

Paper #2-8

OFFSHORE ENVIRONMENTAL FOOTPRINTS AND REGULATORY REVIEWS

Prepared by the Offshore Operations Subgroup
of the
Operations & Environment Task Group

On September 15, 2011, The National Petroleum Council (NPC) in approving its report, *Prudent Development: Realizing the Potential of North America's Abundant Natural Gas and Oil Resources*, also approved the making available of certain materials used in the study process, including detailed, specific subject matter papers prepared or used by the study's Task Groups and/or Subgroups. These Topic and White Papers were working documents that were part of the analyses that led to development of the summary results presented in the report's Executive Summary and Chapters.

These Topic and White Papers represent the views and conclusions of the authors. The National Petroleum Council has not endorsed or approved the statements and conclusions contained in these documents, but approved the publication of these materials as part of the study process.

The NPC believes that these papers will be of interest to the readers of the report and will help them better understand the results. These materials are being made available in the interest of transparency.

The attached paper is one of 57 such working documents used in the study analyses. Also included is a roster of the Subgroup that developed or submitted this paper. Appendix C of the final NPC report provides a complete list of the 57 Topic and White Papers and an abstract for each. The full papers can be viewed and downloaded from the report section of the NPC website (www.npc.org).

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Table of Contents

EXECUTIVE SUMMARY	5
INTRODUCTION	7
A. Concept of Environmental Footprints.....	7
B. Need for Accord Between Regulations and Technology.....	7
CURRENT PRACTICES	8
HISTORY OF DEVELOPMENT.....	8
Table 1. US Government Agencies and Statutes Involved in Offshore Oil and Gas Regulations.	9
A. Regulatory and Environmental Process	10
B. Federal Inspection Program	13
C. Non-US Offshore Inspection Programs	16
D. Special Considerations for Abandonment and Reclamation.....	16
E. BOEMRE Approach to Categorical Exclusions.....	17
F. Emerging Policy: Coastal Marine Spatial Planning	18
OFFSHORE REGULATORY APPROACHES	19
A. US OCS Regulatory Approach	19
B. Non-US Regulatory Approach.....	20
C. Innovations Related to “Rigs to Reefs” Program.....	20
REGULATION OF OIL-SPILL RESPONSE PLANS	21
FINDINGS.....	22
REFERENCES	24
APPENDICES	26
A. Appendix 1: Glossary.....	26
B. Appendix 2: Case Study of a “Rigs to Reef” Project in the Gulf of Mexico	30

EXECUTIVE SUMMARY

In the context of offshore oil and gas development, the environmental footprint is regarded as the spatial extent of exploration and production activities as perceptible modifications to the sea bottom or sea surface as well as any quality-related influence on air, water or marine ecology. Each phase of development, and each facility that is constructed, can be regarded as establishing an individual environmental footprint. Decommissioning an offshore facility (including reclamation or abandonment) determines a project's residual footprint.

Minimizing and managing environmental footprints is the shared purview of technology and regulations. Prudent development of offshore oil and gas resources requires effective management and safe operation of systems in conjunction with a coordinated regulatory process that can quickly adjust to changing technological capabilities and environmental conditions.

The Outer Continental Shelf Lands Act, as amended (OCSLA), governs the development of offshore mineral resources, including oil and natural gas. But there are 13 other federal statutes that also affect offshore developments, including: (1) Clean Air Act (CAA); (2) Clean Water Act (CWA); (3) Coastal Zone Management Act (CZMA); (4) Endangered Species Act (ESA); (5) National Historic Preservation Act (NHPA); (6) Hazardous Material Transportation Act (HMTA); (7) Magnuson-Stevens Fishery Conservation and Management Act (MFC/MSA); (8) Marine Mammal Protection Act (MMPA); (9) National Environmental Policy Act (NEPA); (10) National Fishing Enhancement Act (NFEA); (11) Natural Gas Policy Act (NGPA); (12) Oil Pollution Act (OPA); (13) Rivers and Harbors Act (RHA).

The Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE), which replaced the Minerals Management Service (MMS) in 2010, is the US federal government agency tasked with regulating and managing all phases of offshore renewable and oil and gas energy leasing, exploration and development operations on the Outer Continental Shelf (OCS). The United States Coast Guard (USCG), within the Department of Homeland Security, regulates the safety of life and property on OCS facilities and vessels and the safety of navigation. The USCG enforces requirements related to security, personnel, workplace activities, and conditions and equipment on the OCS. In addition to BOEMRE and USCG, there are at least 7 other federal agencies with various authorities that affect offshore developments, including: (1) Department of Transportation (DOT); (2) Environmental Protection Agency (EPA); (3) National Oceanic and Atmospheric Administration (NOAA); (4) NOAA National Marine Fisheries Service (NMFS); (5) Federal Energy Regulatory Commission (FERC); (6) US Fish and Wildlife Service (USFWS); (7) US Army Corps of Engineers (USACE).

Advancements in technology and changes in administration of regulations have not maintained the mutual synchronization needed for optimum development of offshore oil and gas through the safest and most effective methods. Regulatory expertise and capacity has not kept pace with available technologies and technology developments have been slowed by uncertainties about the pace and scope of inspections, approvals and permits.

Major findings include:

- Conflicting statutory mandates make it difficult to achieve a balanced and predictable federal offshore policy.
- Federal regulatory agencies lack technical expertise to oversee complex technical systems and operations.
- Decommissioning offshore platforms includes beneficial options such as “Rigs to Reefs” that have been underutilized.
- DOI/BOEMRE has implemented a NEPA policy which limits the use of categorical exclusions (CE). The preparation of more time consuming environmental assessments has further stalled the commencement of drilling in the Gulf of Mexico with no commensurate environmental or safety protections.
- The Federal government ESA policy has restricted oil and gas development both onshore and offshore.
- Industry initiatives in response to the BP Macondo spill represent encouraging developments that should provide improved future response. Given suitable regulatory agreement, industry consortiums are attractive ways to ensure “economies of scale” as a means to keep individual company costs down by “pooling” assets and resources.

INTRODUCTION

A. Concept of Environmental Footprints

Every human activity holds potential for modifying its surroundings. An environmental footprint is a measurement of how a human activity modifies the air, water or land within its radius of influence. Unlike a “carbon footprint”, which is a virtual amount of carbon dioxide (or its greenhouse-gas equivalent) added to Earth’s global atmosphere per year, an environmental footprint can include physical effects at specific geographic locations. The latter, for example, could be the number of square miles physically occupied or modified by rigs, platforms or pipelines.

In the context of offshore oil and gas developments, the environmental footprint is regarded as the spatial extent of exploration and production activities as perceptible modifications to the sea bottom or sea surface as well as the volumetric influence on air, water or marine ecology. Each phase of development, and each facility that is constructed, can be regarded as establishing an individual environmental footprint and the overall suite of activities can be regarded as establishing a collective footprint.

It is intuitively granted that small footprints are better than large footprints. But to be useful as a planning and performance tool, an environmental footprint should be measurable (or at least calculable) using consistent, objective criteria. Predictable, quantitative metrics for footprints are necessary if minimization of footprints is to be addressed through technology and adherence to footprint limits is to be enforced through regulations.

Some of the most conspicuous footprints are those associated with offshore production platforms. At the end of the useful working lifetime of each platform, decisions are required concerning decommissioning, including options for abandonment or reclamation. So at the end of an offshore oil or gas development, which could last several decades, the residual footprint of greatest visibility might be the disposition of the decommissioned platform.

B. Need for Accord Between Regulations and Technology

Minimizing and managing environmental footprints is the shared purview of technology and regulations. Prudent development of offshore oil and gas resources requires effective management and safe operation of systems in conjunction with a coordinated regulatory process that can quickly adjust to changing technological capabilities and environmental conditions. Overall wellness of resource developments can be affected as much by inertia in the regulatory arena as by stagnation in the technology arena.

