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Coastal Marine Institute

Diversifying Energy Industry Risk in the Gulf of Mexico: Post-2004 Changes in Offshore Oil and Gas Insurance Markets

U.S. Department of the Interior
Bureau of Ocean Energy Management
Gulf of Mexico OCS Region

Cooperative Agreement
Coastal Marine Institute
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ABSTRACT

Hurricanes Ivan, Katrina, Rita, and Ike had significant implications for offshore oil and gas activities in the Gulf of Mexico (GOM). These “Big Four” hurricanes significantly changed the perception of oil and gas industry’s exposure to weather-related risks. This project surveys historic (pre-storm) offshore insurance markets and investigates insurance-related changes occurring after the advent of the Big Four storms. Each major offshore insurance type has been examined including commercial insurance coverage, mutualization coverage, insurance-linked securities, and self-insurance. The research finds that, while considerable offshore insurance changes have been made, post-storm insurance markets reacted in relatively expected ways by changing total coverage limitations, coverage terms, risk-sharing terms, and premiums. The more significant unexpected change rests with the higher annual informational requirements for insuring offshore assets and the greater degree of asset risk assessment and modeling that is now commonplace in the industry.

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EXECUTIVE SUMMARY

Prior to 2004, offshore oil and gas operators tended to insure against hurricane-related risk in one of three different manners: traditional commercial insurance; mutualization; or self-insurance. Commercial insurance for the offshore oil and gas industry has tended to be structured in a fashion comparable to other types of high-cost energy assets: a level of coverage is defined, and a premium level and structure is assessed on that requested coverage. A deductible is typically defined that establishes a certain degree of risk-sharing between the oil and gas company seeking insurance, and the insuring company or parties. Like other forms of commercial insurance, a higher deductible can lead to lower premiums (insurance costs), given the higher share of risk assumption held by the insuring party. Lloyd's of London, a form of international insurance exchange, is a commonly-recognized source of commercial insurance for the offshore oil and gas industry.

Mutualization is another important form of insurance that can serve as competition or as a supplement to traditional commercial insurance for offshore oil and gas operators. Mutual insurance is often referred to as "club" or "pool" insurance and, as the name suggests, refers to a form of insurance where individual companies form a collective pool in order to "mutually" insure one another's assets. The largest and most common form of mutual insurance in the energy business is Oil Insurance, Ltd. or "OIL."

Self-insurance is not necessarily a specific "form" of insurance that companies purchase, but rather a practice in which larger energy companies, typically those with a relatively large and diverse set of assets, diversify their exposure to external risks, including hurricanes. Self-insurance is usually secured by the creation of some form or type of deferred account, the balances of which are allowed to accumulate to pay for potential losses from unforeseen events. Most integrated major oil companies have some significant levels of self-insurance, usually conducted through the creation of a special purpose affiliate that is dedicated to the task of insuring the parent's, and often other subsidiaries' assets.

While hurricane exposure has been an ongoing threat to offshore operations since its earliest days, offshore oil and gas insurance experienced a period of significant duress starting with the tropical storm season of 2004, and continuing up to as recently as 2008. During this period, four major hurricanes leveled a swath of destruction across virtually the entire Gulf of Mexico (GOM) and all of the major sets of assets supporting energy exploration, production, transportation, and processing. The "Big Four," including Hurricanes Ivan, Katrina, Rita, and Ike, imposed an inflation-adjusted total of some $25.25 billion in damages to energy infrastructure along the GOM: a combined level of destruction never before experienced over a relatively short period of time.

A number of important lessons were learned by all parties during and after the Big Four hurricanes. The first, and primary lesson learned during this period is that, while the industry was significantly challenged, from both a logistical and financial perspective, insurance providers, and most all forms of insurance, were preserved. The logistical challenges during this period included the significant number of claims made by individual companies and the industry as a whole. The financial challenges during this period included the extreme stress placed on the balance sheet of a number of insurance companies and individual self-insurance subsidiaries between 2004 to 2008: insurance claims, on an individual and industry-level basis, reached totals not seen in the history of the oil and gas industry.

The second important lesson learned during this period is the important role of reinsurance in diversifying the risk associated with high-cost assets such as deepwater oil and gas platforms and wells. Reinsurance can be thought of as insurance coverage for insurance companies. Reinsuring companies "purchase" a share of the risk portfolio held by traditional commercial insurance companies in return for some claim on the coverage premiums, in an attempt to profit from further risk diversification. Reinsurance companies were relatively newer players in the offshore oil and gas insurance market prior to the 2004 hurricanes, and have increased their presence in the market since that time.

The third important lesson learned during this period is the role of information. Prior to Hurricane Ivan, the use of general industry standards and common understanding of asset types governed premium levels and coverage structures. The diverse nature of the destruction after Hurricane Ivan, and particularly after Hurricanes Katrina and Rita, forced commercial insurance providers to reassess this generalized approach. Today, commercial coverage is much more customized, and reflects a "richer" collection of asset-specific information and analysis than was common in years past.

Prior to 2004, hurricane coverage tended to follow more discrete patterns that ebbed and flowed with tropical and weather-related events typically leading to claims. This practice was acceptable in prior years since individual storm-related events were typically not large enough to create dramatic changes in overall premiums and coverage terms. The last and perhaps most important lesson learned during and after the Big Four hurricanes is that offshore insurance coverage should be evaluated on a more continuous, evolutionary basis than the discrete practices of the past. Continuous evaluation and exposure modeling approaches have led to a greater degree of resilience for all types of offshore insurance, and, as consequence, preserved risk-adjusted affordability and availability for most types of offshore assets.

1. INTRODUCTION

1.1. Purpose of the Proposed Research

Hurricanes Katrina and Rita inflicted considerable economic damage on the Gulf Coast economy. The impacts associated with oil and gas supply interruptions created by the hurricanes went beyond the region's economy by impacting both national and international energy markets. These oil and gas supply interruptions occurred during perhaps one of the most inopportune times in the recent history of energy markets and underscored the need for diversifying energy industry risk in the Gulf of Mexico (GOM).

This project investigates how the energy industry diversifies its risk exposure in general in the GOM, with a particular emphasis on insurance-related issues. Risk mitigation is secured through the use of various strategies, including but not limited to the following: the private insurance market, energy supply portfolio management, alternative resource development, and non-traditional markets such as hedge funds. All strategies, but most notably the private insurance market, have undergone significant changes in recent years.

For example, the estimated insured losses to on/offshore energy industry infrastructure in the GOM due to hurricanes in the 2004 and 2005 season is approximately $9.4 billion. Wave action was the principal source of damage, followed by sea-floor instability, and wind. Immediately following Katrina and Rita, an expert panel estimated that the energy industry would see property damage premium increases in excess of 400 percent on offshore property and equipment, and 25 percent to 50 percent increases on onshore coastal property. Business interruption insurance, the availability of which was questioned at one time, was also expected to increase by 300 to 400 percent. Yet, as this report will show, while rates did increase considerably in the aftermath of 2005 tropical season, the offshore insurance industry did adapt and change in manners that reduced the potential premium increases to operators by requiring them to share in greater levels of weather-related risk.

1.2. Organization of the Report

This report is organized into six sections including the introduction and conclusion. Section 2 investigates the factors impacting offshore energy insurance rates and coverage. Section 3 describes the various forms and methods of offshore energy insurance including a description of self-insurance, private insurance, mutualization, reinsurance, and insurance-linked securities. Section 4 details the impacts that each of the major post-2004 hurricanes had on offshore oil and gas operations. Section 5 examines the post-hurricane reaction of insurance companies and offshore operators and how coverage rates, terms, and conditions changed as a result of the post-2004 storm seasons. Section 6 presents the research conclusions and findings.

2. FACTORS IMPACTING OFFSHORE INSURANCE RATES AND COVERAGE

2.1. Overview

Given the risky nature of offshore activities, it should come as no surprise that insuring against these risks is no trivial matter. Yet understanding the nature of "risk" is difficult without some further context including: (1) defining "risk;" (2) identifying the various types of risk facing offshore operations; and (3) examining how risk and insurance are related.

Risk is a commonplace term that is used colloquially on an everyday basis in a fashion that tends to differ from the more theoretic and formal definition used in economics, finance, and the development of insurance products. For instance, a colloquial definition of risk suggests that risk is associated with unforeseen events.

However, the more formal definition of risk is the combination of the likelihood (i.e., probability) of a harmful event and the severity of the damage created by that event when it occurs. This differs from uncertainty which is used more formally to connote the occurrence of events that cannot be measured. Frank Knight, an early twentieth century economist, considered the father of risk and uncertainty analysis in economics, noted this apparent dichotomy in the use of the term "risk" in practice and theory (Spiegel, 1983).

In standard probability theory, risk is simply measured as the probability of an event occurring times the damage created by the occurrence of that event. Offshore oil and gas operations, for instance, have a number of relatively broad categories of "risks" each of which are measurable in terms of their frequency (i.e., number of occurrences) and their damage (the historically-report costs of the various types of incidents). As a general matter, offshore oil and gas operational risks can be categorized into those that are transportation-related, operator-related, equipment-related, environmental-related, and weather-related risks.

2.2. Transportation-Related Risks

Transportation risk arises in a number of forms, from vessels supplying offshore platforms to the transportation of mobile offshore drilling units. Transportation risk is a major concern within the offshore oil and gas industry (Fowler and Sorgard, 2000). Mobile offshore drilling units and offshore platforms are constantly tended by a number of vessels with specific duties. Crewboats are made specficially to shuttle workers from shore to rigs and platforms, while offshore supply vessels (OSVs) handle both shuttle crew and supplies. OSVs shuttle drilling fluids, cement, fuel, water, bulk cargo, and chemicals to rigs and platforms. The nature of handling fuel itself introduces a special risk to operating an OSV (Antonsen, 2009). Bulk cargo, especially that which is loaded and unloaded by crane, can introduce additional risk to personnel and the vessel itself.

The Gulf of Mexico operating region averaged 24 vessel collision accidents per year from 2006 through 2009. About two-thirds of those accidents caused more than $25,000 of damage (USDOI, MMS, 2010a).

2.3. Operator-Related Risks

Offshore oil and gas exploration and production is an inherently dangerous process fraught with risk that requires a significant amount of human labor to carry out. The nature of offshore rigs and platforms put humans in close proximity to volatile substances and chemicals. While processes and procedures have been developed to mitigate all types of risks, frequently the human condition of offshore workers (and also design flaws in the technology they use) can expose those risks. While the offshore oil and gas industry has spent significant sums of money in the name of creating a safety conscious culture on offshore rigs and platforms, operator-related risks due to error and negligence still exist.

The federal Gulf of Mexico oil and gas producing region averaged 7.5 fatalities per year due to exploration and production activities (USDOI, MMS, 2010b). The majority of GOM fatalities on average during the period were drowning events. Further, in 2009, there were 133 operator-related fire or explosion events in the GOM rigs and/or producing platforms, though almost all of the events could be considered incidental. No fatalities were reported, but several injuries did occur. The Gulf of Mexico operating region averaged 128 fire or explosion events from 2006 through 2009 (USDOI, MMS, 2010c).

2.4. Equipment-Related Risks

Equipment-related risks are also an important factor of offshore oil and gas activity and the insurance industry associated with it. Crane accidents and equipment defects and malfunctions create hazards for operating crews as well as the insurance companies that insure oil and gas companies against those risks.

Operators work alongside regulators, standards organizations, and insurers to mitigate risk. Standards organizations such as the American Petroleum Institute analyze common preventable risks to determine best practices for risk mitigation. Through workshops and meetings with operators, the organizations formulate recommended practices that are often coopted as rules by regulators. Insurers act as a mechanism of indirect enforcement through insurance contract clauses that except coverage in the case that regulations and certain specified recommended practices are not followed (Aven and Vinnem, 2005). The Bureau of Safety and Environmental Enforcement (BSEE) regulates cranes by requiring lessees and operators to comply with the American Petroleum Institute's Recommended Practice for the Operation and Maintenance of Offshore Cranes (API RP 2D), 5th Edition, June 2003; API RP 2A-WSD, Recommended Practice for Planning, Designing and Constructing Fixed Offshore Platforms – Working Stress Design, Twenty-first Edition, December 2000; and API Spec 2C, Specification for Offshore Cranes, API revised API SPEC 2C, 6th Edition, March 2004 (USDOI, MMS, 2010e).

2.5. Environmental-Related Risks

The environmental-related risks facing offshore drilling rigs and platforms are the most serious of all risks. Environmental risks include blowouts, fires and explosions, spills, unintentional discharges, pipeline strikes and failures, and platform strikes and failures. Environmental-related risks can be considered the most serious due to the interaction of consequences and the probability of an event. Three specific offshore environmental accidents help define the extreme environmental and financial damages that can result from accidental discharges from offshore accidents. These bellwether offshore environmental events include: (1) the 1969 Santa Barbara oil spill in California (discussed further in section 3.3.1); (2) the 1979-1980 IXTOC I spill off the Mexican coast on the GOM; and (3) the 1989 Exxon Valdez tanker-related accident in Alaska.

The Santa Barbara oil spill of 1969 is commonly attributed as the catalyst for the modern environmentalist movement. The oil spill resulted in 80,000 to 100,000 barrels (Bbls) of crude oil washing up along the beaches of Santa Barbara County (County of Santa Barbara, 2010). The public reaction to the spill resulted in at least two new major laws being passed to ensure greater protection for the environment. On January 1, 1970, the National Environmental Policy Act (NEPA) was signed into law. The law created requirements for federal government agencies to prepare Environmental Assessments (EAs) and Environmental Impact Statements (EIS) for actions they propose to take "significantly affecting the quality of the human environment (NEPA, 1969)." A second policy innovation as a result of the spill was the Coastal Zone Management Act (CZMA). The Act was the first step towards the creation of a governmental mechanism to systematically manage the nation's coastlines. The Act encouraged states to work in conjunction with the federal government to establish subset zones within each states' waters (CZMA, 2006).

Prior to the Deepwater Horizon oil spill, the record holder as the largest oil spill in the Gulf of Mexico offshore oil and gas industry's history was the IXTOC I oil spill which occurred on June 3, 1979. Estimates place the amount of oil spilled per day between 10,000 and 30,000 barrels until March 23, 1980, when the well was finally capped (USDOC, NOAA, 1979).

The third historic offshore environmental accident to influence the oil and gas industry was actually a transportation-related event and occurred when the oil supertanker Exxon Valdez ran aground on Bligh Reef in Prince William Sound, Alaska (USDOC, NOAA, 1989). The spill would ultimately result in about 264,000 Bbls of oil being spilled in Prince William Sound (USDOC, NOAA, 1989). The spill would usher in the Oil Pollution Act of 1990 (OPA 90), that would govern the formal response to an oil spill designated as one of "National Significance." The Act required oil companies to plan to prevent spills that may occur and to have a detailed containment and cleanup plan on file (Center for Wildlife Law, 2009).

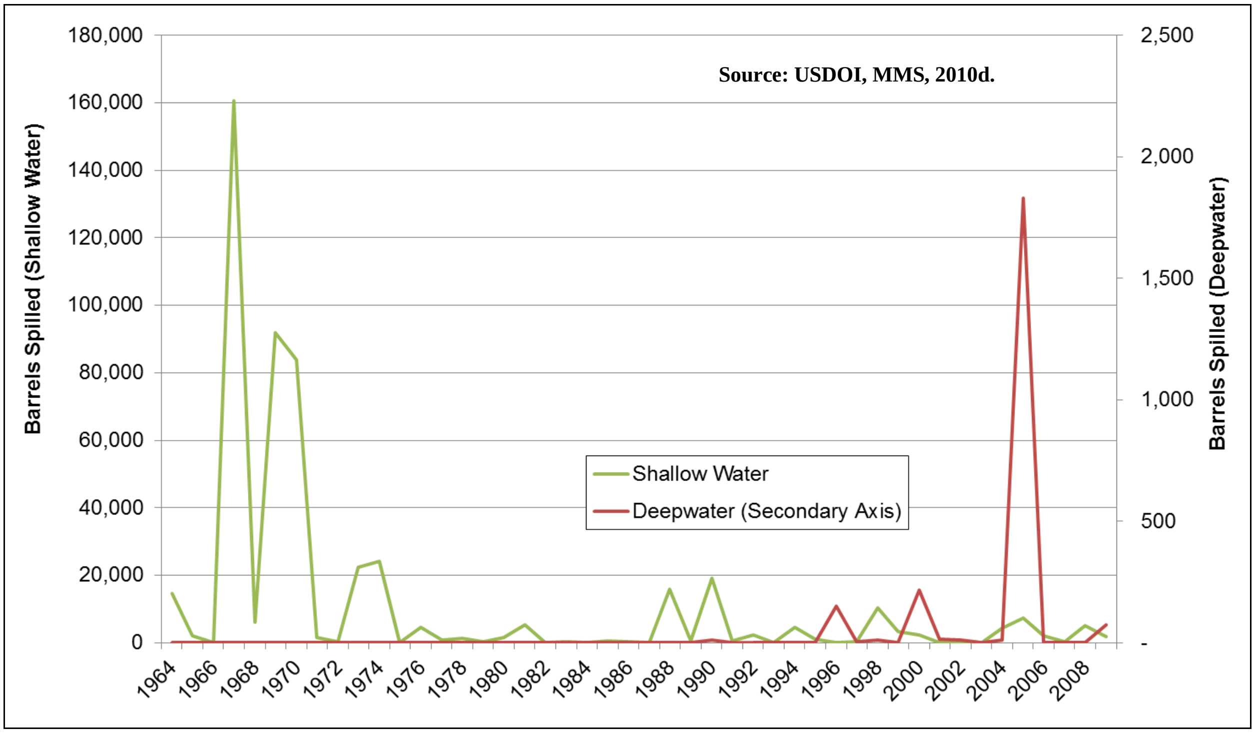

Figure 1. Oil spills in the Gulf of Mexico.

Figure 1 shows the historic trend in GOM oil spills since 1964. The chart generally shows that spill performance has improved significantly since the historic highs experienced during the decade between 1964 to 1974. While total spills are down relative to the historic highs, there have been a few years where small, but stubborn, spills have increased including 2004, 2005, and 2008. These years, however, correspond to each of the Big Four hurricanes (2004-Ivan, 2005-Katrina/Rita, 2008-Ike) and highlight the “compound” events (risks) that can occur on the GOM.

The environmental and safety performance of offshore oil and gas operators in the GOM has been studied in considerable detail by Pulsipher et al. (1998 and 1999) and will not be belabored here. Despite what has been a relatively stellar past oil spill performance history, accidents can and do happen. The single most notable reminder of the severity of offshore environmental-related accidents has been the BP-Deepwater Horizon accident (Figure 2).

Figure 2. Transocean Ltd.'s Deepwater Horizon drilling rig fire.

On April 20th, 2010 the Deepwater Horizon, a semi-submersible drilling rig owned by Transocean Ltd., and operating in 5,000 feet of water, exploded in an accident of unparalleled magnitude in North America. The rig was under contract by BP and drilling in the Macondo field to a sub-surface depth of approximately 18,000 feet. To date, about 5 million barrels of crude oil have been spilled or released as a result of the accident. Early estimates of the total damage of the event are in the range of $30 billion (Upstreamonline.com, 2010). While the purpose of this research focuses on offshore weather-related risks and changes in insurance resulting from the Big Four hurricanes, it is likely that the BP-Deepwater Horizon accident will have at least equally-significant ramifications and likely be the subject of future research.

2.6. Weather-Related Risks

Few industries are as susceptible to weather-related risks as the offshore oil and gas industry. Offshore structures, located entirely in a marine environment, are typically fixed or moored to a fixed location with little ability to physically move to avoid inclement weather. Even on a "good" weather day, offshore structures and equipment are exposed to waves, wind, sun, heat, salt, water spouts, and lightning strikes. These factors can create a range of damage that may seem as minor as accelerated equipment and structure "wear and tear" to complete destruction and potential loss of life.

Perhaps the biggest weather-related risk and the primary purpose of the instant research are those created by catastrophic hurricane activity. Hurricane-related risks have existed since the beginning of offshore oil and gas activities along the GOM in the late 1940s. What differs, and will be discussed in greater detail in Section 4 of this report, has been the significant increase in the destructive capability of these storms over the past several years.

2.7. The Role of Insurance in Mitigating Weather-Related Risks

The general purpose of insurance is to mitigate risks. In their simplest form, insurance markets are comprised of buyers and sellers of risk mitigation products. For the offshore oil and gas industry, insurance is secured for a variety of different risks that go beyond just physical damage to structures and equipment and can include insuring against a wide range of liabilities and business interruptions and contingencies. These types of products are explained in greater detail in Section 3 of this report.

Since risks have some degree of measurability, both in terms of frequency and damages, the value of "fair" insurance is simply the expected value of a negative outcome, where "fair," in this instance, is simply insurance with no economic "profit." Sellers offer insurance to buyers because these sellers have the ability to manage risks in a more efficient (i.e., lower cost) manner than buyers. Gains from mutually-beneficial trade occur between these two parties since a seller can make a certain degree of profit by mitigating the risk of a buyer at a rate lower than the buyer's opportunity cost of mitigating that risk himself.

The degree of that profit (seller) or benefit (buyer) retained by either party in an insurance transaction is a function of a variety of factors that include market structure (i.e., number of buyers and sellers) and the degree of information available about the insurance purchaser's actions and past performance. The system works well so long as competitive market conditions exist on both sides of the market (buyer and seller): when these fail, prices (premiums) can increase or coverage can become restrictive, resulting in less than optimal market outcomes.

On the seller side of the market, market power and market concentration can lead to potential market failures if there are barriers to entry limiting the number of offshore insurers. Longer term market concentration can lead to outcomes where a few companies have the opportunity to raise prices and to artificially restrict coverage to levels that are not supported by changes in overall operating risks (i.e., costs). Such an outcome would prejudice offshore insurance purchasers, leading to unfair and unreasonable premiums and coverage terms.

Market failures can also arise on the buyer's side of the market also leading to market failures and inefficiencies. Insurance, for instance, can suffer from "moral hazard" problems that arise in instances where an economic agent facing a certain degree of risk behaves differently when it is insulated from that risk than it would if the risk were not insured (Nicholson, 1990). Moral hazard is, in effect, the behavioral difference that results from the presence or introduction of insurance. Moral hazard results in a "market failure" or inefficiency because the agent receiving the insurance does not have to bear the full responsibility for its actions.

An example of potential moral hazard problem in public policy has been the 2009 – 2010 banking and financial crisis that led to policies bailing out banks and other financial institutions considered "too big to fail." Many financial institutions were given billions of dollars in bail-outs and other forms of financial support to buttress their financial positions devastated by past risky lending actions. Some analysts have argued that these policy actions have done nothing to correct the underlying problem leading to the 2009 financial crisis and in fact, in the long run, may have exacerbated these problems since in the future banks may use this policy precedent as support for future rescue actions from continued risky practices (Wilson and Wu, 2010; Hakenes and Schnabel, 2010; Helwege, 2010).

Moral hazard problems are created by informational asymmetries or instances when the insuring party does not have complete information about the buyer's willingness and efforts to avoid, or mitigate risk. Often, insurers have to turn to other means of acquiring information that provides "signals" about the types of risk to which buyers are potentially exposed. As will be shown in later sections of this report, the informational requirements for offshore oil and gas insurance coverage have increased exponentially since the Big Four hurricanes.

Historically, offshore insurance providers have mitigated potential moral hazard problem by relying upon an examination of offshore operators' compliance with a combination of standards, common practices, and regulatory oversight to mitigate financial risks created by offshore weather-related events, including hurricanes. Standards included in such guidelines as the American Petroleum Institute's (API) Recommended Practice 2a (RP2A) publications, and the International Standards Organization's 1990X-X, serve as the basis for modern offshore structure design in the GOM (Laurendine, 2007). These standards specifically address the meteorological and oceanographic challenges created by hurricanes and provide physical recommendations that are designed to mitigate the structural damages created by these weather-related events. Mandatory compliance with these standards, as well as other government-created standards and guidelines, are commonplace.

API issued its first set of RP2A standards in 1969 after hurricanes Hilda and Camille created considerable structure/structural damage. Since that time the RP2A standards have undergone a number of revisions and are currently on their 22nd edition. Figure 3 provides a timeline for the major developments and revisions in the RP2A structural regulations and guidelines.

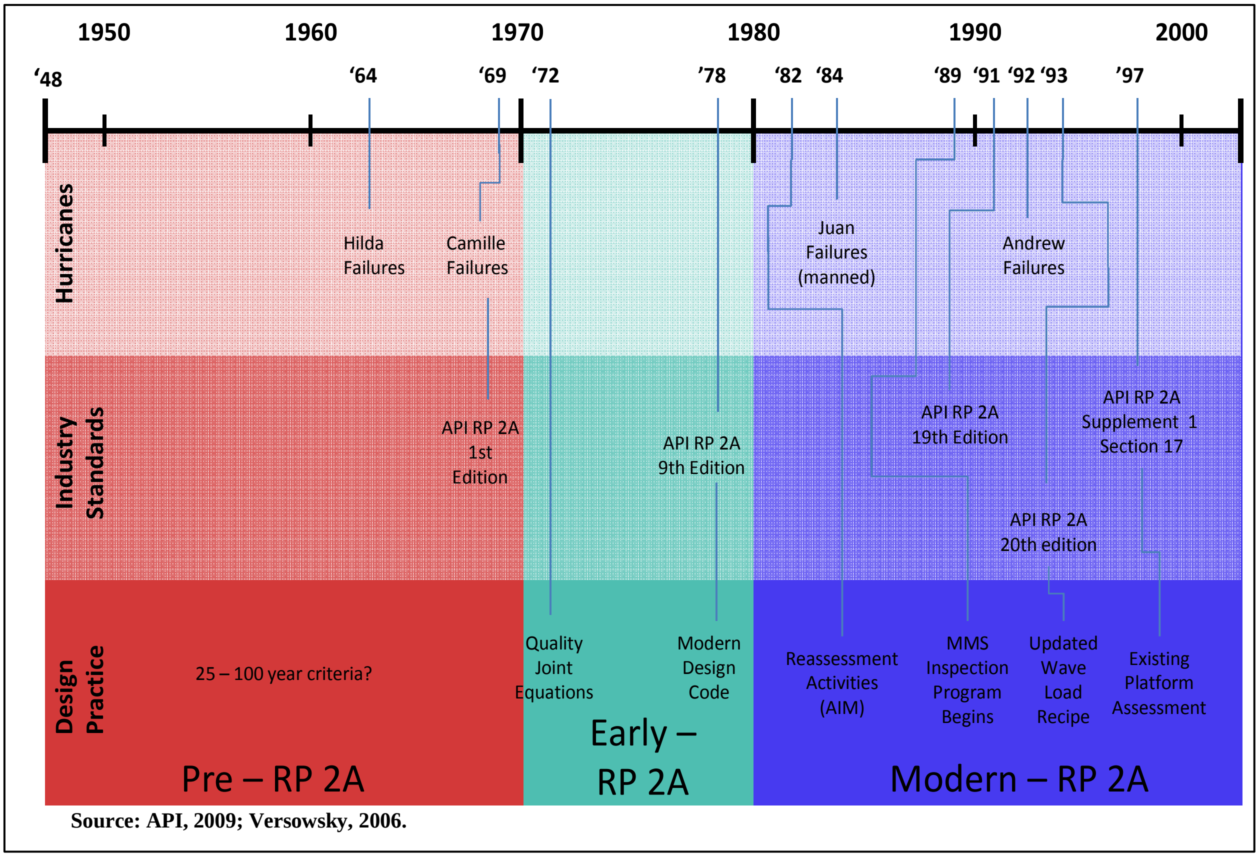

Figure 3. Timeline of API RP2A major milestones.

Insurance companies continue to rely heavily on standards and regulatory oversight in determining exposure to financial risk from structure damage to offshore assets. However, as will be shown later in this report, standards and guidelines are simply not enough. The tropical storm seasons beginning in 2004 created a new environment for insuring against weather-related risk. These storms highlighted the structural diversity of the industry, as well as the implications that significant storms could have on very large and diverse assets that range from underwater gathering systems, to traditional fixed platform structures in shallow waters of the Gulf of Mexico (GOM), to massive deepwater production and processing facilities. The key to providing insurance for these assets is understanding their diversity and potential exposure, and the key to understanding this diversity is through information.

Thus, today's offshore insurers conduct considerable analyses and have considerable information requirements prior to covering offshore operating companies and/or their assets. Specific asset information is always required prior to entering into a traditional insurance agreement that includes platform deck height (air gap), age of structure, wave height, historical levels of subsidence, proneness to mud slides, environmental impacts, existing corrosion, and damage from previous hurricanes. One basic set of information utilized by these insurance companies includes the Bureau of Ocean Energy Management (BOEM) Office of Structure and Technical

Support (OSTS) Inspection Reports as well as their Annual Platform Assessment Reports. A sample of the information provided in these reports is summarized in Table 1.

Table 1

Sample Information Compiled in BOEM OSTS Inspection and Assessment Reports

Platform Identification	Platform Type	Platform Design
Area code	Structure type	Exposure category
Block number	Water depth	Deck height
Structure name	Longitudinal framing	Soil data
Complex ID number	Transverse framing	Number of decks
Structure number		Number of Well conductors
Field		
Installation Date		
Authority type		
Authority number		
Authority Status		

Source: Laurendine, 2007.

One of the more obvious and important types of information considered in the development of insurance premiums and coverage terms for an individual structure is its age or vintage. The age of a facility provides important information on the likely structural stresses the platform can withstand, the potential wear and depreciation of the asset, and the replacement or insurance value should the structure become completely destroyed.[1] Another important factor influencing offshore coverage and premiums includes the measured distance between the sea level and deck structure (air gap). Recent experience supports the perception that older structures are more prone to hurricane wave damage due to antiquated design, along with seabed subsidence that in many cases reduces an already deficient air gap (Det Norske Veritas, 2006). Hurricane wave heights are the most important factors that affect offshore structures and influence design standards. Prior to Hurricanes Katrina and Rita, air gap information was not generally required by insurers (Slanis and Shockley, 2010).

