# INQUIRY INTO THE DEEPWATER HORIZON GULF COAST OIL SPILL

## HEARING

BEFORE THE

SUBCOMMITTEE ON OVERSIGHT AND INVESTIGATIONS

OF THE

COMMITTEE ON ENERGY AND COMMERCE

HOUSE OF REPRESENTATIVES

ONE HUNDRED ELEVENTH CONGRESS

SECOND SESSION

MAY 12, 2010

**Serial No. 111–122**

Printed for the use of the Committee on Energy and Commerce

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## WITNESSES

SUBMITTED MATERIAL

# INQUIRY INTO THE DEEPWATER HORIZON GULF COAST OIL SPILL

**WEDNESDAY, MAY 12, 2010**

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON OVERSIGHT AND INVESTIGATIONS,
COMMITTEE ON ENERGY AND COMMERCE,
*Washington, DC.*

The subcommittee met, pursuant to call, at 10 a.m., in Room 2123, Rayburn House Office Building, Hon. Bart Stupak [chairman of the subcommittee] presiding.

Present: Representatives Stupak, Braley, Markey, DeGette, Doyle, Schakowsky, Ross, Christensen, Welch, Green, Sutton, Dingell, Waxman (Ex Officio), Burgess, Sullivan, Blackburn, Gingrey, Griffith, Latta, and Barton (Ex Officio).

Also Present: Representatives Engel, Capps, Inslee, Melancon, Castor, Stearns, Myrick, Scalise, and Jackson Lee.

Staff Present: Phil Barnett, Staff Director; Kristin Amerling, Chief Counsel; Bruce Wolpe, Senior Advisor; Brian Cohen, Senior Investigator and Policy Advisor; Greg Dotson, Chief Counsel, Energy and Environment; Robb Cobbs, Policy Analyst; Caitlin Haberman, Special Assistant; Dave Leviss, Chief Oversight Counsel; Meredith Fuchs, Chief Investigative Counsel; Stacia Cardille, Counsel; Alison Cassady, Professional Staff Member; Al Golden, Professional Staff Member; Jennifer Owens, Investigator; Ali Neubauer; Karen Lightfoot; Communications Director, Senior Policy Advisor; Elizabeth Letter, Special Assistant; Lindsay Vidal, Special Assistant; Earley Green, Chief Clerk; Mitchell Smiley, Special Assistant; Alan Slobodin, Minority Chief Counsel; Mary Neumayr, Minority Counsel; Peter Spencer, Minority Professional Staff Member; Andrea Spring, Minority Professional Staff Member; and Garrett Golding, Minority Legislative Analyst.

Mr. STUPAK. This meeting will come to order.

Today, we have a hearing titled, "Inquiry Into Deepwater Horizon Gulf Coast Oil Spill."

We have a number of Members present for this hearing who are not members of the subcommittee but are members of the full committee. We welcome them, and I note that they will be allowed to submit written statements for the record, but they will not be allowed to deliver verbal opening statements. In addition, after all subcommittee members complete their questioning, full committee members will be allowed to ask questions. Members who are not on the subcommittee or full committee are welcome to observe, but they will not be permitted to give a verbal opening statement or ask questions due to time constraints.

The chairman, ranking members and chairman emeritus will now be recognized for a 10-minute opening statement. Other members of the subcommittee will be recognized for 3-minute opening statements.

I yield to the chairman of the full committee, Mr. Waxman, for an opening statement.

### OPENING STATEMENT OF HON. HENRY A. WAXMAN, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF CALIFORNIA

Mr. WAXMAN. Last month, the blowout occurred on an oil rig drilling in deep water off the Gulf of Mexico. Eleven people lost their lives and an environmental calamity is now unfolding in the Gulf as oil gushes from the well and threatens the coast.

We are here today to begin the process of understanding what went wrong and what we need to do to prevent future catastrophes. The investigation is at its early stage, but already we have learned some key facts. BP, one of the world's largest oil companies, assured Congress and the public that it could operate safely in deep water, and that a major oil spill was next to impossible. We now know those assurances were wrong. Halliburton, one of the world's largest oil service companies, says that it had secured the well through a procedure called cementing, and that the well had passed a key pressure test, but we now know this is an incomplete account. The well did pass positive pressure tests, but there is evidence that it may not have passed crucial negative pressure tests. According to a senior BP official, significant discrepancies were observed in at least two of these tests which were conducted just hours before the explosion.

Transocean, one of the world's largest operators of drilling rigs, says it has no reason to believe that the rig's failsafe device, called a blowout preventer, was not fully operational, but we have learned from Cameron, the manufacturer of the blowout preventer, that the device had a leak in a crucial hydraulic system and a defectively configured ram. And we know there our major questions about the effectiveness of BP's response to the spill. The company said it could manage a spill of 250,000 barrels a day, yet it is struggling to cope with this blowout, which is releasing only 5,000 to 25,000 barrels a day.

The more I learn about this accident, the more concerned I become. This catastrophe appears to have been caused by a calamitous series of equipment and operational failures. If the largest oil and oil service companies in the world had been more careful, 11 lives might have been saved and our coastlines protected.

It is dangerous to drill for oil a mile below the ocean surface. An accident can wreak environmental havoc that destroys livelihoods and imperils fish and wildlife. The oil companies make billions of dollars from taking these risks, but they don't bear the full costs when something goes drastically wrong.

In the course of our investigation, we have received over 100,000 pages of documents. The story that these documents and our interviews tell us is a complicated one. At this early stage in the investigation, we have far more questions than answers, but we have learned some important facts which Chairman Stupak, Chairman Markey, and I will describe in our statements.

There are four principal areas of inquiry that our committee is pursuing. The first involves questions related to well integrity. We know there was a failure of the well because gas surged up the riser and exploded on the rig. We will be investigating what caused the breach in well integrity and who was responsible.

The second area of inquiry involves what happened on the Transocean drill rig. There are pressure monitors on the rig that feed information constantly to the drill operators, and there are panels on the rig that control the operations of the blowout preventer and the drill string. We will be examining what the drill operators knew and what decisions they made. In the rest of my statement I will discuss what we have learned about these two areas of the inquiry.

Our third area of inquiry involves the blowout preventer, which is also called the BOP. This is supposed to be the last line of defense against the blowout of the well, but it failed. We have learned a lot about the blowout preventer, and Chairman Stupak will summarize this part of our investigation.

The final area of inquiry involves the response of BP and other companies to the spill. They promised to contain any spill, but they are not succeeding. Chairman Markey, who chairs our Energy subcommittee and the Select Committee on Energy Independence, will cover this area of our inquiry in his opening statement.

We recently received a document from BP called, "What We Know." It was prepared on May 6, and it summarizes what BP knew about the spill at that time. I want to focus on the first four bullets. I also ask unanimous consent, Mr. Chairman, that this document and other documents cited during this hearing be made part of the official hearing record.

Mr. STUPAK. Without objection, so be it.

Mr. WAXMAN. The first bullet says, "Before, during or after the cement job, an undetected influx of hydrocarbons entered the well bore." What this means is that there was a breach somewhere in the well integrity that allowed methane gas and possibly other hydrocarbons to enter the well.

The second bullet says, "The 97H inch casing was tested. The 97H casing hanger packoff was sent and tested, and the entire system was tested." BP explained to us that this refers to a positive pressure test in the well. What this means is that fluids were injected in the well to increase the pressure and to monitor whether the well would retain its integrity. The well passed this test.

Rigs like Deepwater Horizon keep a daily drilling report, and Transocean has given us the report for April 20, the day of the explosion. It is an incomplete log because it ends at 3 o'clock in the afternoon, about 7 hours before the explosion, but it confirms that the three positive pressure tests were conducted in the morning to the early afternoon.

The next bullet says, "After 16½ hours waiting on cement, a test was performed on the well bore below the blowout preventer." BP explained to us what this means. Halliburton completed cementing the well at 12:35 a.m. On April 20, and after giving the cement time to set, a negative pressure test was conducted around 5 p.m.

This is an important test. During a negative pressure test, the fluid pressure inside the well is reduced, and the well is observed to see whether any gas leaks into the well through the cement or casings.

According to James Dupree, the BP Senior Vice President for the Gulf of Mexico, the well did not pass this test. Mr. Dupree told committee staff on Monday that since test results were not satisfactory and inconclusive, significant pressure discrepancies were recorded. As a result, another negative pressure test was conducted. This is described in the fourth bullet.

During this test, 1,400 PSI was observed on the drill pipe while zero PSI was observed on the kill and the choke lines. According to Mr. Dupree, this is also an unsatisfactory test result. The kill and choke lines run from the drill rig 5,000 feet to the blowout preventer at the sea floor. The drill pipe runs from the drill rig through the blowout preventer deep into the well. In the test, the pressures measured at any point from the drill rig to the blowout preventer should be the same in all three lines, but what the test showed was that the pressures in the drill pipe were significantly higher. Mr. Dupree explained that the results could signal that an influx of gas was causing pressure to mount inside the well bore.

Another document provided by BP to the committee is labeled, “What could have happened?” It was prepared by BP on April 26, 10 days before the first document. And according to BP, their understanding of the cause of the spill has evolved considerably since April 26, so this document should not be considered definitive. But it also describes the two negative pressure tests and the pressure discrepancies that were recorded.

What happened next is murky. Mr. Dupree told the committee staff that he believed the well blew moments after the second pressure test, but lawyers for BP contacted the committee yesterday and provided a different account. According to BP’s counsel, further investigation has revealed that additional pressure tests were taken, and at 8 p.m. Company officials determined that the additional results justified ending the test and proceeding with well operations.

This confusion among BP officials appears to echo confusion on the rig. Information reviewed by the committee describes an internal debate between Transocean and BP personnel about how to proceed. What we do know is that shortly before 10 p.m., just 2 hours after well operations apparently resumed, gas surged from the well, up the riser, and the rig exploded in a fireball. This hearing and future hearings the committee will conduct in the coming weeks will explore these questions. Our goal is to learn what caused the fatal explosion so that Congress and the executive branch can act to prevent future disasters.

But as we focus on these narrow questions of what happened and why, we also need to keep the broader perspective in mind. Our national energy policy is broken, and nothing illustrates this better than this massive spill. Our dependence on oil and other fossil fuels is fouling our beaches, polluting our atmosphere, and undermining our national security.

One lesson is already apparent from the catastrophe in the Gulf; we need an energy policy that emphasizes clean, renewable sources of energy. Now we can’t snap our fingers and transform our energy economy overnight. If we do not have the courage to take on the oil companies and take decisive steps to reduce our overreliance on oil, when the consequences of doing nothing are so clear, we may never start down the path toward a clean energy economy.

Mr. Chairman, I look forward to today's hearing, and I thank the witnesses for appearing and for their cooperation in the investigation.

[The prepared statement of Mr. Waxman follows:]

ONE HUNDRED ELEVENTH CONGRESS

# Congress of the United States

## House of Representatives

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**Opening Statement of Rep. Henry A. Waxman**
**Chairman, Committee on Energy and Commerce**
**Inquiry into the Deepwater Horizon Gulf Coast Oil Spill**
**Subcommittee on Oversight and Investigations**
**May 12, 2010**

Last month, a blowout occurred on an oil rig drilling in deep water in the Gulf of Mexico. Eleven people lost their lives and an environmental calamity is now unfolding in the Gulf as oil gushes from the well and threatens the coast.

We are here today to begin the process of understanding what went wrong and what we need to do to prevent future catastrophes.

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And we know there are major questions about the effectiveness of BP's response to the spill. The company said it could manage a spill of 250,000 barrels per day. Yet, it is struggling to cope with this blowout, which is releasing only 5,000 to 25,000 barrels per day.

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This hearing – and future hearings the Committee will conduct in the coming weeks – will explore these questions. Our goal is to learn what caused the fatal explosion so that Congress and the Executive Branch can act to prevent future disasters.

But as we focus on these narrow questions of what happened and why, we also need to keep the broader perspective in mind. Our national energy policy is broken and nothing illustrates this better than this massive spill. Our dependence on oil and other fossil fuels is fouling our beaches, polluting our atmosphere, and undermining our national security.

One lesson is already apparent from the catastrophe in the Gulf: we need an energy policy that emphasizes clean, renewable sources of energy. We can't snap our fingers and transform our energy economy overnight. If we do not have the courage to take on the oil companies and take decisive steps to reduce our over-reliance on oil – when the consequences of doing nothing are so clear – we may never start down the path toward a clean energy economy.

Mr. Chairman, I look forward to today's hearing, and I thank the witnesses for appearing and for their cooperation in our investigation.

Mr. STUPAK. Thank you, Mr. Chairman.

Next I will go to Mr. Barton, ranking member of the full committee, for an opening statement. Your opening statement, please.

## OPENING STATEMENT OF HON. JOE BARTON, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF TEXAS

Mr. BARTON. Thank you, Chairman Stupak. I am going to submit my written statement for the record and speak extemporaneously because I think, based on what Chairman Waxman just said, we need to kind of set the parameters.

There is nobody on either side of the aisle in this subcommittee or the full committee that doesn't want to get the facts on the table about what happened down in the Gulf of Mexico approximately 1 month ago, why it happened, what can be done to prevent it happening in the future, and remediate any damages, both human and environmental. The 11 people that lost their lives is a primary tragedy. The fact that 5,000 barrels a day of oil is spilling out of the well and coming to the surface and beginning to wash up on some of the beaches in Louisiana and Alabama is a problem, but it is a problem that can be remediated.

I want to focus on some of the things that Chairman Waxman said right at the end of his statement when he made the comment that if we can't take on the oil industry, as if this was some sort of an adversarial situation between the people in the industry. Nothing could be further from the truth. The United States of America is the greatest nation in the world because we are based on the premise of freedom for every individual in this country. That freedom is enunciated in the Declaration of Independence.

Our Founding Fathers had the foresight and the wisdom—and so far political leadership for the last 200 years—and said the best way to protect our freedoms is to provide maximum economic opportunity through a free market, capitalistic system. We are one of the few nations in the world that have let the private sector develop our natural resource base. That has given us the most productive economy, the largest economy. Literally, the United States economy by itself is approximately one-third of the total world's gross product. That is not a consequence of government, it is a consequence of free men and women exercising free choices to maximize their opportunity, and in so doing, create economic opportunity for everybody in the world.

We are in a situation now where if we are going to have additional domestic energy production in a way that maintains our existing lifestyle, it is going to be because we develop our natural resource base both onshore and offshore. I have absolutely no problem with the alternative energy sources, whether it be solar, wind, ethanol, hydro, you name it, but there is a reason that we are an oil-based economy, it is because that barrel of oil, refined into all the products that flow from it, have tremendous, tremendous productivity potential. You can take a gallon of gasoline and you can power a 4,000-pound car with four adults in it at 60 miles an hour in air-conditioned comfort down the highway all the way from New York City to Los Angeles, California.

Now, we do not want, on either side of the aisle, to have people have to import more and more foreign oil. Whether we like it or not, the only real place to find significant additional oil deposits in meaningful quantities is in the Outer Continental Shelf. Now, we have had an accident. It is not an act of God. The amount of pressure, the amount of gas and oil that came up that bore hole is something that was foreseeable, it is something that could have been and should have been contained. The blowout prevention equipment that was on that rig had a design capacity that should have controlled that explosion, it didn't.