Effective harmony between refinement of regulations and advancement of technologies includes at least two major considerations: (a) how the regulators keep pace with changing expertise, and responsive capacities, needed to evaluate technologies and perform inspections in a timely manner; (b) how technologists can anticipate regulatory changes that affect schedules and capital investments in new hardware, software and methodologies.

CURRENT PRACTICES

The Federal government's role in the extraction of oil and gas resources on the Outer Continental Shelf (OCS) encompasses many steps that can span several decades starting with pre-lease geological and geophysical surveys; then continuing into leasing, exploration, development, and production; and finally ending with abandonment and decommissioning. Table 1 summarizes the complex oversight matrix that applies to offshore developments.

Since 1982, the Minerals Management Service (MMS) had been the agency tasked with regulating and managing all these phases. The *Deepwater Horizon* accident and the loss of 11 lives resulted in the abolishment of MMS and the restructuring of its functions into the new Bureau of Ocean Energy, Management and Enforcement (BOEMRE) with three distinctly separate entities related to oversight, resource management and revenue collection on the OCS. The purpose of the reorganization was to address real and perceived conflicts in responsibilities of the former MMS and to help restore credibility in the performance of its functions. A phased implementation is expected to begin in January 2011 and be completed within nine to twelve months following a complex process that will divide roles and responsibilities, manage ongoing interactions, determine administrative resources for the new entities, and consider the addition of new personnel.

The United States Coast Guard (USCG), within the Department of Homeland Security, regulates the safety of life and property on OCS facilities and vessels engaged in OCS activities, and the safety of navigation. The USCG is responsible for promoting workplace safety and health by enforcing requirements related to personnel, workplace activities, and conditions and equipment on the OCS. The USCG is also responsible for regulating security on OCS facilities, as specified under the Maritime Transportation Security Act, and has select duties for regulating deepwater ports as enumerated in the Deepwater Ports Act, as amended.

HISTORY OF DEVELOPMENT

The 1953 Outer Continental Shelf Lands Act, as amended (OCSLA), governs the development of offshore mineral resources, including oil and natural gas. The OCS consists of submerged lands lying between the seaward extent of state jurisdiction and the seaward extent of federal jurisdiction. OCSLA provides the authority to USCG and BOEMRE to exercise control over the "exploration, exploitation or development" of OCS mineral resources. In 2010, the OCS provided the nation with 31 percent of its total domestic oil production and 11 percent of its domestic natural gas production.

MMS was created in 1982 by consolidating the OCS units from within the Department of the Interior (DOI) into a single bureau. Although MMS had primary responsibility for inspecting technical offshore oil and gas facilities, the 1978 amendments to the OCSLA required the USCG to promulgate and enforce regulations for the safety of life and property on OCS facilities and vessels. Although BOEMRE inherited the original MMS duties, the USCG still conducts inspections to determine the existence and adequacy of lifesaving and fire-fighting equipment and that personnel have received appropriate lifesaving training. The amended OCSLA also

requires USCG, like BOEMRE, to conduct scheduled annual inspections and periodic unannounced inspections of OCS facilities. The USCG also inspects and certifies the seaworthiness of mobile offshore drilling units, issues licenses for certain marine personnel, and supervises cleanup of oil and other hazardous discharges.

Current regulation of offshore oil and gas developments is much broader and more complex than simply the OCSLA and federal agency involvements are much more numerous than simply BOEMRE and USCG. Indeed at least 14 federal statutes apply and at least 9 federal agencies are involved (Table 1).

Table 1. US Government Agencies and Statutes Involved in Offshore Oil and Gas Regulations.

Regulatory Authority (1)	Federal Statute (2)	Offshore Oil and Gas Project Phase			
		Pre-Development Phase (Exploration)	Development Phase (Design, Construct)	Produce Phase (Operations)	Divestiture Phase (De-Commissioning)
Bureau of Ocean Energy, Management and Enforcement (BOEMRE) ¹	OCSLA, NEPA, NFEA, CAA, NHPA	☐	☐	☐	☐
US Coast Guard (USCG)	OPA, PWSA	☐	☐	☐	☐
US Department of Transportation (DOT)	HMTA			☐	
Environmental Protection Agency (EPA)	CWA, CAA, RCRA	☐	☐	☐	☐
National Oceanic and Atmospheric Administration (NOAA)	CZMA	☐		☐	
NOAA National Marine Fisheries Service (NMFS)	MMPA, ESA, MFC	☐		☐	☐
Federal Energy Regulatory Commission (FERC)	NGPA			☐	
US Fish and Wildlife Service (USFWS)	ESA	☐		☐	☐
US Army Corps of Engineers (USACE)	CWA, RHA			☐	

Footnotes to Table 1:

(1) BOEMRE replaced the Minerals Management Service (MMS) in June 2010. BOEMRE further was divided (January 2011) into two other agencies: Bureau of Ocean Energy Management (BOEM) and Bureau of Safety and Environmental Enforcement (BSEE).

(2) Key to Federal Statutes:

CAA	Clean Air Act
CWA	Clean Water Act (also known as the Federal Water Pollution Control Act)
CZMA	Coastal Zone Management Act
ESA	Endangered Species Act
NHPA	National Historic Preservation Act
HMTA	Hazardous Material Transportation Act
MFC	Magnuson-Stevens Fishery Conservation and Management Act
MMPA	Marine Mammal Protection Act
NEPA	National Environmental Policy Act
NFEA	National Fishing Enhancement Act
NGPA	Natural Gas Policy Act
OCSLA	Outer Continental Shelf Lands Act
OPA	Oil Pollution Act
RHA	Rivers and Harbors Act

A. Regulatory and Environmental Process

During BOEMRE's 5-Year OCS planning process, lease sale, and exploratory and development project phases, an environmental impact analysis (EIS) is conducted pursuant to the National Environmental Policy Act (NEPA), which is designed to identify risk producing factors at a level appropriate for the different stages of development. As the process moves from a regional perspective to a very specific location for a project, stipulations are implemented to minimize and mitigate potential for harmful impacts to the environment as well as avoid conflicts between different user groups. Before the project phase can occur, a number of different mechanisms are used to ensure extensive oversight and intensive environmental review:

- **Statutory Requirements.** Energy and mineral activities on the OCS are governed by numerous statutory obligations. Operations may not proceed unless the process requirements of the following laws are satisfied: (1) OCSLA, (2) NEPA, (3) Coastal Zone Management Act (CZMA), (4) Marine Mammal Protection Act (MMPA), (5) Endangered Species Act (ESA), (5) Clean Water Act (CWA), (6) Ports and Waterways Safety Act, (7) Clean Air Act (CAA), and (8) National Historic Preservation Act.
- **Consultation Requirements.** Proposals for potential uses of the OCS must be published for public review and comment pursuant to specified statutory and regulatory provisions. For example, OCSLA requires the Secretary of the Interior to subject programmatic leasing proposals to three rounds of review prior to final approval; OCSLA requires the Secretary of the Interior to solicit comments on sale-specific proposals for an additional two rounds of public review and comment; all NEPA analysis is subject to public review in accordance with regulations by the Council for Environmental Quality (CEQ); the ESA, MMPA, and CAA permits/authorizations all include opportunity for public review and comment.