Potential mudslide exposure is a new insurance coverage consideration arising from the experiences of Hurricane Ivan in 2004. During Ivan, and to a lesser extent after Katrina, a significant number of important pipelines were exposed to damages create by underwater mudslides along the seafloor. During Ivan, 16 underwater pipelines (part of larger gathering systems) were damaged by underwater mudslides. These mudslides created two insurance

[1]Most policies reimburse coverage holders for the fair market value of damaged or destroyed asset. Fair market value is typically defined as replacement value less depreciation, which is commonly a function of age (Sharp, 2009).

challenges since (1) pipelines were damaged and had to be replaced and (2) the damage/destruction associated with these pipelines interrupted considerable energy supplies from reaching the beach during a high market price period, resulting in considerable business interruption (BI) claims not only for pipelines, but operators as well. In today's offshore insurance market, operators are required to provide more information on localized gathering systems and interconnection opportunities associated with the insured structure (Slanis and Shockley, 2010).

3. FORMS OF OFFSHORE ENERGY INSURANCE

3.1. Self-Insurance and Captives

Most major oil and gas companies, particularly those referred to as "super majors,"[2] have balance sheets, and asset bases, that are larger than the insurance companies that it contracts with for coverage. For instance, seven of the top twenty companies in the world, as valued by market capitalization, are energy companies, while only one is associated with insurance (Financial Times, 2009). Thus, many oil and gas companies have asset bases they can leverage themselves, in order to protect (or insure) against certain types of isolated events such as hurricane damage in the GOM. While many upstream oil and gas companies engage in a multi-pronged approach to risk management, the largest companies typically rely on a strategy of either mutualization and/or self-insurance.

Self-insurance is more of a strategy of insuring against risk rather than an explicit form of insurance that is purchased in the market. Companies pursuing self-insurance typically create what is referred to as a "reserve fund," or "affiliate reserve fund," to protect against unanticipated events. A reserve fund can be generally described as a relatively large savings account into which the self-insuring company deposits an amount of money (capital) to serve as a financial base to call upon during an adverse event. The capital, or contributions, made to the reserve fund are comparable to the premiums that would be made to a private insurance company. The primary difference between traditional insurance and self-insurance is that the self-insuring company actual pays the premiums (or makes contributions) to itself rather than a third party. Companies will evaluate the merits of self-insurance at the margin: meaning that if the self-insuring company can insure itself cheaper than what is being offered in the market it will do so; otherwise, it will purchase traditional insurance. Thus, if large profit premiums, or cost inefficiencies, start to become embedded in overall coverage premiums, larger companies may find that providing its own insurance is more cost-effective (Bawcutt, 1987). Given the size and scope of many super majors, and their diversified asset bases (and earnings streams), many can secure capital to fund insurance operations at a cost considerably lower than insurance companies themselves (Bawcutt, 1987).

An "affiliate reserve fund" is simply a reserve fund that has been created, and booked for financial reporting purposes, to an affiliate, or subsidiary company of a larger energy company. These affiliate reserve funds typically become stand-alone affiliates or operating companies themselves, and their sole function is to internally insure (or finance risk) for the parent company, other operating affiliates, and sometimes partners, joint venture or special purpose projects, and in some instances other project contractors. Affiliate reserve funds created by super majors and other energy companies are referred to as "captive insurance companies" given their specialized function (Bawcutt, 1987).

The rationale for self-insurance can extend beyond the simple economics of comparative costs with more traditional forms of insurance. For instance, one benefit offered by self-insurance is the general financial insulation from market cycle swings in the insurance business. Self-insuring companies with operations in the GOM, for instance, were likely to have received

[2]Super Majors: ExxonMobil, Royal Dutch Shell, BP, Chevron Corporation, ConocoPhillips, Total S. A.

considerable benefits during the period between 2004 and 2008 when premiums leaped in the aftermath of several damaging hurricane seasons (Willis Group Holdings, 2008). Self-insuring companies are also likely to reduce its overall transactional costs of insurance and in many instances, can create greater flexibilities for coverage that may not be available in the market. There can also be a number of additional tax benefits created by self-insurance depending upon the nature, format, and structure that self-insurance takes (Adkisson, 2006).

Another benefit of captives is that they allow the parent company to internalize the knowledge associated with brokering insurance. The company learns intimate knowledge of its risks and losses, this in turn, allows the company to avoid paying external brokers a markup when negotiating with reinsurers through its captive. The company also has the benefit of having an insurance company whose interests are completely in line with the parent company's interests. Usually companies take advantage of this knowledge by making the captive an integral part of their risk management teams (Adkisson, 2006).

Many captive companies are located offshore, or in specific states of the U.S., for competitive reasons centering on taxation and regulation (Adkisson, 2006). Bermuda, Vermont, and Utah, for instance, have become major centers of domicile for captives. Utah has ramped up an economic development program with the purpose of attracting captive insurance companies beyond the 148 companies already domiciled within the state.[3]

Vermont manages a website with the specific purpose of wooing potential captives to establish headquarters/domicile within the state (Vermont Captive, 2010). Vermont was home to 26 energy industry captives in 2008 with the top six provided in Table 2.

Table 2

Vermont-Domiciled Energy Company Captives by Premium Issued as of December 31, 2008

Captive Name	Parent
Ancon Insurance Company	**ExxonMobil Corporation**
Sooner Insurance Company	**ConocoPhillips**
Noble Assurance Company	**Royal Dutch/Shell Group**
Colonnade Vermont Insurance Company	**Valero Energy Corporation**
Iron Horse Insurance Company	**Chevron Corporation**
AES Global Insurance Company	AES Corporation
Yorktown Assurance Corporation	**Marathon Oil Company**
National Grid Insurance Company	Keyspan Corporation
Ashmont Insurance Company	Ashland, Inc.
Energy Risk Assurance Company	Ameren Corporation

Source: Risk and Insurance Magazine, 2009.

[3]Utah also has its own website with the purpose of reaching out to potential captive insurance companies.

3.2. Private Insurance

The private insurance market for offshore oil and gas insurance is comprised of two primary parts: (1) mutualization (pooling of risk between similarly-situated companies) and (2) traditional or "commercial" private insurance. While there are two components to this industry, it is rarely the case that they operate entirely independently of one another and, in fact, typically tend to work in ways that mutually assist, or reinforce, their various risk mitigation services. For instance, in some cases, particularly for large oil and gas companies, the commercial market will write policies that "wrap" primary mutualization coverage.[4] For companies not participating in some form of mutualization, the commercial market may write those companies' entire GOM asset base.

Increasing platform cost and complexity, particularly for deepwater operations, has led to the emergence of a number of new players in commercial insurance market that are commonly referred to collectively as "reinsurers" or the "reinsurance market." Reinsurers help diversify the risk of primary commercial insurance companies: in other words, reinsurance companies are insurance companies for insurance companies.

Reinsurers frequently purchase the "excess" capacity[5] in addition to capacity offered by direct market insurers. For example, if a direct market insurer's capacity to write an individual risk was limited to two billion dollars, but the total single site value that the client wished to have insured was three billion dollars, the direct market insurer may turn to a reinsurer to assist in covering the difference. In the case of a claimable catastrophe, the direct insurer would be liable for the entire three billion dollar policy, but could turn to a reinsurer for any losses beyond his two billion dollar capacity.

Interactions between mutualization pools, commercial insurance companies, and reinsurers help spread the risk of increasingly large deepwater assets, and require a large amount of understanding and coordination, especially between direct insurers and reinsurers. Brokers are largely those who help facilitate these interactions between each of these major players, as well as the companies seeking insurance themselves. Typically an oil company interested in offshore energy insurance will solicit a broker, who will develop an insurance package that is shopped to direct insurers. While some insurance companies can write smaller risks without the help of one or more reinsurers, it is becoming increasingly uncommon, especially for high value deepwater platforms and large platform fleets.

Much of the commercial insurance market is physically located in London. Lloyd's of London (Lloyd's), a type of insurance exchange, with a physical location similar to the New York Stock Exchange, serves as a meeting place for insurers and brokers. Underwriters are employees of an insurance company who negotiate and write policies and define the terms of insurance contracts that assign risk to various parties in return for financial payment (profit) and assurances. An underwriter's seal must be affixed to each commercial policy. At Lloyd's, underwriters work in what are called "syndicates" that represent a group of underwriters serving as gate keepers for

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[4]To "wrap" an insurance policy is to use a separate additional insurance policy to cover risks not insured by that policy.
[5]Capacity is defined as the value of the largest single-site asset to be insured.

participating companies signing new policies. The members[6] of Lloyd's provide capital, and the syndicates[7] exercise that capital based on their best professional judgment. Lloyd's brokers work with the syndicates employed by direct and reinsurance companies to find a solution for offshore oil and gas companies. In some instances, a direct insurance and reinsurance company may exist under the same roof, as in the case of the Watkins Syndicate, the largest GOM direct insurer (Granger), and Munich Re, the world's largest reinsurer (Aglionby, 2009).

In addition to direct market participants such as brokers, direct insurers, and reinsurers, there are several boards and associations influencing the underwriting of offshore oil and gas risks. For example, the London Market Association's Joint Rig Committee is a group of industry experts that produces recommendations for the industry, including many standard policy wordings. (London Market Association, 2010). While the Committee is non-binding, their recommendations are near-universally accepted by the industry (Sharp, 2009).

The Lloyd's Franchise Board is another important member of the Lloyd's exchange and supervises syndicate accountability for the risks they have underwritten since each Lloyd's syndicate is collectively backed up by all Lloyd's members. The "Realistic Disaster Scenarios" is a recent tool developed in 2006, after Hurricanes Katrina and Rita, that assists the Franchise Board in quantifying syndicate exposure to various types and degrees of risk. For instance, each year a specific hypothetical GOM hurricane will be created, and each syndicate is required to define and quantify their exposure according to pre-defined parameters such as gross insured losses, storm track, wind speed, wave heights, storm surge, and specific infrastructure affected. The process forces syndicates to follow their stated beginning-of-the-year underwriting goals in a strict manner. This approach is a prime example of the ways in which the commercial insurance market has adapted to changes in risks from the major hurricane events that began in 2004.

3.2.1. Types of Insurance Affected by Hurricanes

Offshore oil and gas insurance is typically sold as a package of individual policies all pooled together into one over-arching "umbrella" policy. Some of these individual, separate policies had little to nothing to do with weather-related risks created by hurricanes such as construction insurance or workers compensation. A large number of these individual policies, however, could be impacted, and impacted considerably by offshore weather-related events such as business interruption, removal of wreck, and liability coverage. Well control insurance, commonly written under what is referred to as a "making wells safe" rider, can also include weather-related considerations (Sharp, 2009). A number of these individual policies, their purposes, structure, and conditions, are described below.

[6]The members of Lloyd's are a group of participating insurance companies that individually and jointly employ syndicates. Each member is a franchise of Lloyd's, independently owned, but subject to collectively decided rules administered by the Lloyd's Franchise Board.

[7]A syndicate is a group of underwriters housed at Lloyd's who are either individually or jointly employed by Lloyd's members (insurance companies) to examine and decide which insurance policies to grant on behalf of members.

3.2.1.1. Control of Well and Operator's Extra Expense

Control of well (COW) insurance was the first form of offshore oil and gas insurance offered to offshore oil and gas companies. COW coverage was first offered in the 1940s by insurers located at Lloyd's and has now evolved into what is called "operator's extra expense" coverage (Hoare, 2009). COW coverage now protects oil companies from the costs associated with re-drilling or well safety protection. COW insurance protects oil and gas companies from losses occurring from a blowout, cratering, or loss of well control created by an adverse weather event like a hurricane. Today, the London market combines COW and "extra expense" coverage under a standard form approach, call the "Energy Exploration and Development 8/86 Form" (EED 8/86) form (Granger, personal communication, 2009).

COW insurance can also include a number of riders and amendments. Two common COW riders include a "making wells safe" (MWS) rider and an "extended re-drilling and restoration cost" (ERRC) amendment. A MWS rider protects operators from losses arising from well re-entry requirements created by a damaged or destroyed rig or platform.[8] This type of coverage is common in the GOM and has incurred significant claims with each hurricane. An ERRC amendment provides financial protection to an operator seeking to rework a damaged well instead of plugging and abandonment.

3.2.1.2. Offshore Drilling Insurance

GOM offshore drilling insurance policies are typically based upon one of two standard policy wordings: (1) the "American Institute Hull Clauses" and (2) the "London Standard Drilling Barge Form" (and its derivatives) (Sharp, 2009).

Colloquially called the "American Form," the standard policy wording of the American Institute Hull Clauses (AIHC) was first published on June 2, 1977 (Sharp, 2009). Many GOM drilling rigs are insured by policies adopting the AIHC. The form is adaptable and can cover partial or total loss. The standard wording included in the AIHC includes a pre-defined list of events or accidents (called "named perils"). These "named perils" include events that can impact GOM offshore drilling rigs such as explosions, collisions, and pass-through "pilotage and towage" indemnity. Relatively few exclusions are individually listed on the AIHC, but war and strikes are two common exclusions that have been specifically identified. Drilling rigs are also restricted to certain pre-defined geographical location parameters.

The London Standard Drilling Barge form (LSDBF), the most commonly used standard policy wording for GOM drilling insurance, was first published on March 9, 1972 (Sharp, 2009). The standard policy wording included in the LSDBF represented the first insurance form specific to offshore drilling. Prior to the LSDBF, drilling rigs were covered under definitions applicable to other forms of standard marine commercial insurance. The form has since been updated and is now referred to as the "London Market Offshore Mobile Unit" form (LMOMUF). The new LMOMUF is characterized as an "all risks" form indicating that damages from all forms of negative events can be claimed with the exception of those specifically listed. The LMOMUF also imposes geographical navigational limitations on insured drilling rigs much like the AIHC.

[8] See Appendix A.

Such limits are usually defined by contract parameters, and navigation beyond those parameters requires prior insuring company approval.

3.2.1.3. Offshore Liability Coverage

Many upstream and offshore oil and gas companies will sign policies insuring against operational liabilities with their offshore activities. These policies cover damages created by the destruction of another party's property, injury, and loss of life. Since a single platform may have numerous contracted entities working in close proximity, a web of bilateral indemnity is typically created. That is, each company will reciprocally write indemnity for the operator and other contractors working on the platform. These series of indemnities are not formal insurance company policies or riders, but standard legal and contracting conventions that have the effect of allocating (or clearly defining) risk to each participating party. In the past such a web of indemnity, and in some cases a lack of it, has created contention among the parties when an accident occurs (Sharp, 2009).

Liability insurance tends to be a very customized product in the offshore insurance industry. Coverage can be obtained specifically for environmental damage, risk assumed from already completed projects, directors' and officers' liability, injury by chemicals or other products, professional liability, risk arising from chartering vessels, towing liability, service contracts, helicopter and vessel liability, control of wild wells, removal of wreck or debris, to name a few examples (Sharp, 2009). Ultimately, oil and gas companies will work with brokers to assess the cost of purchasing insurance on each of these various types of risk and will make cost-benefit assessments on their purchase.

Commercial liability insurance tends to seamlessly switch from a platform construction policy to an operating policy once construction is complete and a certain number of agreed upon contractual parameters are met. The same is true for wells that are covered under an AIHC and LMOMUF policy, but switch to an operating policy once completed. While construction policies are typically purchased jointly by partners in the case of a joint-venture (JV), separate policies will be purchased by each party with respect to operations (Sharp, 2009). The interaction of multiple policies create an additional complexity, but one that the market (and presumably the operators) prefers since multiple contracts arise on a regular basis. Generally, it is the project operator that assures the coordination of the partners' policies should the project be part of a JV. Operating insurance policies are typically renewed every twelve months. Policy duration typically balances oil companies' wish to minimize transaction costs with insurance companies' desire for capital mobility.

3.2.1.4. Repair or Replacement (Property Damage)

There are three main types of offshore property insurance that reimburses owners for either repair or replacement costs resulting from an adverse event or peril. The first, and oldest, is commonly referred to as "off-the-shelf" or "like-for-like" replacement (Sharp, 2009). This type of policy reimburses an insured party for the replacement cost of an offshore platform or well. However, since the replacement process itself can span a period of over a year, offshore operators worked with insurers to develop an additional contingency deemed "increased cost of repair or replacement" coverage that includes inflationary adjustments (Sharp, 2009). Steel price increases as shown in Figure 4 during the 2007 through 2008 time period, in particular, created significant repair and replacement challenges for insurers in the aftermath of Hurricane Ike. Combined, both types of insurance cover the dual risks of (a) the repair or replacement of the platform and/or well, and (b) any inflation associated with equipment and materials costs for making repairs or replacements.

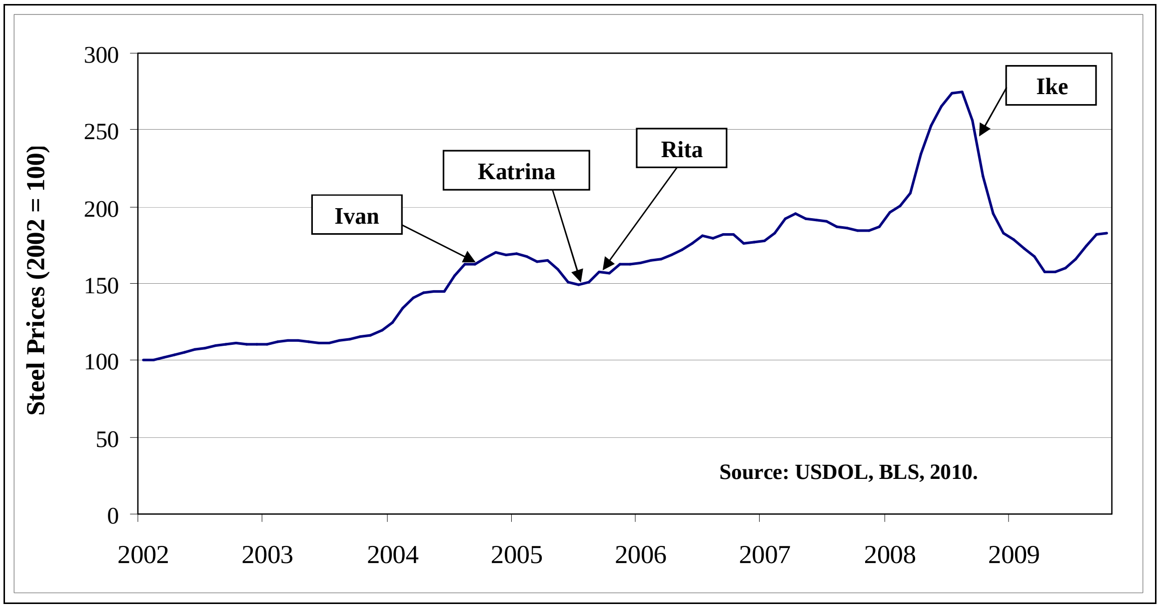

Figure 4. Steel commodity price changes, 2002 to 2010.

The third form of repair or replacement insurance is commonly referred to as "total loss only." This form of insurance is especially important for companies in the GOM since it extends repair or replacement coverage to the additional cost that may be incurred after-hurricane, such as sub-surface costs, like reconnecting pipelines and re-drilling wells. Total loss insurance will cover supplemental repair and replacement activities as an excess, typically at a lower marginal rate than the main repair or replacement policy (Sharp, 2009). However, like any other repair or replacement policy, total loss only insurance reimbursements will discount replacement costs for reservoir depletion and depreciation.

3.2.1.5. Offshore Removal of Wreck Insurance

Removal of wreck (ROW) coverage is typically written as part of property damage coverage. In its simplest form, ROW covers an operator's legal obligation to remove a hurricane destroyed platform and its sub-components. Removal of risers, subsea Christmas trees, casing, and wellheads are covered under this type of policy. Wells are typically insured against hurricane damage, along with platforms, through an additional rider on a ROW policy. Another approach requires oil and gas companies to identify specific wells for ROW coverage with intention of either replacement or re-drilling in the event of weather-created damage.

Some ROW reimbursement controversies have arisen in recent years over what constitutes a proper and fair claim for the removal of structures and equipment associated with non-producing or uneconomic wells. While insurance companies recognize that oil and gas companies are entitled, at least in some cases, to some measure of replacement value for these uneconomic platforms, such cases were likely to lead to what insurance companies viewed as a forward-looking "moral hazard" problem.[9]

In other words, if insurance companies continue to make operators completely whole for hurricane-created losses associated with uneconomic structures, then operators will have lower incentives (to the extent allowed by regulations) to remove these structures on their own, and will wait for adverse weather related events to seek damages to cover for what should otherwise be a normal removal and abandonment cost. This moral hazard problem has been solved by the creation of a new assessment and replacement approach referred to as "dual value," which limits recovery, on a percentage basis, to the remaining share of producible reserves associated with an insured structure.

3.2.1.6. Business Interruption

BI insurance is primarily designed to protect an oil and gas company from lost operating revenues resulting from a shutdown in operations. BI coverage may also include insuring against financial losses associated with post-storm reductions in energy production. BI insurance coverage is very important for many small to mid-size GOM operators that must seek to financially protect themselves from a hurricane-created shutdown.

BI policies are typically issued with a waiting period that functions like a deductible. Once a shutdown or business interruption occurs, the company must wait a certain number of days before BI claims can be paid out (Willis Group Holdings, 2006). Recent tropical activity and high energy prices have significantly increased the waiting periods for BI reimbursements in the GOM insurance market. Prior to the 2004 tropical season, BI waiting periods averaged around 30 days. This number has increased to sixty days post-Ivan (Geisel, 2007).

BI policies are typically written to cover only net revenue. Factors used to "net out" revenue recovery amounts include the typical outage time for workover or routine maintenance, royalties or taxes, or other known factors created by planned production outages (Sharp, 2009). Some scaled-down BI policies only aim to cover interest on loans and overhead or forgone capital opportunity should an operator's borrowing opportunities become more expensive. Many BI policies also contain an endorsement that covers extra expenditures incurred by an insured party in an attempt to mitigate production loss or shorten interruption periods (Sharp, 2009). Further, the coverage will be subject to an overall specified limit to length of coverage.

Oil and natural gas commodity price fluctuations, shown in Figure 5, have put pressure on BI insurance policies and rates. Many large companies have chosen to forgo business interruption post-Katrina/Rita, while many companies with annual revenues smaller than $100 million have continued to purchase BI insurance (Geisel, 2007; Willis Holding Group, 2006).

[9] Moral hazard is defined as the change in behavior created by the presence of insurance.

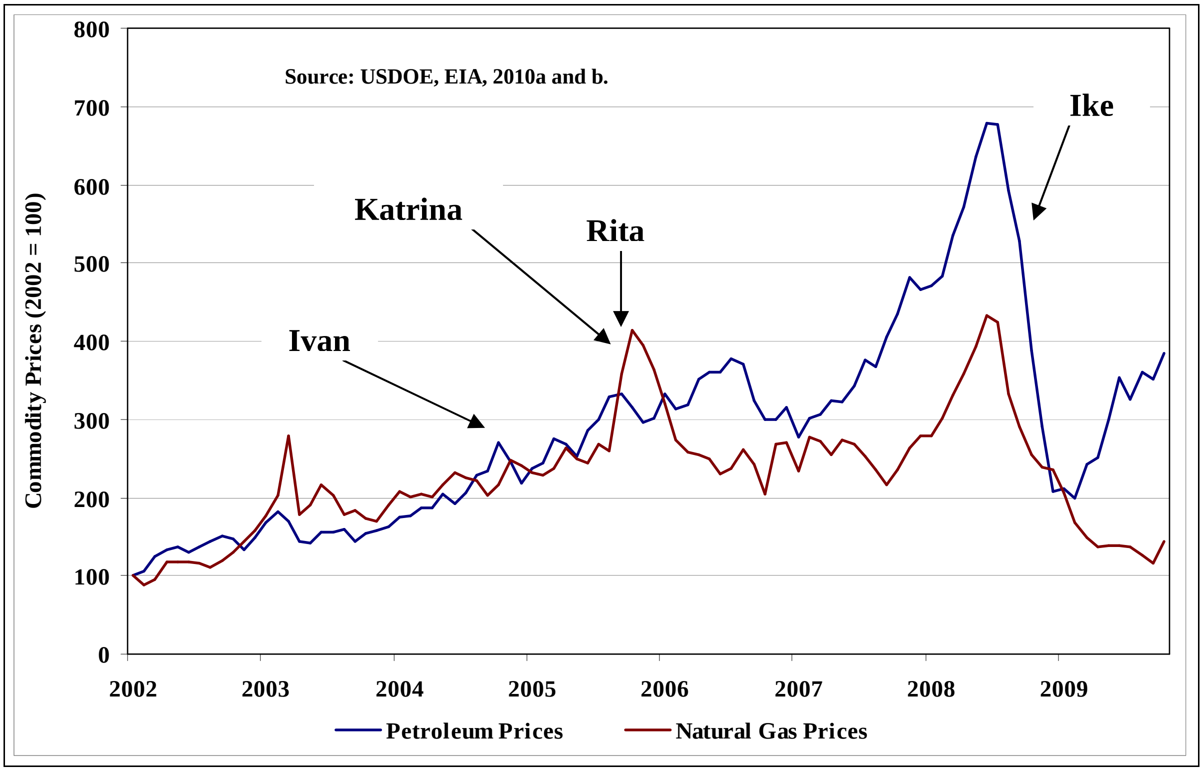

Figure 5. Crude oil and natural gas prices.

One variant of business interruption coverage, and one that has been contentious as a result of the recent hurricanes, is called "contingent business interruption" (CBI) coverage. This type of coverage protects offshore operators from production interruptions created by third parties. For instance, a shutdown in a third-party owned pipeline that prevents an otherwise active well from moving output to markets. A real-world variation of this example is a production interruption caused by an upstream pipeline interruption created by dragging anchors and mooring systems for jack-up rigs moved across the GOM by hurricane wind and wave activity.

3.3. Mutualization

Another important form of offshore oil and gas insurance can be generally referred to as "mutual," "pool," or "club" insurance. Mutualization is based upon the development of a common insurance "club," comprised of similarly-situated companies that "mutually" insure one another against various types of adverse outcomes. What makes this form of insurance different from others is the fact that policyholders of the mutual insurance company are also the owners/shareholders thereby diversifying risks, and reducing overall costs. Mutualization, while common in the energy business, has its origins in the shipping and maritime industries (UK P&I Club, 2010).

One of the factors leading to the use of mutual insurance in the energy and maritime industries is its ability to form a pool of similarly-situated policyholders meeting certain financial and/or operating characteristics. The breadth, size, scope, and common risk profile of participants in the mutual insurance club are thought to enhance insurance availability, expand the terms under which insurance is offered, diversify risk, and reduce the overall cost of insurance. Oil Insurance, Ltd., or “OIL” is the major energy industry example of a mutual insurance company.

3.3.1. OIL Formation

Prior to the mid-1960s, most petroleum companies secured property insurance under typical forms of private insurance that offered an energy company the ability to insure a set of assets at a given value with a corresponding deductible/premium trade-off (OIL, 2008a). Traditional insurance coverage allowed an energy company to increase its deductible (risk retention) in return for a lower premium, and vice versa. Until the 1960s, private insurance for energy assets, under a traditional premium/deductible form, was not difficult to obtain and premiums were considered reasonable (OIL, 2008a).

Two events in the late 1960s, however, created significant changes for the energy industry in terms of insurance availability and price. The first incident was a 1967 explosion at the Cities Service Company (Cities) refinery in Lake Charles, Louisiana.[10] The accident killed six people, injured another fourteen and led to over $17 million in damages and claims, a record amount for the industry at that time ($109 million in 2009 dollars) (CITGO, 2010). The accident caused the insurer of record, the Simmonds Group, to default and go bankrupt soon after paying out the claim (OIL, 2008a).

The second accident included the now infamous 1969 Santa Barbara oil spill, often heralded as the beginning of the environmentalist movement. The accident, created by an explosion at a Union Oil company offshore crude oil well, resulted in over 54 Mbbls of crude oil spilled along the California coastline (Clarke and Hemphill, 2002).

Both incidents, occurring within a relatively short amount of time of one another, revealed the potentially high costs and liability that could be placed upon the energy industry from a catastrophic environmental and safety-related event. The level and magnitude of both incidents challenged the traditional insurance market’s ability to absorb that level of risk, and created concerns about future potential liabilities that could surpass those recognized by the two accidents of the late 1960s. As a result, energy industry insurance coverage became considerably more expensive and more likely to have limitations that did not exist in the decades prior to the 1960s.

The Lake Charles and Santa Barbara accidents directly led to the formation of a new type of insurance company for the oil and gas industry, commonly referred to as “OIL,” which is one of the first major mutual insurance companies servicing the energy sector including offshore oil and gas drilling and production assets. OIL was formed in 1971, in the Bahamas, by a group of 15 energy companies (OIL, 2008a). The original purpose of OIL was to develop an alternative to the high premium and limited coverage options that were emerging at that time in the private commercial insurance industry. Through mutualization, OIL’s members hoped to form a collective, lower-cost insurance pool for similar-situated energy companies.

[10]Cities Service Company is now known as Citgo, and is owned by Petroleos de Venezuela. The refinery is still in operation in Lake Charles, Louisiana and has a distillation capacity of 440,000 barrels per day.

OIL did not originally form as a true mutual insurance company. Its original design was based upon what is referred to as "a risk-financing facility." Under this mechanism, insurance participants (members) were required to pay premiums in advance, which in turn, were deposited into separately identified reserves attributable to each participant (OIL, 2008a). For example, Citgo's premiums were directly deposited into its account of record, while Phillips's premiums were deposited into its own account of record. Funds at this time were not deposited, like many mutual insurance companies, into a common pool.

Under the original formation terms, if a claim were made on OIL, any party making a claim in excess of its reserve balance would receive its full claimed amount, and be required to pay back any differences over a five-year basis. For instance, if Citgo had an ongoing account balance of $200 million, but made a claim for $300 million, the company would receive the full $300 million. In this hypothetical, the balance in Citgo's account of record would be used to fund the first $200 million, and the company would be required to amortize the additional $100 million on a five-year repayment schedule: hence, the term "risk financing" facility. The prior example shows that, at least under the original OIL organizational structure, the "insurance" provided to each of its members did not shift or reduce risk like traditional or "true" mutual insurance, but simply served as a financing mechanism (or loan) to pay for claims in excess of the self-insured amount (i.e., reserve).

