6.3	6.4
St. John the Baptist	n.a	n.a	10.1	1.5	5.8	2.8	6.7	n.a
St. Martin	1.7	5.7	10.7	1.5	4.8	4.0	6.8	6.6
St. Mary	6.1	6.4	9.9	1.8	4.2	4.5	6.4	6.4
Terrebonne	6.2	5.3	10.8	0.9	4.2	4.0	6.5	6.4
Vermillion	6.1	3.9	10.1	3.1	4.4	4.0	6.6	6.3
Coastal SMSAs/Parish								
Lafayette	4.3	4.3						
Lafayette			11.6	2.3	4.1	4.4	7.1	
Lake Charles	3.9	4.6						
Calcasieu			9.6	1.7	5.6	3.3	6.3	
New Orleans	3.3	4.2						
Jefferson			8.7	4.1	3.8	4.0	6.3	
Orleans			8.5	4.5	5.1	3.3	6.3	
Plaquemines			10.2	2.7	4.3	2.5	6.2	
St. Bernard			8.5	2.9	3.2	3.8	5.9	
St. Tammany			9.3	4.0	5.0	4.3	6.9	

[a] Data for 1959/50 and 1968/59 are taken from (Scott et al. 1971, pages 98-164).
[b] Data for U.S and these states during the 1950-59 and 1959-68 are from (USDOC, BEA. 2006a).
[c] St. Tammany is a part of the New Orleans Standard Metropolitan Statistical Area (SMSA) but not considered a coastal parish in this report and not included in the coastal parish average.
[d] Averages for parish classifications are arithmetic means of each cell for which data is available.

Table 2 (continued)

Average Annual Percentage Change in Per Capita Personal Income for GOM States, Louisiana Parishes and SMSAs, 1950 to 2000, for Selected Periods

Parish/ SMSA	1959/ 1950	1968/ 1959	1980/ 1969	1985/ 1981	1990/ 1986	2000/ 1991	2000/ 1969	2000/ 1950
Non-Coastal Parishes and SMSAs								
Allen	4.2	3.5	8.9	3.1	4.2	3.9	6.2	5.6
Ascension	5.0	10.5	9.8	3.3	6.2	4.0	6.8	7.1
Avoyelles	3.8	4.1	9.2	5.0	5.3	4.1	6.8	6.3
Beauregard	3.8	2.0	10.1	4.3	4.9	3.0	6.6	6.0
Bienville	5.4	3.2	9.3	4.8	3.5	3.5	6.6	6.6
Caldwell	2.0	4.9	9.9	5.7	4.9	3.5	6.9	6.0
Catahoula	1.9	7.0	9.4	2.9	5.5	3.8	7.0	6.2
Claiborne	4.3	4.9	9.0	4.4	3.3	3.8	6.4	6.1
Concordia	3.9	2.1	8.9	2.8	5.1	2.9	5.7	5.7
De Soto	4.3	3.5	9.5	3.6	3.2	4.6	6.6	6.5
East Carroll	8.6	3.8	9.0	4.2	5.3	1.6	6.3	6.2
East Feliciana	4.1	4.7	10.7	5.0	5.1	4.0	7.3	7.0
Evangeline	1.7	5.3	10.4	3.4	4.5	3.3	6.6	6.0
Franklin	2.8	8.0	8.9	5.1	6.4	3.3	7.0	6.2
Grant	5.4	3.5	8.5	4.9	5.0	4.1	6.5	6.5
Iberville	4.9	8.0	9.9	3.6	5.3	2.7	6.4	6.4
Jackson	4.8	3.4	8.8	5.0	3.5	5.1	7.0	6.4
LaSalle	3.4	1.8	9.9	6.6	4.7	2.8	6.6	5.6
Lincoln	5.1	4.0	9.2	5.3	5.3	3.0	6.6	6.3
Livingston	n.a	n.a	9.0	3.4	4.9	4.3	6.5	n.a
Madison	5.0	4.4	7.4	4.8	7.5	2.3	6.2	6.0
Morehouse	2.4	4.8	9.1	3.9	5.1	3.1	6.6	5.6
Natchitoches	4.6	5.7	8.5	5.8	4.1	4.0	6.7	6.6
Pointe Coupee	3.2	5.2	9.8	4.5	4.3	4.8	7.1	6.9
Rapides	4.1	4.6	8.7	5.6	5.2	4.2	6.8	6.3
Red River	3.7	6.8	7.8	4.9	4.6	3.0	5.9	6.4
Richland	3.0	7.3	9.9	3.8	4.8	3.1	6.8	6.4
Sabine	5.4	2.9	8.3	6.4	5.5	3.3	6.8	6.5
St. Helena	3.6	6.8	9.6	6.2	4.7	4.5	7.1	6.7
St. Landry	3.5	5.3	10.7	3.1	5.4	3.3	7.0	6.5
Tangipahoa	4.3	3.9	9.4	4.6	4.2	4.0	6.8	6.4
Tensas	6.2	4.9	8.5	3.5	6.1	3.1	7.1	6.8
Union	3.6	3.7	8.6	5.5	4.3	3.8	6.7	6.6
Vernon	4.9	12.8	5.2	7.3	3.7	3.1	5.4	6.8
Washington	4.6	2.1	8.6	4.2	3.7	3.5	6.1	5.5

Table 2 (continued)

Average Annual Percentage Change in Per Capita Personal Income for GOM States, Louisiana Parishes and SMSAs, 1950 to 2000, for Selected Periods

Parish/ SMSA	**1959/ 1950**	**1968/ 1959**	**1980/ 1969**	**1985/ 1981**	**1990/ 1986**	**2000/ 1991**	**2000/ 1969**	**2000/ 1950**
Webster	3.7	7.6	8.2	5.2	3.2	3.6	6.0	5.6
West Baton Rouge	4.6	5.2	10.4	4.6	5.4	4.1	7.1	6.9
West Carroll	5.1	4.7	9.0	5.1	4.4	3.8	6.8	6.5
West Feliciana	1.6	11.3	10.9	7.0	1.9	5.4	7.2	6.4
Winn	4.2	5.6	8.8	5.6	4.8	2.8	6.3	5.9
Non-Coastal	3.0	4.3	9.1	4.7	4.7	3.6	6.5	
SMSA Parish								
Baton Rouge	3.5	4.0						
East Baton Rouge			9.4	3.8	5.3	3.4	6.4	
Monroe	3.3	4.9						
Ouachita			9.1	5.1	4.7	4.1	6.8	
Shreveport	2.1	3.9						
Bossier			8.7	5.3	5.1	3.7	6.6	
Caddo			8.8	4.7	4.2	3.6	6.3	

Table 2 summarizes the change in per capita personal income (PCPI) from 1950 to 2000. Over the 1950 to 2000 period, each of the Gulf Coast States grew more rapidly than the nation as a whole, although the differences were minimal in the case of the two most energy intensive states, Louisiana and Texas, and small for Florida. Mississippi and Alabama, starting from the lowest absolute level, grew at rates significantly faster than the nation. Over the first three sub-periods, Louisiana grew faster but during the next three sub-periods grew at a slower rate than the nation. Rates of growth for the individual states varied in the sub-periods, which we have defined to coincide with trends in the energy markets, but the variation even in the 1969-1980 "boom" and 1981-1985 "bust" are not as great as the conventional wisdom may assume.

The averages for Louisiana's coastal and non-coastal parishes are not comparable to the state averages, since they are simply un-weighted averages of each parish or, for the earliest two periods, SMSAs, for which data are available. Since some parishes such as Orleans are much more populous and during some periods have grown relatively slowly, the unweighted average for both groups of parishes can exceed the state average. Over the longer term, considered as either 1950 to 2000 or 1969 to 2000, there is remarkable little difference in the growth rates for the two groups—one-tenth of one percent in both cases.

Regional differences in the change in per capita personal income over time have been studied for a number of reasons. One focus has been whether personal income was becoming more or less uniformly or equally distributed among the states or regions of the country. Another focus has been concerns about the economic future of regions as exemplified by terms like "Sun Belt" and "Rust Belt." Economic theory would suggest that economic activity would migrate from higher

cost regions to lower cost regions. Whether reality in fact followed this suggestion also has motivated a number of economic studies (Baro and Sala-I-Martin 1991; Blanchard and Katz 1992; Eff 1999; Garofalo and Yamarik 1999; Kim 1998; Michener and McLean 1999; Roback 1988).

From the 1940s to the 1980s there was a regional convergence in the average level of per capita personal income between the "richer" northeast, Midwest, and Far West states and the "poorer" south, plains, and mountain regions. In the 1980s, the convergence appeared to have stopped when incomes in the "richer" New England and Mideast states began again to increase relative to the national mean. Other higher-than-the-average regions, such the Far West and Great Lakes states, continued to approach the national average with the Great Lakes states falling slightly below the average in the mid-1980s.

A similar divergence took place among the "poorer" states when convergence stopped and stabilized in the mid-1980s. The data are outlined in Table 3 and illustrated year-by-year in Figures 10 and 11. Figure 10 illustrates the converging and diverging regional trends for the eight major census regions for years in the 1969 to 2000 period that will be used in the study.

Broad regional groupings can conceal important differences at the state level. Table 4 and Figure 11 show the trends in per capita income relative to the U.S. average for the five GOM states for the same periods. Texas and Louisiana, the principal oil and gas producers, show significant gains during the 1969 to 1980 boom, but ten years later had fallen back close to their 1969 levels. Mississippi and Alabama exhibit slower but steadier growth, while Florida hovered very close to the national average throughout the period.