- NEPA Compliance. Each successive step in the process is subject to NEPA analyses. For example, federal agencies perform NEPA analysis for 5-year Program proposals, lease sale proposals, MMPA authorizations, seismic exploration proposals, exploration proposals, and development and production proposals.
- State and Local Government Roles. CZMA requires federal agencies to provide state and local governments the opportunity to review leasing and permit proposals. If states disagree, an elaborate mechanism for ensuring consistency with State coastal zone plans is provided. OCSLA requires the Secretary of the Interior to accept the recommendations of state and local governments on leasing proposals unless it is determined that they do not balance federal and state interests. Onshore support facilities are regulated by numerous state and local statutory regimes.
- OCSLA Programmatic Process. Pursuant to Section 18 of the OCSLA, no area of the OCS may be offered for leasing unless the Secretary of the Interior complies with the requisite scientific, analytical, and deliberative process requirements. The Secretary must document an analysis of: (a) national and regional energy needs, (b) geological, geographical, and ecological characteristics of each area, (c) regional distribution of developmental benefits and environmental risks, (d) potential conflicts with other uses of the seabed, (e) industry interest, (f) relative environmental sensitivity among regions, and (g) laws, goals, and policies of affected states.
- OCSLA Lease Sale Process. Once a 5-Year OCS Leasing Program is approved in accordance with Section 18 (above), specific lease sale proposals are subject to the process provisions of Section 19 of the OCSLA. Consultation, NEPA analysis, and cost-benefit studies must support any decision by the Secretary of the Interior. Typically, the lease sale process involves from two to three years of analysis, public comment, and deliberation.
- OCSLA Exploration Process. Once a lease is obtained, site-specific exploration proposals (seismic and exploratory drilling) must be subjected to further analysis, NEPA compliance, state and local government CZMA review, MMPA authorization, CAA compliance, CWA discharge permitting procedures, and public consultation and review prior to permit issuance.
- OCSLA Development and Production Process. If oil or natural gas is discovered in commercial quantities during the exploration process, site-specific development and production plans must be subjected to further analysis, NEPA compliance, state and local government CZMA review, MMPA authorization, CAA compliance, CWA discharge permitting, and public consultation and review prior to plan approval.
- Judicial Oversight. Each federal action above is subject to judicial review pursuant to any litigation challenge.

- Congressional Oversight. Each agency is required to inform and update Congress of leasing and permitting activities.
- Federal Inspections. The BOEMRE and USCG regularly conduct facility inspections to ensure safe operations and environmental compliance.

BOEMRE regulations are contained in 30 Code of Federal Regulations (CFR), Chapter II, with operations regulations at Part 250 (30CFR250, 2010). Specific reviews of possible environmental impacts from routine events and accidents are required for plans for exploration, development and production. Separate from these requirements, there is also specific permitting of proposed discharges, cooling water intake entrainment (for new facilities) and implementation of various Best Management Practices plans required under the Environmental Protection Agency's (EPA) National Pollutant Discharge Elimination System (NPDES) permits. All waste transport and onshore disposal/reuse is regulated under the Resource Conservation and Recovery Act (RCRA) and US Department of Transportation (DOT) regulations, as well as specific state regulations.

USCG regulations are contained in 33 Code of Federal Regulations (CFR) Parts 140 through 148, also referred to as Subchapter N (33CFR140-148, 2010). USCG regulations contain provisions for Occupational Safety and Health and citizenship of workers on the OCS, firefighting and lifesaving equipment on OCS facilities, and operational requirements. USCG regulations also contain many references to other requirements in 46CFR1-40 (2010) which is related to shipping, as well as the navigational rules and pollution prevention pertaining to oil, hazardous materials, and human waste.

For state and local government involvement, the CZMA requires federal agencies to provide them the opportunity to review leasing and permit proposals. If a state disagrees with a proposed project, there is a process for resolving inconsistencies with the state's coastal management plan or an appeal can be filed. OCSLA requires the Secretary of the Interior to accept the recommendations of state and local governments on leasing proposals unless it is determined that they do not balance federal and state interests. OCS support facilities that are located onshore are regulated by numerous state and local statutory regimes.

To provide checks and balances in its regulatory program, DOI and other agencies have the opportunity to review and comment on proposed rules and the 5-Year OCS Leasing Program. There are existing Memoranda of Understanding (MOU) and Memoranda of Agreements (MOA) with other agencies (e.g., USCG, US Fish and Wildlife Service (FWS), Department of Energy (DOE) and DOT, with states, and with other countries to accomplish this. BOEMRE is also held accountable to DOI, the White House, and Congress via multiple avenues such as: (a) the 5-Year OCS Leasing Program's planning documents and press releases on specific lease sales, (b) Forms that are submitted to the House, Senate and the Government Accountability Office alerting them of imminent final rules, (c) Information Collection packages (new and updates) that are submitted to the Office of Management and Budget for approval and that provide cost and hour burdens of new and existing rules, (d) An annual publication notice in the Federal

Register listing civil penalties, and (e) Annual appropriation reports to Congress on the agency’s performance over the past year and its future goals.

One major problem faced by BOEMRE that will be difficult to change under any reorganization, is the conflicting goals of OCSLA and other federal statutes. Table 2 provides current examples of those conflicting issues. Leasing and operations functions are governed mostly by OCSLA, which requires consultations with affected states and other federal agencies but, as noted above, the environmental reviews are based mainly under NEPA with other consultations that may be necessary with NMFS for ESA and MMPA, as well as coordination with EPA for CWA and CAA. Since the regulatory responsibilities of some of these other agencies are restricted by a single mandate, there is no requirement that they balance environmental goals with the nation’s energy and economic needs.

Table 2. Examples of Conflicting Goals Between BOEMRE and Other Agencies.

Examples of Conflicting Goals	Purpose or Issue	BOEMRE Regulatory Authorities
MOU between MMS* / BOEMRE and USCG (January 15, 1999)	Identifies the division of responsibilities and communication process for these two agencies. Annex 1 of the MOU includes a responsibility matrix for systems and sub systems related to Mobile Offshore Drilling Units	30 CFR Part 250
Notice to Lessees (NTL) No. 2009-N11 (December 4, 2009)	This NTL clarifies air quality jurisdiction on the OCS in the Gulf of Mexico. However, timing of EPA approvals of air emissions is a prolonged process in Alaska. The timing should better coincide with the BOEMRE permit and plan approval process.	30 CFR 250.302, 303 and 304.
Memorandum of Understanding between DOI and DOT (August 17, 1998).	Implements the regulation of OCS pipelines. BOEMRE regulations apply to all OCS oil or gas pipelines located upstream of the points at which operating responsibility for the pipelines transfers from a producing operator to a transporting operator.	30 CFR Part 250
USCG and BOEMRE	Certain security procedures limit BOEMRE’s ability to conduct unannounced inspections	30 CFR Part 250

* In June 2010, MMS was replaced by the Bureau of Ocean Energy, Management and Enforcement (BOEMRE) which was further subdivided later into two other agencies: Bureau of Ocean Energy Management (BOEM) and Bureau of Safety and Environmental Enforcement (BSEE).

B. Federal Inspection Program

The OCSLA requires annual scheduled inspections and periodic unannounced inspections of OCS oil and gas operations. In addition to its own legal mandates, BOEMRE also conducts inspections for the EPA on air quality and point-source discharges, for the USCG on safety, and for DOT on pipelines—all without reimbursement. Even though the USCG has statutory inspection responsibilities for certain facilities, due to resource constraints and priorities, it does not have an active inspection program, but both agencies oversee and administer strict “workplace safety” requirements for offshore facilities and vessels.