The original insurance structure for OIL, however, did not last very long. In the early 1970s, the U.S. Supreme Court issued a ruling requiring a considerable revision in the way members pooled their collective self-insurance resources and responsibilities (Commissioner, 1971). This Supreme Court decision, referred to as the Lincoln Loan Association decision, did not directly question OIL's organizational and operational structure, but did question certain tax provisions of a similarly-situated insurance organization in the banking industry. The Supreme Court findings did not challenge the validity of mutualization as a form of insurance, but did question the tax status of reserve payments and found that these payments were not similar to insurance premiums that companies commonly pay to private insurance providers. The Court found that reserve payments were deposits (like a bank), and not expenses (like insurance premiums); as such, these reserve payments represented assets, which are taxable, as well as any returns on those balances (Commissioner, 1971).

The Court's decision in Lincoln Loan significantly changed many of the perceived economic benefits of mututalization, as OIL was originally created, leading members to reorganize the club's insurance coverage structure (OIL, 2008a). Under the reorganization, OIL formed along traditional mutual insurance principles by pooling reserves, creating genuine premium structures, and offering various insurance and risk management services to share and spread risks across all of its members. The one difference between OIL's revised structure and the private insurance market continued to be that OIL operates on a fee/cost basis for its services and not upon a profit basis like many private insurance companies (OIL, 2008a).

3.3.2. Original OIL Membership and Coverage

In the early 1970s, OIL started with 15 oil and gas company members (OIL, 2008a). Figure 6 shows that by 2003, OIL membership had peaked to over 80 companies. By 2009, OIL membership had decreased to 55 companies due to mergers, acquisitions, industry consolidation, and, as will be discussed in Chapter 5, hurricane-related activity.

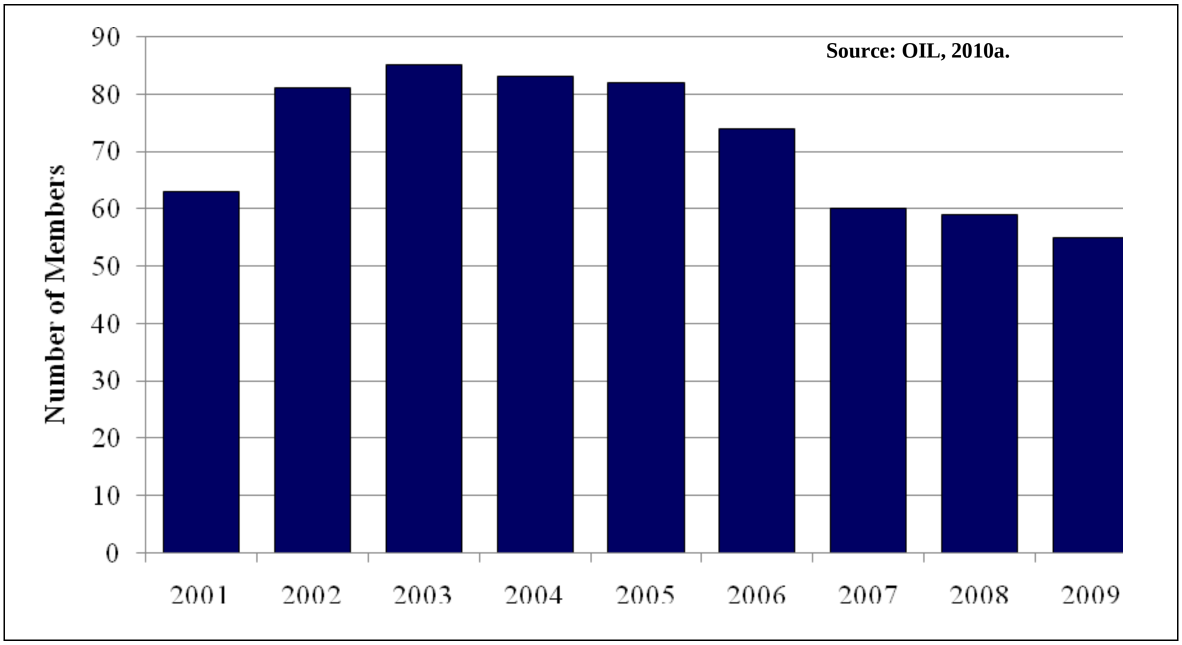

Figure 6. Annual OIL membership levels, 2001 to 2009.

Today's OIL membership is also broader than its simple "oil and gas" company origins, and includes a broad range of "energy" companies that operate in a number of different sectors, are comprised of a number of different financial structures, and operate in a broad range of geographic locations. OIL's current membership includes a number of US-based energy companies as well as several located in Europe, Canada, Australia, and the Caribbean.

A listing of OIL's 2009 membership has been provided in Table 3 and includes a number of vertically integrated major oil companies (Chevron, ConocoPhillips), independent oil and gas companies (Apache, Noble Energy), petrochemical companies (Lyondell Bassell, Westlake), independent refineries (Sunoco, Tesoro) and electric companies (Sempra, Electricit de France). A breakdown of membership by unweighted gross assets by operations type is provided in Figure 7.

Table 3

OIL Membership by Country

Country / Company	
Australia	**United States**
BHP Billiton Petroleum (Americas) Inc.	Apache Corporation
Caltex Australia Limited	Chevron Phillips Chemical Company LLC
Santos Ltd.	Chevron Corporation
Woodside Petroleum Limited	CITGO Petroleum Corporation
	ConocoPhillips
Canada	Drummond Company Inc.
Canadian Natural Resources Ltd.	DTE Energy
Husky Energy Inc.	El Paso Corporation.
Nexen Inc.	Forest Oil Corporation
NOVA Chemicals Corporation	Hess Corporation
Paramount Resources	LOOP LLC
Suncor Energy Inc.	Marathon Oil Corporation
Talisman Energy Inc.	Mariner Energy, Inc.
	Murphy Oil Corporation
Europe	Noble Energy, Inc.
ARKEMA	Occidental Petroleum Corporation
BASF SE	Puerto Rico Electric Power
BG Group plc	Authority (PREPA)
Borealis A/S	Sempra Energy
CEPSA	Southern Union Company
DONG Energy A/S	Sunoco, Inc.
Electricité de France (EDF)	Tesoro Corporation
Eni S.p.A.	The Sinclair Companies
Galp Energia SGPS, S.A.	Valero Energy Corporation
LyondellBasell Industries	Westlake Chemical Corporation
MOL Hungarian Oil and Gas Company	XTO Energy Inc.
OMV Aktiengesellschaft	
Repsol YPF, SA	**Latin America / Caribbean**
Royal Vopak N.V.	Hovensa L.L.C.
StatoilHydro ASA	
TOTAL S.A.	
Yara International ASA	

Source: OIL, 2010b.

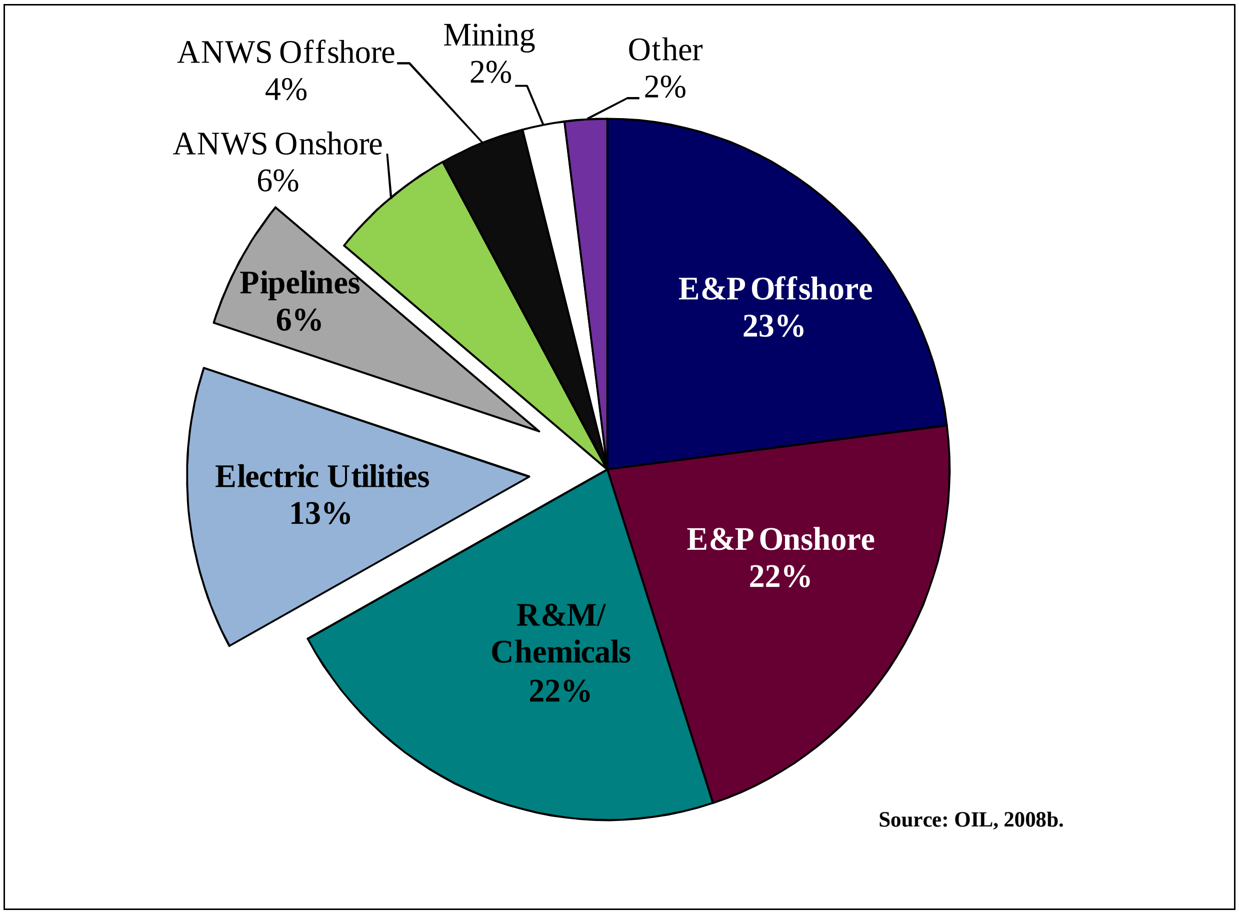

Figure 7. OIL membership, unweighted gross assets by industry sector.[11]

Membership in OIL is based upon four separate requirements. First, any prospective member must have at least $1 billion in gross assets. Second, members must use 50 percent of its assets, or derive 50 percent of its gross revenues, from energy operations. Third, members must be of investment grade credit rating from Standard and Poor's ("S&P") (i.e., equal or greater than a "BBB" rating) and Moody's (equal or greater than a "Baa3" rating). Fourth, a prospective member must provide its ten-year loss history for review by the OIL Board. The Board subsequently meets to review the application for approval or rejection. OIL's insurance structure is based upon a two-tiered system, with the first tier being comprised of a mandatory premium and the second tier comprised of a voluntary premium.

OIL has three main insurance agreements. The property damage agreement covers damage to all physical assets the insured may have (subject to occurrence limits and other factors discussed later). The second form of coverage is broken into several sub-parts that includes what is referred to as "sue and labor," "control of well," and "removal of debris" coverage. Lastly, OIL provides liability coverage resulting from pollution including oil spills. Each form of coverage is packaged together to create the basic insurance policy each member acquires through a minimum

[11]Unweighted gross assets are the total assets, by sector, for all of OIL's members and are not weighted by size, but on total dollar amounts.

membership in OIL. There are, however, exclusions associated with each part of the coverage, as well as extra coverage that may be added with the payment of supplemental premiums.

OIL's coverage options are also broken into mandatory and optional components. Mandatory coverage is capped at the lesser of 10 percent of a company's "unmodified gross assets" or $250 million per incident/claim with no annual aggregate limit (OIL, 2009). If a company selects only the basic mandatory coverage level, its losses will only be paid at 60 percent of the claimed amount up to the $250 million incident/claimed limitation. The insured will retain the remaining 40 percent of the loss. The 60 percent of the loss covered by OIL will be repaid by OIL members per a formula for the standard premium rate. Commonly, the 40 percent of exposure retained by an insured will be covered by the commercial market. OIL does not prohibit companies from "filling the gaps" of its mandatory coverage with other supplemental policies that may be provided by other parties.

OIL's voluntary coverage structure is based upon one of two different options from which an insuring company self-selects. The first option is referred to as an "individual retro" (IR) option and insures a policyholder (energy company) for an additional amount up to $250 million per occurrence. The same occurrence limit is in place for both the first and second tier. The IR electing member pays only the standard premium until it incurs and claims a loss. Once a claim occurs, the member is responsible for a sliding percentage of the IR claim.

The sliding percentage associated with IR claims range from between 33.3 to 62.5 percent. The larger the loss, the smaller the percentage of risk retention: the smaller the loss, the larger the percentage of risk retention. Losses that result in a payback of less than 40 percent provides clear advantages over the simple standard premium option but an outcome of this nature is rare since the average formula retrospective premium percent tends to gravitate towards the 40 percent level. Generally, the percentage calculated by the formula determines the amount an insured company is liable for in terms of its whole claim. An example of the individual retrospective premium option formula has been provided in Appendix B of this report.

The second voluntary premium structure is referred to as a "flat premium" option. If selected, this option insures an OIL policyholder for 100 percent of its losses in excess of the base $150 million coverage level up to a cap of $250 million per claim. The higher coverage level comes at a cost since companies that choose this second voluntary option pay considerably higher premiums than the first voluntary option.

3.4. Reinsurance

3.4.1. General Overview

Secondary market insurance companies, often referred to as "reinsurers," play an important role in the diversification of hurricane risk and other risks arising in offshore oil and gas operations. Reinsurance companies can be thought of as "insurance companies for insurance companies" and, given their close interactions with brokers and underwriters, can often have considerable influence and input into the development of oil and gas industry insurance coverage and premiums. The reinsurance company's product is not surprisingly referred to as "reinsurance," and is an agreement with a ceding insurance company[12] to assume a portion of risk in return for a portion of the premium. Reinsurance companies also reinsure each other in what is called retrocessional insurance (or treaties). Reinsurance contracts are commonly called treaties because the receiver of risk and premium responds by indemnifying the seller of risk, which can be another reinsurer or direct insurance company.

3.4.2. Reinsurance Functions

Reinsurance companies serve a number of market functions. Reinsurance companies' first and primary function, however, is in providing risk mitigation services to direct insurers by effectively leveraging those insurance companies' underlying risk. The availability of reinsurance gives the direct insurer the market option to shore up reserves due to variety of market and institutional changes and risks. For instance, should invested reserves decline in value, a reinsurer may be willing and able to take enough risk off the direct insurer's books to maintain a safe risk-to-reserve ratio. In this way reinsurance can create profit stability and reduce the risk of financial distress and even insolvency.

Capacity expansion[13] represents a second and equally important benefit and market function served by reinsurance companies. Without reinsurance, a direct insurer may not be able to write new risks or renew existing contracts which would reduce the scope of the insurance market and drive up costs (and premiums) for all insurance buyers.

This is particularly important for high cost, geographically concentrated assets, like deepwater oil and gas production facilities that may be so highly-valued that a single loss in that location would be unacceptable to the shareholders of a direct insurance company. By agreeing to sell some of the risk to a reinsurance company, the direct private insurer may be able to offer insurance to a high value risk that it otherwise would not have covered.

Reinsurers play an important role in the GOM oil and gas insurance market, and their collective decisions can greatly influence prevailing premium prices. Overall market dynamics feed into this web of influence since the amount of reinsurance (or capacity) offered to any given sector (like the oil and gas industry) is part of a broader strategy of developing a diversified portfolio of risk that hopefully results in broader gains to reinsurance investors (i.e., reinsurance revenues exceed claims on reinsurance assets). Approximately 50 percent of all U.S. risk exposures are reinsured and about 20 percent of all U.S. exposures are retroceded (reinsurance of reinsured risk)[14] (Banks, 2005).

Reinsurance can take two functional forms: facultative reinsurance and treaty reinsurance. "Facultative reinsurance" requires significant due diligence and a rich set of initial informational

[12]A ceding company is the insurance company buying the insurance, which can also be thought of as the insurance company that is selling risk to another insurance provider.
[13]Capacity is defined as the market insurable value limit of a single location asset. For example, if an oil and gas company had a portfolio of assets valued at five billion dollars, with the largest single asset value at two billion dollars, then two billion dollars would be considered the necessary amount of capacity. In the insurance industry reference to capacity implies the maximum single risk.
[14]All risk including life, property, health, casualty, etc. All commonly insured risks in the United States.

data from which to draw a comprehensive prospective risk analysis. Facultative reinsurance is done on a per risk basis: in other words, each risk is evaluated and insured separately.

“Treaty reinsurance”, on the other hand, involves an ex ante agreement between the reinsurer and private insurance company. The contract will involve a specified overall limit of capacity and policy size that the private insurer can automatically pass to the reinsurer. The contract will also specify the types of risks that are eligible for reinsurance under the policy. In this case, risks are not individually agreed upon by the reinsurance company but taken in aggregate, with some overall cap on policy size and capacity. While treaty reinsurance can considerably reduce overhead costs associated with analyzing individual risks, it also requires the reinsurance company to assume a considerably higher level of risk than under a facultative approach. Thus, treaty reinsurance places exceptional value on the trust built up from a long-term relationship between a reinsurer and a direct insurance company.

Reinsurance coverage options also take a variety of forms that rest primarily upon “proportional-to-loss” coverage and “excess of loss” coverage. Proportional-to-loss reinsurance can be thought of insuring risk with a direct insurer on a side-by-side basis. In other words, both the direct insurance company and the reinsurance company share losses (claims), as well as revenues, on a proportional basis with the shares of each (costs, revenues) being negotiated between the two parties. Excess of loss coverage, on the other hand, is based upon risks sharing beyond some negotiated/contracted limit that is referred to as an “attachment point” (Sharp, 2009).

The relationship between reinsurers and direct insurance companies is symbiotic and based upon a number of market-based functions and arms length negotiations that typically result in fair and profitable outcomes for both parties. This relationship, however, requires direct insurers to carefully weigh the benefits of reinsurance versus its costs. While reinsurance can provide direct insurance companies with a valuable hedge against risk, particularly for high cost assets, these hedges do not come without costs that, in turn, can reduce overall direct insurance company profitability. Direct insurance companies have incentive to not “oversubscribe” to reinsurance coverage since in doing so they reduce their opportunities for growth and profits.

Likewise, reinsurance companies must view their relationship with various direct insurance companies with some degree of scrutiny since there is a clear informational asymmetry between the two parties that can lead to a variety of moral hazard problems. If reinsurers unnecessarily assume too much risk and/or assume risk without pricing it accurately, they will be subject to unanticipated losses, forgone profit, and potentially insolvency. Reinsurance companies are clearly in a business that requires the assumption of a considerable degree of risk. But not all risk is created equally, and if not evaluated properly, can become a considerable business liability, particularly in the face of unanticipated catastrophic losses such as the impact of a destructive hurricane on a large, concentrated number of high value assets.

3.5. Insurance-Linked Financial Instruments

Catastrophic bonds, or “cat bonds,” are one of the more commonly known insurance-linked financial instruments associated with the oil and gas business. Cat bonds were first offered in 1997 by USAA/Residential RE and have evolved over time, along with a number of other comparable financial instruments that are used to support insurers, reinsurers, and a wide array of companies exposed to catastrophe risk (Banks, 2005). Cat bonds, along with what is generally called "contingent capital," provide GOM oil and gas companies with an additional risk management option that leverages capital markets for insurance purposes. Contingent capital instruments allow buyers and sellers of risk to transact to create mutually beneficial gains from trade. Purchasers of cat bonds, for instance, engage in transactions for the possibility of speculative gains made on the coupon price and interest payments associated with the contingent capital instrument. Energy companies, on the other hand, benefit from a relatively lower cost insurance instrument that has a fixed, market-based/market determined rate.

3.5.1. General Overview of Catastrophe Bonds

As seen in Figure 8, the cat bond market has been continually growing since its inception in the late 1990s when the industry issued $1 billion in securities, to a 2008-2009 level averaging in excess of $2 billion (Business Wire, 2009). Particularly impressive is the degree of market growth experiences in 2005, well over 70 percent. The two years following Hurricanes Katrina and Rita saw the largest amount of growth in cat bond issuances, with a 135 percent and 250 percent increase in 2006 and 2007, respectively.[15]

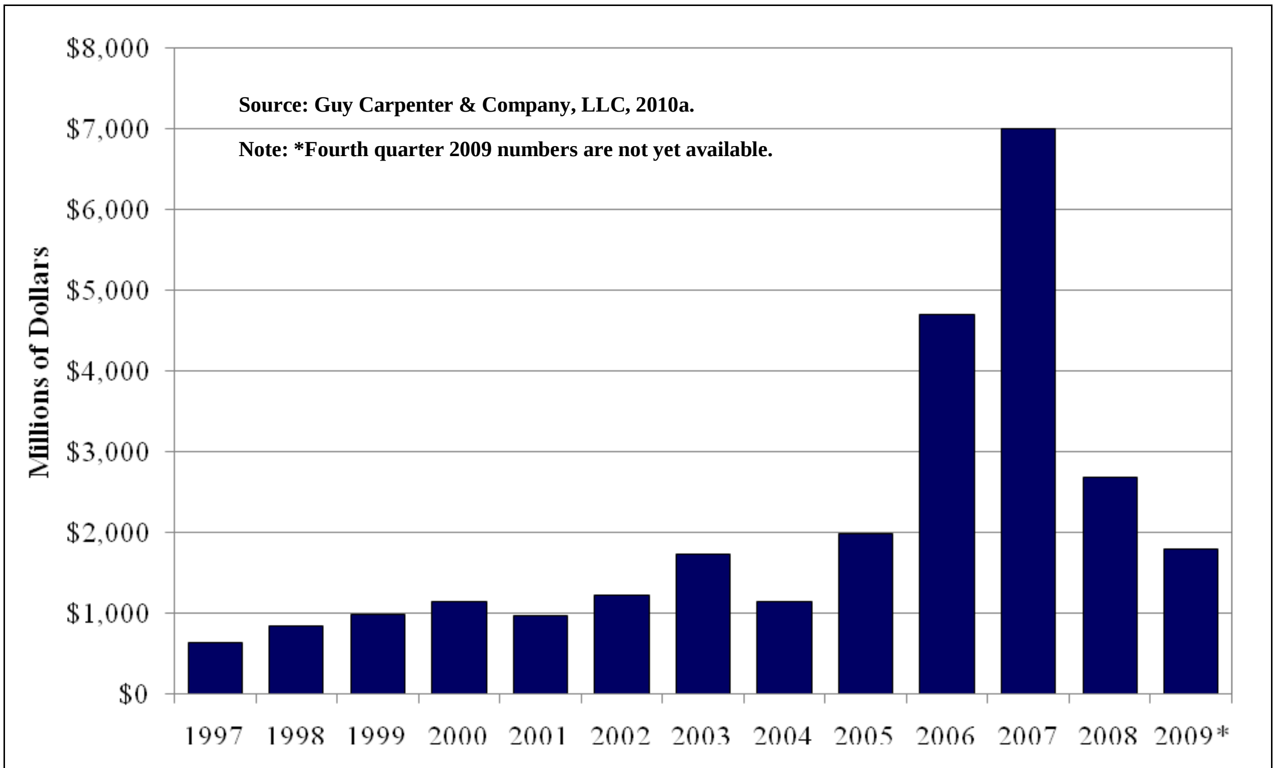

Figure 8. Total catastrophe bond issues.

While annual issuances provide interesting information about the incremental demand for cat bonds, the scope of the market tends to be defined by the number of outstanding bonds in any given year since most of these financial instruments tend to be multi-year in nature. Total outstanding contracts for cat bonds totaled $11.8 billion at the year-end of 2008 (Guy Carpenter

[15]For further discussion of the reasons behind the increases please see Section 1.13 of this report.

& Company, LLC, 2010a). The total outstanding contracts for years 2003 through 2008 are shown in Figure 9. The number of outstanding contracts steadily grew from 2003 through 2007 when the market peaked. While the overall cat bond market has fallen considerably since its 2008 peak, outstanding valuations still remain above years prior to the Big Four hurricanes.[16]

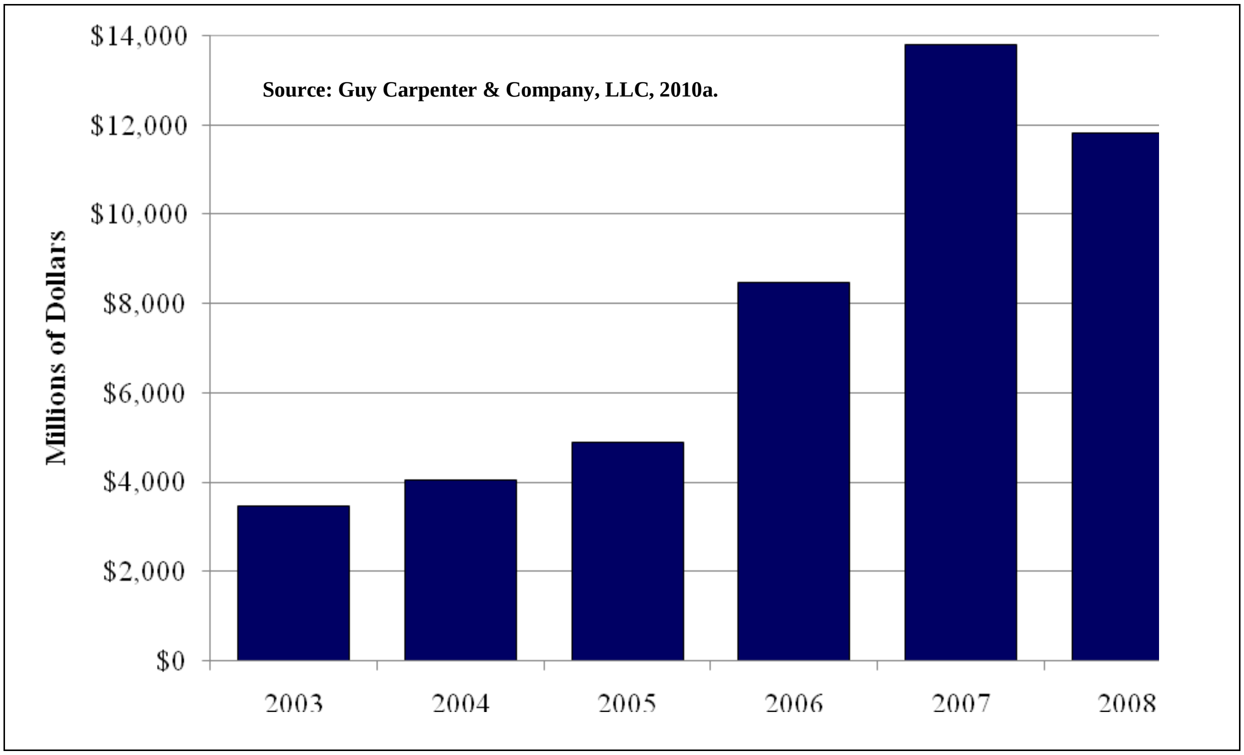

Figure 9. Total outstanding catastrophe bond contracts.

While cat bonds are an important finance tool for the GOM offshore oil and gas industry, the risk transfer mechanism usually happens at arm's length and with the involvement of a number of intermediaries. The central organization in a cat bond deal is a special purpose entity (SPE) or a special purpose reinsurer (SPR) (Klein et al., 2000). A diagram outlining the SPE/SPR's relationship with other market participants is provided in Figure 10.

[16]The Big Four hurricanes are Hurricanes Ivan, Katrina, Rita, and Ike.

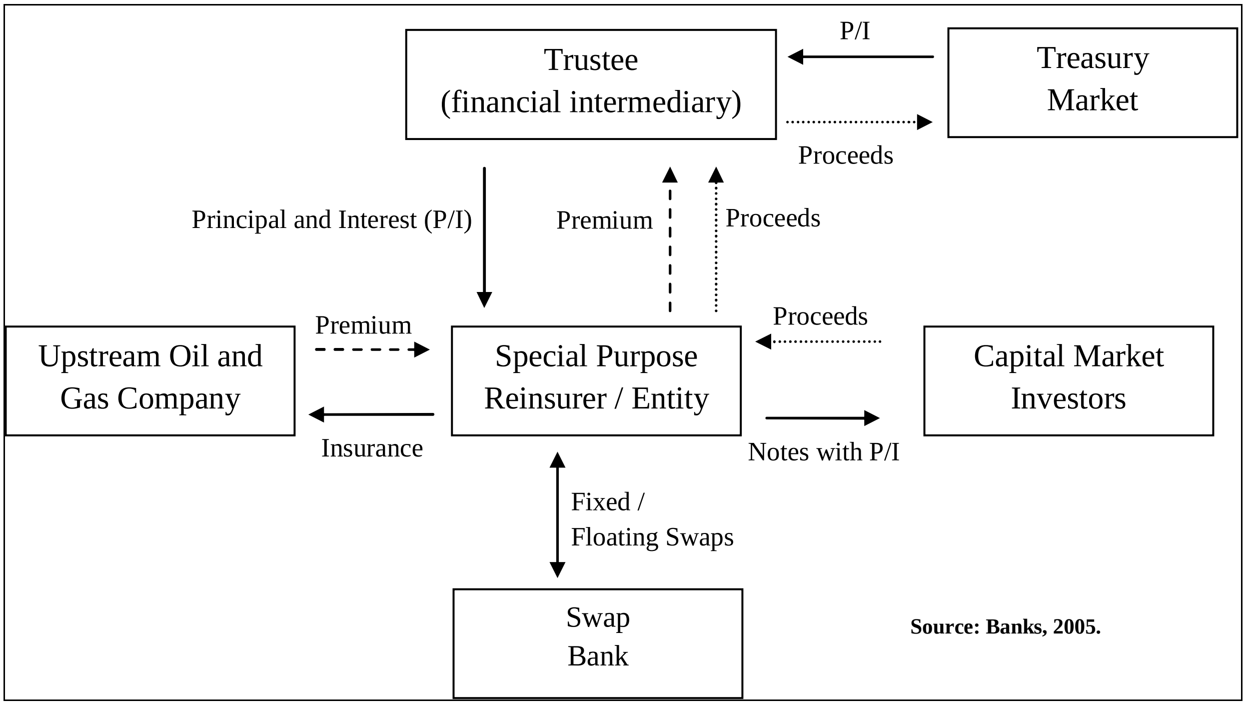

Figure 10. A common catastrophe bond mechanism structure.

