IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF LOUISIANA

HORNBECK OFFSHORE SERVICES, LLC, **Plaintiff,** **v.** **KENNETH LEE "KEN" SALAZAR, in his official capacity as Secretary, United States Department of the Interior; UNITED STATES DEPARTMENT OF THE INTERIOR; ROBERT "BOB" ABBEY, in his official capacity as Acting Director, Mineral Management Service; and MINERALS MANAGEMENT SERVICE,** **Defendants.**	**CIVIL ACTION No. 10-1663(F)(2)** **SECTION F** **JUDGE FELDMAN** **MAGISTRATE 2** **MAGISTRATE WILKINSON**

DECLARATION OF STEVE BLACK

I, Steve Black, do hereby declare as follows:

1. I am the Counselor to the Secretary of the United States Department of the Interior. As the Counselor to the Secretary I am responsible for providing advice and counsel on a wide range of policy issues including energy policy.

2. In my role as Counselor I recently led Department-wide efforts to carry out the President's April 30, 2010 direction to the Secretary of the Interior to conduct a thorough review of the April 20, 2010 explosion and fire on the *Deepwater Horizon* drilling rig in the Gulf of Mexico and to report, within 30 days, on "what, if any, additional precautions and technologies should be required to improve the safety of oil and gas exploration and production operations on the outer continental shelf." The findings of that thorough review are presented in a report to the President titled Increased Safety Measures for Energy Development on the Outer Continental Shelf, issued on May 27, 2010. ("Safety Report").

3. The Safety Report recommends a number of specific measures designed to ensure sufficient redundancy in the blowout preventers, to promote the integrity of the well and enhance well control, and to facilitate a culture of safety through operational and personnel management. Recommended actions include prescriptive near-term requirements, longer-term performance-based safety measures, and one or more Department-led working groups to evaluate longer-term safety issues.

4. The Safety Report presents information to contextualize the recommendations including a primer on current drilling practices and technologies, a review of the existing U.S. regulatory and enforcement regime, a survey of selected foreign regulatory approaches, and a history of OCS production, spills, and blowouts as well as summaries of MMS-sponsored studies on technologies that could reduce the risk of blowouts. The Safety Report does not, however, purport to present or summarize all of the information considered in the course of the 30-day review.

5. In the process of creating the Safety Report, the Department conducted a robust fact-finding mission, consulting with a wide range of experts from government, academia and industry, and had its recommendations peer-reviewed by seven experts identified by the National Academy of Engineering. As part of this fact-finding mission the Department reviewed many source documents to distill its specific set of interim recommendations regarding equipment, systems, procedures, and practices needed for safe operation of offshore drilling activities.

6. The 30-day safety report does not presuppose the outcome to any of the ongoing investigations into the BP oil spill, its causes, or its consequences. Root causes of the explosion and fire on the Deepwater Horizon or the resulting loss of life and damage to the environment were still under review as of the report issue date, May 27, 2010.

7. During the period in which the Safety Report was drafted, at least two facts were readily observable: a well blowout occurred and the safety equipment designed to prevent that blowout from reaching the surface (and escape of hydrocarbons into the environment) failed.

8. To fulfill the President's charge, therefore, the Safety Report identifies an initial set of safety measures designed to reduce the risk of a well control failure or casing integrity failure and subsequent blowout, and to ensure that secondary safety equipment and control systems will function as intended in the event of an emergency. The report also includes recommendations to enhance workplace safety, risk assessment and mitigation, and safety management systems designed to improve the safety of offshore oil and gas development.

9. The oil and gas industry's own recommendations – provided to the Department in response to the Secretary's meeting with industry executives on April 30, 2010, and in subsequent correspondence, including the recommendations of American Petroleum Institute's Joint Industry Task Forces – demonstrate the need to raise the safety bar on offshore drilling practices and procedures. Indeed, while some operators reportedly follow certain best practices, the broad consensus recommendations provided by the Joint Industry Task Force and other industry submissions demonstrate the urgent need—even according to the industry itself—for the immediate implementation of additional safety measures to ensure that all operators on the OCS employ the best available and safest technologies.

10. The purpose of this declaration is to briefly describe the findings and recommendations from the Safety Report that appear to be most relevant to the issues raised in the above-captioned litigation, and to identify the documents and materials that I or staff in my office or other Department offices considered in the course of reaching that finding or recommendation.

11. My identification and description of the documents considered in the context of each finding and recommendation is not intended to be comprehensive, nor could it be due to the very brief amount of time available in which to identify and describe those documents. Nonetheless, I certify by way of this declaration that the documents identified herein were considered in the course of the preparation of the Safety Report and will ultimately form part of the Administrative Record in the above-captioned litigation.

12. The Safety Report, after research, review, and expert consultation, identified safety issues involved in offshore drilling, including the unique challenges associated with drilling operations in deepwater. At least the following documents were considered in the course of that deliberative process:

a. API Joint Industry Task Force White Paper: Recommendations for Improving Offshore Safety (draft submitted to DOI May 17, 2010). A true and correct copy of this document which was considered in the course of the 30-day review is attached as Exhibit A;

b. Thirteen letters of response from industry participants and trade associations suggesting both immediate and long-term responses to the disaster;

c. Industry studies performed on behalf of MMS prior to the disaster, including Technology Assessment and Research Program (TA&RP) Studies 319, 431, 455, and 463.