The USCG regulates certain activities relate to mobile offshore drilling units (MODUs) and Floating Offshore Installations (FOIs) that operate in the Gulf of Mexico. The USCG oversees the safety of systems at the platform level of a MODU, as opposed to the sub-platform drilling and production systems overseen by the BOEMRE. The areas of USCG oversight include the MODU's hull structure, navigation equipment, lifesaving equipment, fire protection equipment and structures, the safety of the electrical system, and the safety of workers as they perform their routine tasks. The USCG conducts an initial examination of a unit before it is allowed to operate on the OCS. Once it has been satisfactorily examined, the MODU is issued a Certificate of Inspection (COI; if U.S. flagged) or a Certificate of Compliance (COC; if foreign flagged). For the COC, the USCG conducts an examination for issuance every two years, with a mid-period re-examination annually. US-flagged MODUs and FOIs receive and annual "topside" inspection and the hull portion is examined twice in a five-year period.

Over the years, as BOEMRE's predecessor, MMS, downsized and industry activity increased, BOEMRE has become vulnerable to staffing pressures. Between 1982 and 2007, OCS leasing increased by 200% while oil production increased by 185%. In that same time, staffing resources decreased by 36% despite the recent and projected increase in leasing activities and oil and natural gas production. Current funding levels for both BOEMRE and the USCG prevent a more rigorous inspection program. On September 13, 2010, President Obama requested additional funding to facilitate the reorganization of BOEMRE. The President's current request for BOEMRE is \$222.9 million, an \$86.4 million increase over the FY2010 BOEMRE appropriation.

The frequency of BOEMRE's inspections is based partly on perceived risk. In the Gulf of Mexico in 2009, there were 97 operators producing oil and 106 operators producing gas along with about 3,000 offshore facilities but only 61 OCS inspectors. In the Pacific, six operators were producing oil and gas at 23 platforms and there were five inspectors. Currently, there is one inspector in Alaska and one operator producing from the Alaska OCS.

Both BOEMRE and USCG recognize that inspections represent only one tool for ensuring safety and that positive inspection results do not guarantee desired performance outcomes. Nonetheless, inspectors are an important line of defense for promoting safety and environmental protection for offshore oil and gas development. One concern that has been expressed is that the recruitment of BOEMRE's engineers and inspectors from the private sector creates ethical issues regarding enforcement of safety and environmental regulations because such employees may be reluctant to assess penalties on their former companies. Alternatively, if government fails to recruit employees with industry experience, employees may not be able to gain the critical knowledge necessary to maintain pace with rapidly changing advancements in technology. The primary challenge is how best to create an "arms-length" relationship between government and its regulated industry while also providing an adequate level of technical expertise to ensure proper oversight and enforcement.

There are certain challenges that affect the overall effectiveness of the inspection program. Specifically, BOEMRE inspectors (a) are part of a program structure that does not provide for the elevation of issues or concerns up the management chain; (b) begin and continue their jobs

with no standardized training, testing, or certification; (c) operate with minimal resources; and (d) sometimes operate without strong management support. OCS inspectors are not required to witness operations, although they will do so when operations are in progress during an inspection. Inspectors have reported, however, that operators would close down work in certain areas when the inspectors were on the facility.

Currently, for BOEMRE, new engineers and inspectors are inducted into the regulatory program through on-the-job training provided by more experienced government personnel. The amount of time and the structure of this training vary from office to office. While hands-on experience is important, it does not address the need for substantive, consistent training in all aspects of the job, including regulations, standards, policies, technical updates and other information. Furthermore, there is no formal process for testing and certification -- inspectors are allowed to work on their own based on office policy and/or the recommendation of the training inspector. Since the agency lacks a formal training, testing, and certification process, it tends to look for new inspectors who already have experience, usually through prior work in the oil and gas industry. A lack of technical expertise could jeopardize environmental protection.

BOEMRE's policy and organizational structure also leaves little opportunity for higher education opportunities and career advancement for inspectors. In the past, inspectors that already had specialized training in drilling or production facilities were assigned accordingly. For the past 15 years, however, the bureau's emphasis has been to cross-train inspectors in all inspection disciplines, which can help provide valuable back-up support within field offices.

Another barrier in the recruitment of experienced engineers and inspectors is salary discrepancies between federal employees and their counterparts in the private sector. That salary-gap issue was noted in the DOI Office of Inspector General's report in December 2010 (DOI OIG, 2010).

There are several examples being considered for the creation of an industry-government oversight entity to ensure the highest operating excellence at offshore facilities. One model is the nuclear industry's Institute of Nuclear Power Options (INPO), which was created as a result of the accident at Three Mile Island in 1979. INPO's mission is to promote the highest levels of safety and reliability in the operation of nuclear power plants. The program specifies appropriate safety standards including those for management, quality assurance and operating procedures and practices. INPO also conducts independent evaluations.

Another model is the Responsible Care program, which is the chemical industry's global voluntary initiative that was first developed in Canada in 1985 to address public concerns about the manufacture, distribution and use of chemicals. The chemical companies work together through their national associations to improve their health, safety and environmental performance.

BOEMRE published a final rule on October 15, 2010 (Federal Register, 2010) that requires operators to integrate a comprehensive safety and environmental management systems (SEMS) program into the management of their OCS operations, thereby providing for the prevention of waste and conservation of natural resources. The rule incorporated and made mandatory the American Petroleum Industry's (API's) Recommended Practice (RP) 75, "Development of a

Safety and Environmental Management Program for Offshore Operations and Facilities”. The intent is to hold the operator accountable for the overall safety of the offshore facility, including ensuring that all contractors and subcontractors have safety policies and procedures in place that support the implementation of the operator’s SEMS program and align with the principles of managing safety as set forth in API RP 75. The October 2010 final rule followed an earlier rule-making cycle, dating from 2009, for which public comments received on the proposed SEMS rule described it as “highly prescriptive (Verret and Sampson, 2009). Specifically, criticism was directed to the agency in 2009 for rewriting API RP 75 and issues related to incorporating industry standards can be contentious such as exempted sections, modifications and interpreting “should” as “must.”

C. Non-US Offshore Inspection Programs

Norway has achieved an outstanding performance record by working closely with industry. The government routinely holds conferences with the regulated community and makes them responsible for explaining their safety practices. All companies have a general duty to ensure compliance with statutory rules as well as their own set of requirements for activities. The supervisory activities of the government agency (Petroleum Safety Authority Norway or Petroleumstilsynet) do not exempt industry of this duty.

The United Kingdom’s Health and Safety Executive (HSE) is a national, independent regulator that works in the public interest to reduce work-related death and serious injury across Great Britain’s workplaces.

Australian inspections are conducted by government inspectors of the National Offshore Petroleum Safety Authority. In some cases, they obtain validation by third-party contractors employed by the operator. The Netherlands has a similar arrangement.

The Brazilian government has public sector inspectors who audit, monitor, and inspect facilities on a regular basis.

Canada Nova Scotia Offshore Petroleum Board requires a Certificate of Fitness from a recognized certifying authority for installations (drilling, accommodation, diving, and production installations). The Petroleum Board also conducts inspections, audits, and investigations. They also rely on industry self-inspections and audits.

New Zealand’s Department of Labour employs government inspectors but also requires installations to have a Certificate of Fitness from a Certifying Authority, or an employer may seek approval to operate a Verification Scheme.

D. Special Considerations for Abandonment and Reclamation

Production platforms include topside (above ocean surface) and subsea components as well as connections to subsea pipelines that transport the produced hydrocarbons to processing and storage facilities. The crucial connector between the topside and subsea wells is a “jacket” consisting of tubular steel that houses production equipment and pipes. Federal regulations

require operators to restore the seafloor to its original condition at the end of an abandonment project. For the US, the operable example is BOEMRE's NTL 2010-G05 ("Decommissioning Guidance for Wells and Platforms"; BOEMRE, 2010b). Any decommissioning plan must include provisions for all of the following steps:

- Platform preparation and initial pipeline scope.
- Topsides and deck removal.
- Jacket removal (and "reefing" if included in permitted scope).
- Site clearance and final pipeline scope.