The SPR/SPE acts as the administrator and general contractor of the security issuance. Typically the SPR/SPE will hire a trustee, a financial institution, to prepare and analyze the financial aspects of administering and handling the proceeds of the bond sale. Bond proceeds are usually passed from investors to the SPR/SPE, and then passed to the trustee for reinvestment, usually in what are considered risk-free assets, such as U.S. Treasury Bills. In return for their involvement, the SPR/SPE and trustee will receive a portion of the premium income as a fee from the insured company. The premium (and interest) from the insured company is also passed back to investors in the form of a bond coupon payment.

The main purpose of employing an SPR/SPE is to further insulate investors from relying on the credit rating of the insured company.[17] This structure allows insured companies to obtain the best possible costs of credit with respect to the solvency of the bond backing organization. Given the complexity of modeling catastrophes, capital investors are mainly represented as institutional investors though consumer-level investors do have the ability to invest in catastrophe bonds in special exchange-traded funds.

Cat bonds come in many different forms to fit the many different types of risk and investors, but each has a specific form of trigger that is activated and induces a corresponding response after a catastrophe has occurred. The three main types of triggers are indemnity, parametric and index triggers:

[17]The SPR/SPE will frequently work in conjunction with external organizations and engage in credit default swaps and fixed/floating currency swaps in order to obtain the highest credit ratings and lowest borrowing costs.

- Indemnity triggers create a hold harmless provision that insulates the insured against any contractually agreed-upon catastrophe risk per a definition. If a catastrophe occurs according to the definition, then the principal and interest due to the bond holder are forfeited up to the level of insured losses or otherwise stated amount.

- Parametric triggers are developed from models, or other formulas, that use storm inputs, such as a hurricane's maximum wind speed or minimum barometric pressure, to determine payouts (can include withheld interest and/or principle depending upon conditions). Geographical considerations are also used in parametric triggers. Parametric triggers are becoming more commonplace in the market because they do not require investors to be experts in the company's asset exposure to calculate potential risk. The Willis Hurricane Index is one such parametric trigger.[18]

- Index triggers tie payouts to industry-wide losses or other metrics not associated with the specific storm such as a parametric model would use (Klein et al., 2000).

In addition to specific bond triggers, bonds can be differentiated by outcomes, and various different tranches, relative to a catastrophic occurrence such as a hurricane (Banks, 2005). Bonds can be split in a variety of pre-defined manners such that interest, loss of principle, or other combinations are withheld as payout. Tranches, on the other hand, may cover any combination of outcomes from requiring that more than one trigger occur before payout, to total loss of principal and interest regardless of company exposure. Each tranche is set according to commonly-recognized bond ratings, and given a label from A/AA to BB rating.

Catastrophe bonds were rarely rated above BB+ (investment grade) before 2006, but beginning in 2007 some catastrophe bond structures changed to more closely resemble collateralized debt obligations (CDOs), thus achieving higher investment-grade ratings (A.M. Best, 2008). Factors that affect ratings include structural, regulatory, and legal documents, the granularity of exposure data available for risk modeling, the results of analyses done by catastrophe modeling firms, the results of stress testing (extreme scenario analysis), exposure to basis risk,[19] the existence of multiple event triggers, and the credit risk of all parties concerned.

The pricing of cat bonds follows insurance and reinsurance costs since these are competitive and alternative forms of insurance. The price/cost differential between insurance and reinsurance costs and catastrophe bonds is the largest market moving factor of catastrophe bonds. The hardening of commercial insurance markets tend to drive up catastrophe bond usage (Banks, 2005), although this trend appears to have dampened in the post-2007 market. This trend is evidenced in Figure 8. Cat bond pricing can also be influenced by the administrative costs for the SPR/SPE, trustees, and others engaged in the counterparty research/coverage work. Tax considerations can also influence cat bond pricing since some may not have as attractive tax

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[18]This index is discussed in greater detail on page 77.

[19]Basis risk is the risk that the payout of the bonds will not equal company losses. This does not exist in indemnity trigger bonds, but can be a major risk of parametric and index trigger based bonds.

considerations for at-risk companies compared to insurance, which can be written down as an annual expense (Banks, 2005).

The cat bond market continues to evolve since its inception in the late 1990s. One of the more important institutional innovations over the past several years includes the establishment of long-run SPR/SPEs (lifes defined “into perpetuity”) for the purpose of handling multiple simultaneous and frequent bond issues, multiple peril issues, and multiple trigger issues. This creates a certain degree of consistency, and signaling of institution knowledge, that markets prefer for higher risk securities like those associated with the cat bond market.

3.5.2. General Overview of Contingent Capital

Contingent capital is similar in nature to catastrophe bonds, since it is based upon the use of financial markets to protect an insuring company against perils while providing a profit opportunity for market-based counterparties. The primary difference between the two financial approaches (cat bonds and contingent capital) is in their use of intermediaries. Cat bonds, as noted earlier, facilitate the use of an SPE/SPR and other intermediaries in conducting various market transactions. Contingent capital, on the other hand, is financed directly by the insuring company without any intermediary. It thus, becomes a direct agreement between the company seeking insurance and financial markets.

The insurance component of contingent capital takes on many of the same approaches as cat bonds. The first step in the process is that the at-risk company defines and creates a financial instrument that provides market-based financial compensation should a storm occur. The costs associated with issuing this instrument tend to be limited to the same types of underwriting fees common with other corporate debt instruments. The financier underwriting the financial instrument for the at-risk company receives a servicing payment regardless of whether there are any peril/catastrophe outcomes and claims.

The form of the financial compensation extended by the financier should a storm occur can take many forms. At-risk companies can often have credit rating concerns that can be challenged by the issuance of large levels of debt, including contingent capital. Thus, contracting parties may agree that the financial compensation should be restricted to a small financial level relative to the potential loss of an asset, or the capital infusion could represent a fixed-rate loan call option. The compensation can also take the form of a direct capital infusion or an obligation to purchase newly issued stock shares (preferred or common). Like catastrophe bonds, contingent capital can take many forms given the needs of the at-risk company and concerns of the financial institution underwriting the transaction (Banks, 2005).

4. IMPACTS OF THE BIG FOUR HURRICANES ON OFFSHORE OPERATIONS

Tropical activity and weather-related events are one of the more obvious challenges associated with managing offshore oil and gas activities in the GOM. Several major hurricanes have occurred in the GOM region since offshore oil and gas activities began in the late 1940s. Figure 11 for instance, shows the changes in GOM production on a MMBOE basis and compares that to the number of hurricanes arising in the Gulf since 1960. Offshore production levels common during historic catastrophic hurricanes, such as Betsy (1964) and Camille (1969), were considerably lower than today's, and those associated with the Big Four post-2004 hurricanes.

At the time of Betsy, the federal OCS produced less than 260 million BOE (9 percent of then-current total domestic production), and 630 million BOE at the time of Camille (18 percent of then-current total domestic production).

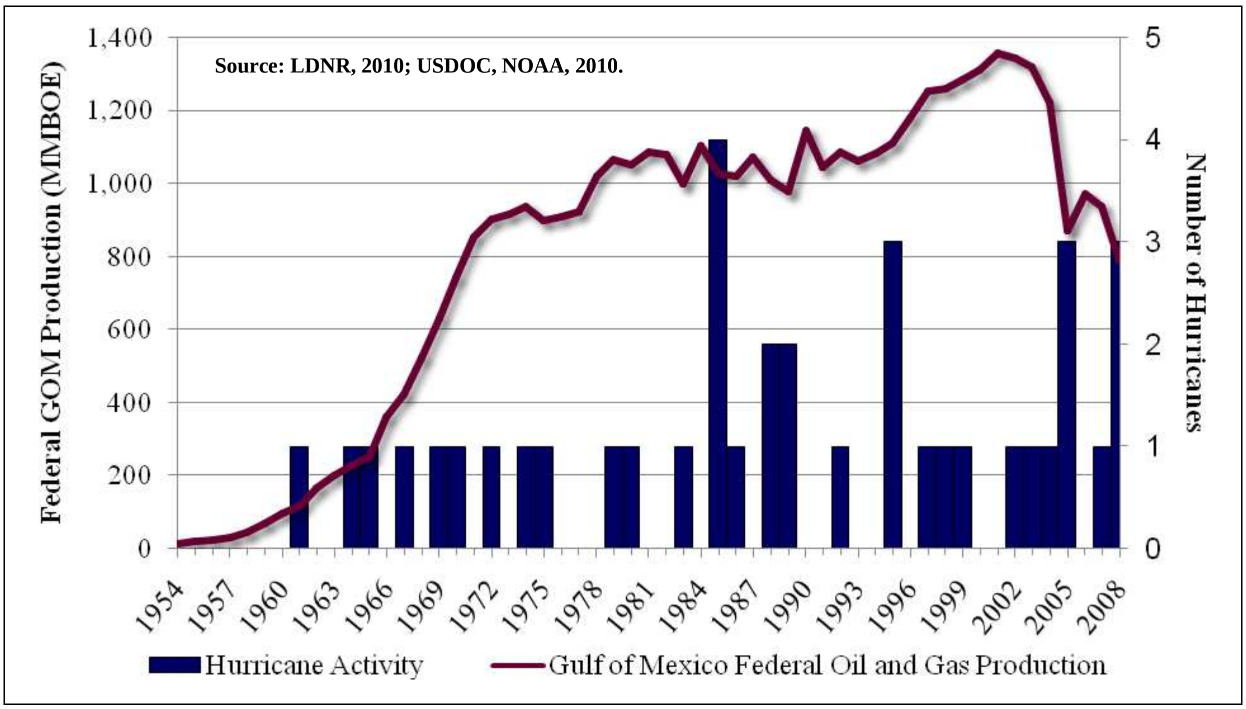

Figure 11. GOM OCS production and hurricanes.

Structure exposure has also changed dramatically since the last round of major catastrophic hurricanes of the 1960s. Figure 12 compares hurricane activity from 1960 to current against the number of active structures in the GOM. During Hurricane Betsy, there were over 1,000 active structures and 469 active platforms operating in the GOM. By the time of Hurricane Camille, there were 710 active platforms. Today, there are some 3,770 active structures and 2,347 active platforms in the Gulf. New platforms cost in the tens of millions, and as much as billions for deepwater structures, leading to the potential for costly hurricane impacts.

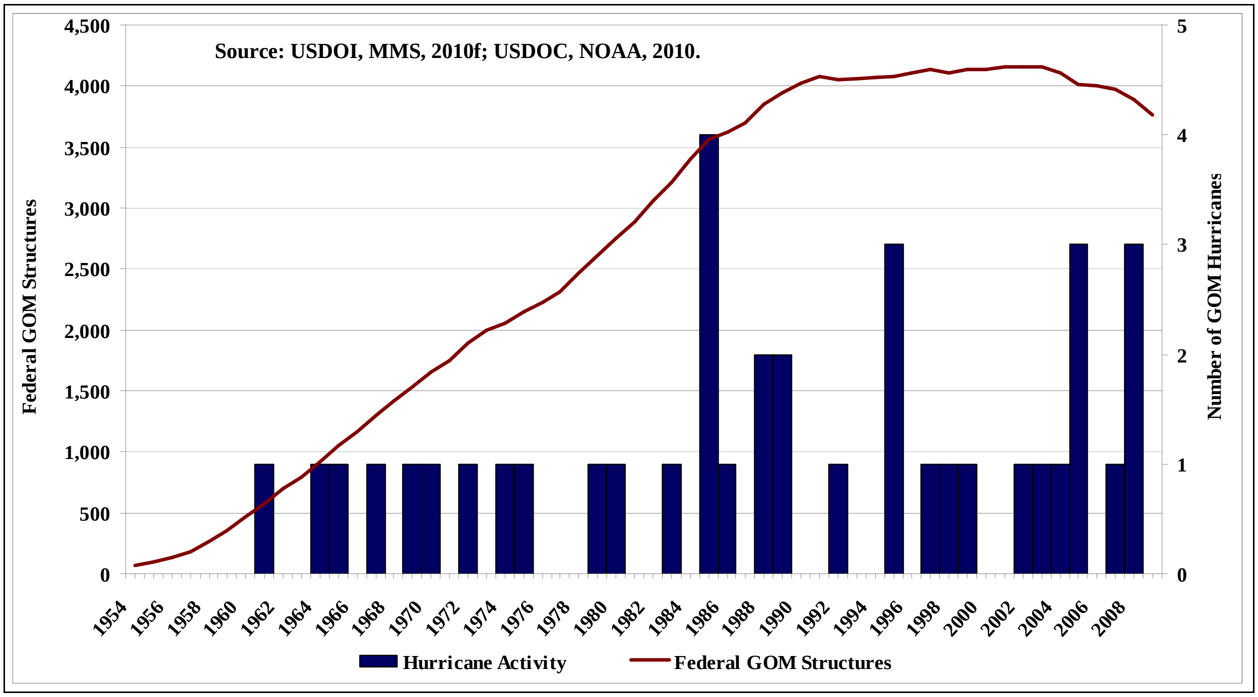

Figure 12. GOM OCS active structures and hurricanes.

Over the past several decades, hurricane impacts on offshore oil and gas activities have tended to be somewhat manageable. The nature of hurricane impacts, however, changed dramatically in 2004, with even greater implications in 2005, and again in 2008. Post-2004, four major hurricanes crossed the prolific oil and gas producing areas of the GOM: Ivan, Katrina, Rita, and Ike. A brief and limited survey of the scope and breadth of each of the "major four" storms is necessary in order to put insurance market changes resulting from these storms into perspective.

4.1. Hurricane Ivan

Hurricane Ivan entered the GOM after passing between the Yucatan Peninsula and Cuba in early September, 2004. Hurricane Ivan strengthened considerably upon entering the warm Gulf waters attaining Category 5 status[20] before decreasing to a Category 4 storm prior to landfall. Ivan generally took a northerly path across the Gulf after passing through the Yucatan Straits. As shown in Figure 13, this path enabled Ivan to impact a number of outlying structures as it approached the Louisiana-Mississippi-Alabama coast. Ivan was a relatively slow paced storm moving at directional speed of about 8 to 11 miles per hour (Stewart, 2005).

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[20]Hurricane strength is typically defined by the Saffir–Simpson Hurricane Scale: a classification used for most Western Hemisphere tropical cyclones that exceed the intensities of tropical depressions and tropical storms. The scale divides hurricanes into five categories distinguished by the intensities of their sustained winds. The classifications are intended primarily for use in measuring the potential damage and flooding a hurricane will cause upon landfall. Officially, the Saffir–Simpson Hurricane Scale is used only to describe hurricanes forming in the Atlantic Ocean and northern Pacific Ocean east of the International Date Line. See: National Hurricane Center.

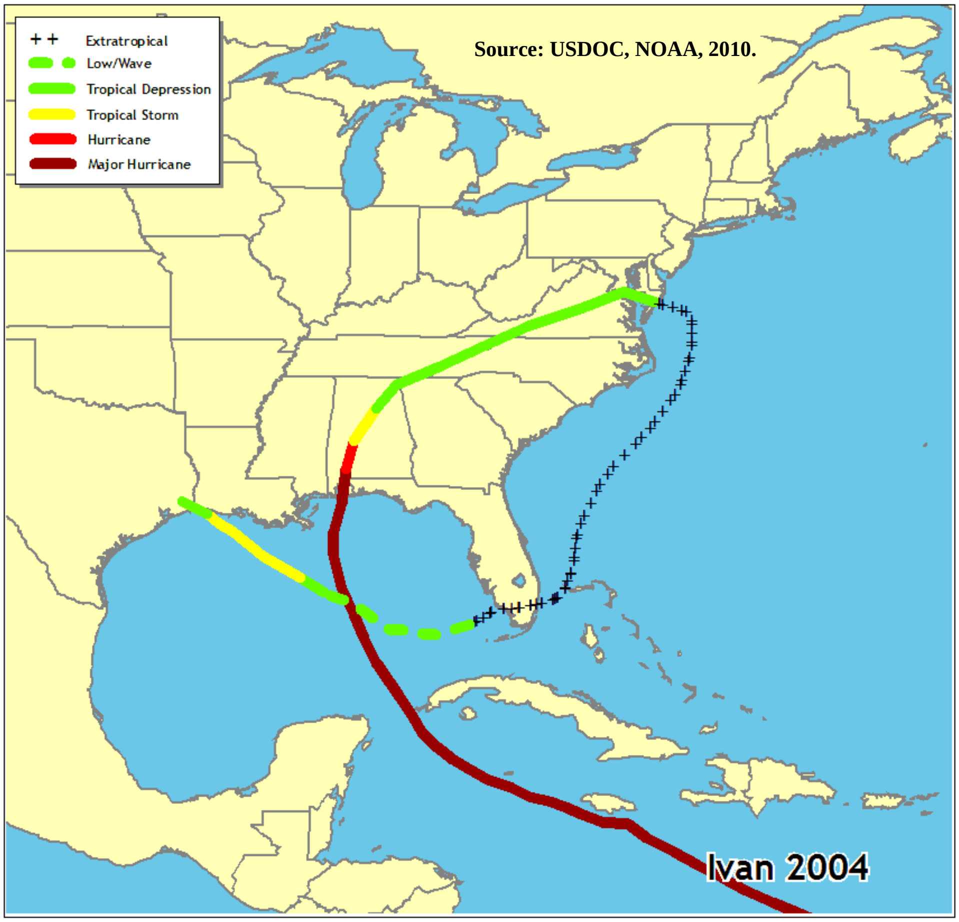

Figure 13. Path of Hurricane Ivan.

Ivan changed course approximately one day prior to landfall, taking a more northeasterly "hook" as the storm appeared to be approaching the Louisiana coast. This change of direction pulled the storm to a landfall just west of Gulf Shores, Alabama on September 16, 2004.

As Ivan approached the GOM producing areas, 575 platforms and 69 rigs were evacuated (USDOI, MMS, 2004a). Ivan's path swept across some of the Gulf's most highly productive deepwater projects located in Mississippi Canyon, Main Pass, Mobile Area, and Viosca Knoll (Gaudet, 2006). Some of the structures suffering significant damage from Ivan's path included the Petronius (compliant tower), Medusa (Spar) and the Ensco 64 drilling rig. An example of the damage sustained by the Ensco 64 is shown in Figure 14.

Source: Rigzone, 2010.

Figure 14. Ensco 64 drilling rig after Hurricane Ivan struck.[21]

[21]Ensco, "ENSCO Jackup Rig Suffers Damage from Hurricane Ivan." September 16, 2004. The Ensco 64 drilling rig after Hurricane Ivan. The rig was directly in the path of the storm. Notice that the right is missing its jack-up legs and its derrick is totally destroyed. The rig was found adrift 40 miles south of its last known location before the storm hit. The rig was insured for $65 million dollars and was declared a constructive total loss (Rigzone, 2004).

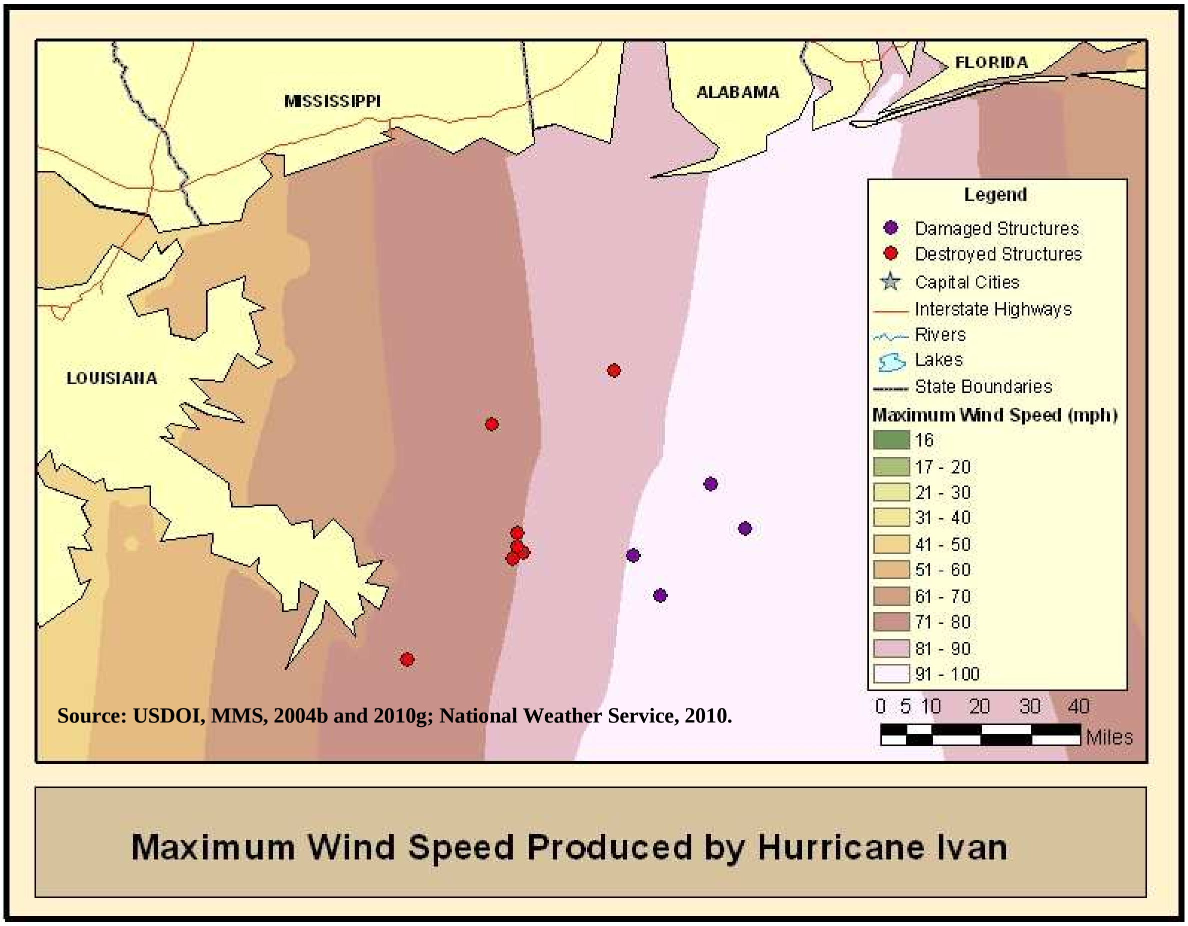

Figure 15. Hurricane Ivan maximum wind field and damaged/destroyed structures.

Figure 15 identifies Ivan's sustained wind speed across the relevant producing areas of the GOM. Ivan's sustained wind speed was between 120 and 130 miles per hour (mph) as it swept across the Central Planning Area (CPA) of the GOM (Stewart, 2005). The storm surge caused by Ivan was between 10 to 15 feet in the coastal areas between Mobile, Alabama and Destin, Florida (Stewart, 2005). Wave heights associated with Ivan were reported at 50 feet with a possible record observed wave height of 52.5 feet reported by the NOAA Buoy 42040 located in the north central Gulf of Mexico south of Alabama (Stewart, 2005). Seven platforms were destroyed and six damaged by Hurricane Ivan, most of which were located in the Main Pass area.

One of the more unique impacts associated with Ivan that had not been experienced with prior hurricanes was the considerable subsea mudslides resulting in some 53 damaged pipelines (USDOI, MMS, 2004b). Additional offshore pipeline damage created by Ivan included: 103 pipeline risers; 16 pipelines between the sizes of 16 inches and 36 inches; and 153 pipelines between the sizes of 2 inches and 14 inches (Gaudet, 2004).

Peak production outages created by Hurricane Ivan occurred on September 17, 2004, resulting in the shut-in of 82.9 percent of the GOM's daily oil production and 52.8 percent of region's daily natural gas production (USDOI, MMS, 2004a). By December 16, 2004, those shut-in percentages had decreased dramatically with BOEM reporting only 8.93 and 4.83 percent of oil and natural gas production, respectively, continued to be shut-in as a result of Ivan (USDOI, MMS, 2004c). The sustained, and long-term production shut-ins created by Ivan were a unique consequence of the storm, and one that would prove to be repeated with other major hurricanes. The daily trends in oil and natural gas production shut-ins created by Hurricane Ivan are provided in Figure 16.

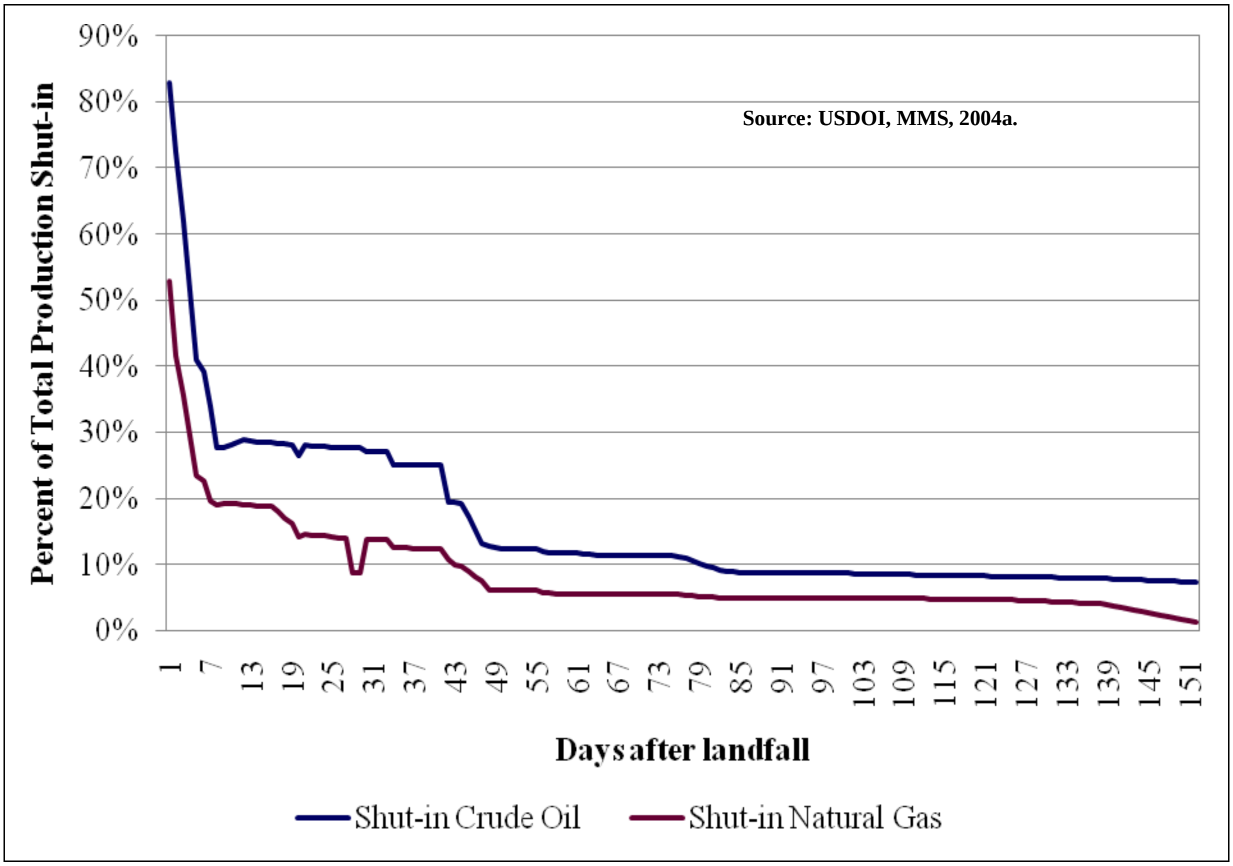

Figure 16. Hurricane Ivan, percent of crude oil and natural gas shut-in after peak shut-in.

Cumulative shut-in oil production associated with Hurricane Ivan was 43.84 MMbbls of oil, representing 7.2 percent of the yearly GOM production at that time (USDOI, MMS, 2005a). Ivan also created the cumulative shut-in of approximately 172 Bcf of natural gas, representing 3.87 percent of annual GOM natural gas production at that time.

4.2. Hurricane Katrina

Hurricane Katrina originated in the western Atlantic, north of Cuba on August 23, 2005 as a tropical depression. As seen in Figure 17, the storm took a track across the southernmost portion of the Florida peninsula on August 25, 2005 as a tropical storm.

Katrina then re-entered the GOM and was anticipated to hook into a northerly path and make landfall somewhere along the northeastern GOM between Pensacola, Florida and Apalachicola, Florida. However over the weekend, the storm took a slow west-southwesterly dip and after a few days of stalled forward movement, the storm's direction changed dramatically. Most households, businesses, and industries along the Central GOM went home on Friday (August 26, 2005), expecting little to no threat from Katrina's destructive force. This expectation changed dramatically by the end of the weekend.

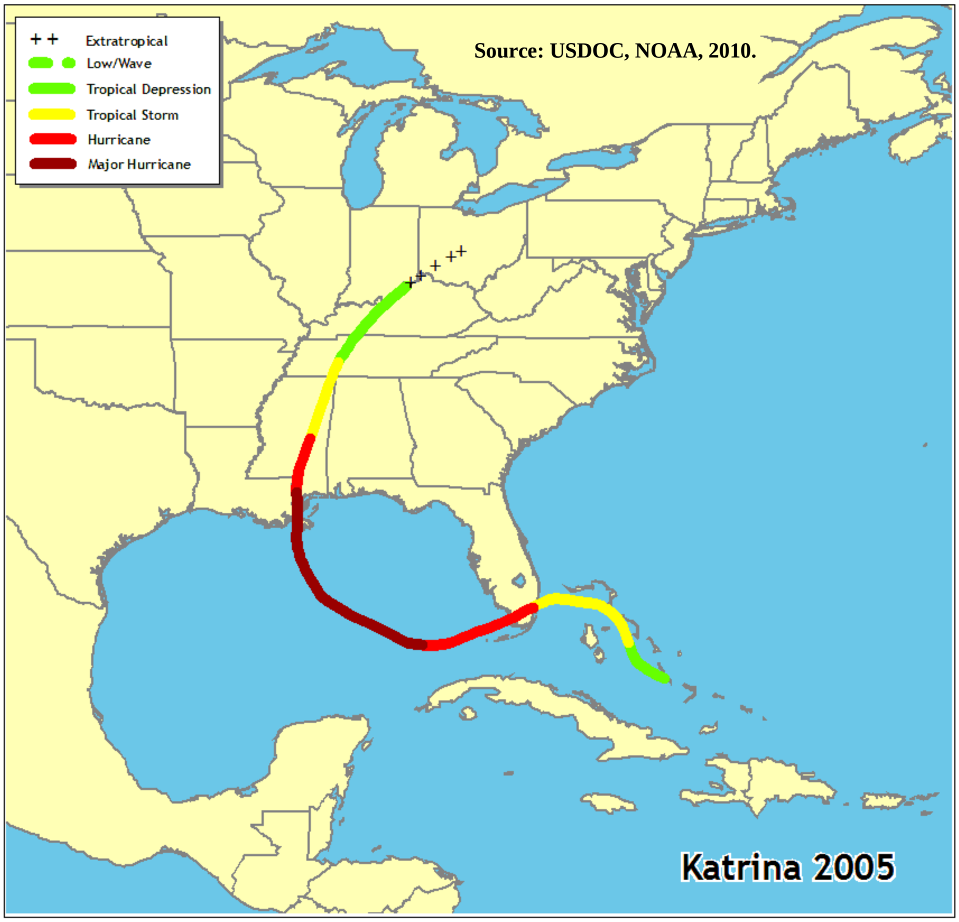

Figure 17. Path of Hurricane Katrina.