13. The Safety Report, after research, review, and expert consultation, made recommendations concerning the quality and sufficient redundancy of blowout preventers. At least the following documents were considered in the course of that deliberative process:

a. Memorandum dated April 27, 2010, from Scott Sigurdson, VP Engineering, Drilling and Completions, BP;

b. Industry suggestions from April 30 meeting with the Secretary (including follow-up correspondence);

c. BP Safety Recommendations (hand delivered May 12, 2010) with follow-up e-mail from Bernard Looney (May 14, 2010);

d. Meetings/Site Visits at BOP Manufacturers in Houston (Cameron and National Oilwell Varco);

e. API Offshore Equipment Task Force Recommendations;

f. MMS Study 431: Evaluation of Secondary Intervention Methods in Well Control – March 2003 (West Engineering). A true and correct copy of a technical summary of this document which was considered in the course of the 30-day review is attached as Exhibit B;

g. MMS Study 319: Reliability of Subsea BOP Systems for Deepwater Applications – November 1999 (Sintef Norway). A true and correct copy of a technical summary of this document which was considered in the course of the 30-day review is attached as Exhibit C;

h. MMS Study 455: Mini Shear Study – December 2002 (West Engineering). A true and correct copy of a technical summary of this document which was considered in the course of the 30-day review is attached as Exhibit D

i. MMS Study 463: Shear Ram Capabilities Study – September 2004 (West Engineering). A true and correct copy of a technical summary of this document which was considered in the course of the 30-day review is attached as Exhibit E.

14. The Safety Report, after research, review, and expert consultation, made recommendations to promote well integrity and enhance well control. At least the following documents were considered in the course of that deliberative process:

a. Memo from multi-national oil and gas company describing recommendations for Well Design and Construction (Adequate Physical Barriers) and Well Control Procedures;

b. API Joint Industry Task Force White Paper: Recommendations for Improving Offshore Safety (draft submitted to DOI May 17, 2010).

15. The Safety Report, after research, review, and expert consultation, made recommendations to promote a culture of offshore drilling safety through operational and personnel management, including a new requirement that all rig operators develop operational, safety, and environmental management plans. At least the following documents were considered in the course of that deliberative process:

a. Interviews with, and congressional testimony by, industry experts including Elmer P. Danenberger III and Ken Arnold;

b. International Association of Drilling Contractors (IADC) Health, Safety and Environmental (HS&E) Case Guidelines for Mobile Offshore Drilling Units (MODU);

c. Documents developed in the course of preparation of MMS's final rule concerning "Safety and Environmental Management Systems for Outer Continental Shelf Oil and Gas Operations" (SEMS Rule), including briefings prepared for the Office of Management and Budget (OMB).

Pursuant to 28 U.S.C. § 1746, I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge.

Executed on this the 16th day of June, 2010,

Steve Black
Counselor to the Secretary
U.S. Department of the Interior

White Paper: Recommendations for Improving Offshore Safety

Joint Industry Task Force to Address Offshore Operating Procedures and Equipment

Cautionary Statement

The Joint Industry Task Force has been formed to make recommendations in response to the request of the Secretary of the Interior, and recommendations will be formulated based on limited information and in advance of any investigative findings in relation to the current incident in the Gulf of Mexico. The contributing joint industry task force companies and trade associations express no views regarding the cause, fault or liability of the incident or regarding any mechanisms of prevention, nor should any recommendations be interpreted as a representation of any such views. The oil and natural gas industry is committed to working with this Department and the Administration as we move forward in efforts to improve offshore safety.

Executive Summary

In response to the Gulf of Mexico (GOM) incident, the oil and gas industry, with the assistance of the American Petroleum Institute (API), has assembled two task forces to focus on critical areas of GOM offshore activity: the Offshore Operating Procedures Task Force and the Offshore Equipment Task Force. Task force sessions began on 10 May and participants are working expeditiously to provide recommendations to the U.S. Department of the Interior Outer Continental Shelf Safety Oversight Board. The task forces are not involved in the review of the incident, but bring together industry experts to identify best practices in offshore drilling operations and equipment, with the ultimate goal of enhancing safety and environmental protection.

Estimated production from the GOM federal waters as of October 2009 represents about 30 percent of domestic oil production and about 11 percent of domestic natural gas production. Approximately 35,000 workers and 90 rigs are currently active in Gulf of Mexico federal waters, including 68 mobile offshore drilling units and 22 platform rigs. There are about 3,500 production platforms in federal waters in the GOM; 978 of those are manned.

General Objectives

Short-term (by May 28, 2010)

- Prepare immediately actionable recommendations concerning GOM deepwater drilling operations.
- These recommendations should 1) close any identified gaps in current blowout preventer (BOP) operating practices; and 2) align industry standards for well drilling and completion practices/procedures with recognized industry best practices.

Long Term (within one year)

- Provide a plan to apply findings from the GOM Incident Root Cause Analysis to revise existing API standards and MMS rule making processes to reflect any identified improvements.

Respective Task Force Goals

- The **Offshore Operating Procedures Task Force** is reviewing critical processes associated with drilling and completing deepwater wells to identify gaps between existing practices and regulations and industry best practices. Their recommendations are intended to move industry standards to a higher level of safety and operational performance and approach or achieve industry best practice.

- The **Offshore Equipment Task Force** is reviewing current BOP equipment designs, testing protocols, regulations, and documentation and will make recommendations to close any gaps or capture any improvements.

Task Force Participants

Offshore Operating Procedures

Anadarko, API, BP, Chevron, ConocoPhillips, ExxonMobil, Halliburton, IADC, Marathon, Murphy, Noble Energy, Schlumberger, Shell, Statoil, Transocean

Offshore Equipment

Anadarko, API, Atwood, BP, Cameron, Chevron, ConocoPhillips, Diamond Offshore, Ensco, ExxonMobil, Frontier, GE Oil & Gas, IADC, Murphy Oil, Noble Drilling, National Oilwell Varco, Oceaneering, Pride International, Seadrill, Shell, Statoil, Transocean, West Engineering

Schedule and Work Plans

Offshore Operating Procedures: Phase 1 Deliverables

Deliver early recommendations and conclusions by May 28, 2010. Based on findings in Phase 1, develop work plan and charter for Phase 2 of study.