The facts that we have uncovered in this investigation through the documents that have been provided show that there was, in all probability, shoddy maintenance; there were mislabeled components; the diagrams didn't depict the actual equipment, but that was not an act of God like a hurricane or an earthquake or a volcano that man can't control. Now, through the efforts of this subcommittee and the full committee and some of the other committees, we will get to the bottom of it; we will find out the facts and we will take corrective measures to prevent that from happening in the future, whether it is legislatively or regulatorily or through best practices changes by the industry. But what we should not do, Mr. Chairman, is make a decision to fence off the Outer Continental Shelf, to use this as the equivalent of the Three Mile Island accident for nuclear power and set back domestic oil and gas production in the Outer Continental Shelf for the next 20 or 30 years. That would not only be a mistake in my opinion, it would be a disservice to the American people.

So I don't want to take on the industry. I want to work with the industry, I want to work with the Congress, I want to find out what the problem was, I want to solve that problem, and I want to move forward. I don't want the United States of America to continue to import 12 to 14 million barrels of oil a day. That one well in the Gulf, although British Petroleum has not been explicit, that one well probably has the potential to produce 50,000 barrels of oil a day. To put that in perspective, there are 200,000 oil wells onshore Texas producing 1 million barrels of oil, that is five barrels a day per well in Texas. This one well is the equivalent to 10,000 oil wells in Texas. That one well in full production is 1 to 2 percent of the production capacity existing in the Gulf of Mexico today. Mr. Chairman, we can't fence that off. We can correct the problem, we can prevent the problem, we can try to change the technology, but do not use this accident as an excuse to take away from the American people probably the biggest domestic energy resource we yet have to develop on the North American continent.

With that, Mr. Chairman, I yield back the balance of my time and I look forward to hearing from the witnesses.

[The prepared statement of Mr. Barton follows:]

**Opening Statement of the Honorable Joe Barton**
**Ranking Member, Committee on Energy and Commerce**
**Subcommittee on Oversight and Investigations Hearing on the Inquiry into the Deepwater Horizon Gulf Coast Oil Spill**
**May 12, 2010**

Thank you Chairman Stupak and Ranking Member Burgess. The events on the Deepwater Horizon drilling rig in the Gulf of Mexico were tragic. Eleven men died. Even if nothing more had happened, the loss of life would alone is worthy of our investigation. Yet today, not only are we looking into the reasons behind their deaths, we are also looking at a vast oil spill that is now threatening the people who live and work along the Gulf Coast.

Mr. Chairman I support the Subcommittee's investigation. But it is important to recognize that the problem in the Gulf of Mexico is an anomaly in an industry that has been exploring offshore for longer than most of us have been alive. What happened was a tragedy, but not an apocalypse, much less doomsday. Offshore oil drilling is important. Given all the sources that can have a measurable impact in enhancing our energy supply, offshore oil drilling is the biggest. This is not the time to panic. We need to figure it out and fix it. Don't let this spill be the Three Mile Island of offshore oil drilling.

The facts are not yet clear, and it is very early to reach any conclusions at all. Indeed, the principal focus of the nation and the companies involved right now should be to stop the spread of oil.

In the foreseeable future, America will continue to have a requirement for domestic energy, and as long as there is a concern about reliance on foreign sources of energy, we're going to need offshore production.

Today is our first hearing on how to get that right, but it won't be the last.

Our job is to ask fair, but tough questions to identify what happened and why it happened, not so we can find excuses to stop offshore production, but so we can ensure that it is safe.

We have to understand who was responsible for the activities and decision-making on the rig. We have to understand whether there was proper oversight of the drilling operations, of the testing, of the well construction by the operator.

In the past, including when I was Committee chairman, we have investigated oil spills on the North Slope of Alaska and traced the problems to human and management failures by the company responsible for the operation, in that case BP. As some of you will recall, I was very disappointed with BP's actions in Alaska. Now we have BP before us again because it is responsible for activity on the Deepwater Horizon.

That said, we do not yet know whether failures can be traced to BP or Transocean, the owner of the rig, or even Halliburton or Cameron – all represented by witnesses appearing before us today.

Unfortunately, we have no witnesses from the Obama Administration, especially Secretary Salazar, to discuss the federal government's oversight and how the Deepwater Horizon was inspected three times since January 2010 by the regional Mineral Management Service office and found to be in compliance.

Ultimately, we have to know what caused this blowout. We have to understand whether there was a material failure or a technological failure that could have been prevented with better maintenance, better planning.

Until this incident, offshore drilling had a strong safety record that was getting stronger. According to data from the Mineral Management Service, between 1996 and 2008, for combined operations on the U.S. Outer Continental Shelf, lost workday incident rates fell from a 3.39 rate in 1996 to a 0.64 rate in 2008. That is a reduction of more than 80%. Hopefully, we can determine the cause and help make offshore drilling even safer.

Our hearing today is about some current and past events, but ultimately, we have to focus on the future in this investigation: How do we ensure the Outer Continental Shelf drilling program will operate in a safe and effective fashion? The United States needs this energy production – which represents 30% of U.S. daily supply. This is a valuable resource, which, until this incident, was produced safely and effectively for decades.

We have to ensure it will be produced safely and effectively for decades to come.

Thank you Mr. Chairman, I will yield back my time and look forward to hearing from the witnesses.

**OPENING STATEMENT OF HON. BART STUPAK, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF MICHIGAN**

Mr. STUPAK. Thank you, Mr. Barton. I will do my opening statement now.

Three years ago almost to the day, this subcommittee held a hearing into British Petroleum disasters at Texas City and on the North Slope of Alaska. The 205 Texas City Refinery explosion resulted in the death of 15 workers and injured more than 170 people.

As a result of that accident and BP's failure to correct potential hazards faced by employees at Texas City, OSHA has twice slapped BP with record-setting fines totaling more than $100 million. Several reports criticized management at the Texas City facility, including BP's own 207 report of the Management Accountability Project, which stated, "A culture that evolved over the years seemed to ignore risk, tolerated noncompliance, and accepted incompetence."

In March of 2006, BP discovered their pipeline on Alaska's North Slope had spilled more than 200,000 gallons of oil on the tundra, making it the largest spill in North Slope history. Our hearings discovered that significant cost-cutting measures resulted in decreased maintenance and inspections of the pipeline, and BP's management culture deterred individuals from raising safety concerns.

Since our last hearing, BP has experienced continual problems on the North Slope. September 29, 2008, an eight-inch high pressure gas line at the Y–Pad location separated, sending three pieces of pipe to the tundra. One segment of the pipe landed 900 feet from the pipeline. Roughly 30 minutes later, a second and unrelated incident occurred on the S–Pad where there was a gas release.

January 15, 2009, a disk cleaning pig became lodged and lost in the 34-inch oil transit line during de-oiling, allowing gas to pass around the pig and travel through Skid 50 to Pump Station number one, causing a significant venting of gas into the atmosphere and a complete shutdown of the Trans-Alaska Pipeline.

October 10, 2009, at the Centro Compressor Plant, low-pressure flare staging valves were stuck closed, causing gas to travel to the back-up, low-pressure serve valves, which activated, caused the gas to vent to the atmosphere, which could have caused an explosion.

November 28, 2009, an 18-inch, three-phase common line near Lisburne Production Center carrying a mixture of crude oil, produced water and natural gas ruptured, spraying its contents over an estimated 84,000 square feet.

In addition to these pipeline incidents, there have been personal injury acts since where employees have been seriously injured or killed, as was the tragic case of Mike Fallinon November 18 when he was crushed between a pipeline and a truck.

Today we are here to investigate the latest BP tragedy, one which has resulted in the loss of 11 lives and is well on its way to becoming one of the largest oil spills in our Nation's history. Let me take a moment on behalf of the entire committee to convey our deepest sympathies to the family, friends, and coworkers of those 11 individuals lost on that fateful day.

On April 20, an explosion and fire occurred in the Deepwater Horizon drilling rig which BP was leasing to drill an exploratory well in the Gulf of Mexico. The rig was owned and operated by Transocean, the world's largest offshore drilling company, and was under contract from BP. On April 22, the rig capsized and sank to the floor of the ocean, resulting in oil leaks from three separate locations among the twisted wreckage.

The world is wondering, what went wrong to allow explosive gas to shoot out of the drill pipe on the Deepwater Horizon causing the explosion? We heard Chairman Waxman discuss theories of what may have gone wrong in the well and what went wrong on the rig. I would like to take a few minutes to discuss issues related to the blowout preventer, the BOP, which was the fail-safe system that cut off the flow of oil and gas to the rig.

In his testimony today, Mr. Lamar McKay, the President of BP America, says that blowout preventers are "intended to be fail-safe." But that didn't happen. The blowout preventer used by Deepwater Horizon rig failed to stop the flow of gas and oil. The rig exploded, and an enormous oil spill is now threatening the Gulf Coast. We know that the blowout preventer, the BOP, did not properly engage. The BOP has multiple rams that are supposed to slam shut to pinch off any flow around the drill pipe and stop the flow of oil from the well. There are also shear rams in the BOP that are supposed to cut and seal the pipe to prevent oil and gas from flowing. The question we will ask is, why did these rams fail?

Our investigation is at its early stages, but already we have uncovered at least four significant problems with the blowout preventer used on the Deepwater Horizon drill rig. First, the blowout preventer had a significant leak in the key hydraulic system. This leak was found in the hydraulic system that provides emergency power to the shear rams, which are the devices that are supposed to cut the drill pipe and seal the well.

I would like to put on the screen a document that the committee received from BP. This document states, Leaks have been discovered in the BOP hydraulic system. The blowout preventer was manufactured by Cameron. We asked a senior official at Cameron what he knew about these leaks. He told us when the remote operating vehicles tried to operate the shear rams, they noticed a loss of pressure. They investigated this by injecting dye into the hydraulic fuel which showed a large leak coming from a loose fitting which was backed off several turns. The Cameron official told us he did not believe the leak was caused by a blowup because every other fitting on the system was tight. We also asked about the significance of the leak. The Cameron official said it was one of several possible failure modes. If the leak deprived the shear rams of sufficient power, they might not succeed in cutting through the drill pipe and sealing the well.

Second, we learned that the blowout preventer had been modified in unexpected ways. One of these modifications was potentially significant. The blowout preventer has an underwater control panel. BP spent the day trying to use this control panel to activate a variable oil ram on the blowout preventer that is designed to seal tight around any pipe of the well; in other words, pinch off the flow of oil. When they investigated why their attempts failed to activate the bore ram, they learned that the device had been modified. A useless test ram, not the variable bore ram, had been connected to the socket that was supposed to activate the variable bore ram.

An entire day's work of precious time had been spent engaging rams that closed the wrong way because it was wired wrong.

BP told us the modifications on the BOP were extensive. After the accident, they asked Transocean for drawings of the blowout preventer because the modifications that drawings they received did not match the structure on the sea floor. BP said they wasted many hours trying to figure this out.

Third, we learned that the blowout preventer is not powerful enough to cut through the joints in a drill pipe. We found a Transocean document that I would like to put on the screen, and it says, Most blind shear rams are designed to shear effectively only on the body of the drill pipe. Procedures for use of BSRs must therefore ensure that there is no tool joint opposite the ram prior to shearing. This seemed astounding to us because the threaded joints between the sections of drill pipe make up about 10 percent of the length of pipe. If the shear rams cannot cut through the joints, that would mean the so-called "fail safe" device would succeed in cutting the drill pipe only 90 percent of the time.

We asked the Cameron official about the cutting capacity of the blowout preventer on the Deepwater Horizon. He confirmed that it is not powerful enough to cut through the joints and the drill pipe. He told us that this was another possible explanation for the failure of the blowout preventer to seal the well.

And fourth, we learned that the emergency controls on the blowout preventer may have failed. The blowout preventer has two emergency controls, one is called the emergency disconnect system, or EDS. BP told us that the EDS was activated on the drill rig before the rig was evacuated, but the Cameron officials said they doubt that the signals ever reached the blowout preventer on the seabed. Cameron officials believe the explosion on the rig destroyed the communications link to the blowout preventer before the emergency sequence could be completed.

In other words, the emergency controls may have failed because the explosion had caused the emergency off the disabled communications to the blowout preventer. Still, the blowout preventer has a dead man switch which is supposed to activate the blowout preventer when all else fails. But according to Cameron, there were multiple scenarios that could have caused the dead man switch not to activate. One is human oversight. The dead man switch may not have been enabled prior to installing the BOP on the ocean floor. One is a lack of maintenance. The dead man switch won't work if the batteries are dead. The dead man switch is connected to two separate control pods on the blowout preventer. Both rely on battery power to operate. When one of the control pods was removed and inspected after the spill began, the battery was found to be dead. The battery in the other pod has still not yet been inspected.

There also appears to be a design problem. The dead man switch activates only when three separate lines that connect the rig to the blowout preventer are all severed, the communication, power and hydraulic lines. Cameron believes the power and communication lines were severed in the explosion, but it is possible that hydraulic lines remained intact, which would have stopped the dead man switch from activating.

These are not the only failure scenarios that could impair the function of the blowout preventer. The Cameron official we met with described many other potential problems that could have prevented the blowout preventer from functioning properly. Steel casings or casing hanger could have been ejected from the well and blocked the operations of the rams, the drill pipe could have been severed successfully, but then dropped from the rig, breaking the seal. All operators on the rig could have tried to activate the shear rams by pushing the shear ram control button. This would initiated an attempt to close the rams, but it would not have been successful.

The shear rams do not have enough power to cut drill pipes unless they are activated through the emergency switch or the dead man switch. In fact, we uncovered an astonishing document that Transocean prepared in 2001 when it bought the blowout preventer from Cameron. I would like to display the executive summary of this document. It says there are 260 separate failure modes that could require polling of the BOP. According to this report, the predominant failures included ram blocking mechanisms. How can a device that has 260 failure modes be considered fail-safe?

The problems with the blowout preventer extend to the procedures for testing the device. CEO of Transocean, Steven Newman, says in his testimony, "We have no reason to believe that they were not operational. They were jointly tested by BP and Transocean personnel as specified on April 10 and 17 and found to be functional." This assertion seems to be contradicted by a document prepared by BP on April 27, one week after the explosion. According to this document, "The blowout preventer stack emergency systems are not typically tested once the BOP stack is on the seabed. What this means is that, while some functions of the BOP may have been tested in the weeks before the explosion, the emergency systems, including the dead man switch and the leaking emergency hydraulic system, were unlikely to have been tested.

After the Alaska Pipeline and Texas refineries disasters, BP promised to make safety its number one priority. This hearing will raise questions about whether BP and its partners fulfilled this commitment. The safety of its entire operations rested on the performance of a leaking, modified, defective blowout preventer.

This is the first of what will certainly be multiple hearings into this disaster. I look forward to a frank and spirited discussion with our witnesses today.

I ask unanimous consent that the documents I referred to be entered into the record.

[The information appears at the conslusion of the hearing.]

[The prepared statement of Mr. Stupak follows:]

**Opening Statement**
**Rep. Bart Stupak, Chairman**
**Committee on Energy and Commerce**
**Subcommittee on Oversight and Investigations**
**"Inquiry into the *Deepwater Horizon* Gulf Coast Oil Spill"**
**May 12, 2010**

Three years ago – almost to the day – this subcommittee held a hearing into British Petroleum's disasters at Texas City and on the North Slope of Alaska. The 2005 Texas City refinery explosion resulted in the deaths of 15 workers and injured more than 170 people. As a result of that accident and BP's failure to correct potential hazards faced by employees at Texas City, OSHA has twice slapped BP with record setting fines totaling more than $100 million. Several reports criticized management at the Texas City facility including BP's own 2007 *Report of the Management Accountability Project* which stated "a culture that evolved over the years seemed to ignore risk, tolerated non-compliance and accepted incompetence."

