NATIONAL OCEAN INDUSTRIES ASSOCIATION

HURRICANES AND THE OFFSHORE OIL AND NATURAL GAS INDUSTRY

Every year, hurricanes of varying strength lay siege to America's coasts. The images of wind-battered buildings and flooded lands are well-known - 2004 and 2005 were particularly destructive seasons.

The impact of the 2005 storms on the vital energy infrastructure of the nation's Outer Continental Shelf was severe, destroying 113 offshore platforms, seriously damaging 52 more and shutting-in significant quantities of the nation's oil and natural gas production.

But did you know:

- there are over 4,000 platforms in the Gulf of Mexico, which means that more than 97 percent of the platforms survived these record-breaking storms?
- there were no deaths or injuries among the 25,000 - 30,000 offshore workers because of stringent and effective safety regulations?
- there were no significant spills from any offshore facility and the minimal oil that did escape from damaged pipelines has had no wildlife impacts?
- most of the facilities damaged or destroyed by the storms were built prior to 1988 when more stringent construction specifications were mandated, while most built to meet the post-1988 requirements survived?
- the offshore industry continuously works to improve its safety and environmental record, as well as improve the time needed to bring shut-in production back to consumers?

More details follow on how the offshore industry contends with hurricane forces - the structural design innovations, the safeguards for employees and the environment, and the improvements being made in advance of future storms.

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HURRICANE FACT: OFFSHORE PLATFORMS ARE DESIGNED TO SURVIVE KILLER STORMS

Even the most damaged facilities were salvageable.

For example, Shell's Mars platform sustained serious damage during Hurricane Katrina (above), but dedicated and talented crews were able to repair the facility (below). Full production resumes near the end of June 2006.

Once the output comes back online, there will be a jump in energy production from the Gulf. The Mars platform accounts for about 40 percent of the roughly 343,000 bpd of Gulf of Mexico oil production still shut-in by last year's storms.

THE VAST MAJORITY OF OFFSHORE PLATFORMS AND RIGS ESCAPED SERIOUS DAMAGE DURING THE 2005 HURRICANE SEASON

- Though 113 platforms were destroyed by Hurricanes Katrina and Rita, there are over 4,000 platforms in the Gulf of Mexico. This means that over 97 percent of the platforms survived these record-breaking storms.

- Platforms are designed to withstand both gale force winds and and severe wave activity. For the upcoming season, new clamps capable of withstanding pressure of 2 million psi have been added to some platforms to hold major components in place under Katrina-like wind conditions.

- Offshore facilities built since 1988 are designed to withstand "100-year Storms," a designation that includes everything up to Category 5 events.
  - These standards are defined by regulations from the Minerals Management Service, the principal regulatory agency for offshore oil and gas operations. The specific regulations can be found in the Federal Register at 30 CFR 250.900
  - To address wave threats, regulations stipulate that the platform deck must exceed the average height of hurricane-driven swells, generally estimated to reach 80 feet. Category 3, 4 and 5 storms all generate waves of approximately the same height.
  - To address wind threats, offshore facilities work in advance of evacuation to prevent any section or piece of equipment being knocked loose and damaging the rest of the platform.

- In recent storms, virtually all platforms seriously damaged or destroyed had been built before the 1988 design specifications were implemented.
  - Hurricanes Katrina and Rita destroyed a total of 113 platforms, of which 108 were built to pre-1988 specifications.
  - These "end-of-life" facilities only represented 1.5 percent of total Gulf of Mexico production.

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HURRICANE FACT: IMPROVEMENTS ARE CONTINUALLY MADE TO LEARN FROM EXPERIENCE

DIFFERENT TYPES OF DRILLING RIGS REQUIRE DIFFERENT APPROACHES AND THERE ARE STANDARD OPERATING PROCEDURES FOR EACH

- **Drillships** can be moved out of the storm's path, provided they are given suffficient and accurate notification of the projected storm track.
  - The offshore industry relies on the accuracy and availability of weather predictions from NOAA's National Weather Service, in particular the National Hurricane Center.
  - Offshore facilities are themselves equipped with advanced communications, radar and weather tracking technology.

- A Joint Industry Project made up of 38 producers, drilling contractors and marine engineering firms is studying how to improve the "stationkeeping" of **Mobile Offshore Drilling Units** (MODUs) when hurricanes strike and to limit damage potential if a rig breaks loose. Some changes under consideration include:
  - collecting and analyzing new types of ocean data (currents, wave patterns, wind effects, etc.) to enable better assessments of the exposure risks for each rig and drilling location.
  - mandating more mooring lines to secure MODUs in place.
  - engineering mooring lines with failsafe breaking points to ensure a dislodged facility will not drag its anchors on the seafloor, damaging pipelines.