That succession of steps reduces the final environmental footprint of the platform but also introduces some additional regulatory complexities, especially if "reefing" is to occur.

E. BOEMRE Approach to Categorical Exclusions

While providing for an environmental impact statement (EIS) to protect environmental quality from a potentially hazardous project, NEPA also identifies categories of activities where stringent EIS requirements can be waived. Categorical exclusions (CEs) are defined as "a category of actions which do not individually or cumulatively have a significant effect on the human environment . . . and for which, therefore, neither an environmental assessment nor an environmental impact statement is required" (40CFR§1508, 2010). As of October 2010, BOEMRE policy (BOEMRE, 2010c) is to review all CEs that include, but are not necessarily limited to, the following:

- Offshore geological and geophysical (G&G) mineral exploration activities, except when the proposed activity includes the drilling of deep stratigraphic test holes or uses solid or liquid explosives. Deep Stratigraphic tests and use of solid or liquid explosives require further environmental analysis.
- Offshore lease or unit exploration development/production plan or a Development Operation Coordination Document in the central or western Gulf of Mexico (30 CFR 250.2) except those proposing facilities:
 - (1) In areas of high seismic risk or seismicity, relatively untested deep water, or remote areas, or
 - (2) within the boundary of a proposed or established marine sanctuary, and/or within or near the boundary of a proposed or established wildlife refuge or areas of high biological sensitivity; or
 - (3) in areas of hazardous natural bottom conditions; or
 - (4) utilizing new or unusual technology.

- Minor revisions to or minor variances from activities described in an approved exploration plan (EP) or development and production plan (DPP) or pipeline applications.
- Preliminary activities (except those in the Central and Western Gulf of Mexico) conducted on a lease. These are activities such as G&G surveys and other surveys necessary to develop a comprehensive EP or DPP.
- Pipeline right-of-way grants and lease term pipeline applications, and any revisions thereto that do not result in a new pipeline corridor to shore.

The BOEMRE policy limits the use of CEs and thereby adds delays to the environmental assessment and permitting processes. Although renewed scrutiny of CEs has been driven by broad inquiries into the *Deepwater Horizon* / BP Macondo incident, the value of restricting CEs is not clear in the light of the commercial delays and negative economic impacts that such restrictions create.

F. Emerging Policy: Coastal Marine Spatial Planning

On July 19, 2010, President Obama signed an Executive Order that led to the creation of a National Policy for the Stewardship of the Ocean, our Coasts, and the Great Lakes. The policy will be guided by the National Ocean Council (NOC), which has been formed and met for the first time in November 2010. NOC has begun developing the draft strategic action plans and these are expected to be released to the public by summer 2011. These plans will address the nine priority objectives that relate to the most pressing challenges facing the ocean, coasts and Great Lakes. One of the priority objectives is for Coastal and Marine Spatial Planning (CMSP).

Coastal marine spatial planning is an integrated ecosystem-based management strategy with the goal of maintaining the marine ecosystem in a healthy, productive and resilient condition. The intent of CMSP is to identify areas most suitable for various types or classes of activities to reduce conflicts among uses, reduce environmental impacts, facilitate compatible uses, and preserve critical ecosystem services to meet economic, environmental, security, and social objectives. The National Ocean Policy states that one of the guiding principles of CMSP is for multiple existing uses (e.g., commercial fishing, recreational fishing and boating, subsistence uses, marine transportation, sand and gravel mining, and oil and gas operations) and emerging uses (e.g., offshore renewable energy and aquaculture) to be managed in a manner that enhances compatibility among uses and with sustained ecosystem functions and services, provides for public access, and increases certainty and predictability for economic investments.

The creation of and strict adherence to “planning or systematic zoning areas” in the ocean environment that preclude oil and gas development could constrain the search for new offshore hydrocarbon resources and limit overall energy development.

Access to offshore areas is needed because the remaining oil and natural gas prospects – particularly larger fields – are likely to be located offshore. The majority of US domestic production, however, consists of modest amounts produced from hundreds of thousands of wells in thousands of onshore and offshore oil and gas fields. The nation’s long-term energy security,

therefore, depends upon a diversity of supply sources as well as a constant supply of new discoveries to replace declining production from existing and end-of-life wells to meet our growing demand for energy.

OFFSHORE REGULATORY APPROACHES

A. US OCS Regulatory Approach

The desired regulatory approach is to effectively minimize injuries, fatalities, accidents, fires, explosions, collisions, pollution incidents, or damage to the marine environment with respect to all oil and gas operations on the OCS. The regulatory approach also must ensure that the respective agency can be responsive to industry when innovative approaches to compliance are developed or when there are technological and environmental changes.

There are two ways to achieve the stated goals, which can be categorized as either “prescriptive” or “performance-based.” These are not mutually exclusive concepts but rather two methods that can be used together in a balanced way to achieve the desired outcomes related to safety, environmental protection, economic growth and national security.

Prescriptive regulations are those that define the minimum requirements to permit an activity. In a complex industry, however, minimum requirements can quickly become restrictive or insufficient and make it difficult for industry to propose alternative approaches that can best meet technological or environmental conditions. A prescriptive approach also demands continued growth in regulations because changes in technology will necessitate changes to the regulatory regime, which also corresponds to significant time to process and greater use of government resources.

It is possible for industry to demonstrate that performance-based regulations can increase the current level of safety and environmental protection. This would also improve the efficiency of the current prescriptive regulatory system by making it more responsive to innovative approaches and technological and environmental changes.

Although most of 30 CFR Part 250 regulations are prescriptive (30CFR250, 2010), a hybrid OCS regulatory program has been in place for years in which operators may meet the performance standard (at the beginning of each regulation) by other means if they can demonstrate that the alternative method provides equal or greater safety/environmental protection. The Subpart O training requirements are performance-based, and deepwater development projects (for which detailed standards do not exist) are described in a Deepwater Operations Plan (DWOP).

There are currently opportunities within the implementing regulations for regulators to ensure a proper balance between prescriptive and performance-based regulations. Those regulations require industry to submit various site-specific plans and permit requests for agency approval before operations can begin. There are many engineering-based prescriptive requirements for installing, maintaining, testing, and inspecting safety control devices by the operator. Current OCS regulations incorporate about 100 referenced standards. Performance-based elements include the following within the areas of safety, training, and broad-based environmental

protections: Performance Standards (30 CFR 250.106–124); Disqualification (30 CFR 250.135 and 136); Subpart O, Well Control and Production Safety Training (30 CFR 250.1500–1510); Best Available and Safest Technology (30 CFR 250.105); the use of alternative technologies (30 CFR 250.141 and 30 CFR 250.408); Pollution Prevention Control (30 CFR 250.300(a)); Drilling Operations (30 CFR 250.401(e)); Well Completions (30 CFR 250.500); Workover Operations (30 CFR 250.600); Production Safety Systems (30 CFR 800); Sulfur Operations (30 CFR 250.1600); and Decommissioning (30 CFR 250.1703(f)).

Without performance-based standards, the rate of technological change as operations move into increasingly challenging environments would make it difficult for the agency to promulgate regulations and participate in the development of industry standards in a timely manner.

B. Non-US Regulatory Approach

Norway's initial experience with prescriptive regulations, like the United States, was not successful as it hindered new technology, kept the regulators behind the industry on the technology curve, and constantly updating prescriptive regulations proved too burdensome to the agency. Norway has moved to a more performance-based approach as a means to ensure industry keeps up with technological advances. The government has initiated a two-year study to assess the program. The results appear positive and will be released in a report soon. The same is true for Britain's HSE approach following the *Piper Alpha* incident in the North Sea in 1988. Canada is also moving in this direction. Australia has a performance-based approach whereby operations must submit and justify detailed safety plans. Each of these countries has a rigorous monitoring and inspection program to ensure companies are adhering to approved standards.