In March of 2006 BP discovered their pipeline on Alaska's North Slope had spilled more than 200,000 gallons of oil on the tundra, making it the largest spill in North Slope history. Our hearings discovered that significant cost cutting measures resulted in decreased maintenance and inspections of the pipeline and BP's management culture deterred individuals from raising safety concerns.

Since our last hearing BP has experienced continued problems on the North Slope

- September 29, 2008 an 8 inch high pressure gas line at the Y-Pad location "separated" sending 3 pieces of pipe to the tundra. One segment of the pipe landed 900 feet from the pipeline. Roughly 30 minutes later a second and unrelated incident occurred on the S Pad where there was a gas release.

- January 15, 2009 a disc cleaning pig became lodged and lost in a 34 inch Oil Transit Line during de-oiling allowing gas to pass around the pig and travel through Skid 50, to Pump Station 1 causing a significant venting of gas to the atmosphere and the complete shutdown of the Trans Alaska Pipeline for a period of time.

- October 10, 2009 at the Central Compressor Plant low pressure flare staging valves were stuck closed causing gas to travel to the backup low pressure flare valves, which activated causing the gas to vent to the atmosphere which could have caused an explosion.

- November 29, 2009 an 18 inch three-phase common line near the Lisburne Production Center carrying a mixture of crude oil, produced water and natural gas ruptured spraying its contents over an estimated 8,400 square feet area.

In addition to these pipeline incidents there have been several personal injury accidents where employees have been seriously injured or killed as was the tragic case of Mike Phalen on November 18th last year when he was crushed between the pipeline and a truck.

Today we are here to investigate the latest BP tragedy, one which has resulted in the apparent loss of 11 lives and is well on its way to becoming the largest oil spill in our nation's history. Let me take a moment on behalf of the entire committee to convey our deepest sympathies to the family, friends and coworkers of those 11 individuals lost on that fateful day.

On April 20th an explosion and fire occurred on the Deepwater Horizon drilling rig which BP was leasing to drill an exploratory well in the Gulf of Mexico. The rig was owned and operated by Transocean, the world's largest offshore drilling company and was under contract from BP. On April 22nd the rig capsized and sank to the floor of the ocean resulting in oil leaks from three separate locations among the twisted wreckage.

The world is wondering what went wrong to allow explosive gas to shoot out of the drill pipe on the *Deepwater Horizon* causing the explosion. We heard Chairman Waxman discuss theories of what may have gone wrong in the well (down hole as they call it) and what went wrong on the rig. I would like to take a few minutes to discuss issues related to the blowout preventer (BOP) which was the "fail safe system" to cut off the flow of oil and gas to the rig.

In his testimony today, Lamar McKay, the President of BP America, says that blowout preventers are "intended to … be fail-safe." But that didn't happen. The blowout preventer used by the Deepwater Horizon rig failed to stop the flow of gas and oil, the rig exploded, and an enormous oil spill is now threatening the Gulf Coast.

We know that the blowout preventer, the BOP, did not properly engage. The BOP has multiple rams that are supposed to slam shut to pinch off any flow around the drill pipe and stop the flow of oil from the well. There are also shear rams in the BOP that are supposed to cut and seal the pipe to prevent oil and gas from flowing. The question we will ask is why did these rams fail?

Our investigation is at its early stages, but already we have uncovered at least four significant problems with the blowout preventer used on the Deepwater Horizon drill rig.

First, the blowout preventer apparently had a significant leak in a key hydraulic system. This leak was found in the hydraulic system that provides emergency power to the shear rams, which are the devices that are supposed to cut the drill pipe and seal the well.

I would like to put on the screen a document that the Committee received from BP. This document states: "leaks have been discovered in the BOP hydraulics system."

The blowout preventer was manufactured by Cameron. We asked a senior official at Cameron what he knew about these leaks. He told us when the remote operating vehicles (ROVs) tried to operate the shear rams, they noticed a loss of pressure. They investigated this by injecting dye into the hydraulic fluid, which showed a large leak coming from a loose fitting, which was backed off several turns.

The Cameron official told us that he did not believe the leak was caused by the blowout because every other fitting in the system was tight.

We also asked about the significance of the leak. The Cameron official said it was one of several possible failure modes. If the leak deprived the shear rams of sufficient power, they might not succeed in cutting through the drill pipe and sealing the well.

Second, we learned that the blowout preventer had been modified in unexpected ways. One of these modifications was potentially significant. The blowout preventer has an underwater control panel. BP spent a day trying to use this control panel to activate a variable bore ram on the blowout preventer that is designed to seal tight around any pipe in the well. When they investigated why their attempts failed to activate the bore ram, they learned that the device had been modified. A useless test ram – not the variable bore ram – had been connected to the socket that was supposed to activate the variable bore ram. An entire day's worth of precious time had been spent engaging rams that closed the wrong way.

BP told us the modifications on the BOP were extensive. After the accident, they asked Transocean for drawings of the blowout preventer. Because of the modifications, the drawings they received didn't match the structure on the ocean floor. BP said they wasted many hours figuring this out.

Third, we learned that the blowout preventer is not powerful enough to cut through joints in the drill pipe. We found a Transocean document that I would like to put on the screen. It says: most blind shear rams are "designed to shear effectively only on the body of the drillpipe. Procedures for the use of BSR's must therefore ensure that there is no tool joint opposite the ram prior to shearing."

This seemed astounding to us because the threaded joints between the sections of drillpipe make up about 10% of the length of the pipe. If the shear rams cannot cut through the joints, that would mean that this so-called failsafe device would succeed in cutting the drillpipe only 90% of the time.

We asked the Cameron official about the cutting capacity of the blowout preventer on the Deepwater Horizon. He confirmed that it is not powerful enough to cut through the joints in the drillpipe. And he told us this was another possible explanation for the failure of the blowout preventer to seal the well.

And fourth, we learned that the emergency controls on the blowout preventer may have failed. The blowout preventer has two emergency controls. One is called the emergency disconnect system or EDS. BP officials told us that that the EDS was activated on the drill rig before the rig was evacuated. But the Cameron official said they doubted the signals ever reached the blowout preventer on the seabed. Cameron officials believed the explosion on the rig destroyed the communications link to the blowout preventer before the emergency sequence could be completed.

In other words, the emergency controls may have failed because the explosion that caused the emergency also disabled communications to the blowout preventer.

Still, the blowout preventer also has a "deadman switch" which is supposed to activate the blowout preventer when all else fails. But according to Cameron, there were multiple scenarios that could have caused the deadman switch not to activate. One is human oversight: the deadman switch may not have been enabled on the control panel prior to the BOP being installed on the ocean floor. One is lack of maintenance: the deadman switch won't work if the batteries are dead. The deadman switch is connected to two separate control pods on the blowout preventer. Both rely on battery power to operate. When one of the control pods was removed and inspected after the spill began, the battery was found to be dead. The battery in the other pod has not been inspected yet.

And one appears to be a design problem. The deadman switch activates only when three separate lines that connect the rig to the blowout preventer are all severed: the communication, power, and hydraulic lines. Cameron believes the power and communication lines were severed in the explosion, but it is possible the hydraulic lines remained intact, which would have stopped the deadman switch from activating.

These are not the only failure scenarios that could impair the function of the blowout preventer. The Cameron official we met with described many other potential problems that could have prevented the blowout preventer from functioning properly. Steel casing or casing hanger could have been ejected from the well and blocked the operation of the rams. The drill pipe could have been severed successfully, but then dropped from the rig, breaking the seal. Or operators on the rig could have tried to activate the shear rams by pushing the shear ram control button. This would have initiated an attempt to close the rams, but it would not have been successful. The shear rams do not have enough power to cut drill pipe unless they are activated through the emergency switch or the deadman switch.

In fact, we uncovered an astonishing document that Transocean prepared in 2001, when it bought the blowout preventer from Cameron. I would like to display the executive summary from this document. It says there are 260 separate "failure modes" that "could require pulling of the BOP." According to this report, "the predominant failures" included "ram locking mechanisms."

How can a device that has 260 failure modes be considered failsafe?

The problems with the blowout preventer extend to the procedures for testing the device. The CEO of Transocean, Steven Newman, says in his testimony: "we have no reason to believe that they were not operational – they were jointly tested by BP and Transocean personnel as specified on April 10 and 17 and found to be functional."

But this assertion appears to be contradicted by a document prepared by BP on April 27, one week after the explosion. According to this document, "BOP stack emergency systems are not typically tested once the BOP stack is on the seabed." What this means that while some functions on the BOP may have been tested in the weeks before the explosion, the emergency systems, including the deadman system and the leaking emergency hydraulic system, were unlikely to have been tested.

After the Alaska pipeline and Texas refinery disasters, BP promised to make safety its number one priority. This hearing will raise serious questions about whether BP and its partners fulfilled this commitment. The safety of its entire operations rested on the performance of a leaking and apparently defective blowout preventer.

This is the first of what will certainly be multiple hearings into this disaster and I look forward to a frank and spirited discussion with our witnesses today. I ask unanimous consent that the documents I referred to be entered into the record.

Mr. STUPAK. I next turn to Mr. Burgess, ranking member of the subcommittee, for an opening statement, please.

## OPENING STATEMENT OF HON. MICHAEL C. BURGESS, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF TEXAS

Mr. BURGESS. I thank the chairman. And thank you for convening this important hearing.

The Deepwater Horizon events obviously represent a shocking tragedy. Eleven lives were lost, and we all regret that, environmental and economic harm continues to the area, and we don't know what caused the disaster. But it is apparent that there was a failure, and now this committee and, indeed the American people, want answers and they want accountability.

This hearing is preliminary. It is a necessary step in getting the answers and getting to that accountability, and that is why I support the efforts of the committee to move rapidly on this investigation. What caused the blowout and the explosion, the failure of the various emergency safeguards on the sea floor and the immediate response to stem the oil spill deserve our close and thorough scrutiny.

Unfortunately, today's hearing and the committee's investigation is what one might call asymmetric oversight. The committee has demanded and obtained thousands and thousands and thousands of pages of documents and testimony from the four companies represented today, but we have obtained virtually nothing from those Federal agencies that were responsible for the licensing and oversight of these operations.

Nothing from the Obama administration, who presumably has already had discussions with likely many of you as to what went wrong and what might be done to mitigate the problem, but no documents, no testimony from the administration or from any of the relevant Federal agencies.

With the benefit of additional interviews and document review, we should have included an examination of other factors in the incident, including the role of inspections, including the role of Federal inspections and oversight of drilling operations, practices, and technology, and indeed the licensing of same. The Federal role would appear to be an integral part of our story. We should have heard from the Secretary of the Interior today. And as Ranking Member Barton and I have respectfully requested, Mr. Stupak, of you and Chairman Waxman, we would like for that hearing, since it is not occurring today, to occur in the near future.

We will hear from others in the administration and other officials under oath in the near future, and I think it is mandatory that this committee do that. We should have representatives from the Department of Interior and from Minerals Management Services here to explain why in March of 2009, in the initial exploration plan for the Deepwater Horizon, a blowout scenario was not contemplated by BP and why, therefore, the site-specific oil spill response plan was in fact not even required by these regulators.

I would also emphasize the subcommittee should resist the temptation to push ahead on the facts and to lose their perspective. The drilling and production operations are not experimental forays into the deep ocean with untested technology. For over 50 years, these have been well engineered and well planned operations.

Until this tragedy, there was a remarkably good record for overall Gulf oil production. The Gulf produces about 1.7 million barrels of oil per day, 6.5 billion cubic feet of natural gas, about one-third of the total United States daily supply on 3,500 platforms, employing 35,000 workers.

In recent years, the bulk of new production has come from deep sea operations, with scores of exploratory and production wells developed at depths equal to or substantially greater than the 5,000-foot depths of the Deepwater Horizon, all without serious incidence. In point of fact, this is the first spill of magnitude in the Gulf waters.

This is not to minimize the disaster we confront today; 11 lives were lost. Four million gallons of oil has been released into a very fragile ecosystem, an ecosystem that has likely over 7,000 miles of actual ocean frontage on the coast of Louisiana. This past Friday, I went to the Gulf with members of the subcommittee, Chairman Markey and Ranking Member Barton, to learn firsthand about the recovery operations that were going on. And the magnitude of the problems that the people in the Gulf face from what we saw flying over the spill really cannot be captured in news photos. The oil slick looks to be the size of Montana. It reinforces why it is absolutely critical that we ensure that the responders have what they need to control and mitigate the spill, and for the future's sake, we must identify what caused the spill.

Our visit also reinforced how critical timing was in the incident in the immediate response to the blowout. We understand that the initial failure of the blowout preventer was critical to the lack of containment of the spill. Had it worked as designed or worked in a timely fashion in those initial hours or days after the blowout, we might be a having a hearing that was focused on entirely different problems today. But the blowout and subsequent failure of the blowout preventer tells us about the process and operations we actually don't yet know, but it may reveal issues in mechanical failure, systems failure, human error, or a combination of the three.

What we hope we do not find is that corners were needlessly cut in order to save time and money because ultimately now time and money are what are at risk.

Potential issues with material integrity or procedures in the construction of the well may provide a clue to how an apparently unexpected gas release occurred in the first place. All such issues may illuminate areas that better lead to operational oversight by the well's producers, the industry, and again, those charged with the regulation of same, which is why a hearing like this, which is asymmetric in its construct, it is why it is inadequate to really address the problems.

I do look forward to hearing the testimony from our key witnesses in the incident, British Petroleum, the operator of the well, Transocean, the driller and rig owner, Halliburton, a provider of various services, including the critical cementing, and Cameron, which manufactured the blowout preventer at the center of the current efforts to stop the flow of oil. But the regulators have failed. A litany of questions need to be asked and must be asked of those inspectors at Department of Interior and Minerals Management Services.

For what it is worth, I want to welcome the witnesses to our committee. I understand you've been going through a very difficult schedule amidst what is an enormous tragedy within your businesses. I appreciate your willingness to come forward and discuss what you know with the subcommittee.

Time is going to be critical today. You have all been through a day of Senate hearings. And some of the testimony that has come forward has been predictable, but some of it has been contradictory and troubling in the testimony that we heard yesterday in the Senate. I am hopeful that maybe we can clear up some of these discrepancies and that you will, in fact, address them in your opening statements to us today.

At the hearings yesterday, Mr. McKay, you testified that the modifications that were made to the blowout preventer and that the claims that your company, BP, was not aware of those. And Mr. Newman, you testified that Transocean made the modifications in 2005 at BP's request and at BP's expense.

So Mr. McKay, in your opening, please tell us, is this true? Did BP, in fact, request and pay for these modifications? And if so, would BP not have some documentation of this? And if that is the case, why are we hearing from our staff that BP was shocked to hear about the modifications?

And to Mr. Newman, tell us in your opening what modifications did you do? Did Transocean fully inform BP of everything it did to the blowout preventer? Do you have documents to back yourself up? Did you inform BP about any labeling discrepancy in the device itself? So we need to cut through some of those contradictions and become aware of the facts.

And then finally, Mr. Chairman, let me just go back to the issue of who's not here today. In the public information, the public release document, which is the application for the drilling of the Deepwater Horizon, there are some serious questions, there are some serious red flags. And I would very much like to have Secretary Salazar here; I would very much like to have Minerals Management Services here.