- One company with a fleet of **Jack-Up Rigs** is evaluating two changes to its storm preparations. In advance of a storm, the company will direct its rig managers to:
  - take on extra ballast water in order to increase the overall stability and weight of the rig on the seafloor.
  - take advantage of this greater weight and stability to raise the deck platforms higher, improving the rig's ability to withstand wave heights of up to 60 feet.

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HURRICANE FACT:
EMPLOYEE SAFETY ALWAYS TAKES PRIORITY

THE OFFSHORE ENERGY INDUSTRY HAS AN ENVIABLE RECORD OF PROTECTING THE LIVES OF ITS OFFSHORE WORKERS, AND COMPANIES PROVIDED CRITICAL SUPPORT DURING RECOVERY EFFORTS ONSHORE IN 2005.

All 25,000 to 30,000 offshore personnel are evacuated in advance of approaching hurricanes

- There are 25,000 – 30,000 workers offshore at any given time. In all, the offshore energy industry employs 85,000 people directly and an additional 85,000 in indirect support capacities.

- Despite the frequency and intensity of hurricanes in 2005, there were no injuries and no loss of life on offshore facilities. This safety record has been achieved consistently year after year.

- Prior to the arrival of a hurricane, offshore facilities evacuate all personnel.
  - Personnel secure the platform and leave in pre-determined stages. A standard hurricane preparation process includes:
    - Evacuation Phase 1 - Receive Storm Notification
      - Review operations forecast.
      - Communicate with air and marine transportation providers.
      - Perform safety system checks.
    - Evacuation Phase 2 - Complete Preparations
      - Secure all equipment.
      - Test communications systems that enable monitoring from shore.
      - Evacuate non-essential personnel.
    - Evacuation Phase 3 - Shut Down and Evacuation
      - Shut-in wells and subsurface safety valves
      - Close incoming and exit pipelines
      - Shut down operating systems
      - Transport remaining personnel to shore

- After Hurricanes Katrina and Rita, offshore companies stepped in to provide support services, emergency funds, housing and other assistance to their employees, and also donated millions to the Red Cross and similar organizations.

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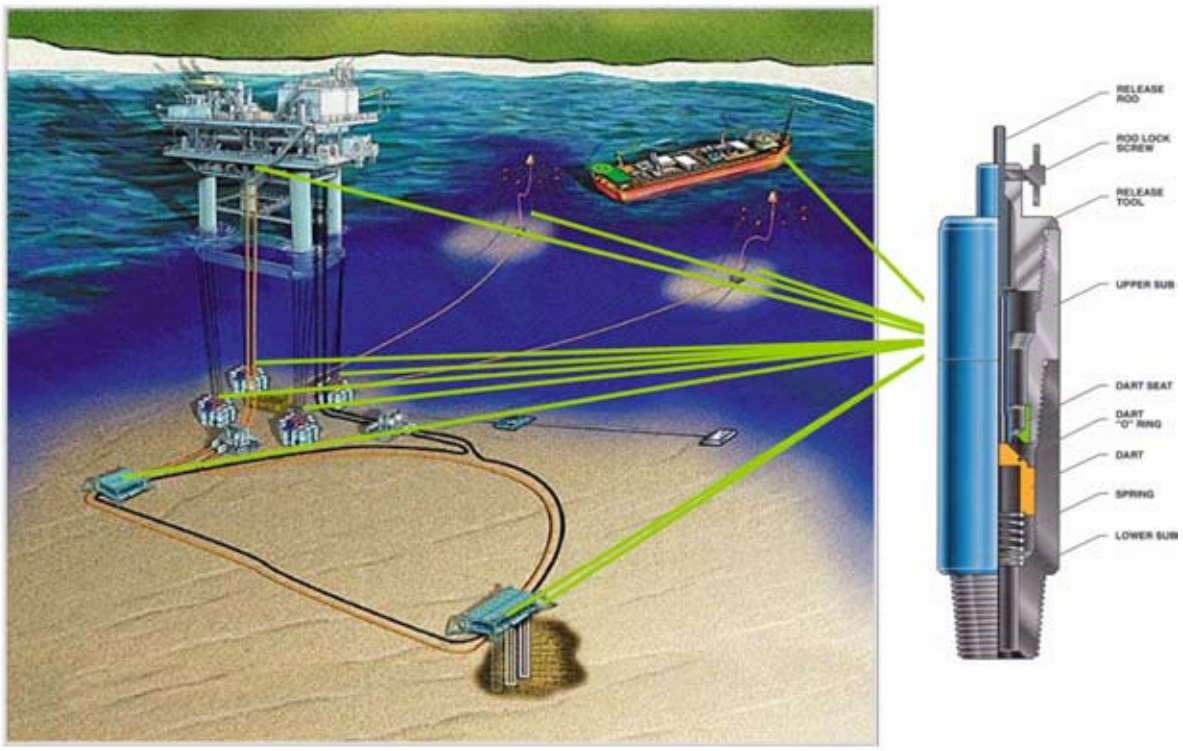
HURRICANE FACT: ENVIRONMENTAL SAFEGUARDS ARE BUILT IN TO THE OFFSHORE INFRASTRUCTURE