The International Regulator's Forum (IRF) monitors offshore performance of each member country based on selected measurements. Results are available online through a link to IRF (2009). The IRF provides an important venue for different countries to share critical data concerning advancements in regulatory practices and compare the various alternatives described in this paper. The IRF provides a useful framework of common definitions and criteria for making comparisons and learning from other experiences. A crucial part of this interchange is the review of recent significant incidents, such as the North Sea *Piper Alpha* incident (July 1988), the Australian Montara incident (August 2009) and the Gulf of Mexico *Deepwater Horizon* / BP Macondo incident (April 2010). Twenty nations participate in IRF and share information on best international practices.

C. Innovations Related to "Rigs to Reefs" Program

Individual state departments of marine resources (for example, the Louisiana Department of Wildlife and Fisheries), BOEMRE and petroleum companies are working together to develop offshore artificial reefs out of decommissioned oil and gas platforms, known as "The Rigs-to-Reefs" program. Title II of the National Fishing Enhancement Act of 1984, initiated a National Artificial Reef Plan by the National Marine Fisheries Service with support from other Federal authorities. Old oil and gas production platforms that were ready for de-commissioning ("idle iron") make for excellent offshore hard-bottom habitat in the northern Gulf of Mexico.

The Mississippi Department of Marine Resources has pursued an active offshore artificial-reef program since the late 1990s (Mississippi DMR, 1999). According to Mississippi DMR (2010):

“The Rigs-to-Reef Program offers conservation-minded alternatives for the platforms, as opposed to onshore disposal with no subsequent habitat value. The average platform jacket can provide up to 2-3 acres of hard-bottom habitat for marine invertebrates and fishes, and these submerged platform jackets currently provide habitat for thousands of marine species. This habitat is beneficial to both the marine organisms that inhabit these reef systems and the commercial and recreational fishermen who seek the highly prized fish that can be found within this newly created ecosystem.”

A case study of “Rigs to Reef” success is included as Appendix 2. Experience acquired from that project is included among the findings listed later in this report.

REGULATION OF OIL-SPILL RESPONSE PLANS

Oil-Spill Response Plans (OSRPs) are prepared in accordance with BOEMRE regulations at 30 CFR 254, which require offshore operators of oil handling, storage, or transportation facilities to submit a prescribed OSRP for approval by BOEMRE prior to facility operation (30CFR250, 2010). An MOU exists between BOEMRE and USCG that establishes jurisdiction and clarifies responsibilities between those agencies regarding oil discharge planning, preparedness, and response although there remain ambiguities in responsibility and authority (see Table 2).

After initial submission and approval, OSRPs are reviewed every two years but many details within the plans may not be reviewed to verify that important information is correct. For example, BOEMRE’s review process has been described by oil-spill coordinators as being designed to check for the inclusion of required sections rather than to verify the accuracy of information in those sections. Furthermore, it appears that BOEMRE did not regularly verify the calculation for worst-case discharge (WCD) scenarios. Those WCD calculations are key drivers for the response requirements in the OSRPs.

According to BOEMRE, containing and controlling the source of the spill is not the emphasis of the OSRP; the plans are instead based largely on recovering oil from the spill. Thus, recovering oil from a WCD scenario is a major driver for the plan’s response requirements. Currently, the regulatory formula for calculation of the WCD scenario anticipates a spill flow of no longer than 30 days. Effective June 18, 2010, BOEMRE issued Notice to Lessees and Operators (NTL) No. 2010-N06 (BOEMRE, 2010a) which requires operators to calculate the highest potential volume of liquid hydrocarbons for a blowout and WCD. The purpose of the NTL was to provide national guidance to lessees and operators regarding the content of the information BOEMRE requires regarding blowout and WCD scenarios.

FINDINGS

Advancements in technology and changes in administration of regulations have not maintained the mutual synchronization needed for optimum development of offshore oil and gas through the safest and most effective methods. Regulatory expertise and capacity has not kept pace with available technologies and technology developments have been slowed by uncertainties about the pace and scope of inspections and approvals.

Specific findings are:

- Conflicting statutory mandates make it difficult to achieve a balanced and predictable federal offshore policy.
 - Overall safety and success of offshore developments would benefit from a more coordinated and consolidated regulatory regime that allows rational and predictable planning and ensures an optimal balancing of the nation’s energy, economic, and environmental goals.
- Federal regulatory agencies lack technical expertise to oversee complex technical systems and operations.
 - Deficiencies include lack of resources, pay grades, and insufficient training.
 - Improvements would include:
 - Adopt standards that allow industry training and experience; administrative procedures that permit use of industry training facilities and programs; industry-government intern exchanges.
 - Increase funding for OCS Inspections Programs, including both BOEMRE and USCG, with emphasis on building skills and leveraging technology to make inspections more effective.
 - Establish an industry-funded independent inspection group, which would be subject to federal oversight.
 - Adopt best practices from the international regulatory community. Participation by DOI and USCG in the IRF would allow the US to benefit from experience of other countries.
- Decommissioning offshore platforms includes beneficial options such as “Rigs to Reefs” that have been underutilized.
 - Decommissioning offshore platforms includes beneficial options in addition to complete removal of “idle iron”. Specifically, re-purposing the subsea components of platforms

can benefit marine ecology as tested in the US “Rigs to Reefs” program in the Gulf of Mexico through some useful revisions:

- The “Rigs to Reef” program could be expanded to reduce the destruction of these marine habitats established around long-lived offshore platforms. One policy enhancement could include increased incentives for operators to reef their platforms.
 - Revision of BOEMRE’s NTL 2010-G05 to allow operators to leave their jacket structures in place for an extended period of time.
- DOI/BOEMRE has implemented a NEPA policy which limits the use of categorical exclusions (CE). The preparation of more time consuming environmental assessments has further stalled the commencement of drilling in the Gulf of Mexico with no commensurate environmental or safety protections.
 - The Federal government ESA policy has restricted oil and gas development both onshore and offshore.
 - Industry initiatives in response to the BP Macondo spill represent encouraging developments that should provide improved future response. Given suitable regulatory agreement, industry consortiums are attractive ways to ensure “economies of scale” as a means to keep individual company costs down by “pooling” assets and resources.

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APPENDICES

A. Appendix 1: Glossary

API. American Petroleum Industry.

BOEMRE. US Bureau of Ocean Energy Management, Regulation and Enforcement. As of June 2010, BOEMRE was created to succeed the former Minerals Management Service (MMS). BOEMRE itself was divided into two different agencies (BOEM and BSEE) in January 2011.

CAA. Clean Air Act. US federal legislation, dating from 1970, that provides for identification and regulation of air pollutants. EPA administers the CAA.

CEQ. Council for Environmental Quality.

CFR. Code of Federal Regulations.

CMSP. Coastal Marine Spatial Planning. A comprehensive, adaptive, integrated, ecosystem-based, and transparent spatial planning process, based on sound science, for analyzing current and anticipated uses of ocean, coastal, and Great Lakes areas. CMSP identifies areas most suitable for various types or classes of activities in order to reduce conflicts among uses, reduce environmental impacts, facilitate compatible uses, and preserve critical ecosystem services to meet economic, environmental, security, and social objectives. In the US, it is manifest as a Federal government policy that prescribes establishment of “planning areas” to manage multiple existing uses (including fishing and boating in addition to oil and gas operations) and emerging uses (for example, offshore renewable energy and aquaculture) of US coastal and marine waters.

COC. Certificate of Compliance.

COI. Certificate of Inspection.