Section 2.0, General Information, Section 2.7, Blowout Scenario, a scenario for a potential blowout of the well from which BP would expect to have the highest volume of liquid hydrocarbons is not required for the operations proposed in this exploration potential. Well, wait a minute. That is one thing for BP to say that, but why did the Federal regulators just simply rubber-stamp this when it was pushed across their desk? You have a well that had the potential to produce 100,000 barrels of oil a day and we are now shocked that 5,000 barrels a day are escaping and we have got no plan for mitigation? The State of Louisiana is scrambling for boom material to protect its fragile coastline. We didn't have anything stockpiled ahead of time? We had to move equipment in and drill a 90-day relief well because that is the only way to stop this thing? It just seems like more care should have been delivered up front.

And yes, while I may criticize the companies that are here in front of us today, I have also got serious questions that this committee needs to ask of the Federal agency that was charged with the oversight. When I get to the questions, there are many other statements in this application that are just as troubling. An offshore coastal dispersion modeling report for the proposed operations is not required for the operations. You could lose control of a 100,000-barrel-a-day production well and you don't have to have a model report for offshore coastal dispersion? It goes on and on.

And again, I don't necessarily fault the company for perhaps trying to save a buck on the application, but the Federal agency responsible for this that simply stamped it received and approved, that is where the problem exists in my mind.

Last Friday, when we were down on the Gulf coast, the Times Picayune had an extensive article on what happened on the rig that day. They talk about the removal of the drilling mud prematurely. I hope somebody at some point will address that, that the drilling mud was removed and replaced with seawater before the second cement plug was placed, and subsequent to that was when the blowout occurred. Was, in fact, there some haste at getting this done? Did we depart from best practices? Or is that standard practice now and something that maybe needs to be revisited on other wells that are being drilled at the time?

And then finally, this morning's Washington Post, just a stunning paragraph from a columnist where Mr. McKay points out, Our operating management system in the Gulf of Mexico is as good as anyone. I can't point to any deficiencies. Well, maybe that was true in March, but it is certainly not true in May.

Thank you, Mr. Chairman, for your indulgence. I yield back the balance of my time.

[The prepared statement of Mr. Burgess follows:]

**Opening Statement of the Honorable Michael Burgess**
**Ranking Member, Subcommittee on Oversight and Investigations**
**Hearing on the**
**Inquiry into the Deepwater Horizon Gulf Coast Oil Spill**
**May 12, 2010**

Thank you for convening this important hearing Chairman Stupak. The Deepwater Horizon oil Gulf Coast oil spill is a shocking tragedy. Eleven lives were lost. Environmental and economic harm continues.

We do not know yet what caused this disaster, but it is apparent there was a failure. The American people want answers and they want accountability.

Although this hearing is really a preliminary examination, it is a good first step in getting those answers and that accountability. This is why I support your efforts to move rapidly on this investigation. What caused the blowout and explosion, the failure of various emergency safeguards on the seafloor, and the immediate response to stem the oil spill deserves our close and thorough scrutiny.

Unfortunately, today's hearing and the Committee's investigation is what one might call ***asymmetric oversight***. The Committee has demanded and obtained thousands of pages of documents and testimony from the four companies represented today but virtually nothing from the Obama Administration – no document requests, no testimony.

With the benefit of additional interviews and document review, we should have included an examination of other factors in the incident, including the role of federal inspections and oversight of drilling operations, practices, and technology. The federal role would appear to be an integral part of the story. We should have heard from the Secretary of the Interior today, as Ranking Member Barton and I had respectfully requested of you and Chairman Waxman. Will we hear from Secretary Salazar and perhaps other Administration officials under oath in the near future? We should have representatives from the Department of the Interior and MMS here to explain why in March of 2009, in the "Initial Exploration Plan" for the Deepwater Horizon, a blowout scenario was not contemplated by BP why, therefore, a "site-specific Oil Spill Response Plan" was not required by the regulators.

I would also emphasize the Subcommittee should resist the temptation to rush ahead of the facts, to lose perspective. These drilling and production operations are not experimental forays into the deep ocean with untested technology. For over fifty years, these have been well engineered, well planned operations.

Until this oil spill, there was a remarkably good record for overall Gulf oil production. The Gulf produces about 1.7 million barrels of oil per day, 6.4 billion cubic feet of natural gas per day – about one-third of total U.S. daily supply – on some 3,500 platforms, employing about 35,000 workers. In recent years, the bulk of new production has come from deep sea operations, with scores of exploratory and production wells developed at depths equal to or substantially greater than the 5,000 foot depths of the Deepwater Horizon – all without serious incidents. In point of fact, this is the first spill of this magnitude in Gulf waters.

This is not to minimize the disaster we confront today. Eleven lives were lost and over 4 million gallons of oil has been released into the fragile ecosystem. This past Friday, I went to the Gulf with Energy Subcommittee

Chairman Markey, Ranking Member Barton, and several other Committee colleagues to learn first hand about the recovery operations.

The magnitude of the problems people face on the Gulf, from what we saw flying over the spill, cannot be captured in news photos. This reinforces why it is absolutely critical that we ensure the responders have what they need to control and mitigate the spill and that, for future's sake, we must identify what caused this spill.

Our visit also reinforces how critical timing was in the incident and immediate response to the blow out. We understand the initial failure of the blowout preventer, the so-called "BOP," was critical to the lack of containment of the spill. Had it worked as designed, or worked in a timely fashion in those initial hours and days after the blow out, we would be having a very different hearing today.

What the blowout and subsequent failure of the BOP tells us about processes and operations we don't yet know, but it may reveal issues of mechanical failure, systems failure, human error or a combination of the three. Potential issues with material integrity or procedures in the construction of the well may provide a clue to how an apparently unexpected gas release occurred in the first place. All such issues may also illuminate areas that need better operational oversight by the well producers, the industry, and regulators.

Which is why this asymmetrical hearing is inadequate. While I look forward to hearing from four key players in the incident, BP the operator of the well, Transocean the driller and rig owner, Halliburton the provider of various services including the critical cementing, and Cameron, which manufactured the blow out preventer at the center of current efforts to stop the flow of oil, the regulators failed and a litany of questions need to be asked of the inspectors at Interior and MMS.

Let me welcome the witnesses. I understand you have been undergoing a grueling schedule amidst a great tragedy, and I appreciate your willingness to come and discuss what you know with the Subcommittee. Our oversight work, ultimately, aims to spotlight problems and compel positive solutions.

Thank you Mr. Chairman.

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Mr. STUPAK. Thank you, Mr. Burgess.

Next I will turn to Mr. Markey, chairman of the Energy Subcommittee on Select Committee on Energy Independence, for an opening statement, please.

**OPENING STATEMENT OF HON. EDWARD J. MARKEY, A REPRESENTATIVE IN CONGRESS FROM THE COMMONWEALTH OF MASSACHUSETTS**

Mr. MARKEY. Thank you, Mr. Chairman.

To be honest, it is hard to have confidence in BP. When BP applied for the rights to drill in this lease, they called the chance of a major spill "unlikely." When the accident initially happened, they said it was manageable. And last week, when BP and the other companies appeared before this committee, they said they never thought the rig could sink. Right now, by their own admission, BP is largely making it up as they go. They are engaging in a series of elaborate and risky science experiments at the bottom of the ocean. And after the failure of the containment dome, we are now hearing of plans to stuff the blowout preventer full of a mixture of golf balls, old tires, and other junk.

When we heard the best minds were on the case, we expected MIT, and not the PGA. We already have one hole in the ground, and now their solution is to shoot a hole in one. We expected a lot more sophistication when it came to dealing with something of this magnitude.

I think a root cause for this accident is the "drill baby drill" boosterism. There was oil industry boosterism that minimized potential hazards. There was a boosterism on the part of the previous administration that got rid of protections that they viewed as obstacles to increased drilling. Now we see the results. Boosterism led to complacency and complacency led to disaster, and this is a disaster. But it was not inevitable, it was preventable. And now we must enact protections that prevent similar catastrophes in the future.

As a result of the BP Deepwater Horizon disaster, lives have been lost, livelihoods have been threatened, and a huge ocean and coastal ecosystem has been endangered. We have a duty and obligation to find out what happened here, why it happened, who is responsible, and how we can ensure that it never happens again.

Thank you, Mr. Chairman.

Mr. STUPAK. Thank you, Mr. Chairman.

Mr. Sullivan for an opening statement, 3 minutes, please.

**OPENING STATEMENT OF HON. JOHN SULLIVAN, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF OKLAHOMA**

Mr. SULLIVAN. Thank you, Mr. Chairman. I want to thank our witnesses here today. I know you are going through some challenging times right now and I appreciate you being here.

Chairman Stupak, thank you for holding this hearing today, "Examining the Causes of the Deepwater Horizon Gulf Coast Oil Spill." While the exact cause of this terrible tragedy is still being investigated, I am interested in learning from our witnesses their thoughts on what went wrong and their ideas moving forward to prevent this from ever happening again.

On April 20, 2010, a fire and explosion occurred on the Deepwater Horizon oil drilling rig in the Gulf of Mexico, unfortunately killing 11 of the 126-person crew and injuring many others. Our thoughts and prayers are with all the affected families.

This spill has the potential to be a massive ecological catastrophe, as nearly 4 million gallons of oil have already spilled into the Gulf since the accident. I commend the brave men and women who are working day and night to stop the leak and protect the shoreline in the Gulf region. This is a challenge of epic proportions, and it is the job of this committee to conduct a fact-based investigation into the disaster to find out what went wrong and how we can prevent it from ever happening again.

However, I am disappointed that no one from the Obama administration is here to testify on the Department of Interior's role in response to the accident. Given the integral role of Federal oversight and offshore drilling operations, it is critically important to hear the administration's point of view and to get their take on what safety lapses occurred, and if any regulatory breakdowns happened at the Minerals Management Services that may have contributed to this terrible accident.

During this hearing and the continuing investigation, it is important that we do not lose sight of the fact that 30 percent of the total U.S. production of crude oil comes from offshore. While some may want to stop drilling offshore altogether, this would be a terrible mistake. If we were to ban or restrict offshore drilling, we would simply increase our national dependence on foreign oil which makes our Nation less secure in the short and long-term and increases the cost of energy. We should not use this tragedy as an excuse to roll back the gains we have made in finding new ways to develop our own energy resources as we will need more oil and natural gas to help meet the growing demand for energy in the coming decades.

We still have work to do to uncover exactly what went wrong. There are many questions that will be asked today on ongoing efforts to contain the leak, whether there are potential equipment or operational irregularities that played a part of the accident, and what we can learn from this tragedy going forward. I look forward to getting to the bottom of this tragedy, and I yield back the balance of my time.

Mr. STUPAK. Thank you, Mr. Sullivan.

Mr. Dingell for an opening statement, please, sir.

## OPENING STATEMENT OF HON. JOHN D. DINGELL, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF MICHIGAN

Mr. DINGELL. Thank you, Mr. Chairman. And thank you for holding this important hearing today.

The Obama administration has proposed expanding offshore oil and natural gas drilling in a way that complies with all of our environmental and safety laws. I support expanded offshore drilling if it is done right and if the permitting is done according to law and if the law, in fact, does work. However, these rigs go further and further from shore, and it becomes then critically important that we understand what happened to the Deepwater Horizon rig and well, as well as what additional precautions we need to take to prevent something like this from happening again.

Now, this is not BP's first time appearing before the Energy and Commerce Oversight Subcommittee. Members of this committee will recall in 2007 a hearing regarding corrosion in the pipeline leading up to the Alaska Pipeline which led to 1 million liters of oil leaked in Alaska's North Slope. At that time, I observed that BP workers were often forced to forego safety measures to save money and to ultimately increase BP profits, and yet these safety programs in many cases appear to have been halted or cut due to budgetary reasons. This is the cost of what we have learned about the way that BP managed Prudhoe Bay. Until BP finally acknowledges the role of cost cutting and budget pressures played in creating this mess, I fear that other problems like this may be incurring at other BP facilities through the United States.

The North Slope disaster is unfortunately one example of BP's being before this subcommittee. We also investigated BP's Texas City operations. Back in 2007, BP and its subsidiaries agreed to pay $50 million in criminal fines because of the 2005 explosions at its Texas City refinery. I note with irony and some dismay this fine is equal to less than a day's corporate profits. And here we are again, this time like the explosions at BP's Texas City refinery, we not only have an environmental disaster, but again, we have confronted tragic loss of lives.

A little more than a year ago, in April of 2009, the Minerals Management Service exempted BP's lease at Deepwater Horizon from an Environmental Impact Statement as required by the National Environmental Policy Act. BP called the prospect of an oil spill unlikely, and stated that no mitigation measures other than those required by regulation and BP policy will be employed to avoid, diminish, or eliminate potential impacts on environmental resurface .

This, Mr. Chairman, is, quite frankly, outrageous. NEPA has been the law of the land for a long time, and for a good reason—I happen to know that because I wrote the legislation.

Now, I sincerely hope that when this investigation is completed, that we don't find that BP again once tried to cut costs at the expense of safety. Given their history, I am somewhat skeptical that that will be the conclusion, but I am hopeful, even though I have a pocketful of promises given me by BP during the time we had them before this committee that they would do better and that there was a new regime going on there that was aware of the environmental concerns as a Nation and the duties of that organization.

I do think, Mr. Chairman, that we need to hear from the administration because we have not heard from them about why this was handled the way it was, failures of the leasing services and failures to properly implement NEPA. Now, we all know Gulf Coast is one of the most environmentally sensitive areas of the country. Four hundred species of rare birds, waterfowls and sea turtles are at serious risk. Coastal wetlands are a fragile ecosystem that deserves protection and doesn't appear to be having it.

Since BP's effort to get the containment dome into place didn't work, the company is now going to use golf balls, knots of rope, and materials of miscellaneous character to try and plug the hole. If it works, great. It strikes me though as odd that with all the technology we have, golf balls are our best hope.

I look forward to hearing more about this and efforts to stop the leaking in the Gulf. I look forward to the answers of our witnesses. I hope that we will hear from the government about why they were so generous in allowing this to go forward without full appliance of application of all the laws of the United States.

Thank you, Mr. Chairman.

[The prepared statement of Mr. Dingell follows:]

## News From Congressman John D. Dingell

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**Wednesday, May 12, 2010**
**Contact:** Adam Benson, 202.225.4071 (office) / 202.271.8587 (cell)

# Dingell Statement from BP Oil Spill Hearing

*Washington, DC* – Congressman John D. Dingell (D-MI15) made the following comments at today's Energy and Commerce Subcommittee on Oversight and Investigations hearing "Inquiry into the Deepwater Horizon Gulf Coast Spill":

"Mr. Chairman – thank you for holding this important hearing today. The Obama Administration has proposed expanding offshore oil and natural gas drilling in a way that complies with all our environmental and safety laws – and I support expanded offshore oil drilling, if it is done right. However, as these rigs go further from shore and into deeper waters, it is critically important that we understand what happened to the Deepwater Horizon rig and well, as well as what additional precautions we need to take to prevent anything like this from happening again.

"Now, this is not BP's first time appearing before the Energy and Commerce Oversight Subcommittee. Indeed, in a 2007 hearing regarding corrosion in pipeline leading up to the Alaska Pipeline which led to 1 million liters of oil leaked in Alaska's North Slope, I said 'Workers were often forced to forgo safety measure to save money and to ultimately increase BP's profits' and 'yet these [safety] programs in many cases appear to have been halted or cut due to budgetary reasons. This is the cost of what we've learned about the way BP managed Prudhoe Bay. Until BP fully acknowledges the role cost cutting and budget pressures played in creating this mess, I fear other problems, like this, may be incurring at other BP facilities through the United States.'