- All offshore platforms are equipped with safety valves that shut-in oil and natural gas in the event of storm damage. These valves lock closed at regular intervals so that oil or gas cannot flow if equipment is broken or separated. Every single safety valve held during the 2005 hurricane season.



Safety valves at all major junctures prevent oil and natural gas leaks when hurricanes cause damage

- During the 2005 hurricane season, there were no significant oil spills from offshore production facilities.
  - In a few isolated instances, small holding tanks on the platforms themselves were damaged or knocked overboard.
  - Most of the oil that ended up in the Gulf after Hurricanes Katrina and Rita came from damaged onshore facilities.

- Since 1985, more than 7 billion barrels of oil have been produced in federal offshore waters with less than 0.001 percent spilled — a 99.999 percent record for clean operations, according to the Minerals Management Service.[5]

HURRICANE FACT: "LESSONS LEARNED" WILL SPEED FUTURE RECOVERY EFFORTS

LESSONS LEARNED IN 2004 AND 2005 WILL ALLOW THE ENERGY PRODUCTION PROCESS TO SAFELY AND QUICKLY RESTART, DELIVERING VITAL ENERGY SUPPLIES TO U.S. CONSUMERS.

- Re-starting shut-in production is a complex process with well-defined stages:
  - Visual Inspection of Affected Area: Operators perform fly-by inspections of facilities for preliminary assessment of damage.
  - Pre-Boarding Safety Meeting: Facility personnel and managers meet to review post-storm inspection information.
  - Damage Assessment: Core personnel return to the facility to conduct a more thorough review, which may be complemented by data underwater ROVs (Remotely-Operated Vehicles).
  - Equipment Integrity Verification: Review of the physical topside structure and the pipelines is completed.
  - Safety System Function Test: Individual systems are brought back on-line to be tested one at a time.
  - Facility Startup.

- Damaged pipelines on the seafloor are the most frequent impediment to re-starting the flow of energy to consumers. After Hurricanes Katrina and Rita, some companies asked for and received authorization from MMS to bypass damaged pipelines using barging and tankering operations.

- In some cases, "jumper" pipelines have been laid to connect major pipeline arteries on the seafloor. This will allow for oil and gas flows to be redirected around damaged sections.

- Companies are already pre-positioning equipment and resources around the region so they can deploy as soon as the danger has passed. These resources include diving teams and ROV vessels to assess the condition of underwater pipelines, wells and connections, and spill response equipment and personnel.

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BACKGROUND INFORMATION: A BRIEF INTRODUCTION TO OFFSHORE TECHNOLOGY

UNDERSTANDING THE TECHNOLOGY: RIGS VS. PLATFORMS

An **offshore drilling rig** is a facility housing equipment to drill for oil and natural gas from underground reservoirs. Sometimes a drilling rig is also used to complete (prepare for production) the well. The rig itself is not involved with the extraction of the oil, however. Its primary function is to make the hole in the ground so that the oil can be produced.

Jack-up Rig

An **offshore oil platform** is a structure used to house workers and machinery needed to produce oil and natural gas in the ocean. Depending on the circumstances, the platform may be attached to the ocean floor or float. A typical platform may have many wellheads and access reservoirs using directional drilling both at different depths and at remote positions miles away from the platform. Platforms may also connect to many subsea wells on the seafloor miles away.

DRILLING PLATFORM TYPES:

Drill Ship

- **Jack-up rigs** are towed to the drilling site, three or four 'legs' are lowered until they penetrate the ocean floor to the point of resistance. This allows the working platform to rest above the surface of the water, as opposed to a floating barge. However, jack-up rigs are suitable for shallower waters, as extending these legs down too deeply would be impractical. These rigs are typically safer to operate than drilling barges, as their working platform is elevated above the water level.