CWA. Clean Water Act. US federal legislation, dating from 1972, that prescribes the regulatory structure for protecting US water from pollution. Section 301(a) of the CWA, 33 USC 1311(a), renders it unlawful to discharge pollutants to waters of the United States in the absence of authorizing permits. The EPA is responsible for administration of the CWA.

CZMA. Coastal Zone Management Act. US federal legislation, dating from 1972, that prescribes the regulatory structure for management of coastal resources, including the Great Lakes, and balances economic development with environmental conservation. It provides for two national programs: National Coastal Zone Management Program and the National Estuarine Research Reserve System. The NOAA is responsible for administration of the CZMA.

DOE. US Department of Energy.

DOI. US Department of the Interior.

DOT. US Department of Transportation.

DWOP. Deepwater Operations Plan

EPA. US Environmental Protection Agency. This independent agency is responsible for rulemaking and enforcement of environmental regulations.

ESA. Endangered Species Act

FOI. Floating Offshore Installation.

FWS. US Fish and Wildlife Service.

G&G. Geological and geophysical. An abbreviation favored in some MMS or BOEMRE documents with reference to offshore oil and gas exploration otherwise abbreviated as E&P (exploration & production).

GOM. Gulf of Mexico.

HMTA. Hazardous Material Transportation Act. US federal legislation, dating from 1975, that provides for regulations to protect against the risks to life and property inherent in the transportation of hazardous material in commerce. Hazard material is defined as any “particular quantity or form” of a material that “may pose an unreasonable risk to health and safety or property.” The DOT is responsible for administering the HMTA.

HSE. UK Health and Safety Executive

INPO. Institute of Nuclear Power Operations.

IRF. International Regulators’ Forum.

MFC (or MSA). Magnuson-Stevens Fishery Conservation and Management Act. US federal legislation, dating from 1976 and amended in 1996 and 2006, which provides for regulatory, marine fisheries management in US federal waters. Areas of focus include development of baseline scientific data, establishment of catch limits and international coordination. The NOAA is responsible for administering the MFC (MSA).

MMPA. Marine Mammal Protection Act. US federal legislation, dating from 1972 and significantly amended in 1994, which prohibits, with certain exceptions, the "take" (hunting and killing) of marine mammals in US waters and by US citizens on the high seas, and the importation of marine mammals and marine mammal products into the US. The exceptions are for Alaska Native subsistence hunting and limited scientific research. The NOAA is responsible for administering the MMPA.

MMS. US Minerals Management Service (MMS). As of June 2010, it was replaced by the BOEMRE.

MOA. Memorandum of Agreement.

MODU. Mobile drilling unit.

MOU. Memorandum of Understanding.

NEPA. National Environmental Policy Act (NEPA). US federal legislation, dating from 1970, that provides for an environmental impact statement (EIS) as a core requirement of federal regulatory agencies that are responsible for permitting infrastructure projects, including oil and gas exploration and development.

NFEA. National Fishing Enhancement Act. US federal legislation, dating from 1984, that provides for regulations to establish national standards for the construction and siting of artificial reefs in US waters to enhance fishery resources and fishing opportunities. The NOAA, and especially NMFS, is responsible for administering NFEA.

NGPA. Natural Gas Policy Act. US federal legislation, dating from 1978, which provides for Federal regulation of interstate oil and gas pipelines. The Federal Energy Regulatory Commission (FERC) is designated to administer the NGPA.

NHPA. National Historic Preservation Act. US federal legislation, dating from 1966 and amended in 1992 and 2006, which commits the Federal government to "provide leadership" for preservation, "contribute to" and "give maximum encouragement" to preservation of pre-historic and historic sites of cultural significance. The significance to offshore developments is that NHPA requires all Federal agencies to take into account the effects of their actions on historic properties. The US National Park Service (NPS) was designated as the coordinator of Federal support with State and Native American cultural organizations.

NMFS. US National Marine Fisheries Service.

NOAA. US National Oceanic and Atmospheric Administration. An agency within the US Department of Commerce that is responsible for collecting, organizing and distributing oceanographic, weather and climate data for US states and territories.

NPDES. National Pollutant Discharge Elimination System.

NPS. US National Park Service.

NTL. Notice to Lessees and Operators.

OCS. Outer Continental Shelf. By physiographic definition the continental shelf is the expanse of seafloor between the shoreline and the break in slope at the continental margin that defines the continental slope and the more distant benthic regions of the ocean bottom. The continental shelf varies in width and depth. For US regulatory purposes, the OCS is defined as "an offshore area in the United States that begins where state ownership of mineral rights ends and ends where international treaties dictate". The OCS includes both shallow and deepwater developments.

OCSLA. Outer Continental Shelf Lands Act. US Federal legislation, dating from 1953 and amended through 2002, which provides for regulation of the use of "submerged lands" of the Outer Continental Shelf that are defined as US land. The original Act designated the DOI to administer the regulations and currently BOEMRE (formerly MMS) is the administrator.

OPA. Oil Pollution Act. US Federal legislation, dating from 1990, which requires oil-spill contingency planning both by government and industry and prescribes fines and other legal penalties for operators whose actions create oil spills. Administrative authority for OPA is shared between the US Coast Guard (USCG) and the US Environmental Protection Agency (EPA).

OSRP. Oil Spill Response Plan.

RCRA. Resource Conservation and Recovery Act. US federal legislation, dating from 1976, that provides for a “cradle to grave” regulation of hazardous waste. The EPA administers RCRA.

RHA. Rivers and Harbors Act. US Federal legislation, dating from 1899, which provides for regulation of projects and activities in navigable waters, including and harbors and rivers. In 1966, authority over bridges and causeways was transferred to the US Department of Transportation (DOT) but other administrative authority for the RHA remains with the US Corps of Engineers (USACE).

RP. Recommended Practice.

SEMS. Safety and Environmental Management Systems.

USACE. US Army Corps of Engineers.

USCG. US Coast Guard.

WCD. Worst Case Discharge

B. Appendix 2: Case Study of a “Rigs to Reef” Project in the Gulf of Mexico

Summary

Shell Offshore Inc. (SOI) proposed donating the eight-pile jacket of the Eugene Island 331A Platform located in OCS-G-02116 to the Louisiana Artificial Reef Development Program administered by the Louisiana Department of Wildlife and Fisheries (LDWF).

The platform was installed by SOI in 1972. It sustained structural damage from Hurricane Ike in 2008. The platform had no future utility by SOI and needed to be abandoned. All platform wells were plugged and abandoned in 2004.

The jacket was approximately 55' x 156' at surface and 110' x 188' at mud-line base. The height of the jacket was approximately 276'. The platform location, Eugene Island 331 was not in an MMS classified sensitive biological area.

SOI's intent was to remove the complete jacket section in one piece after the deck and associated production equipment had been removed and brought to shore. Contingency plans were in place if the jacket had to be removed in two separate sections due to prior hurricane damage. The jacket will be free of any hydrocarbons or other hazardous materials that may be detrimental to marine life.

SOI was responsible both operationally and financially to place the donated structure at a specific site selected by the LDWF. Based on earlier discussions with the LDWF, the proposed site that would provide optimum marine habitat for the reefed jacket (and taking into account the towing distance) was the southeast corner of the Eugene Island 313 Special Artificial Reef Site (SARS) location. The center point of the proposed reefing site was 625' from the south line of the EI313 block. The orientation of the jacket on the seafloor was determined by the LDWF. Water depth is approximately 217' in the block.

Hurricane Ike Damages

The EI 331A platform was located approximately 155 miles southwest of New Orleans. On September 12, 2008 the platform was hit by Hurricane Ike, a Category 2 hurricane with wind speeds exceeding 105 - 120 mph and wave heights exceeding 55 feet.