Offshore Operating Procedures: Continuing Work Plan

- Review findings from GOM incident. Identify Drilling & Completion processes that may have been related to the incident.
- Identify critical processes (3-5) associated with Drilling & Completion of deepwater wells based on risk/exposure to safe and reliable operations.
- Benchmark practices against best-in-class practices and against existing “recommended practices” and regulations.
- Identify opportunities to move “recommended practices” to industry best practices.
- Provide weekly progress reports to the Governance Review Board on progress.
- Issue final report at end of Phase 1.

Offshore Equipment: Phase 1 Deliverables

Deliver 1st set of recommendations by May 28 (Phase 1). Based on findings in Phase 1, develop work plan and charter for phase 2 of study.

Offshore Equipment: Work Plan

- Review industry data associated with operation and testing of BOPs with the objective of identifying issues, areas of concern, potential failures in equipment, etc.
- Review existing testing and inspection requirements, regulations, protocols for BOPs. Based on industry experience, incident data, etc, and overlaying current regulations and requirements, make recommendations that can improve safety and reliability of BOP systems.
- Review information available from recent GOM incident, specifically associated with BOP system (including ROV interface).
- Provide weekly progress reports to the Governance Review Board on progress
- Issue final report at end of Phase 1.

Key Areas of Focus

The Joint Industry Task Forces have initially identified six key areas of focus for Gulf of Mexico deepwater operations.

The recommendations summarized in the table below are detailed in later sections of this document.

Focus Area	Description	Summary of Recommendation(s)
Health, Safety & Environment Case	Safety case methodology designed to reduce risks to the health and safety of the workforce and limit environmental impact associated with offshore drilling and completion operations using a subsea BOP.	A safety case is produced by the owner of the deepwater mobile offshore drilling unit (MODU) (i.e., Drilling Contractor) and reviewed by a competent and independent regulator who may prohibit activities if there are significant shortcomings in the safety case. The IADC has developed a guideline, "Health, Safety and Environmental Case Guidelines for Mobile Offshore Drilling Units," to provide a sound basis for drilling contractors to initiate Safety Case requirements in the OCS. Develop Well Construction Interfacing Document (WCID) to manage well construction activities and mitigate unexpected events that impact health, safety and the environment.
Procedures Related to Mechanical Loads, Cementing Practices, Barriers, and Well Displacement Procedures	Load and resistance conditions during casing string installation.	Engage casing hanger latching mechanisms when casing is installed in the subsea wellhead. Form API subcommittee to study physical loads, design practices for subsea well completions and completion configurations that provide maximum reliability.
	Variables affecting the cementing operation design, placement techniques, well conditions and execution practices related to cementing casing strings.	Upon release, adopt API RP 65 Part 2: Isolating Potential Flow Zones during Well Construction.
	Independent barriers across potential flow paths during well completion / abandonment activities.	Provide two independent barriers, including one mechanical barrier, for each flow path prior to displacement to underbalanced fluid columns. Perform negative tests to a differential pressure ≥ anticipated pressure after displacement. Positively test each casing barrier to a pressure exceeding the highest estimated integrity of casing shoes below that barrier.
	Well displacement procedures.	Close blowout preventers during displacement to underbalanced fluid columns. Perform separate displacement operations for riser and casing. Monitor displacement volumes in and out. Ensure shearable drillstring components are positioned in the shear rams during displacement.
Secondary BOP Control Systems	Reliable function in the event of unintended disconnect of the lower marine riser package (LMRP) or loss of surface control of the subsea BOP stack.	Ensure BOP can automatically close blind/shear ram(s) and close choke/kill line valves. Perform full surface function / pressure testing prior to running of the BOP stack to simulate 1) unintended disconnect of lower marine riser package; and 2) loss of surface control of the subsea BOP stack. At prescribed intervals, conduct subsea testing of hydraulic function of rams and valves downstream of the trigger to simulate 1) unintended disconnect of lower marine riser package (LMRP); and 2) loss of surface control of the subsea BOP stack. Verify proper operation of the system by testing to MMS-approved Application for Permit

Focus Area	Description	Summary of Recommendation(s)
		to Drill (APD) casing pressure below blind / shear rams after system activation. Arm the system when BOP stack is latched on the wellhead. Disarm and rearm only if approved through a formalized Management of Change process.
BOP Testing and Test Data	Frequency and type of testing. BOP test data retention.	Upon completion of the testing, forward test charts and function test work sheets to the District MMS office that approves the well permit..
Acoustic Systems and Other Secondary Control Systems	Reliability of acoustic systems in ultra-deepwater environments. Availability of non-industry systems.	Establish Phase 2 work group to develop a matrix showing system combinations and capabilities under various conditions. Evaluate these options and recommend systems to be adopted. Evaluate processing in acoustic systems to remove ambient noise and to prevent inadvertent activation. Engage national research facilities to assess major acoustic system manufacturers' signal processing technologies.
Remotely Operated Vehicles (ROV)	Improvement and potential expansion of ROV capabilities and functions.	Ensure ROV can close blind shear rams, pipe rams, casing shear rams, and choke and kill valves. Ensure ROV can unlatch the lower marine riser package. Develop capability to function within prescribed closing times. Standardize ROV hot stab and receptacle per API Spec 17H. Standardize hot stab designs between drilling and production operations. Surface test ROV functionality and ROV pump and verify closure visually. Develop visual reference capability to confirm ram closure (position indicator). Identify methods for testing without introducing detrimental effects of seawater in BOP system. Stage ROV tooling / external hydraulic power supplies strategically in Gulf of Mexico for rapid mobilization.