"The North Slope disaster is unfortunately only one example of BP being before this subcommittee – we also investigated BP's Texas City operations. Back in 2007, BP and its subsidiaries agreed to pay $50 million in criminal fines because of the 2005 explosions at its Texas City refinery. I note with irony and dismay this fine is equal to less than a day's corporate profits.

"Sadly, here we are again. This time, like the explosions at BP's Texas City refinery, we not only have an environmental disaster, but we have the tragic loss of lives.

"A little more than a year ago, in April 2009, the Minerals Management Service exempted BP's lease at Deepwater Horizon from an environmental impact statement as required by the National

Environmental Policy Act. BP called the prospect of an oil spill "unlikely" and stated that "no mitigation measures other than those required by regulation and BP policy will be employed to avoid, diminish or eliminate potential impacts on environmental resources." This, Mr. Chairman is outrageous. NEPA is the law of the land for a reason. I know because I wrote it.

"I sincerely hope that when the investigation is completed we don't find that BP once again tried to cut costs at the expense of safety. Given their history, I am somewhat skeptical that will be the conclusion, but I am hopeful.

"The Gulf Coast is one of the most environmentally sensitive areas in the country. There are more than 400 species, including rare birds, waterfowl and sea turtles that are at very serious risk from this disaster. The coastal wetlands are a very fragile ecosystem that deserves protection.

"Since BP's effort to get the containment dome in place didn't work, the company is resorting to golf balls, knots of rope and other miscellaneous materials to try and plug the hole. If it works, great – it just strikes me as odd that with all the technology we have, golf balls are our best hope. I look forward to hearing more about this and other efforts to stop the leaking of oil into the Gulf.

"Mr. Chairman, I look forward to hearing from our witnesses today about their efforts thus far."

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Mr. STUPAK. Thank you, Mr. Dingell.

Mr. Gingrey for an opening statement, please, three minutes.

**OPENING STATEMENT OF HON. PHIL GINGREY, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF GEORGIA**

Mr. GINGREY. Mr. Chairman, thank you. And I've got a written statement. I would like to ask unanimous consent to submit it for the record and——

Mr. STUPAK. Without objection.

Mr. GINGREY [continuing]. Offer it extemporaneously. Going back to what the chairman emeritus just said, I think his wisdom always comes through, and his remarks really strike a balance in regard to the concern over what the industry's culpability is and also to bring forth, as our ranking member of the subcommittee, Dr. Burgess, pointed out, that we need to hear from the administration, we need to hear from the Department of Interior, we need to hear from the Minerals Management Services.

I can't help but wonder as I listen to this hearing and the opening statements of the members, what is our intent here really? We are using up a tremendous amount of time already on the majority side, something like 30 minutes of opening statements, and we will go on and on and on and probably give each of the witnesses 5 minutes. And the information we have about the blowout preventer and all these different things at the bottom of the sea, those of us who may have a technical background but not in petroleum engineering, we have been fed information from our staff, but we really need to hear from these experts.

I listened to some of the Senate hearing yesterday, Mr. Chairman. And when Mr. Waxman, the chairman of the full committee, says about BP oil, they don't bear the full cost when something goes wrong. I think we are going to hear from Mr. McKay that indeed they will and do and plan to bear the full cost when something goes wrong. I am not defending anybody here, I just want to learn the facts, the actual facts, fair and balanced.

In regard to the criticism of some of the attempts to plug the leak that was commented by a Senate majority member yesterday in that hearing that it seems like these guys, BP oil in particular, are just making it up as they go along. It sounds analogous to what our majority party and administration are doing in regard to the economic meltdown of this country, kind of making it up as they go along. And so far, our unemployment rate has gone from 7.6 to almost 10 percent, and we still have 16 million people out of work despite a $1 trillion economic stimulus package. So I think we need to be fair and balanced here.

I certainly look forward to the testimony of the witnesses. And yes, we are going to ask some question, tough questions. Eleven lives were lost, and the ecosystem and the economy of the Gulf Coast is at risk, and this is a very important hearing. But let's just don't put on our makeup and have our hair done and pander before the C–SPAN cameras. Let's get the facts right. That is, after all, why we are here.

With that, Mr. Chairman, I yield back.

Mr. STUPAK. Mr. Braley for an opening statement, please.

## OPENING STATEMENT OF HON. BRUCE L. BRALEY, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF IOWA

Mr. BRALEY. Thank you, Mr. Chairman. This is indeed a very important hearing, and I will submit my formal remarks for the record and speak extemporaneously.

This hearing shows what happens when political chants of "drill, baby, drill" evolve into the tragic reality of spill, baby, spill." And for all of my colleagues on the other side who wish that there were representatives of the administration here today, I would remind them that there was a joint congressional briefing held on May 4 where representatives from Interior, Homeland Security, Coast Guard, Commerce, EPA, Minerals Management Services, NOAA and the National Ocean Service did appear, gave us extensive briefings and were there to answer questions to every Member of Congress who chose to end up at that hearing.

Well, probably one of the most profound statements made at that briefing was by Commandant, Admiral Thad Allen, from the Coast Guard, who gave a tremendous overview of what was going on as part of the Federal Government's response. And he made this statement in describing what is happening: This is closer to Apollo 13 than to the Exxon Valdez.

And Mr. Chairman, I think that the fundamental issue of this hearing should be to try to figure out why that is the case because Apollo 13 happened 40 years ago, 240,000 miles away from the Earth, with limited resources to try to solve the disaster that was occurring on that mission. That was 10 years into the manned space program.

And Mr. Chairman Waxman, the first submerged and oil wells in salt water were drilled under the Santa Barbara Channel in California in 1896. So why is this more like Apollo 13 than the Exxon Valdez? Why were we not better prepared to deal with the enormous environmental and safety risks caused by this massive explosion?

Secretary Salazar said at that briefing, this was supposed to be a failsafe system. Obviously, it was not. And the question for all of us is why not?

So as we listen to the witnesses and hear the latest information they have to share with us, these are the questions I want answers to. How did this happen? Why did this happen? Who is responsible? Most importantly, what have we learned? What are we, Congress, going to do, and what are we prepared to do to ensure this never happens again?

And finally, who will bear the cost? Because despite the assurances we received at that briefing from Secretary Salazar and others that BP has made repeated assurances to stand the full cost of this recovery, some of the actions that are taking place in response to this catastrophe would give us the indication otherwise.

And that is why as we look at these serious issues, I look forward to the testimony of our witnesses in answering those questions. And I yield back the balance of my time.

[The prepared statement of Mr. Braley follows:]

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**Statement of Congressman Bruce Braley**

**Subcommittee on Oversight and Investigations**

**"Inquiry into the Deepwater Horizon Gulf Coast Oil Spill"**

**May 12, 2010**

Thank you, Chairman Stupak and Ranking Member Burgess, for holding this important hearing today on the Deepwater Horizon Gulf Coast oil spill. It is critical that we determine what caused the explosion at the Deepwater Horizon drilling rig to ensure that this type of tragedy does not happen again in the future and to ensure accountability for this historic disaster.

This accident – which led to the tragic deaths of eleven people, an historic environmental disaster, and billions of dollars in economic losses for the fishing, seafood, and tourism industries – is a dangerous reminder of the risks that offshore drilling poses. The oil spill not only jeopardizes the livelihoods of the millions of hard-working Americans in the area, but in the long-term, could also impact Iowa's middle class families by raising gas prices that are already too high. We must work to ensure a comprehensive and thorough investigation into the cause of and response to this disaster, both to ensure that this type of accident is prevented in the future and to ensure the most thorough and effective cleanup and recovery possible. We must also work to ensure that American taxpayers do not end up footing the bill for big oil's mistakes.

This hearing is an important step in getting to the root of the cause of the disaster and to providing necessary oversight of the companies' and U.S. government's response. I'm also glad that the Administration has ordered inspections of all rigs in deep water to prevent this type of unacceptable tragedy from happening elsewhere.

I've also taken action to ensure that British Petroleum – and not the American taxpayers – pay for the effects of this spill. While I'm glad that BP has indicated they will be responsible for all clean-up costs, last week I introduced the *Big Oil Company Bailout Prevention Act* with Congressman Holt to ensure that taxpayers are protected from paying for the disastrous effects of this spill. Currently, the responsible party in an oil spill must pay for all the economic damages up to $75 million, including lost revenues from fishing and tourism, natural resources damages, or lost local tax revenues. This legislation would raise the cap to $10 billion and would also eliminate the current $500 million cap on natural resources damages. This legislation is critical to ensuring that if big oil companies are responsible for a disaster, big oil companies pay for the clean-up and damage. I hope this hearing will examine this critical issue of responsibility and accountability, and will also be instrumental in ensuring that the companies responsible bear the burden of fixing the problem.

I also hope this hearing will result in an honest and informed discussion of the risks and benefits of expanded offshore drilling, including an extensive risk-benefit analysis, and an open discussion of the best and safest ways to produce energy for our country. This disaster clearly highlights the risks that offshore drilling poses to our environment, American businesses, families, and communities. It also highlights the need for us to continue to move forward aggressively to harvest more safe, alternative energy, like biofuel and renewable wind power. My state of Iowa is leading the way in these safe, clean energy industries, and I look forward to working with my colleagues here to expand production of these alternative energy sources in my state and across the country.

I look forward to hearing the testimony of the witnesses today and to working to hold those responsible accountable and to prevent this type of disaster from happening again.

Mr. STUPAK. Thank you, Mr. Braley. Mr. Griffith for an opening statement, please.

## OPENING STATEMENT OF HON. PARKER GRIFFITH, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF ALABAMA

Mr. GRIFFITH. Thank you, Mr. Chairman. I would like to thank the chairman and ranking member for calling this important hearing today and the witnesses for taking time to come before our subcommittee to discuss the Deepwater Horizon oil spill.

Before I begin I would like to take a moment and offer my sincere condolences to family and friends of those who lost their lives on the Deepwater Horizon. Please know my thoughts and prayers are with you.

We cannot achieve energy independence without assuming some risk. Whether it is nuclear, coal, oil or natural gas, the process of harnessing energy is inherently risky. Having said this, it is the role of the Federal Government and good corporate citizens to minimize this risk while working towards United States energy independence. Blocking future production will not protect America. It will simply cause us to be much more dependent on unfriendly sources of oil.

The oil and gas industry employs hundreds of thousands of Americans, many in my home State of Alabama. We must continue to drill and avoid knee-jerk reactions to this accident. The oil and gas industry has a safety record that has been steadily improving over the years, and I have no doubt that what is learned from this incident will be incorporated into the future increase in safety.

That being said, we must allow this investigation to go forward and ensure that Congress provide appropriate oversight. It is important to focus on not assigning blame based on theories, but to allow the time to pass that is necessary for a thorough investigation. Once investigations are complete, it is vital that we learn lessons from this incident so that we can keep our workers and environment safe while continuing to produce our valuable oil and gas resources.

Again thank you for coming today, and I look forward to your testimony. And I yield back the balance of my time, Mr. Chairman.

Mr. STUPAK. Thank you, Mr. Griffith.

Ms. DeGette for an opening statement, please.

## OPENING STATEMENT OF HON. DIANA DEGETTE, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF COLORADO

Ms. DEGETTE. Thank you, Mr. Chairman.

As Congress debates the role of a forward-looking energy plan, we are going to need to see what part drilling expansion plays in development of that plan. And we are going to need to see what the causes of this tragic accident were because given the scope of this disaster, we cannot afford to vastly expand offshore drilling in the future if this type of disaster can be expected to occur, even as some on the other side say, on a rare basis. The damage in terms of environment and loss of human life is simply too great.

Accidents on this scale raise innumerable questions about what went wrong. And usually, and probably in this case, there is no single answer or single point of blame. But as we attempt to determine the cause in order to prevent such tragedies in the future, two issues stand out in my mind and the chairman raised both of them.

The first one is, what role did the cementing job play in the accident? The timing of the accident indicates that the cementing was likely a culprit as the accident occurred soon after the cement was injected into the well.

This would not be the first time that cementing has caused problems in the Gulf of Mexico. According to a 2007 study by the Minerals Management Service, nearly half of all blowouts in the Gulf over the last 14 years are due to faulty cementing. In addition, poor cementing has been identified as the cause of the recent 2009 blowout at an offshore oil platform in Australia. Cementing has been a cause for concern in onshore drilling as well with groundwater contamination incidents tied to improper cementing in my home State of Colorado and elsewhere.

The second issue that this committee needs to probe further is the failure of the blowout preventer. This device is designed to be the failsafe mechanism that will prevent tragedies such as this spill. Its failure is extremely troubling as it calls into question whether these devices can be trusted to function properly at offshore drilling locations.

I know that we won't be able to identify the root cause of the accident today and that the investigation is still in its early stages, but finger pointing will not cause this problem. It is in the interest of all of the witnesses to get to the bottom of this issue if they want to assure the American people that offshore drilling is a safe practice that we should actually expand farther.

Frankly, I watched part of the hearing yesterday as well and I was dismayed at the parsing of words by all parties yesterday in terms of liability and in terms of willingness to pay for these tremendous costs. And so I think that those responsible need to step up. They need to bear the cost, and they need to fix this technology. Because if they don't, we will not have expansion of offshore drilling until this committee and the U.S. Congress can be assured that it can be done in a safe and in an environmentally and human—and in a way to save human life way. Otherwise it simply won't be part of our plan. And many of us don't object to offshore drilling. We support it where appropriate, but not if it cannot be done safely.

Thank you, Mr. Chairman.

Mr. STUPAK. Thank you, Ms. DeGette.

Mr. Latta for an opening statement please; 3 minutes.

## OPENING STATEMENT OF HON. ROBERT E. LATTA, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF OHIO

Mr. LATTA. Thank you, Mr. Chairman, Ranking Member Burgess. First and foremost, I also want to extend my heartfelt condolences to families of those who have lost loved ones and those who have been injured. I am also deeply saddened by the destruction caused by the recent oil spill in the Gulf. I want to commend the thousands of dedicated workers, the volunteers and military personnel who are currently in the Gulf responding to this spill to protect the shoreline and wildlife. The cleanup process from this spill will take months if not years.

As the Marine Board of Investigation, made up of the Minerals Management Service, MMS, and the Coast Guard, convened yesterday to identify the factors leading to the explosion, loss of life, sinking and subsequent oil spill of the Deepwater Horizon, I look forward to what the investigation will render and what facts and recommendations will come forth.

It is my understanding, Mr. Chairman, that over 42,000 oil wells have been drilled in the Gulf of Mexico since 1979 when, the first deepwater well was first drilled in the Gulf. Sixty percent of all the wells drilled in the Gulf are now deepwater wells and over 2,200 deepwater wells have been drilled.

As Members of Congress, we must ensure that the United States continues its domestic energy production while also maintaining stringent environmental safety regulations. We cannot become complacent when it comes to American lives and our natural resources. We need to ensure that the investigation into the Deepwater Horizon oil spill is thorough and those individuals responsible for this disaster are held accountable. We cannot afford to have a repeat of this kind of a disaster.

As has already been noted, it is important to note that the oil and natural gas industry in America plays a vital role to our economy and supplies this country with millions of jobs. Most recent data, according to a American Petroleum Institute study, shows that this industry contributes more than $1 trillion to the U.S. economy over a year. The State of Ohio contributes over 229,000 jobs through the oil and natural gas industry, and it is also important to note that we maintain these jobs, but also we need to maintain the safety of our hardworking Americans who are employed in this industry.

