OCS Study
MMS 95-0031

University Research Initiative

Oil in the Gulf: Past Development, Future Prospects

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

LUMCON Cooperative Agreement
University Research Initiative
Louisiana Universities Marine Consortium

OCS Study
MMS 95-0031

University Research Initiative

Oil in the Gulf: Past Development, Future Prospects

Author

Robert Gramling

April 1995

Prepared under MMS Contract
14-35-0001-30470
by
Louisiana Universities Marine Consortium
8124 Highway 56
Chauvin, Louisiana 70344

Published by

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

Cooperative Agreement
University Research Initiative
Louisiana Universities Marine Consortium

DISCLAIMER

REPORT AVAILABILITY

Extra copies of the report may be obtained from the Public Information Unit (Mail Stop 5034) at the following Address:

U.S. Department of the Interior
Minerals Management Service
Gulf of Mexico OCS Region
Public Information Unit (MS 5034)
1201 Elmwood Park Boulevard
New Orleans, Louisiana 70123-2394

Telephone Number: 1-800-200-GULF

CITATION

Gramling, Robert. 1995. Oil in the Gulf: Past Development, Future Prospects. OCS Study MMS 95-0031. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA 72 pp.

ABSTRACT

This volume is a history of offshore oil development in the Gulf of Mexico and of the events and technological development that preceded and allowed that development to go forth. The book also traces the national and international events that shaped and limited offshore development in the Gulf of Mexico, as well as the impacts of that development in general and of the Federal Outer Continental Shelf leasing program, initiated in 1954, in particular.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

Chapter 1: The Early Technology and Politics of Offshore Oil

The first over-water drilling for oil occurred in 1896 at Summerland, California, from a wooden pier into the Pacific Ocean. The success of this endeavor brought quick emulation, and by 1902 a photograph of the Summerland development shows over 40 derricks on piers over the Pacific (Lankford 1971: 1367). Although, technically, the drilling was over water, little modification of existing land-based technology was required because of the direct land connection. Over-water technology moved slowly in the Pacific.

The 1901 discovery of the first major oil reservoir at Spindletop in Texas not only transformed the petroleum industry, it also focused attention on the Gulf coast and on the adjacent state of Louisiana and, eventually, led to the evolution in offshore technology. A decade later, this technological adaptation to the marine environment progressed with the development of the Caddo Lake field in northwestern Louisiana. By 1905 successful oil wells had been drilled surrounding the lake, and in 1910 the Board of Commissioners of the Caddo Levee District advertised for bids on leases on the lake bed. The big bidder was the newly formed Gulf Oil company, which leased 8,000 acres (Forbes 1946; Lankford 1971).

The Caddo Lake development required a solution to several technical problems that were later to prove useful in the move offshore in the Gulf of Mexico. First, because the reservoirs were deeper, the downhole pressures were higher than anything encountered before. Many of the early wells blew out, caught fire, and burned uncontrollably. This resulted in several State laws regulating drilling procedures and a withdrawal of further public lands in the area for development by the U.S. Department of the Interior's General Land Office (Lankford 1971). The movement into the Caddo field was quickly followed by the emergence of increasingly reliable blowout preventors (Brantly 1971: 1290-1305), a necessary precondition for movement into the high-pressure reservoirs along much of the Gulf coast.

At Caddo, drilling and production had to occur without direct connection to land, although the initial exploration and development were again little more than creative utilization of existing land-based drilling technology. Platforms were constructed on pilings driven into the lake bottom, and drilling equipment was barged to the site. Finally, another technological innovation, underwater pipelines connecting the production wells to one of four gathering stations on the lake, was a precursor of the collection lines currently used offshore. The Summerland and Caddo experiences were the start of the offshore technology.

Into The Marine Environment

This technology moved ahead with the development of the Maracaibo field, one of the largest ever discovered in the western hemisphere, ultimately producing approximately 4.6 billion barrels of oil (Lankford 1971). Lake Maracaibo in northern Venezuela differed from Caddo Lake in three important ways. First, it was larger, approximately two-thirds the size of Lake Erie. Second, it was deeper, up to 120 feet. Third, it was connected to salt water. This latter characteristic required the first modification in drilling practices. In 1924, as the Lago Petroleum Company brought in the first well in Lake Maracaibo, drillers faced the problem of the *teredo*, or shipworm, which thrived in the brackish water of the lake and destroyed wooden pilings in six to eight months. After experimenting with a variety of local timber to no avail, the material of choice became concrete. Concrete pilings were driven in as legs and as support under the drilling machinery, and a concrete base was cast in place (Lankford 1971). In later drilling on the lake, the concrete base was replaced with a steel deck, which eliminated the need for the central support pilings and, as greater water depth required, the pilings were replaced with hollow, steel reinforced-concrete caissons. Later, in the North Sea and North Atlantic, this technology evolved into gravity-based platforms.

A large number of over-water wells were used to tap the huge reservoir under Lake Maracaibo. Following onshore practices, during the early years of the reservoir's development, wells were sunk by setting the drilling machinery on a platform and, later breaking it down and moving it to a new platform. The inefficiencies of this process led to the steam drilling barge. During drilling the derrick continued to be mounted on the platform, but the power supply and the machinery for drilling were mounted on a barge, which could be easily moved from platform to platform. This increased mobility led to considerable savings and provided a model for the drilling tenders first used in the shallow waters of the Gulf of Mexico.

Early Development Along the Gulf Coast

Following the massive discoveries in east Texas, and as nondestructive exploratory (seismic) techniques evolved in the 1920's, numerous salt domes were located by geophysical exploration along the Texas and Louisiana Gulf Coast. Access to these discoveries was a problem, however, since as Lankford (1971:1377) noted, "these inviting prospects were often situated in very uninviting terrain--marshes, swamps, and the shallow open waters of bays and lakes." Neither the traditional land-based drilling techniques nor those evolving in Caddo Lake or Lake Maracaibo worked very well. The problem was the extremely fine silt laid down in great depth by the Mississippi River. The lower portion of Louisiana was a deltaic plain primarily comprised of this material. Over thousands of years, decayed vegetation had also become incorporated as a major element of this soil. Since the decayed vegetation absorbs water and the silt acts as a lubricant, the resulting "highly aqueous organic ooze" (Russell 1942:78) has a consistency slightly stiffer than chocolate pudding. As found in the shallow marshes, this material proved to be a problem for the land-based drilling techniques current in the 1920's. Since this material underlay the shallow open water comprising much of coastal Louisiana, the bottom became a major problem. The silt layer can be very thick and pilings driven into it have no solid foundation, relying entirely on the friction between the pilings and the mucky bottom. As Lankford (1971) notes, since platforms built on such pilings cannot be cross-braced below the water line and since drilling machinery produces significant vibrations, up to 250 pilings were needed for a single exploratory platform. As interest grew in deeper prospects, these techniques became cost inefficient for exploration, because the nonrecoverable cost of platform construction increased regardless of the outcome of the drilling. Nevertheless, exploration and development did go forth along the Texas coast and, to a lesser extent, along the more inhospitable Louisiana coast.

The technological breakthrough that facilitated exploration in the shallow coastal waters and marsh came in 1933 with the Texas Company's introduction of the submersible drilling barge. The Texas Company (later Texaco), like Gulf Oil, had been born out of the discoveries at Spindletop. It became a vertically integrated company to compete with Standard Oil which was dominating the world oil market, but lacking resources to compete fully on the world market, the company initially saw its interests and greatest potential as lying along the Gulf coast, including the environs of south Louisiana. In the late 1920's Texas leased large tracts of marsh from the Louisiana Land and Exploration Company, as well as submerged lands under the contiguous lakes and bayous from the State of Louisiana (Lankford 1971). The problems with exploration and development remained, however, and Texas began to explore other solutions. During a routine patent search made after a Texas employee submitted plans for a mobile drilling barge in 1932, it was discovered that Louis Giliasso had been issued a patent for a submersible drilling barge four years earlier. Giliasso was located the following year, operating a bar in Panama, and an agreement for the use of the patent was struck.

In theory, the submersible barge could be towed to the drilling site and sunk. Since the water at these locations was shallow, the barge resting on the bottom, provided a stable base for drilling. The elevated derrick was positioned over a rectangular vertical slot extending from one end of the barge to its center. Drilling proceeded down through this slot. Once drilling was complete, the barge could be raised and moved to a new location. The *Giliasso* (as the first barge was appropriately named) was built in Pennsylvania and brought down the Ohio and Mississippi Rivers to Lake Pelto, Louisiana, one of the protected estuaries behind Louisiana's barrier islands.[1] There on a State lease on November 17, 1933, the Lake Pelto No. 10 was spudded. The barge's success brought a new era in marine drilling (Williams 1934). Although in retrospect the principle seems simple, the submersible drilling barge revolutionized the movement into the marine environment. The increasing demand for such barges throughout the 1930's and 1940's led to the emergence of a marine supply and construction infrastructure in coastal Louisiana and, once the technological problems involved with offshore drilling had been solved, this infrastructure allowed for a virtual explosion of offshore drilling.

The Legacy of Exploration and Development in Inland Waters

The deltaic plain was not empty in the 1920's and 1930's as initial exploration and development of oil was occurring. Soon after settlers of European descent moved into the area in the mid-1700's, the extraction of renewable resources from coastal wetlands became a major part of the regional economic picture. By the mid-1800's over 150 wetland-oriented communities were in existence in the Louisiana alluvial wetlands (Davis 1990). Connected only by water transportation routes, this large, isolated, but permanent population harvested

---

[1] Due to coastal erosion, Lake Pelto, once an enclosed coastal bay, is now an arm of Terrebonne Bay protected from the open Gulf by a series of barrier islands (Isles Dernieres) off the Louisiana coast.

shrimp, oysters, fish, furs, and a variety of other minor marsh commodities. The inhabitants of the marsh consumed marsh products and marketed them to settlements along Bayou Teche and in New Orleans via those same water routes (Comeaux 1972; Davis 1990).

Concomitant with, and aiding, the movement of oil activities into the marsh in the 1920's and 1930's was the spread of the highway network. The increasingly attractive development along the long, thin ribbons of natural levees, parallel to the waterways crossing the marsh, attracted migrants from the more isolated locations in the deltaic plain and concentrated populations in long "string town" (Kniffen 1968) settlements. This abandonment of the more isolated locations in the marsh and the concentration of the population in more urban areas assisted the transition from subsistence activities in the marsh towards a more commercial harvest perspective. The growing population along the settlement strips also provided a local labor supply for expanding petroleum activities, which in turn reinforced their movement into the marsh.

Movement into marsh environs was initially accomplished by the construction of "board roads." The roads were set on a base of 12-inch wide by 20-foot-long planks laid perpendicularly to the direction of the road. Across the center of these planks, additional boards were laid (sometimes elevated on cross ties in the softer marsh) parallel to the direction of travel to form the road surface (see Nicholson 1942 for a detailed description). Travel across the shallow open water of the deltaic plain with heavy equipment was equally problematic, but the introduction of the submersible drilling barge was quickly followed by the means to provide access not only to the open water bodies but also to marsh locations.

In 1938 a barge-mounted dragline prepared the first marsh location for the new class of submersible barges (McGee and Hoot 1963). It was usually much easier to dig canals across the marsh or through shallow estuaries, float equipment on barges to the site, and supply the operation via vessels through the newly cut canals than to prepare the marsh itself to support the weight of drilling locations and access roads and this new technology moved ahead with no regulation.

In the four decades between 1937 and 1977 approximately 6,300 exploratory wells and over 21,000 development wells were drilled in the eight Louisiana coastal parishes. As Davis and Place (1983) note, most of these were in wetlands or inland water bodies. Thus, it was during the 1930's, following the introduction of the drilling barge and barge-mounted dragline, that the extensive networks of canals associated with oil development along the northern Gulf Coast (primarily in Louisiana) was initiated. The eventual extent of the destructiveness of this practice has yet to be completely assessed (see Turner and Cahoon 1988, Gagliano 1973). In lieu of virtually any permitting practices, private landholders and the State of Louisiana allowed almost unlimited access via barge to drill sites in the coastal zone, and a network of pipeline corridors through the same wetlands only exacerbated the problem. Barrett (1970) measured more than 7,300 km. of canals south of the Gulf Intracoastal Waterway in Louisiana alone, resulting in a direct land loss of over 190 square miles due to canal surface alone (Gagliano 1973). There is little doubt that this channelization process, accompanied by erosion, alteration of the hydrologic regimes, and saltwater intrusion, has contributed greatly to the current annual loss of between 35 and 50 square miles of wetlands in the state.

This damage can only be understood in light of the environment (both physical and social) in which it occurred. Movement into the Louisiana marsh in the 1920's and 1930's happened at a time when not only was the idea of protecting wetlands was nonexistent (Freudenburg and Gramling 1993; 1994), but the concept of the marsh as a valuable resource had not emerged. Resources are things that are valued by human cultures in a given place and time (Freudenburg et al. 1992); a scant seven decades before this period, petroleum itself was not much of a resource because it had little social or economic worth. The same was true of the marsh in the 1930's, a hostile environment that was seen with a "conquest of the frontier" mentality. This was an exuberant age with almost unlimited faith in technology (Catton and Dunlap 1980), and in this age the exploration and development of oil and gas occurred blind to any environmental consequences.

In addition, the coast of Louisiana is simply not accessible in the same way that most other coastlines in the U.S. are. The same band of marsh that was viewed simply as a problem by the early oil developers effectively precluded "coastal" residents from reaching the coast. The entire deltaic plain from the coast of Mississippi to almost the Texas border was inaccessible by land (and to a large extent still is). Thus, there was no conception by local residents of a "coast" and certainly not of a "beach," and this led to very different perceptions of the "value" of these "resources" by Louisiana coastal residents in the 1930's than are current in the U.S. today (See Freudenburg and Gramling 1993; 1994; Gramling and Freudenburg 1994 for detailed discussion of these issues).

Finally, from the time of the earliest non-native settlers in the region, economic exploitation of the swamps and marshes had been the mainstay of local residents' livelihood (Comeaux 1972). While many of these resources (fish, crayfish, oysters, shrimp) were harvested in a sustainable fashion, others (primarily cypress lumber) were not. Timber is theoretically a "renewable" resource but, given the centuries necessary to replace it, this distinction becomes academic. As soon as technology evolved to the point where massive harvest of the cypress in coastal Louisiana was possible, massive harvest occurred. By the time oil was emerging as an exploitable resource in the coastal marshes, cypress was in decline, and by the late 1930's virtually all of the old growth cypress was gone (Comeaux 1972; Norgress 1947). Oil provided an alternative, and the shift from one harvest to another seemed natural (Freudenburg and Gramling 1993; 1994).[2]

By the late 1940's, the technology of the submersible drilling barge had expanded in several ways. First, the barges had gotten larger and more powerful, allowing them to tap the deeper oil-bearing formations along the Gulf coast. Drilling as deep as 18,000 feet was possible (Sterrett 1948a). A second innovation allowed the larger size; the operation occurred on two barges with half of the drill slot built into the starboard side of one barge and half built into the port side of the other. On site, the two barges were tied together to produce a single drilling unit, effectively doubling the available space but retaining the smaller size of the older rigs for easier transportation and handling. This also meant that canals dug through the marsh did not have to be any larger than with the previous technology

[2] Cypress logging as it was practiced in the coastal areas also frequently required digging canals for access.

(*Oil Weekly* Staff 1946a). A third innovation meant more flexibility and power; diesel-electric rigs replaced steam engines. The diesel engines were used to turn generators, which supplied electricity for the electric motors that powered the various elements of the drilling operation (Humble Oil, Production Department 1946).

By the early 1950's these huge inland submersibles were over 200 feet in length and 55 feet in width and were capable of drilling to 20,000 foot depths (Albright and McLaughlin 1952; McLaughlin 1952). A final introduction in 1952 of the tungsten carbide drilling bit added to the efficiency of these enormous machines, and by 1955 inland submersibles were setting world drilling depth records of 22,500 feet (*Drilling* Staff 1955a).

Response to the New Technology

The continued movement into the coastal marshes and estuaries led to two additional innovations, one technical and one social. The isolated location of wells along the Gulf Coast, with no access to roads and the necessity to move oil from wells to refineries, led to the emergence of extensive pipeline networks and to the adaptation of the pipeline to the marine environment. The first real marine application came with a 25-mile stretch of pipeline crossing Lake Pontchartrain, north of New Orleans, in 1941. The solution of the logistical problems associated with positioning and assembling a continuous pipeline in a marine environment led to the early technology associated with "lay-barges" that work the Gulf today (Sterrett 1941) and the eventual proliferation of the massive pipeline network in the northern Gulf. A decade later, United Gas Company spanned over 25 miles of the open Gulf of Mexico to tie two offshore platforms into the pipeline network (Taylor 1951). The following year the Texas Pipeline Company completed a 22-inch-diameter, 216-mile-long pipeline from near the Lake Pelto field to refineries in Port Arthur, Texas (Trow 1952). Much of this line was through the coastal and marine environment.

During this same period, the necessity for construction and drilling crews to work in isolated locations, where it was impractical to commute daily, led increasingly to the use of living quarters located near the work location and the division of work into concentrated working periods (e.g., a week at work and a week off). By 1941, Nicholson (1941:30) was describing the luxury of the newest and largest of the remote living quarters, created from a converted river steamer and supplied by Gulf Oil near the mouth of the Mississippi, as providing "excellent food and sanitation" as well as "[f]ountains supplied with running ice water" and rooms with "reversible window fans." By the mid-1940's, the larger of these living quarters had come to be described as "modern floating hotel[s]" (*Oil Weekly* Staff 1946b:44).

The investment structure associated with work in the marine environment also affected work scheduling. The equipment associated with work in these environments was expensive, the ventures were capital intensive, and needed to return investment as quickly as possible. These factors led to 24-hour-a-day operations and the concentrated work scheduling now common offshore (Gramling 1989).

Movement Offshore

California

As noted above, the first drilling for oil over water occurred from piers extending into the Pacific Ocean at Summerland, California, a few miles east of Santa Barbara. Oil had been found down to the shoreline, and natural oil seeps were found in the Santa Barbara Channel. By the 1920's, the State of California was leasing offshore tracts in the channel. When applications for offshore tracts got out of hand in the late 1920's and it became apparent that the State lacked the legal foundation to control offshore activities, leasing offshore was curtailed by the 1929 repeal of the California State Mineral Leasing Act. In 1938 the State Lands Act was passed, giving the State the necessary legal control over offshore leasing, and limited development offshore resumed (Steinhart and Steinhart 1972). Major offshore efforts, however, did not really begin again until after World War II.

The Gulf of Mexico

In 1938, a joint effort by Superior and Gulf brought in seven producing wells in the Creole field from a platform a mile offshore from Cameron Parish, Louisiana, in nine feet of water (Logan and Smith 1948). This was the first attempt in the open Gulf, and it used a system similar to that practiced in Lake Maracaibo; the drilling was accomplished from a deck supported by pilings, and the support for drilling (crews, etc.) was primarily from the nearby shore. By the mid-1940's a number of proposals to extend the concept of the drilling barge to the open Gulf began to appear in the trade journals: self-contained, reusable drilling devices, illustrative of modern submersible drilling barges (Tucker 1946a), drill ships (Tucker 1946b), or even guyed production platforms (Shrewsbury 1945; Armstrong 1947), the latter approach not actually being used until the late 1980's.

In spite of these visionary proposals, the first attempt to move the entire drilling support system offshore relied on more traditional technology. In 1945 the State of Louisiana held an offshore sale and the only bidder, Magnolia Petroleum Company (later to become part of Mobil), leased 149,000 acres offshore (*World Oil* Staff 1956a). The following year, using a mixture of wood and steel pilings, Magnolia constructed a platform in the open Gulf on their newly acquired tract. The site was south of Morgan City, five miles from the nearest land. The platform was designed to withstand 150-mile-per-hour hurricane winds and a deck load of 2.25 million pounds. Drilling crews were rotated back and forth from one of the "floating hotels" anchored behind Eugene Island, ten miles away. This first endeavor foretold of changes in coastal occupations.

> For this work [initial survey] as well as the construction and drilling operations that followed, Morgan City's shrimp fleet proved most helpful, a number of these boats manned by seamen schooled in the Gulf Coast waters, being utilized for survey purposes as well as for transportation of personnel, supplies and equipment used in seismic and drilling operations. (*Oil Weekly* Staff 1946c: 31).

Although the attempt was a dry hole, technologically it was a success by demonstrating that exploration in the open Gulf was feasible. The subsequent two decades that followed Magnolia's first Outer Continental Shelf (OCS) attempt saw the emergence of a full-blown offshore technology capable of working in 500 feet of water and over 60 miles offshore (*Offshore* Staff 1966a). But, before this could happen, the question of who owned offshore lands had to be settled, and the question raised a heated national debate.

The Tidelands Controversy

As the technology evolved, allowing penetration into the coastal estuaries and bays of the Gulf of Mexico and the nearshore waters of the Pacific, the States of California, Louisiana, Texas and Florida quickly realized the potential for revenue. By 1929, California was issuing leases in nearshore waters and, in 1936, the Louisiana legislature created the State Mineral Board and directed the board to lease the waters adjacent to the state competitively. While exploration and development had not yet moved into the open Gulf, the technology existed for this step, and intensified activities in coastal Louisiana, particularly behind the barrier islands in Timbalier Bay, indicated that movement into the open gulf was not far away. Expectations in general were high that oil would be found under the open seas.