White Paper: Recommendations for Improving Offshore Safety

Joint Industry Task Force

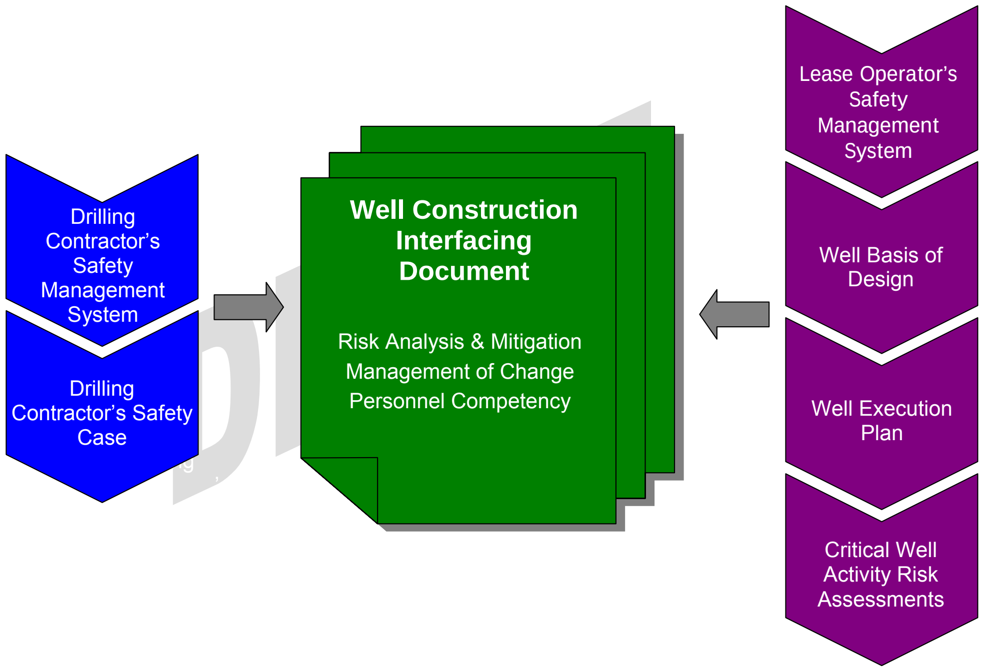
Acronyms

ALARP	As Low As Reasonably Practicable
APD	Application for Permit to Drill
API	American Petroleum Institute
BOP	Blowout Preventer
DOI	Department of the Interior
EDS	Emergency Disconnect System
HSE	Health, Safety and Environment
IADC	International Association of Drilling Contractors
LMRP	Lower Marine Riser Package
MMS	Minerals Management Service
MOC	Management of Change
MODU	Mobile Offshore Drilling Unit
MUX	Multiplex
OCS	Outer Continental Shelf
OIM	Offshore Installation Manager
ROV	Remote Operated Vehicle
RP	Recommended Practice
SMS	Safety Management System
WCID	Well Construction Interfacing Document

1. Health, Safety and Environment (HSE) Case

This task force recommends the adoption of a process that includes a safety case methodology, well basis of design, well execution plan and critical risk assessments for all operations using a subsea blowout preventer (BOP) stack on the U.S. Outer Continental Shelf (OCS). The process would incorporate well-specific Management of Change (MOC), risk assessment and personnel competency requirements that would be implemented to improve risk recognition and response when executing critical well operations.

The primary purposes of a safety case are to reduce risks to the health and safety of the workforce and limit environmental impact associated with offshore facilities.



The Well Construction Interfacing Document (WCID) addresses the management of well construction activities and mitigates unexpected events that impact HSE.

A safety case demonstrates that the facility and the operation are sufficiently described in order to verify that the design, systems and operating parameters are capable of providing a safe working environment for personnel and that there are sufficient barriers to reduce identified hazards and risks to as low as reasonably practicable (ALARP).

The safety case is produced by the owner of the deepwater mobile offshore drilling unit (MODU) (i.e., Drilling Contractor) and reviewed by a competent and independent regulator who may prohibit activities if there are significant shortcomings in the safety case.

Principle features of a safety case are as follows:

- Identifies the safety critical aspects of the installation, both technical and managerial, with clear linkage to the Safety Management System (SMS)
- Defines appropriate performance standards for the operation of the safety critical aspects

- Requires workforce involvement

The International Association of Drilling Contractors (IADC) has developed a guideline, "Health, Safety and Environmental Case Guidelines for Mobile Offshore Drilling Units,"[1] to help drilling contractors meet regulatory requirements in the countries that operate under a Safety Case regime. This guideline effectively addresses the focus areas described above and will provide a sound basis to initiate Safety Case requirements in the OCS.

A Well Construction Interfacing Document (WCID) will be developed to manage the well construction activities and mitigate unexpected events that impact health, safety and the environment. This document will link the safety case with the lease operator's Safety Management System (SMS), well-specific information such as the basis of design, the well execution plan and critical risk assessment. It will describe how management of change and risk assessment processes will apply during well construction activities and ensure personnel competency. The WCID will also provide alignment between the parties to ensure that their health, safety and environment (HSE) standards are not compromised while undertaking shared activities. The WCID will assign or delineate specific responsibilities for the operator's personnel as well as provide a vehicle for the contractor to intervene in the case that unsafe acts are identified.

Attachment: Health, Safety and Environmental Case Guidelines for Mobile Offshore Drilling Units

2. Barriers and Mechanical Loads

Casing and Cementing Overview

Standard drilling practices call for steel casing (pipe) to be installed within a drilled wellbore hole section at predetermined intervals. The casing string reaches from the bottom of the drilled section to the surface of the well (wellhead).

Following casing installation, cement is pumped through the drillstring to create a solid barrier between the exterior of the casing and the exposed wellbore formations. A one-way valve (casing shoe) located at the bottom of the casing string holds the cement in place outside the casing and prevents formation fluids from entering the casing. After cementing operations are completed, testing is conducted to verify both cement and casing integrity.