As the ranking member has stated, I, too, would like to have witnesses from the Department of the Interior, particularly MMS and the United States Coast Guard. I hope that any future hearings in this committee on this subject will include government agencies that are at the forefront working on this issue.

Finally, Mr. Chairman, I look forward to hearing from today's four witnesses, each of whom represents a company who will play a pivotal role in this investigation. And with that, Mr. Chairman, I yield back. Thank you.

[The prepared statement of Mr. Latta follows:]

**Robert E. Latta**
**Opening Statement**
**House Energy and Commerce Committee**
**Subcommittee on Oversight and Investigations**
**Hearing on "Inquiry into Deepwater Horizon Gulf Coast Oil Spill"**

Chairman Stupak and Ranking Member Burgess:

I want to extend my heartfelt condolences to the families of those who have lost loved ones, and to those who have been injured. I am deeply saddened by the destruction caused by the recent oil spill in the Gulf of Mexico.

I commend the thousands of dedicated workers and military personnel currently in the Gulf responding to this spill to protect the shoreline and wildlife. The cleanup process from the spill will take months, if not years. As the Marine Board of Investigation, made up of the Mineral Management Service (MMS) and the Coast Guard, convened yesterday to identify the factors leading to the explosion, loss of life, sinking, and subsequent oil spill of the Deepwater Horizon, I look forward to what the investigation will render and what facts and recommendations will come forth.

It is important to note that the oil and natural gas industry in America plays a vital role to our economy, and supplies this country with millions of jobs. Most recent data according to a American Petroleum Institute study shows that this industry contributes more than $1 trillion to the U.S. economy every year. The state of Ohio contributes over 229,000 jobs to the oil and natural gas industry. It is not only important that we maintain these jobs, but we also need to maintain the safety of our hard working Americans who are employed in this industry.

It is my understanding, Mr. Chairman, that over 42,000 wells have been drilled in the Gulf of Mexico since 1979, when the first deepwater well was drilled in the Gulf. 60 percent of all wells drilled in the Gulf are deepwater wells, and over 2,200 deepwater wells have been drilled.

As Members of Congress, we must ensure that the United States continues its domestic energy production, while also maintaining stringent environmental and safety regulations. We cannot become complacent when it comes to the American lives and our natural resources, we need to insure that the investigation into the Deepwater Horizon oil spill is thorough and those individuals responsible for this disaster are held accountable. We cannot afford to have a repeat of this kind of disaster.

I would have liked to have heard testimony from expert witnesses from the Department of the Interior, particularly the MMS, and the United States Coast Guard. I hope that any future hearings in this Committee on this subject will include government agencies that are at the forefront working on this issue.

Finally, Mr. Chairman, I look forward to hearing from today's 4 witnesses, each of whom represents a company who will play a pivotal role in this investigation.

With that Mr. Chairman, I yield back.

Mr. STUPAK. Thank you, Mr. Latta.

Mr. Doyle for an opening statement, please.

**OPENING STATEMENT OF HON. MICHAEL F. DOYLE, A REPRESENTATIVE IN CONGRESS FROM THE COMMONWEALTH OF PENNSYLVANIA**

Mr. DOYLE. Mr. Chairman, thank you for convening this hearing today.

First let me offer my condolences and prayers to the families and friends of the 11 people on the Deepwater Horizon rig that tragically lost their lives in a catastrophe 3 weeks ago. It is a sad, grave reminder of the level of risk and danger involved in deepwater drilling. Economic and environmental concerns aside, we owe it to these families to fully and responsibly investigate what went wrong.

After reading the testimony that you have all supplied, one thing seems quite clear. None of you before us today is prepared to accept full responsibility for what happened on April 20. And though I'm very interested in learning who is responsible, I don't believe it is the most pressing issue at hand today. Today what is most critical are the health, environmental and economic effects of this oil leak that continues to grow as this well gushes nearly 5,000 barrels of oil into the Gulf each day, and that is a conservative estimate.

The Unified Command has quickly been activated to arrest and mitigate the effects of this oil spill on surrounding communities. Workers and volunteers are setting hundreds of thousands of feet of boom to protect coastlines, releasing massive volume of dispersants to break up the oil, and even skimming the water surface to collect the oil. This vast response has been swift by most standards, and I commend each of your companies for its willingness to devote all the necessary resources to this effort.

It is troubling, though, in your eagerness to drill you told the Minerals Management Service in February 2009 that you could handle a worst case scenario of 162,000 barrels of oil from an uncontrolled blowout. Now you're dealing with 5,000 barrels a day, and the containment dome hasn't worked, a relief well is far from complete, the blowout preventers can't be activated, and you may need to resort to a jump shot.

What I have a hard time understanding is how 3 weeks after the initial explosion there are not better solutions. By any standard I think it is safe to say that each of your companies have done quite well over the last year. In fact a quick review of your profits show that Transocean netted $677 million in profits, Halliburton $206 million, and BP rounded out with 6.1 billion in profits, and that is just for the first quarter of this year. With the success of this industry, both financially and in technological developments that allow us to drill 30,000 feet underground, how is it not possible that we haven't developed better technologies to plug a well?

Recent news reports explain a maneuver call a jump shot that involves shooting golf balls and rubber tires into a well to stop the leak. I had to ask my staff if that was really true or a misprint. Surely with profits of $6.1 billion, we can devote greater resources to more advanced technologies than golf balls and tires.

I hope our examination here today and in the future months will help us understand how we can allow such high risk drilling to go on without any surefire means for addressing a blowout.

I hope that in response to this horrendous accident that you will all devote sizable resources to developing safer technologies and better regulations to protect your workers, our environment, our wildlife and our domestic energy portfolio.

Mr. Chairman, I yield back.

[The prepared statement of Mr. Doyle follows:]

**Statement of the Honorable Mike Doyle**
**Energy and Commerce Committee**
**Subcommittee on Oversight and Investigations**
**Inquiry into the Deepwater Horizon Gulf Coast Oil Spill**
**Wednesday, May 12, 2010**
**10:00am**

Mr. Chairman, thank you for convening this hearing today to investigate the Deepwater Horizon Gulf Coast oil spill. First, let me offer my condolences and prayers to the family and friends of the 11 people on the Deepwater Horizon rig that tragically lost their lives in the catastrophe three weeks ago. It has been a sad, grave reminder of the level of risk and danger involved in deepwater drilling. Economic and environmental concerns aside, we owe it to these families to fully and responsibly investigate what went wrong on the Deepwater Horizon.

After reading the testimony that you all have supplied, one thing seems quite clear. None of you before us today is prepared to accept full responsibility for what happened on April 20th. Though I am very interested in learning whom is responsible, I don't believe it is the most pressing issue at hand today.

Today what is most critical are the health, environmental and economic effects of this oil leak that continues to grow as this well gushes nearly 5,000 barrels of oil into the gulf each day - and that is a conservative estimate. The Unified Command has quickly been activated to arrest and mitigate the effects of this oil spill on surrounding communities. Workers and volunteers are setting hundreds of thousands of feet of boom to protect coastline; releasing massive volumes of dispersants to break up the oil and even skimming the water's surface to collect the oil. This vast response has been swift by most standards. I commend each of your companies for its willingness to devote all the necessary resources to this effort.

It is appalling that in your eagerness to drill, you told the Mineral Management Service in February of 2009 that you could handle a "worst-case scenario" of 162,000 barrels of oil from an uncontrolled blow-out. Now you're dealing with 5,000 barrels a day and the containment dome hasn't worked, a relief well is far from complete, the blow out preventers can't be activated and you may need to resort to a "junk shot."

What I have a hard time understanding is how three weeks after the initial explosion – there are not better solutions. By any standard, I think its safe to say each of your companies have preformed quite well over the last year. In fact a quick review of your first quarter profits show that TransOcean netted $677 million in profits, Halliburton netted $206 million and BP rounded out with $6.1 billion in profits – and that's just for the first quarter of this year. With the success of this industry both financially and in technological developments that allows us to drill 30,000 feet underground…how is it possible that we have not developed technologies to plug a well? Recent news reports explain a maneuver called a "junk shot" that involves shooting golf balls and rubber tires into the well to try and stop the leak. Surely, with profits of 6.1 billion dollars you can devote greater resources to more advanced technologies than golf balls and tires.

I hope that our examination here today and in future months will help us understand how we could allow such high-risk drilling to go on without any sure-fire means for addressing a blow-out. I hope that in response to this horrendous accident you all will devote sizable resources to developing safer technologies and better regulations that protect your workers, our environment, our wildlife and our domestic energy portfolio.

Mr. STUPAK. Thank you, Mr. Doyle.

Mrs. Blackburn for an opening statement, please.

**OPENING STATEMENT OF HON. MARSHA BLACKBURN, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF TENNESSEE**

Mrs. BLACKBURN. Thank you, Mr. Chairman, and I do want to welcome our witnesses. And thank you for the preparation you have put into planning to be with us here today.

There is no doubt this is a terrible event, and it is one that concerns us. And I represent middle and west Tennessee but I grew up in the Mississippi coastal plains and I know very, very well the impact of the oil production industry on those communities and on the livelihood of those citizens. And also I know how dependent they are on the Gulf, also, for wetlands and for seafood. And so this is a tragedy and it does have so many tentacles, and of course the loss of life is very sad. And I know that it reaches deep within those families across the Gulf.

I think that what we, my focus today, what I would seek to do is to understand what happened and the cause and to understand that without any bias. I think that while going on a search for villains can make for compelling TV, it is not going to put us on the path forward that we need. And that needs to be a pathway to sustainable and responsible drilling in the Gulf.

And we need to look at this, have an honest investigation so that we find opportunities for avoidance that may have been missed both by Washington and by the industry.

I think that we also need to focus our attention on cleaning up the current spill, securing other wells until a long-term solution can be found. In this type business, risk cannot be 100 percent managed and I understand that. And realizing that, I think it is maybe necessary to review contingency plans and to require operators to have prepositioned containment equipment to limit the impacts. Maybe that is something we need to talk about and look at today.

This hearing is a first step to address these issues. Members of this panel are going to have questions of the witnesses on the protocols that are followed, the equipment that was used, and on what a proper course of action should be.

So, Mr. Chairman, thank you, and to our witnesses, thank you for being here today.

Mr. STUPAK. Thank you, Mrs. Blackburn.

Mrs. Christensen for opening statement, please.

**OPENING STATEMENT OF HON. DONNA M. CHRISTENSEN, A REPRESENTATIVE IN CONGRESS FROM THE VIRGIN ISLANDS**

Mrs. CHRISTENSEN. Thank you, Mr. Chairman, and thank you, Chairman Stupak and Ranking Member Burgess, for holding this important hearing to examine the Gulf Coast oil spill disaster situation of grave and far reaching magnitude which is likely to eclipse the Exxon Valdez spill of 20 years ago.

It has been approximately 3 weeks since the explosion that caused the Gulf Coast oil spill and many questions remain unanswered. What caused the explosion? Why did several safety mechanisms fail to prove successful and, the billion dollar question, how can we stop the oil from spewing into the ocean and towards the shore and how can we do it as soon as possible?

I look forward to the testimony this morning, and I thank everyone for coming to yet another hearing. What I am not anxious to hear is a blame game. There are investigations underway that will answer the questions of what went wrong and who and what was at fault. Someone speaks of collaborative efforts in their testimony, and to my mind this is a tragic accident which all companies, operator and contractors, probably share some responsibility, just as they all have a role in the response, cleanup and recovery as well and, importantly, making sure this does not happen again.

We need to clarify what we do know, but the important issue now is how to stop the thousands of gallons of oil from continuing to pour out and how best we can work with all Federal and private partners in the Unified Comman to do just that.

Despite the fact that we can never know everything because of the settlement, there are reports of severe health consequences in those who worked on the Exxon Valdez spill and others, and so I have grave concerns about the health and safety issues for the responders in this one and want to have the assurance that every precaution is being taken to prevent illness and disability in these workers.

I am also concerned about the hundreds of other oil rigs that are functioning now, some in deep waters. Are we better prepared today to respond to an accident on these than we were on April 20? What is being done to ensure that we are? And does BP need what I understand are the higher permitting standards of the U.K. In their operations here in the United States?

Of course, like my colleagues, I am also concerned about the protection and preservation of the fisheries and other shoreline wildlife and other economic impacts of those who depend on these resources for livelihood and, of course, the loss of life.

It is my hope that we will leave this hearing better informed than when we came in. I would also like to take this opportunity to express my sincere condolences to the families who lost loved ones in the April 20th tragedy and wish Godspeed to them, the survivors and their families as they go through their recovery process.

Thank you, Mr. Chairman. I yield back the balance of my time.

Mr. STUPAK. Thank you.

Mr. Welch for an opening statement, please, 3 minutes.

**OPENING STATEMENT OF HON. PETER WELCH, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF VERMONT**

Mr. WELCH. Thank you very much, Mr. Chairman. I thank the witnesses for coming and I, along with my colleagues, want to acknowledge the extraordinary loss of love and lives of brave and hardworking people who died and perished in this accident.

A couple of things. I took the trip to the Gulf Coast with the chairman and ranking member, Mr. Barton, some of my colleagues, Mr. Scalise and Mr. Melancon most significant among them because they live with the folks whose livelihoods and whose sense of self depends on oil and on fishing, and the heartache that we saw was very powerful.

When we flew out over the oil spill, the journey was in a Coast Guard plane that flew low and slow. And traveling out over that magnificent Mississippi Delta and looking down at all the wildlife that we could see, seeing the boats that wanted to be out fishing but couldn't be, going over the Chandeleur Islands with that pristine white sand, knowing how much that landscape and how that economic livelihood is so cherished by Mr. Scalise's people and Mr. Melancon's people and then seeing that first ribbon of an oil slick, that metallic blue ominous sight that we saw a few miles off the Chandeleur Island, and then to see this magnificent blue sea become ink black and then to get out over the oil site or the rig site where those 11 men perished and to see this cancerous, flame orange glow on the sea that is the combination of the emulsifiers and the oil is just heart breaking.

And gentlemen, you obviously share the concern about this, but you do have the responsibility. You have been well paid. The head of BP I think made about $6 million last year, Mr. Newman about 5.4 million, Mr. Probert about 3 million, Mr. Cameron about 8 million. The folks who are now cleaning up the oil spill, we have got a picture and Mr. Burgess and I spoke to them, a couple of women from New Orleans who come out and work for 12 bucks an hour. It is not just golf balls and the other things people mentioned. It is hardworking people who are coming out standing in the hot sun, and they would like a bit of a raise, to tell you the truth.

But the other thing we saw that was so heart breaking to me was fishermen and their boats are not filled with fish; they are filled with these booms, and that is what those two women in the earlier picture, they load these boats with booms. These fishermen are proud. They work incredibly hard. However hard you work, they work harder. And right now they are imperiled. The only thing that is keeping them going is that you are paying them to put booms out to try to keep the oil from the shore and the seabed.

But at the end of the day we know harm is going to be done, and the one question I want conclusively answered is whether BP, who has the ultimate responsibility here, is going to acknowledge specifically and categorically that it will not limit its liability to those fishermen and women and those tourist industries in that Gulf Coast, those people who have protected the environment, that you will not stop your obligation at the $75 million limit that was established after Exxon Valdez. If they have been harmed by conduct that you are responsible for, then I want and I think all of us want an assurance that those fishermen and women, those folks in the tourist industry in Steve Scalise and Charlie Melancon's district will be made whole.

Thank you, Mr. Chairman. I yield back.

Mr. STUPAK. Thank you, Mr. Welch.

Mr. Green, do you have an opening statement? You are recognized for 3 minutes then.