Consequently the issue of ownership of subsurface lands arose.[3] While the States of Louisiana, Texas, Florida, and California assumed that they owned the sea bottoms, there were those in the Federal government who did not agree. Chief among these was Secretary of the Interior Harold Ickes. As early as 1937, at Ickes encouragement, a resolution passed the Senate directing the Attorney General to assert Federal ownership of offshore lands, but the House took no action on the matter, and World War II soon overshadowed the issue. Throughout the war, Ickes continued to push for Federal ownership of offshore lands, and shortly after the end of the hostilities approached Truman on the issue. Truman was sympathetic to Federal ownership and in 1945 issued a proclamation (Executive Order 9633, *Federal Register* 12304 (1945); 59 Stat. 885) asserting Federal ownership of the continental shelf.[4] In addition, Ickes persuaded Truman to initiate a suit against California in the U.S. Supreme Court. The states argued that they owned mineral deposits in the waters adjacent to their coasts as remnants of their jurisdiction over the marginal sea (the 3-mile strip of sea adjacent to a nation's coast) as original colonies. The Federal government argued that the

---

[3] For a detailed background see Bartley (1953), for a more concise discussion see Nash (1968).

[4] The continental shelf is the comparatively shallow waters between the shore and the continental slope, which is the steeper drop into the deep ocean basin. The width of this shelf varies around the world from only several miles to several hundred miles.

marginal sea concept did not arise until after the revolution.[5] In spite of the Truman Proclamation and the impending suit, in the absence of clear legal precedent the State of Louisiana continued to lease offshore lands and Texas soon followed. By 1950 Louisiana and Texas had leased almost 5 million acres offshore (Mead et al. 1985).

In 1947 the Supreme Court ruled against California. Ultimately, the conflicting claims to the OCS were settled by this decision and a series of additional decisions between 1947 and 1950 by the U.S. Supreme Court known as the Tidelands Cases. The Tidelands cases established the legal rights of the Federal Government over all U.S. offshore lands (see Cicin-Sain and Knecht 1987 for a detailed discussion of this conflict). Throughout this period Congress struggled with the issue and a number of bills were introduced to address the conflict.[6] Early in 1952 Congress passed a bill allowing state claims, which Truman vetoed.

In the wake of the Supreme Court decisions, Congressional action, and Presidential veto, the Tidelands controversy became a major issue in the 1952 Presidential election, with Eisenhower supporting the "state's rights" position and Stevenson coming down clearly on the side of Federal ownership. Within the oil industry, the sentiment ran heavily in favor of the states, and the specter of big government interfering in state and individual rights was a popular one.

> Supporters of the claims of California, Texas and Louisiana have warned that if the Federal government successfully consummated the tidelands seizures, no state or private property would then be safe from similar confiscation. Under this convenient doctrine of "paramount rights"[7] of the U.S. government, it was warned, a socialist-minded administration could easily nationalize all property and socialize the country. (*World Oil* Staff 1951:73; see also *World Oil* Staff 1952)

---

[5] While the suit was progressing, the issue came to the attention of the American public with Truman's nomination of Edwin Pauley as Under-Secretary of the Navy and Ickes, testimony that Pauley had offered to contribute $300,000 to the Democratic Party if Ickes would get the suit stopped.

[6] Interestingly, one of them proposed that the states should share in the revenue from royalties derived off Federal leases at the same 37.5% that were in effect for Federal onshore lands within states (see *World Oil* Staff 1953a). Although ultimately the states got none of the revenue from Federal offshore leasing, this revenue sharing from offshore Federal lands remains an issue to the present.

[7] The Supreme Court ruled that the Federal Government had paramount right to the nations seas.

The major oil companies believed it would be easier to deal with the states than with the Federal government[8] and undertook a major lobbying effort in support of states' rights. Along the Gulf coast and in California, the issue was a hot one, and as Solberg notes:

> Feelings ran highest in Texas, where the Tidelands issue topped all others. When Democratic candidate Adlai Stevenson came out for Federal control in the face of crowds bearing placards "Remember the Alamo and the Tidelands Oil Steal,"...Governor Allan Shivers announced that he could not support the party's candidate. With the hero born in Denison, Texas, leading the way, the oil of the tidelands had much to do with detaching Texas from its historic allegiance to the Democratic party. (Solberg 1976: 164)

Federal Lands

Several months later, with the threat of a veto removed, Congress passed the Submerged Lands Act (43 U.S.C § 1301-1315),[9] which assigned to the states the title to the offshore lands that were within three miles of the shoreline, and Eisenhower quickly signed it into law to the relief of the industry (Logan 1953; *World Oil* Staff 1953a). Two current exceptions to this act involve Texas and the west coast of Florida, where the Supreme Court later ruled that the states had held title to three marine leagues (approximately 10.4 miles) as sovereign nations before they were admitted to the Union. Although there were challenges to the Submerged Lands Act by states that did not stand to benefit (*World Oil* Staff 1953b; 1954a), and conflicts between coastal states and the Federal government[10] (Logan 1953), and even between departments within the government (*World Oil* Staff 1954b) over just where state waters ended, the Submerged Lands Act eventually defined the limits of state ownership.

While much attention was devoted to the states' rights issue, very little controversy centered on the submerged lands beyond the 3-mile limit. Because of the Supreme Court decision and in the absence of Congressional action deeding these lands or a portion of the

---

[8] Ironically, in most cases this has not been the case. With the exception of the central and western Gulf of Mexico, it has been the Federal Government that has pushed to lease offshore, and the states that have resisted it.

[9] The U.S.C. classification system refers to the volume and location within volume of the U.S. Code. Thus (43 U.S.C. § 1301-1315) refers to volume 43 of the U.S. Code, parts 1301-1315. While the U.S.C. classification refers to where the law is published, the other way in which Federal laws are referenced is by a "Public Law" citation which is assigned according to the Congress which passed them, and the order in which they passed. Thus, for example, (P.L. 92-103) would designate the 103rd law passed by the 92nd Congress.

[10] In the first Federal sale off Louisiana the State offered some of the same tracts for bid after the Federal Government had advertised then for lease (*World Oil* Staff 1954a).

revenue from them to the states, they soon passed into Federal ownership. Why this happened is not clear. By 1946 Magnolia Petroleum had demonstrated that drilling was possible beyond three miles offshore (*Oil Weekly* Staff 1946c), and by 1948 there were 24 operations underway over three miles offshore in the Gulf of Mexico (Logan and Smith 1948). The following year, technology had evolved to the point where a mobile offshore drilling rig was available and at work. Shortly thereafter, offshore drilling was known to be feasible in over 60 feet of water (Logan 1953), and industry reports were touting the resource potential of the OCS (*World Oil* Staff 1953c; 1954c). The States of Louisiana and Texas had already sold over 300 leases in the Gulf over three miles offshore (Minerals Management Service 1993), most off the Louisiana deltaic plain, and there was little doubt that the offshore lands would produce oil.

The answer may lie in the fact that the action for Federal ownership was initiated by litigation, which, as Gramling and Freudenburg (1992a) have noted, tends to lead to intractable positions on both sides. Further, the legal battle came to be over the "Territorial Seas," which as a matter of international law had come to be defined as out to three miles (Cicin-Sain and Knecht 1987). Thus, it may well have been not ignorance of the potential of these lands, and certainly not by those most directly involved in the industry and in the states of Louisiana and Texas, but rather lack of conceptual clubs with which to enter the legal/political fray, coupled with a rush by the Eisenhower administration to make good on campaign promises that led to the limiting of state lands to three miles. Whatever the cause, if the intent was to hand over the bulk of offshore resources to the states, the action was a failure.

The second piece of offshore legislation that ultimately was of much more importance was the Outer Continental Shelf Lands Act (OCSLA) of 1953 (43 U.S.C. § 1331-1356). This act authorized the Secretary of the Interior to lease, through competitive bidding, the offshore lands ("out") beyond the 3-mile limit, the "Outer Continental Shelf," for the development of the oil, gas, salt and sulphur resources found there and to subsequently administer these leases. The act served as the major legislation guiding policy for Federal offshore leasing starting in 1953 until it was amended in 1978.

Within the Department of the Interior, the Bureau of Land Management (BLM) and the U.S. Geological Survey (USGS) were given the shared responsibility for this task. Initially, after conducting a resource evaluation of a broad offshore area, an invitation to nominate tracts within that area was published in the *Federal Register*. Selection of a number of offshore tracts (each limited to a maximum of 5,760 acres, a 3-mile-square "block") was based on the ensuing indication of interest by industry and on the resource assessment conducted by USGS. Eventually a sale date and a final selection of tracts were also published. Although the OCSLA allowed some leeway, the Department of the Interior prior to 1978 generally used a cash bonus system with a fixed royalty rate of 16¾ percent. This meant that bidders bid a cash amount to lease a tract and agreed to pay royalties of one-sixth of any subsequent production (see Mead et al. 1985, for more detail).

The first OCS lease sale was held in the Gulf off Louisiana on October 13, 1954. Ninety tracts were leased (Gould et al., 1991), and the OCS development program was underway. Later that year, a lease sale was held off Texas, and in 1959, a lease sale was held off Florida.[11] Although Louisiana and Texas went to court to block the implementation of the OCSLA and succeeded in delaying offshore sales in 1956, 1957 and 1958, ultimately the states lost, although Louisiana continued the fight until the mid-1960's (*Offshore* Staff 1966a), resulting in sporadic lease sales during this period. With these early exceptions lease sales in the Gulf have been held at least annually and as frequently as five times a year (in 1974) (Gould et al. 1991). Thus, with the settlement of the ownership of offshore lands and the initiation of the Federal leasing program, offshore development moved ahead rapidly in the Gulf.

[11] Ironically, the leases were sold in the vicinity of the Florida Keys, and three exploratory wells were subsequently drilled. In the 1980s drilling off South Florida was to become the source of a major conflict between Florida and the Department of Interior.

Chapter 2: Moving Offshore

Emergence of the Offshore System: Technology

Between 1946 and the settlement of the ownership issue in 1953, offshore development proceeded, albeit it at times in a legal vacuum. Following on Magnolia Petroleum Company's lead and using the same type of technology, Kerr-McGee brought in the first producing well on the OCS in 1947, 12 miles off the Louisiana coast in 18 feet of water. This sparked additional interest offshore, and by the middle of 1948, in addition to offshore production by Kerr-McGee and the Creole field initiated in 1938, 13 locations were in various stages of development off the coasts of Louisiana and Texas, two additional dry holes had been abandoned, and plans were under way for drilling in 14 other locations (Logan and Smith 1948). Magnolia Petroleum Company and Kerr-McGee had emerged as the clear leader for continental shelf operations (Logan and Smith 1948; Seale 1948). One of the more promising prospects underway in 1948 resulted not only in significant discoveries but also in the establishment of a support base on Grand Isle, Louisiana (Sterrett 1948b) which has remained in continuous operation to the present. With a success rate offshore of 70% (*World Oil* Staff 1956a), almost 200 structures were in place on Federal waters by the time the first official Federal offshore lease sale was held in 1954 (Carmichael 1975). All of these structures were in relatively shallow water, and many of them were simply platforms for exploratory drilling. A short two years later *World Oil* would proclaim the emerging offshore development "successful," and paint a rosy picture for future offshore development (Cram 1956:78).

Throughout the early offshore development the basic technological problem faced was essentially the same as that faced in the marsh, prior to Texas Company's introduction of the mobile drilling barge in 1933. Because drilling took place from a fixed platform, the cost of each offshore attempt was between $750,000 and $2,000,000, a considerable sum in the 1940's, all sunk cost and lost in the event of a dry hole. Most offshore efforts had quickly moved to smaller (less expensive) platforms to house the drilling machinery and floating tenders moored to the platform, which contained crew quarters and storage. The tenders were at least mobile and reusable. Mobile drilling barges used in protected waters had reached considerable size and complexity by this time (Sterrett 1948a). However they were not useful offshore, because of increased water depths and because wave action could move them laterally during storms. Platforms, which had by this time withstood hurricane-force winds (see Farley and Leonard 1950), derived strength not only from pilings driven deeply into the bottom, a firmer bottom than that found in the marsh and estuaries, but also because waves passed through the pilings dissipating little of their strength on the structure.

The breakthrough, equivalent to Texas' Giliasso, came in 1949 when John Hayward designed an offshore drilling barge. The 160 by 54 foot barge was compartmentalized with a drilling slot similar to those used in protected waters. But the drilling platform, machinery, and crew quarters were mounted on a platform 20 feet above the deck, supported by a lattice work of braced columns or posts (leading vessels of this type to become known as "posted barges"). The barge was brought to the location, and its compartments were flooded in a controlled fashion to maintain stability. When resting on the bottom, the barge provided a stable base for the drilling platform. Because, as with pilings on an offshore platform, wave action could pass through the columns, the barge was not moved off of its location during storms. Since this top-heavy structure was unstable during the flooding procedure, two large pontoons, running the length of the barge, were attached to columns on either of its sides. These pontoons remained floating (providing stability) until the barge was firmly on the bottom, and then they too were flooded, adding additional stability on the bottom. Raising the barge involved reversing the procedure, floating the pontoons first for stability before the main hull was raised. When the Bretton Rig 20 (as the first barge was named) moved off its first location in the Gulf and on to the second location (there was considerable skepticism that the barge would ever be successfully re-floated), the "revolutionary" nature of the barge was noted (Wolff 1949). All of the previous technological innovations (mobility, transparency to wave action, offshore scheduling of work, and the inclusion of living quarters) came together for the first time in the Bretton Rig 20 to produce the first self contained, reusable, offshore drilling machine.

Throughout the early 1950's, in spite of the success of the Bretton Rig 20, the offshore drilling picture was dominated by fixed platforms with floating tenders (*World Oil* Staff 1954d). A number of innovations increased the efficiency of offshore drilling: for example installing two drilling rigs on one platform, doubling the drilling speed but not doubling the costs, as the tender and much of the support equipment could be shared (Kastrop 1950). Submersible rigs became the dominant type of mobile offshore exploratory drilling rig during the decade following their introduction, although the three alternatives to submersibles (jackup rigs, drill ships and barges, and semi-submersible rigs) all appeared in the 1950's and early 1960's.

Growth of the Offshore System: Technology

Exploration

By the time of the first Federal sale in 1954, four submersible rigs, similar to, and including Bretton Rig 20 were operating in the Gulf. These had been joined by the first jackup rig and one floating drilling barge, which was only used to take cores (geological samples) for survey work (Howe 1966c). All exploratory drilling not done by the five exploratory rigs was accomplished by the traditional technique of constructing a platform in place. The basic problem with the submersible rigs of the Bretton 20 design was the limitation as to how high above the barge the drilling platform could be mounted and still retain stability while afloat. This limited the water depth in which such barges could work. Kerr-McGee commissioned and operated a larger barge late in 1954 capable of operating in up to forty feet of water (Gibbon 1954), but that appears to be about the practical limit of the design. There were also developments in drilling from fixed platforms, the most notable being the construction of modular units which could be loaded onto completed platforms and bolted together to begin drilling. By the mid-1950's the entire offshore drilling machinery structure was available in four units ranging from 30 to 184 tons. Each of these could be lifted by crane onto a completed platform and bolted together. Time needed to begin drilling was measured in hours. Still, the fixed platform's limitation remained the initial cost. Given the restricted depths in which submersible barge could operate four new designs emerged during the 1950's and early 1960's, which addressed these limitations.

The first of these was the jackup rig. This design, which was tested in 1953 (*World Oil* Staff 1953d), first appeared in 1954 (Howe 1966b) with prototypes theoretically capable of use in waters up to 100 feet by 1955 (Davidson 1955). The arrangement consisted of a barge on which the drilling equipment, machinery, and crew quarters was mounted. The barge was towed to the drilling site, and legs along the periphery of the barge were extended to the bottom, lifting the barge clear of the water, above wave action. Drilling occurred either through an opening in the barge or over one of the sides. The first jackup tested was a standard 300 foot barge with six 100 foot long legs on each side (*World Oil* Staff 1953d), but by 1955 the design had evolved to the tripod arrangement in use today. With this design, first evidenced by Zapata Offshore's Rig No. 1, three legs, each consisting of several vertical pipes braced with a latticework of smaller tubular braces, were positioned to lift a much lighter triangular platform (Hanna 1955). Although the three legged structure was assessed as "unusual in design" while it was under construction (*Drilling* Staff 1955b:68), the design became the industry standard following its successful deployment off Aransas Pass in 1956, and the survival of 100 mile-per-hour winds from Hurricane Audry by a similarly designed rig off Cameron, Louisiana in 1957 (*Drilling* Staff 1957).

The rapid rate of the evolution of offshore technology can be made by comparing industries comments on the design of the "unusual" rig in 1955. Three years later, in 1958, when the same firm unveiled a much longer-legged version it was described as "similar in appearance to the <u>conventional</u> LeTourneau design (*Drilling* Staff 1958:84 emphasis added)." Following the longer-legged tripod version, jackups have evolved into massive structures which today can commonly work in up to 300 feet of water.

The second innovation in offshore drilling was the drillship. Introduced in 1953, the first drillships were converted offshore barges or small ships with the derrick mounted over the bow (barges) or over the side (ships). A number of vessels were converted in 1955 and 1956 for core drilling to obtain geological information in the Pacific off California and by 1957 were drilling in over 1,000 feet of water (*World Oil* Staff 1957a). By the early 1960's, drillships were being built from the ground up with center line derricks for drilling through the center of the vessel and with dynamic positioning equipment replacing anchors. The third innovation occurred in 1956 when Kerr-McGee introduced the "bottle" type submersible drilling rig. The drilling platform was mounted on the top of "bottles" (large cylindrical bottle shaped tanks, similar in shape to a wine bottle, which were connected by a latticework of pipe and positioned around the periphery of the rig). When empty, the bottles floated the platform high over the water. Towed into position, the bottles were flooded, and their bottoms sat on the sea floor to provide a stable base for drilling. Because the bottles were mounted around the periphery of the drilling platform and even when empty were half submerged from their own weight and the weight of the drilling platform, the design was very stable. Since the platform sat on the narrow necks of the bottles, the narrow necks offered little resistance to wave motion when sitting on the bottom. This design ultimately resulted in rigs capable of drilling (with 25 foot deck clearance) in 175 feet of water (Howe 1966a).

Finally, in 1962 semi-submersible drilling rigs were first used. Early semi-submersibles were converted bottle-type submersibles, which were partially submerged, for stability in deep water and anchored in place. Later designs involved multiple, parallel, submerged cylindrical hulls (like submarines) connected together and to a drilling deck with a latticework of shafts. Because the majority of the weight was below the water line, the rigs were very stable and because the only surfaces subjected to wave action were the columns connecting the hulls to the deck, this design was able to operate in rough water. These later designs are also self-propelling and like modern drillships are capable of transporting themselves to virtually any region of the world.

Although there were a number of proposals for other types of offshore mobile rigs, such as totally submerged drilling rigs which operated below the surface (Martin 1956), early forerunners of the gravity-based platforms used later in the North Sea (Gregory 1955), and even innovative uses of existing technology, such as transporting offshore and using a submersible drilling rig designed for inland waters from a converted dry dock (*Drilling* Staff 1956a), the four standard designs came to dominate the U.S. offshore picture during the 1950's and 1960's. Jackups continue to be the most common offshore rigs with semisubmersibles emerging as the choice for rough water and drillships the choice for greater water depths.

In addition to the technological changes in the design of the rigs, there were corresponding changes in drilling operations and in support facilities. Marine radar and radio emerged as commercial products following World War II and were promptly adapted by the offshore support and communications sector. The concept of moving the drilling rig to different locations on the offshore platform in order to drill multiple wells without moving the platform emerged almost concurrently with the Federal leasing program (*Drilling* Staff 1956a). Safety regulations for offshore structures were first promulgated by the U.S. Coast Guard in 1956 (*Drilling* Staff 1956b).

By 1966, a little over a decade after the Federal offshore leasing program commenced, there were an estimated 150 mobile drilling rigs in operation, most of them in the Gulf (Howe 1966a; 1966b; 1966c). Most of the continental shelf in the Gulf, at least out to 500 foot depths (*Offshore* Staff 1966a), was open for exploration. Submersible rigs ceased to be built by the late 1950's. Although jackups, drillships and semi-submersibles have continued to evolve, the basic designs were in place by the mid-1960's. Also by the mid 1960's the dominant offshore drilling companies had emerged and had specialized in the type of rigs they continue to use. Global Marine was the dominant drill ship company in the world with ODECO (Ocean Drilling and Exploration Company) capturing the recently emerging semisubmersible market, and The Offshore Company, Penrod Drilling, and Zapata Offshore dominating the deep water jackup market.

While the rate of technological development in offshore rigs between 1955 and 1965 was astounding, it was not without mishaps. During this same period there were 23 "major mishaps" involving the capsizing and or sinking of offshore rigs (Howe 1966a). The early jackup rigs were the most vulnerable; six were lost in 1965 alone.

Production

All types of mobile drilling rigs are used during exploration or, later, to drill additional wells on existing platforms. Once oil or gas is discovered and the extent of the field has been delineated, a production platform is put in place. Production platforms provide a stable base from which to drill production wells and to mount the necessary equipment to control production from the wells. Early production platforms were the same platforms constructed for exploratory drilling and, of course, were built in place (i.e., piles were driven into the sea bottom and a deck was constructed on top of them). These platforms also provided mooring for barges to take the crude oil to onshore processing facilities. Both the on-site construction of platforms and the transportation of oil by barge began to change by the mid-1950's.

Offshore production in the Gulf underwent a transformation similar to that for exploration in the decade following the first Federal lease sale. The most fundamental change came because it was not practical to build production platforms in place in deeper water. Because the pilings could not be effectively braced below the water line after they were driven, sufficient stability to support the weight and vibration involved in offshore drilling could only be accomplished in relatively shallow water. This meant that, for deeper water, the entire production platform had to be fabricated on land and set in place offshore. By 1955, one year after the first Federal lease sale and six years after the first submersible drilling barge, a number of these "self-contained" platforms (because they did not require tenders during drilling) were in place in the Gulf (Hanna 1955). That same year the McDermott facility, the first fabrication yard solely for the construction of offshore platforms, opened east of Morgan City, Louisiana, on Bayou Boeuf. Eventually this facility expanded to over 1,000 acres (Davis and Place 1983). It is still in operation today.