The casing is suspended (hung) inside the wellhead located on the seafloor. A properly sized and pressure-rated blowout preventer stack (BOP) is then attached (latched) onto the wellhead/casing string. The BOP stack is connected to the wellhead and provides a sealable barrier between the wellhead and the riser (pipe connecting the floating rig to the well).

Subsequent to the successful testing of all system equipment, drilling of the next wellbore section can proceed. The well is drilled to total depth by continuing to drill, case and cement each successive hole section before proceeding to the next section.

Load and Resistance. This task force recommends that casing hanger latching and/or lock down mechanisms shall be engaged at the time the casing is installed in the subsea wellhead. In addition, the blowout preventers (BOP) shall be closed during displacement to underbalanced fluid columns to prevent gas entry into the riser should a seal failure occur during displacement.

[1] www.iadc.org/hsecase/index.html

An American Petroleum Institute (API) subcommittee will be formed to study the physical loads and design practices used in subsea well completions with long strings and liner/tieback wellbore configurations. The purpose is to further understand the relative merits of each configuration and provide operators a framework to select the completion configuration that provides the highest overall system reliability.

The subcommittee will complete this activity and provide recommendation to industry by end of year 2010.

Cementing. The success of any cement job is a function of design, placement techniques, well conditions and execution. This task force recommends that API RP 65 Part 2 be adopted by industry. RP 65 Part 2 is currently being released and addresses the gaps in primary cementing practices that have been identified in recent years. Once the specifics of the investigation of the Gulf of Mexico incident are made available, the Industry will consider the information and determine whether additional recommendations can be made.

Attachment: API RP 65 Part 2: Isolating Potential Flow Zones during Well Construction.

Fluid Displacement Overview

Each well section is drilled with a specialized, weighted drilling fluid. This fluid is pumped down the drillstring and exits through the bit at the bottom of the drillstring. The fluid circulates back to the surface via the annulus (the space between the outside of the drillstring and the wellbore wall). A primary function of the drilling fluid is to overbalance formation pressure to prevent the uncontrolled intrusion of formation fluids (e.g., gas) into the wellbore while drilling.

When drilling operations are completed and the production casing is in place, prior to removing the BOP stack from the well the drilling fluid is replaced with seawater. Before this displacement is performed, the well is checked to confirm it is secure and will not flow when the pressure is removed (negative test), Positive testing is conducted on the barriers and casing.

Abandonment and Wellbore Barriers. This task force recommends that two independent barriers, including at least one mechanical barrier, should be in place for each flow path (i.e., casing and annulus), prior to the displacement of kill-weight drilling fluid from the wellbore.

If the shoe track (the cement plug and check valves that remain inside the bottom of casing after cementing) is to be used as one of these barriers, it must be negatively tested prior to the setting of the subsequent casing barrier. A negative test should also be performed prior to setting the surface plug.

Negative tests will be made to a differential pressure equal to or greater than the anticipated pressure after displacement. Each casing barrier should be positively tested to a pressure that exceeds the highest estimated integrity of the casing shoes below that barrier.

Displacement of the riser and casing to fluid columns that are underbalanced to the formation pressure in the wellbore should be conducted in separate operations. In both cases, BOPs should be closed on the drillstring and circulation established through the choke line to isolate the riser, which is not a rated barrier. During displacement, volumes in and out must be accurately monitored.

Drillstring components positioned in the shear rams during displacement must be shearable.

Blowout Preventer Overview

A typical offshore BOP stack contains annular blowout preventer(s), pipe ram(s) and shear ram(s). The annular BOP and pipe ram(s) are designed to seal around the drillstring should it become necessary to shut-in the well to control an influx of formation fluid. The ability to control ("kill") the influx of formation fluid is facilitated by the capability to pump kill-weight drilling fluid to the bottom of the well via the drillstring. Activation of the shear ram(s) severs the drillstring at the sea floor. Therefore, the shear ram(s) are generally considered a measure of last resort.

In order to ensure that the BOP stack functions properly under a wide range of emergency conditions, including loss of surface control or unintended disconnect of the riser, secondary control systems are in place on every rig. Activation of secondary control systems can be executed with remotely operated vehicles (ROV). At present, other secondary control options such as acoustic systems are being evaluated for application in ultra deep water operations.

The BOP system and related components are regularly tested for functionality and their ability to seal under rated pressures within a prescribed amount of response time. A typical deepwater BOP stack is rated to 15,000 psi.

1. Secondary BOP Control Systems

The recommendations below are designed to ensure that secondary BOP systems are verified and functioning as designed. These recommendations are in addition to testing requirements currently in place for primary BOP control systems.

Secondary BOP control systems (often referred to as Deadman / Auto Shear) are to be required for all floating drilling rigs. These systems are to be automatically activated if either of the situations below occurs:

1. Unintended disconnect of the lower marine riser package (LMRP).
2. Loss of surface control of the subsea BOP stack.

When activated, the BOP must automatically perform the following functions as a minimum:

- Close the blind / shear ram(s).
- Ensure closure of choke / kill line valves.

The secondary BOP system is to be tested at the following frequency:

- Conduct full surface function and pressure testing prior to running of the BOP stack to simulate 1) unintended disconnect of lower marine riser package; and 2) loss of surface control of the subsea BOP stack.
- With the BOP subsea, conduct testing of hydraulic function of rams and valves downstream of the secondary BOP activation mechanism to simulate 1) unintended disconnect of lower marine riser package (LMRP); and 2) loss of surface control of the subsea BOP stack. This should be done after initial running and latching of the BOP stack, or every six months minimum if the BOP stack is not recovered to surface between wells.