- **Drill ships** have a broadly conventional ship's hull, but also feature a large aperture, known as a "moon pool", through which drilling takes place. Drill ships use either anchors or dynamic positioning to maintain station. The latest drill ships can operate in more than 10,000 feet of water.

Semi-submersible platform

- **Semi-submersible drilling platforms** are supported primarily on large pontoon-like structures submerged below the sea surface. The operating decks are elevated perhaps 100 or more feet above the pontoons on large steel columns. This design has the advantage of submerging most of the area of components in contact with the sea and minimizing loading from waves and wind. Semi-submersibles are usually anchored with six to twelve anchors tethered by strong chains and wire cables, which are computer controlled to maintain stationkeeping.

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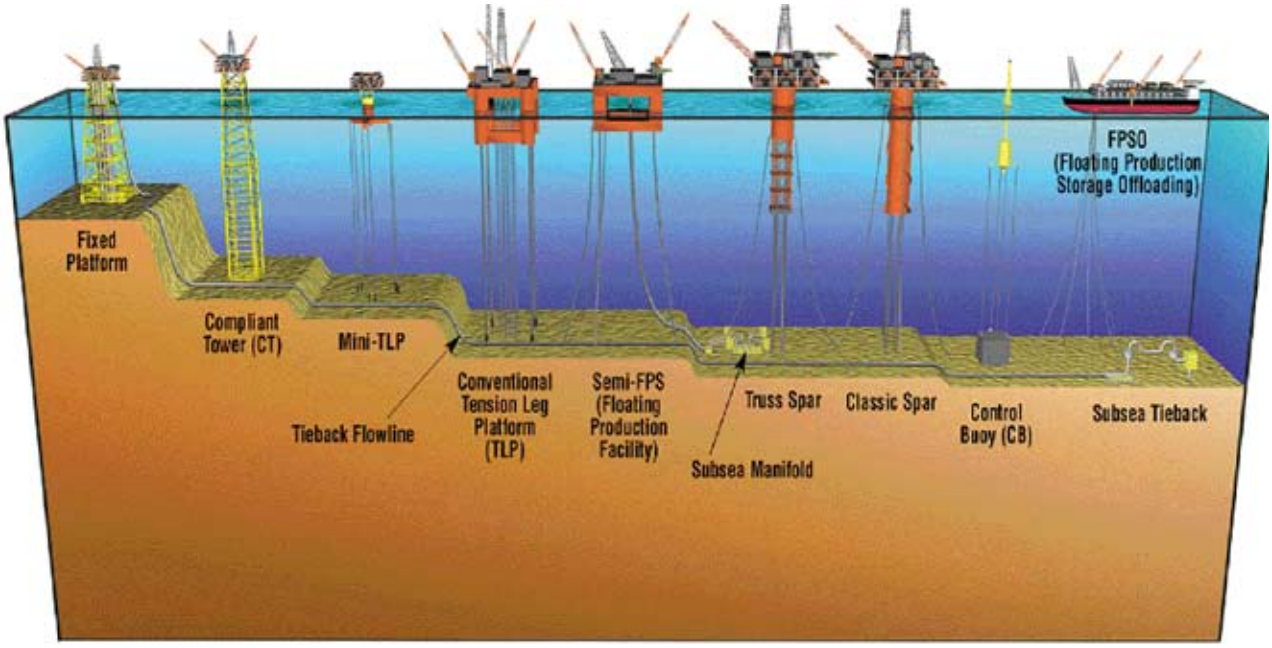
PRODUCTION PLATFORM TYPES:

- **Fixed Platforms** sit on legs anchored directly in the seabed, supporting a deck with space for drilling rigs, production facilities and crew quarters. Fixed platforms are economically feasible for installation in water depths up to about 1,700 feet (520 m).
- **Compliant Towers** consist of narrow, flexible towers and a piled foundation supporting a conventional deck for drilling and production operations. Compliant towers are designed to sustain significant lateral deflections and forces, and are typically used in water depths ranging from 1,500 and 3,000 feet (450 and 900 m).
- **Tension-Leg Platforms** (TLPs) consist of floating rigs tethered to the seabed in a manner that eliminates most vertical movement of the structure. TLPs are used in water depths up to about 6,000 feet (2,000 m).
- **Semi-Submersible Platforms** have several "legs" which have sufficient buoyancy to cause the structure to float. Semi-submersibles can be moved and are generally anchored by mooring cables and anchors. Semi-submersibles are used in depths greater than 600 feet (200 m).
- **Spar Platforms** are moored to the seabed like the TLP, but use more conventional mooring lines. The Spar has more inherent stability than a TLP since it has a large counterweight at the bottom. It also has the ability, by use of chain-jacks attached to the risers, to move horizontally over the oil field.
- **Floating production, storage and offloading systems** (FPSOs) are large ships equipped with processing facilities and moored to a location for a long period. Although they are authorized for use in the Gulf of Mexico, no FPSO has yet been deployed in the region.