The technology for the production and installation of these platforms developed quickly. Also in 1955, McDermott produced a marine crane capable of lifting 800 tons, touted as the "largest single mechanical lift ever created" (*Drilling* Staff 1955c:93), for use in the installation of offshore platforms. McDermott had installed platforms in 100 feet of water late that same year and in 200 feet of water by 1959 (Clark, 1963).

Platforms are designed for a specific location and offshore field and are ordered after exploratory drilling and the characteristics of the field are known. In the U.S., the "steel jacket" production platform is the norm. Early platforms were simply rectangular structures consisting of a series of parallel upright columns supporting a deck and connected by a latticework of smaller pipes. As production moved farther offshore by 1956, the basic design of the jacket (that portion that extends from the sea floor to above the water line) had been modified to resemble a slender truncated pyramid still constructed of a latticework of upright columns and braces but with the base being wider than the top of the structure to provide increased stability (*World Oil* Staff 1956b). The size and configuration of the jacket are based on the depth of the water, bottom support condition, the number of wells and the processing equipment required. Whatever the size, the jacket and the deck (the portion of the platform above the water line, with all the production equipment, living quarters, etc.)

are constructed separately. After the jacket is barged offshore[12] and secured in place by pilings driven through the vertical columns, the deck is brought out and installed. While the description implies a simple operation, steel-jacketed platforms have been installed in up to 1,350 feet of water. The largest ("Bullwinkle") platform is 1,615 feet tall[13] and 400 feet across at the base.

Transportation and Supply System

Through the 1950's most offshore operations in the Gulf brought oil ashore via barges, and for a while there was considerable interest in offshore submersible storage tanks (Lacy 1957; Lacy and Estes 1960). As oil and gas production moved farther and farther offshore, however, so did the pipeline network. In 1951, the first large-diameter pipeline for offshore production was laid in the Gulf (Clark, 1963), and by 1958 the development offshore had reached the point that the construction of underwater gathering lines was beginning to be economically feasible (Edmondson 1958). Pipelines are laid from a specially designed "lay barge." The lay barge has an anchoring system, which allows it to be pulled across the area that the pipeline is to traverse. As it moves over the area, sections of pipe are welded to the end of the pipeline, coated to prevent rust and marine growth, and are passed along a ramp that is built into the barge, and over the stern of the vessel. Once in the water, the pipe rides along a supporting ramp, or "stinger," to the bottom where it is buried under the sea floor. As the pipeline networks moved into deeper water, the lay barges became larger and more sophisticated. Like offshore drilling rigs, the lay barge constitutes a system that must be constantly supplied from shore with sections of pipe, coating material, a rotating labor supply, fuel, food, and water.

The earliest offshore attempt, in what is now Federal waters, made by Magnolia Petroleum in 1946, used local expertise and vessels (primarily shrimp boats) for transportation of personnel and supplies. Following World War II, Navy LSTs became available as government surplus, and these were quickly purchased by a number of offshore operators and pressed into service as offshore tenders (Hanna 1955). Concurrent with the spread of offshore activities, methods of supply evolved quickly and, as with mobile drilling rigs, the prototypes for offshore vessels were soon apparent. Some of the necessary vessel types for offshore operation, such as marine tow boats (for moving exploratory rigs, and steel jackets on barges) were already available, but others quickly materialized. The two vessels most closely associated with the offshore industry are the "crew boat" and the "supply boat," both of which appear to have evolved from their military equivalents, "PT" boats and "LSTs." By 1956 crew boats and supply boats built specifically for offshore oil and gas activities were becoming the norm (Craig 1956; *World Oil* Staff 1957b).

---

[12] Jackets are built on their side and barged offshore also on their side. Once in position the specialized barge(s) is selectively flooded, tipping the jacket upright.

[13] By contrast the Sears Tower in Chicago is 1,454 feet tall, and the World Trade Center and Empire State Building, 1,353 and 1,250 respectively.

Crew boats are fast planing hulls; originally wooden and 50 to 60 feet long, they are today usually constructed from aluminum and are up to 150 feet long. Although, as the name implies, they were first commonly used to transport crews offshore, as helicopters gradually took over that role they are more commonly used today to transport specialized equipment and smaller quantities of supplies that do not merit a supply boat. Supply boats are larger displacement[14] hulls with raised bows for crew quarters and low flat decks for carrying heavy loads (such as drill casing or cement) extending over the back two-thirds of the vessel. They frequently have built-in tanks below deck for water or drilling mud. Typically in the Gulf of Mexico, supply vessels are 180-220 feet in length, although in some areas of the world, such as the North Sea, they are frequently over 250 feet in length (Alderdice 1969).

By 1955, a year after the first Federal lease sale on the OCS the helicopter had made its appearance (Monroe 1955), and it quickly became an integral part of the offshore transportation picture (Hanna 1957). With the rapid expansion offshore in the 1960's and early 1970's and the increasing distance from land involved in the movement into deeper waters, helicopters became the standard means of transporting crews and specialized personnel offshore. The expansion of all of these forms of transportation created a burgeoning transportation sector in the northern Gulf of Mexico with the construction and leasing of vessels and leasing of helicopters constituting a major economic activity in their own right. By the late 1970's, Petroleum Helicopters, based in Lafayette, Louisiana, had become the worlds largest helicopter company. Far more than with most industrial sectors, transportation is an integral part of offshore oil and gas activities, and that necessary mobility has a number of implications that emerged early in the Gulf of Mexico.

Mobility

In contrast to the more geographically specific types of development (a generating plant is built, a mine is opened, etc.), offshore energy exploration and development tends to be a highly mobile phenomena, and this has major implications for areas in which it develops. Not only does this mobility tend to disperse both the positive and negative social and economic impacts associated with its activities but, as we will see, if economic or resource availability factors dictate, much of the offshore sector can relocate. This mobility is evidenced in four basic areas. First, the development itself is highly mobile. Offshore

---

[14] The difference between planing and displacement hulls is both a function of performance and design. Planing hulls usually have sharp entries ("V" bows) to cut through waves and are relatively flat over the back two-thirds of the bottom. The propeller shaft(s) extends through the bottom of the hull, and can thus push the boat up to where it is planing over the surface of the water and still maintain a bite in the water. Planing hulls are fast but necessarily more top heavy than displacement hulls. Displacement hulls are more rounded with lower centers of gravity. The propeller shaft(s) extends through the transom of the vessel (like a ship) and thus cannot push the vessel up to plane over the surface. Displacement hulls are slower than planing hulls but are more seaworthy and can carry heavy loads.

drilling rigs can be, and frequently are, moved to virtually any coastal area in the world. The exploratory drilling phase, through the development drilling and completion phases of offshore activity, is the most labor and resource intensive, leading to most of the employment associated with OCS activity. During this time, drilling activities offshore must be supplied with labor, drilling mud, casing and drill pipe, fresh water for drilling, food and potable water for human consumption, fuel, and a variety of specialty tools and equipment. It is also during this period that platform construction will take place, and pipeline to connect the platform to the existing network will be laid. Once the wells are tied into pipeline networks, the actual production of petroleum offshore and the maintenance of platforms are much less labor intensive and provide considerably fewer jobs. Thus, the basic economic activity upon which development hinges is a highly mobile phenomenon. Additionally, the primary support sectors must also shift the concentration and delivery pattern of their products to follow development.

A second factor in the mobility of the offshore energy production industry is the transportability of many of the products, that the industry and support sectors buy. While the transportation of products is characteristic of most industrial development, with the exception of the transportation industry (shipping, railroads, trucking), rarely are the construction projects themselves transportable. Three types of construction projects are commonly purchased and transported by the various industrial sectors associated with offshore energy production: drilling rigs of various types, production facilities (jackets, platforms), and support vessels. Since these products must be constructed on land and transported to a site offshore, they are designed to facilitate mobility. Since they can be produced in any coastal region in the world, the construction or fabrication associated with offshore development does not necessarily have to occur in the vicinity of that development. While extensive local fabrication has been associated with offshore development in Louisiana and Texas, this occurred because this was the first area where offshore oil was developed (Freudenburg and Gramling 1994).

Louisiana was the primary location for offshore exploration. As activities moved into more distant environs, existing equipment had to be modified and redesigned. The need was local, the conditions were local; this encouraged the development of a strong fabrication and shipbuilding sector of the economy with little competition from a world market. Recently, however, areas of the world with much lower labor cost have become extremely competitive in the production of offshore drilling rigs, platforms, and vessels, and this trend will undoubtedly continue for the foreseeable future. When planning was underway for the development of the massive Hibernia field off Newfoundland, there was considerable debate leading to intervention of the provincial government, as to whether the production platform would be a gravity-based[15] concrete platform (which would be constructed locally), or a

[15] Gravity-based platforms are constructed of giant reinforced hollow caissons, which are turned upright and fastened to one another to form a rectangular structure, similar in shape to a grain elevator. From the top of these caissons a comparatively slender column(s) supports a deck on which production machinery and crew quarters are located. When the caissons are empty they float upright and can be towed to the offshore production site. There some of the

floating fabricated-metal platform that would probably have been built in Asia. Pressure from the government helped to turn the tide for a gravity platform and local jobs.

Thirdly, the products themselves, oil and gas, are also very mobile. With few exceptions, production platforms in the U.S. are tied directly into pipeline networks, and the products are brought ashore via pipeline. As pipelines can be run practically anywhere, secondary treatment, refining, scrubbing, etc., can also take place far from the actual recovery activities. The exception to this, off-loading directly to tankers, actually provides an even more mobile alternative.

Taking all three of these factors into account means that the impacts of offshore activities, jobs and economic development may or may not accrue to the communities closest to that development. Thus, offshore activities in many cases act as a distribution mechanism, distributing both positive (jobs, income, and other economic activities) and negative (stress on community infrastructure, family problems) impacts far beyond the geographic area in which primary development occurs. This leads to a fourth and final type of mobility, that associated with the labor force employed in offshore and related sectors, which is discussed in detail under "Social Environment" below.

Development of the Onshore Support System

Infrastructure and the Physical Environment

There are a number of factors that shaped the evolution of the infrastructure supporting offshore development in the Gulf. Because the system for offshore oil and gas production evolved in the Gulf of Mexico, there was no precedent, and the equipment and structures used for offshore exploration and development had to be locally constructed (often from the ground up) to meet local needs. Moreover, because of the rapidity with which the industry moved offshore during the 1950's and early 1960's, design and engineering were in a constant state of flux. The result of these factors was that, unlike areas of the world where offshore production came later and where past experience made planning at least possible if not always successful (Manners 1982), the onshore support system in the northern Gulf emerged with no systematic planning.

An additional factor was the nature of the physical environment itself. The deltaic plain of Louisiana from where most of the activity was supported was aptly described by Davis and Place:

> East of Vermilion Bay, sediment accumulation has resulted in the sequential development of a delta system. Known as the deltaic plain, the area is the site of a series of six major deltaic lobes that extended seaward at different times during the last 7,000 years. Each lobe advanced into the

---

caissons are flooded and the structure sits on the sea floor. Some of the caissons may be used for the storage of crude oil. The structure is designed so that the caissons are below the surface, and wave action, and the deck is held well above the surface and wave action.

> shallow waters of the Gulf of Mexico... and was distinguished by numerous distributaries... These channels continued to bifurcate aiding the distribution of the river sediments and progradation of the coast. Natural levees formed along the channels and served as favorable settlement sites.
>
> Two distinctive plant communities have influenced development of the deltaic plain by the oil and gas industry -- flotant and roseau cane ... Flotant communities, distinguished by abundant "plant species tolerant of frequent and sustained flooding," are "anchored in a relatively thin, matted layer of decomposing vegetable debris that is either truly floating on water or supported by highly aqueous organic ooze" (Russell 1942: 78-79). Roseau cane marsh communities, on the other hand, are dominated by tall grasses and reeds and essentially is land; it can support a man's weight... while flotant "trembling prairie" is a quagmire underfoot. The ease of excavation of flotant marsh has facilitated development of networks of canals associated with the 144,900 ha [approximately 560 square miles] classified by the USGS as extractive land, a category almost synonymous with the oil industry in coastal Louisiana. (Davis and Place 1983: 4,8)

The nature of the terrain restricted settlement and industrialization to the many scattered natural levees of current or previous waterways, and while at times high ground was at a premium, access to the Gulf certainly was not. Anywhere one of these strips of high land met an existing waterway was a potential construction or support site, and these sites sprung up like mushrooms as offshore development moved ahead. The result was that the emerging support, transportation and fabrication sector was scattered across southern Louisiana and later Texas. Fabrication yards ranged from the 1,000+ acre sites near Morgan City to operations the size of half an acre with a welding truck and a portable toilet. Staging areas similarly ranged across the coast, and concentrations quickly materialized at Venice, Bayou Lafourche, Morgan City/Berwick, Intracoastal City, Cameron, Orange and Port Arthur. Wherever road or rail met waterways, local docks and staging areas appeared.

Some of these areas, like Morgan City/Berwick and the towns along Bayou Lafourche, were fishing communities before the turn of the century. The towns grew rapidly, often with few zoning regulations. Existing settlement patterns were altered, transportation networks were extended, and community services were quickly overwhelmed. Morgan City became a textbook example of rapid community expansion (Stallings et al. 1977; Manuel 1980; Gramling and Brabant 1986a) with housing shortages, inadequate utility networks and social services, and an economy almost totally tied to offshore support (Gramling and Freudenburg 1990).

Other areas like Venice and Intracoastal City had little in the way of indigenous populations in the 1950's, and as a result became commercial settlements with staging areas and company offices but little in the way of a permanent population. Lafayette, centrally located and able to offer more amenities, became a corporate headquarters city for the offshore industry during this period (Gramling 1983; Gramling and Brabant 1986a). Coastal Texas, which had already been transformed by the oil industry, received new impetus during this period, with Houston becoming the financial center for oil-related activities (Feagin

1985) and major fabrication yards springing up in the Beaumont, Orange and Port Arthur areas.

By the early 1960's, over 100 platforms a year were being placed offshore in ever-deeper water (see Table 1). This meant that not only were over 100 platforms fabricated each year and moved offshore and supplied while production drilling was proceeding, but also that each year an additional 100 platforms were added to the growing base of offshore facilities that had to be serviced and maintained.

Through the analysis of telephone directories, Davis and Place (1983) identified over 3,500 businesses in coastal Louisiana alone directly serving the petroleum industry by the early 1970's. This was up from approximately 1,200 businesses in the mid-1950's, a growth rate of over 100 businesses a year. These firms were located on over 28,000 acres of land given over to industrial and commercial uses scattered throughout the coastal zone of the state. If all of this marine activity and the associated support and managerial activity had been concentrated into one port, it would have been by far the busiest commercial port in the world from the late 1950's through the mid-1980's.

The Push For Development

By 1957 there were 101 offshore drilling rigs operating in the U.S., 96 off Louisiana (with five off Texas and one off California), most of them off the deltaic plain (*World Oil* Staff 1957c), when an increasingly active Federal leasing program began to kindle what would become an offshore boom. Table 2 shows production, leasing and exploration and development well trends on the Gulf OCS from 1954 through 1990.

Starting from the 275 tracts leased by Louisiana and Texas prior to 1954, a total of 237 tracts was offered during the first year of the OCS leasing program (1954), and of these, 109 (46%) were leased. As can be seen from Table 2, there was a number of years in the late 1950's and early 1960's when there were no lease sales in the Gulf. However, the stipulations associated with the leases served to smooth the offshore development curve and, in general, drive it steadily upward. The primary term of the lease was for five years,[16] but the lessee could retain the lease beyond this period if the tract was producing or, with approval of the Department of Interior, as long as drilling operations were underway (43 U.S.C. 1337(b)). Thus, once a lease was obtained, the lessee had to have exploratory drilling underway within five years or risk losing the lease. Because of limitations on available offshore rigs, the lag time involved in planning offshore operations and the fact that the major players held many leases and had to balance their attention between them, there was no one-to-one annual correspondence between leases sold and offshore activity. There was, however, a pressure to begin exploration on a lease within five years, and if commercially feasible quantities of oil or gas were found, then there was financial incentive to bring the tract into production. In the Gulf, the average time between lease sale and

[16] Some of the more recent leases in more difficult terrain (deeper water or in Alaska) are for ten years.

Table 1

Installation and Removal of Production Platforms on the Federal Outer Continental Shelf

	Gulf of Mexico		Pacific	
	Installed	Removed	Installed	Removed
1953-1960	474	7	0	0
1961	111	0	0	0
1962	123	0	0	0
1963	86	2	0	0
1964	130	0	0	0
1965	126	5	0	0
1966	116	2	0	0
1967	134	0	1	0
1968	107	1	3	0
1969	105	1	1	0
1970	124	1	0	0
1971	101	4	0	0
1972	121	6	0	0
1973	98	1	0	0
1974	52	18	0	0
1975	100	32	0	0
1976	111	31	1	0
1977	116	15	1	0
1978	164	25	0	0
1979	159	43	2	0
1980	169	32	3	0
1981	171	24	2	0
1982	192	21	0	0
1983	177	36	1	0
1984	229	47	1	0
1985	214	68	3	0
1986	109	33	1	0
1987	119	24	1	0
1988	178	102	0	0
1989	188	100	2	0
1990	174	107	0	0
Total	4,578	788	23	0

Source: Gould et al., 1991; American Petroleum Institute 1993; Minerals Management Service 1993.

production over the entire history of development in the Gulf is about five years (Minerals Management Service 1993).

This relatively short time between sales and production, the difficult logistics involved and the number of leases being sold, all combined to become a driving developmental force in the Gulf. They created a growing demand for improved technology (in order to explore and develop more rapidly, and in ever deeper waters), greater numbers of exploratory rigs, more efficient ways to bring development platforms on line, pipelines to transport offshore production, and a massive support sector to support these other demands. The economic forces at work brought about integrated changes in the technology, infrastructure base, physical environment, and concomitant changes in the social and economic environments of the coastal Gulf of Mexico. Together these factors worked to produce a massive offshore/onshore system in a remarkably short period of time. Nor was all the Gulf of Mexico development exclusively for the Gulf. Because of the mobility, noted above, early offshore efforts in other regions of the world were supported from the Gulf of Mexico. Of the four production platforms in place in the Pacific at the time of the Santa Barbara spill, two of the steel jackets and two of the decks were built in Morgan City, Louisiana (Gould et al. 1991). In a similar fashion, not only was early exploration in the North Sea supported by vessels and equipment from the Gulf of Mexico, but the evolution of altered forms of work scheduling meant that many of the experienced personnel from the Gulf were involved in the expansion of offshore activities around the world, a trend that continues to the present.

The Social Environment

The movement offshore required support from a number of social and economic systems, which in some cases had to develop new ways of operating, new networks of supply and support, and new ways of adjusting to the impacts of the growing offshore sector. Certain occupations, primarily associated with transportation or military endeavors, have historically required individuals to travel considerable distance in association with their employment. However, the movement into the marsh and estuaries of the Louisiana deltaic plain provided a situation that had not really existed before. Here, the development was large scale, intense, and relatively permanent, but it was happening in environments where human settlement was not really possible. At the same time, the isolation of the activity and the time and expense of commuting meant that its range would have to be limited by a point of diminishing returns. It is precisely this consideration which has been responsible for the concept of "labor force" being defined geographically, as an area in which people can commute to work (Killian and Tolbert 1993). If, however, time at work and time away from work can be concentrated, then space between work and residence can be increased since trips must be made less frequently.