Table 3

Per Capita Personal Income as a Percentage of U.S. Average for Selected Years

Year / Region	1970	1980	1981	1985	1986	1990	1991	2000	2003
Far West	115	115	114	111	111	109	108	107	105
Mideast	113	108	108	111	112	116	116	114	114
New England	109	105	105	112	115	117	115	121	121
Great Lakes	103	102	100	99	99	98	98	99	99
Plains	94	94	96	96	95	93	94	95	97
Rocky Mtns	92	97	97	92	91	89	90	95	96
Southwest	88	96	98	95	91	88	88	91	90
Southeast	81	86	86	87	88	89	89	89	90

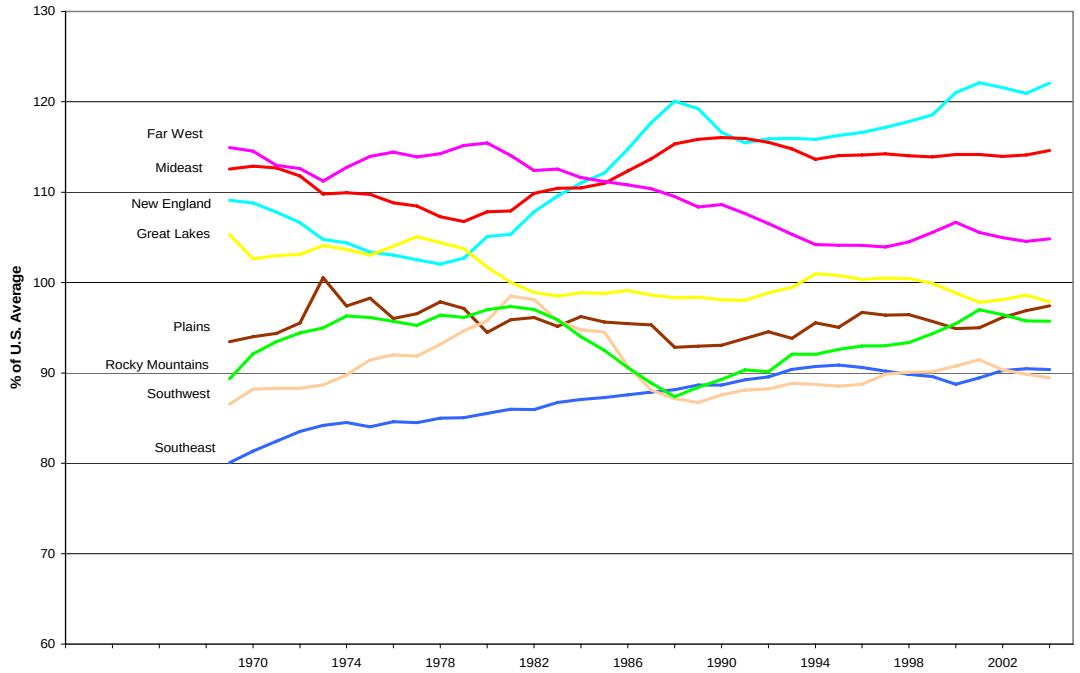
Source: Calculated by author from BEA regional economic data.

Table 4

Per Capita Personal Income in Gulf of Mexico States as a Percentage of the U.S. Average for Selected Years

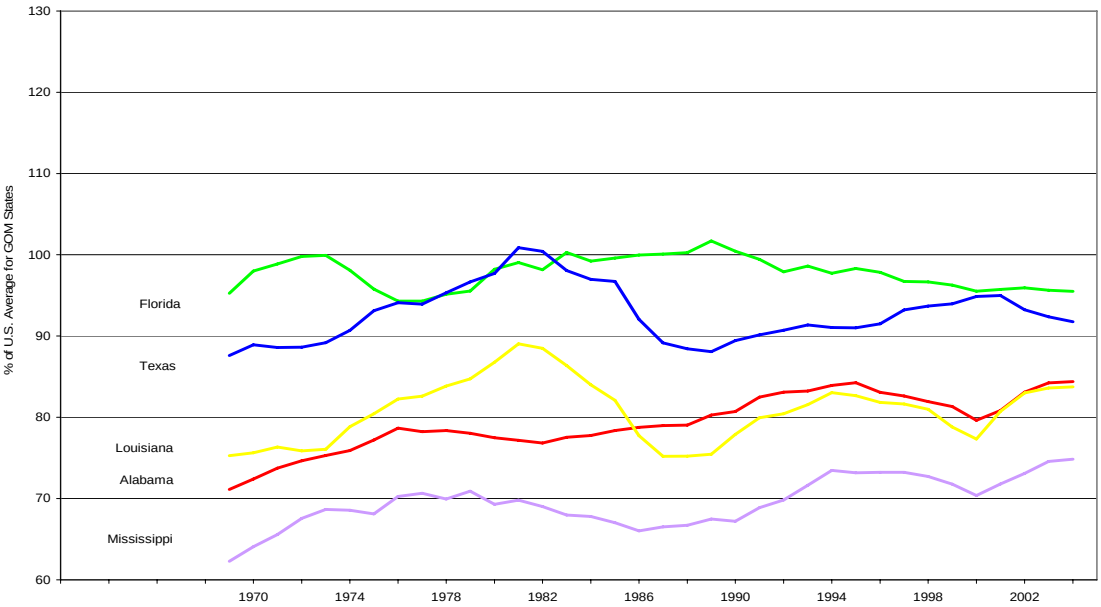
Year / *State*	1969	1980	1981	1985	1986	1990	1991	2000	2003
Texas	88	98	101	97	92	89	90	95	92
Louisiana	75	87	89	82	78	78	80	77	83
Mississippi	64	69	70	67	66	67	76	70	74
Alabama	72	77	77	78	79	81	82	80	84
Florida	98	98	99	100	100	100	99	96	95

Source: Calculated by author from BEA regional economic data, 1969 taken from (Garnick and Friedenberg 1982).



Source: USDOC, BEA. 2006a.

Figure 10. Comparison of PCPI for Various Regions as a Percent of U.S. Average.



Source: USDOC, BEA. 2006a.

Figure 11. Comparison of PCPI for GOM States as a Percent of U.S. Average.

11.5. The Evolution and Perturbation of Oil and Gas Markets

Prior to the embargo declared by the Organization of Arab Petroleum Exporting Countries (OAPEC) in the fall of 1973, prices in U.S. oil and gas markets were extensively "administered" or regulated by governmental agencies or industry organizations. The annual variation in nominal oil prices was recorded in pennies not dollars. Regulations evolved at the state and national level to guard against prices falling because of excess domestic capacity and the availability of cheaper imports.

The Federal Power Commission regulated the price of natural gas moving between the states. Thus factors changing the demand or supply of either product were not automatically, nor necessarily, reflected in the prices paid for the commodity. Complicating the picture were import controls and the prorationing system that was in effect in the 1960s, the wage and price controls set up in 1972 by the Nixon Administration and excess profit taxes levied to prevent energy producers from reaping windfall profits from the escalation of prices internationally that began with the 1974 Arab oil embargo and the gradual decontrol of U.S. prices in the 1980s.

Figure 12 shows the posted price of the common benchmark West Texas Intermediate oil for the period 1950 to 2000. If the figure were extended to the left to1940 there would be little change in the stability of the 1950 to 1973 period. However, after the OAPEC embargo was announced in the Fall of 1973 the changes are dramatic, especially in the perspective with the near stability during the preceding decades. In retrospect, it seems clear that much of the oscillation in oil and gas prices and the inefficiencies that resulted were the consequence of counter-productive measures to respond to the perceived crisis kicked off by the Arab oil embargo in the early 1970s followed by the Iran/Iraq war at the decade's conclusion.

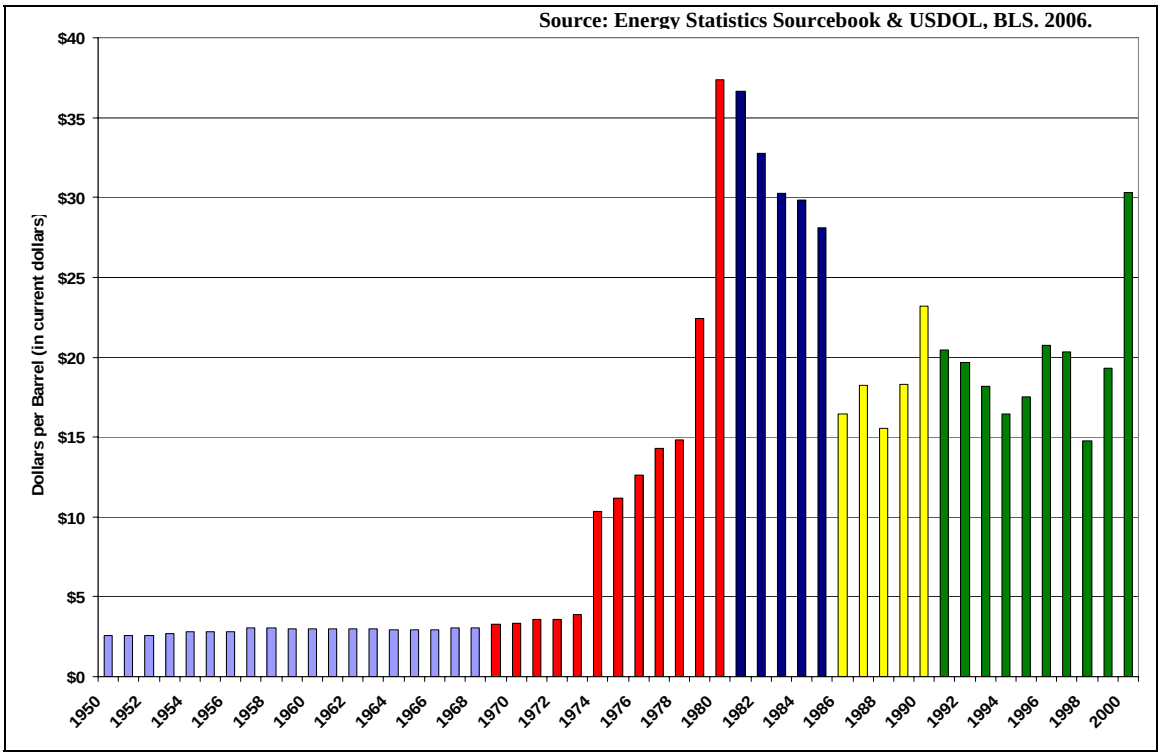


Figure 12. Posted Price for West Texas Intermediate Beginning of the Month (in current dollars).