There are numerous types of offshore platforms. Most of the platforms destroyed by hurricanes are the older, fixed-leg type.



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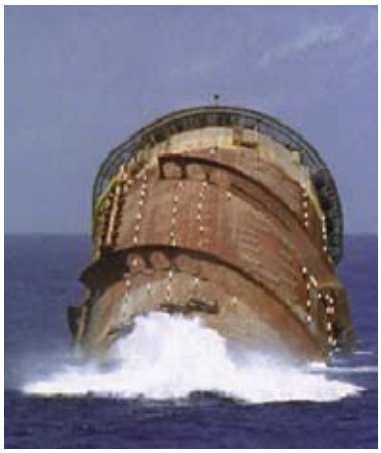
BASIC FACTS ABOUT OUTER CONTINENTAL SHELF OIL AND NATURAL GAS

U.S. offshore energy production is an essential component of the nation's energy and economic security. U.S. offshore development accounts for more than 25 percent of the country's natural gas and more than 30 percent of its oil.[1]

Each year, offshore energy development contributes between $4 billion and $6 billion in revenues to the federal Treasury.[2] Millions are also paid to states and local communities.



The federal offshore produces approximately 600 million barrels of oil[3] and about 4.5 trillion cubic feet of natural gas annually.[4]

The U.S. offshore industry leads the world in developing and commercializing advanced technologies that protect sensitive environments and improve the quality of life for all Americans.

The U.S. offshore energy industry operates in accordance with the world's most stringent standards for human safety and environmental protection.

Since 1985, more than 7 billion barrels of oil were produced in federal offshore waters with less than 0.001 percent spilled — a 99.999 percent record for clean operations.[5]

Government statistics show that the injury and illness rate for offshore workers is about 70 percent lower than for all of private industry.[6]

Thirty percent of the 15 million fish caught by recreational fishermen annually off the coasts of Texas and Louisiana are caught near platforms. Conservative estimates show annual catches of approximately 450,000 pounds of reef fish annually, valued at approximately $2 million.[7]

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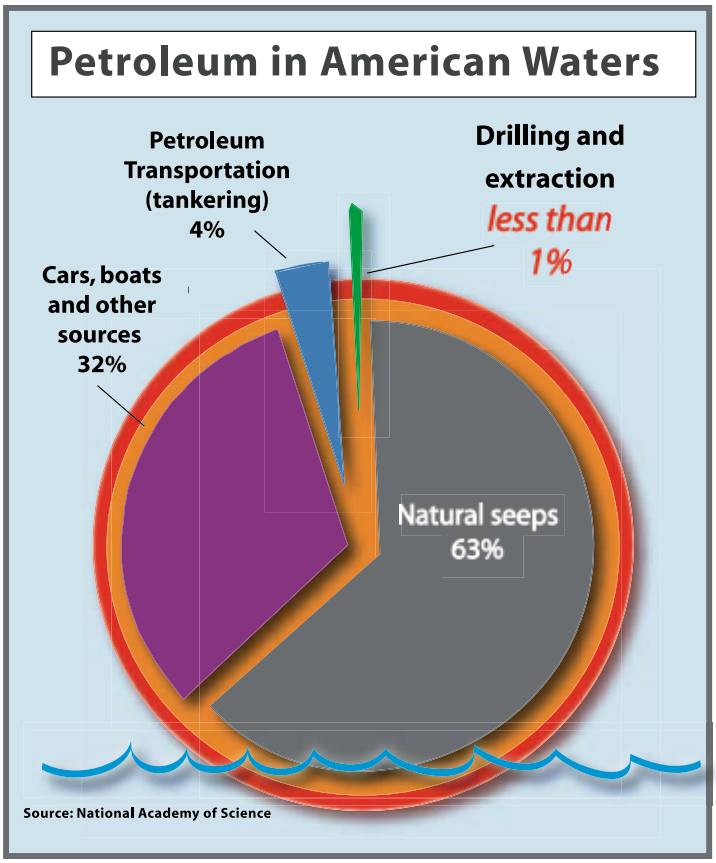
AN ENVIABLE RECORD OF ENVIRONMENTAL SAFETY