Extended presence at the place of employment has also occurred historically. As perhaps the most notable example, sailors commonly live and work aboard ships for months or even years at a time. Like ships, drilling operations in the marine environment required 24-hour manned operations to be cost efficient, but three major factors worked against the "ship model" of development for marine petroleum activities as they emerged in the Louisiana deltaic plain. First, the movement was *from* traditional land-based activities *out* toward the

Table 2

Gulf of Mexico Outer Continental Shelf Activities

Year	Troff	Acroff	Trlsd	Acrlsd	Total $	$/Ac	Exwell	Devwell	Prod-Oil	Prod-Gas
	a	b	c	d	e	f	g	h	i	j
1954	237	860608	109	461870	139735505	303	3	61	3.3	56.3
1955	210	674095	121	402567	108528726	270	18	117	6.7	81.3
1956	0	0	0	0	0	NA	41	182	11.0	82.9
1957	0	0	0	0	0	NA	47	282	16.1	82.6
1958	0	0	0	0	0	NA	56	172	24.8	127.7
1959	118	539813	42	171300	89746992	524	86	213	35.7	207.2
1960	385	1610254	147	704526	282641815	401	114	259	49.7	273.0
1961	0	0	0	0	0	NA	110	335	64.3	318.3
1962	830	3718115	420	1929177	489481061	254	148	351	97.4	451.9
1963	0	0	0	0	0	NA	188	357	104.6	564.4
1964	28	34028	23	32671	60340626	1847	200	474	122.5	621.7
1965	0	0	0	0	0	NA	169	619	145.0	645.5
1966	70	263891	41	139773	188010893	1345	260	596	188.7	1,007.4
1967	206	971489	158	744456	510079178	685	287	604	221.9	1,187.2
1968	195	775375	126	570983	743767835	1303	294	651	269.0	1,524.1
1969	65	190153	36	108657	110945535	1021	215	607	312.9	1,954.5
1970	161	666845	138	598510	945064773	1579	201	628	360.6	2,418.6
1971	18	55872	11	37222	96304523	2587	254	556	418.5	2,777.0
1972	210	970711	178	826195	2251347556	2725	296	545	411.9	3,038.6
1973	276	1514940	187	1032570	3082462611	2985	291	527	394.7	3,211.6
1974	1006	5006881	356	1762158	5022860815	2850	336	459	360.6	3,514.7
1975	1143	5989734	265	1369828	670821011	490	310	517	330.2	3,458.7
1976	193	942092	77	337413	555125455	1645	278	782	316.9	3,595.9
1977	223	1074536	124	605427	1170093432	1933	322	851	303.9	3,737.8
1978	362	1865423	206	1052467	1666298621	1583	305	808	292.2	4,385.1
1979	247	1166118	171	812702	3160826960	3889	334	753	285.6	4,672.9
1980	273	1367883	183	934977	4094889184	4380	349	754	277.4	4,641.4
1981	421	2159295	258	1308213	3893097504	2976	327	808	289.7	4,849.5
1982	378	1952417	171	871478	1802832942	2069	372	792	321.2	4,679.5
1983	13023	71153488	1040	5393997	4906889551	910	378	717	348.3	4,040.7
1984	20816	115413886	970	5125178	2478473398	484	559	710	370.2	4,537.8
1985	15754	87028709	670	3529325	1542346514	437	490	617	368.3	4,000.9
1986	10724	58670104	142	734427	187094747	255	263	396	389.2	3,948.9
1987	10926	31846415	640	3447825	497247006	144	399	416	366.1	4,425.6
1988	11282	61492451	917	4829523	514083346	106	550	423	320.7	4,309.9
1989	11013	60097672	1049	5580867	645646870	116	475	501	305.2	4,200.3
1990	10459	56788766	825	4263446	584301918	137	451			

(a) Tracts offered (b) Acres offered (c) Tracts leased (d) Acres leased (e) Total bonuses collected (f) $ per acre collected (g) Exploratory wells (h) Development wells (i) Production of oil, millions of barrels (j) Production of gas, trillions of cubic feet

Sources: Gould et al. 1991; American Petroleum Institute 1993.

marine environment. As noted above, early marine operations with similar types of scheduling, though less uniform in nature, had been in effect in maritime operations since ere supported by fishing vessels, simply because the maritime expertise did not exist in the oil industry. Thus, whileprobably before recorded history, the scheduling of operations in the marsh and later offshore did not directly come out of these experiences. Second, ships isolated at sea are designed to be virtually self sufficient, needing no supplies or additional personnel while in route. In contrast, drilling locations must be constantly supplied not only with a variety of products, but also with specialized personnel to respond to various stages and potential scenarios throughout the drilling procedure. This means that constant transportation avenues must be maintained, and thus regular exchange of personnel is possible. Finally, ships are designed for maximum personnel efficiency to utilize as few people as possible. Marine drilling operations require many more activities than does the piloting of a ship and as a result are both more labor intensive, and require a more diverse labor force.

In response to these unique variables, a form of concentrated work scheduling evolved around marine petroleum activities in the Gulf of Mexico. The common pattern for offshore work is for the employee to meet at a pre-arranged site to "go offshore" either by boat, or more recently, by helicopter. The stay offshore varies but is typically for seven, fourteen, or twenty-one days. Following the stay offshore, the employee is returned to the meeting site and has a period of time off, typically the same length as the stay offshore. When offshore, the crew is divided into two shifts that are on for twelve hours and off for twelve hours alternately. In effect there are four complete crews for each operating rig, two of which are offshore at any given time. More specialized personnel, who are not part of the crew necessary for the basic operation of the drilling rig (downhole logging, etc.), may work other schedules, such as on-call 24 hours a day. Offshore employees work, eat, sleep, and, in short, live at the place of employment. This concentration of work scheduling, which became the model for offshore development, was one of the necessary elements of social engineering for development in the isolated environs of the continental shelf. This pattern of employment has been operational in the Gulf of Mexico for over four decades (Gramling and Brabant 1986a). The intent of this practice was to minimize transportation time and cost, but over time two unanticipated consequences have emerged.

First, because of the temporal scheduling of offshore work, employees can realistically seek and obtain employment considerable distance from where they live. If, for example, one works a fourteen on and fourteen off shift, the round trip between place of residence and place of work must only be made once every twenty-eight days. This decreased rate of commuting allows considerably more time and money to be spent in transit before a point of diminishing returns is reached.

Gramling (1980) conducted a labor survey in the eastern part of St Mary Parish, one of the most heavily involved parishes in Louisiana in the support of offshore activities, during the height of the offshore boom in 1980.[17] Because concentrated work scheduling

---

[17] The survey was a stratified random sample of businesses in east St. Mary Parish, stratified by Standard Industrial Classification Code (U.S. Department of Commerce 1979) and number

Table 3

Miles Traveled by Years of Residence, For Offshore Workers

Miles Traveled	Years of Residence			
	0-1 years	2-5 years	6-10 years	10+ years
0-25 miles	10	4	5	18
26-50 miles		1	1	5
51-99 miles	10	22	6	25
over 100 miles	38	64	34	120
Totals	58	91	46	168

allowed long-distance commuting, some of these high-paying jobs were in communities far from where individuals were employed. Table 3 shows distance traveled to work as related to the number of years that individuals had lived in their community of residence at the time of the survey. Not only does the table show that a fairly large portion of the sample commuted from over 100 miles away, but that over 70% (120 out of 168) of these long-range commuters had been doing so for over ten years when they were surveyed in 1980. In fact, the sample contained individuals living in 18 states and communing to work offshore in Louisiana from such improbable locations as New York and California.
Gramling and Brabant (1986b) noted that less than one-third (30%) of the 381 offshore workers in their sample lived within one hundred miles of where they met to go offshore. Over eleven percent (11.5%) of the employees lived more than 500 miles from where they worked. Similarly, Centaur Associates (1986) found that of the estimated 21,847 employees working offshore in waters off the State of Louisiana in 1984, 2,167 (9.9%) did not live in the State of Louisiana, and the overwhelmingly majority did not live in the parish (county) where they were employed.

Second, this nontraditional scheduling of work allows decisions concerning the site selection of drilling activities to be made with less regard to human settlement patterns, since decision makers can count on long-distance commuters. These two points are obviously different sides of the same coin: the first refers to decisions by employees, the second, to

---

of employees. All employees of each sample firm were asked to complete a questionnaire involving basic social and economic characteristics (e.g., age, sex, marital status, place of residence, income, occupation number of miles traveled to work, etc.). Of 152 sampled firms 107 or 70.4 percent cooperated with the survey resulting in 1,560 completed employee questionnaires or about 11.1 percent of the total estimated labor force in East St. Mary Parish. For details of the sampling, administration and coding procedures, see Gramling (1980).

decisions by employers. By increasing the length of the period of intensive work, and correspondingly the period of time off, a particular economic activity, such as an offshore drilling rig, can be sited literally in any coastal region of the world, and the labor force to man the platform can be from any other region of the world. Initial development off the North Slope of Alaska was staffed largely by experienced offshore drilling crews from Louisiana and Texas. The scheduling of work was simply changed to thirty days on and thirty days off to allow feasible commuting. Likewise, as offshore exploration and development moved off the North American Continent (to the North Sea, the Persian Gulf, Indonesia, etc.), work scheduling was extended to ninety days, and the same individuals who had obtained their experience in the northern Gulf of Mexico were employed in these locations.

In fact, in the North Sea, where U.S. companies dominated the early offshore activities, it quickly became obvious that the corporations preferred to employ their overseas labor from the experienced labor force located near the Gulf of Mexico. The corporations involved profited because they were relieved of the necessity to train or relocate employees. Thus, few of the people employed in early North Sea development were citizens of, or lived in, those countries. As a result those countries did not gain from the benefits of those jobs. Once this trend became clear, the countries involved, led by Norway, moved legislatively to require that quotas of local residents be employed and local supplies purchased in virtually all offshore activities. This led to an economic development model, which Noreng (1980) calls the North Sea Model and House (1984) refers to as regulated capitalism.

The point is that this particular altered form of work scheduling produced such a successful combination of a geographically separated economic activity and a labor force that legislative intervention was required to alter it. For certain highly skilled individuals in the oil industry this pattern has become a way of life. Much like experienced construction foremen or consultants, these individuals work wherever the action is. Unlike construction foremen, they continue to "live" in a traditional place of residence. Unlike consultants, their employment is regular and frequently with the same corporation and in the same location for years. Thus, in the offshore industry and certain highly skilled individuals have literally become part of a worldwide labor market independent of the geography of oil.

While these operations were supported by maritime operations, these were not a part of these operations, and neither the oil worker in the marshes in the 1930's and 1940's nor the vessel operators and crews that got them to work were a part of the long tradition of labor relations that had built up around seafaring (Forsyth 1989; Forsyth et al. 1984; Forsyth and Gramling 1987). While this may seem to be a minor point, it is not. The emerging occupational structure of work associated with oil and gas extraction in the marine environment both diverted from and shared with elements of the more traditional maritime industry. These shared elements and diversions have shaped labor relations and the legal environment of offshore work to the present. The gradual extension of land-based oil extraction activities in the 1930's and 1940's into the marine environment, the support of those activities by an emerging class of vessels that were too large to be considered "boats" and too small to be "ships," and the isolation of this system in inaccessible areas, along with traditional southern antagonism toward unionism, meant that this emerging industrial issue was left behind.

The late 1930's and early 1940's saw the growth of the union movement in the U.S., following the passage of the National Labor Relations Act of 1935, and although the earliest maritime unions can be traced to the late 1800's, the primary thrust for the seaman unions paralleled the time period of the union movement in general (Forsyth 1989). By this time established patterns of employment surrounding oil and gas extraction activities had developed in the coastal Gulf of Mexico, and several features of that activity ensured that, unlike seamen, these and later offshore workers in the U.S. never became unionized.

Shrimpton and Storey (1987; see also Storey and Shrimpton 1986) summarize the problems with unionization at isolated mine sites in Northern Canada where both the scheduling of work (Gramling 1989) and the isolation are very similar to that in offshore oil:

> The problems that 'fly-in' [there are no roads, so miners fly in to work] pose for unionism centre on the facts that the entire mine site, including the mine, camp and airstrip, are under company control, and that at any one time only half the workforce is at the site (half of whom are working), while the other workers are at home in a large number of widely dispersed communities. Access to the site has to be negotiated with the employer, or achieved through government intervention, and it is difficult to hold meetings and votes, achieve group solidarity, and provide union training. In the case of a labour dispute it would be very difficult to picket, prevent the use of non-union labour, or maintain solidarity among the dispersed workers. There is also no 'community' support, in the form of the support from the spouses and children living in the single-industry town that has proven so important in numerous labour disputes. (Shrimpton and Storey 1987: 4)

Although offshore workers in Europe are largely unionized, the offshore industry in Europe (North Sea) developed in the 1960's, around relatively mature technology and was organized along the lines of the existing shipping industry and the accompanying maritime unions. Maritime unions have been successful, at least partly, because of licensing requirements for every entry into critical jobs and the comparative labor scarcity created by these entrance requirements.

In addition, ships (because of their draft, and the facilities needed to load and unload them) come into a limited number of ports. Union halls were established in the 1930's in all of these major ports, which provided a gathering point for seamen and a focus for union activities. There is no comparative point of concentration or licensing requirement for those involved in offshore oil and gas activities in the U.S. As noted above, because of the smaller scale and limited requirements, early marsh and offshore activities were spread out over numerous local waterways across the Mississippi deltaic plain. Thus, in the United States, where the offshore industry evolved as a gradual extension of onshore practices, the industry has successfully avoided unionization throughout its 60-year history.

What the industry did not avoid that was a direct result of the gains of the maritime union was protection for injured workers under the Jones Act, a quirk of the U.S. judicial system that has led to a plethora of personal injury suits in the Gulf of Mexico (Beer 1986). Following the sinking of the *Titanic* in 1912 and the outbreak of World War I in 1914, national attention focused on the protection of sea lanes and on seamen who manned American vessels (Beer 1986). In 1920 Congress passed the Merchant Marine Act, (section 33 of which has come to be named the Jones Act), which provided a recourse (including a trial by jury) for "seamen" for the collection of damages for injury suffered "in the course of his employment" (46 USC § 688(a)). Congress recognized the seaman as a special type of plaintiff for two reasons: the seaman's *exposure* to the perils of the sea and the relative *isolation* from recourse and remedies (Caffery 1990). As a consequence the Jones Act makes it easier for seamen to establish employer negligence and to claim damages than with other occupations. Neither "seaman" nor "vessel" were defined by the act.

In 1955 a suit was brought against the Texas Company in U.S. District Court by the estate of a worker who was killed on a submersible drilling barge, and the court returned a settlement under the provisions of the Jones Act. Although the Fifth Circuit Court of Appeals overturned the decision, the Supreme Court upheld the original decision. The effect was to define submersible drilling barges (and later offshore rigs) as "vessels," and employees on these vessels as "seamen" entitled to protection under the Jones Act. Because work in the oil field in general and offshore in particular is dangerous, this decision touched off a wave of Jones Act litigation in coastal Louisiana and Texas, which continues to the present (Beer 1986).

Working Offshore

The geographic job mobility noted above constitutes one of the better examples of both positive and negative impacts distributed by offshore development. One of the most positive impacts of the concentrated work scheduling associated with working offshore is that it allows individuals living in depressed economic areas, sometimes far from the coast, to maintain a high-paying job offshore while continuing to live in (often rural) communities with their family and social networks (Gramling 1989).

There are, however, a variety of individual problems that occur with offshore employment, such as lack of privacy on the job, loneliness, limited recreational facilities, physical risk and arduous labor in the midst of hostile elements. In addition, time off the job may also be unrewarding. Extended periods of leisure time, when all of one's friends are working, are less than ideal. Boredom probably leads to more second jobs by offshore workers than does financial need.

Individuals generally compartmentalize their lives in many ways, but a common one is to divide time between work and leisure. Shift work interrupts this normal compartmentalization and interrupts the individual's interaction within a variety of social institutions (Laska et al., 1993; Gramling and Forsyth 1987). There have been some attempts by local institutions to adjust to this interruption. For example, the University of Southwestern Louisiana at Lafayette, Louisiana, near the center of offshore production, offers classes which meet every other week for those employed offshore. However, the most difficult adjustment for offshore workers is with their family life.

Gramling (1984) noted some specific family problems related to decision making, child rearing, and sex that are associated with offshore work, but Gramling and Forsyth (1987), in a more comprehensive approach, examined the general relationship between work scheduling and family interaction. In this study they assume that successfully arriving at a consensual definition or an agreed upon set of ground rules is an ongoing enterprise as each new situation that the family faces must be defined and rules worked out for how members should act in these situations. "Problems" arise in families when they are unable to arrive at a set of agreed upon rules[18]. The process is essentially one of negotiation, requiring human interaction. Thus, for a viable definition or set of rules to emerge, the presence of those to whom the definition or rules will apply is necessary. Offshore work interrupts the presence of one member of the family, usually the male. These prolonged and periodic absences mean that inevitably new problems and resolutions will arise and be made accountable while one family member is not present. Because of the situational nature of these "solutions," the absent member may not understand why and how decisions were made and may disagree with them. If these absences continue it may become impossible to maintain a single coherent set of rules for the social system of a specific family.

Often the families of offshore workers involve two discrete social systems with two sets of rules. One set of rules defines areas of competence, lines of authority, and guidelines for interaction when the offshore worker is absent; the other is in operation when he is home. The relationship between these two situations seems to fall into a limited number of adaptations (Forsyth and Gramling 1987 identify five), ranging from quasi-replacement of the husband/father in the decision-making process during his absence (usually by a male kin) to the acquisition of the "periodic guest" role by the husband/father when he is home with little input into the day-to-day operation of the family. There are also almost inevitably areas where the two constructs conflict.

Economic Adaptations to Mobility

While the development offshore, starting in the 1950's, generated tremendous economic growth along the northern Gulf of Mexico, the interaction of the mobility of that activity with the structure of ownership by the major multinationals produced a relatively unique economic environment in the Gulf. The major multinationals, because of their immense capital potential, own (or through the leasing process acquire control of) the potential oil and gas resources in the reservoirs and the refineries required to produce a marketable product. In addition, they may own the means of delivering raw materials to the refineries and the distribution system allowing the marketing of finished products from the wholesaler to the Texaco station on the corner. What these fully integrated corporations most notably do *not* own are the corporations and equipment that address the various pieces of the process necessary to get the resource in the ground to a point where it is available to

[18] Using the construction of reality approach (Berger and Luckmann, 1966; Berger and Kellner, 1964), the family was conceptualized as a small social system, which in modern industrialized cultures is less and less guided by traditional norms and increasingly must operate by a set of rules, which are largely negotiated, by the members of the family. These continually updated rules or constructs define appropriate behavior for each individual family member, as well as what constitutes appropriate interaction among family members.

be transported to a refinery. Although the necessary capital for the first offshore operations was only available from the largest oil companies, the concept of equipment leasing (including offshore drilling rigs and support vessels) and independent offshore supply companies (e.g., to supply drilling mud, water, etc.) quickly emerged as offshore operations began to standardize in the 1950's (Lietz 1956; *Drilling* Staff 1956c). It is here in this most temporary of situations where the opportunity for the myriad smaller players in the offshore game exists and where much of the expertise in the Gulf infrastructure remains.

For example, let us say British Petroleum is the successful bidder on an offshore tract. British Petroleum will contract with an offshore exploration company to do the seismic exploration and, if the results warrant, perhaps with another company to do the necessary exploration for underwater hazards. Then they will contract with an offshore drilling company to drill an exploratory well. The drilling company owns offshore rigs but contracts with a host of other specialized companies to support the drilling operation, providing support vessels, catering, potable water, drilling mud, casing and drill string, and even crews. Many of these companies further contract with still another level of support companies to provide additional services. Thus, a corporation that owns and leases offshore supply boats will probably engage another company to provide offshore safety classes for their employees.

If the exploratory well finds commercially feasible quantities of oil or gas, then the oil company will contract with a fabrication company to produce an offshore production jacket and perhaps with another company to produce the deck. Additional companies may move the completed jacket and install it, requiring support (e.g. a diving company) throughout the process, and install the completed deck structure on the jacket. At this point, perhaps, another drilling company gets involved drilling the production wells, also being supported by many firms through a process that may last several years. After completion, a pipeline company connects the platform to the existing pipeline network, also being supported with crews, fuel, water, pipe, coating, divers, etc. throughout. If something breaks down during any of these operations or later modifications need to be made, a host of additional corporations swing into action with specialized services and tools. Once the resource is available to be delivered, the oil company again assumes primary control and profit.

Several attributes of this process are noteworthy. First, it is in this niche between initial ownership and availability for transportation (exploration/development) that the primary opportunity for local entrepreneurial activity exists. Second, this is one of the more capital intensive aspects of the enterprise, and products that facilitate the process are very valuable. Third, this part of the process from acquisition of lease to availability for refining is the most temporary. Finally, because of the uncertainty involved at each stage of the exploration/development process and the necessity to rely on services outside one's control, many jobs cannot be bid at a fixed cost, as say the construction of a house or road can be. A supply vessel company cannot bid a fixed price for supplying a drilling rig, because they do not know how long the operation will take and often cannot even give a daily rate in advance, because they do not know what difficulties will be encountered (up to and including such factors as the weather) and, as a consequence, what vessels will be required and for how long. Personal services are similarly constrained, as are the production of individual specialized products used in the system. Thus, the whole support sector works on an hourly or daily basis and on a high markup for specialized products.

Given these attributes and the Federal leasing program, a unique and transient entrepreneurial environment arose surrounding offshore activity in the northern Gulf of Mexico. Because payment was on an hourly or daily basis, and because of the large markups, the emphasis came to be on speed, not costs. When a $60,000+-a-day offshore drilling rig is down for lack of a part, the question is not how much but how soon. Similar metrics are at work to a lesser scale with a $6,000-a-day supply vessel or with skilled labor, when the demand for a product is high. The fabrication yards in Morgan City were paying $18 an hour for welders in the mid-1970's and could not get enough. Thus, while the economic environment provided jobs, entrepreneurial opportunities, and in many cases fortunes the adaptation was to a narrow niche which proved to be problematic later.

By the mid-1960's, the offshore system was a mature industrial complex, fully integrated into coastal Louisiana and Texas. Operations were underway in the Pacific off southern California and had started in the North Sea. In less than two decades, the industry had evolved into a system capable of working throughout the world. During the next decade, while this world-wide expansion continued, operations in the Gulf grew at a steady pace. Lease sales proceeded on an annual basis in the Gulf, and the steady annual average increase of over 100 platforms continued to drive the development of the support and construction sectors of the economy. Although the January 28, 1969, spill in the Santa Barbara Channel halted additional OCS lease sales in the Pacific and postponed initial sales in the Atlantic and Alaska, the spill did not affect the Gulf. For the next five years, while the OCS of most of the U.S. was closed to leasing, the leasing program in the Gulf and the accompanying developmental pressures moved steadily ahead.[19]

[19] The Santa Barbara spill provided at least partial impetus for the National Environmental Policy Act (NEPA), Earth Day, much of the subsequent environmental movement in the U.S., and eventually the Outer Continental Shelf Lands Act Amendments (OCSLAA) in 1978.

Chapter 3: Political Storm Clouds: OPEC, California, and the Embargo

The Formation of OPEC

Exploration and production technology moved ahead faster than consumption. Production on the Gulf of Mexico OCS was in full swing by the late 1950's, discoveries were still being made in coastal Louisiana and Texas, and the Middle East was found to have enormous reserves. With reservoirs close to the surface and close to the sea, which facilitated transportation by tanker, production costs in the Middle East ranged from five to ten cents a barrel and the resulting profits encouraged production. In addition, Soviet oil was beginning to come on the world market.

The transportation structure of the market was also changing. Following World War II and the Marshall Plan's funding of the transition from coal to oil, much of Europe was supplied with Middle Eastern oil via the Suez Canal. When Nasser closed the canal in 1956 in response to the British and French invasion to retake it, the progenitor of the super tanker was born. The industry moved quickly to build 250,000-ton tankers. These ultimately proved to be so cost effective that eventually it became cheaper to bring oil from the Middle East to Europe around Africa.