The topsides structure had no visible damage to the main structure; however the damage to the secondary structure was substantial.

Grating and handrails were missing and equipment on the deck was displaced. Several stairways were twisted and the platform quarters were damaged extensively.

An underwater inspection of the jacket structure by divers discovered three jacket legs facing the storm approach side were severely damaged. However the piles, inside the legs, were still intact. Many diagonal braces were buckled, broken or missing. Fortunately no damage to any of the 11 pipelines connecting to the platform was found.

It was determined that the repair of topsides facilities was feasible; however Shell structural engineers determined it was not feasible to repair the supporting structure, the jacket. Therefore the platform needed to be removed to safeguard against a potential future collapse if exposed to any additional hurricanes.

Consequently, all pipelines had to be re-routed or abandoned.

Developing the Plan

Once the damage was assessed after Hurricane Ike, it allowed for the development of a more detailed way forward.

Staff resources were identified and a project team was assembled. The BOEMRE was engaged and informed of the abandonment plans. The remaining strength of the damaged platform was estimated by combining observations and surveys with analyses. Allowable weather criteria for decommissioning operations were established to ensure the safety of workers on the platform.

A project strategy was developed to determine the best way to remove the structure. The jacket condition and removal timing requirement drove the strategy.

This project was separated into the following four main campaigns:

- 1) Platform preparation and initial pipeline scope.
- 2) Topsides and deck removal.
- 3) Jacket removal and reefing.
- 4) Site clearance and final pipeline scope.

Platform Preparation & Pipeline Work

a) Initial Preparation

To prepare the platform for workers, missing grating and handrails were replaced to make the platform safe. The pipelines and facilities were “de-inventoried” to remove the hydrocarbons. Once the pipelines were pigged, flushed, plugged, & disconnected, the platform equipment packages were prepared for removal.

The work was accomplished using helicopter day trips, as well as one mobilization of Global Industries *Olympic Challenger*.

b) Auger 20” Pipeline Re-route and Repairs

During normal operations the Auger TLP 20” oil export line flowed over EI331A. It needed to be re-routed around the damaged platform as part of the abandonment campaign.

c) Pipeline Re-Route – Phase I

To allow the Auger TLP to resume production after Hurricane Ike, a temporary pipeline re-routing was initiated capping the Auger 20” line at EI 331A and opening existing subsea valves allowing flow into the Poseidon oil pipeline system. It was completed on October 29, 2008.

d) Pipeline Re-Route-Phase II

The permanent re-routing re-established flow into the original Auger pipeline export system, after by-passing the damaged platform. Permanent subsea pipe spools were installed around the EI-331A platform to re-establish the normal flow path. It was completed on February 8, 2009.

The pipeline was re-routed at a radius of 500 ft around the platform.

The *Normand Clipper*, under contract to Oceaneering, was used to set large spools on the seafloor. Divers from Epic Divers completed the flange make-ups.

Topsides and Deck Removal

The primary campaign commenced on April 23, 2009 and the final deck section was removed on May 27, 2009.

The order of operation consisted of completing making the platform safe for access, and removing small deck debris. Thereafter, heavy packages, the production skid, the pump module and the helideck were all removed. Additionally, the flare tower was removed in seven sections. Finally the deck was removed in three sections, which was the same sequence in which it had originally been installed.

The Global Industries Derrick Barge *Hercules* was used to remove the topsides packages and the deck.

The lift capacity of the *Hercules* is about 2,000 tons and it was also used as a flotel for offshore construction workers during the topsides campaign.

According to plan, the Topsides Campaign was complete before the beginning of hurricane season minimizing any chance of platform collapse if hit by another hurricane.

Jacket Removal and Reefing

The offshore work started on August 3, 2009 with the jacket toppling at the reef site commencing on September 20, 2010.

The main pilings and skirt pilings were to be cut 15’ below mud-line. Explosives were not to be used in the removal process in order to minimize impact on the environment. An internal cutting tool was used to cut the piles.

The following main operations were conducted in sequence. (i) The piles were jetted out and cut below the mudline with the internal hydraulic cutting tool (ii) Divers prepared the underwater jacket by cutting pin holes in the jacket legs and piles in order to keep the jacket-pile assembly intact. Pins were inserted into the holes. (iii) Hook assemblies were installed at the top-of-leg locations. (iv) The jacket was lifted free and towed vertically through the water. (v) The Jacket was toppled in the reef site.

Versabuild was contracted to execute the jacket preparation, lifting, transportation and toppling campaign using their *Bottom Feeder*.

a) Reefing Permits

The Rigs-to-Reefs Program in Louisiana is administered by the Department of Wildlife and Fisheries (LDWF). The LDWF coordinates application approvals or denials with the BOEMRE. Early in the project SOI met with the LDWF to discuss the potential for reefing the jacket and remained engaged with the LDWF throughout the project. Steps to acquiring reefing permits consist of:

- If there is a qualified reefing candidate, review and permit from the US Army Corps of Engineers are required
- The legal title and liability for the jacket is turned over to the state of Louisiana after reefing
- The LDWF onsite staff will witness the reefing event
- A monetary donation is made by the prior operator to the LDWF rig- to-reefs program equal to one-half the cost difference between reefing and taking the jacket to shore for disposal.

b) Site Clearance

Federal regulations require operators restore the sea floor to its original condition at the end of an abandonment project. The Veolia *Kingfisher* Dive Support Vessel (DSV) was used for the site clearance campaign.

Large baskets were placed on the sea floor by the vessel crane and divers picked up debris from the bottom and placed it into the basket, which was then raised up on to the vessel deck when filled. Filled baskets were then taken to shore for proper disposal of the material.

Documentation verifying the site clearance was submitted to the regulators signifying the completion of all offshore activities.

Conclusions

Shell's safety philosophy of "Goal Zero" (no injuries or environmental incidents) drove the operational philosophy throughout the project. Personnel safety was the #1 priority. An impressive record was established with over 300,000 man-hours worked safely.

All the work was accomplished with no harm to the environment. The project was executed in a timely manner to mitigate against any potential collapse during future hurricanes. The jacket was reefed in one piece to provide the best habitat for marine life. Underwater video footage taken of the jacket 5 hours after reefing showed it teeming with fish of many species.

At the ceremony to present the monetary donation to the LDWF, Robert Barham, Secretary of the LDWF, commented that he was extremely impressed with the level of care and commitment to the environment that SOI maintained throughout the project and stated that the reefing of EI 331A jacket was now "the gold standard" for reefing projects in Louisiana.

The removal of offshore jacket structures, which provides excellent habitat for marine life, will cause a loss marine habitat in the Gulf of Mexico if these structures are not used as artificial reefs. The artificial reef programs in both the states of Louisiana and Texas have been effective in converting many of these structures to the program; however, many structures have ultimately been salvaged and not placed on reef sites due to the higher cost.

Recent clarifications to regulations issued by the Department of Interior Bureau of Ocean Energy Management (NTL 2010 – G05) have called for the abandonment of an estimated 850 offshore structures. This is detrimentally impact marine habitat in the Gulf of Mexico by destroying those existing habitat if these requirements are not changed or if additional incentives are not put in place.

Recommendations

The following recommendations are made to help preserve and enhance these marine ecosystems located in the Gulf of Mexico:

- The rigs to reef program should be expanded to reduce the destruction of these marine habitats.
- Revise the existing program to provide increased incentives for operators to reef their platforms.
- Revise NTL 2010-G05, Decommissioning Guidance for Wells and Platforms to allow operators to leave their jacket structures in place for an extended period of time (decks and facilities should be removed at initial abandonment) if bonds covering the cost of eventual removal are maintained.