Unrealistic expectations engendered by these events on the part of energy producers and consumers (and analysts), however, was probably the more consequential result: namely, the widespread assumption during the 1974 to 1980 run-up that price increases and shortages would continue unabated into the future. Fifty-dollar-a-barrel crude oil and two-dollar-a-gallon gasoline were the conventional expectations.

Two stages to the erosion of expectations about the energy future can be seen in Figure 12. Uncertainty about the consequences of war between two major Persian Gulf exporters, complicated by inefficient and distorting domestic allocation regulations in the U.S. and uncertainty and speculation in international markets, almost doubled oil prices between 1979 and 1980 from a little over $20 per barrel to about $40 per barrel. Then, for the following five years, prices declined in small, steady increments as the combined forces of: 1) more efficient energy use and conservation, 2) the extraordinary ability and willingness of Saudi Arabia to either make up oil market shortfalls or restrict its own exports to stabilize (high) prices, and 3) increased oil supplies from non Persian Gulf suppliers became apparent.

Slowly eroding oil prices slipped into a full collapse in 1985, when Saudi Arabia decided to support them no longer. Saudi Arabia had cut back its own exports from about 8 million barrels a day to 2 million barrels a day over the preceding ten years and finally decided “enough was enough” and began to return shut-in capacity to production.

The effects on the oil and gas industries along the Gulf coast were by any measure dramatic. Most directly, as illustrated in Figures 13a and 13b, efforts to find and develop oil and gas reserves also collapsed. The number of drilling rigs active in South Louisiana and in offshore waters fell from its 1981 peak of nearly 500 to 150 by 1986. On the offshore alone the decline was from a 1981 peak of about 250 to about 100 rigs in 1986.

The "unstacked" depiction in Figure 13b compares rigs in South Louisiana (roughly the same area we designate as Coastal Louisiana) with rigs active on the federal OCS. The two series track each other closely as the rig count increased from about 100 at the time of the 1974 embargo to around 230 at the 1981 price peak. Rigs steadily left both areas until the early 1990s with the OCS maintaining about 50 or so more active rigs than Coastal Louisiana. After bottoming out, the number of rigs on the OCS increased with the exploration and development of deeper water, reaching nearly 150 by the end of the decade. In South Louisiana the rig count remained close to its minimal value of 50 throughout the period.

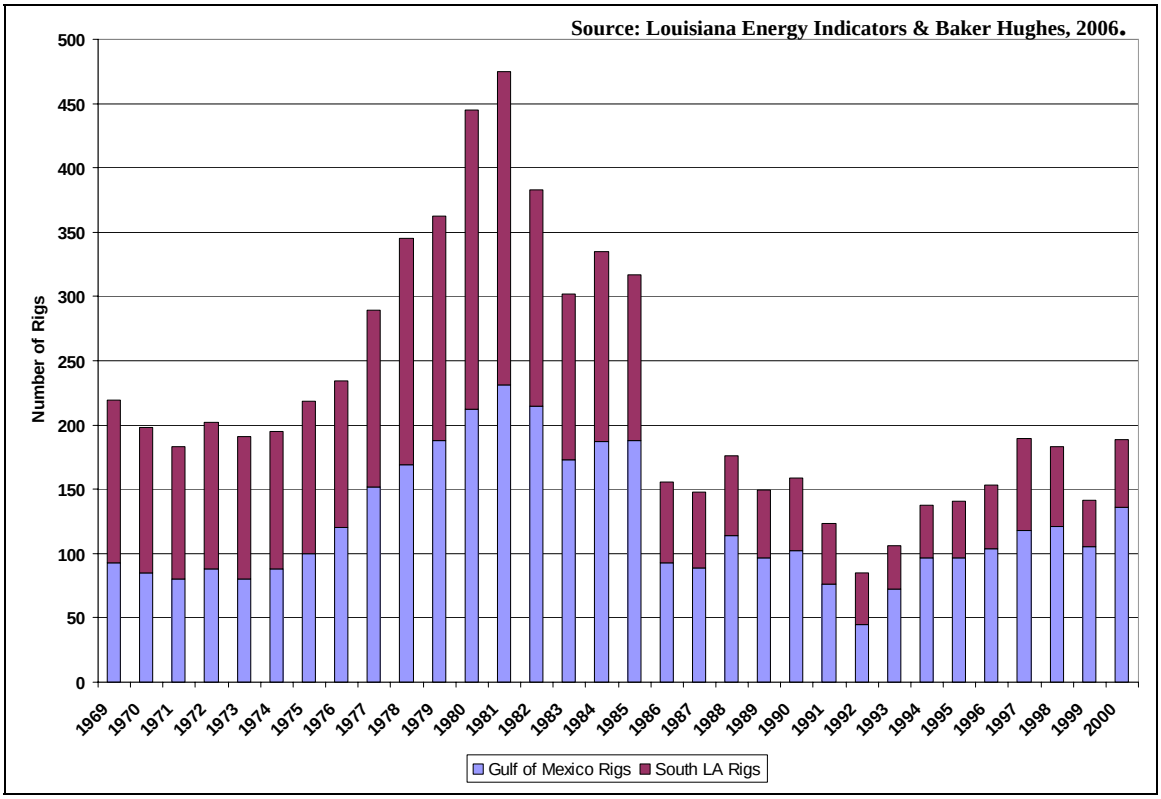


Figure 13a. Rig Count - Gulf of Mexico and South Louisiana, Bar Graph.

The modest increase in offshore activity reflected in the figure does not, however, reflect an important change in the offshore industry—the movement to the "deep gulf." Drilling in very deep waters without fixed platforms means that the size of drilling and development projects, and their associated budgets, has increased very significantly. Much larger platforms are involved in the deep gulf and many more wells are drilled from each platform. This development, however, did not start until the mid-1990s, thus although a simple "rig count" may tend to underestimate the recovery, the effect is probably limited to the last few years of the study period.

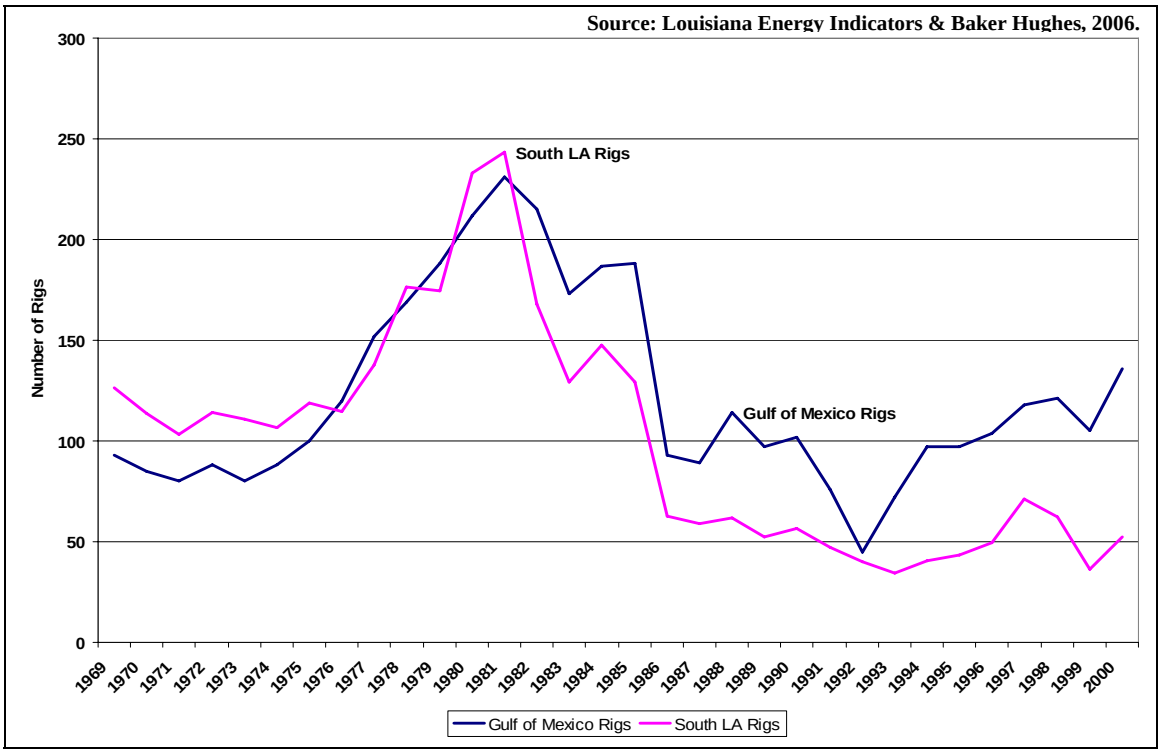


Figure 13b. Rig Count - Gulf of Mexico and South Louisiana, Line Graph.

The perturbations in oil and gas markets that occurred in the 1970s and 1980s and their repercussions on offshore activity provide an unusual context of "extremes" to study the effects of offshore oil and gas development on coastal economic activity and communities. Usually changes in economic and social data are more gradual and moderate. Using extremes in empirical economics has both analytical advantages and disadvantages. Larger and more frequent variations in data make it easier to be confident in differentiating causal relationships from stochastic ones. However, if as in our case, we are interested in understanding the longer-term, cumulative effects of industry activity on coastal economies and communities, extreme variation may confuse short-run adjustments to unusual events with long-term trends or relationships.