By the late 1950's concerns about oversupply began to emerge. In 1959, following a series of unsuccessful attempts at voluntary controls Eisenhower announced a quota on foreign oil. The quota resulted in a decline in the demand for Middle Eastern oil, and the following summer Exxon abruptly announced a 14-cent-per-barrel cut in its posted price for Persian Gulf oil (Atkins 1973). This simple profit-motivated action had far reaching consequences. In September of 1960 the Ministers of Oil of Iran, Iraq, Kuwait, and Saudi Arabia had met in Baghdad, and the Organization of Petroleum Exporting Countries (OPEC) was born (Ghanem 1986). OPEC had little initial success in establishing quotas, and the world surplus of oil continued. The major oil companies consulted with the new Kennedy administration to be certain that they would have the permission of the antitrust division of the Justice Department to act jointly if OPEC became a problem (Senate Subcommittee on Multinational Corporations 1974).

Offshore California

During this same period, events were unfolding on the west coast that were also to eventually alter the OCS program (Cicin-Sain et al. 1992). By 1957 the Monterey-Texas Company had producing wells in the Pacific from an artificial island off Seal Beach (*World Oil* Staff 1957d). In 1958, borrowing from Gulf of Mexico technology,[20] the first true offshore platform in the Pacific (Hazel) was set at 100-foot depth in state waters, offshore from Summerland. By 1966 the State of California had leased all state offshore lands from

[20] The first production platform in over 100' of water was placed in the Gulf of Mexico four years earlier, in 1954 (Clarke 1963).

Point Conception on the West eastward to the Ventura County line, practically the entire coastline of the Santa Barbara Channel. The exception to this was a 16-mile sanctuary, adjacent to Santa Barbara and the Goleta valley, where the strongest protests against offshore development forced the State's hand (Steinhart and Steinhart 1972). To date, there have been over 3,500 development wells drilled in state waters off California (American Petroleum Institute 1993).

Spurred by this growing movement offshore into state water, the first Federal lease sale in the Pacific was held in May of 1963 (Gould et al. 1991). Although 41 tracts off central and northern California were leased in this first sale and 101 in a sale off the Washington and Oregon coasts the following year, exploratory drilling found no commercially feasible quantities of oil. In 1966 a one block "drainage" sale in the promising Santa Barbara Channel area was held, over local protests. This sale was to counteract the effects of production on state leases adjacent to Federal waters, and industry response expressed their views of the perceived potential of the Pacific OCS. A consortium of three of the major oil companies[21] bid $21,189,000 for a 1,995.48 acre tract, or $10,618.50 an acre (*Offshore* Staff 1967a).

With the 1968 Santa Barbara sale the Department of Interior began to face the first real opposition to its offshore leasing program. The proposal for Sale P4 (originally scheduled for 1967) brought substantial protests within Santa Barbara County and a county report opposing the sale (Steinhart and Steinhart 1972). As a result Interior delayed the sale and agreed to a two mile buffer around the Santa Barbara sanctuary. Industry optimism concerning the Pacific was evidenced by the five mobile drilling rigs that lay idle in California ports during the delay (*Offshore* Staff 1967b).

The delayed February 6, 1968 sale turned out to be a record one from a financial perspective. Total bonus for the leased blocks of over $602 million surpassed all previous Gulf or Pacific sales (Gould et al. 1991). Within weeks of the sale, two drilling rigs were on location and working (Armstrong 1968). About a year later, on January 28, 1969, on Union Oil's Platform A, a blow out occurred around the casing below the sea floor. The strata below Platform A continued to leak throughout much of 1969, although the worst was over by mid-March. Estimates of the total spill range from one to three million gallons.

The Santa Barbara oil spill became a national media event throughout the spring of 1969. Scenes of helpless birds mired in a layer of oil became common and, coupled with the inability of either the oil companies or the Federal government to stop the flow, had far reaching effects (Molotch 1970). The spill has been variously credited with lending support to the emerging environmental movement (Dunlap and Mertig 1992), Earth Day in 1970, and the passage of the National Environmental Policy Act in the waning days of 1969. As a result of the spill, lease sales were suspended in the Pacific, and proposed sales in the Atlantic and off Alaska were postponed. The immediate effect of the suspension was to halt the planned development on the OCS outside of the Gulf of Mexico and consequently to enhance the importance of Middle Eastern oil.

---

[21] Continental, Cities Service, and Philips

Background to the Embargo

Another critical, less publicized, event that was ultimately to have far reaching implications for the offshore leasing program also happened in 1969; the rise of Muammar el-Qaddafi to power in Libya through a military coup (see Anderson and Boyd 1983 for details of this period). Following the closing of the Suez Canal during the 1967 Arab/Israeli war, Libya, since it was located on the Mediterranean, became the centerpiece of a strategy to provide an alternative to Middle Eastern oil for Europe. A key player in this strategy was the Occidental Petroleum Company, which had major holdings in Libya and markets in Europe. By the end of 1969, Qaddafi had announced what essentially amounted to the expulsion of the British and U.S. air bases.

In January of 1970 Qaddafi demanded an unprecedented 40-percent price increase for Libyan oil, a larger share of the profit to Libya, and threatened to stop production if his demands were not met. Several factors worked in Libya's favor. First, Nigeria's production was low due to a civil war. Second, an unusually cold winter in Europe had drawn down supplies. Third, the building of tankers for the trip from the Middle East by going around Africa had not yet caught up with the transportation bottleneck caused by the second closure of the Suez Canal. This put Libyan oil, which could be delivered across the Mediterranean at a premium, and Occidental Petroleum in a bind. Realizing this, Qaddafi began to cut Occidental's production. By early September Occidental capitulated. Most of the major buyers of Libyan oil followed this capitulation and met Qaddafi's demands before the end of the month.

With Qaddafi's success, the members of OPEC had a new model for negotiations with the multinationals, and they lost no time in applying it. Demands similar to the gains secured by Libya were soon made to the oil companies with similar threats of shutting down production or even nationalization of holdings if demands were not met. Initially the oil companies closed ranks against the demands but, by the middle of February, conditions similar to those won by Libya were in effect for the Persian Gulf members of OPEC. By the end of March, Qaddafi had made new demands, which the companies met (Anderson and Boyd 1983). With the events in Libya and the Middle East during 1969-1970, control of the world oil production passed from the cartel of multinational corporations to the producer states. Between 1971 and 1973 the price of Middle Eastern crude doubled.

There were, however, warning signs on the horizon. In 1970 Nixon signed the Clean Air Act, which began to move the country away from coal, and toward cleaner fuels, particularly natural gas. Gas, however, continued to be federally regulated at what many thought was an artificially low price, and there had been no big push by industry to increase available supplies. In addition, the projected development curve of the OCS outside of the Gulf of Mexico had been severed by the moratoria following the Santa Barbara spill. Finally, to the extent that long range planning was being undertaken, the projected 1.7 million barrels a day, which would ultimately flow through the Trans-Alaskan pipeline, had been delayed by heated opposition and the failure of the partners in the venture to come up with an acceptable environmental impact statement (Gramling and Freudenburg 1992b).

The Embargo

Throughout 1971 and 1972, the producer nations moved to solidify their position through "participation" (increasing nationalization of corporate holdings) with the multinationals. As part of these agreements, the producer nations were transporting and refining increasing amounts of their oil. This forced the companies to curtail some of their long-term supply contracts to utilities, independent refineries, and other large users which, in turn, forced these buyers into the more volatile spot market.

On October 6, 1973, Egypt and Syria invaded their occupied territories, and their initial success led Israel to call on the U.S. for support. Representatives of the oil industry warned the White House that support for Israel would bring an embargo (Sampson 1975), but Nixon called on Congress for aid to Israel. Soon after this the Arab members of OPEC initiated an embargo against the U.S. Although the embargo was over by the spring of 1974, its effects continue to the present. When the volatile spot market reacted and demonstrated to the OPEC members that the market would bear much more than the current posted price of oil, OPEC raised the price. In a three month period from October of 1973, to January of 1974, Middle Eastern oil prices soared from $5.12 a barrel to an official OPEC price of $11.65 a barrel and at times much higher on a nervous spot market. This came on top of the doubling of price between 1971 and 1973 (Darmstadter and Landsberg 1976). These increases were only the beginning of a steady climb that would see crude oil peak at over $30.00 a barrel seven years later.

The impact of this trend on the OCS program was twofold. First, and quite directly, in the Gulf of Mexico where leasing had continued after the Santa Barbara oil spill, the rising prices within a year drove the bids on leases and exploration and development activities up (see Table 2 above; Gould et al 1991). A more circuitous impact came from the Nixon administration's response to the crisis.

In response to the situation, President Nixon presented a "quick fix" to the shortages and price rises following the embargo by offering the American public Project Independence, which was proposed to bring energy independence by 1980. In addition to a renewed call for the Trans-Alaska pipeline, the plan instructed the Secretary of Interior to increase the OCS acreage offered for lease to 10 million acres for 1975 (about three times what had been planned) and to begin lease sales in "frontier" areas, those that had never seen leasing and those that were closed following the Santa Barbara spill. A Senate staff report (Magnuson and Hollings 1975) noted a number of problems with the plan. First, there was the overly optimistic estimates of the reserves on the OCS and hence the questionable ability of the OCS to meet the nation's energy needs. Second, the report noted that the increased offerings would probably result in lower dollars per acre for bonus bids for OCS leases. Third, there was also the possibility for increased impacts on coastal areas as a result of the increased activities. Finally, the industrial capacity to explore the increased acreage (drilling rigs, support vessels, etc.) simply did not exist (Magnuson and Hollings 1975). This latter fact was also recognized by the industry (*Offshore* Staff 1974). President Ford continued Nixon's OCS policy, although lease sales never approached the 10 million acre goal. In 1975 sales resumed on the Pacific OCS and on the Atlantic OCS in 1976.[22] The first Alaska sale also occurred in 1976. In the Gulf, acreage sold in 1975 exceeded that of any previous year (Gould et al. 1991).

Outside of the Gulf, OCS leasing had become an increasingly unpopular activity. The initial sales in Alaska and off the east coast and the resumption of sales in California in the mid-1970's met with resistance from various interest groups and state governments. In California, the Santa Barbara spill had galvanized local groups and increased pressure statewide for protection of the coast. In 1972 California passed Proposition 20, which created the California Coastal Commission with authority over almost all types of development on the coast and out to the three mile limit of state waters. The Commission's first task was to develop a plan detailing acceptable uses of the coastal zone. The plan went before the State legislature in 1976, and after a bitter fight passed. While the plan had no direct control over OCS lands, the process set up by the Coastal Commission provided access to a variety of information, rallying points, and communication vehicles for various users of the coast. In short, it made organization to oppose OCS activities easier (Kaplan 1982), and opposition began to re-emerge shortly after the announcement of the proposed resumption of leasing. The initial sale in California after the moratorium (Sale 35), proposed for 1974, was opposed by the State, which sued, maintaining that the requirements of NEPA had not been met. The State ultimately lost, but in the meantime two sales proposed for 1976 and 1978 were dropped. The next sale (48), originally proposed for 1977, was delayed until 1979, after a suit brought by the County of Santa Barbara failed to halt it. During the same period, proposals to establish marine sanctuaries (excluding OCS oil and gas activities) surrounding the Santa Barbara and Farallon Islands went forth to the National Oceanic and Atmospheric Administration, under the 1972 Marine Protection, Research and Sanctuaries Act.

Sale 48 raised an issue that was not resolved until 1990--the relationship between OCS leasing and federal consistency under the 1972 Coastal Zone Management Act (CZMA). Under this voluntary program, states with federally approved coastal zone management programs would receive federal funds for planning and management in their coastal zones. A clause in the CZMA required that federal activities be consistent with the requirements of the state programs. Thus, the consistency clause in the CZMA requires that the federal agency certify that its activity is consistent with state guidelines and submit that certification to the state for verification. While there was general agreement that OCS exploration and development fell under the activities requiring consistency, with Sale 48, the California Coastal Commission requested the Secretary of the Interior to certify that the sale itself met consistency. Interior refused, arguing that the sale itself produced no potential impacts. California countered that all other activities flowed from the sale and that the purchase of a lease implied a right to develop, since Interior could hardly lease a tract and then deny the lessee the activity for which they had purchased the lease. In addition, the stipulation of the

---

[22] The first sale on what is now considered the Atlantic Outer Continental Shelf actually occurred in 1959, when 23 tracts were leased and three exploratory wells were drilled south of the Florida Keys without incident. The wells were dry holes, and all have been plugged and abandoned.

leases required timely development. A Justice Department review of the issue and later a Department of Commerce opinion both agreed with California, but because no tracts were actually in dispute (i.e., California would have agreed with the consistency determination), the issue was not resolved (Kaplan 1982).

Chapter 4: Boom and Bust in the Gulf

Throughout the 1960's and early 1970's, offshore exploration and production continued to increase in the Gulf of Mexico. It was during this period that offshore energy development expanded to become a worldwide phenomena. Exploration in the North Sea began in the late 1950's, and by the mid-1960's leasing and development were underway. During this same time period, exploratory drilling was proceeding in the Persian Gulf, off Africa (Nigeria), the Far East (Japan, Borneo, Australia), and Cook Inlet in Alaska.

Still the major development was in the Gulf of Mexico. The expansion in the Gulf during this period was primarily from off the Louisiana deltaic plain westward to western Louisiana and Texas and southward into the deeper waters of the Gulf. The Louisiana deltaic plain was the clear leader both in leases sold and in platforms sited until the late 1960's and early 1970's, when western Louisiana and Texas began to catch up.

Continuing Technological Development

Driven by forecasts of growing energy consumption (*Offshore* Staff 1966b; 1966c), evolution of the offshore industry continued with an emphasis on movement into deeper water and more hostile environments. The loss of the drilling rig *Sea Gem* in the North Sea in 1965 (*Offshore* Staff 1966d) indicated the dangers associated with the new environments, and the adaptation of Gulf of Mexico technology to the more hostile conditions elsewhere, a process that was already underway, received new impetus. By 1966, the first of a new generation of massive offshore semi-submersibles and drillships began to be available for work virtually anywhere in the world, many of them constructed in the Gulf of Mexico (*Offshore* Staff 1966e; 1966f; 1966g; 1966h) and many of them going to the North Sea (*Offshore* Staff 1967c). The North Sea scene had actually begun in 1959 with the announcement of Groningen gas field off Holland. By 1962 the enormous size of the field was recognized and, by the mid 1960's, a multi-million dollar drilling effort that was in full swing (*Offshore* Staff 1967d). By 1967 the extent of the potential for the North Sea was beginning to be realized as new strikes were reported (*Offshore* Staff 1967e) and the first North Sea production came ashore (*Offshore* Staff 1967f).

This same period saw the beginnings of sophisticated underwater survey techniques (Hill 1966), including side-scan sonar (*Offshore* Staff 1966i), and technological advances in deep-water diving and pipeline laying (Black 1966; Lahm 1966), which supported the direction the offshore industry was headed. By 1967 there were 75 countries worldwide exploring for offshore oil and gas and 20 producing offshore (Weeks 1967).

Throughout the 1960's, however, the primary action was in the Gulf of Mexico, and Gulf technology was state-of-the-art. A number of offshore "giant" reservoirs (producing over 1,000 barrels a day and estimated to contain over 100 million barrels) had been identified in the Gulf[23] (*Offshore* Staff 1967g). A controlled Federal leasing program was leasing tracts for top dollars (*Offshore* Staff 1967h; Schempf 1968a) and much optimism was being expressed by operators in the Gulf (*Offshore* Staff 1969a).

Gulf technology had little competition. By 1967 McDermott had built, in their Bayou Bouef yard near Morgan City, two platforms for Shell Oil and installed them in over 300 feet of water in the Gulf (*Offshore* Staff 1967i). In 1968 the *Glomar Challenger*, a state-of-the-art drillship, built in Orange, Texas, began a series of worldwide trips for the Scripps Institute to take deep bottom cores for research purposes. The technology involved was inconceivable only several years before. Before the trips were over the *Glomar Challenger* would drill an almost 3,000-foot hole in over 16,000 feet of water (*Offshore* Staff 1969b).

Construction of offshore drilling rigs began what can only be described as an incredible construction boom with most continuing to be built in the Gulf. During 1966 shipyards around the world had 34 drilling units (17 jackups, 10 submersible/floaters, and 7 drillships) under some phase of construction (*Offshore* Staff 1967j), a figure that climbed to 40 by the following year (Schempf 1968b).

Because of the oversupply of drilling rigs due to moratoria on offshore drilling in most areas other than the Gulf of Mexico, many of the major oil companies looked to other areas of the world for offshore discoveries. This reinforced an already extensive move overseas by the drilling and support companies (*Offshore* Staff 1968). By the mid-1970's, 75% of the world's offshore drilling operations were abroad, and the North Sea was the prime offshore area (Feder 1974). Through a deliberate government initiative, Norway began to surface as a leader in offshore technology, and Norwegian companies began to compete with their U.S. counterparts for a world market during the 1970's (*Offshore* Staff 1967k; Hansen et al., 1982). As early as 1973, 34 percent of the semisubmersibles[24] under construction were for Norwegian firms, and 24 percent of the semisubmersibles under construction were in Norwegian yards (Thobe 1973).

The Boom

The rapid growth in OCS activities in southern Louisiana and in the North Sea resulted in tremendous demands for goods and services and in increased employment opportunities. These, in turn, resulted in immigration and population growth (see Table 4). The growth of the population and commercial activities placed strains on existing transportation networks, community infrastructures, and the delivery of social services. The impacts of OCS activities were not uniform throughout the coastal Gulf of Mexico. The communities hit hardest by the OCS boom were those traditional settlements that had become staging areas for offshore activities (Morgan City, Berwick, Patterson, Houma, Larose,

---

[23] At Bay Marchand block 2, Eugene Island block 126, Grand Isle blocks 16 and 47, Main Pass block 69, South Marsh Island block 73, South Pass block 24 and 27, Timbalier Bay (in State waters), and West Delta block 30.

[24] More suitable for the rough North Sea waters

Table 4

Population and Growth Rates, Coastal Louisiana and Texas

Parish/County	1940	1950	1960	1970	1980	1990	40/50	50/60	60/70	70/80	80/90
	Population of Select Coastal Zone Parishes 1940-1990						Percentage Change 1940-1990				
<u>Louisiana</u>											
Assumption	18541	17278	17991	19564	22084	22753	-6.8	4.1	8.7	12.9	3.0
Calcasieu	56506	89635	145475	145415	167223	168134	58.6	62.3	0.0	15.0	0.5
Cameron	7203	6244	6909	8194	9336	9260	-13.3	10.7	18.6	13.9	-0.8
Iberia	37183	40059	51672	57397	63752	68297	7.7	29.0	11.1	11.1	7.1
Jefferson	50427	103873	208769	337568	454592	448306	106.0	101.0	61.7	34.7	-1.4
Lafayette	43941	57743	84656	111745	150017	164762	31.4	46.6	32.0	34.2	9.8
Lafourche	38615	42209	55381	68941	82483	85860	9.3	31.2	24.5	19.6	4.1
Orleans	494537	570445	627525	593471	557515	496938	15.3	10.0	-5.4	-6.1	-10.9
Plaquemines	12318	14239	22545	25225	26049	25575	15.6	58.3	11.9	3.3	-1.8
St. Mary	31458	35848	48833	60752	64253	58086	14.0	36.2	24.4	5.8	-9.6
Terrebonne	35880	43328	60771	76049	93393	96982	20.8	40.3	25.1	22.8	3.8
Vermilion	37750	36929	38855	43071	48458	50055	-2.2	5.2	10.9	12.5	3.3
Louisiana	2363880	2683516	3257022	3643180	4205900	4219973	13.5	21.4	11.9	15.4	0.3
<u>Texas</u>											
Brazoria	27069	46549	76204	108312	169587	121862	72.0	63.7	42.1	56.6	-28.1
Calhoun	5911	9222	16592	17831	19574	19053	56.0	79.9	7.5	9.8	-2.7
Cameron	83202	125170	151098	140368	209727	260120	50.4	20.7	-7.1	49.4	24.0
Chambers	7511	7871	10379	12187	18538	20088	4.8	31.9	17.4	52.1	8.4
Galveston	81173	113066	140364	169812	195940	217399	39.3	24.1	21.0	15.4	11.0
Harris	528961	806701	1243158	1741912	2409547	2818199	52.5	54.1	40.1	38.3	17.0
Jefferson	145329	195083	245659	244773	250938	239397	34.2	25.9	-0.4	2.5	-4.6
Matagorda	20066	21559	25744	27913	37828	36928	7.4	19.4	8.4	35.5	-2.4
Nueces	92661	165471	221573	237544	268215	291145	78.6	33.9	7.2	12.9	8.5
Orange	17382	40567	60357	71170	83838	80509	133.4	48.8	17.9	17.8	-4.0
San Patricio	28871	35842	45021	47288	58013	58749	24.1	25.6	5.0	22.7	1.3
Texas	6414824	7711194	9579677	11198655	14229191	16986510	20.2	24.2	16.9	27.1	19.4
<u>U.S.</u>	131669275	150697361	179323175	203225299	226549448	248709873	14.5	19.0	13.3	11.5	9.8

Golden Meadow, and Grand Isle), and managerial centers for offshore activities (primarily Lafayette). Some of the traditional port cities of Louisiana and Texas (New Orleans, Baton Rouge, Lake Charles, Port Arthur, Houston [see especially Feagin 1985], and Galveston) also experienced growth of both staging and managerial activities, but because of their larger size and more diversified economies, the impact was less than in the rural coastal communities on the deltaic plain.