Throughout the weekend of August 27th and 28th, it became apparent to many along the GOM that Katrina was going to be a storm that would make landfall somewhere along the central Gulf Coast. A series of voluntary and mandatory evacuations began in earnest over the weekend including the evacuation of offshore oil and gas platforms and structures in the Gulf. Mandatory evacuation orders were put into place by most oil and gas companies and by Monday, August 29, 2005, 75 percent of manned platforms and 72 percent of rigs had been evacuated (USDOI, MMS, 2005b).

Hurricane Katrina took a sweeping path across the GOM and impacted a large number of production structures, including many still recovering from Hurricane Ivan's wrath from the prior year. Katrina gained considerable strength as it moved across the warm waters of the Gulf where water temperatures, at that time, exceeded 89 degrees (NASA, 2007). Katrina gained strength from these warm waters, resulting in wind speeds that, at one time, reached 162 mph on a sustained basis. Barometric pressures for Katrina were the lowest ever recorded at that time at 902 millibars (Knabb et al., 2005): a pressure level only to be exceeded by Hurricane Wilma occurring two months later (Pasch et al., 2006).

Katrina rapidly reached Category 5 status and remained at that level for a good portion of the time it crossed the GOM. Structures impacted by Katrina, and the wind speeds to which they were subjected, are provided in Figure 18. Katrina's wind speeds slowed somewhat prior to landfall, being reported as a Category 4 storm at that time of land fall. Later, post-storm evaluation of landfall wind speeds revised Katrina's landfall status to a strong Category 3 storm (Knabb et al., 2005).

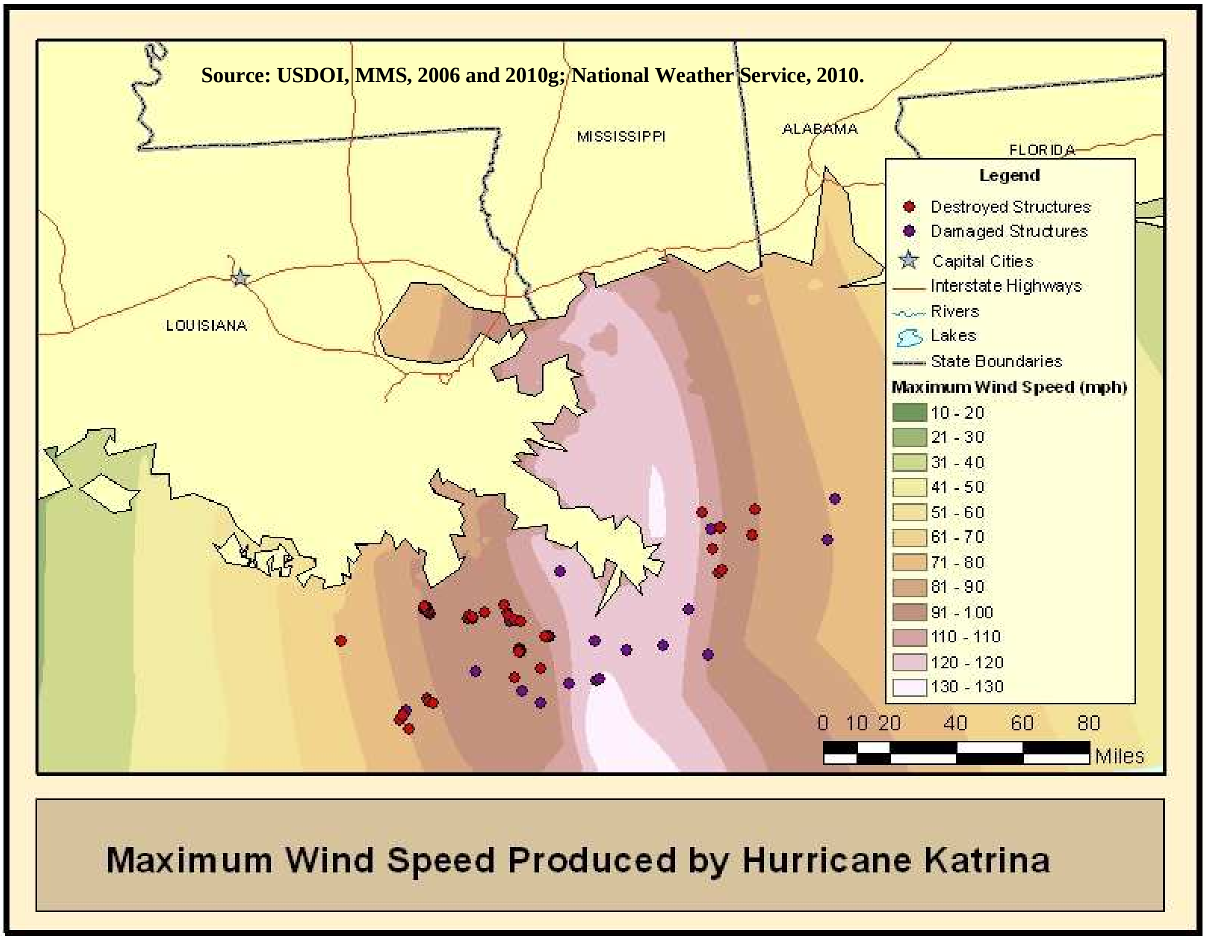

Figure 18. Hurricane Katrina maximum wind field and damaged/destroyed structures.

The storm surge created by Katrina was considerable and reported between 24 to 28 feet in the coastal areas between the Louisiana-Mississippi border and Pass Christian, Mississippi (Knapp et al., 2005). Wave heights associated with Katrina surpassed records set one year earlier with Hurricane Ivan, with many in excess of 55 feet (Stewart, 2005). An additional unique feature of Hurricane Katrina was the breadth of the storm. Hurricane force winds were reported to have spread some 28 to 34 miles to the west of the eye wall and up to 86 miles to the east of the eye wall (Knabb et al., 2005). Tropical force storm winds were reported as being felt an additional 230 miles away from the eye wall (Knabb et al., 2005).

Hurricane Katrina destroyed 46 platforms and 4 jack-up rigs and damaged another six jack-ups (Cruz and Krausmann, 2008). The most notable platform damaged by Katrina was the Mars TLP owned by Shell and BP. Most of the platforms damaged by Katrina were located in the Main Pass, West Delta, Grand Isle, and South Timbalier areas.

Pipeline destruction was also experienced during Katrina, but unlike Ivan, where pipelines were destroyed by underwater mudslides, pipeline damage created by Katrina was facilitated in large part by mooring lines and anchors being dragged across the sea floor as runaway jack-ups and semisubmersibles were tossed miles across the Gulf. Ocean Warwick, a jack-up rig owned by Diamond Offshore Drilling, was found 60 miles from its pre-storm position off the coast of Dauphin Island, Alabama (Figure 19). Katrina led to 61 reports of submerged pipeline damage, mostly due to drifting anchors and mooring lines (Cruz and Krausmann, 2008). The distribution of platforms destroyed by Hurricane Katrina was over relatively shallow water. Damage to platforms occurred over a larger distribution and stretched out to GOM deepwater (see Table 4).

Table 4

Number of Platforms Destroyed and Damaged by Hurricane Katrina

Water Depth	Number of Platforms Destroyed
less than 90 ft	16
90 to 180 ft	14
180 to 360 ft	14
Water Depth	**Number of Platforms Damaged**
less than 180 ft	16
180 to 360 ft	14
260 to 720 ft	14
720 to 3,000 ft	4

Source: Cruz and Krausmann, 2008.

Figure 19. Post-Katrina damage to the Ocean Warwick drilling rig.

Peak production outages associated with Katrina damage occurred on August 30, 2005, resulting in the shut-in of 95 percent of the GOM's daily oil production, and 88 percent of the region's daily natural gas production. Two weeks later, 57 percent of total GOM oil production and 37 percent of all natural gas production continued to be shut-in as a result of Katrina's damage (Figure 20). This differed considerably from the experience of Hurricane Ivan where 72 percent of all daily crude oil and 82 percent of all daily natural gas production were restored within two weeks of landfall. (USDOI, MMS, 2005b).

By December 1, 2005, BOEM reported that 36 and 29 percent of all daily GOM crude oil and natural gas production continued to be shut-in as a result of Katrina (and Rita), respectively. The sustained, and long-term production shut-ins created by Katrina and Rita (discussed later), created one of the most challenging natural gas market conditions ever experienced in the U.S.

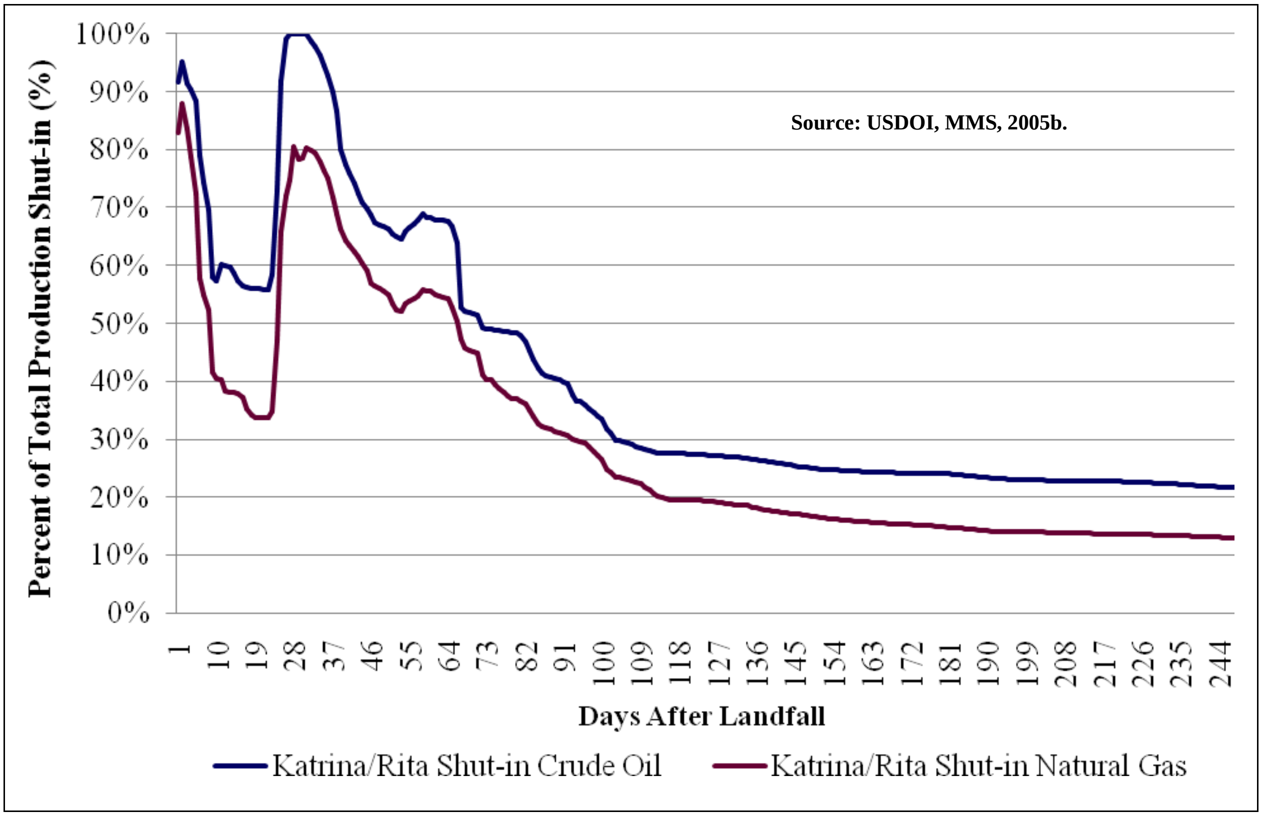

Figure 20. Hurricanes Katrina/Rita, daily percentage shut-in, crude oil and natural gas.

4.3. Hurricane Rita

The most unique and devastating aspect of the 2005 tropical season was the landfall of not one, but two major and destructive hurricanes in an area closely approximate to one another, and one that supports over one-quarter of the total U.S. energy production infrastructure and one-third of the total U.S. energy processing and transportation infrastructure. Within one month of Katrina's landfall, the GOM found itself bracing for the onslaught of another powerful storm, Hurricane Rita. As this occurred, the region was forced to suspend recovery and restoration activities, and rapidly prepare to defend itself against another catastrophic event.

Hurricane Rita formed in almost the same area of the Western Atlantic as Katrina. Rita started out as a slow moving tropical depression before rapidly strengthening into a tropical storm as it cleared the Florida Straits and entered the GOM. Like Katrina, Rita passed an area in the lower southeastern corner of the GOM that was marked by exceptionally high water temperatures. These warm waters supercharged Rita's strength, challenging virtually all of the hurricane development records set by Katrina one month earlier.

As seen in Figure 21, Hurricane Rita took a north-northwesterly track across the GOM. Unlike Katrina, which hooked northwesterly as it approached the coast, Rita maintained a broad, nearly westerly track. This enabled Rita to expose its winds and storm surge to a large amount of the GOM's offshore production infrastructure in both the BOEM Central Planning Area and the BOEM Western Planning Area.

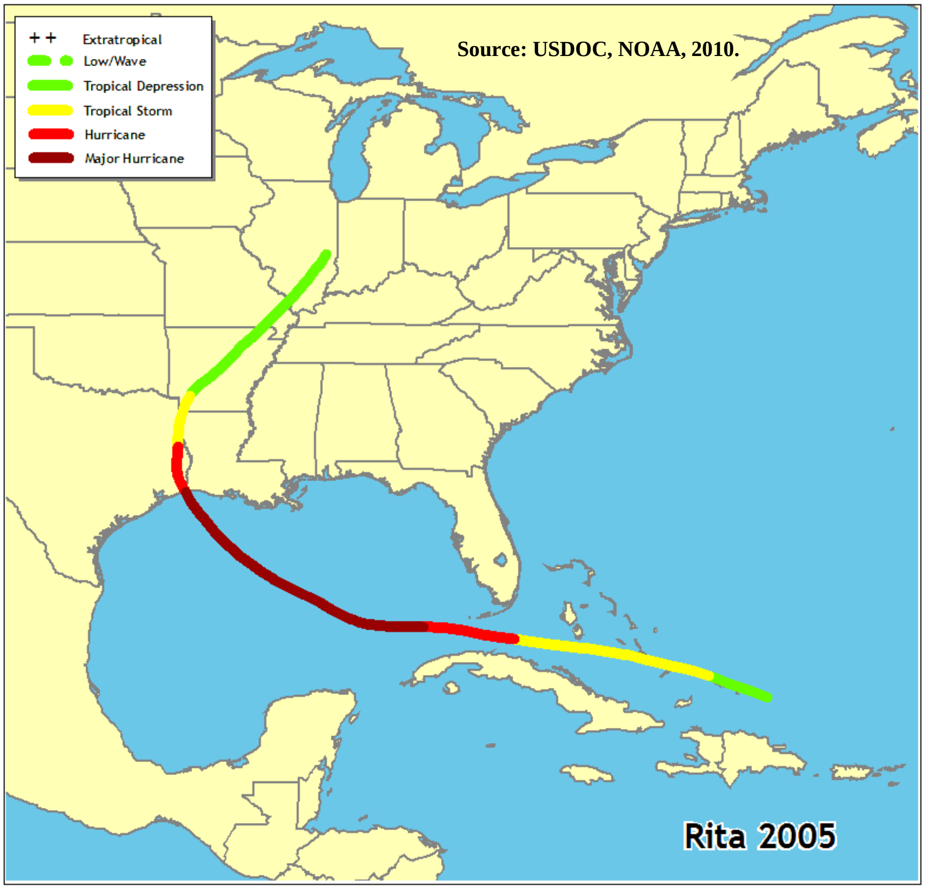

Figure 21. Path of Hurricane Rita.

The advance of Rita forced most GOM personnel to be evacuated from production structures on September 20, 2005, one day before the storm approached the central GOM. This was an untimely event since many crews were working at break-neck speeds to repair offshore structures and equipment damaged one month earlier by Katrina. By September 25, 81 percent of the offshore production personnel, as well as several thousand repair crews, were evacuated (USDOI, MMS, 2005c).

Rita gained considerable strength as it moved across the GOM, reaching Category 5 strength with sustained winds at one point topping 178 mph (Knabb et al., 2006). Rita reached a low barometric pressure of 895 millibars (Knabb et al., 2006). Figure 22 shows that, like Katrina, Rita had an exceptionally broad wind field stretching some 86 miles in either direction of the storm's eye.

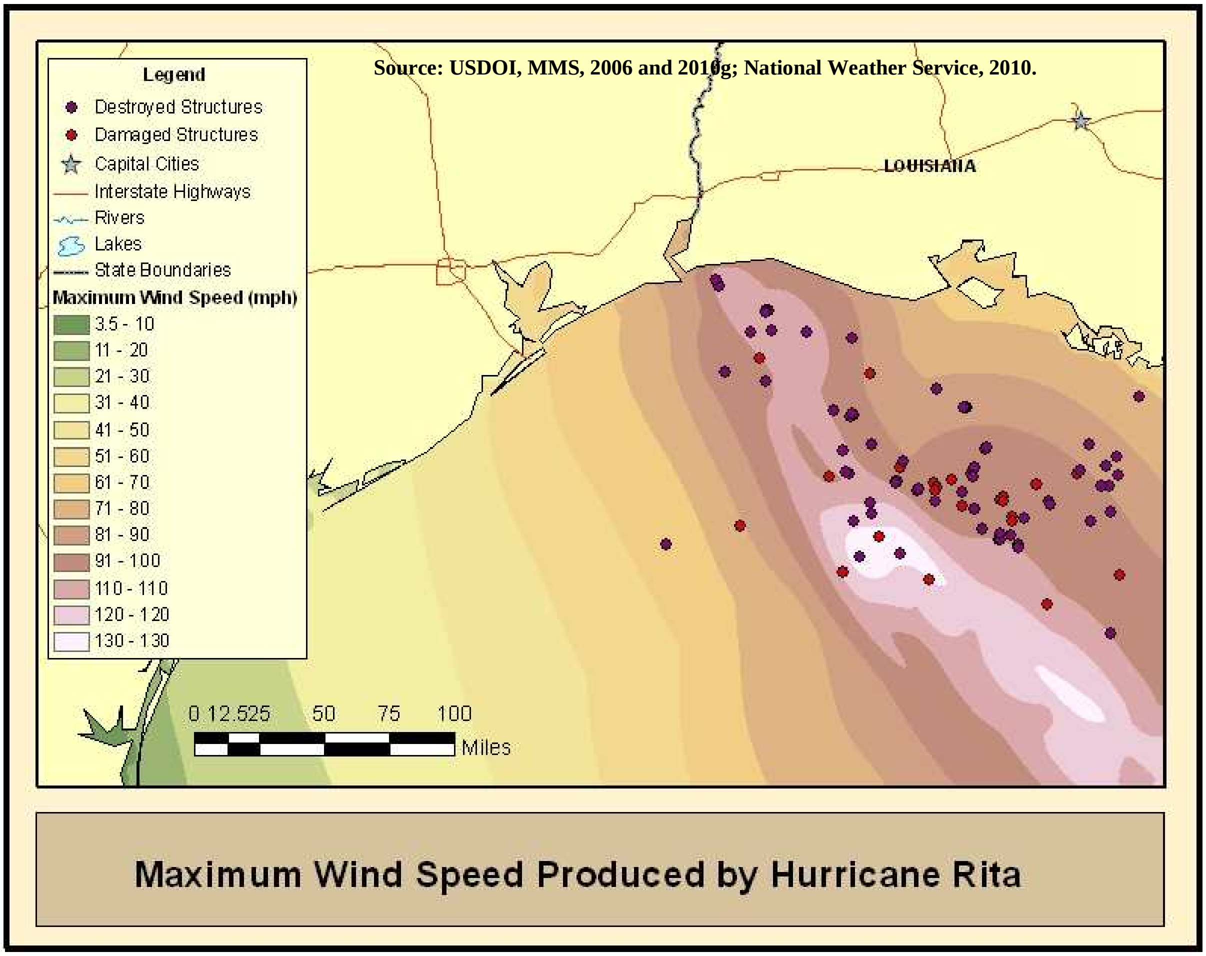

Figure 22. Hurricane Rita wind fields and damaged/destroyed structures.

Rita, like Katrina, created considerable wave heights and storm surge damaging both offshore structures (wave height) and onshore support bases (storm surge). Wave heights were reported as high as 38 feet offshore during Rita's trek across the GOM (Stockdon et al., 2007). Storm surge was also considerably high and impacted a more westerly area of the GOM than Katrina. Storm surge measurements were hampered by the failure of a large number of gauges. The estimated average storm surge where the storm came ashore on the Louisiana-Texas border was 10.4 feet (Stockdon et al., 2007).

Rita destroyed 69 and damaged 32 oil and gas platforms in the western central GOM (USDOI, MMS, 2006). The storm also caused damage to 31 submerged pipelines, with much of this damage being created by rigs and platforms dragging anchors across the seafloor and over pipelines (Det Norske Veritas, 2007). In total, 542 pipeline damage reports were filed as a result of Katrina and Rita (Det Norske Veritas, 2007). Pipeline risers accounted for 378 of the total 542 damage reports submitted to the BOEM, although BOEM does not technically count pipeline riser damage as pipeline damage (Det Norske Veritas, 2007).

Chevron Typhoon, a major GOM tension-leg platform, was found drifting 70 miles from its original mooring (Cruz and Krausmann, 2008). The platform's topsides were found floating upside down in the water separated from its mounting unit (see Figure 23).

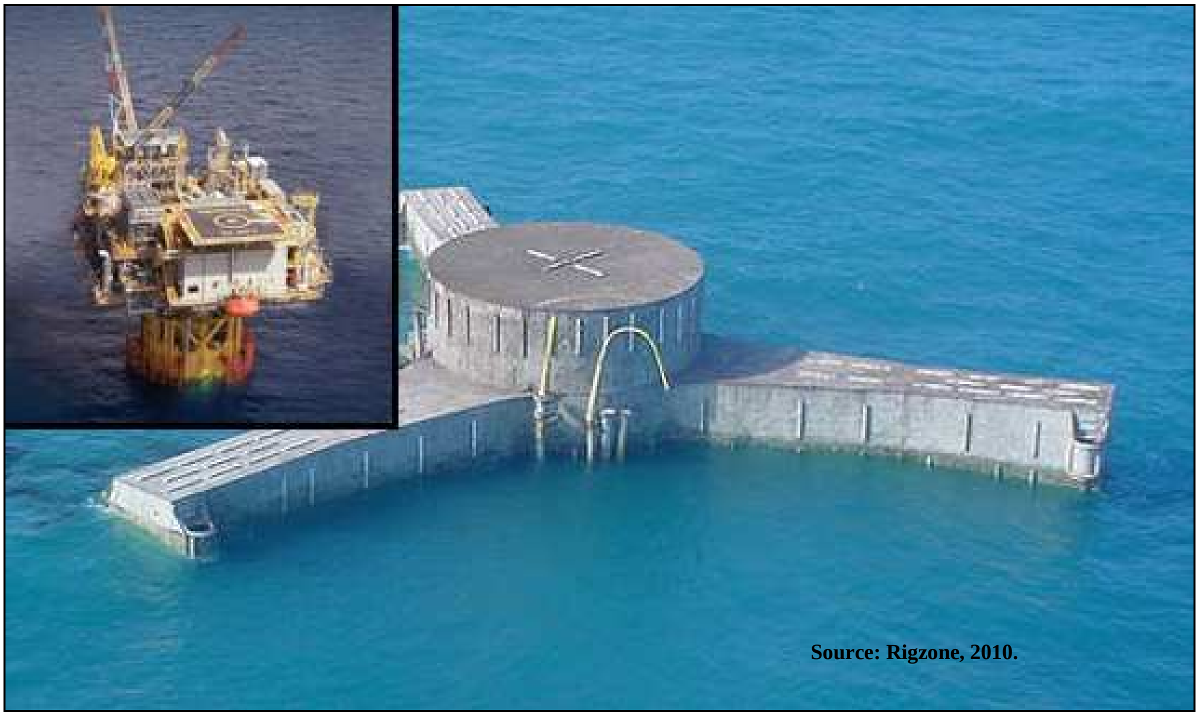

Figure 23. Chevron's Typhoon Mini-TLP after Hurricane Rita.

Table 5

Number of Platforms Destroyed and Damaged by Hurricane Rita

Water Depth	Number of Platforms Destroyed
less than 90 ft	30
90 to 180 ft	27
180 to 360 ft	11
greater than 360 ft	1
Water Depth	**Number of Platforms Damaged**
less than 90 ft	7
90 to 180 ft	18
180 to 360 ft	5
360 to 600 ft	2

Source: Cruz and Krausmann, 2008.

Hurricane Rita left a path of destroyed platforms mostly in shallow water (see Table 5). Many of the structures destroyed by Katrina and Rita were older fixed leg structures with 66 percent of destroyed structures older than 31 years, and 21 percent older than 40 years (Cruz and Krausmann, 2008).

Hurricane Rita created a peak production outage on September 25, 2005, resulting in the shut-in of 100 percent of the GOM's daily oil production and 80 percent of region's daily natural gas production. Amazingly, production shut-ins for both crude oil and natural gas production remained over 75 percent of total for 8 days: something never experienced with any prior GOM hurricane. One month after land fall, production shut-ins associated with Rita (and lingering effects of Katrina) were still well over 60 percent for crude oil and 50 percent for natural gas.

By December 1, 2005, BOEM reported that 36 percent and 29 percent of all daily natural gas production continued to be shut-in as a result of Rita and Katrina, respectively. The cumulative shut-in oil production associated with Katrina and Rita has been estimated at 166,312 MMbbls of oil, or some 30 percent of GOM annual production at that time (USDOI, MMS, 2006). Approximately 803 Bcf of natural gas production was also shut-in on a cumulative basis, representing 22 percent of annual GOM production (USDOI, MMS, 2006).

4.4. Hurricane Ike

The 2008 tropical season came close to providing a repeat of the 2005 season with two major GOM hurricanes making landfall within one month of one another. On August 25, 2008, Hurricane Gustav formed in the lower Caribbean and crossed the GOM prior to making landfall as a Category 2 storm near Grand Isle, Louisiana. Less than one week later, Hurricane Ike formed as a Cape Verde storm off the African coast and began its long trek across the Atlantic, Caribbean, and GOM waters before making landfall as a Category 2 storm at Galveston, Texas. While both storms were powerful at their peak, reaching Category 4 status with winds in excess of 145 mph, both storms tended to peak relatively early, and unloaded a considerable amount of their energy on Cuba before entering the GOM.

Of the two storms, Ike was the only one to attain "Big Four" status by insurers due to the relatively more significant damage created relative to Gustav. The larger degree of offshore damage created by Ike is attributable to the duration each of the two storms spent traveling across the GOM. Gustav, for instance, was a relatively fast-moving storm spending only two days (August 31 and September 1, 2008) crossing the GOM while Ike, spent four full days (September 10-13, 2008, inclusive). Ike also took a broad and more westerly track (like Hurricane Rita) exposing its winds, waves, and storm surge to a broader geographic area than Gustav (Figure 24).

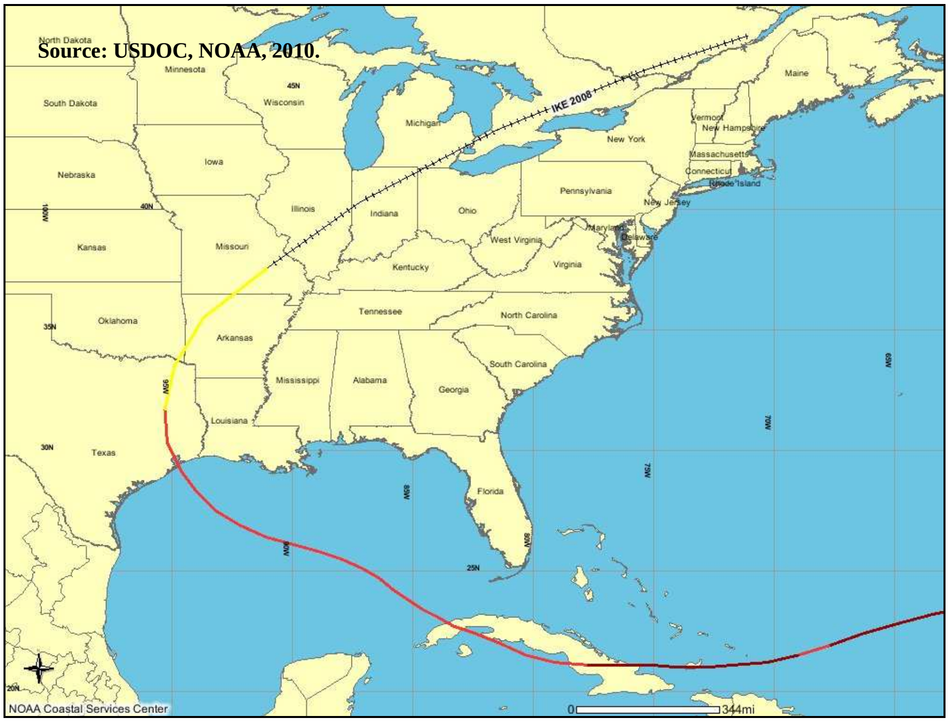

Figure 24. Hurricane Ike storm path.