11.6. Components of Change in Per Capita Personal Income

Edward Dennison and others developed "growth accounting" in the Bureau of Economic Analysis of the U.S. Department of Commerce in the 1970s to better understand the slowing of the rapid economic growth experienced during the 1950s and 1960s. The technique is based on the following identity summarized mathematically as:

$$\textbf{(1)}\ \frac{TPI}{N} = \frac{H}{J} \times \frac{E}{H} \times \frac{J}{N} \times \frac{FI}{E} \times \frac{TPI}{FI},$$

Where TPI is total personal income, N is total population, H is hypothetical earnings—essentially what earnings in the parish or metropolitan area would be if those employed in the sectors or industries in the region were to be paid the national average wage of that industry or sector, J is the number of jobs, E is earnings actually paid in the region, and FI is factor income (property income plus earnings). The comparisons used here are the percent change in these components which sum to the overall growth rate. These components are called:

- The industry-mix (H/J) component measures the contribution to growth in per capita personal income attributable to industries paying higher wages growing faster relative to industries paying lower wages in the jurisdiction.[64]
- The relative wage component (E/H) measures the extent to which wages in the parish increased or decreased relative to the average wage paid nationwide, with the mix of industries kept constant.
- Labor force participation (J/N) refers to changes in personal income attributable to changes in the proportion of the population that participates in the paid labor force.
- Transfer payments (TPI/FI) include social insurance, public assistance, and other income supplements not dependent upon participation in the labor force.
- Property income (FI/E) comes from payments to individuals from interest, rent, and dividends.

The technique is useful because it divides the change in per capita personal income into components that are conceptually distinct and correspond to factors that are easily intelligible to non-specialists. In the following three sections, this technique is used to describe and to compare the economic performance of :

- The five Gulf Coast States of Alabama, Florida, Louisiana, Mississippi, and Texas.
- Louisiana's 19 coastal parishes and the 45 non-coastal parishes.

[64] For individual parishes and metropolitan areas, industries are defined using the very broad one-digit standard industrial classification (SIC) that only divides economic activity into 13 broad sectors; agriculture, mining, construction, manufacturing, etc. For states, in addition to the one-digit classification, a two-digit SIC classification is available that distinguishes industries or sectors into a finer division; for example, it distinguishes petroleum refining from the chemical industry within the manufacturing sector, but does not distinguish chemical plants that make commodity chemicals such as chlorine from plants that manufacture pharmaceuticals.

11.7. Components of Per Capita Personal Income Growth in the Gulf Coast States

The five Gulf Coast states include about 13 percent of the nation's land area and 17 percent of the nation's population. The composition of their economies differs significantly. Florida's population has been growing rapidly with tourism, retirement, and services providing much of the impetus. The state's population grew more than four times faster than Alabama, Mississippi, and Louisiana and almost twice as fast as Texas. Personal Income in the aggregate also grew at a faster rate in Florida, although the difference was not nearly as great—about twice as fast as Alabama and Mississippi, two and a half times as fast as Louisiana and about 40 percent faster than Texas.

The relationship of growth in per capita personal income among the states, however, is reversed. Over the 1969-to-2000 time period per capita personal income in Florida grew at a rate of 6.4 percent—the lowest rate among the five Gulf States. Alabama and Mississippi grew at nearly 6.8 percent, Texas at 6.7 percent, and Louisiana at nearly 6.5 percent. Comparing growth rates of the Gulf Coast states to the distribution for all 50 states, only Alabama and Mississippi are more than one standard deviation from (above) the U.S. mean.

Florida is a large energy consumer, but it has vigorously resisted oil and gas development in offshore areas as environmentally and economically threatening to its economic foundation of tourism, recreation and retirement. The manufacturing sector of Alabama's economy has evolved from heavy primary industries like iron and steel to automobiles. A small but growing natural gas based energy sector has developed in Mobile Bay. Mississippi is the most rural of the five states, but gambling, manufacturing, and tourism have helped it grow in the later part of the period. It has a refining and chemical complex in Pascagoula. Louisiana is the most energy intensive state from both a production and consumption basis, but also has considerable manufacturing activity and, in New Orleans, a well developed tourism base. Texas is also an energy intensive state with Houston becoming the national center for oil and gas headquarters and technology. It has a more diversified economy than the other states, including a growing high-tech sector in Dallas, Austin and San Antonio.

Table 5 shows the growth rates of per capita personal income and their components for the Gulf Coast states for the four divisions of the study period.

Table 5

Growth Rates of Personal Income and Its Components for Gulf Coast States, 1969-2000

Period: 1969-2000 STATE	ΔPersonal Income/Person	Industry mix	Relative wage effect	Labor Force Participation	Property Income Ratio	Transfer Payment Ratio
1969-1980						
Alabama	8.79	7.09	0.38	0.68	-0.27	0.92
Florida	8.33	6.59	0.01	0.86	-0.13	0.99
Louisiana	9.26	7.24	0.53	1.31	-0.24	0.41
Mississippi	8.97	7.20	0.15	0.63	-0.48	1.47
Texas	8.99	6.99	0.61	1.21	-0.31	0.49
Mean	8.87	7.02	0.34	0.94	-0.29	0.86
1981-1985						
Alabama	5.75	4.41	-0.03	0.96	0.05	0.36
Florida	5.54	4.56	-0.41	1.33	-0.21	0.27
Louisiana	3.81	3.86	-0.91	-0.73	0.36	1.22
Mississippi	4.63	4.60	-0.49	-0.04	0.16	0.40
Texas	4.59	3.86	-0.08	-0.06	0.18	0.69
Mean	4.86	4.26	-0.38	0.29	0.11	0.59
1986-1900						
Alabama	5.13	3.52	-0.17	1.53	0.11	0.15
Florida	4.74	3.51	0.56	0.11	-0.08	0.64
Louisiana	4.68	3.85	-1.01	1.69	0.18	-0.03
Mississippi	5.00	3.67	-0.20	1.37	0.07	0.09
Texas	4.07	3.66	-0.69	1.08	0.32	-0.30
Mean	4.72	3.64	-0.30	1.15	0.12	0.11
1991-2000						
Alabama	3.71	3.36	-0.72	0.79	-0.01	0.28
Florida	3.66	3.65	-0.47	0.94	0.16	-0.62
Louisiana	3.73	3.39	-0.77	1.03	0.03	0.05
Mississippi	4.27	3.31	-0.14	1.03	0.02	0.05
Texas	4.57	3.74	0.50	0.71	0.43	-0.81
Mean	3.88	3.50	-0.40	0.90	0.13	-0.21
1969-2000						
Alabama	6.77	5.44	-0.06	0.88	-0.07	0.57
Florida	6.42	5.37	-0.14	0.81	-0.09	0.48
Louisiana	6.49	5.42	-0.31	0.91	-0.03	0.50
Mississippi	6.79	5.56	-0.10	0.75	-0.17	0.77
Texas	6.66	5.42	0.31	0.79	0.06	0.07
Mean	6.63	5.44	-0.06	0.83	-0.06	0.48

11.7.1. Embargo, War and Rising Energy Prices: 1969-1980: During the initial period of the embargo, the Iran/Iraq war, and the end of administered and controlled energy prices, the two principal energy producing states, Louisiana and Texas, were among the states with the fastest rates of growth in per capita personal income, as was Mississippi with a much smaller energy sector—only eight percent of gross state product compared to 38 and 21 percent in Louisiana and

Texas respectively in 1980. During this period only Wyoming and Alaska grew faster than Louisiana, and the growth rates in Louisiana, Texas and Mississippi all were more than one standard deviation above the mean for all states. Only Wyoming and West Virginia gained more from improvements in industry mix than did Louisiana. Mississippi had the next largest improvement. Texas, however, had a more modest gain.

Although an improving industry mix is by far the largest contributor in all of the Gulf Coast States, the contributions from other factors reveal significant differences among the roots of the growth. In Louisiana and Texas, increases in wages relative to the rest of the nation, and labor force participation were major factors. But in Mississippi and in Florida, after improvements in industry mix, the next largest contributor to growth was an increase in transfer payments. Although the increases in labor force participation in Louisiana and Texas were large in absolute terms and in comparison to the other Gulf States, this was a period of fairly rapid growth in labor force participation nationwide, and the contribution in neither state was more than one standard deviation above the mean.

11.7.2. Eroding then Collapsing Energy Prices and Expectations: 1981-1985: After oil prices peaked in 1980 and then slid steadily downward until their collapse in 1985, Louisiana went from the third fastest to the third slowest growing state in the nation as measured in terms of the growth per capita personal income. Only Wyoming and Montana grew more slowly. In Louisiana, the contribution from relative wages went from a sizeable plus to a sizeable minus, with only two other energy-producing states, Wyoming and Oklahoma, experiencing larger relative declines. Louisiana's energy misfortunes were partly offset by rising transfer payments, which accounted for one-third of the state's growth in per capita personal income during the energy bust. The effects of the energy turmoil on the other Gulf Coast states—even Texas—were not distinguishable from the rest of the nation in the sense that in none did the growth rate for PCPI fall beyond one standard deviation below the mean for all states. The contribution from an improved industry mix, however, did fall in Texas to almost the same level as in Louisiana—a drop of nearly 50 percent. Although relative wages and participation also fell in Texas, the decline exceeded a standard deviation only in the case of participation.

11.7.3. Recovery from the Oil Price Collapse: 1986-1990: Despite the severity of falling oil prices and evaporation of expectations of a permanent energy boom, remarkably few differences are apparent between the two energy intensive states and the other Gulf Coast states or between the energy intensive states and the other 48 states during the post-collapse, "recovery" period from 1986 to 1990. Per capita personal income growth rates for all of the Gulf Coast states lie within one standard deviation of the national mean, with Louisiana and Florida almost exactly at the mean and Texas the only Gulf Coast state below the mean. Among the components of growth, Louisiana's improvement in industry mix and retreating relative wages fell beyond the one standard deviation boundary, as did Florida's (positive) transfer payments and (negative) labor force participation. The only other outlier was Texas' property income. It might be argued that the severity of Louisiana's decline should have produced a bigger bounce in the recovery, but the state's growth rate was only slightly below Florida's and above that of Texas. Growth rates in all of the Gulf Coast states except Texas exceeded the nation's average.

11.7.4. The Energy Lull: 1991-2000: The expectation of the early 1980s that oil and gas prices would continue to escalate toward, and beyond, the $50 per barrel landmark were not realized. Within three years of the 1985 collapse, oil was selling for $15 a barrel and bounced between $15 and $25 for the rest of the 1980s and 1990s. In real or inflation corrected terms, energy prices fell and consumers needed to spend progressively less of their incomes for energy, especially for gasoline.