**OPENING STATEMENT OF HON. GENE GREEN, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF TEXAS**

Mr. GREEN. Thank you, Mr. Chairman, for holding this hearing today. I would like to welcome our panel. It is certainly under tragic circumstances that we convene here today and my condolences go out to the families who lost their lives in this accident and also those who are injured. As Member of Congress from East Harris County and Houston, Texas, I have just literally hundreds of people who work offshore, offshore Texas, offshore literally all over the world, and along with our infrastructure we still produce oil and natural gas in a very urban-suburban area but we also have refineries and chemical plants who need that product that is being produced.

This hearing today will be the first of many on this subject and ultimately will determine what went wrong on the Deepwater Horizon rig and apply those lessons to reduce the chance of this ever happening again. However, we should continue to focus on stopping the spill and cleaning it up as soon as possible, and I look forward to hearing from the panel about the latest efforts on this front.

In the wake of the tragic accident, many people are understandably concerned about the safety and environmental risks associated with offshore drilling, and drilling is certainly not risk free. Neither is anything else. However, we should be careful not to rush to judgment on the issue on offshore drilling until we learn what went wrong in this particular case.

In fact, this is the first major accident in the Gulf of Mexico since 1979, and that is almost 31 years. And we have used a lot of that product that has come out of the Gulf of Mexico to move our country for many years.

Like after the Exxon Valdez incident, I anticipate Congress will respond in ways aimed at mitigating a similar accident from ever reoccurring, and I agree we must take every possible precaution to guard against that happening again. The Energy Information Administration maintains that oil, natural gas and coal will continue to make up the large majority of U.S. energy use in 2030 and beyond. If we are to reduce our dependence on foreign policy, we must safely and responsibly explore and produce more domestically, which is a very important issue. Because unless we want to continue to import, I heard the other day we import 55 percent of our oil right now from overseas, Canada, Mexico, but they are producing as much as they can. If we don't produce it in the Gulf of Mexico or offshore, then we are going to get it from Venezuela, we are going to get it from parts of the world that we may not have the best relationships with. So that is why we need to get it right and produce it domestically.

I look forward to the testimony today and again, Mr. Chairman, I thank you for holding the hearing. I yield back my time.

Mr. STUPAK. Thank you, Mr. Green.

Mr. Ross for an opening statement.

**OPENING STATEMENT OF HON. MIKE ROSS, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF ARKANSAS**

Mr. ROSS. Thank you, Chairman Stupak, for holding today's hearing to examine the causes of the recent explosion of the Deepwater Horizon rig and the effects of this oil spill on both the Gulf Coast region and our Nation's domestic energy policy. We all recognize this tragic event was an accident, and my thoughts and prayers go out to those who lost loved ones in the explosion and to the people along the Gulf Coast who have been adversely affected by this incident in an already tough economy.

This accident is a wake-up call for our domestic oil and gas production, and we must take this opportunity to carefully examine our safety standards and protocols in deepwater drilling.

America has led the world in technological innovation by putting a man on the Moon, sending a robot to Mars, and decoding the human genome. Given all the knowledge and technology at our disposal, it amazes me that we could have an accident of this magnitude in 2010. What is even more concerning is that the companies responsible did not have the foresight to anticipate this accident or have an action plan ready or procedures in place that would have immediately remedied this situation and reduced the harmful consequences before it got out of control.

After 3 weeks of oil still leaking into the Gulf, it is clear these procedures were either not in place or did not work effectively, and I am pleased we are now addressing this issue today in this hearing.

However, I want to make it clear that this event does not diminish our need to continue domestic drilling as part of our overall diverse energy policy, but it does remind us of the risk associated and the safety standards that must be adhered to and improved to ensure this never happens again.

I believe that now, more than ever, we shall be investing in the most advanced 21st century technologies that will allow us to recover domestic oil and natural gas safely instead of sending half a trillion dollars a year overseas, much of which is ending up in the hands of those who want to harm us.

I am hopeful that this tragic event and this hearing can be a learning experience to help us to examine our current policies for drilling offshore and in the end help secure America's domestic energy supply for future generations.

And with that, Mr. Chairman, I yield back the balance of my time.

Mr. STUPAK. Thank you, Mr. Ross.

We next hear from Ms. Sutton from Ohio for an opening statement, please.

## OPENING STATEMENT OF HON. BETTY SUTTON, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF OHIO

Ms. SUTTON. Thank you, Chairman Stupak, and thank you for holding this very important hearing on the Gulf Coast oil spill.

It has been 3 weeks since the first explosion on the Deepwater Horizon drilling rig, 3 weeks and we are still looking for answers, what caused the explosion, when will the oil leaks be closed, and what long-term impacts will this tragedy have on our families, small businesses, the environment, and local and State governments.

The one thing we do know is that the companies involved in this oil well operation have failed. And these companies are pointing the finger at each other. These companies failed to have a plan to deal with this type of incident. The companies failed to implement adequate safety measures, and the companies have failed to find sufficient solutions to contain and mitigate this disaster.

And while America waits for a resolution to this disastrous spill, 5,000 barrels of oil, over 200,000 gallons a day, continue to pour out of the seabed into the Gulf.

The wake of this oil spill is broad and sweeping. Eleven workers died, 17 were injured, the Gulf Coast States' economies are crippled. The livelihoods of workers, their families and the small businesses that rely on the Gulf remain in question, and there is a grave possibility that the Gulf Stream could carry this spill around the tip of Florida and to the Atlantic Coast.

The ramifications of this disaster pose great questions about safety measures in deepwater drilling and the priorities of BP, Halliburton, and others.

BP has stated that they will do whatever it takes to stop these leaks. But did BP and Transocean do whatever it took to prevent these leaks, this disaster from occurring? BP and Transocean have been careful to say that the measures they are taking to end the leaks have never really been used before, and one example being the failure of the cofferdam placement over one of the leaks this past weekend, something that had happened never been attempted at such depth.

BP and Transocean have proven that they did not have a response plan sufficient to meet the need in place for a deepwater well spill. The technology for deepwater drilling has continued to advance through significant investment by oil companies, enabling them to access oil in places once thought impossible, but it is now apparent that the necessary investment to develop safety measures and contingencies for deepwater drilling were not adequately advanced. Safety must be put first and investment in it must match if the search for oil and drilling in our waters off of the shore are to continue.

I remain troubled by the continuation of hazardous safety practices at BP's facilities, including fines imposed on their refinery in Toledo, Ohio, and while we wait for BP to stop these leaks, which could possibly take months, the future of our families, workers, small businesses, and the environment remain at the mercy of the winds of the Gulf, and that is not how it should be.

So I look forward to hearing the testimony today.

Mr. STUPAK. Thank you, Ms. Sutton.

That concludes the opening statements of members of this subcommittee. I would note that members of the full committee that have been here, Mr. Scalise, Mr. Melancon, Ms. Castor, Mr. Inslee was here, Mrs. Capps, I expect they will probably stay or come back during questions. I know members will be in and out today. It should also be noted that Congresswoman Sheila Jackson Lee is here from Houston, who is sitting in on today's proceedings. She is welcome to do so and welcome to the committee.

That concludes the opening statements by members of the subcommittee. We have our first panel of witnesses before us. On our panel we have Mr. Steven Newman, who is President and CEO of Transocean Limited, which owned and operated Deepwater Horizon oil rig and blowout preventer; Lamar McKay, Chairman and President of BP America, who is a responsible party in the Gulf leak; Mr. Tim Probert, who is the President, Global Business Lines and Chief Health, Safety, and Environmental Officer at Halliburton, which did the cementing of the well; and Mr. Jack Moore, who is Director, President and CEO of Cameron International, which manufactured the blowout preventer used by Transocean with the Deepwater Horizon rig.

It is the policy of this subcommittee to take all testimony under oath. Please be advised that you have the right under the rules of the House to be advised by counsel during your testimony. Do any of you wish to be represented by counsel? Mr. Newman, Mr. McKay, Mr. Probert, Mr. Moore?

Witnesses indicate they do not. So therefore I'm going to ask you to please rise and raise your right hand to take the oath.

[Witnesses sworn.]

Mr. STUPAK. Let the record reflect that witnesses replied in the affirmative. You are each now under oath. We will hear your 5-minute opening statement. You may submit a longer statement for the record and it will be included in the hearing record.

Mr. Newman, if you don't mind, we will start with you, please, if you would start your opening statement, and thank you for being here.

**STATEMENTS OF STEVE NEWMAN, PRESIDENT AND CEO, TRANSOCEAN LIMITED; LAMAR McKAY, CHAIRMAN AND PRESIDENT, BP AMERICA, INC.; TIM PROBERT, PRESIDENT, GLOBAL BUSINESS LINES, CHIEF HEALTH, SAFETY, AND ENVIRONMENTAL OFFICER, HALLIBURTON; AND JACK B. MOORE, DIRECTOR, PRESIDENT AND CEO, CAMERON INTERNATIONAL**

## STATEMENT OF STEVE NEWMAN

Mr. NEWMAN. Chairman Waxman, Subcommittee Chairman Stupak, Chairman Emeritus, Ranking Members Barton and Burgess, other members of the committee, I want to thank you for the opportunity to speak with you this morning. My name is Steven Newman, and I'm the Chief Executive Officer of Transocean Limited.

Transocean is a leading offshore drilling contractor with more than 18,000 employees worldwide.

I am a petroleum engineer by training, and I have spent years working with and on drilling rigs. I have been with Transocean for more than 15 years, and I am incredibly proud of the contributions our company has made to the energy industry during that time.

Today, however, I sit before you with a heavy heart. The last few weeks have been a time of great sadness and reflection for our company and for me personally. Nothing is more important to Transocean and to me than the safety of our crew members. And our hearts ache for the widows, parents and children of the 11 crew members, including 9 Transocean employees who died in the Deepwater Horizon explosion. These were exceptional men, and we are committed to doing everything we can to help their families as they cope with this tragedy.

Over the last few weeks, we have also seen great acts of courage and kindness in our colleagues and in our communities. That courage and kindness was embodied by the 115 crew members who were rescued from the Deepwater Horizon and were as concerned about the safety of their colleagues as they were about themselves.

It was embodied by the brave men and women of the U.S. Coast Guard, who conducted onsite operations and search and rescue operations, and by the medical professionals who received the injured crew members when they arrived onshore, and it is embodied by our friends and colleagues at Transocean and across the industry who have rallied to help the families of the men who were lost.

This has been a very emotional period for all of us at Transocean, and it has also been a period of intense activity and effort.

Immediately after the explosion, Transocean began working with BP and the Unified Comman in the effort to stop the flow of hydrocarbons from the well. Our finest engineers and operational personnel have been working with BP to identify and pursue options for stopping the flow as soon as possible. Our drilling rig, Development Driller III, is involved in drilling the relief well at the site, and our drill ship, the Discoverer Enterprise, is on location participating in the crude oil recovery operations. A third Transocean drilling rig, the Development Driller II, will be on location in the next day or two to also participate in those onsite operations. We will continue to support BP and the Unified Comman in all of these efforts.

At the same time, we have also been working to get to the bottom of the question to which this committee, Congress, and the American public desperately want an answer. What happened on the night of April 20? And how do we assure the American public that it will not happen again?

Transocean has assembled an independent investigative team to determine the cause of these tragic events, a team that includes dedicated Transocean and industry experts. They will be interviewing people who have potentially helpful information and studying the operations and the equipment involved.

Because the drilling process is a collaborative effort among many different companies, contractors, and subcontractors, the process of understanding what led to the April 20 explosion and how to prevent such an accident in the future must also be collaborative. Our team is working side by side with others, including BP and governmental agencies, and these investigative efforts will continue until we have satisfactory answers.

While it is still too early to know exactly what happened on April 20, we do have some clues about the cause of the disaster. The most significant clue is that the events occurred after the well construction process was essentially finished. Drilling had been completed on April 17, and the well had been sealed with casing and cement. For that reason, the one thing we do know is that on the evening of April 20, there was a sudden catastrophic failure of the cement, the casing, or both. Without a failure of one of those elements, the explosion could not have occurred.

It is also clear that the drill crew had very little, if any, time to react. The initial indications of trouble and the subsequent explosions were almost simultaneous.

What caused that sudden violent failure? Was the well properly designed? Were there problems with the casing or the seal assembly? Was the casing properly cemented and the well effectively sealed? Were all appropriate tests run on the cement and the casing? Were the blowout preventers damaged by the surge that emanated from the well beneath? Did the surge blow debris into the BOP that prevented them from squeezing, crushing or shearing the pipe?

These are some of the questions that need to be answered in the coming weeks and months. Until we know exactly what happened on April 20, we cannot determine how best to prevent such tragedies in the future. But regardless of what the investigations uncover, ours is an industry that must put safety first. We must do so for the sake of our employees, for the sake of their families, and for the sake of people all over the world who use, enjoy, and rely on our oceans and waterways for their sustenance.

And before I close let me respond to Representative Burgess' specific question that arose during yesterday's Senate testimony.

The modification referred to was the result of an agreement between representatives of BP and Transocean approximately 5 years ago. It was done at BP's request and at BP's expense.

Thank you for the opportunity to speak here today, and I am happy to answer any questions.

[The prepared statement of Mr. Newman follows:]

**Testimony**
**Before The Committee On Energy & Commerce**
**Subcommittee On Oversight & Investigations**
**United States House of Representatives**
**May 12, 2010**

***Inquiry into the Deepwater Horizon Gulf Coast Oil Spill***

**Steven Newman, Chief Executive Officer, Transocean, Ltd.**

Chairman Waxman, Subcommittee Chairman Stupak, Ranking Members Barton and Burgess, and other members of the Committee, I want to thank you for the opportunity to speak with you today.

My name is Steven Newman, and I am the Chief Executive Officer of Transocean, Ltd. Transocean is a leading offshore drilling contractor, with more than 18,000 employees worldwide. I am a petroleum engineer by training, I have spent considerable time working on drilling rigs and I have worked at Transocean for more than 15 years. I am proud of the Company's historical contributions to the energy industry during that time. Today, however, I sit before you with a heavy heart.

The last few weeks have been a time of great sadness and reflection for our Company – and for me personally. Nothing is more important to me and to Transocean than the safety of our employees and crew members, and our hearts ache for the widows, parents and children of the 11 crew members – including nine Transocean employees – who died in the *Deepwater Horizon* explosion. These were exceptional men, and we are committed to doing everything we can to support their families as they struggle to cope with this tragedy.

We have also seen great courage and kindness since April 20 that has reaffirmed our faith in the human spirit. That spirit is embodied by the 115 crew members who were rescued from the *Deepwater Horizon* and were as worried about the fate of their colleagues as they were about themselves. It is embodied by the emergency workers and friends and family who were waiting for the injured crew members when they arrived ashore. And it is embodied by the friends and colleagues who have rallied to help the families of those who were lost at sea.

While this has been a very emotional period for all of us at Transocean, it has also been a period of intense activity and effort.

Immediately after the explosion, Transocean began working with BP (in BP's role as operator/leaseholder of this well) and the "Unified Command" (which includes officials from the U.S. Coast Guard, the Department of the Interior's Minerals Management Service (MMS), and the National Oceanic and Atmospheric Administration (NOAA)) in the effort to stop the flow of hydrocarbons. Our finest operational personnel and engineers have been working with BP to identify and pursue options for stopping the flow as soon as possible. Our drilling rig, the *Development Driller III*, is involved in drilling the relief well at the site, and our drillship, the *Discoverer Enterprise*, is involved in the unique oil recovery operations in the Gulf. We will continue to support BP and the Unified Command in all of these efforts.