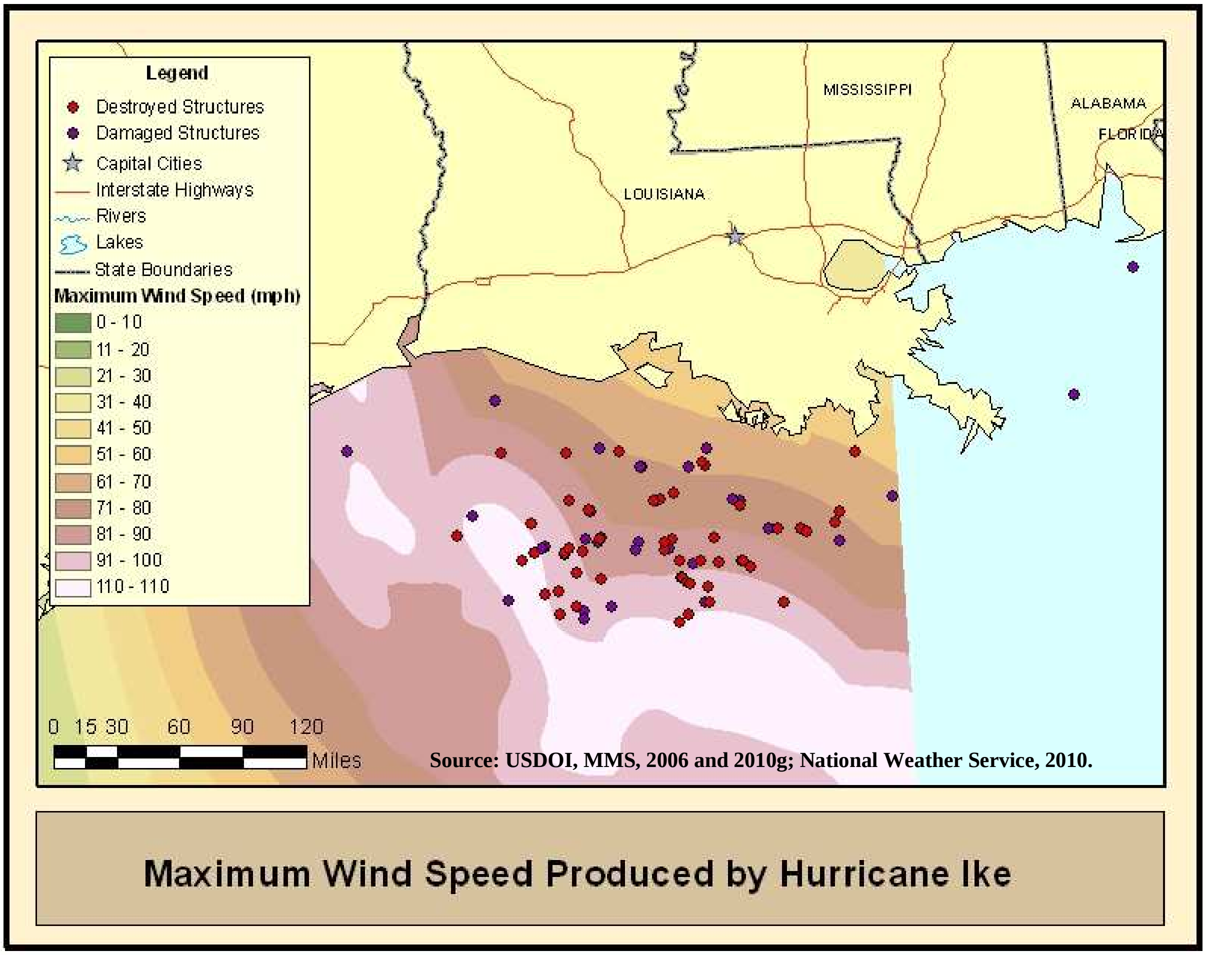

Figure 25. Hurricane Ike wind fields and major damaged/destroyed structures.

Hurricane Ike spent four days subjecting offshore GOM production structures to high winds and waves (Figure 25). Average wave heights during Ike's passing were recorded at 25 feet (Risk Management Solutions, 2008). Storm surge along the southwestern Louisiana coast were reported between 10 to 13 feet (Berg, 2009). Storm surges along the Texas coast, near Jefferson County, reached as high as 17 feet, while Galveston, the location of the storm's landfall, recorded a surge of 10 to 15 feet (Berg, 2009).

The BOEM reported that Ike destroyed 60 oil and gas platforms, exceeding the number of destroyed platforms from Hurricane Katrina. Interestingly, Table 6 shows that while Hurricane Rita resulted in a high damage rate relative to structure exposure, Ike did not, even though both storms took relatively similar westerly paths across the GOM.

Table 6

Comparison of Damage and Costs of Recent Major GOM Hurricanes

Hurricane	Year	Structures in Storm Path	Structures Destroyed or with Major Damage	Damage Rate (%)	Physical Damage (billion $)
Andrew	1992	700	87	12	0.9
Lili	2002	800	10	1	0.4
Ivan	2004	150	31	21	1.5
Katrina	2005	2,068	66	3	6.4
Rita	2005	793	101	13	3.7
Gustav	2008	677	6	1	n.a.
Ike	2008	1,450	54	4	3.9

Note: "n.a." is not available.
Source: USDOI, MMS, 2010g; National Weather Service, 2010; and Willis Group Holdings, 2010.

Hurricane Ike created a peak production outage on September 15, 2008, resulting in the shut-in of 99 percent of the GOM's daily oil production and 93.8 percent of region's daily natural gas production. Production shut-ins for both crude oil and natural gas production remained over 75 percent of total for four days, somewhat comparable to the experience from Katrina and Rita (Figure 26). These statistics, however, should be viewed with some caution since market conditions, which can significantly drive the speed of restoration activities, were considerably different in the early fall 2008 than they were in 2005.

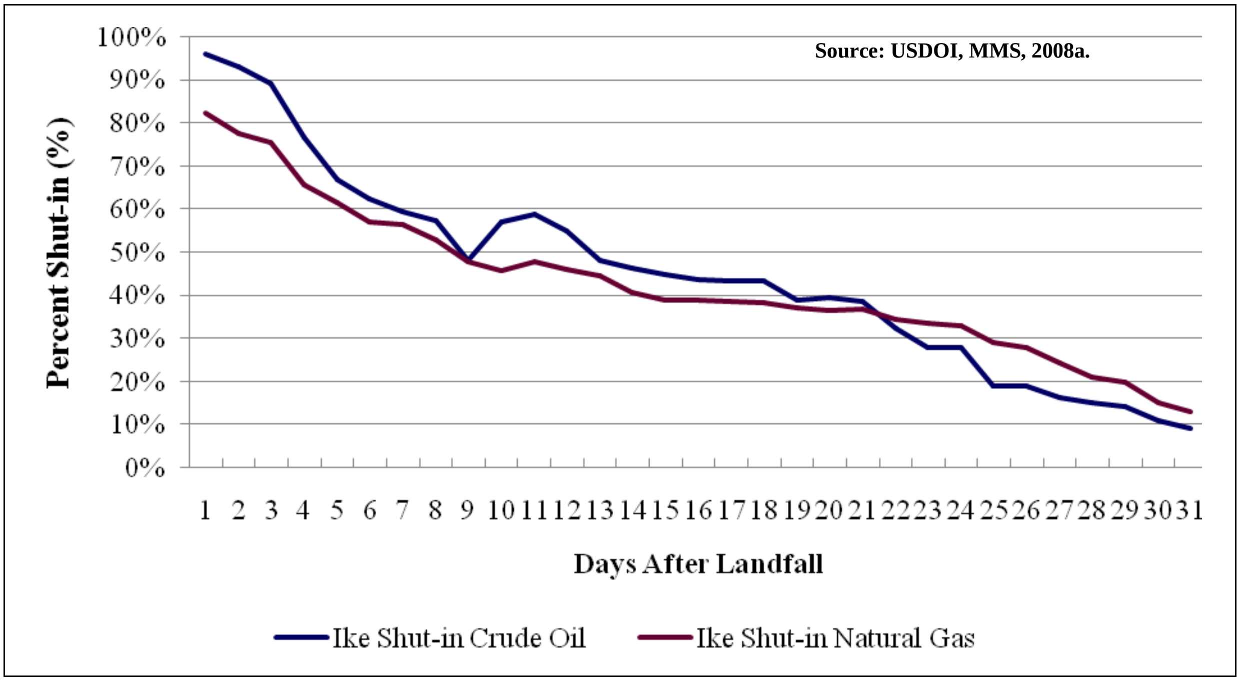

Figure 26. Hurricane Ike: shut-in percentages; crude oil and natural gas.

By the time Ike made landfall, the U.S. was entering one of the worst economic recessions since the Great Depression, significantly dampening energy demand during this period. On the supply side, new production arising from the prolific Barnett Shale area of Texas was providing considerable supply to a market that needed little natural gas. In fact, Hurricane Ike likely removed more natural gas demand from the market in the greater Houston area and southwestern Louisiana than it did displace supply resources.[22] This unique combination of factors started the process of declining natural gas prices that remained for the better part of 2009 and had considerable implications for how fast producers were inclined to commit investment dollars to rapidly restore energy production in an uncertain market.

By December 3, 2008, BOEM reported that 14 and 20 percent of all daily GOM crude oil and natural gas production continued to be shut-in as a result of Ike. Total cumulative oil and natural gas shut-in numbers were not published.

[22]The Louisiana and Texas Gulf Coast have some of the largest concentrations of industrial demand for natural gas usage in the world. Hurricane-related interruptions during this period, in combination with new supply sources of gas in the Barnett Shale, therefore, did not create market short-falls, and were likely to have contributed to excess net supply.

5. POST-HURRICANE OFFSHORE INSURANCE MARKETS

5.1. Private Insurance

5.1.1. General Market Reaction

The risks associated with tropical activity highlight an important difference between insurance coverage for the offshore oil and gas industry relative to other businesses and activities. An additional important difference in relative insurance coverage has been the dramatic and rapid change in assessing and pricing insurance associated with offshore risks since 2004. The commercial insurance industry, mutualization companies, and financial markets also modified the terms, conditions, and expectations of offshore coverage virtually every year, whereas in the past, these changes were much less common, and more discrete (Sharp, personal communication, 2010).

The Big Four hurricanes taught insurers a number of lessons, the most painful of which was that deductible levels were too low, coverage terms too broad, and premiums insufficient to cover the potential risk exposure a catastrophic storm could have in any given year (Marsh, 2009). Yet, despite these lessons, few insurance companies packed up their offices and left the Gulf and its offshore operators to their own devices. The offshore GOM insurance market is simply too large, and potentially too profitable for many companies to ignore (Marsh, 2009).

Figure 27 highlights the consequences of the post-2004 storm environment for many GOM insurers. Estimates place total claims at 4.25 times collected premiums during the course of the post-2004 market. Consensus among insurers is that going forward the market must be able to handle an “Ike-size” hurricane every year and still make a profit (Lloyd & Partners Limited, 2008; Granger, personal communication, 2009; Sharp, personal communication, 2010). In order to do this profitably, private insurance markets of all types are raising premiums, increasing deductibles, and requiring a considerable amount of asset-specific information in order to customize insurance to the potential risk of loss involved. The days of generic standardized coverage are long gone, and not likely to return in the future.

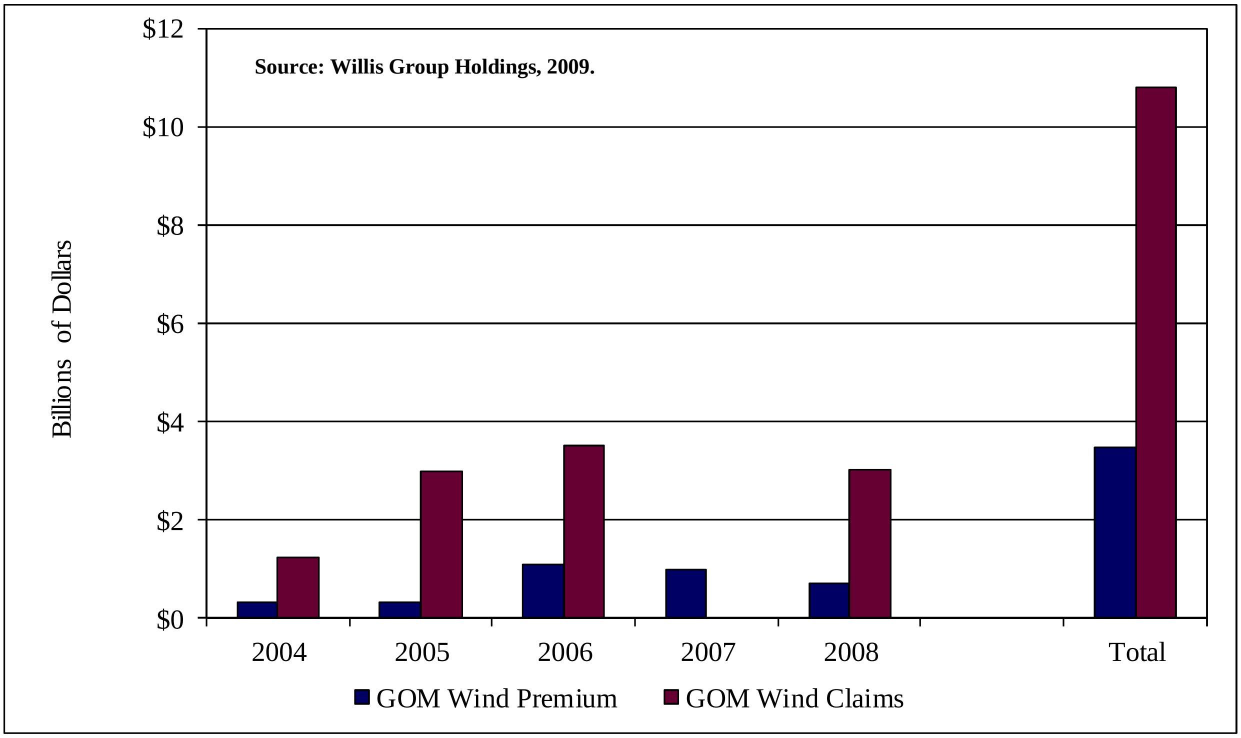

Figure 27. Energy insurance market GOM premium versus claim (estimates).

Table 7 characterizes the losses by type (Commercial Insurance, OIL-insured, and uninsured losses) for each of the Big Four hurricanes and also states the percentage of total share that each category bore. This table also states the Saffir-Simpson scale rating of each storm.

Table 7

Hurricane Loss Metrics[23]

($ Millions)	Ivan	Katrina	Rita	Ike
Saffir-Simpson	2	5	4	2
Platforms Destroyed	7	46	69	54
Platforms Damaged	24	20	32	95
Total Loss Incidents	57	147	124	107
Total Loss (Incl. not insured)	$1,859	$7,078	$5,557	$5,949
Infl-adjusted Total Loss ($ 2008)	$2,592	$9,362	$7,350	$5,949
Infl-adjusted Average Total Loss	$ 45	$ 64	$ 59	$ 56
Comm. Market Insured Losses	$1,250	$3,000	$3,500	$3,000
Share of Lossses Insured by Commercial Market	67%	42%	63%	50%
Total OIL Paid Claims	$ 560	$ 810	$ 800	$ 600
Share of Losses Insured by OIL	30%	11%	14%	10%
Estimated Losses borne by Industry	$ 49	$3,268	$1,257	$2,349
Share of Losses borne by Industry	3%	46%	23%	39%

Source: Gaudet, 2006; Det Norske Veritas, 2007; USDOI, MMS, 2008b; USDOC, NOAA, 2010; and Willis Group Holdings, 2010.

5.1.2. Offshore Insurance Cycles and Tropical Activity

The offshore insurance business in the GOM tends to move in cycles closely related to tropical activity. For instance, rates will tend to be relatively low for long periods of time when tropical activity is relatively limited. Interestingly, profit margins for private insurance companies during relatively calm periods can be challenged and lead to some participants exiting the offshore coverage market for more lucrative returns elsewhere. These calm and relatively low-profit periods are referred to as a "soft market" by those providing offshore coverage. Premiums and coverage terms in these soft markets turn decidedly in favor of offshore companies. For instance, offshore energy insurance premiums decreased between 20 to 30 percent in the 2008 renewal season after two years of relative tropical activity calm in the GOM (Gonzalez, 2008). While the 2008 renewal season cannot be considered a soft market by traditional terms, it is a clear example of how calm tropical periods affect the market.

[23]The number of platforms damaged and destroyed comes from BOEM-reported statistics. The number of total incidents and total losses, both number and dollar figure, come from the Willis Energy Loss Database. The dollar figures of associated commercial market losses come from the 2009 Willis Energy Market Review. OIL loss figures come from OIL's website. The estimated share of losses borne by industry is calculated as the difference between total losses, commercial market losses, and OIL losses.

The cycle can, however, move in the opposite direction during periods of busy tropical activity. These periods can be thought of as a “hard market” for insurance coverage where profitability increases, coverage terms become more stringent, premiums increase, and offshore operations find coverage expensive and limited. Market conditions during this period swing decidedly in favor of private insurance companies that can raise premiums and deductibles, provided overall energy markets are relatively strong and robust. These hard market periods can also be thought of as ones in which offshore operators will tend to absorb more risk associated with their actions than would be the case in a soft market.

For instance, the post-2004 market found many offshore operators in the positions of having to reduce their portfolios and coverage (Granger, personal communication, 2009). Although exclusions are likely under hard market conditions, there is some anecdotal information indicating that there were not as many exclusions to coverage as there were greater tendencies for greater information, and more specialized coverage/premium terms than in years past. As a result, more companies, primarily those with larger balance sheets, moved to greater levels of self-insurance to avoid costly coverage (Granger, personal communication, 2009).

5.1.3. Insurance Market Reaction: Hurricane Ivan

According to the Willis Energy Loss Database (WELD), Hurricane Ivan caused approximately $1.8 billion in energy asset damages. While large, the “soft” state of the market at the time cushioned the impact to rates, retentions, coverage, and capacity. Willis estimated the amount of available capacity for an upstream offshore single site risk to be around $1.1 billion from Lloyd’s insurers and about $1.2 billion for other insurance companies during this time period (Willis Group Holdings, 2005). Lloyd’s and Willis estimated the highest available economically viable capacity at $2.3 billion (Willis Group Holdings, 2005). Ivan-created losses resulted in premium increases of between 10 to 100 percent depending on each company’s loss history and required level of coverage. By comparison, insurance rates for non-GOM energy assets during this period were estimated to be flat to decreasing by as much as 10 percent from the prior year (Willis Group Holdings, 2005).

5.1.4. Insurance Market Reaction: Katrina and Rita

The 2005 tropical season, that included offshore destruction from two major hurricanes, proved to be the market defining event for the offshore insurance industry. Willis estimated total GOM energy losses at $7.08 billion and $5.56 billion for Katrina and Rita, respectively. Both numbers are still not finalized, and are likely to continue to rise as claims continue to be settled as late as 2010. The 2006 Willis EMR described the market reaction as one resulting in “massive rate increases, incomplete reinsurance programs, general confusion and a (perhaps understandable) lack of underwriting consistency, as different underwriters develop their own solutions to trading in a new environment” (Willis Group Holdings, 2006). Willis also expressed the concern that, “there is doubt in some quarters as to whether upstream energy underwriting can ever again be profitable” (Willis Group Holdings, 2006). Some insurance suppliers discussed abandoning the GOM market to focus on international business (Sharp, personal communication, 2010).

5.1.4.1. Business Interruption

BI insurance claims constituted a significant portion of total claims for all Big Four hurricanes, but were especially significant after Hurricanes Ivan, Katrina and Rita. Available statistics indicate that offshore BI losses accounted for 15 and 21 percent of total claimed losses for Katrina and Rita, respectively. Pipeline damage caused by mudslides during Hurricanes Ivan and Katrina are thought to have created especially significant CBI insurance claims although the exact statistics are not publicly available. These CBI losses were especially challenging for many underwriters who failed to impose the down claim sub-limits that were common on the downstream portion of the industry during a similar time period (Willis Group Holdings, 2006). Since that time, offshore CBI underwriters now require defined sub-limits. In addition, CBI underwriters require significantly more information about physical infrastructure constraints potentially impacting contingencies in order to qualify for CBI coverage approval. This information includes, but is not limited to, a detailed schedule of all pipeline connections and downstream transportation choke points upstream from an insured structure and its associated production wells (Sharp, personal communication, 2010).

The GOM was relatively quiet in the post-2005 tropical season period. This led to small reductions in premiums although technical factors defining insurance underwriting, such as retention levels and the level of coverage continued to change as a result of the earlier catastrophic hurricane seasons. The Lloyd and Partner's Energy & Marine Insurance Newsletter, a leading industry publication, reported that, "despite calls from senior management of insurers (and from the Lloyd's Franchise Directorate) to "kill-off" the insurance market cycle through disciplined underwriting, signs are that the cycle is in full health and speeding down the other side of the peak [in rates] almost as quickly as it climbed it following the rocket it was given by 2005 losses (Lloyd & Partners Limited, 2008)."

5.1.5. Insurance Market Reaction: Hurricane Ike

The 2008 tropical season created a near repeat of the two-storm experiences of 2005, although the 2008 levels of destruction, and overall level of claims were considerably lower than the Katrina-Rita events. Hurricane Ike resulted in an estimated $5.95 billion in energy industry losses (not all offshore). Adjusted for inflation, Ike caused about 64 percent and 81 percent of the total dollar losses created by Katrina and Rita, respectively (Willis Group Holdings, 2009). In the 2009 annual Lillehammer Claims Conference, an important annual conference for energy insurance underwriters, Dominick Hoare, head of the Watkins Syndicate[24] noted that, after Ike, 2009 was likely to be the "last chance saloon" for the industry to learn how to make a profit in the face of a large tropical storm like Hurricane Ike (Hoare, 2009). The industry consensus is that premiums, coverage structure, and deductibles will have to be fashioned in such a manner to defend against a possible Ike every year for the foreseeable future.

5.1.6. Insurance Industry Reaction: Aggregate Limits

Prior to the 2004 tropical season, aggregate limits, while not uncommon, were not widely utilized. After 2004, and particularly after 2005, underwriters and reinsurers decided the

[24]Watkins Syndicate is the largest Lloyd's of London energy risk underwriter by insured asset value.

uncertainty with open ended policies, and disputable asset values under dramatically changing market conditions, was simply too risky, particularly under current premium levels and structures. When Hurricanes Katrina and Rita struck, some offshore insurance providers, especially reinsurers, lacked proper assessments (i.e., information) regarding their total exposure.

Insurers (direct and reinsurance) have reacted by a series of new aggregate limits as well as the imposition of retrocessional coverage which is simply a contract between reinsurers to mutually cover or "back up" each others' exposure under certain conditions. This has the effect of shoring up stability and increasing the reliability of capacity over the short- and long-run by diversifying risk across a number of different parties, particularly in the reinsurance market (Willis Group Holdings, 2008; Sharp, personal communication, 2010). Retrocessional coverage, along with aggregate limits, has helped insert stability back into the direct market and especially the reinsurance market. The net result is greater capacity, greater stability, and lower premiums.

5.1.7. Insurance Industry Reaction: Lloyd's Realistic Disaster Scenario

One important realization reached by all types of insurance providers post-2004 has been that no company can have too much information about the operators or the assets it is insuring. An additional realization reached in the period immediately following the 2004 storm season was how little information the insurance industry had about its clients' business activities, assets, and interrelationships with other assets. Insurers' bottom lines depend on a better understanding of how hurricanes can be predicted and, if possible, maintaining a constant awareness of their exposure to such storms through analyses, research, and empirical/financial/risk simulation and modeling.

These are the reasons that led to the annual Lloyd's Realistic Disaster Scenarios (RDS) exercise being created by London insurers. Each year, Lloyd's develops a set of hypothetical scenarios it "unleashes" on syndicate insurers who report back exposures. A simulated GOM hurricane is always part of the exercise, and is labeled a "compulsory event scenario" for all underwriters. The results are shared with the Lloyd's Franchise Board who, depending upon the results, can force a syndicate to take actions to conform to a previously submitted business plan. If the Board believes any one syndicate's reactions and coverages are entirely out of line, it can, under a more extreme situation, censure the offending syndicate raising significant reputation challenges and embarrassment to that syndicate's chief underwriter. Since each Lloyd's member insures the whole, the Board's annual RDS exercise is seen as an important self-enforcing component of keeping Lloyd's a functioning and successful insurance marketplace. An example of this analysis/simulation, based upon the 2009 GOM hurricane and windstorm scenario, is pictured in Figure 28.

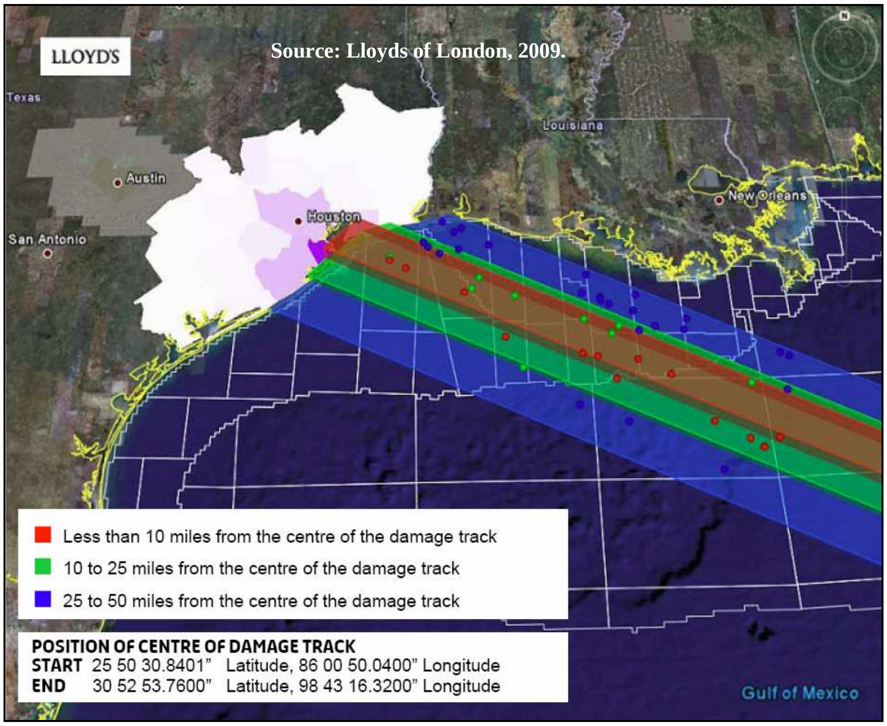

Figure 28. Lloyd's of London 2009 Realistic Disaster Scenario.[25]

5.1.8. Insurance Industry Reaction: Hurricane Forecasting

Hurricane modeling and prediction (i.e., forecasting) has become an important aspect of the GOM offshore energy insurance industry. Third-party companies such as Risk Management Solutions Applied Insurance Research and Eqecat actively model hurricane activity for insurance clients. Investment banks investing in contingent capital and cat bonds tend to rely heavily on these private meteorological modeling services provided by a number of companies.

5.1.9. Insurance Industry Reaction: Market Recovery

High premiums and tight market conditions often create the makings of their own demise since they result in higher profitability, enticing new market participants and expanded competition. For instance, Berkshire Hathaway expanded its energy insurance position in February 2010 by covering 10 percent of Marsh Inc.'s London energy portfolio (Bradford, 2010). Willis EMR, for instance, noted in 2003 that:

> the energy insurance business has been very profitable for carriers over the last 12 to 18 months. As a consequence, competition has started to increase. Onshore property premiums have been drifting downward, and offshore property rates appear to have peaked.[26]

[25] Assumed destruction: $5.5 billion offshore energy (insured by Lloyd's of London syndicates).
[26] This is due to rising rates after the 9/11/2001 terrorist attack on the World Trade Center in New York City. After the attack rates rose and corresponded with three relatively low loss years.

Willis, a leading insurance broker, keeps track of energy asset losses in its Willis Energy Loss Database (WELD). The database records all losses not specific to claims from insurance companies. The trends in offshore damages, as well as offshore premiums, are provided in Figure 29.

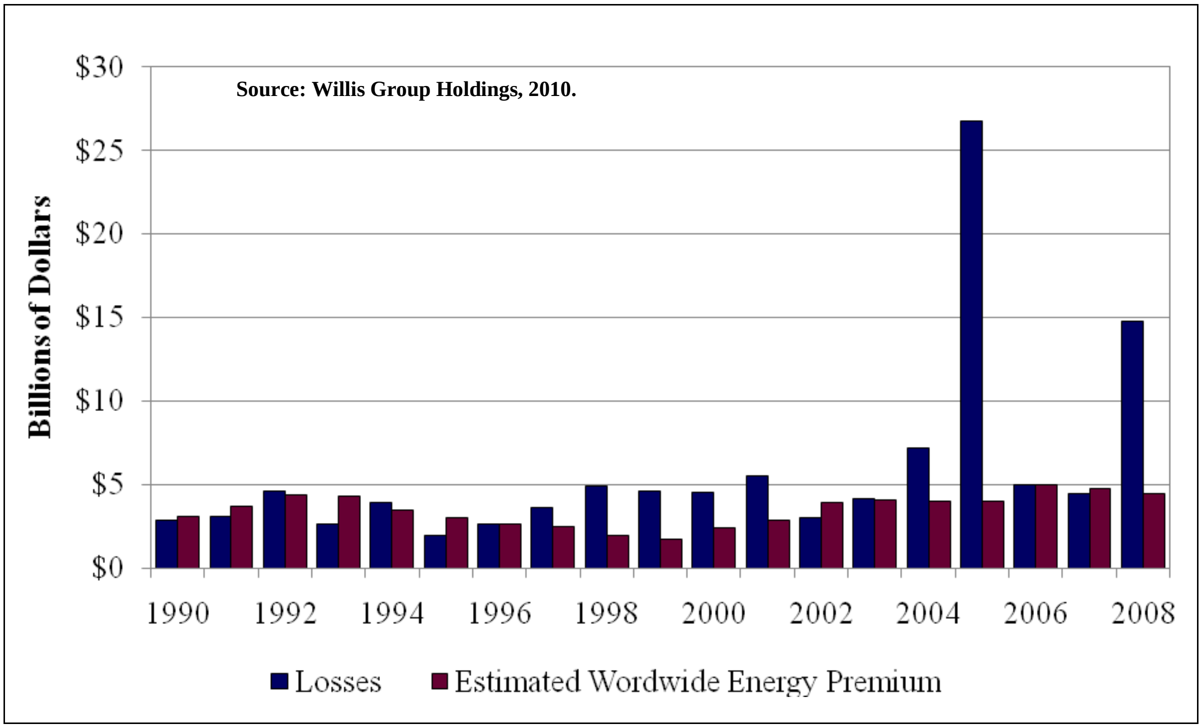

Figure 29. World energy total losses vs. estimated world energy premium.[27]

5.2. Mutualization Impacts and OIL

OIL, the leading energy industry mutual insurer, suffered many of the same insuring and claims challenges as other private insurance companies in the aftermath of the 2004 and 2005 tropical seasons. Hurricane Ivan, for instance, represented one of the first significant claims made on OIL's financial reserves. Table 8 provides the estimated claims made against OIL's reserves by its member companies for the last four major hurricanes. The total estimated losses by OIL members for the Big Four hurricanes were reported to be $5.47 billion in 2008 inflation-adjusted dollars. However, due to aggregate limits imposed per OIL's bylaws, the amount actually paid out was somewhere in the order of $2.77 billion in 2008 inflation-adjusted dollars.