- Confirm the system has operated as designed and is able to contain pressure by testing to the MMS-approved Application for Permit to Drill (APD) casing pressure below the blind / shear rams after system activation.

The secondary BOP system shall be armed when BOP stack is latched on the wellhead. Disarming and rearming the system shall only be performed through a formalized Management of Change approval process.

These recommendations should be initiated as soon as possible, with implementation completed no later than 1 May 2011 on all rigs with subsea BOP equipment operating in the GOM region.

2. BOP Testing

It is recommended that Industry submit all BOP test charts and forms (stump test, function test and pressure test) to District MMS offices for verification and retention.

The current method of retention for these test charts is to file them onboard the MODU after review and sign off by the Offshore Installation Manager (OIM) and Lease Operator's Representative. These test charts remain filed onboard and are witnessed by MMS inspectors during periodic inspections on offshore MODUs.

Industry proactively proposes that all test charts and function test work sheets be forwarded to the District MMS office that originally approved the well permit. This will allow easier access for the MMS to review and verify test data immediately after each test period and at any subsequent time. It will provide greater transparency and a retention component that is currently not in place. It will also ensure there is a copy of all tests at a secure shore base facility should the records become damaged or lost on an offshore facility.

3. Acoustic Systems and Other Secondary BOP Activation Systems

The addition of acoustic or other secondary BOP activation systems may provide additional redundancy for the systems currently used to ensure proper operation of critical BOP functions.

We recommend the establishment of a Phase Two work group to evaluate possible secondary system combinations and capabilities under various conditions. The goal of the work group is to evaluate these options and make recommendations concerning the safest and most reliable systems to be adopted.

It is recommended that the following options be included in the scope of work:

1. Reliability of Acoustic Controls
    a. Evaluate the status of processing to remove ambient noise and to prevent inadvertent activation.
    b. Use existing industry alliances with national research facilities to evaluate major acoustic system manufacturers' signal processing technologies. The goal is to determine if better acoustic systems are available outside industry.

4. Remotely Operated Vehicles (ROV)

Our recommendation for improvement of ROV capabilities is as follows:

1. Minimum Functionality for ROV Intervention Panel
    a. Close blind shear rams

b. Close pipe rams

c. Close casing shear rams (if equipped)

d. Close choke and kill valves

e. Unlatch LMRP

2. Minimum Requirements for ROV Pump and Associated Equipment

   a. Develop ROV capabilities to perform the functions listed above within API Spec 16D requirements for BOP closing times.

   b. Require industry standardization of hot stab and receptacle in accordance with API Spec 17H.

3. ROV Testing Requirements

   a. Test ROV on surface using flying lead to demonstrate functionality, using fluid volume count and visual observation to verify closure.

   b. Test ROV pump on surface with test fixture using hot stab to verify flow rate and pressure.

   c. It is recommended that when possible, a time/date stamped record be made of ROV test(s) performed to verify closing capability.

4. Implementation Schedule

   Implementation of these recommendations should begin as soon as possible, and should be completed no later than December 2012.

5. Further ROV Improvements

   Our recommendation is to form a Phase Two work group to develop further improvements to ROV operating capabilities. Among the items to be explored are the following:

   - Standardized stabs and receptacles between drilling and production.
   - Develop visual reference capability to confirm ram closure (position indicator).
   - Methods of subsea testing without introducing detrimental effects of seawater in BOP system (example: ROV with external hydraulic supply).
   - Require staging of ROV tooling and external hydraulic power supplies at strategic locations across Gulf of Mexico to allow rapid mobilization.

Equipment Definitions

Emergency Disconnect System (EDS): A BOP control system when armed and initiated that sequentially operates specific BOP functions to secure the well and disconnect the LMRP from the wellhead. The EDS can be a subsystem of the control pods or a stand alone alternate control system.

1. **Active EDS:** An active EDS system is initiated when the rig moves a predetermined distance from well center and is computer controlled – no human interaction is necessary. Applies to both MUX and conventionally piloted systems.

2. **Passive EDS:** A **manually** activated system usually corresponds or triggers when a Red Alert is issued for station keeping. Requires human activation. Applies to both MUX and conventionally piloted systems.

Deadman Circuit: A BOP control sub-system when armed and initiated that sequentially operates a series of BOP functions to secure the well.

1. **Active Deadman**

   a. **MUX System:** Initiated by the loss of electrical AND hydraulic supply to the pod to activate a series of functions to secure the well; no human interaction is necessary.

   b. **Conventional Piloted System:** Initiated by the loss of pilot pressure AND the loss of hydraulic supply to activate a series of functions to secure the well; no human interaction is necessary.

2. **Passive Deadman (MUX Only):** Manual function that is hard wired and bypasses the normal pod communication system to activate a series of functions to secure the well. Used if software communications are lost with the pods.

Auto Shear: An automatic function that when armed is triggered by separation of the LMRP from the lower stack and activates a series of functions to secure the well. No human interaction is required. Applies to both MUX and conventionally piloted systems.

Acoustic Controls (MUX & Conventional): A stand alone alternate control system that is manually triggered by encoded acoustic sound waves which activate a series of functions through a dedicated pod to secure the well. Activation is from permanent and/or self contained portable control units on the surface.

Remote Operated Vehicle (ROV) Intervention: An interface that when activated allows an ROV to connect to and control specific functions or systems on the BOP to secure the well and may include non-emergency functions. Applies to both MUX & Conventionally Piloted Systems

1. **ROV Active Function:** A function or series of functions that is both activated by an operating fluid supplied by the ROV through a stab to complete the function(s).

2. **ROV Piloted Function:** A function or series of functions piloted by the ROV, through a stab, that activates functions on the control pod which are supplied operating fluid from stack mounted accumulators to secure the well.