The resulting plateau in oil and gas activity is reflected in the rig count data shown in Figures 13a and 13b. OCS activity, however, increased steadily driven by major improvements in technologies for finding (3D seismic) and developing (non-fixed platforms and sub-sea completions) resources, especially in very deep water as reflected in the oil and gas production levels shown in Figures 4a and 4b.

The effects of this lull in the oil and gas sector on the economies of the Gulf Coast states were mixed and difficult to interpret.

Texas grew the fastest during the period and was the only Gulf Coast state whose growth rate was one standard deviation above the national mean. Texas also was the only Gulf Coast state that grew faster in the 1990s (4.57 percent per year) than during the previous 1986-1990 "recovery" (4.07 percent per year). The only states that grew faster than Texas were Colorado and Massachusetts. This suggests it may have been "new economy" or "high tech" rather than energy providing the momentum for Texas' surge. This conjecture is supported by the fact that the improvement in Texas' industry mix was exceeded only by Nevada.

Florida's improvement in industry mix ranked fourth in the nation, while the contribution from industry mix improvements in the other three Gulf Coast states was below the national mean.

Relative wage growth in Texas was positive and one standard deviation above the mean but negative and below the national average in the other four Gulf Coast states. Per capita personal income in Louisiana grew at 3.73 percent per year, only about 80 percent as fast as Texas.

Relative wages in Louisiana made a negative contribution to growth and were more than one standard deviation below the national mean.

The only other components that fell beyond plus or minus one standard deviation from the national mean for the period were: (1) transfer payments, where negative contributions in Florida and Texas and a positive contribution in Alabama were outside that range; and (2) property income, where the positive contribution in Texas led the nation.

11.7.5. The Long-Term View: Looking at the change in per capita personal income over the entire 1969 to 2000 study period for the five Gulf Coast states suggests that the effects of oil and gas development were largely limited to the early embargo/war/deregulation cycle. During that period the two most energy intensive states, Louisiana and Texas, grew at faster rates than the rest of the nation and their pattern of growth was consistent with the economic stimulation coming from the energy boom. Similarly, both Louisiana and Texas were harder hit by the

collapse of energy prices in the subsequent 1981 to 1985 cycle and the end of expectations that energy prices would continue to increase. The negative effects were less intense in Texas, however, with the drop in PCPI less than (or within) a standard deviation from the mean for all states.

During the two cycles that comprise the second half of the study period, however, there is little to distinguish the energy intensive states from their neighbors—or from the other 45 states of the union. Texas seems to have benefited more from the "high tech" and "new economy" trends and the differences among the five states were not consistently related to energy developments. Other economic factors offer more cogent explanations of differences in PCPI growth along the Gulf Coast than do energy effects.

State-versus-state comparisons usually are not the best framework for regional economic analysis. States are political and administrative units and not economic entities. They are often of quite disparate sizes, geographical configurations, and even cultures. In large states, state-level data may "average out" or otherwise mask effects that are most relevant to the question or issue at hand.

The next two sections apply the same methodology used in the previous section to compare changes in per capita personal income of the coastal and non-coastal parishes in Louisiana and the coastal and non-coastal Metropolitan Statistical Areas (MSAs).

11.8. Components of Per Capita Personal Income Growth in Louisiana's Parishes

Table 6 summarizes the growth rates for the 19 coastal parishes and 45 non-coastal parishes shown in Figure 8. The overall growth rate was allocated among its five components for each parish. A normalized standard deviation, or "Z score," was calculated for each contributor in each parish based on the distribution of the value among all the parishes in the state. The means for the overall growth rate and for each of the five contributors were computed, and means for the group of 19 coastal parishes were compared to the corresponding means of the 45 non-coastal parishes for each of the four time periods. The results are summarized in the following table.

Table 6

Changes in Per Capita Personal Income and Its Components, 1969-2000[65]

Period Group	Δ Personal Income/ Person	Improved Industry Mix	Relative Wage Effect	Labor Force Participation	Transfer Payment Ratio	Property Income Ratio
1969-1980						
Coastal	10.04	7.49	0.60	2.38	0.04	-0.51
Non-C	9.13	6.91	0.45	0.51	1.75	-0.68
1981-1985						
Coastal	2.41	3.49	-1.31	-2.59	2.01	0.42
Non-C	4.67	4.46	-1.04	-0.03	0.91	0.27
1986-1990						
Coastal	4.63	3.70	-1.33	2.21	0.22	0.03
Non-C	4.74	3.87	-0.62	1.24	-0.01	0.22
1991-2000						
Coastal	3.62	3.54	-1.05	0.88	0.33	0.01
Non-C	3.62	3.45	-0.91	1.12	0.22	-0.19
1969-2000						
Coastal	6.47	5.43	-0.54	0.99	0.72	-0.16
Non-C	6.61	5.45	-0.30	0.87	0.89	-0.20

To further help the reader follow the analysis, a chart comparing changes observed during the period being discussed and the previous period is inserted between the discussions of each period—except the first. Following the detailed comparisons of the components of changes in per capita personal income in the next two sections, there is a brief discussion of net migration at the parish level for the same time periods.

11.8.1. 1969 to 1980: Embargo, War, Rising Energy Prices and Expectations: This period was one of exceptional improvement in both coastal and non-coastal parishes, but despite the similarity of their overall growth rates, the components of the growth were discernibly different in the two groups of parishes.

About three-fourths of the growth was attributable to an improvement in industry mix, i.e., higher wage industries or sectors grew faster relative to lower wage sectors, using average national wage levels to define high- and low-wage sectors of the economy. This was true for both groups of parishes.

[65] Tables A1a to A5b in Appendix A in Pulsipher (2006) show growth rates and "z scores" for each parish for the same periods. The reference also includes a more detailed description of the components of growth and an analysis of the standard metropolitan statistical areas.

The contribution of the other major factors differed significantly between the two groups:

- Keeping the mix of industries constant, wages increased relative to the national average in both coastal and non-coastal parishes, but they increased in coastal parishes about 25 percent more rapidly than in the non-coastal parishes.
- The regional wage effect was small relative to industry mix improvements, however, contributing about six percent of the total in coastal parishes and about five percent of the total in non-coastal parishes.
- Change in the extent to which the population participated in the labor force contributed 2.4 percentage points to the growth rate of personal income in the coastal parishes (about a quarter of the total growth rate) but only 0.5 percentage points, or about six percent, in non-coastal parishes.
- Conversely, changes in transfer payments contributed 1.75 percentage points to the mean growth rate in non-coastal parishes (about 19 percent) but only 0.04 percentage points or 0.4 percent, in coastal parishes.

Thus, increases in relative regional wages, and, especially, increased labor force participation increased growth rates in coastal parishes, while transfer payments offset much more modest regional wage and labor force participation gains in non-coastal parishes.

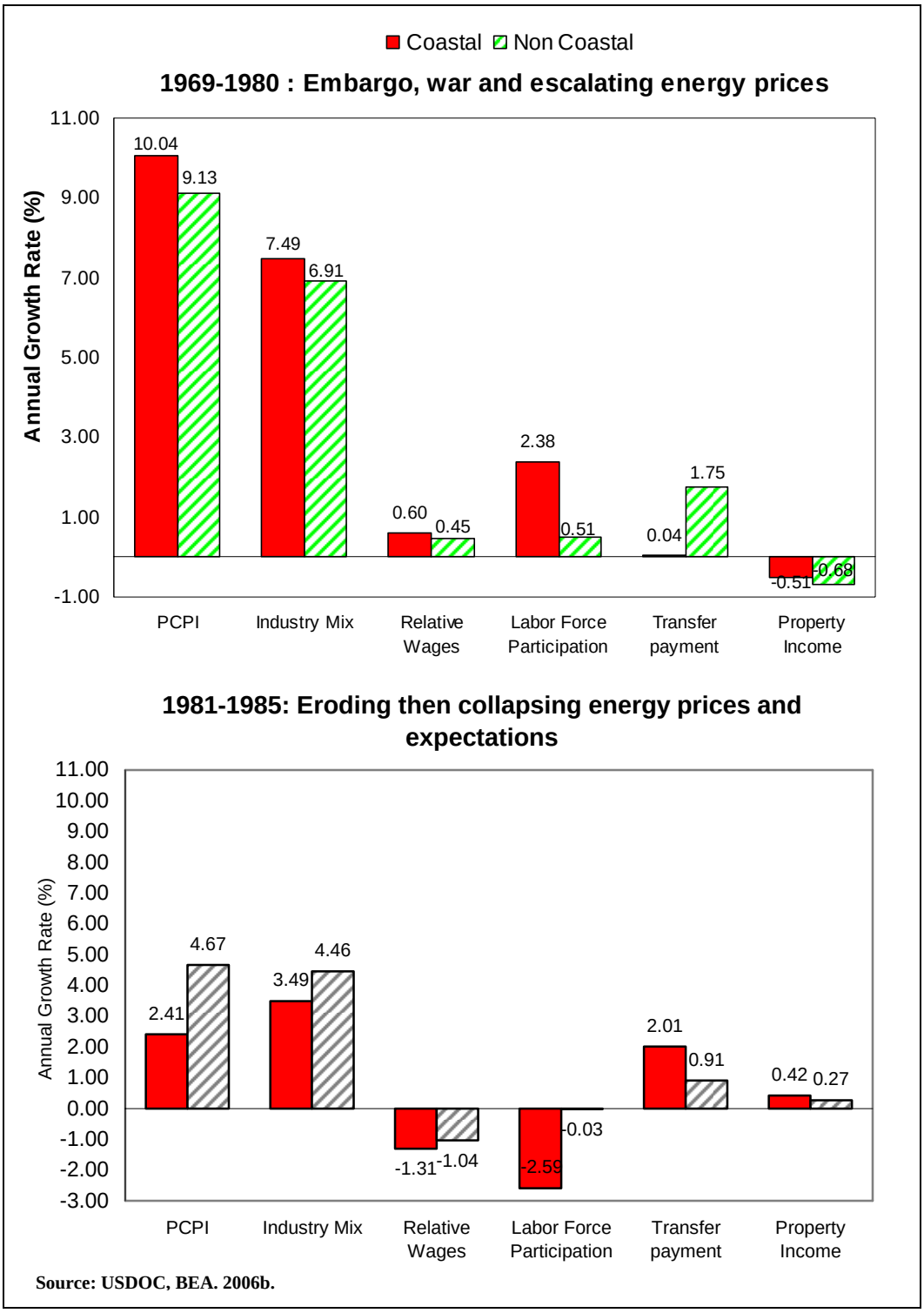


Figure 14. Change in PCPI - 1969-1980 Compared to 1981-1985.