[27]Includes uninsured losses.

Table 8

OIL Estimated Hurricane Claims

Hurricane	Total Losses (billion $)	OIL Scaling Factor	Total OIL Paid Claims (billion $)
Ivan	$ 0.79	0.71	$ 0.56
Katrina	$ 2.02	0.40	$ 0.81
Rita	$ 1.46	0.55	$ 0.80
Ike	$ 1.20	0.50	$ 0.60
Total	**$ 5.47**		**$ 2.77**

Source: OIL, 2010c.

Loss coverage on claims made for each of the Big Four GOM hurricanes was limited in order to proportion pay-outs among several members making claims. For instance, pay-outs for Hurricane Ivan-related claims were capped, on average, to 71 percent of total filed claims. Payouts for the other three storms were capped at lower amounts ranging from 40 percent (Katrina) to 55 percent (Rita). OIL imposes aggregate limits to ensure continuity and viability of its mutualization model. The scaling factor is basically used to ensure proportional payout until members can efficiently and correctly be paid for the whole aggregate limit (OIL, 2010c).

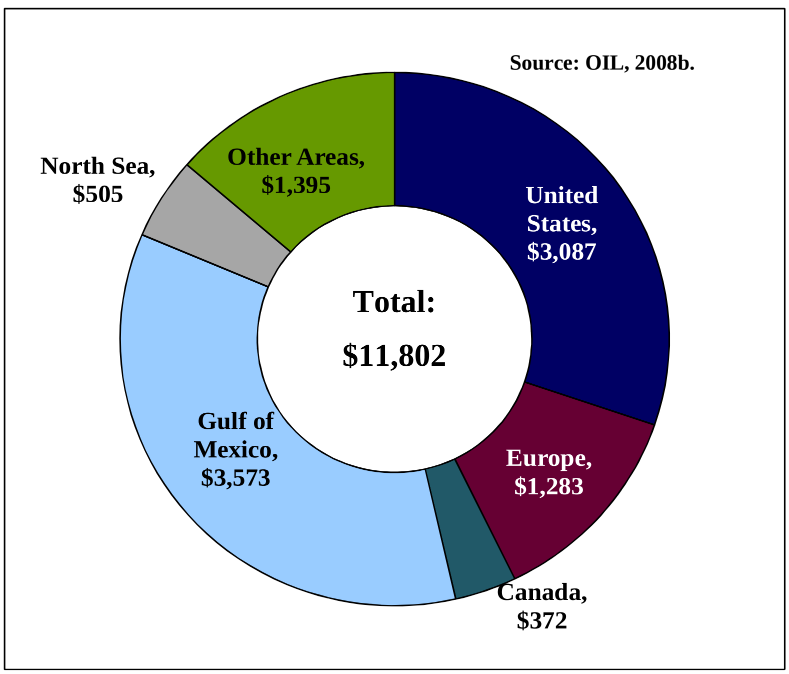

Figure 30. OIL's cumulative reported net incurred losses by geographic region (1972 to 2008, million $).

Figure 30 provides a chart examining OIL's reported net incurred losses by geographic region on a cumulative basis for the period of 1972 to 2008. The cumulative losses reported for the GOM region are considerable. Out of the $11 billion in total incurred losses over the past 26 years, some $3.6 billion (32 percent) were in the GOM region alone. An estimate of the hurricane and non-hurricane related losses can be developed by subtracting the $2.77 billion (25 percent) in Big Four-related claims provided in Table 8 from the cumulative claims identified in Figure 31.

An estimate of the annual incremental losses per region can also be estimated by examining the changes in OIL's cumulative reports on a year-by-year basis. Figure 31 examines these estimated losses by OIL members by region, over time, and shows the considerable spike created by the post-2004 tropical activity along the GOM.

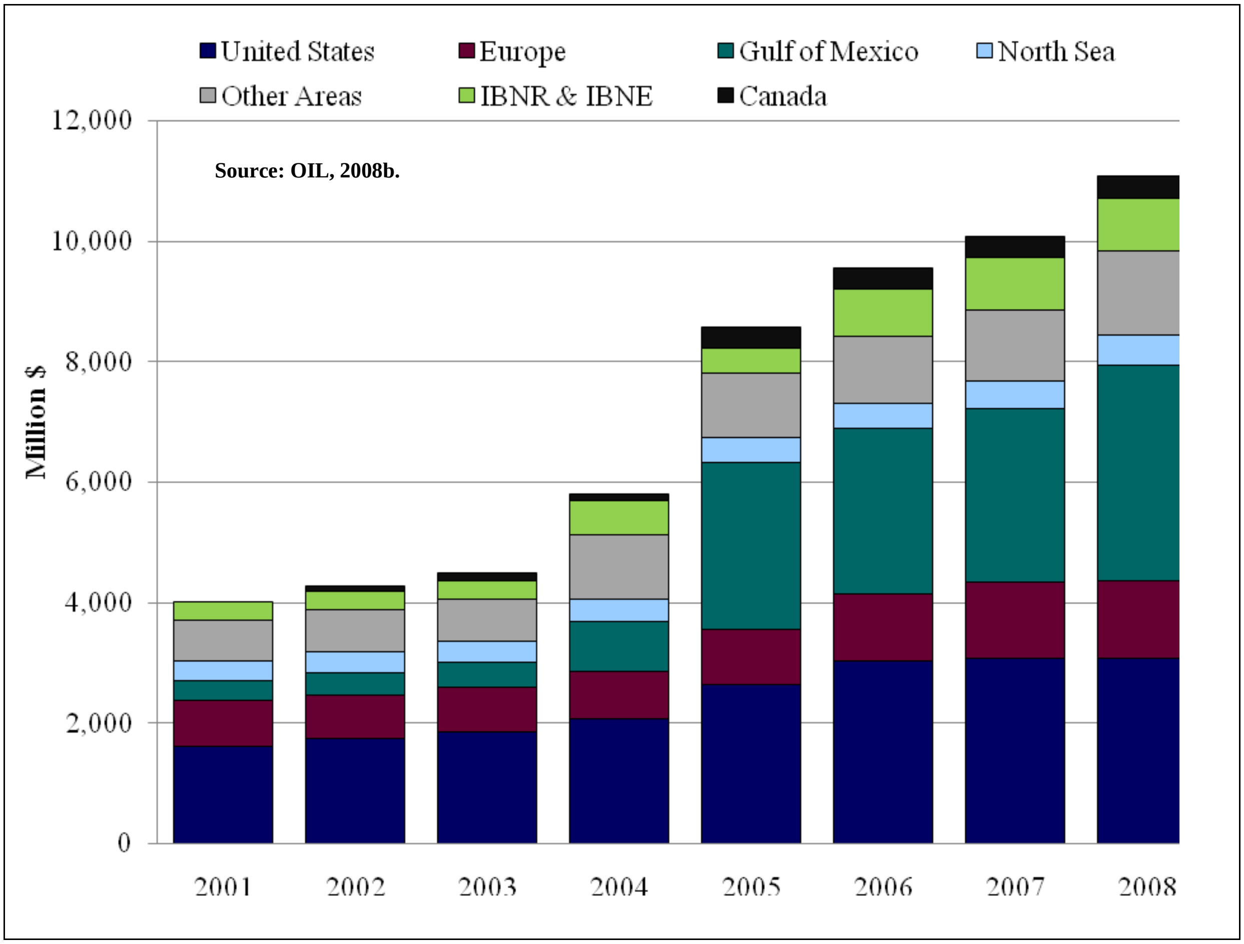

Figure 31. OIL cumulative net incurred losses by geographic region (1972 to 2008).[28]

Figure 32 presents OIL's estimated cumulative net incurred losses on an industry sector basis for the period 1972 to 2008. Offshore E&P activities account for $4.8 billion in cumulative losses from 1972 to 2008, or some 40 percent of OIL's $11.1 billion in cumulative losses. Refining and marketing losses account for the second largest cumulative sectional losses at $2.8 billion. Prior

[28]INBR stands for 'incurred but not reported' and INBE stands for 'incurred but not expensed'.

to the hurricanes, E&P reported losses were below those reported in the refining and marketing sectors on several occasions.

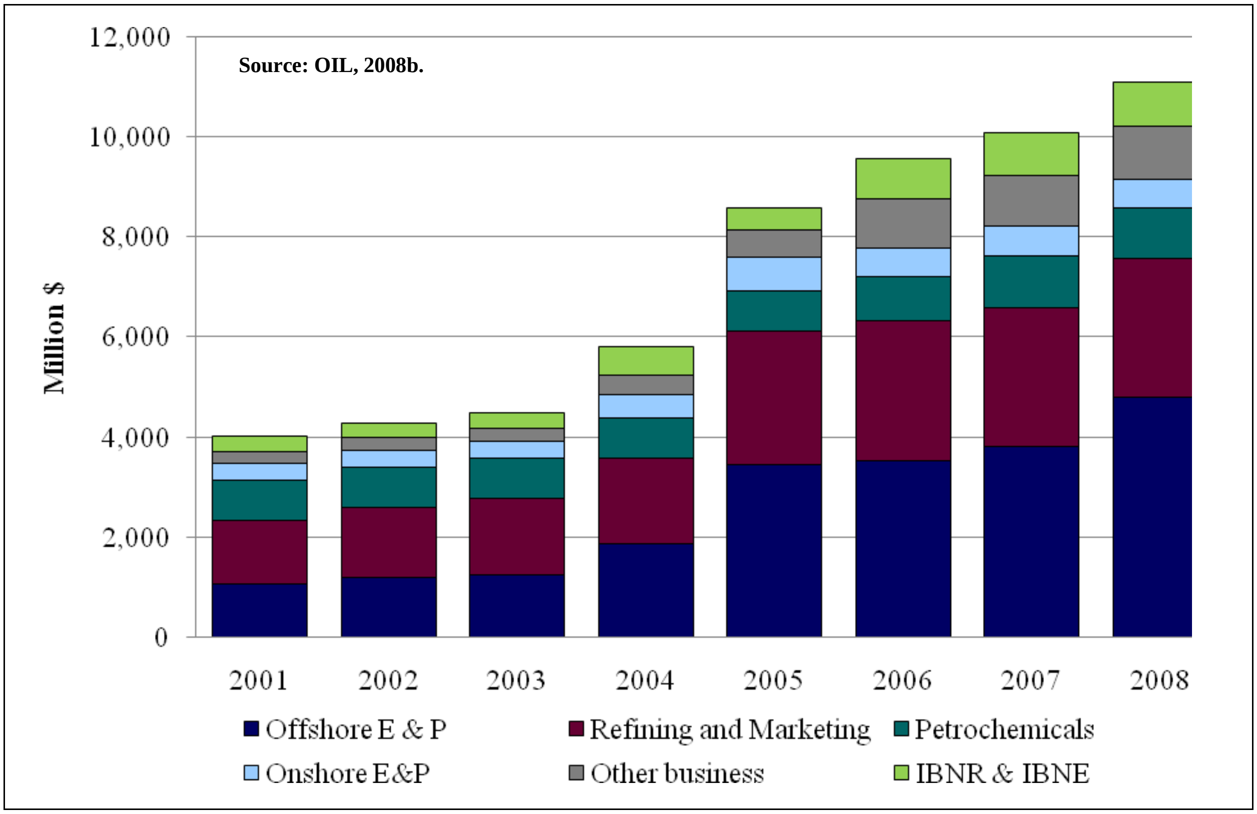

Figure 32. OIL cumulative reported net incurred losses by sector.

An estimate of the annual (incremental) losses by sector can also be derived by examining the annual differences in OIL's cumulative reported net losses. Figure 33 provides those estimates and highlights the fact that prior to 2004, offshore losses were actually smaller than claims made in the refining and marketing sector.

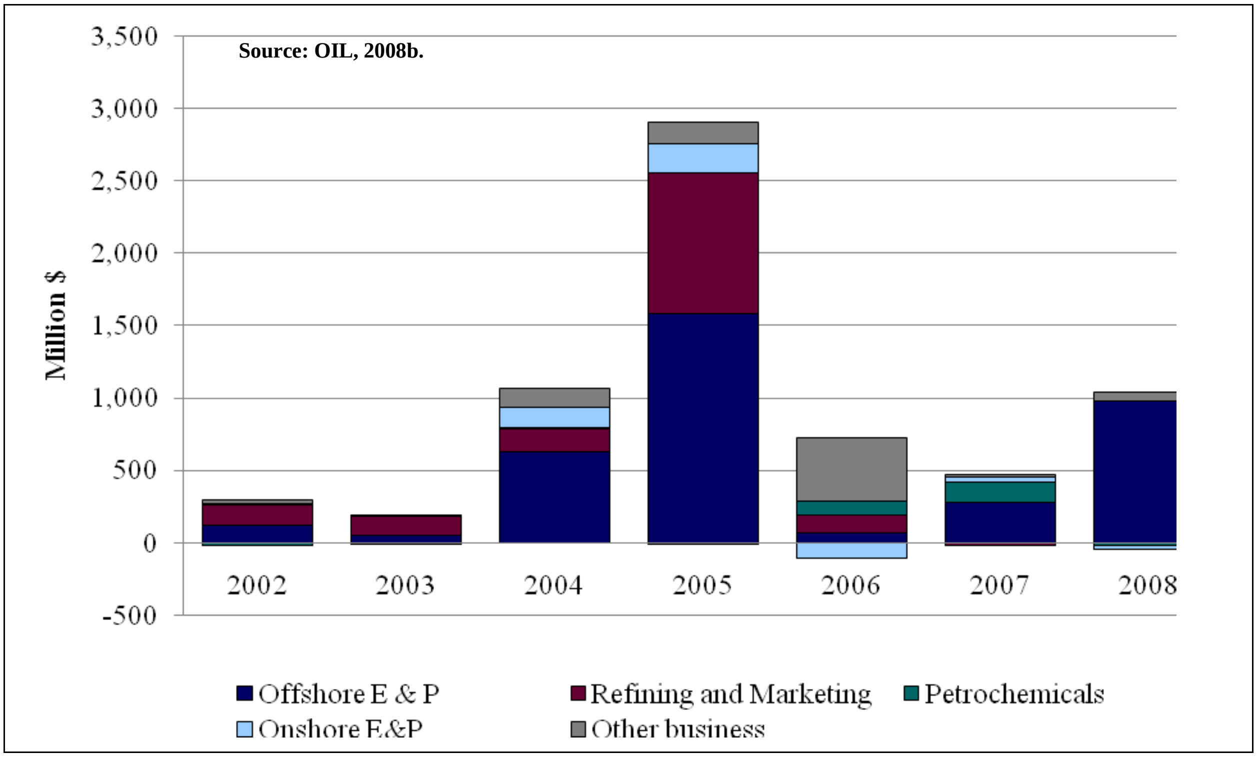

Figure 33. Estimated OIL incremental reported net incurred losses by sector.

OIL's balance sheet has seen a number of changes over the past decade in reaction to changes created by the post-2004 tropical activity along the GOM. Figure 34 presents a summary graph of some of the main components of OIL's balance sheet over the past decade including total assets, loans payable, outstanding losses, and shareholder equity.

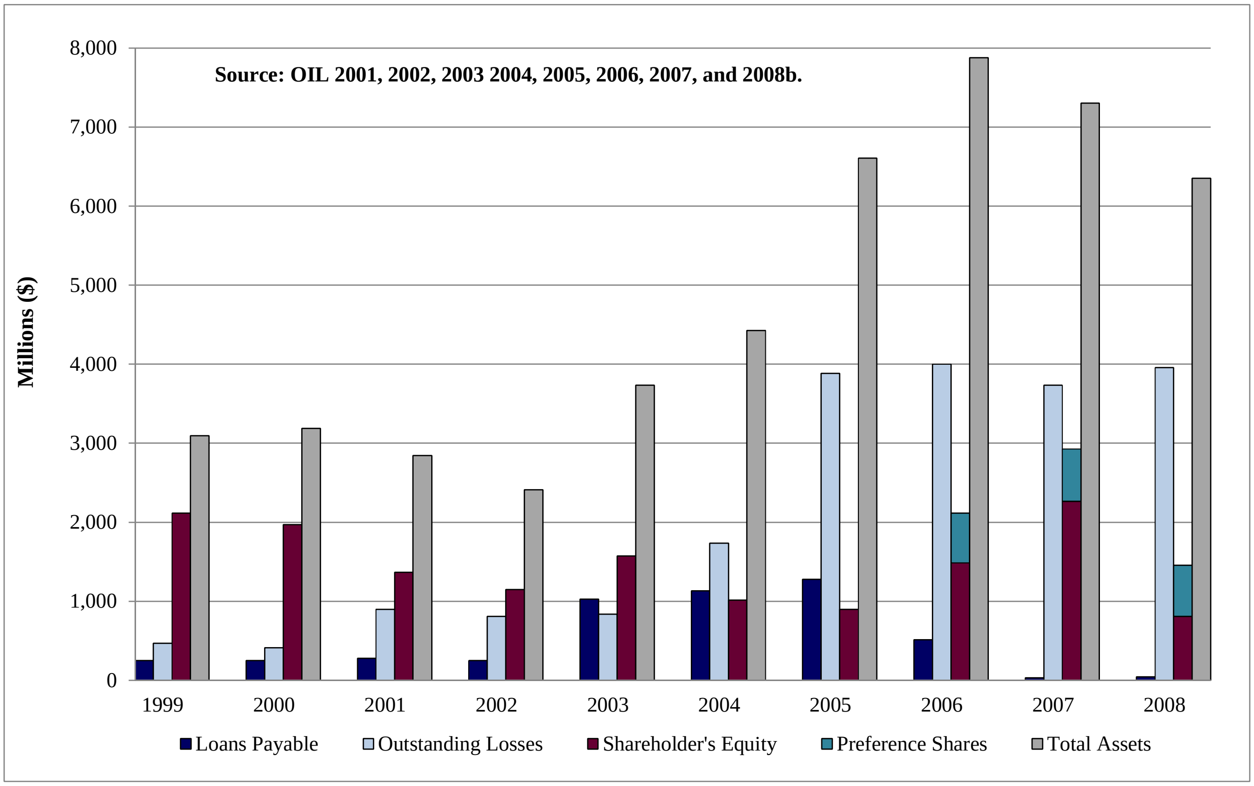

Figure 34. OIL annual balance sheet figures.

A number of trends are discernable from Figure 34. First, the period prior to 2003 was marked by relative stability in OIL asset growth and claims. OIL's outstanding losses,[29] for instance, were less than $1 billion prior to 2003. These losses increased significantly on a percentage basis in 2001, but were relatively small in absolute value, and small as a share of total assets (32 percent). Loans payable, or the outstanding loans used by OIL to make claims payments and fund other business operations, remained at a relatively constant level ($250 million) from 1999 to 2002.

OIL saw another significant annual increase in outstanding losses in 2004, in part from the claims resulting from Hurricane Ivan. Loans payable used to support business operation activities increased in 2003, but remained relatively constant all the way through to 2005. Assets during this period increased from $2.4 billion in 2002 to over $6.6 billion in 2005.

OIL saw a significant shift in its balance sheet in 2005. Total assets leaped from a 2004 level of over $4.4 billion to a 2005 level of over $6.6 billion, a 50 percent increase driven in large part by a substantial increase in reserve fund investments and booked accounts receivable due to hurricane-related losses. Outstanding losses in 2005 increased dramatically, due in large part to the combined impact of Katrina and Rita in that same year. Loans payable increased only slightly to $1.3 billion as OIL appears to have relied more on collected premiums to pay off claims than the use of loans from other financial institutions and the market.

[29]Outstanding losses represent the estimated amount necessary to settle all outstanding claims, including claims which are incurred but not reported, as of the balance sheet date.

The last several years (2006-2008) continue to reveal many of the same trends that materialized for the first time in 2005. Total assets have remained well in excess of $6.0 billion, and actually approached $8.0 billion in 2006 before declining over the past two years. Outstanding losses remain over $3.5 billion, increasing slightly in 2008 with the landfall of Hurricane Ike on the Texas Gulf Coast. Loans payable ceases to exist at any significant level and appears to have been replaced with a new component in OIL's capital structure. Now, OIL appears to rely more on preferred equity and reserves for financing as opposed to debt (loans).

One of the most significant changes experienced by OIL membership resulting from 2005 tropical activity has been a substantial increase in rates. Figure 35 charts the annual changes in net incurred losses from 2002 to 2008 and compares those to changes in OIL insurance rates for a similar period. Between 2002 and 2004, both standard (first tier mandatory coverage) and flat premium (second tier voluntary coverage) rates remain less than $0.10 per dollar insured. In 2005, these rates increased by over 450 percent for standard rates and over 350 percent for flat premium rates. The increases however, have been relatively short-lived and by 2008, have returned to levels comparable to 2002.

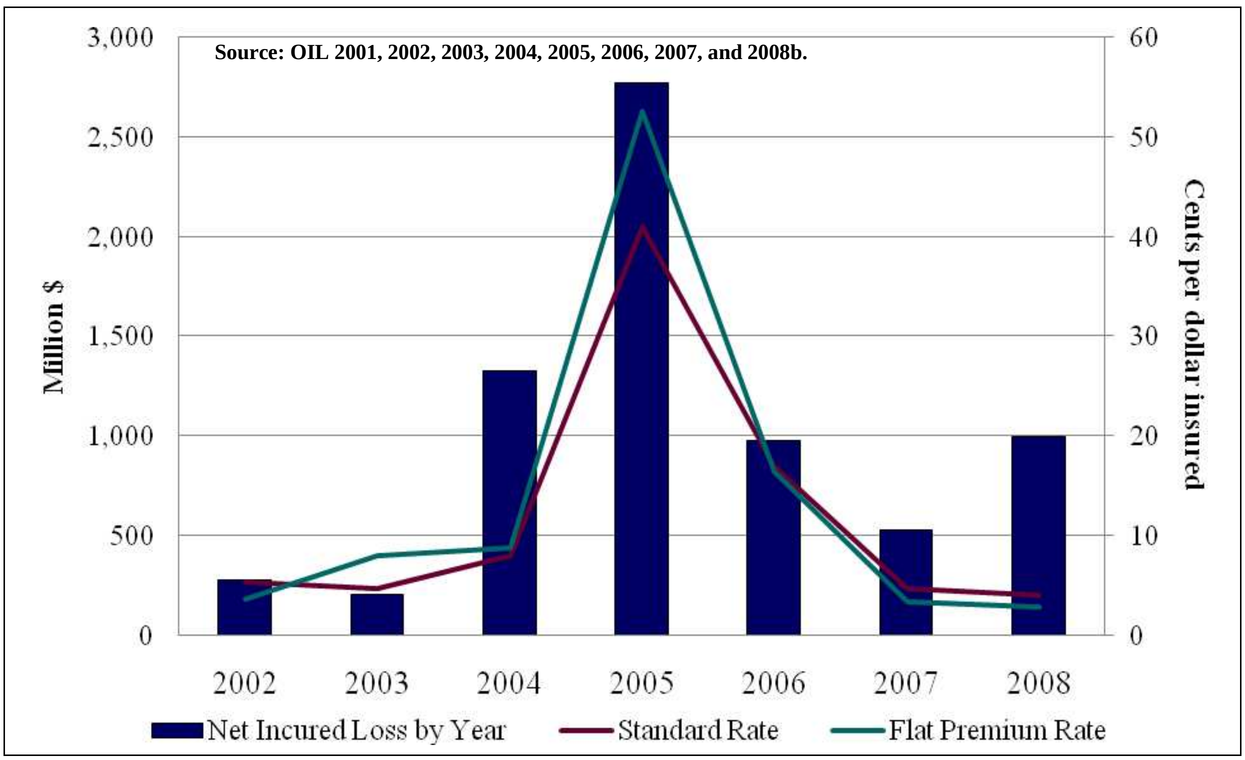

Figure 35. OIL net incurred losses and rates.

While OIL's post-2005 insurance rates have returned to near normal levels, a number of new coverage limits and conditions have been adopted changing the nature of insurance for some policyholders/members. One of the initial steps taken by OIL immediately after Hurricane Katrina (September 23, 2005) was to resort to "extraordinary" measures to convert $800 million, or the “vast majority” of its “incurred but not evolved”[30] (IBNE) reserves, to premiums (Willis Group Holdings, 2006). This action was reported to have been taken to circumvent a potential credit downgrade by S&P.

Seven days later, however, S&P downgraded OIL’s credit status from “A+” to “A-”. Since OIL shares risk across its members, this downgrade translated directly into an increased cost. OIL is reported to have responded further to this downgrade by collecting close to $900 million in supplemental payments (premiums) from shareholders.

One of the more significant post-2005 changes made by OIL, that has had a lasting impact on how members’ assets are insured, has been through the creation of what is referred to as the “Atlantic Named Windstorm Sector” or “ANWS.” This categorization segments assets based upon their potential exposure to tropical cyclone activity. The categorization is further differentiated by onshore and offshore assets. This new ANWS categorization was adopted by the OIL Board in June 2007.

Under the new ANWS, OIL’s gross insurable assets will be categorized for each member as being either: (a) not eligible; (b) onshore ANWS eligible; or (c) offshore ANWS eligible. Different discount factors will be applied to the gross insurable onshore and offshore assets. These discount factors will be determined on what appears to be a subjective basis by an individual OIL underwriter. The purpose of the discount factors is to reduce the insured value of assets subjected to tropical cyclone risk.

[30]OIL collects payments from shareholders which it holds in a fund called, “Incurred but not evolved.” The fund is a reserve fund for claims that have not yet occurred.

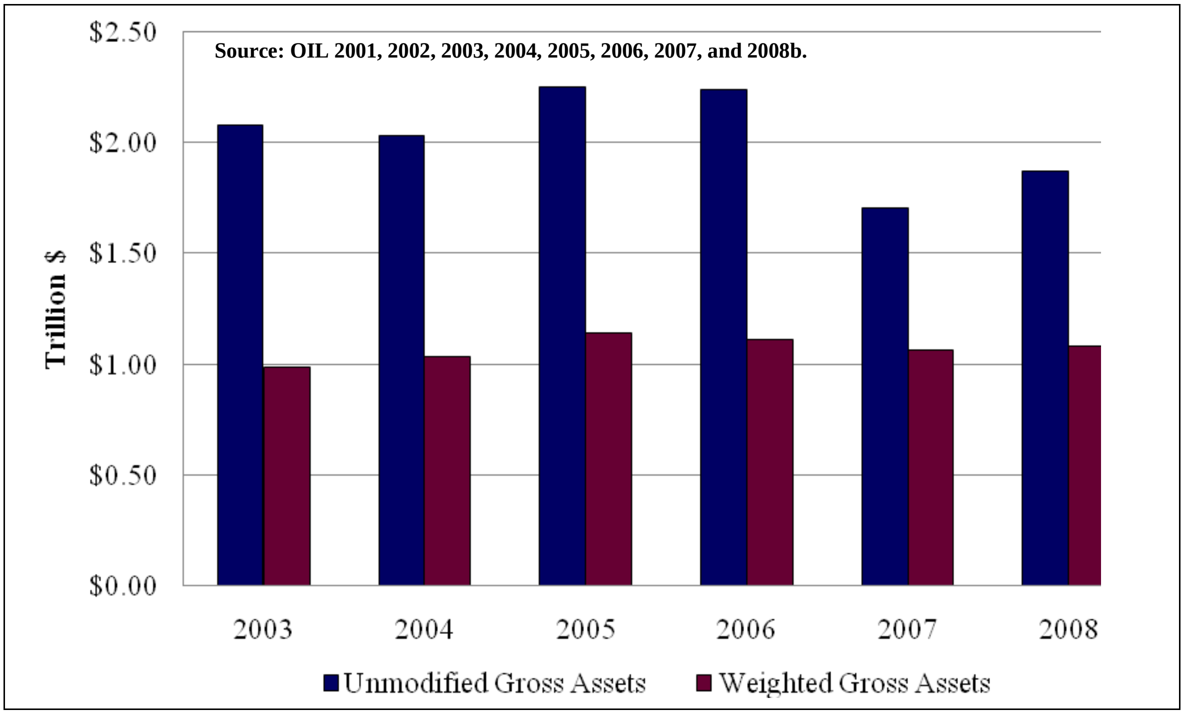

Figure 36. OIL member gross assets (OIL-insured value).

Figure 36 provides an estimate developed by OIL, which shows the discount that the ANWS classification has caused from unmodified gross assets. For most years, these factors would have discounted OIL gross insurable assets by as much as 50 percent.

The last major policy change by OIL in the aftermath of the 2005 storms has been the 2007 adoption of a new "theoretical withdrawal premium" or "TWP." The TWP was reportedly adopted by OIL to stem unnecessary withdrawals from OIL's membership (Willis Group Holdings, 2006). While industry consolidation has contributed to membership contraction since the late 1990's, the 33 percent reduction in membership since 2005 appears to go beyond industry trends and could represent attempts by members to shirk on their longer-term commitments to the insurance mutual in the face of challenging exogenous events (i.e., hurricanes).

The TWP was adopted recently as a contractual premium obligation made by members wishing to disassociate themselves from OIL. The TWP is calculated as a company's annual historical pool percentage applied against specific historical loss years (Willis Group Holdings, 2008). In order to withdraw from OIL, a member must provide 90 days' notice, in addition to booking a TWP liability (OIL, 2009). This balances a member's need to shop for competitive insurance coverage against the need for long-term commitments needed for mutualization-based insurance companies.