3. **ROV Passive Function:** A function or series of functions lined up by the ROV and supplied with a "flying lead" and stab from stack mounted accumulators or external accumulator banks to secure the well.

Technical Summary of MMS Engineering and Research Study No. 431 entitled
Evaluation of Secondary Intervention Methods in Well Control
Friday, May 07, 2010

Objective

This research project provides a review of the design and capabilities of various secondary BOP (blowout preventer) intervention systems installed as of the time of the report in March 2003 on newly built and significantly upgraded drilling rigs. In addition, the report identifies the best systems and practices available at that time as well as recommendations that could enhance the effectiveness of those systems.

Background

Secondary intervention can be defined as an alternate means to operate BOP functions in the event of total loss of the primary control system or to assist personnel during incidents of imminent equipment failure or well control problems. These systems can be completely independent of the BOP control system or utilize components of the primary BOP.

Deepwater BOP functions are powered utilizing hydraulic fluid transported from a surface hydraulic system and most frequently augmented with fluid stored subsea. These functions are transmitted subsea using either electrical or hydraulic signals.

Findings & Recommendations

The findings are far too numerous to list here. Refer to section 6 of the report (pages 71 – 83) with emphasis on sub-sections 6.3 – 6.10 which list dozens of critical issues/findings and recommendations to reduce risk.

Other Information

This report covers several key areas of well control. Two of those areas that have received a high level of attention in the media are the use of acoustic control systems and ROV's as secondary method of well intervention. These two areas are highlighted below.

Acoustic System Acutator
A *stand alone* alternate control system that has the capability of operating BOP stack functions from permanent and/or self-contained portable control units through the use of acoustic signals transmitted through the water. The system requires dedicated subsea hardware, software, accumulators and hydrophones.

Possible shortcomings of an acoustic system include the following:

1. Some systems may not have hydrophones strong enough to penetrate a mud plume that would be present in a disconnect situation.
2. The correct hydrophone must be specified for deep water.

Steve Black Declaration
Exhibit B

3. Acoustic interference caused by the noise of a flowing well may make operation unreliable.
4. Depending on the system, control valves may be too small to operate the ram BOP in the API recommended time.
5. Hydrophones must be in the water in order to operate. There has been at least one failure attributed to the hydrophone not being deployed when needed.
6. Acoustic communication can be unreliable if operated in water depth that differs significantly from the design criteria (e.g. in water that is either much shallower or much deeper than the design range). Signal intensity varies significantly with water depth. An acoustic system optimized for 4,000 feet may be too loud at 1,000 feet and have insufficient amplitude at 7,000 feet. Acoustic systems can be adjusted for water depth. However, many rigs don't have the tools or technical training to do so.
7. Many drilling companies do not use acoustic systems unless mandated by regulation because of high cost and perceived high failure rates.

Note: Additional shortcomings, not addressed in the Shortcomings list of the report but addressed elsewhere in the report include:

8. Under section 4.7.2.2.2 the report states that in the event the rig is evacuated or lost (as is the case with the DW Horizon) prior to activation of any BOP actuated acoustic system in order for the acoustic system to remain effective, the rig operator must have a portable activation unit located separate from the rig that can be activated by a person knowledgeable in the operation of the acoustic control system.
9. Under section 5.1.6.3, the report states that "Noise generating components on the surface (such as thrusters) are dealt with during the design and commissioning of the rig", however, "the acoustic control system manufacturers do not have noise data for blowouts and thus neither design for nor guarantee operation during a blowout". Note: The same section goes on to explain that:
   a. Acoustic controls manufacturers are aware of the issue and argue that modern acoustic systems either already will, or can be modified to function during a blowout. However, to date they have no actual test data or model of blowout noise that can be used for evaluation or implementation of an appropriate design and
   b. Some operators have elected to use acoustic control systems as the primary system with no backup other than ROV intervention. These are used on wells drilled from a floating platform but using a surface BOP stack for well control. The acoustic system controls a single blind/shear ram and two hydraulic connectors on the sea floor. This system is known as either the Seafloor Isolation System or the Environmental Safeguard System. Regardless of the name, the system is not considered a component of well control and therefore not subjected to the same requirements and regulations.

<u>Remote Operated Vehicles (ROV)</u>

ROV intervention is a *stand alone system* that is the simplest and *most basic form of secondary intervention* and has been in use for many years. ROVs can be used to disconnect the LMRP riser connector, close and lock a ram, or operate any other function on the BOP stack provided that function has been equipped with the requisite ROV connection. It can also be used for mechanical operations such as replacing connector gaskets. For well control purposes, the *ROV is equipped with a hydraulic pump* and has the ability to insert a quick disconnect stab into a female receptacle connected directly to a function such as a ram BOP. While the ROV can be equipped with a hydraulic reservoir for lower volume functions, high volume functions such as rams are usually operated with seawater.

<u>Possible shortcomings of an acoustic system include the following:</u>

1. An ROV should not be used for secondary intervention unless the well is benign (non flowing) or unless it can be demonstrated that the designated functions can be performed in the API recommended time.
2. If not already in the water ROV deployment will require a long time, possibly long enough that the rams to become unusable due to erosion damage, depending on the well flow rate.
3. Even if the ROV is at the stack, it can usually handle only one tool at a time and most likely won't have the stab needed to effect closure of the ram. In this case deployment time will be twice as long as it would be if the ROV were at the surface, as it will have to travel to the surface to obtain the correct tool and return to the stack before closure of the ram could begin.
4. Often the ROV is capable of operating the shear ram only. Should a serious leak occur through the failsafe valves, there would be no way to isolate the valve from the pressure.
5. ROVs cannot be deployed in rough weather.
6. ROVs have limited use in high current conditions.
7. Some ROV systems have high downtime rates, and therefore may not be available for secondary intervention when needed.