Particularly hard hit were some of the communities in the eastern part of St. Mary Parish (Morgan City, Berwick, Patterson) and the eastern part of Terrebonne Parish (Gramling and Brabant 1984; 1986a; Gramling and Freudenburg 1990). Housing became critically short and real estate prices escalated, as demand far exceeded supply. The provision of public utilities and services, water supplies, sewage treatment, utilities (Johnson 1977; Durio and Dupuis 1980), transportation (Stallings and Reilly 1980), recreational facilities (Reilly 1980), and medical facilities (Gramling and Joubert 1977) lagged behind the population growth throughout the 1960's and 1970's. One of the hardest hit community services was public education. The educational system in Louisiana has never been sufficiently funded. The influx of students into systems that were already marginal at best, led to teacher shortages, overcrowding, and scarce supplies. Because demand increased more rapidly than the tax base, there was little way for the supply of these services to catch up (Gramling and Reilly 1980; Brabant 1984).

The offshore activity attracted transient labor for work offshore, and the economic growth in general attracted significant numbers of the transient, chronically unemployed (Brabant 1993a; 1993b; Brabant and Gramling 1985; 1991). Labor camps, which provided lodging, food, and job contacts for exorbitant prices, were in operation in the Morgan City area. Shelters and social service agencies that provided basic human services (food, clothing, shelter) were often taxed beyond their capacity (Brabant 1993b). Crime rates rose. By the mid-1970's the violent crime rate in Morgan City ranged from two to three times the average rate for cities of comparable size in the U.S. By the mid-1970's portions of coastal Louisiana exhibited many of the characteristic stresses and strains associated with the classic boom town syndrome (Gramling and Brabant 1986a; Gramling and Freudenburg 1990; Seydlitz et al., 1993a). The region received national attention during this period, and articles appearing in major tabloids encouraged even more in-migration of transient labor.

The Embargo

The 1973-1974 oil embargo by the Arab members of OPEC against the U.S. and the Netherlands in retaliation for their support for Israel during the 1973 round of the Arab-Israeli war became a major stimulus for offshore development in the Gulf and in the remainder of the U.S. While crude oil production on the Gulf OCS had actually peaked and began to decline by this time (although natural gas production was still climbing; Manuel 1984), offshore activity continued to grow. By the time of the embargo the offshore industry was a worldwide enterprise, although the Gulf of Mexico continued to be a dominating influence for the next decade.

Two factors directly affected OCS operations: 1) the dramatic rise in the price of crude oil following the embargo provided increased economic incentive for exploration and development on the OCS, and 2) Project Independence, President Nixon's proposed fix for the shortages and price rises. OCS sales resumed in Pacific, the Atlantic, and in Alaska following the initiation of Project Independence. Table 2 (above) shows the marked increase in exploratory and production drilling (the most labor-and resource-intensive phases) following the 1973-1974 embargo. As a result of the new impetus provided by the skyrocketing price of crude oil and an aggressive Federal leasing system, the offshore industry expanded its operations. In the U.S., in spite of Federal encouragement, this expansion was limited primarily to the Gulf of Mexico.

Table 5 shows the pattern of lease sales in the Gulf of Mexico over the history of leasing on the OCS While the majority of the early sales were off the Louisiana deltaic plain (Figure 1), by the mid-1960's sales had increased in western Louisiana and the shallow areas off Texas. Following the embargo and the increased Federal offerings, movement into these areas increased, along with sales in deeper water off both Louisiana and Texas.

Looking at the second panel in Table 5 we can see, however, although sales moved into other regions in the Gulf of Mexico, that the primary area of actual development (i.e., siting of production platforms) continued to be off the deltaic plain with accompanying movement into western Louisiana waters. This geographic trend in lease sales and development was paralleled by construction of offshore production platforms.

Table 6 shows the number of offshore production platforms under construction worldwide in 1975, 1978, and 1981. Several important trends are noticeable. First, as in sales and development, by 1975 the offshore fabrication industry had begun to move out of the Louisiana deltaic plain into Texas, a trend that accelerated over the next decade and a half. Second, throughout this period following the embargo until the peak of the offshore boom in 1981, the Gulf of Mexico continued to be the site of almost half of the world offshore production platform construction. Third, throughout this period Louisiana dominated the market for fabrication of production platforms within the Gulf. In a similar fashion Louisiana dominated the fabrication of offshore support vessels, becoming a world leader in the construction of thousands of crew boats, supply boats, push boats, tow boats, and various other more specialized offshore vessels (*Ocean Industry* Staff 1974; Tubb 1978).

Table 5

Gulf Area by Leases Sold

Gulf Area by Total Leases Sold

	DELTA LA[a]	DELTA EX-LA[b]	EAST LA[c]	WEST LA[d]	DEEP LA[e]	COAST TX[f]	EX TX[g]	DEEP TX[h]	AL MS[i]	NO FL[j]	MIDL FL[k]	SO FL[l]
Before 1954	169	0	13	96	0	97	0	0	0	0	0	0
1954-1959	115	0	0	98	0	46	0	0	0	0	0	0
1960-1964	219	108	37	173	0	59	0	0	0	0	0	0
1965-1969	110	45	56	31	0	124	36	0	0	0	0	0
1970-1974	112	133	42	272	52	23	169	14	3	39	26	0
1975-1979	117	59	28	229	24	157	121	3	0	9	16	14
1980-1984	267	218	137	425	576	499	206	146	47	92	7	89
1985-1989	267	259	108	473	1293	465	261	207	33	78	8	13
1990-1993	179	154	79	336	456	252	99	57	11	74	19	0
TOTAL	1555	976	500	2133	2401	1722	892	427	94	292	76	116

Gulf Area by Lease Date With At Least One Platform Installed by 1992

	DELTA LA[a]	DELTA EX-LA[b]	EAST LA[c]	WEST LA[d]	DEEP LA[e]	COAST TX[f]	EX TX[g]	DEEP TX[h]	AL MS[i]	NO FL[j]	MIDL FL[k]	SO FL[l]
Before 1954	80	0	5	31	0	2	0	0	0	0	0	0
1954-1959	41	0	0	15	0	3	0	0	0	0	0	0
1960-1964	100	33	11	42	7	0	0	0	0	0	0	0
1965-1969	36	8	15	8	0	4	2	0	0	0	0	0
1970-1974	49	47	9	115	7	6	59	3	0	0	0	0
1975-1979	43	20	14	83	4	48	27	0	0	0	0	0
1980-1984	86	26	50	117	13	110	17	1	17	0	0	0
1985-1989	27	14	12	49	6	55	8	0	5	0	0	0
1990-1993	2	1	2	1	1	1	0	0	0	0	0	0
TOTAL	464	149	118	461	31	236	113	4	22	0	0	0

Gulf Area by Lease Date With At Least Ten Platforms Installed by 1992

	DELTA LA[a]	DELTA EX-LA[b]	EAST LA[c]	WEST LA[d]	DEEP LA[e]	COAST TX[f]	EX TX[g]	DEEP TX[h]	AL MS[i]	NO FL[j]	MIDL FL[k]	SO FL[l]
Before 1954	19	0	2	5	0	0	0	0	0	0	0	0
1954-1959	2	0	0	1	0	0	0	0	0	0	0	0
1960-1964	10	0	1	2	0	0	0	0	0	0	0	0
1965-1969	2	0	0	0	0	0	0	0	0	0	0	0
1970-1974	2	0	0	1	0	0	0	0	0	0	0	0
1975-1979	2	0	0	2	0	0	0	0	0	0	0	0
1980-1984	2	0	1	0	0	1	0	0	0	0	0	0
1985-1989	0	0	0	0	0	0	0	0	0	0	0	0
1990-1993	0	0	0	0	0	0	0	0	0	0	0	0
Total	39	0	4	11	0	1	0	0	0	0	0	0

Source: Minerals Management Service 1993

(a) Deltaic Plain Louisiana (original offshore areas) (b) Extension Areas off the Deltaic Plain (e.g., Grand Isle South Addition)
(c) Louisiana, Mouth of the Mississippi and eastward (d) Louisiana West of Vermilion Bay
(e) Deep Water Louisiana (south of the original "south additions" to the limits of U.S. waters)
(f) Coastal Texas (original offshore areas) (g) Extension areas off Texas (h) Deep Water off Texas
(i) Off Alabama and Mississippi (j) Northern and Western Florida offshore areas (including Destin Dome and DeSoto Canyon areas)
(k) Middle Florida (including the Florida Middle Grounds) (l) South Florida (including Pulley Ridge)

Figure 1. Gulf Offshore Areas

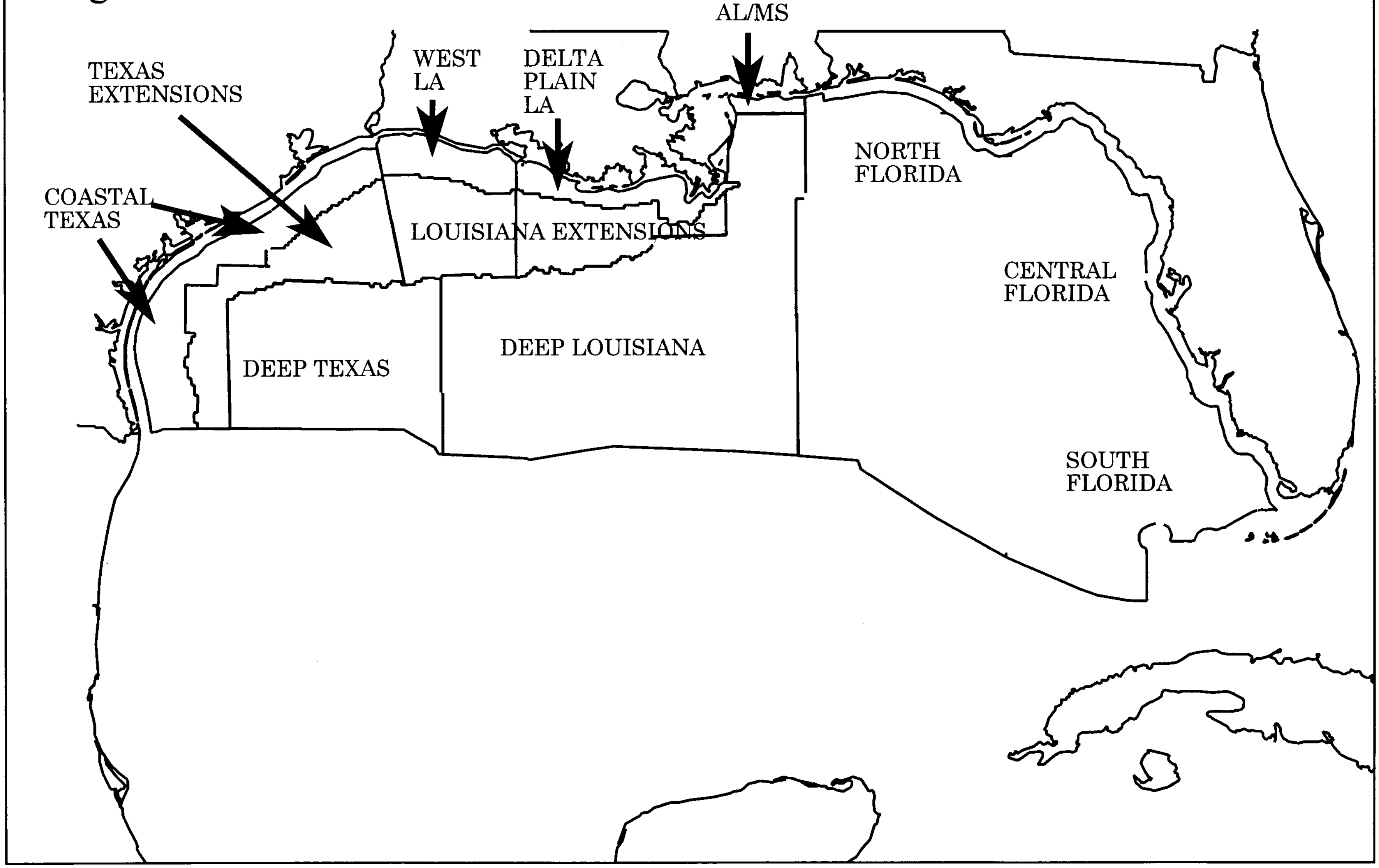


Table 6

Fixed Platforms under Construction for 1975,[1] 1978,[2] and 1981[3]

	Totals			Percentage		
Location	1975	1978	1981	1975	1978	1981
California	1	0	2	0.6	0	0.6
Louisiana	61	55	94	37.4	37.4	30.4
Texas	9	20	52	5.5	13.6	16.8
Outside U.S.	92	72	161	56.4	49.0	52.1
Total Worldwide	163	147	309	100	100	100

Source: Davis and Place 1983.
[1] January
[2] March
[3] March

In spite of this dominance in offshore construction and support, the geography of the deltaic plain did provide one limitation. Between the Calcasieu River and the mouth of the Mississippi, a nautical distance of approximately 200 miles, that includes the area of heaviest offshore development, there are no deep-water ports. The single exception to this is the Atchafalaya River, which has a 20-foot-deep channel as far inland as Morgan City[25]. Even here, the actual frontage on the river is extremely limited with most of the connections to the major fabrication yards, both in Morgan City and throughout the deltaic plain, being via the Gulf Intracoastal Waterway, which is only guaranteed to 12-foot depths. This does not pose a problem for the fabrication of steel jacketed production platforms, which are fabricated on their side, loaded onto a barge(s) of less than 12 foot draft, and taken offshore. It does mean that no facilities for building large ships have emerged.

Unlike production platforms, exploratory drilling rigs must be fabricated and floated to their initial destination, and virtually all of the deep-water rigs require more than 12 feet of water. As the offshore rig technology evolved, by necessity construction moved out of Louisiana. By 1976 much of the U.S. construction of exploratory rigs was taking place in Texas and Mississippi (primarily Pascagoula and Vicksburg), a general trend that continued into the 1980's (*Ocean Industry* Staff 1976; Tubb 1977). In addition to direct activities occurring in the Gulf, movement into many of the "frontier" regions, under the new push for

[25] In the last decade Bayou Lafourche has been dredged to 20 foot depths for several miles near its mouth.

offshore development on Federal lands, continued to be supported from the Gulf. Experienced offshore workers and even decks for production platforms off California continued to come from the Gulf (Gould et al., 1991).

In spite of the rapid economic growth with its heated entrepreneurial conditions (Gramling and Brabant 1986a; Gramling and Freudenburg 1990), the direction of the growth was one that in one respect would be an almost textbook example of regional development success. As Lovejoy and Krannich (1982) have noted in summarizing the economic development debate, often the success of a particular economic development scenario hinges at least as much on the ability of the region to capture spin-off and spill-over activities, as on the primary development. These linked activities, both upstream (those that supply the primary activity) and downstream (those that use the product produced by the primary activity) can generate jobs and capital that supplement the primary activity and result in a more diversified form of development.

Since the Gulf of Mexico was the primary area for offshore development throughout the 1950's, 1960's and much of the 1970's, and since the problems faced were local, most of the technological and human capital development was also local. Because much of the support for these activities had to be local, the capture of spin-off was almost inevitable. The extent to which this happened can be seen by examining offshore-related employment (often a more important indicator of development than population growth, Gramling 1992) in one of the areas most closely tied to offshore development, the Louisiana deltaic plain, west of the Mississippi River delta. Table 7 shows total employment, employment in oil and gas extraction, and employment in three of the sectors most directly related to offshore activity, metal fabrication (platform construction), ship and boat building and repair, and water transportation for Lafayette, Lafourche, St Mary and Terrebonne Parishes. These are certainly not the entire employment associated with offshore oil. In fact, examination of only these limited sectors misses much of the employment directly related to offshore development (e.g., offshore catering, marine diesel mechanics, hot-shot drivers, etc.) and most of the secondary and tertiary employment (e.g. land transportation, construction, insurance, accounting, etc.). Nevertheless, the marked increase in employment in only these sectors in the late 1950's and early 1960's as the offshore system of development was emerging, and the steady proportion of total employment (22-28 percent) through the mid-1980's are indicative of the extent to which the social and economic environment along the coastal Gulf was affected by offshore trends. The growth of employment in oil and gas extraction exploded following the settlement of the litigation between Louisiana and the federal government and the resumption of an extensive Federal leasing program in 1959. While employment grew slowly during the 1964-1974 decade, it again jumped significantly following the 1973-1974 embargo. Employment in the linked sectors grew more steadily throughout the 1959-1979 period and by 1974 had actually exceeded employment in the primary sector in some parishes.

Table 7

Employment In Oil and Linked Sectors Coastal Louisiana

Lafayette Parish					
YEAR	Total[a]	Oil/Gas[b]	%O/G[c]	Link[d]	%Link[e]
1959	14426	621	4.30	0	0.00
1964	18487	2747	14.86	265	1.43
1969	25071	3627	14.47	188	0.75
1974	35441	2362	6.66	859	2.42
1979	62572	7620	12.18	1303	2.08
1984	76644	10073	13.14	1430	1.87
1989	65615	5710	8.70	781	1.19
Lafourche Parish					
YEAR	Total[a]	Oil/Gas[b]	%O/G[c]	Link[d]	%Link[e]
1959	7497	608	8.11	655	8.74
1964	10269	2149	20.93	1106	10.77
1969	10610	1122	10.57	1763	16.62
1974	13622	940	6.90	3149	23.12
1979	18605	1081	5.81	5638	30.30
1984	17418	845	4.85	4135	23.74
1989	15137	175	1.16	3588	23.70
St. Mary Parish					
YEAR	Total[a]	Oil/Gas[b]	%O/G[c]	Link[d]	%Link[e]
1959	7750	755	9.74	922	11.90
1964	12139	2943	24.24	1762	14.52
1969	16477	3219	19.54	2537	15.40
1974	19374	1812	9.35	4420	22.81
1979	31212	3552	11.38	8436	27.03
1984	25181	1373	5.45	8095	32.15
1989	17519	981	5.60	4146	23.67
		0.00	0.00		
Terrebonne Parish					
YEAR	Total[a]	Oil/Gas[b]	%O/G[c]	Link[d]	%Link[e]
1959	8032	165	2.05	507	6.31
1964	12528	2821	22.52	945	7.54
1969	16443	3926	23.88	1310	7.97
1974	26331	6641	25.22	3573	13.57
1979	33598	6294	18.73	3976	11.83
1984	31663	4904	15.49	2495	7.88
1989	28143	3834	13.62	1651	5.87

Sources: U.S. Department of Commerce 1959, 1964, 1969, 1974, 1979, 1984, 1989.
(a) Total Employment (b) Employment in Oil and Gas Extraction (c) Percentage Employed in Oil and Gas Extraction (d) Employment in Linked Sectors (water transportation, metal fabrication, ship and boat building and repair (e) Percentage Employment in Linked Sectors.

Rebuilding the Environment

The growth in both the primary and the linked industrial sectors through the 1970's demonstrated vigorous growth. However, that growth was predicated on an extractive economic activity. When the OCSLA passed in 1953, Lafayette was the distribution center of the traditional "Acadiana" region, having recently been transformed from a railroad town to the center of a highway network (Gramling 1983). Morgan City was the self-proclaimed "shrimp capital of the world" and most of the remainder of the region was primarily oriented toward agriculture or the harvesting of renewable resources: shrimp, fish, crawfish, etc. (Comeaux 1972). Over the next three decades, offshore activities gradually came to constitute the most important primary sector of the economy (both in the Acadiana area and eastward along the coast) and secondary and tertiary support sectors developed in response to the growth opportunity.

Brabant sums up the change:

> Alexander Godunov, Mikhail Baryshnikov, Rudolph Nuriyev--names associated with stages in New York, San Francisco, possibly Chicago, Washington D.C., maybe New Orleans--but Lafayette, Louisiana? Yet between 1982 and 1986, each of these internationally acclaimed ballet superstars appeared on the stage of the Lafayette Municipal Auditorium... How could this be? The answer is simple--oil. (Brabant 1993a: 161)

The change was pervasive. Trade schools altered their offerings (in response to demand) to teach ever more specialized skills, marketable primarily offshore and in offshore support sectors (Gramling and Reilly 1980). High school education (or less) was sufficient for good wages with these types of skills and, as a result, many entered the labor force early but with few transferable skills. The director of an area economic development association noted this clearly in retrospect:

> The downside to the oil industry as I see it from economic development has been the deterrent in education. Because so many of our people -- high school students, drop-outs, those types, were able to get such good jobs -- as a roustabout working in the oil industry -- that they didn't finish their education. They've come back. They've either been sitting on the unemployment roll or we've convinced them to go into other types of training --skilled labor training (Freudenburg and Gramling 1994: 40)

Even with no skills, labor in offshore development or in many of the support sectors was well paid. The opportunities were extensive, since the primary activities, drilling and production, were massive economic undertakings and, as noted, cost was a secondary consideration to time.

Thus, new investment (some of it massive) centered around the needs of the offshore sector. Fabrication yards sprang up on the banks of local bayous as offshore production platforms, offshore drilling rigs, support vessels, and metal fabrication of all types were in great demand. To attract the fabrication and construction industries associated with offshore activities and thus produce local jobs, communities approved long-term bond issues for the construction of the marine equivalent of local industrial parks (small ports) contiguous to the waterfront near the community, committing local resources to the continuation of the offshore sector. In addition to fabrication yards, many other types of companies were chartered and thrived during the offshore boom. These included offshore catering, drilling mud service, oil field tubing (drill pipe, casing), transportation (water, land, and air), and various types of specialized equipment (compressors, tanks, etc.) and instrumentation (down hole logging) companies. New development was not the whole picture, as conversion of existing facilities, such as dock space, also significantly altered the environment. By the mid-1970's, Morgan City, the self-proclaimed "shrimp capital of the world" in the 1950's, had no resident shrimp fleet and no operating shrimp processing plants.