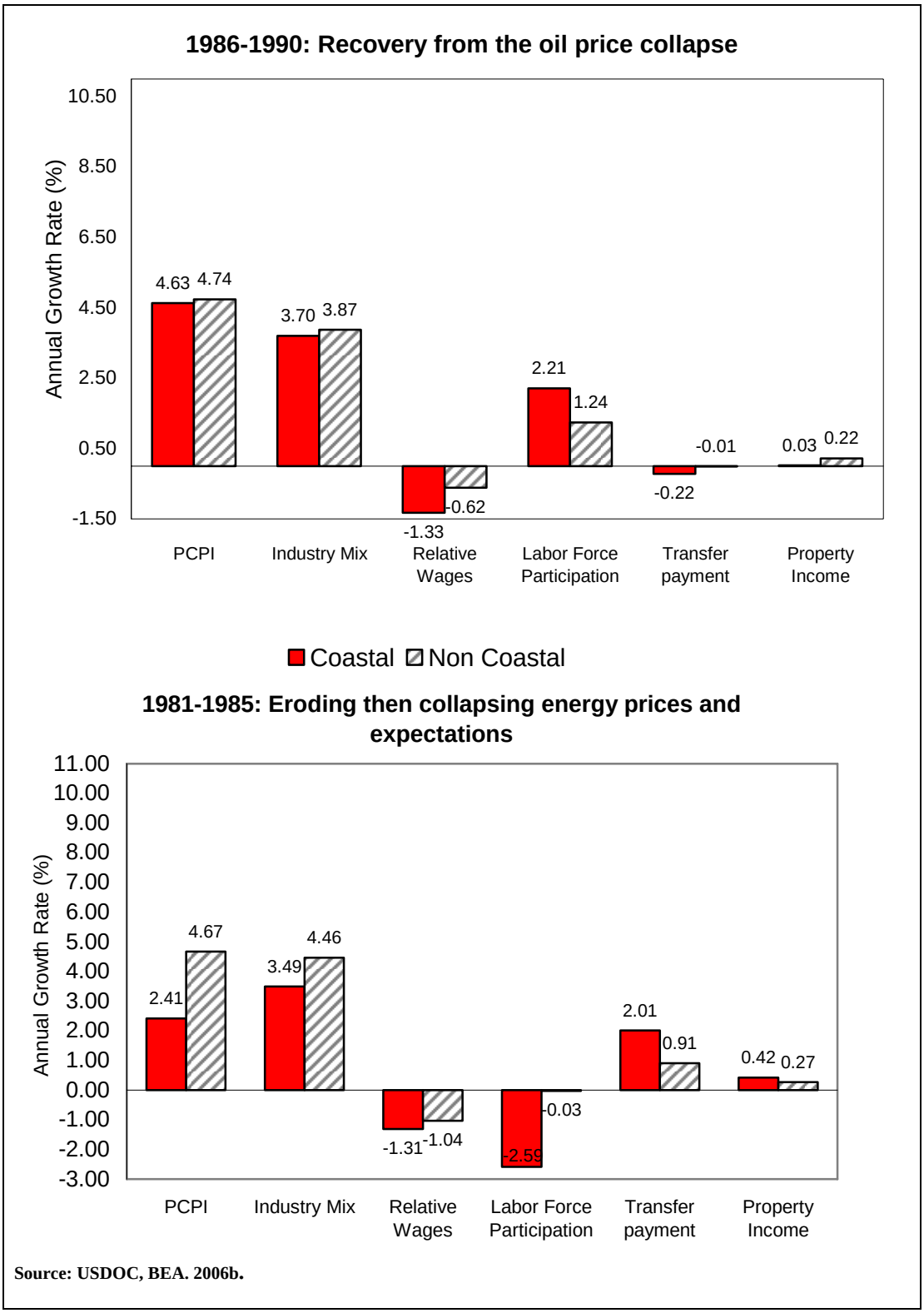
11.8.2. 1981-1985: Eroding then Collapsing Energy Prices and Expectations: The collapse in world oil prices reduced growth rates in both coastal and non-coastal parishes, but the drop was almost twice as deep in the coastal parishes. The growth rate of per capita personal income was below the mean for the state by more than one standard deviation in 53 percent of the coastal parishes but none of the non-coastal parishes. Of the coastal Parishes, only Orleans, Jefferson, and St. James had growth rates above the state mean and none came close to the one standard deviation interval.

The positive contribution of a better industry mix continued but declined in both groups of parishes. It added 3.5 percentage points to the growth of PCPI in coastal parishes and 4.5 percent in the non-coastal group.

The contributions of the other factors more or less reversed the relationships evident in the previous period of quite rapid growth.

- Wages declined relative to the nation in both groups of parishes, subtracting 1.31 points from the growth of PCPI in coastal parishes and 1.04 in the non-coastal parishes. Among the coastal parishes, only Orleans experienced a small relative improvement.
- Decreased labor force participation was a major factor holding down growth in coastal parishes, making a negative contribution of −2.59 percentage points relative to an overall rate of only 2.56. The decline in non-coastal parishes was very small, only −0.03 compared to an overall rate of 4.7.
- Transfer payments constituted a major source of support for personal income in the coastal parishes, adding 2.01 percentage points (79 percent) to the overall growth rate of 2.56. In non-coastal parishes the contribution of transfer payments was only about 20 percent of the total.

Thus, falling relative wages and decreased labor force participation were principal avenues of adjustment to falling world oil prices in coastal parishes, their negative effects on income modified significantly by increases in transfer payments. In non-coastal parishes both the negative and positive contributors were much weaker and the overall growth rate was not quite twice as fast as it was in the coastal parishes.



Source: USDOC, BEA. 2006b.

Figure 15. Change in PCPI - 1981-1985 Compared with 1986-1990.

11.8.3. 1986-1990: Recovery from the Oil Price Collapse: The effects of a "recovery" from the collapse of world oil prices are apparent only among the coastal parishes where the overall growth rate increased by about 90 percent from the depressed level of the previous period. Coastal parishes regained parity with non-coastal parishes, but both groups grew at only about half as fast as they had during the boom of the 1970s.

Industry mix's contribution to growth fell below levels exhibited during the bust for non-coastal parishes, 3.87 down from 4.46, but improved to a slightly faster rate in coastal parishes, 3.70 up from 3.49.

Wages continued to be a modest negative relative to the rest of the nation in both groups of parishes, but subtracting twice as much from the PCPI growth rate in coastal parishes, −1.33 compared to −0.62 for the non-coastal group.

Increased participation in the labor force was the principal evidence of recovery among the coastal parishes, adding 2.2 percentage points to the 4.6 overall growth rate. The contribution in non-coastal parishes was positive but only half as large.

Transfer payments did not make nearly as large a contribution as they did in the previous two periods for either group of counties. The contribution was negative but negligible in non-coastal parishes and slightly larger and negative in the coastal parishes.

Property income made a small positive contribution in the non-coastal parishes and a negligible but positive contribution in the non-coastal parishes.