Note: An additional shortcoming not addressed in the Shortcomings list of the report but addressed elsewhere in the report include:

8. Under section 5.1.7.3 under the heading of "Blind Shear Ram", the report states that "The ROV will be able to help secure the well, assuming the well is not flowing. If flowing, the ROV may not be able to close the rams due to the turbulence it will encounter".

<u>Means to reduce the risk of existing ROV systems:</u>

1. Utilizing subsea accumulators as a hydraulic supply source could allow the ROV to operate a ram within the API specified time frame. This could be accomplished by either utilizing existing stack mounted accumulators or by adding a bank of dedicated accumulators that could be lowered to and retrieved from the sea floor independent of the stack.
2. Function testing of the ROV system prior to running the stack should be performed. The functions should be operated at the same pressures and flow rates as capable by the ROV.
3. A wellbore test should be conducted after closing, locking and venting the ram as described above. A wellbore test is the only acceptable method of proving the function was operated correctly.
4. The lower pipe ram should be considered the master valve, and ROV intervention should be available to execute that function. Note that the drill pipe would have to be in the ram bore for this to be effective.

Technical Summary of MMS Engineering and Research Study No. 319 Entitled Reliability of Subsea Bop Systems for Deepwater Applications, Phase II DW
Friday, May 07, 2010

Objective

The main focus of this report was to test the effect of various testing regiments on the BOP (blowouts preventer) stack as a whole, and its individual components, in regards to the reliability of the BOP to function without failure. Also, it ranked components in terms of which are most responsible for affecting the reliability of the stack.

Background

This study was an extension of study 455, and tried to see if the method used BOP (blowout preventer) manufactures to calculate the shear force needed was appropriate to design a shear ram properly. Actual tests results were submitted to West by the manufactures for analysis.

Findings & Recommendations

The main contributor to BOP failure and drilling downtime was the control system.

Of the 105 rams in this study, with 16193 combined days in service, 11 failures were seen; 1 premature closure, 1 failed to close, 1 failed to stay closed, 1 externally leak hydraulic fluid, 4 leaked hydraulic fluid through the ram, and 3 failed to open once closed. No shear rams failed to cut through pipe during testing.

The most important BOP test is the BOP body test that verifies that there are no external leakages in the lower part of the BOP stack.

It is recommended to remove the regulation related to testing of variable pipe rams on both diameters and instead to include a requirement that the test joint for testing the rams shall include diameters reflecting all the sizes of pipe in use.

Other Information

It is stated that the most important test is a bi-weekly body test and bi-weekly function test. A weekly function test only has a small effect on reliability but they don't make a recommendation to remove the test, probably because it only takes about and hour to perform.

No rig followed in this report (GoM only) has and acoustic backup system. 6 of 10 rigs in a previous phase (non-GoM) had acoustic back up systems. Backup control systems have been mandatory in Norway since early 1980's. It does not state specifically that acoustic systems are mandatory.

Steve Black Declaration
Exhibit C

Technical Summary of MMS Engineering and Research Study No. 455 Entitled
Mini Shear Study
Friday, May 07, 2010

Objective

This study was designed to answer the question “Can a given rig’s BOP (blowout preventer) equipment shear the pipe to be used in a given drilling program at the most demanding condition to be expected?”

Background

Shear rams are a component of a BOP that are designed to be able to cut trough the drill pipe and seal off the well as a means of preventing uncontrolled flow. These components are typically tested to see if they can successfully shear the pipe when 3000 psi of pressure is applied to them.

Findings & recommendations

Of the 7 rigs that performed tests, 5 had successfully sheared their samples by 3000psi (71% success). This was done via a physical test.

Once the data was corrected for the most demanding operational conditions to be expected, 3 of 6 rigs failed to shear their samples by 3000psi (50% success). These results were obtained through calculations. One rig’s results were discarded due to a lack of data to make the adjustment.

At the time of this study, “WEST [was] unaware of any regulatory requirements that state the obvious: that the BOP must be capable of shearing pipe planned for use in current drilling program”

Other Information

Two of the rigs performed tests on multiple samples of pipe. If a rig tested unsuccessful on at least on of its samples, the rig was considered to have failed the test.

After the tests concluded, two of the rigs involved in the study replaced their components to be able to shear the pipe being used for their drilling program.

Steve Black Declaration
Exhibit D

Technical Summary of MMS Engineering and Research Study No. 463 Entitled
Shear Ram Capabilities Study
Friday, May 07, 2010

Objective

This study was designed to answer the question "Can a given rig's BOP (blowout preventer) equipment shear the pipe to be used in a given drilling program at the most demanding condition to be expected?"

Background

This study was an extension of study 455, and tried to see if the method used BOP (blowout preventer) manufactures to calculate the shear force needed was appropriate to design a shear ram properly. Actual tests results were submitted to West by the manufactures for analysis.

Findings & Recommendations

Two manufacturers involved in this study use a form Distortion Energy Theory to calculate the pressure needed for a successful shear. The third did not supply their method to West. West felt that this theory with some adjustments should be a good predictor for shear force.

For 49 of 214 samples of pipe, the actual shear force was high than that calculated for the sample using the yield strength in the Distortion Energy Theory. When using the pipes ultimate strength, this number drops to 24 out of 214.

Other Information

In this study, 214 pipe samples were tested against various ram models. Of the 214 samples, 16 (7.5%) were unsuccessful in shearing the pipe below the 3000psi limit. All 16 of these cases involved a particular shear ram and pipe combination. A good conclusion here would be that this particular combination is not suitable for actual drilling operations.

Many new rigs have casing shears placed below the sealing shears to cut through the thicker joints of the pipe if they can't ensure that the pipe shears are aligned with the thinner body of the pipe. Casing shears were not included in this study.

Steve Black Declaration
Exhibit E