In addition to creating membership equity, the TWP has resulted in a positive impact on the company's balance sheet. After adopting the TWP, OIL petitioned Standard and Poor's to recognize the TWP as outstanding capital. S&P, in addition to other rating agencies, subsequently recognized this potential source of capital, allowing OIL to book over $1 billion in TWP capital credit to its balance sheet (OIL, 2006).

5.3. Changes in Self-Insurance

One major outcome of the higher premium prices in the wake of Hurricanes Katrina and Rita has been the increase in the number of companies deciding to self-insure all or an increasing share of their assets. While the exact number of companies that decided to self-insure or increase the level of their self-insurance coverage since the storms is unknown, anecdotal evidence suggest the numbers are significant (Benning, 2009; Martin, personal communication, 2009; Winchester, personal communication, 2010). Estimates place the number of firms choosing to increase exposure at one-third, with another one-third choosing to entirely self-insure (Phillips, 2009).

Another form of "self-insurance" that is becoming more common is the tendency for some companies to choose to incur more risk (and possibly more savings) by increasing their deductibles "across-the-board" since the first of the Big Four hurricanes hit. Significant increases in deductibles represent another form of self-insurance.

The super major oil and gas companies continue to self-insure through captive programs and mutuals post-Big Four hurricanes. The pressure (and the possibility of choice) to move to self-insurance is greater for mid-size companies, as small cap companies are often forced by lenders to maintain insurance (Martin, personal communication, 2009).

5.4. Reinsurance

The availability of reinsurance is crucial to the functioning of the GOM offshore energy insurance market. The supply and demand of reinsurance, and the extent to which hurricanes affect both factors, determines the availability of direct insurance to GOM offshore energy companies. The Big Four hurricanes had the effect of increasing demand, yet reducing the supply of reinsurance. This created a number of negative outcomes for direct insurance companies including paying higher reinsurance premiums, general reinsurance scarcity, and higher attachment levels (deductibles to direct insurers).

There are accounts of the lack of retrocessional insurance in the wake of Hurricanes Katrina and Rita (Bradford, 2005). The lack of retrocessional insurance further compounds the impact of a hard insurance market on purchasers and limits the overall availability of reinsurance and thus direct insurance available to energy companies. The Benfield Group, now a part of Aon Corporation, a leading reinsurance brokerage firm, estimated the price increase of catastrophe reinsurance for property renewals at 10 percent to 115 percent. Figure 37 shows a comparison of year-over-year estimated price changes for property catastrophe renewals in reinsurance.

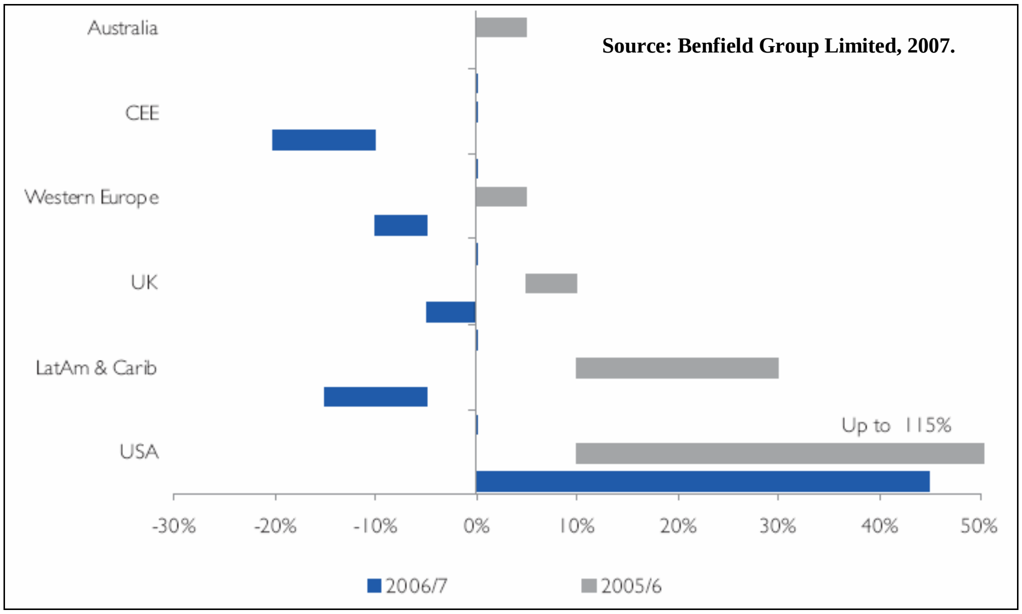

Figure 37. Annual catastrophe reinsurance rates (property reinsurance).

The increase in rates in 2007 is especially interesting given that 2006 was a quiet year for natural disasters and likely reflected the anticipation of a difficult 2007 for GOM hurricane activity. Indeed, the Department of Atmospheric Science at Colorado State University predicted an "above-average Atlantic basin tropical cyclone season in 2007" and an "above-average probability of United States major hurricane landfall" (Klotzbach et al., 2006). Another reason why rates remained high for offshore energy insurance is that reinsurers began significantly differentiating GOM offshore energy risk from other energy and catastrophe risk coverage in 2006 in reaction to Hurricanes Katrina and Rita (Willis Group Holdings, 2007).

In reaction to high rates in the wake of Katrina and Rita, reinsurance "sidecars" became increasingly popular. Reinsurance sidecars are deals between investors (usually investment banks) to assume a portion of reinsurance risk in return for an amount of premium. An estimated $2.4 billion of capital for reinsurance was made available by sidecars in 2006 (Benfield Group Limited, 2007). In addition to sidecars, high rates offered for reinsurance attracted a number of new reinsurance companies to enter the market (Table 9).

Table 9

2006 Reinsurance Market Entrants

Name	Capital (million $)
Aeolus Re	$ 500
Advent Re	$ 38
Alba Syndicate 4455	$ 18
Asia Capital Re	$ 625
Empyrean Re	$ 150
New Point Re	$ 250
Norton Re	$ 108
Syndicate 1919	$ 98
Syndicate 3334	$ 16
Syndicate 4242	$ 148
Syndicate 3820	$ 128
Total	**$ 2,079**

Source: Benfield Group Limited, 2007.

The energy reinsurance market entered 2008 having experienced two years of outstanding profitability. Benign hurricane seasons and relatively high rates of premium were the largest contributing factors to the market's success. Evidence suggests that GOM energy rates were softening and that competition was increasing throughout the 2007 and 2008 renewal seasons (Willis Group Holdings, 2008; Guy Carpenter & Company, LLC, 2010b).

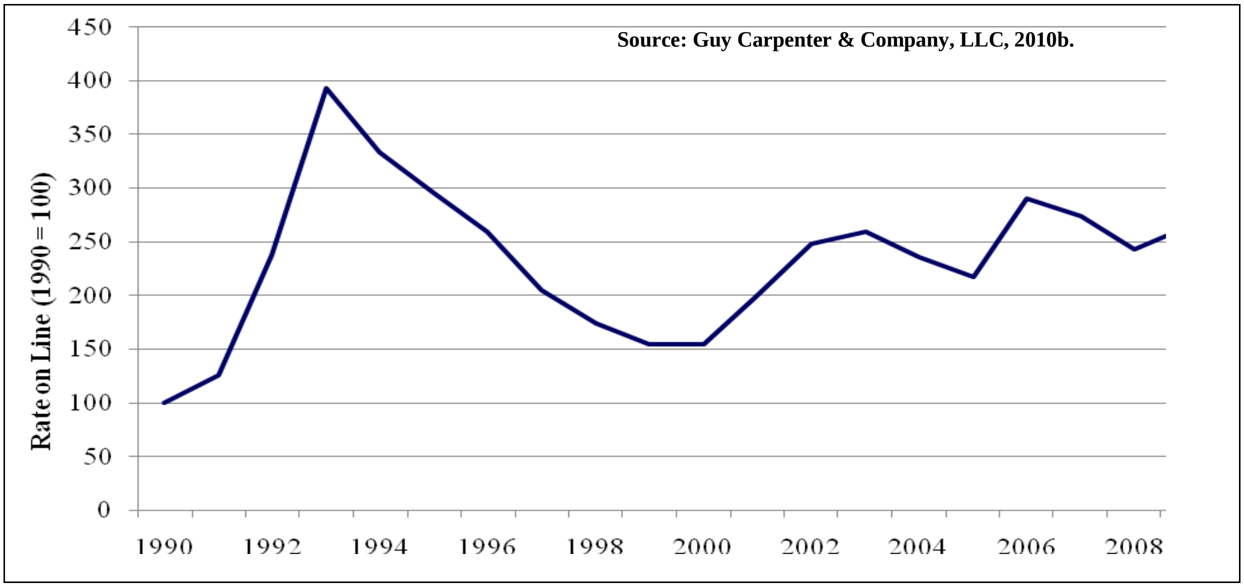

Figure 38. Guy Carpenter world rate on line index.

As shown in Figure 38, reinsurance rates spiked in 2006, but began to marginally retreat in 2007 and 2008 with 5.7 and 11.3 percent year-over-year reductions, respectively.

As GOM hurricanes largely drove reinsurance rates between the years of 2005 and 2009, the worldwide reinsurance market rates are reflective of the rates and factors determining GOM energy company premiums. The fact that GOM hurricane activity has largely driven worldwide reinsurance rates is reflected in the rate reductions presented in Figure 39.

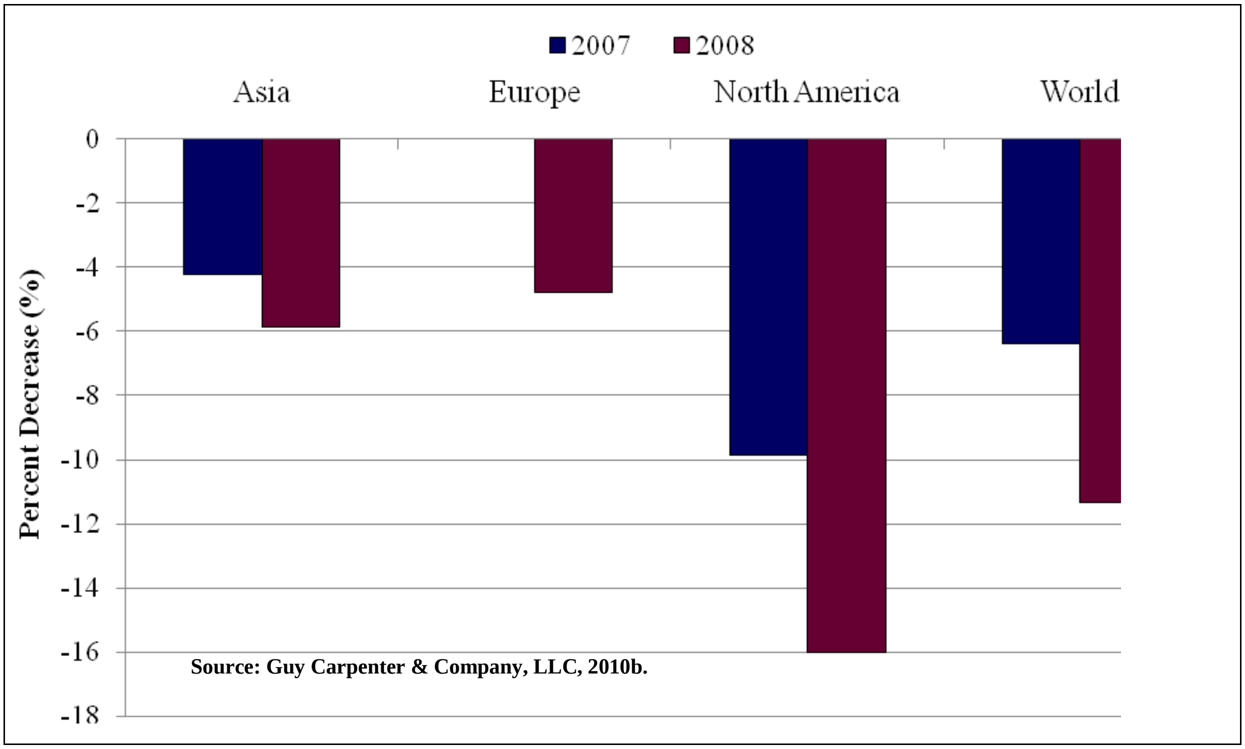

Figure 39. Year-over-year reinsurance rates by region.

U.S. reinsurance rates were up 12 percent in 2009, 4 percent higher than worldwide increases, mostly due to 2008 GOM claims related to Hurricanes Ike and Gustav and the financial crisis (Guy Carpenter & Company, LLC, 2009). The Big Four hurricanes had a lasting effect on the reinsurance market. The main difference being premium price differentials and aggregate limits applied specifically to GOM offshore energy insurance policies.

5.5. Insurance-Linked Financial Instruments

Financial instruments used to capitalize GOM offshore energy insurance became a central focus of the market after Hurricanes Katrina and Rita. At that time the perceived risk (and rates) for GOM offshore energy assets was at an all-time high. The market for insuring such assets was hard and reflected a shortage of supply of capital for issuing policies. During this time the dollar value of catastrophe bond issues exploded, increasing from $2 billion in 2005 to over $4.7 billion in 2006 and $7 billion in 2007. Along with the overall softening of the market in 2008, catastrophe bond issues fell to over $2.7 billion, still higher than pre-Big Four as evidenced in Figure 40.

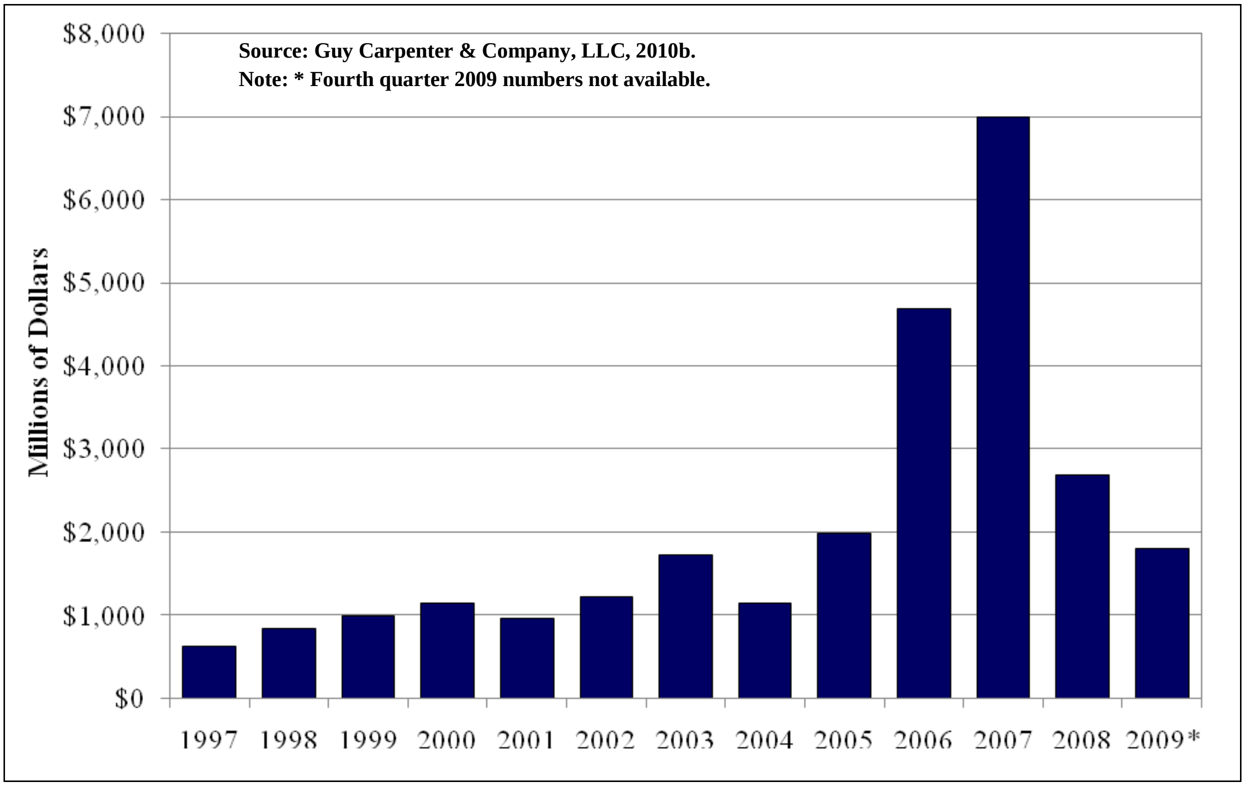

Figure 40. Catastrophe bond issues.

Hurricane Katrina was the first storm to deliver a total principal loss to catastrophe bond investors when a KAMP Re company parametric-triggered bond was triggered. Post-Katrina bond issues were at higher yields-to-maturity, reflecting the greater perception of risk affecting GOM offshore energy assets. Despite the increased risk, the high returns made possible by catastrophe bonds attracted a significant amount of capital post-Katrina and Rita and continue to deliver capacity to GOM offshore energy insurers that did not previously exist.

5.5.1. Parametric Bond Triggers

The Willis Research Network (WRN), the world's largest partnership between academia and the insurance industry, seeks to understand how hurricanes can be predicted among other catastrophes (Willis Research Network, 2010). Started in 2006, the WRN includes a number of top university programs and employs meteorologists, seismologists, hydrologists, engineers, actuaries, and statisticians. WRN research is one significant example of how brokers, mutuals, insurers, and reinsurers are adapting to the hurricane energy risk market. Some stakeholders choose to rely on a combination of in-house research as well as consulting firm research. A number of risk modeling firms, such as Risk Management Solutions, Eqecat, and Tropical Storm Risk, work with insurers to quantify risk exposure.

One interesting outcome related to catastrophe bonds has been the Willis Hurricane Index (Figure 41). Noting the disparity between the Saffir-Simpson scale of Hurricane Ike (Cat 2) and the dollar amount of its damage (~$6 billion in energy losses), Willis Research Network and National Center for Atmospheric Research set out to create an index that would better statistically define hurricane damage. These partners used a set of commonly published parameters to build the model. The parameters include: the amount of energy dissipated at the surface by the maximum winds, the radial extent and character of the surface wind field, and the translational speed of the hurricane. The result of the model was an average of 96 percent explanation of the variation on dollar-value energy industry hurricane losses over all major Gulf of Mexico hurricanes from Andrew through Ike.

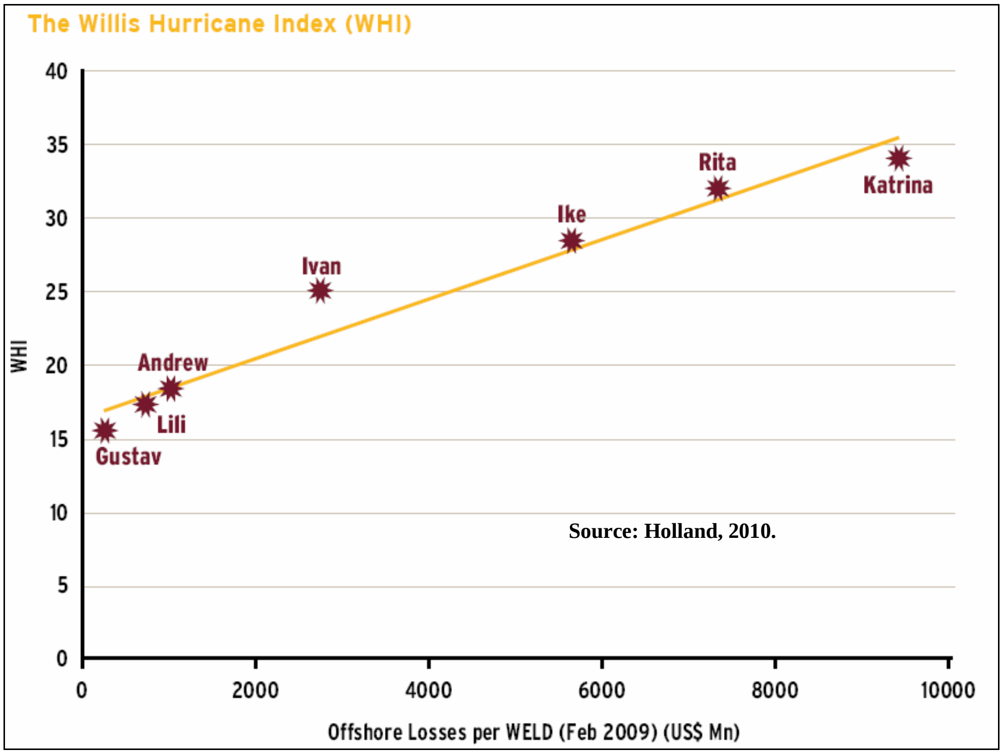

Figure 41. Willis Hurricane Index (WHI).

Indices such as the Willis Hurricane Index are poised to assist in the standardization of parametric-trigger bond issues. Parametric-trigger catastrophe bonds are particularly vulnerable to basis risk, that is, the risk that the issuer of the bond will suffer a loss without triggering parameters. The WHI and other indices is a step-forward for the industry in terms of minimizing basis risk while attracting investors with transparent and easy to understand triggers.

Despite recent successful efforts in creating such an index, the ability to predict energy industry hurricane damage from models used to examine existing hurricanes still remains a young field.

6. CONCLUSIONS

This report addresses a number of key issues associated with the offshore oil and gas industry's ability to insure against hurricane-related risks in the GOM. Historically, insurance coverage for the offshore industry was based upon a structure not too dissimilar from other energy industry sectors. Prior to 2004, a significant share of offshore insurance coverage was provided on a commercial basis by private companies, mitigating storm-related and other risks in return for a fee (premium). These services were not limited to physical damages created by weather-related events alone, but included insurance against financial losses for business interruption, as well as asset replacement inflation.

Prior to 2004, and even to the current period, the offshore industry had a number of competitive insurance alternatives including mutualization and self-insurance. The destruction created by the Big Four hurricanes forced all three insurances types (commercial, mutualization, and self-insurance) to make a number of important changes that included: new aggregated policy limits; increased deductibles and waiting periods; more stringent informational requirements; and a new and increasingly more important role for reinsurance coverage and insurance-linked securities.

New aggregate limits imposed by commercial insurance markets, as well as mutual insurance companies like OIL, reflect the reality of operating in today's high cost energy environment, where the consequences of asset destruction and business interruption are considerable. Consider that the gross revenues lost from the interruption of a 300,000 barrel per day deepwater well could run as high as $30.0 million per day at a $100/Bbl oil price. This, coupled with the destruction of a production structure with a replacement value of close to $1 billion like Chevron's Typhoon TLP, creates significant financial challenges for any kind of insurance, regardless of type.

Aggregate limits shift the structure and nature of offshore energy insurance coverage by requiring operators to assume a larger financial share of extreme events. In many ways, aggregated coverage limits can be thought of as another form of self-insurance, since individual operations now have to assume some share of the "upper bounds" of those potential losses. The imposition of these aggregate limits has been seen as necessary during and after the advent of the Big Four hurricanes. The overall solvency of many individual commercial insurance companies, mutuals, and even self-insuring affiliates, would become challenged without some limitations on massive claims. Aggregate limits are seen as a means by which coverage capacity in the market can be maintained by requiring part of that capacity to be held by individual operators. Over time, as claims and catastrophic incidents decrease, commercial coverage capacity can begin to expand as more investment capital, seeking to earn a return on financing this offshore risk, enters the market.

Changes in deductibles, and the impositions of waiting periods (primarily for business interruption claims), are additional coverage modifications developed to secure a relatively healthy and robust offshore insurance market. Both coverage limitations are additional examples of the increasing share of risk being assumed by offshore operators. Both restrictions (higher deductibles, longer waiting periods) require operators to assume risk on the "lower bound" of a potential catastrophic weather-related accident. Coupled with aggregate limits, these restrictions put operators firmly in the position of having to share risk, almost on an equal basis, with commercial or mutual insurance types.

Higher deductibles, for instance, require operators to assume a larger initial share of weather-related damages than a lower deductible level. Waiting periods create similar risk profiles for offshore operators: the longer the waiting period, the greater the share of initial (and total) financial losses borne by an offshore operator. Operators can attempt to reduce both deductibles and waiting periods, but must do so at a cost: higher premiums.

One of the more dramatic and significant changes created the Big Four hurricanes has been in the area of risk assessment and evaluation. Prior to 2004, offshore insurance providers (commercial as well as mutual providers) were making some, albeit limited, movements at expanding and improving their asset risk evaluation and risk management practices. Part of this initiative was driven by overall trends in the financial and energy sectors placing greater emphasis on the use of risk management tools and methods during the mid- to late-1990's. The Big Four hurricanes rapidly accelerated the industry to adopt more detailed, sophisticated, and rigorous methods of risk evaluation.

The ability to conduct a thorough and rigorous risk exposure analysis falls upon one key input: information. Prior to 2004, most aspects of the offshore insurance industry relied upon a standardized approach of evaluating policies based upon compliance, or asset categorization, within a set of uniform industry engineering standards. Post-storms, the evaluation process becomes more diverse, requiring a significantly broader and more extensive set of asset-specific information from offshore operations. This detailed information was used with a new set of modeling approaches and independent third party analysis, to develop new asset/ insurance analyses, classes, and categorizations such as Lloyd's "Realistic Disaster Scenarios" and Oil's "Atlantic Named Windstorm Sector."

An additional, ongoing change to offshore insurance markets created by the Big Four hurricanes has been the increasingly important role of reinsurance and insurance-based securities such as "cat bonds" and contingent capital. Both represent various forms of additional insurance, or risk diversification, for primary forms of insurance including commercially-provided insurance, self-insurance, and mutualization. Reinsurance firms raise capital from markets, and in turn, invest this capital in risk held by commercial insurance companies for some share of its premium revenues. Insurance-based securities fund risk directly like corporate debt. Underwriters issue bonds that can be used (redeemed) if a catastrophic event occurs. Otherwise, the principal and some return is paid to the cat bond holder for the assumption of risk during the posted term of the bond.

Both reinsurance and insurance-based securities are based upon the premise of efficient arbitrage: that markets for risk, if freely traded, can find the most efficient sources of capital to mitigate damages from extreme events. This efficiency creates two benefits. First, it reduces overall insurance cost by allowing more efficient insurance providers to assume various shares of offshore operating risk for a mutually beneficial fee: a fee high enough to encourage the reinsurance company to assume the risk, but lower than the insurance cost or alternatives for the primary commercial provider. Second, reinsurance and insurance-based securities expand the scope of the insurance markets, create competitive alternatives, and generally expand capacity that would otherwise be lacking in the aftermath of such catastrophic events such as a hurricane of the magnitude of Katrina or Rita.

Offshore insurance is a competitive market and competitive forces work to both align the interests of market participants and keep prices (premiums) commiserate with the degree of perceived offshore operations risk. The presence of such market forces does not suggest that insurance rates for offshore operations will be low: it simply suggests the premiums will not rise above unnecessary levels. Premiums are said to be competitive or efficient when they reflect the risk-adjusted cost of insuring a particular offshore asset class or business activity with a reasonable return or profit.

As noted earlier, high premiums and restrictive coverage conditions are reflective of what is considered a "hard market" for offshore energy insurance. Short-term supernormal profits may be possible during hard market conditions as the market searches for an understanding of the true degree of risk (cost) and appropriate degree of compensation (profit) for insuring offshore risk: particularly in the aftermath of sudden and unexpected events. Insurance providers that believe they can provide insurance at rates or under coverage terms that are more favorable than prevailing market conditions will enter the market to capture market share from other less efficient (more costly) providers.

Likewise, when markets for offshore insurance become restrictive, individual operators will face greater incentives to pool together in mutual insurance companies/organizations to avoid unnecessarily costly premium structures, administrative and service fees, or even profits being assessed by commercial providers in a hard market. The same holds true with self-insurance: if large companies have the financial breadth and wherewithal to assume increasing degrees of risk by self-insuring, they will do so if the costs of assuming this risk are lower than the benefits.

Therefore, the over-arching conclusion that can be reached from the post-2004 tropical storm season is that offshore insurance markets, while tested considerably, work and adapt to rapidly changing risk exposures in the GOM. Clearly, limits were imposed, premiums increased, and deductibles and other claims restrictions were implemented. These structural and market changes led, however, to the expansion of existing insurance providers, as well as the emergence of new players, all supported by expanded capital resources provided by reinsurance and other insurance-based financial instruments. The result of this experience has been a much tested but more resilient and robust offshore insurance market that continues to provide support and capacity for current and projected offshore oil and gas activities.

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APPENDIX A

ENERGY EXPLORATION AND DEVELOPMENT INSURANCE

MAKING WELLS SAFE ENDORSEMENT

In respect of wells insured hereunder and subject to all terms and conditions and exclusions stated therein and the Combined Single Limit of Liability applicable thereto, Section A of this policy is endorsed to cover reimbursement to the Assured for the actual costs and expenses incurred in preventing the occurrence of a loss insured hereunder when the drilling and/or workover and/or production equipment has been directly lost or damaged by lightning; fire; explosion; or implosion above the surface of the ground or water bottom; collision with land, sea or air conveyance or vehicle; windstorm, collapse of derrick or mast; collision or impact of anchors, chains, trawl boards or fishing nets; flood; strikes; riots; civil commotions or malicious damage; but only when in accordance with all regulations, requirements, and normal and customary practices in the industry, it is necessary to re-enter the original well(s) in order to continue operations or restore production from or plug and abandon such well(s).

Underwriters' liability for costs and expenses incurred by reason of this endorsement shall cease at the time that:

1) operations or production can be safely resumed, or
2) the well is or can be safely plugged and abandoned, or
3) whichever shall first occur.

APPENDIX B

Oil Insurance Limited

Retrospective Premium Determination Schedule (OIL, 2009)

Maximum Factor **("MaxF")**	Slope Factor **("SF")**	Minimum Factor **("MinF")**
62.5	33.33	33.33

For Incurred Losses less than $150,000,000, the Modifier is determined according to the following formula:

Modifier = 1/500 x (MaxF - ((Incurred Losses / 150,000,000) x (MaxF - SF)))

For Incurred Losses equal to or greater than $150,000,000, the Modifier is determined according to the following formula:

Modifier = MinF / 500

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 the 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 communities.

The Bureau of Ocean Energy Management

The Bureau of Ocean Energy Management (BOEM) works to manage the exploration and development of the nation's offshore resources in a way that appropriately balances economic development, energy independence, and environmental protection through oil and gas leases, renewable energy development and environmental reviews and studies.