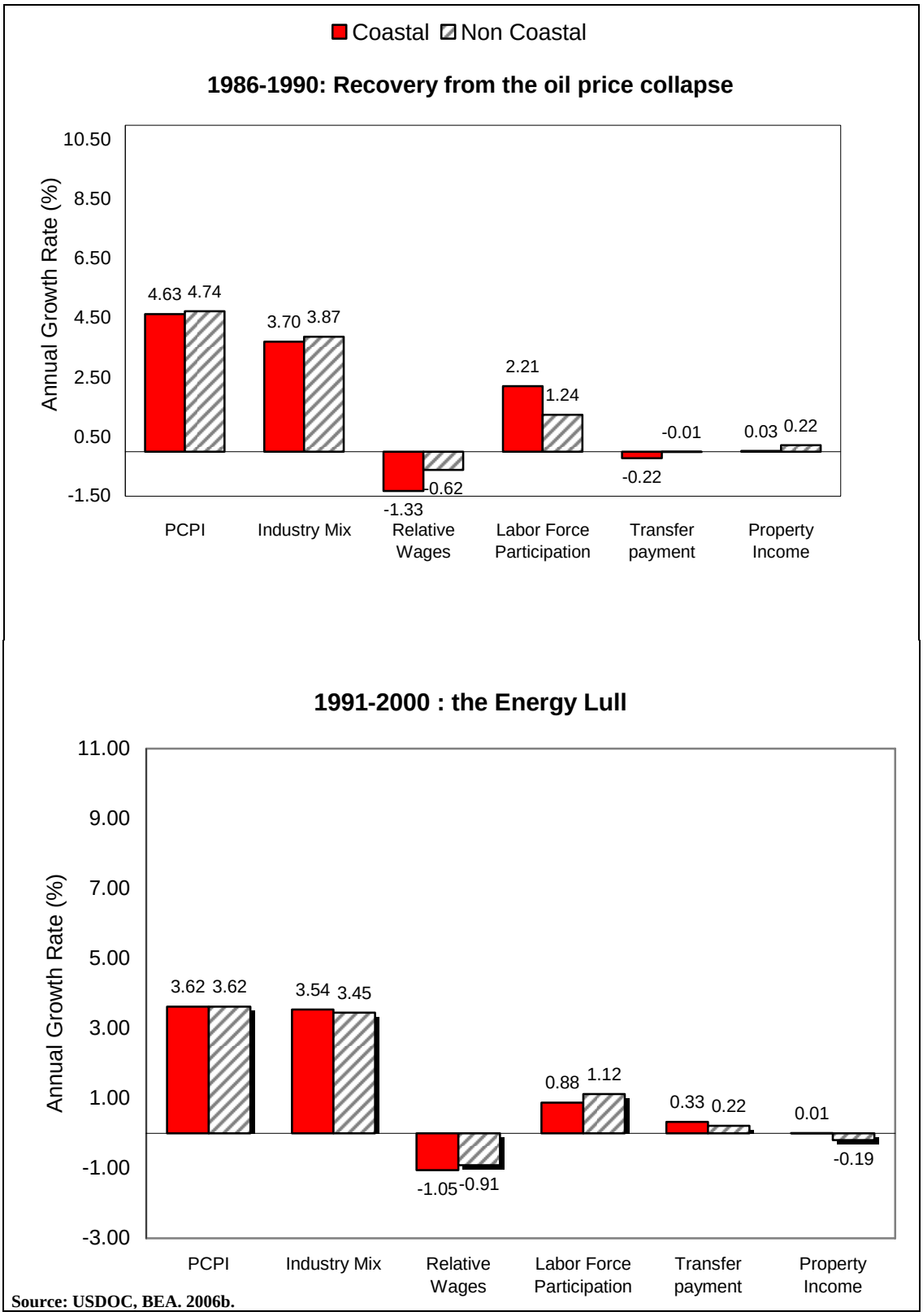


Figure 16. Change in PCPI - 1986-1990 Compared with 1991-2000.

11.8.4. Change in PCPI 1991-2000: The Energy Lull, Sustained But Slower Growth: During the decade-long energy lull of the 1990s there are almost no analytically or statistically significant differences apparent between the two groups of parishes in terms of either the total growth rates or the components of the growth. The decline in the rates of growth observed in the previous two periods continued in the period. The growth rates of PCPI in the coastal and non-coastal parishes were equal to the second decimal place during the decade of the 1990s. For both groups of parishes, the growth rate was more than a full percentage point slower, or 25 percent, than the rate of the previous period.

The industry mix components were also nearly identical, and their contributions accounted for more than 95 percent of the oval growth rate for both groups. In absolute terms, the contribution of an improved industry mix was slightly less than the previous period.

In both groups of parishes, wages relative to the nation declined and made a negative contribution to the overall growth rate of about one percentage point. In relative terms, the negative contribution of relative wages was a little less than a third for the coastal parishes and about a quarter for the non-coastal parishes.

Increased participation in the labor force added a little more than one percentage point to the growth of per capita personal income in the non-coastal parishes (1.12) and a little less (0.88) in the coastal parishes. In coastal parishes the contribution was less than half that made in the previous period, in non-coastal parishes the contribution was only slightly lower—1.12 percentage points compared to 1.24.

The contribution from transfer payments was modestly larger in both groups of parishes, 0.33 percentage points in coastal parishes and 0.22 in non-coastal parishes. A negligible 0.01 percentage point positive contribution in coastal parishes and a small −0.19 negative percentage point contribution in non-coastal parishes.

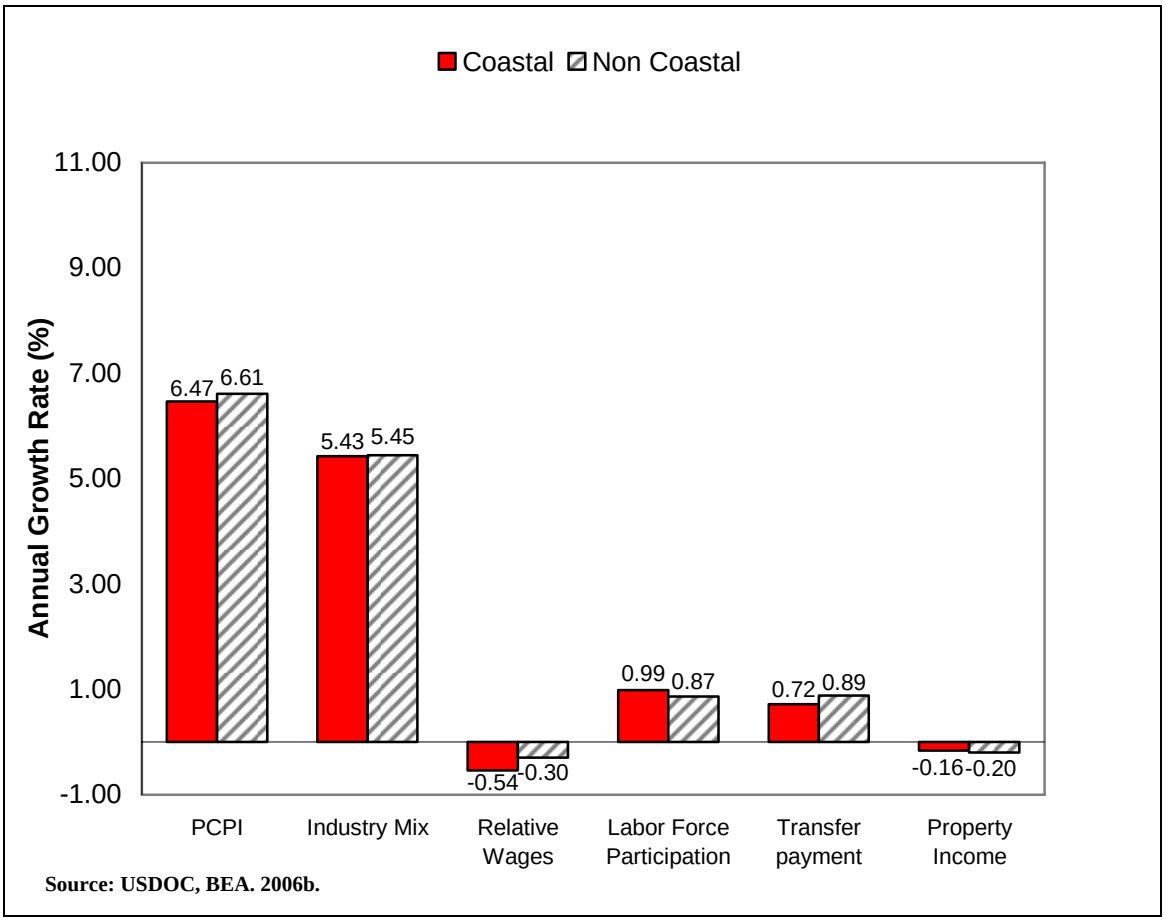


Figure 17. Annual Growth Rate of Per Capita Personal Income and Components for Coastal and Non-Coastal Parishes, 1969-2000.

11.9. Per Capita Personal Income and Changes in Population

In the newspaper and at meetings of rotary clubs and chambers of commerce, economic growth is usually closely, if implicitly, associated with a growing population. Economists have argued among themselves about the direction of causation, but they also often assume a direct and positive link between the two phenomena. Economic development practitioners, and the regional business and civic leaders that support them, usually justify public policies to encourage economic activity in a state or locality as necessary to provide jobs for a growing population who other wise would migrate out of the region. The benefits from more jobs will be evidenced as increases in retail sales of goods and services, as well as state and local taxes, which will benefit the existing population as well.

The following section of this essay explores the relationship between population and per capita personal income in Louisiana's coastal and non-coastal parishes using the same time periods used in the previous discussion of the components of change in per capita personal income. [66]

11.9.1. Population Change in Coastal and Non-Coastal Parishes: Population growth in coastal and non-coastal parishes is consistent with the pattern of the growth of per capita personal income when measured over the time periods used in the previous analysis. Table 7 shows the change in population in coastal and non-coastal parishes during the four periods of the energy boom of 1970 to 1980, the collapse of 1980 to 1985, the recovery from 1986 to 1990 and the energy lull of 1991 to 2000.

Over the entire 1970 to 2000 period non-coastal parishes gained 556,485 people, an increase of 29 percent over 1970 levels, while coastal parishes added 293,731, an increase of 15 percent. The comparison is distorted, however, by the fact that Orleans Parish, the state's largest, tends not only to dominate the total for coastal parishes but also exhibits a different pattern of growth, or more accurately, a pattern of decline. Over the period Orleans parish lost 116,999 individuals, a decline of 18 percent. If coastal parishes were considered without Orleans parish, their gain would be 410,730; an increase of 32 percent.

[66] A more detailed descriptive framework developed by Paul Gottlieb (2002) to characterize some implications of the relationship between growth rates in per capita personal income and population growth is applied to coastal and non-coastal parishes in the Pulsipher (2006).

Table 7

Nominal Population Change for Coastal and Non-Coastal Louisiana Parishes, 1970-2000

	1970-1980	**1981-1985**	**1986-1990**	**1991-2000**	**1970-2000**
Coastal	242,713	69,223	-107,912	71,782	293,731
% change from respective base year	*13.6*	*1.9*	*-4.7*	*3.1*	*15.4*
Orleans parish	-34,157	-9,209	-54,268	-11,513	-116,999
% change from respective base year	*-5.8*	*-1.9*	*-8.8*	*-1.6*	*-18.4*
Coastal—Orleans removed	276,870	78,432	-53,644	83,295	410,730
% change from respective base year	*23.1*	*3.3*	*-3.2*	*4.7*	*32.2*
Non-Coastal	330,179	115,789	-81,021	178,254	556,485
% change from respective base year	*17.7*	*3.9*	*-3.9*	*7.4*	*29.2*
Statewide	572,892	185,012	-188,933	250,036	850,216
% change from respective base year	*15.7*	*2.9*	*-4.3*	*5.4*	*22.4*

The comparisons show roughly the same pattern over the four periods. Orleans parish declined in population by about 6 percent during the 1970 to 1980 boom and the increase in population of coastal parishes was about 14 percent if Orleans were to be included and 23 percent if it was not. During the collapse and slow recovery of the 1980s, like the coastal parishes and the rest of the state, Orleans parish lost population, but not as fast as the coastal parishes. During the energy lull of the 1990s, Orleans lost population, but much more slowly.