The National Academy of Science's National Research Council completed in 2002 a comprehensive study entitled, **Oil in the Sea III: Inputs, Fates, and Effects**. The report finds that although the amount of oil produced and transported on the sea continues to rise, improved production technology and safety training of personnel have significantly reduced both blowouts and daily operational spills. In fact, the report states, today, accidental spills from platforms represent only 2 percent of petroleum inputs in U.S. waters and about 4 percent worldwide.16 Furthermore, the MMS has found that most spills are quite small — with the median being three barrels or less. Between 1971 and 2000, 41 percent of all spills were less than three barrels in size, 81 percent were less than 10 barrels, and 96 percent were less than 100 barrels.[17]

Offshore oil and natural gas extraction accounts for less than one percent of all oil in the oceans.



The industry remains under intense scrutiny by its two primary regulators — the MMS and the U.S. Coast Guard— as well as a host of other governmental agencies with oversight responsibilities such as the Environmental Protection Agency and the National Oceanic and Atmospheric Administration. However, it is the MMS that regulates all exploration, development, and production activities on about 8,000 active leases to ensure that these activities are conducted safely and in an environmentally sound manner. The MMS reviews and approves industry exploration and development plans before allowing any operations to commence, monitors all lease operations to ensure that industry is in compliance with relevant requirements, and conducts scheduled and unscheduled inspections. In 1997, MMS conducted over 12,000 inspections of OCS facilities.

For further information, contact these other government agencies and industry associations:

Government Agencies:

- Minerals Management Service: *www.mms.gov*
- National Hurricane Center: *www.nhc.noaa.gov*
- U.S. Coast Guard: *www.uscg.mil*
- U.S. National Data Buoy Center: *seaboard.ndbc.noaa.gov/index.shtml*
- U.S. National Weather Service Hurricane Photo Library: *www.photolib.noaa.gov/historic/nws/index.html*

Industry Associations:

- National Ocean Industries Association: *www.noia.org*
- American Petroleum Institute: *www.api.org*
- Association of Diving Contractors: *www.adc-usa.org*
- International Association of Drilling Contractors: *www.iadc.org*
- Independent Petroleum Association of America: *www.ipaa.org*
- Natural Gas Supply Association: *www.ngsa.org*
- Offshore Marine Service Association: *www.offshoremarine.org*
- Offshore Operators Committee: *www.offshoreoperators.com*

If you have additional questions, would like to request image files or video B-roll, or are interested in contacting one of our member companies, please call Michael Kearns, NOIA's Director of Public Affairs, at (202) 347-6900.

ENDNOTES

1 U.S. Department of the Interior, Minerals Management Service. "Offshore Minerals Management." <http://www.mms.gov/offshore/> (Accessed June 2, 2004.)

2 U.S. Department of the Interior, Minerals Management Service. http://www.mrm.mms.gov/Stats/pdfdocs/coll_off.pdf (Accessed March, 2004.)

3 U.S. Department of the Interior, Minerals Management Service. "Total OCS Gas Production." <http://www.mms.gov/stats/PDFs/OCSNaturalGasProduction_March2004.pdf> Accessed March 11, 2004.

4 U.S. Department of the Interior, Minerals Management Service. "Federal Offshore Crude and Condensate Production: 1992-2003."<http://www.mms.gov/stats/PDFs/FederalOffshoreCrudeCondensateProduction92-03_March2004.pdf> Accessed March 11, 2004.

5 U.S. Department of the Interior, Minerals Management Service. "Oil Spill Facts 2002" <http://www.mms.gov/stats/PDFs/2002_OilSpillFacts.pdf > Accessed June 2, 2004.

6 U.S. Department of the Interior, Minerals Management Service. "MMS Honors Best of the Best at Annual Energy Industry Awards Ceremony" <http://www.mms.gov/ooc/press/2004/press0427c.htm> (Accessed June 3, 2004.)

7 Committee on Techniques for Removing Fixed Offshore Structures, Marine Board. (1996) An Assessment of Techniques for Removing Offshore Structures. National Research Council.

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NOIA's mission is to secure reliable access to the nation's valuable offshore energy resources in order that they may be developed, produced and supplied in an environmentally responsible manner.

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