Under these circumstances, local social and economic systems adapted and did so at a variety of levels. On an individual level, people made career decisions based on the expectation that past trends would continue. Seventeen-year-olds dropped out of high school to gain and use (often specialized) skills in the support and fabrication sectors surrounding offshore activities. Those who graduated often pursued specialized types of skills (associated with the offshore and support sectors) at the expense of other skills or more flexible higher education (Seydlitz et al. 1993b).

The incentive to move into the offshore support sectors was high. Employment offshore and in the oil-related sector in general paid well. Table 8 compares income distribution for those who work in a concentrated scheduling format (e.g., seven and seven) across sectors of the economy directly related to oil production and sectors not directly related to oil production. In general, it is quite clear that both working shifts and working in sectors of the economy directly related to the production of oil influenced income positively. In addition to changes in individual careers, adaptation occurred within organizations. At the small business level, businesses tended toward specialization. Mechanic shops became marine diesel repair facilities (with considerable investment in tools and equipment to make the transition). New specialty businesses opened to take advantage of the growing opportunities (offshore catering services, hot-shot drivers[26], etc.). Both of these trends happened in an economic environment of such unparalleled prosperity that good business practices were not necessary for success. With profit margins high enough, inventory control, billing, machine and equipment layout, etc., could be marginal, and still enterprises prospered (Freudenburg and Gramling 1992a). As one informant put it, "people made money in spite of themselves, and unfortunately came to believe that they were good businessmen."

---

[26] "Hot-Shot" drivers deliver the more portable equipment used offshore (e.g., pumps, compressors and specialized offshore drilling tools) between the source of the equipment and offshore staging areas. Most of the drivers have a pickup truck and a large trailer, and work "on call" 24 hours a day. This economic niche is possible because of the necessity to get equipment offshore as quickly as possible in order not to shut down an expensive offshore operation.

Table 8

Annual Income by Industrial Sector and Shift Work, 1980

	Shift Work			
	No		Yes	
	Non-oil	Oilfield	Non-oil	Oilfield
0-4,999	147	8	8	6
5,000-9,999	293	30	5	32
10,000-14,999	168	39		59
15,000-19,999	80	54	2	120
20,000-24,999	78	20	2	100
25,000-29,999	31	11	1	42
30,000-34,999	12	8		19
OVER 35,000	31	17		12
Totals	840	187	18	390

Source: Gramling 1980.

Adaptation also occurred at the regional level, as the interaction between the resources associated with human and social capital, skills, knowledge, experience, teamwork, networks of supply and distribution and the physical capital of buildings, equipment, and other physical infrastructure developed quickly and in response to the potential for profit. The 3,600 advertised business activities directly connected to oil and gas activities that Davis and Place (1983:1) located in coastal Louisiana were indicative of this trend.

Simply put, the northern Gulf of Mexico was by 1980, hands down, the most developed, and impacted, area in the world with regard to offshore oil and gas activities. It was also the most specialized area in the world with regard to offshore activities, raising the specter, as Freudenburg and Gramling (1992b) noted, that with extractive economies, even those with the extensive development of linkages, a region could find all of its linked economic eggs in one falling basket. As U.S. demand for petroleum products began to fall in the late 1970's, resulting in a crash in oil prices in the mid-1980's, this lesson became quite apparent.

In addition to individuals, businesses, and the infrastructure associated with communities, overadaptation may also be characteristic of smaller social systems, such as families. Forsyth and Gramling (1987) examined the adaptation strategies that families utilize to adapt to the periodic absence of one member of the family (usually the male) in situations such as those associated with employment in the offshore oil sectors (see also, Gramling and Forsyth 1987; Forsyth and Gauthier 1991; 1993; Storey et al., 1986; Fuchs et al., 1981). Their basic conclusion was that the resulting interaction within families, while different from families experiencing more traditional forms of work scheduling, was not evidence of pathology but of adaptation. Adaptation to these altered forms of work scheduling is a source of stress for families and is one of the most frequently mentioned problems with work in the "oil patch." The point is that certain forms of development (here extensive offshore oil and gas development) can lead to altered forms of interaction within the family (such as minimal involvement of the male in day-to-day activities), which are maladaptive if the situation changes and offshore work is no longer available.

Beginning of the End

Following the oil embargo, the price of crude oil rose steadily throughout the 1970's, and the rising value of the commodity had two predictable results. First, motivated by an obvious profit motive, the major players in the world oil market sought to increase their production and were quite successful. Figure 2 shows the increase in world production during this period. In 1979 world oil production peaked at levels that have not occurred since.

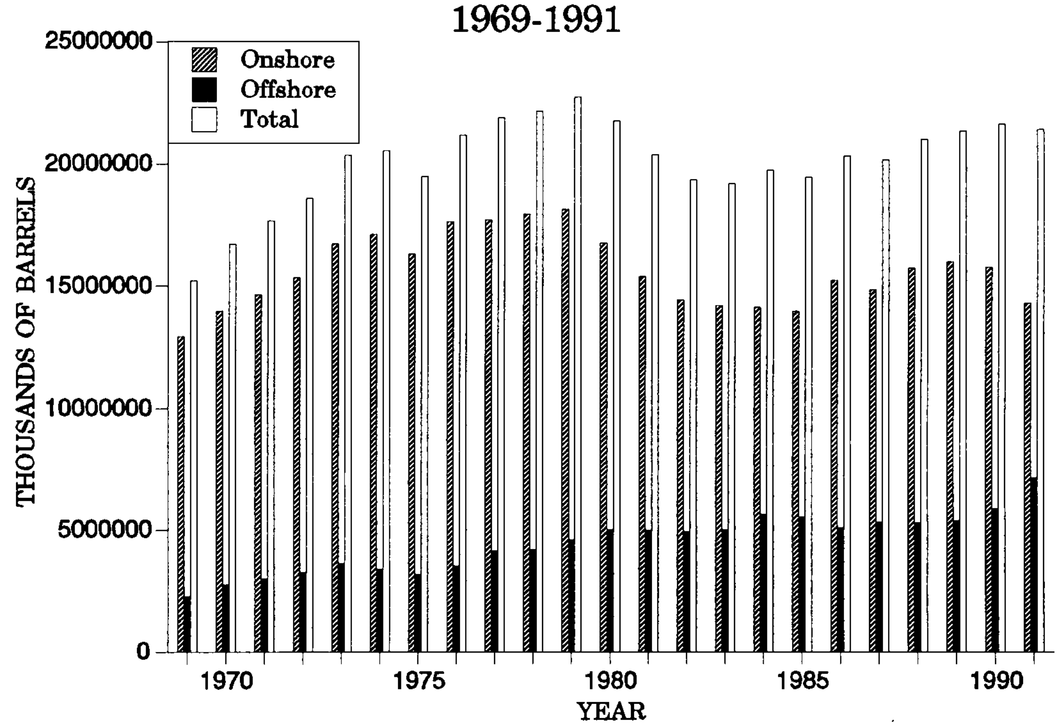
The second predictable result of skyrocketing oil prices was a fall in consumption. Oil is what economists call an elastic commodity. Unlike commodities that are driven by a fixed need, like milk, and show little variation in consumption as price changes, oil consumption (or more properly consumption of its refined products) varies considerably with the price of the product. However, in the case of petroleum products, this decline in consumption shows up gradually as consumers replace their automobiles with more fuel-efficient models, buy better insulated homes (or insulate the ones they own), and make a host of other travel- and energy-related decisions. The average mileage for automobiles per gallon of gasoline was 13.1 in 1973; by 1985 it had risen to 17.9, a 36.6 percent increase (Beck 1988). As a result of this trend, by 1981 consumption of petroleum products in the U.S. had fallen to below pre-embargo levels.

With the growing production of oil and the falling consumption of the refined products, the stage was set for the collision of these two trends, and that collision came in early 1986. The price of oil had fluctuated between 1982 and 1985; by December of 1985 oil was still $24.51 per barrel, but by July of 1986, it was $9.39. The growth-related problems in the coastal Gulf of Mexico began to moderate somewhat when crude oil prices began to fall in 1982. However, with the crash in crude oil prices in 1986, it became evident that the integration of the offshore industry into the local communities had resulted in a significant modification of the social, economic, and physical environment, and a whole new set of problems.

The decline in prices on the world oil market demonstrated the vulnerability of the offshore oil and gas related activities, and accompanying development, to trends in the commodities market, and the extent to which coastal Louisiana and Texas had become dependent on these activities (see Manuel 1980; Gramling and Freudenburg 1990). Over 90 percent of the variance in total employment in some coastal Louisiana parishes over the last two decades can be statistically explained using only national and international indicators of the world oil market, world rig count, average annual price of oil, etc. (Gramling and

Freudenburg 1990). This means that in these coastal parishes, events completely beyond their control largely dominated their economies. What it also means is that much of this development and many of these skills are not directly transferable.

Figure 2. World Oil Production 1969-1991



Source: API 1993

The Bust

The fall in crude oil prices in late 1985 and early 1986 hit coastal Louisiana and Texas hard. Much of the investment and accumulation in both financial and human capital, associated with the rebuilding of the physical, social and economic environment, was lost. The reaction along the coastal Gulf of Mexico was near panic. Unemployment in the most heavily affected coastal parishes in Louisiana, which had remained in the four-to-five percent levels for decades, exceeded 20 percent in some cases by the end of 1986. Table 7 also shows the downturn in employment in the most heavily affected parishes in Louisiana.

The region received national attention again due to the local recession, the effects of which were sufficient to bring Senate hearings to the region (Senate Committee on Energy and Natural Resources 1987). A more poignant local indicator was when the formerly exclusive Petroleum Club in Lafayette was forced to open its membership to non-oil industry members (*The Times of Acadiana* 1993). Once again social services came under pressure but for different reasons. Whereas before local organizations were hard pressed to respond to the needs of migrants looking for jobs, now these same local organizations were finding that their clients were formerly well-employed local residents, newly unemployed and looking for jobs.

Brabant quotes one informant:

> We had massive unemployment. We had people standing in line all the way out the door and into the streets. We didn't have near enough staff to service the people coming in. We were hiring temporary people...We had engineers, people with Ph.D.'s, geophysicists, geologists, people making upwards to $250,000 a year coming in and filing claims for unemployment insurance for $205 a week....If you or a member of the family are a stockholder in a company, you must prove that the company has been dissolved. People had board meetings at the interviewer's desk to dissolve their companies right here in the office so they could qualify for the unemployment insurance. It was really a hard thing to look out and see. (Brabant 1993a:184-85)

The bust forced many to leave to look for work, and since the same people who migrated in are not necessarily the ones to leave, this often resulted in the separation of extended families whose descendants had been in the area for over two centuries.

Current Trends

Throughout the history of OCS production in the U.S., several statistical trends are clear. First, the vast majority of petroleum products produced on the OCS have been produced in the Gulf of Mexico (well over 90 percent of the oil and approximately 99 percent of the gas; Gould et al. 1991). Second, within the Gulf, most OCS production (97.6 percent of the oil and 88.1 percent of the gas) has been within the Central Region of the Gulf (Gould et al. 1991). Third, within the Central Region, the overwhelming majority has been produced from waters adjacent to or supported from Louisiana. Fourth, by all indications, current trends will continue into the foreseeable future. The majority of proven reserves on the OCS are in the Central Gulf Region (Gould et al. 1991), and the Central and Western Gulf Regions are the only OCS regions where federal offshore leasing has to date encountered little resistance to lease sales and to OCS activity in general.

However, some changes in the patterns of offshore activities in the Gulf are occurring. Most notably, new production in the central and western Gulf has moved into deeper and deeper water over the last several decades. New finds are increasingly on the margins of the continental slope, and at the margins of development technology. Operations at these 1,000+ foot depths are expensive, and only the larger reservoirs are profitable to develop. The push into deeper water is driven by the same dynamics that have operated historically, with the depletion of the reservoirs that are more readily accessible, and closer to shore. As a result the shallow water reservoirs with sufficient resources to be commercially exploitable are already under production, and new discoveries in these areas are increasingly unlikely. In short, while production in the central and western Gulf will continue for some time, from fields currently in production, exploration and development has almost surely peaked under almost any foreseeable price scenario. The OCS is certainly not exhausted, and there are even positive signs for production on it. New three dimensional seismic techniques allow better visualization of geological structure and have already resulted in the location of new reservoirs from areas in the Gulf of Mexico thought to be depleted or in decline. The recent announcement of a large discovery in the central Gulf, indicates that reserves on the OCS may be larger than thought.

The 1992 Energy Policy and Conservation Act (42 U.S.C. § 6201) provides for greater use of alternative fuels for the federal vehicle fleet, and significant tax incentives for service stations that install alternative fuel refilling facilities. The most likely alternative fuel for automobiles is natural gas, and these initiatives to encourage natural gas usage will eventually lead to more of these resources in the Gulf being tapped. There are also plans underway for development in the eastern Gulf, south of Fort Walton Beach and Destin. However, the number of offshore rigs operating in the Gulf is near historic lows (since the statistics have been kept), and many of the rigs are moving out of the Gulf to South America, Africa, and southeast Asia.

References

Albright, Charles F. and Philip L. McLaughlin. 1952. "Integrated Drilling Barge Has Maximum Flexibility." *World Oil* December:139-141.

Alderdice, Robert. 1969. "Boats and the Offshore Operator." *Offshore* February:76-72.

American Petroleum Institute. 1993. *Basic Petroleum Data Book.* Washington D.C.: American Petroleum Institute.

Anderson, Jack and James Boyd. 1973. *Fiasco.* New York: Times Books.

Armstrong, Edward R. 1947. "Seadrome-Type Offshore Foundation for Continental Shelf Operations." *The Oil Weekly* January, 27:40-41.

Armstrong, Ted A. 1968. "Drillers Fog to Santa Barbara." *Offshore* March:23-27.

Atkins, James E. 1973. "Oil: This Time the Wolf is Here." *Foreign Affairs* (April).

Barrett, Barney. 1970. Water Measurements of Coastal Louisiana. New Orleans: Louisiana Wildlife and Fisheries Commission.

Bartley, Ernest R. 1953. *The Tidelands Oil Controversy.* Austin: University of Texas Press.

Beck Robert J. 1988. "Forecast Review." Pp. 89-98 in Oil and Gas Journal, *Data Book.* Tulsa: Pennwell Publishing Company.

Beer, Peter. 1986. "Keeping Up With the Jones Act." *Tulane Law Review* 61:379-414.

Berger, Peter and Hansfried Kellner. 1964. "Marriage and the construction of reality." Diogenes 46:1-23.

Berger, Peter and Thomas Luckmann. 1966. The Social Construction of Reality. Garden City: Doubleday.

Black, Murray D. 1966. "New Subsea Work Chamber." *Offshore* August:73-74.

Brabant, Sarah. 1984. "Education in the Coastal Zone Parishes." Pp. 135-164 in R. Gramling and S. Brabant (eds.) The Role of Outer Continental Shelf Activities in the Growth and Modification of Louisiana's Coastal Zone. Lafayette: U.S. Department of Commerce/Louisiana Department of Natural Resources.

Brabant, Sarah. 1993a. "The Impact of a Boom/Bust Economy on Poverty." Pp. 161-194 in Shirley Laska, Vern Baxter, Ruth Seydlitz, Ralph Thyer, Sarah Brabant, and Craig

Forsyth, *Impact of Offshore Oil Exploration and Production on the Social Institutions of Coastal Louisiana.* New Orleans: Minerals Management Service

Brabant, Sarah. 1993b. "From Boom To Bust: Community Response To Basic Human Need." Pp. 195-208 in Shirley Laska, Vern Baxter, Ruth Seydlitz, Ralph Thyer, Sarah Brabant, and Craig Forsyth, *Impact of Offshore Oil Exploration and Production on the Social Institutions of Coastal Louisiana.* New Orleans: Minerals Management Service

Brabant, Sarah and Robert Gramling. 1985. "Academic Versus Street Definitions of Poverty: Implications for Policy Formulations." *Applied Sociology* 2:33-42.

Brabant, Sarah and Robert Gramling. 1991. "The Impact of a Boom/Bust Economy on Poverty." Presented at the annual meeting of the American Sociological Association, Cincinnati.

Brantly, J.E. 1971. *History of Oil Well Drilling.* Houston: Gulf Publishing Co.

Caffrey, Evan T. 1990. "Slicing the Net: A Legislative Answer to the Problem of Seaman Status Under the Jones Act." *Tulane Maritime Law Journal* 14:361-380.

Carmichael, Jim. 1975. "Industry Has Built Over 800 Platforms in the Gulf of Mexico." *Offshore* 36 (5):83-90, 230-36.Louisiana.

Catton, William R., Jr. and Riley E. Dunlap. 1980. "A New Ecological Paradigm For Post-exuberant Sociology." *American Behavioral Scientist* 24(September/October):15-47.

Centaur Associates. 1986. *Indicators of the Direct Economic Impacts due to Oil and Gas Development in the Gulf of Mexico.* New Orleans: Minerals Management Service.

Cicin-Sain, Biliana, Robert Gramling, Ralph Johnson and Charles Wolf. 1992. "The Evolution of the Federal OCS Program: National and Regional Perspectives." Pp. 107-137 in National Research Council, *Assessment of the U.S. Outer Continental Shelf Environmental Studies Program: III. Social and Economic Studies.* Washington: National Academy Press.

Cicin-Sain, Biliana and Robert Knecht. 1987. "Federalism Under Stress: The Case of Offshore Oil and California." Pp. 149-176 in Harry Scheiber (ed.) *Perspectives on Federalism* Berkeley: Institute of Governmental Studies, University of California.

Clark, James A. 1963. *The Chronological History of the Petroleum and Natural Gas Industries.* Houston: Clark Book Co.

Comeaux, Malcolm L. 1972. *Atchafalaya Swamp Life: Settlement and Folk Occupations.* Baton Rouge: Louisiana State University Press.

Craig, J. C. 1956. "Costly Sea and Air Fleets Service Offshore Rigs." *Drilling* August:70-74.

Cram, Ira H. 1956. "Offshore Development Proving Successful." *World Oil* June:78-81.

Darmstadter, J. and H. Landsberg. 1976. "The Economic Background." Pp. 15-37 in R. Vernon (ed) *The Oil Crisis*. New York: Norton.

Davidson, Rollo E. 1955. "Offshore Drilling Gets DeLong Mobile Platform." *Drilling* February:75.

Davis, Donald W. 1990. "Living on the Edge: Louisiana's marsh, Estuary and Barrier Island Population." *Louisiana Geological Survey* 40:147-160.

Davis, Donald W. and John L. Place. 1983. The Oil and Gas Industry of Coastal Louisiana and Its Effect on Land Use and Socioeconomic Patterns. Reston, VA: U.S. Department of Interior/U.S. Geological Survey (Open File Report 83-118).

Drilling Staff. 1955a. "Worlds Deepest Well." *Drilling* December:52.

Drilling Staff. 1955b. "Offshore." *Drilling* December:68-70.

Drilling Staff. 1955c. "Derrick Barge is Engineered For Heavy Duty Gulf Work." *Drilling* December:93.

Drilling Staff. 1956a. "Move It Over." *Drilling* August:83.

Drilling Staff. 1956b. "Safety Rules Take Effect on the Outer Continental Shelf." *Drilling* August:83.

Drilling Staff. 1956c. "Mud Delivery Offshore Serve Drilling Rigs." *Drilling* August:83.

Drilling Staff. 1957. "Spring Storms and Hurricane Threats." *Drilling* August:177.

Drilling Staff. 1958. "Marine Drilling." *Drilling* March:83-87.

Dunlap, Riley E. and Angela G. Mertig. 1992. *American Environmentalism: The U.S. Environmental Movement, 1970-1990.* Philadelphia: Taylor and Francis.

Durio, C. and K. Dupuis. 1980. "Public Utilities." Pp. 258-277 in R. Gramling (ed.) East St. Mary Parish, Economic Growth and Stabilization Strategies. Baton Rouge: Louisiana Department of Natural Resources.

Edmondson, Cameron. 1958. "Drilling Log." *Drilling* February:19.

Farley, R. C. and J. S. Leonard. 1950. "Hurricane Damage To Drilling Platform." *World Oil* March:85-92.

Feagin, Joe R. 1985. "The Global Context of Metropolitan Growth." *American Journal of Sociology* 90:1204-1230.

Feder, Judy. 1974. "All Offshore Areas of the World Show Gains and Development." *Offshore* December:51-53.

Forbes, Gerald. 1946. "A History of the Caddo Oil and Gas Field." *Louisiana Historical Quarterly* 29:3-16.

Forsyth, Craig. 1989. *The American Merchant Seaman and His Industry: Struggle and Stigma.* New York: Taylor & Francis.

Forsyth, Craig, W. B. Bankston and J. H. Jones. 1984. Organizational and Extra-organizational Determinants of Occupationally Induced Social Marginality: A Study of Merchant Seamen. *Sociological Focus* 17:325-336.

Forsyth, Craig and Deann Gauthier. 1991. "Families of Offshore Oil Workers: Adaptations to Cyclical Father Absence/Presence." *Sociological Spectrum* 11:177-202.

Forsyth, Craig and DeAnn K. Gauthier. 1993. "Familial Structural Responses To Cyclical Father Absence: The Offshore Oil Family." Pp. 209-246 in Shirley Laska et al. Impact of Offshore Oil Exploration and Production on the Social Institutions of Coastal Louisiana. New Orleans: Minerals Management Service

Forsyth, Craig and Robert Gramling. 1987. "Feast or Famine: Alternative Management Techniques Among Periodic Father Absence Single Career Families." *International Journal of Sociology of the Family* 17:183-195.

Freudenburg, William R., Scott Frickel and Robert Gramling. 1992. "The Sociocultural Definition of 'Natural' Resources: Learning to Think About a Mountain" Presented at the Society For the Study of Symbolic Interaction, Stone Symposium, Knoxville.