The changes in the population of Orleans parish are a component of the spread of its population into the surrounding suburbs and bedroom communities, a phenomena occurring in most of the nation's metropolitan areas during this time period. Trying to isolate or account for this phenomena in an attempt to measure the impact of the oil and gas cycle is complicated by the fact that although Jefferson, St. Bernard and Plaquemines parishes are included in the coastal group, St. Tammany parish which became an important residence for New Orleans commuters during the study period is in the non-coastal group.

A more detailed study could sort population effects out more precisely, but it would extend the analysis beyond the resources available for this study. However, the more general conclusion is strengthened by the more limited comparison presented here. No differential effects are apparent in the coastal parishes compared to non-coastal parishes when changes in population are considered. That is, like changes in personal income, population does not show a differential impact from development of the offshore oil and gas reserves in coastal Louisiana. Over the entire 1970 to 2000 period, coastal parishes without Orleans parish included in the group grew by 32.2 percent while non-coastal parishes grew by 29.2 percent.

11.9.2. Net Migration in Coastal and Non-Coastal Louisiana Parishes: Since the change in the population of a parish comes about through the natural increase caused by births and deaths and migration into or out of the parish jurisdiction, a somewhat more precise indicator of differential economic effects on population might be to concentrate only on migration into or out

of the parish. Subtracting the natural increase from the change in population yields net migration—the change in population accounted for by persons entering or leaving the parish by means other than the biological routes of birth or death. Regional differences in birth rates, death rates, and the age structure of the parish population can be substantial, and using net migration rather than the nominal change in population can remove such differences from the comparisons.

Table 8 records net migration for Louisiana's coastal and non-coastal parishes for the 1970 to 2000 time period divided into the same intervals used in the previous analysis. Over the entire period, net migration for the state was a loss of 370,998 persons.

Table 8

Net Migration Among Coastal and Non-Coastal Louisiana Parishes, 1970-2000

	1970-1980	**1981-1985**	**1986-1990**	**1991-2000**	**1970-2000**
Coastal	50,226	-49,142	-205,992	-114,551	-322,413
Orleans parish	-71,721	-31,058	-73,907	-67,589	-256,017
Coastal—Orleans removed	121,947	-18,084	-132,085	-46,962	-66,396
Non-Coastal	149,876	806	-177,982	-14,440	-48,585
Statewide	200,102	-48,336	-383,974	-128,991	-370,998

Of this total, 256,017 or 69 percent were attributable to net migration from Orleans Parish. If net migration from the coastal parishes calculated without Orleans Parish is compared to the non-coastal parishes, the coastal group accounts for 17.9 percent of the net migration and the non-coastal parishes account for the 13.1 percent.

11.10. Conclusions and Implications

Our goal is to understand the effects of the development of the reserves of oil and gas located on the Outer Continental Shelf under Federal jurisdiction on the economies of the communities located in the adjacent coastal parishes of Louisiana. Louisiana is the nation's most energy intensive state. Our two principal methodological or analytical premises are:

1) If cumulative economic effects of OCS development are not evident in Louisiana's coastal parishes, they are not likely to be found in more distant, less energy intensive locations.

2) In order to characterize the magnitude and duration of the effects that OCS development may have had on the Gulf Coast economy, other changes in the national and regional economy affecting the region must be accounted for and made comparable. If this is not done, an illusion of causality can be created simply by the limits of the analysis itself.

The method used in the study to provide a consistent and comprehensive analytical framework is "growth accounting." Growth accounting decomposes changes in per capita personal income into its basic conceptual components; namely, changes in per capita personal income attributable to changes in:

- The mix of industries operating in the region,
- Wages in the region in relation to wages in the nation,
- The proportion of the population in the labor force,
- Transfer payments, and,
- Property income.

These components of change were compared for the 19 coastal parishes and 45 non-coastal parishes in Louisiana, and, to provide context and as a kind of consistency check, also for the five states bordering on the Gulf of Mexico and Louisiana's eight MSAs.

The 1969 to 2000 period saw extreme fluctuation in energy prices and energy production. Oil and gas prices had been abnormally stable in the United States from the end of the Second World War until the Arab oil embargo in 1974. After the embargo, however, there was extreme variation by any historical standard—especially during the oil "boom" of the 1970s and the subsequent "bust" in the mid-1980s.

Variation is an analytical advantage when trying to discern effects and relationships, but there are also analytical disadvantages that complicate the analysis. Major technological and structural changes in the industry occurred as a response to the extreme variation both by market forces and governmental policies. From our standpoint, however, the more serious problem is separating the effects of development on the OCS from the effects of on-shore trends and events.

Production of oil and gas from within the state's jurisdiction rose very rapidly by almost 600 percent from 1950 to its peak in 1970. It then declined even more rapidly, falling back to 1950 levels by 1980. In contrast, offshore oil production declined only modestly during the 1970s, and offshore gas production continued to increase. Offshore oil production resumed growth in 1990 and is currently well above its previous peak 1970 level (see Figures 4a and 4b).

Despite such a precipitous drop in production, other measures of oil and gas activity like the rig count and energy extraction employment continued to rise throughout the 1970s. An implication of the divergent patterns of offshore production and onshore production (shown in Figures 4a and 4b) is that if the sort of cumulative effects usually associated with the traditional "boom town" conceptualization of economic effects are to be found, the 1990s, not the 1970s, would be the place to look for them. By 1990 the economic and social adjustments to the decline of onshore activity should have been made and the increase from 300 million barrels to over 500 million barrels that occurred in offshore production over the following decade should create the sort of pressure on public services and diseconomies for existing economic activity usually hypothesized by the "boom town" model of socioeconomic effects. We find no such evidence, at least in the behavior of per capita personal income and its principal components or in the association between per capita personal income and population growth.

Thus, in a broader context, offshore production mitigated or had an opposing (positive) effect compared to onshore production. It was a source of stability and growth for coastal communities. It gave them partial relief from the economic consequences of nose-diving onshore production. Our analysis does not attempt to separate the mitigating or positive effects of offshore production from the negative effects of the onshore collapse. Why the precipitous drop in coastal, onshore production did not seem to affect the rest of the industry during the 1970s is an interesting question but is not a part of this study.

The analysis of changes in per capita personal income among the 19 coastal Louisiana Parishes and 45 non-coastal Louisiana Parishes, the five Gulf States, and eight Louisiana MSAs, shows a consistent pattern. The economic effects of energy producing states and state jurisdictions in coastal parishes are limited to the 1974 to 1980 energy price explosion and the 1981 to 1985 energy price erosion and collapse.

The analysis of the components of change during these two episodes shows that the effects were greater than the rate of change in per capita personal income considered alone would indicate. In the 1970 to 1980 boom, increases in relative wages and labor force participation accounted for more of the relative increase in energy producing jurisdictions, while increases in income from transfer payments made a much more substantial contribution in non-energy producing jurisdictions. As the cycle reversed and energy prices fell, transfer payments increased in energy producing jurisdictions and labor force participation and relative wages declined. The major longer-term driver accounting for changes in per capita personal income was the rate of improvement in industry mix. It mirrored the coastal/non-coastal dichotomy but at a much more modest level, increasing marginally during the boom in energy producing jurisdictions and decreasing modestly during the bust. But it was not nearly as much of an explanation as were changes in labor force participation and transfer payments.

These effects seem limited, however, to these two periods. During the "recovery" of 1986 to 1990 and what we term the "energy lull" from 1991 to 2000, there are no apparent differences between oil and gas producing jurisdictions and non-oil and gas producing jurisdictions. Changes observable among the Gulf States seem to be attributable to factors unrelated to their energy intensity or industrial composition. This also appears to be the case for Louisiana's parishes and MSAs.

This is consistent with broader views of the U.S. economy. Evaluating the performance of the national economy over roughly the same period we consider here, William Nordhaus (2004, page 30) concluded:

> But the past is not prologue, and the 1970s productivity slowdown has over the last decade been overcome by a productivity growth rebound originating primarily in the new-economy sectors. As the economy made the transition from the oil age to the electronic age, the aftershocks of the energy crises have died off and productivity growth has attained a rate close to its historic norm.

The application or implication for the Gulf Coast economy is that the repercussions of the energy boom and collapse of the 1970s and 1980s should not be confused with the cumulative economic

effects of the exploration and production of oil and gas from the federal OCS. Louisiana is the nation's most energy intensive state, and although it may still be closer to the oil than to the electronic age, twenty years later the coastal parishes of Louisiana don't seem to be any worse off or any better off than the rest of the state now that the energy adjustments have been made.

Looking at the experience of the five Gulf Coast states leads to a similar conclusion. Differential effects are evident during the 1970s and early 1980s, but no lasting, cumulative effects are in evidence. Energy is important but it is a part of a much larger national and global economy. Different regions and localities are affected by different factors, but there is little evidence of persisting, cumulative effects, either positive or negative, from oil and gas production.

11.11. References

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The Department of the Interior Mission

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

The Minerals Management Service Mission

As a bureau of the Department of the Interior, the Minerals Management Service's (MMS) primary responsibilities are to manage the mineral resources located on the Nation's Outer Continental Shelf (OCS), collect revenue from the Federal OCS and onshore Federal and Indian lands, and distribute those revenues.

Moreover, in working to meet its responsibilities, the **Offshore Minerals Management Program** administers the OCS competitive leasing program and oversees the safe and environmentally sound exploration and production of our Nation's offshore natural gas, oil and other mineral resources. The MMS **Minerals Revenue Management** meets its responsibilities by ensuring the efficient, timely and accurate collection and disbursement of revenue from mineral leasing and production due to Indian tribes and allottees, States and the U.S. Treasury.

The MMS strives to fulfill its responsibilities through the general guiding principles of: (1) being responsive to the public's concerns and interests by maintaining a dialogue with all potentially affected parties and (2) carrying out its programs with an emphasis on working to enhance the quality of life for all Americans by lending MMS assistance and expertise to economic development and environmental protection.