Freudenburg, William R. and Robert Gramling. 1992a. "Community Impacts of Technological Change: Toward a Longitudinal Perspective." *Social Forces* 70:937-57.

Freudenburg, William R. and Robert Gramling. 1992b. "Linked to What? A Critical Examination of Economic Linkages In An Extractive Economy." Presented at the Annual meeting of the Rural Sociological Society, State University, PA.

Freudenburg, William R. and Robert Gramling. 1993. "Socio-environmental Factors and Development Policy: Understanding Opposition and Support for Offshore Oil." *Sociological Forum* 8:341-364.

Freudenburg, William R. and Robert Gramling. 1994. *Oil in Troubled Waters: Perceptions, Politics, and the Battle Over Offshore Drilling*. Albany: State University of New York Press.

Fuchs, Richard P., Gary Cake and Guy Wright. 1981. The Steel Island. St. John's, Newfoundland: Department of Rural, Agricultural and Northern Development, Government of Newfoundland and Labrador.

Gagliano, S. M. 1973. Canals, Dredging, and Land Reclamation in the Louisiana Coastal Zone. Report 14: Baton Rouge: Center for Wetland Resources, Louisiana State University.

Ghanem, Skukri. 1986. OPEC: *The Rise and Fall of an Exclusive Club*. London: Routledge and Kegan Paul.

Gibbon, Anthony. 1954. "Here's the Newest Ship in the Petroleum Navy." *World Oil* December:140.

Gould, Gregory J., Robert M. Karpas and Douglas L. Siltor 1991. *OCS National Compendium*. Herndon, VA: Minerals Management Service.

Gramling, Robert. 1980. "Labor survey of East St. Mary Parish. Pp. 80-108 in East St. Mary Parish, Economic Growth and Stabilization Strategies, edited by Robert Gramling. Baton Rouge: Louisiana Department of Natural Resources.

Gramling, Robert. 1983. "A Social History of Lafayette Parish." Pp. 8-52 in Energy and Economic Growth in Lafayette, LA: 1965-1980, edited by David Manuel. Lafayette, LA: The University of Southwestern Louisiana.

Gramling, Robert. 1984. "East St. Mary Parish: A Case Study." Pp. 171-198 in R. Gramling and S. Brabant (eds.) The Role of Outer Continental Shelf Activities in the Growth and Modification of Louisiana's Coastal Zone. Lafayette: U.S. Department of Commerce/Louisiana Department of Natural Resources.

Gramling, Robert. 1989. "Concentrated Work Scheduling: Enabling and Constraining Aspects" *Sociological Perspectives* 32:47-64.

Gramling, Robert. 1992. "Employment Data and Social Impact Assessment." Evaluation and Program Planning 15:1-7.

Gramling, Robert and Sarah Brabant (eds.). 1984. The Role of Outer Continental Shelf Activities in the Growth and Modification of Louisiana's Coastal Zone. Lafayette, LA: U.S. Department of Commerce/Louisiana Department of Natural Resources.

Gramling, Robert and Sarah Brabant. 1986a. "Boom Towns and Offshore Energy Impact Assessment: The Development of a Comprehensive Model." *Sociological Perspectives* 29:177-201.

Gramling, Robert and Sarah Brabant. 1986b. "Reply to Richard Gale." *Sociological Perspectives* 29:511-515.

Gramling, Robert and Craig Forsyth. 1987. "Work Scheduling and Family Interaction: A Theoretical Perspective." *Journal of Family Issues* 8:163-175.

Gramling, Robert and William R. Freudenburg. 1990. "A Closer Look at 'Local Control': Communities, Commodities, and the Collapse of the Coast. *Rural Sociology* 55(4): 541-58.

Gramling, Robert and William R. Freudenburg. 1992a. "Opportunity-Threat, Development, and Adaptation: Toward A Comprehensive Framework for Social Impact Assessment. *Rural Sociology* 57:216-234.

Gramling, Robert and William R. Freudenburg. 1992b. "The Exxon Valdez Oil Spill In the Context of U.S. Petroleum Energy Politics." *Industrial Crisis Quarterly* 6:1-23.

Gramling, Robert and William R. Freudenburg. 1994. "Crude v Coppertone: Socio-Environmental Factors And Resource Exploitation" presented at the annual meeting of the American Sociological Association: Los Angeles.

Gramling, Robert and Edward Joubert. 1977. "The Impact of Outer Continental Shelf Petroleum Activity on Social and Cultural Characteristics of Morgan City, Louisiana," Pp. 106-143 in E. F. Stallings (ed.) Outer Continental Shelf Impact, Morgan City, Louisiana. Baton Rouge: Louisiana Department of Transportation and Development.

Gramling, Robert and T.F. Reilly. 1980. "Education in East St. Mary Parish". Pp. 109-116 in R. Gramling (ed.) East St. Mary Parish, Economic Growth and Stabilization Strategies. Baton Rouge: Louisiana Department of Natural Resources.

Gregory, J. N. 1955. "Sea Legs." *Drilling* December:74-75.

Hanna, Fares K. 1955. "Off-Shore Trends." *Drilling* August:78-100.

Hanna, Fares K. 1957. "Marine Designs." *Drilling* August:71-75.

Hansen, Thorvald B., Odd J. Lange, Håkon Lavik and Willy H. Olsen. 1982. *Offshore Adventure*. Stavenger: Universitetsforlaget.

Hill, Jack O. 1966. "Marine Pipeline Pre-Lay Surveys and Right-of-Way Investigation." *Offshore* June:69-72.

House, J.D. 1984. "Oil and the North Atlantic periphery: the Scottish experience and the prospects for Newfoundland." Presented at Conference for Oil and Gas Development in Have-Not Regions: Some Lessons for Nova Scotia. Gorgebrook Research Institute, St. Mary's University, Halifax, Nova Scotia.

Howe, Richard J. 1966a. "Evolution Of Offshore Mobile Drilling Units: Part I." *Offshore* March:68-92.

Howe, Richard J. 1966b. "Evolution Of Offshore Mobile Drilling Units: Part II." *Offshore* April:76-92.

Howe, Richard J. 1966c. "Evolution Of Offshore Mobile Drilling Units: Part III." *Offshore* May:102-120.

Humble Oil, Production Department. 1946. "Big Diesel Electric Drilling Rig" *The Oil Weekly* December 30:28-31.

Johnson, D. 1977. "Municipal Services." Pp. 160-208 in E.F. Stallings (ed.) Outer Continental Shelf Impacts, Morgan City, Louisiana. Baton Rouge: Louisiana Department of Transportation and Development.

Kaplan, Elizabeth R.. 1982. "California: Threatening the Golden Shore." pp. 3-28 in Joan Goldstein (ed.) *The Politics of Offshore Oil*. New York: Praeger.

Kastrop. J. E. 1950. "Dual Rig Platform Reduces Offshore Drilling Costs." *World Oil* June:149.

Killian, Molly S. and Charles M. Tolbert. 1993. "Mapping Social and Economic Space: The Delineation of Local Labor Markets in the United States." Pp. 69-79 in Joachim Singelmann and Forrest A. Deseran (eds.) *Inequalities in Labor Market Areas*. Boulder: Westview Press.

Kniffen, Fred B. 1968. *Louisiana: Its Land and People*. Baton Rouge: Louisiana State University Press.

Lacy, Ray. 1957. "A Fresh Approach to Offshore Development." *Drilling* May:119-120.

Lacy, Ray and John Estes. 1960. "How New Underwater Oil Storage Unit Works." *World Oil* November:92-93.

Lahm, Jack. 1966. "New Methods, Equipment Progress In Deep Diving." *Offshore* August:75-76.

Lankford Raymond L. 1971. "Marine Drilling" Pp. 1358-1444 in J. E. Brantly (ed.) *History of Oil Well Drilling*. Houston: Gulf Publishing Co.

Laska, Shirley, Vern Baxter, Ruth Seydlitz, Ralph Thyer, Sarah Brabant, and Craig Forsyth. 1993. *Impact of Offshore Oil Exploration and Production on the Social Institutions of Coastal Louisiana*. New Orleans: Minerals Management Service, Gulf of Mexico OCS Region.

Lietz, Richard T. 1956. "Equipment Leasing Helps Meet Offshore Rig Needs." *Drilling* August:76-77.

Logan, L.J. 1953. "Offshore Development to be Speeded Up." *World Oil* June, 1953:53-54.

Logan, R. J. and Cecil Smith. 1948. "Continental Shelf Activity Intensified." *World Oil* July:37-39.

Lovejoy, Stephen B. and Richard S. Krannich. 1982. "Rural Industrial Development and Domestic Dependency Relations: Toward an Integrated Perspective." *Rural Sociology* 47 (Fall):475-495.

Magnuson, W. G. and E. F. Hollings. 1975. *An Analysis of the Department of the Interior's Proposed Acceleration of Development of Oil and Gas on the Outer Continental Shelf.* U.S. Government Printing Office, Washington, D.C.

Manners, Ian R. 1982. North Sea Oil and Environmental Planning: The United Kingdom Experience. Austin: University of Texas Press.

Manuel, David P. 1980. "East St. Mary Parish in the 1970's: The Economics of a Sustained Energy Impact." Pp. 44-58 in R. Gramling (ed.) East St. Mary Parish, Economic Growth and Stabilization Strategies. Baton Rouge: Louisiana Department of Natural Resources.

Manuel, David P. 1984. "Trends in Louisiana OCS Activities." Pp. 27-40 in R. Gramling and S. Brabant (eds.) The Role of Outer Continental Shelf Activities in the Growth and Modification of Louisiana's Coastal Zone. Lafayette: U.S. Department of Commerce/Louisiana Department of Natural Resources.

Martin, Charles K. 1956. "That Submarine Drilling Rig Plan Intrigues the Industry." *Drilling* January:87-88.

McGee, Ed and Carl Hoot. 1963. "Mighty Dredges, Little Known Work Horses of Coastal Drilling, Producing, Pipelining, Now 25 Years Old." *Oil and Gas Journal* 61 (9):150-59.

McLaughlin, Philip L. 1952. "Luxury and Efficiency Afloat." *World Oil* April:164-165.

Mead, W., A. Moseidjord, D. Mauraoka, and P. Sorensen.1985. *Offshore Lands: Oil and Gas Leasing and Conservation on the Outer Continental Shelf.* Pacific Institute for Public Policy Research.

Minerals Management Service. 1993. Data file provided by Minerals Management Service to the author in the spring of 1993, containing information on all leases in the Gulf of Mexico. Statistical manipulations were done by the author in order to obtain the results reported.

Molotch, Harvey. 1970. "Oil in Santa Barbara and Power in America." *Sociological Inquiry* 40 (Winter):131-144.

Monroe, Dorothy. 1955. "Magnolia Adds Offshore Field." *Drilling* May:127.

Nash, Gerald D. 1968. *United States Oil Policy 1890-1964.* Westport: Greenwood Press.

Nicholson, Gordon M. 1941. "Houseboat Provides Many Comforts at Marine Location." *The Oil Weekly*. September 15:30.

Nicholson, Gordon R. 1942. "Road Construction In Swamps Presents Difficulty." *The Oil Weekly* August 10:25-32.

Noreng, O. 1980. *The Oil Industry and Government Strategy in the North Sea*. London: Croom Helm.

Norgress, R. E 1947. The History of the Cypress Lumber Industry in Louisiana. *Louisiana Historical Quarterly* 30:3-83.

Ocean Industry Staff. 1974. "Marine Transportation Fleet." *Ocean Industry* 6:44-51.

Ocean Industry Staff. 1976. "Marine Transportation Fleet." *Ocean Industry* 11:49-66.

Offshore Staff. 1966a. "Shell Drilling In Record Water Depth Off Louisiana." *Offshore* August:46.

Offshore Staff. 1966b. "Boom Forecast as: Oil Demand Grows World-Wide." *Offshore* January:52.

Offshore Staff. 1966c. "Big Hike in Energy Demand." *Offshore* July:74.

Offshore Staff. 1966d. "Operators Ante up 84 Million More In U.K. North Sea Quest." *Offshore* January:18-22.

Offshore Staff. 1966e. "Big Floater Outbound for Persian Gulf." *Offshore* February:35.

Offshore Staff. 1966f."*Glomar North Sea* To Drill off Iran." *Offshore* February:37.

Offshore Staff. 1966g. "*Sea Quest* Outfitting for North Sea." *Offshore* February:38.

Offshore Staff. 1966h. "U.S. Built Rig to Drill off Norway." *Offshore* February:40.

Offshore Staff. 1966i. "New Sonar in Subsea Work." *Offshore* September:68-70.

Offshore Staff. 1967a. "Huge Bid Off Santa Barbara." *Offshore* February:98.

Offshore Staff. 1967b. "Long Wait On California Sale idles Men, Ships, Rigs." *Offshore* December:24.

Offshore Staff. 1967c. "Giant Jackup to Drill Off Denmark." *Offshore* July:29-30.

Offshore Staff. 1967d. "North Sea Gamble Looks Better." *Offshore* June:92-100.

Offshore Staff. 1967e. "Phillips Gets Record Breaking Strike." *Offshore* March:25.

Offshore Staff. 1967f. "First BP Gas Moves Ashore." *Offshore* April:30.

Offshore Staff. 1967g "Gulf of Mexico is Still Booming." *Offshore* June: 60-69.

Offshore Staff. 1967h. "Offshore Louisiana 1/2 Billion Sale." *Offshore* July:21-26.

Offshore Staff. 1967i. "4 Platforms to Work for Shell." *Offshore* January:38.

Offshore Staff. 1967j. "Drilling Platform Construction Boom." *Offshore* January:20-24.

Offshore Staff. 1967k. "'Super' Drillers-A New Trend?" *Offshore* September:25-26.

Offshore Staff. 1968. "Zapata Off-Shore Courts Foreign Rig Assignments." *Offshore* January:55-56.

Offshore Staff. 1969a. "Gulf of Mexico Logs Exciting Year." *Offshore* June:41-44.

Offshore Staff. 1969b. "Deep Sea Drilling Project Completes Second Leg." *Offshore* January:67-72.

Offshore Staff. 1974. "Offering More Leases is Only part of the Solution." *Offshore* November:53.

Oil Weekly Staff. 1946a. "U-Shaped Drilling Barge." *The Oil Weekly* September 2:40-41.

Oil Weekly Staff. 1946b. "Modern Floating Hotel for Marine Rig Crews." *The Oil Weekly* August 26:44-45.

Oil Weekly Staff. 1946c. "Magnolia Company's Open Gulf Test Is Below 8400 Feet." *The Oil Weekly* October 28:31-31.

Reilly, T.F. 1980. "Recreation," Pp. 288-302 in R. Gramling (ed.) East St. Mary Parish Economic Growth and Stabilization Strategies. Baton Rouge: Louisiana Department of Natural Resources.

Russell, R. J. 1942. "Flotant." *Geographic Review* 32:74-98.

Sampson, Anthony. 1975. *The Seven Sisters: The Great Oil Companies and the World They Made*. New York: Viking.

Schempf, F. J. 1968a. "Louisiana Lease Nets $94 Million." *Offshore* December:45-46.

Schempf, F. J. 1968b. "Rig Building Tops Previous Records." *Offshore* July:23-26.

Seale, A. F. T. 1948. "Discovering Oil 12 Miles Offshore in the Gulf." *World Oil* May:113-116.

Senate Committee on Energy and Natural Resources. 1987. Hearings, Domestic Petroleum Industry Outlook. Lafayette, LA: February 9, 1987.

Senate Subcommittee on Multinational Corporations. 1974. *Multinational Corporations and United States Foreign Policy*. Committee on Foreign Relations, Hearings, 93rd Congress.

Seydlitz, Ruth, Shirley Laska, Daphne Spain, Elizabeth W Triche, and Karen L. Bishop. 1993a. "The Impacts of the Offshore Oil Industry on Suicide and Homicide Rates. *Rural Sociology*. 58:93-110.

Seydlitz, Ruth, Shirley Laska, Daphne Spain, Elizabeth W. Triche and Karen L. Bishop. 1993b. "Development, Human Capital, and Economic Health: An Empirical Examination." Pp. 105-125 in Shirley Laska (ed.), *Impact of Offshore Oil Exploration* *and Production on the Social Institutions of Coastal Louisiana*. OCS Study MMS 93-0007. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Regional Office. New Orleans, LA.

Shrewsbury, R. D. 1945. "Deep Sea Drilling." *The Oil Weekly* September 10:33-45.

Shrimpton, Mark and Keith Storey. 1987. "Fly-In: The Benefits and Costs of a New Approach to Developing Remote Mineral Resources." Department of Geography, Memorial University of Newfoundland, St. John's, Newfoundland: Unpublished Paper.

Solberg, Carl. 1976. *Oil Power*. New York: Mason.

Stallings, E.F., T.F. Reilly, R.B. Gramling and D.P. Manuel (eds.). 1977. Outer Continental Shelf Impacts: Morgan City, Louisiana. Washington, D.C.: Government Printing Office.

Stallings, E.F. and T. F. Reilly. 1980. "Transportation--East St. Mary Parish," Pp. 278-297 in R. Gramling (ed.) East St. Mary Parish Economic Growth and Stabilization Strategies. Baton Rouge: Louisiana Department of Natural Resources.

Steinhart, Carol E. and John S. Steinhart. 1972. *Blowout: A Case Study of the Santa Barbara Oil Spill*. Belmont, CA: Duxbury Press.

Sterrett, Elton. 1941. "25-Mile Under-Water Span in Seafaring Pipe Line." *The Oil Weekly*: October 20:33-38.

Sterrett, Elton. 1948a. "Giant Rig for Deepest Marine Drilling. *World Oil* March:75-89.

Sterrett, Elton. 1948b. "Amphibian Drilling Goes Deep Sea." *World Oil* June:77-82.

Storey, Keith, J. Lewis, Mark Shrimpton and D. Clark. 1986. *Family Life Adaptations to Offshore Oil and Gas Employment*. Ottawa, Canada: Environmental Studies Revolving Funds Report.

Storey, Keith and Mark Shrimpton. 1986. "A Review of the Nature and Significance of the Use of Long Distance Commuting by Canadian Resource Industries." Research paper prepared for: Review of Demography and the Implications for Economic and Social Policy, Health and Welfare Canada.

Taylor, Donald M. 1951. "Only Four Months Required to Lay Biggest Offshore Line. *World Oil* November:223-224.

The Times of Acadiana. 1993. "Petroleum Club of Lafayette Celebrates 40th Anniversary." *The Times of Acadiana* September 15:2.

Thobe, Susan. 1973 "Norwegians Make Big Play for Rig Market." *Offshore* August:27-31.

Trow, Raymond B. 1952. "The Wettest Inch." *World Oil* August:249-252.

Tubb, Maretta. 1977. "1977-1978 Directory of Marine Drilling Rigs." *Ocean Industry* 12 (9):39-180.

Tubb, Maretta. 1978. "1978-1979 Survey of Marine Transportation Fleet." *Ocean Industry* 13(2):51-65.

Tucker, A. J. 1946a. "Underwater Drilling For Any Depth." *The Oil Weekly* August 12:60-66.

Tucker, A. J. 1946b. "Bollard Method: For Shallow Water Drilling." *The Oil Weekly* September 16:98-104.

Turner, R. Eugene and Donald R. Cahoon. 1988. *Causes of Wetlands Loss in the Coastal Central Gulf of Mexico*. New Orleans: Minerals Management Service, Gulf of Mexico OCS Region.

U.S. Department of Commerce. 1959, 1964, 1969, 1974, 1979, 1984, 1989. *County Business Patterns*. Washington D.C.: Government Printing Office.

Weeks, Lewis G. 1967. "Offshore Operations Around the World." *Offshore* June:41-59.

Williams, Neil. 1934. "Practicability of Drilling Unit on Barges Definitely Established in Lake Barre, Louisiana Tests." *Oil and Gas Journal* May 31:47.

Wolff, Paul. 1949. "Barnsdall-Hayward Barge: A Development For Offshore Drilling." *World Oil* August:87-96.

World Oil Staff. 1951. "U.S. Tidelands Grab Only the Beginning." *World Oil* September, 1951:73.

World Oil Staff. 1952. "The Tidelands Issue and You." *World oil* June, 1952:65-67.

World Oil Staff. 1953a. "Cartel and Tidelands Issue High on Eisenhower Agenda." *World Oil* February, 1953:46.

World Oil Staff. 1953b. "Legal Barriers are Still Holding Up Offshore Exploration." *World Oil* September, 1953:100.

World Oil Staff. 1953c. "Continental Shelf Could Be A Major Resource For U.S. Oil. *World Oil* April, 1953:64-65.

World Oil Staff. 1953d. "Is This the Answer To Offshore Operations?" *World Oil* June:116.

World Oil Staff. 1954a. "Tidelands Suits Certain." *World Oil* October, 1954:107-108.

World Oil Staff. 1954b. "Tidelands Tiff Denied." *World Oil* August, 1994:98.

World Oil Staff. 1954c. "Offshore Work Receives a Boost." *World Oil* April, 1954:72.

World Oil Staff. 1954d. "Majors Speed Offshore Efforts." *World Oil* June:95-100.

World Oil Staff. 1956a. "Why Louisiana's Offshore Prospects Look Better." *World Oil* April:163-166.

World Oil Staff. 1956b. "New Platform Has Slanted Piling For Deepest Gulf Drilling." *World Oil* July:116-117.

World Oil Staff. 1957a. "Offshore Drilling Goes Deeper." *World Oil* November:130-131.

World Oil Staff. 1957b. "Transportation Practices." *World Oil* May:122-123.

World Oil Staff. 1957c. "Offshore Picture." *World Oil* May:118-121.

World Oil Staff. 1957d. "Drilling Practices." *World Oil* May:132-147.

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 **Royalty Management Program** 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.