We have also been working hard to get to the bottom of the question to which the Members of this Committee – and the American people – want and deserve an answer: What happened the night of April 20th, and how do we assure the American public that it will not happen again?

Transocean has assembled an investigative team to determine what led to these tragic events – a team that includes dedicated Transocean and industry experts. They will be interviewing people who have potentially helpful information and studying the operations and the equipment involved. Our team is working side by side with others, including BP and governmental agencies, and these investigative efforts will continue until we have satisfactory answers.

As is often the case after a tragedy of this kind, there has been a lot of speculation about the root cause. I believe it is premature to reach definitive conclusions about what caused the April 20th explosion, but on behalf of our Transocean employees, I feel compelled to respond to some of this speculation. In particular, as we seek to uncover what happened, it is important to understand the well construction process – and the roles of the various parties involved in an operation like the one that was taking place in the Gulf of Mexico.

All offshore oil and gas production projects begin and end with the Operator. When the Operator (in this case, BP) leases a parcel of land on the outer continental shelf (OCS) from the U.S. government, it must prepare and submit detailed plans specifying ***where*** and ***how*** a well is to be drilled, cased, cemented and completed based on its interpretation of propriety data, including geologic data from seismic surveys. Once those plans are approved and permits are issued and work begins, the Operator – or leaseholder – serves as the general contractor that manages all of the work that is performed on its lease. In this capacity, the Operator hires various contractors to perform specific functions in the construction of the well.

In addition, the Operator brings in various sub-contractors to perform specific roles. For example:

- The Operator selects a driller (in this case, Transocean), which provides a vessel (called a "rig") from which drilling operations are performed. As the name suggests, the driller is also responsible for rotating the long string of drill pipe with a drill bit on the end that drills a hole deeper and deeper into the ocean floor. The Operator's well plan dictates the manner in which the drilling is to occur, including the location, the path, the depth, the process and the testing. The drill bits, which are selected by the Operator, are supplied by another sub-contractor.

- A key element of the drilling process is drilling mud, a heavy fluid manufactured to the Operator's specifications. That mud is pumped into the well hole and circulated in order to hold back the pressure of the reservoir and prevent oil, gas or water in that reservoir from moving to the surface through the well. The mud is monitored by another sub-contractor (the mud engineer) (in this instance, M-I Swaco) to detect any problems.

- As the drilling progresses, huge pipes are inserted into the well to maintain the integrity of the hole that has been drilled and to serve as the primary barrier against fluids entering the well. This job is coordinated by the casing sub-contractor selected by the Operator (in this case, Weatherford). In its well plan, the Operator specifies the diameter and strength of each casing segment, purchases the casing, and dictates how it will be cemented in place. Well casing is inserted in a telescope-like manner, with each successive section inside the previous one. Each casing segment also includes a seal assembly to ensure pressure containment.

- After drilling is concluded, yet another area of expertise comes into play. The cementing sub-contractor is responsible for encasing the well in cement, for putting a temporary cement plug in the top of the well, and for ensuring the integrity of the cement. The purpose of this work is to seal the well to make sure that the contents of the reservoir (*i.e.,* oil and natural gas) are not driven by the reservoir pressure into the well. (Once drilling is complete and the well is cased and cemented, it is no longer necessary to circulate

> drilling mud through the well; at that point, the casing and cement serve to control the formation pressure.) The cementing process is dictated by the Operator's well plan, and the testing of the cement on the *Deepwater Horizon* was performed by the cement contractor (Haliburton in this instance) as specified and directed by BP.

Against that background, let me turn to the April 20 *Deepwater Horizon* explosion and its possible causes. What is most unusual about the explosion in this case is that it occurred ***after*** the well construction process was essentially finished. Drilling had been completed on April 17, and the well had been sealed with cement (to be reopened by the Operator at a later date if the Operator chose to put the well into production). At this point, drilling mud was no longer being used as a means of reservoir pressure containment; the cement and the casing were the barriers controlling pressure from the reservoir. Indeed, at the time of the explosion, the rig crew, at the direction of the Operator, was in the process of displacing drilling mud and replacing it with sea water.

For that reason, the one thing we know with certainty is that on the evening of April 20, there was a sudden, catastrophic failure of the cement, the casing, or both. Therein lies the root cause of this occurrence; without a disastrous failure of one of those elements, the explosion could not have occurred. It is also clear that the drill crew had very little (if any) time to react. The explosions were almost instantaneous.

What caused that catastrophic, sudden and violent failure? Was the well properly designed? Was the well properly cemented? Were there problems with the well casing? Were all appropriate tests run on the cement and casings? These are some of the critical questions that need to be answered in the coming weeks and months.

Over the past several days, some have suggested that the blowout preventers (or BOPs) used on this project were the cause of the accident. That simply makes no sense. A BOP is a large piece of equipment positioned on top of a wellhead to provide pressure control. As explained in more detail in the attachment to my testimony, BOPs are designed to quickly shut off the flow of oil or natural gas by squeezing, crushing or shearing the pipe in the event of a "kick" or "blowout" – a sudden, unexpected release of pressure from within the well that can occur during drilling.

The attention now being given to the BOPs in this case is somewhat ironic because at the time of the explosion, the drilling process was complete. The well had been sealed with casing and cement, and within a few days, the BOPs would have been removed. At this point, the well barriers – the cementing and the casing – were responsible for controlling any pressure from the reservoir.

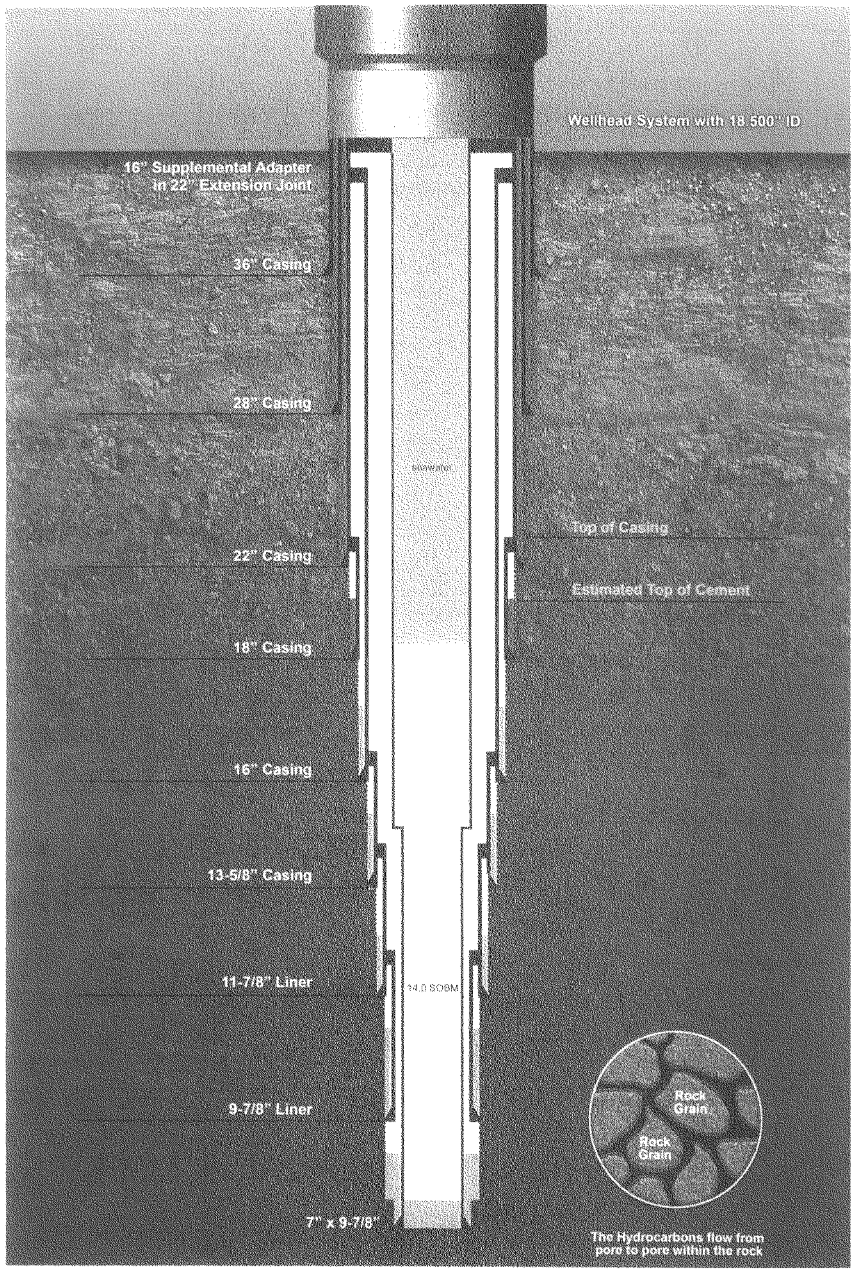
To be sure, BOPs are an important aspect of well control. During drilling, BOPs provide a secondary means of controlling pressure if the primary mechanisms (*e.g.*, drilling mud) prove inadequate. BOPs are robust, sophisticated pieces of equipment that can be activated by various direct and remote methods. Since the BOPs were still in place in this circumstance, they may have been activated during this event and may have restricted the flow to some extent. At this point, we cannot be certain. But we have no reason to believe that they were not operational – they were jointly tested by BP and Transocean personnel as specified on April 10 and 17 and found to be functional. We also do not know whether the BOPs were damaged by the surge that emanated from the well beneath or whether the surge may have blown debris (*e.g.*, cement, casing) into the BOPs, thereby preventing them from squeezing, crushing or shearing the pipe.

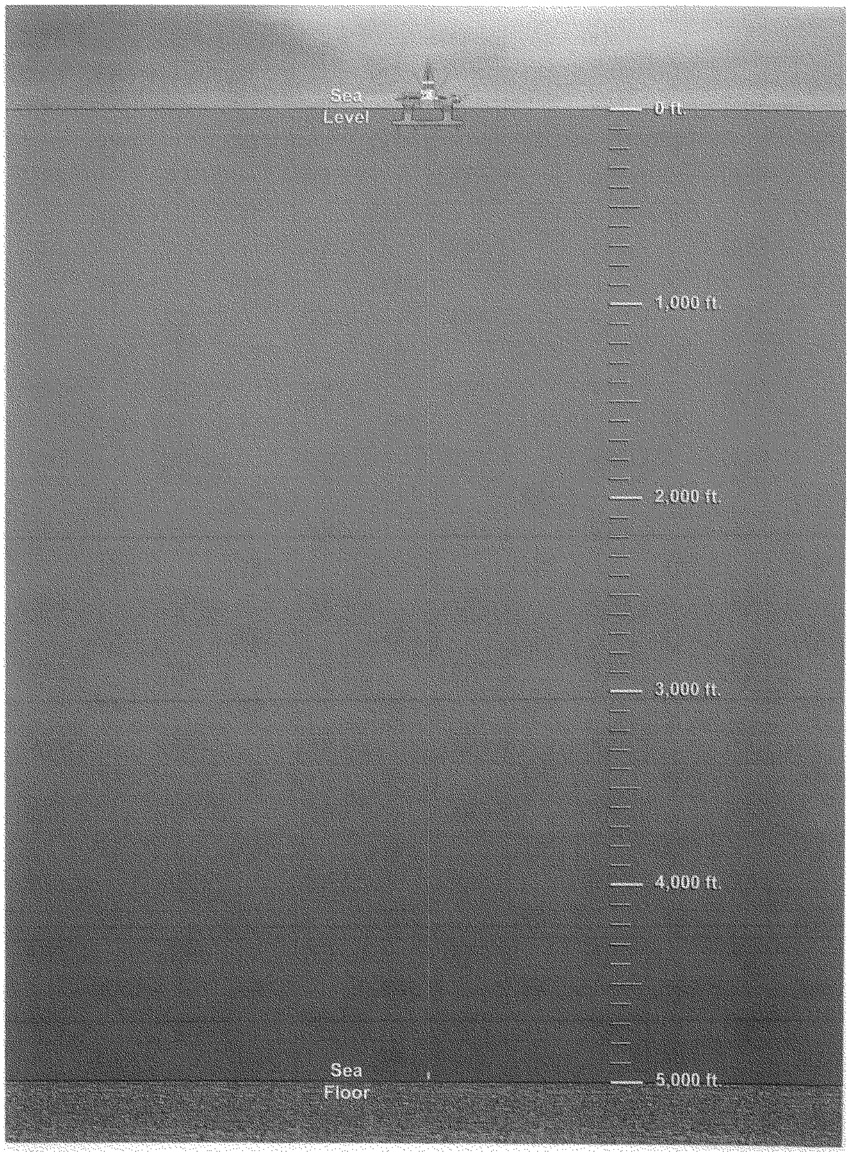
For these reasons, I believe it is inappropriate to focus any causation discussions exclusively on the BOPs. Certainly, we need to understand what happened to the BOPs and whether changes should be made to improve the effectiveness of these devices in the unusual circumstances of an accident like the one on April 20. But the BOPs were clearly not the root cause of the explosion. Our most important task is to understand why a cased and cemented wellbore suddenly and catastrophically failed. As a starting point, our investigative team has looked at numerous possible causes, contributing factors, or trigger events, in an effort to ensure that nothing is overlooked in this investigation.

As I explained earlier, the well construction process is a collaborative effort. For the same reason, the process of understanding what led to the April 20 explosion and how to prevent such an accident in the future must also be collaborative. ***Ours is an industry that must put safety first.*** And I can assure you that Transocean has never – and will never – compromise on safety. In 2009, Transocean recorded its best ever Total Recordable Incident Rate (TRIR). And the federal agency charged with enforcing safety on deepwater oil rigs, MMS, which – as you know – is a unit of the U.S. Department of the Interior, awarded one of its top prizes for safety to Transocean in 2009. The MMS SAFE Award recognizes "exemplary performance by Outer Continental Shelf (OCS) oil and gas operators and contractors." In the words of MMS, this award "highlights to the public that companies can conduct offshore oil and gas activities safely and in a pollution-free manner, even though such activities are complex and carry a significant element of risk." In awarding this prize to Transocean, MMS credited the Company's "outstanding drilling operations" and a "perfect performance period."

Despite a strong safety record, Transocean has never been complacent about safety. We believe that any incident is one too many. Last year, our Company experienced an employee accident record that I found unacceptable. As a result, I recommended to our Board of Directors that they withhold bonuses for all executives in order to make clear that achieving stronger safety performance was a basic expectation – and fundamental to our success. That recommendation was accepted, and our Company paid no executive bonuses last year, in order to send a loud message that we evaluate our success in large part based on the safety of our operations.

Until we fully understand what happened on April 20, we cannot determine with certainty how best to prevent such tragedies in the future. But I am committed – for the sake of the men who lost their lives on April 20, for the sake of their loved ones, for the sake of all the hard-working people who work on Transocean rigs around the world, and for the sake of people in each of the affected states and worldwide who rely on our oceans and waterways for their livelihood – to work with others in the industry, with Congress and with all involved federal agencies to make sure that such an incident never happens again.


Wellhead System with 18.500" ID
16" Supplemental Adapter
in 22" Extension Joint
36" Casing
28" Casing
seawater
Top of Casing
22" Casing
Estimated Top of Cement
18" Casing
16" Casing
13-5/8" Casing
11-7/8" Liner
14.0 SOBM
9-7/8" Liner
Rock
Grain
Rock
Grain
7" x 9-7/8"
The Hydrocarbons flow from
pore to pore within the rock


Sea
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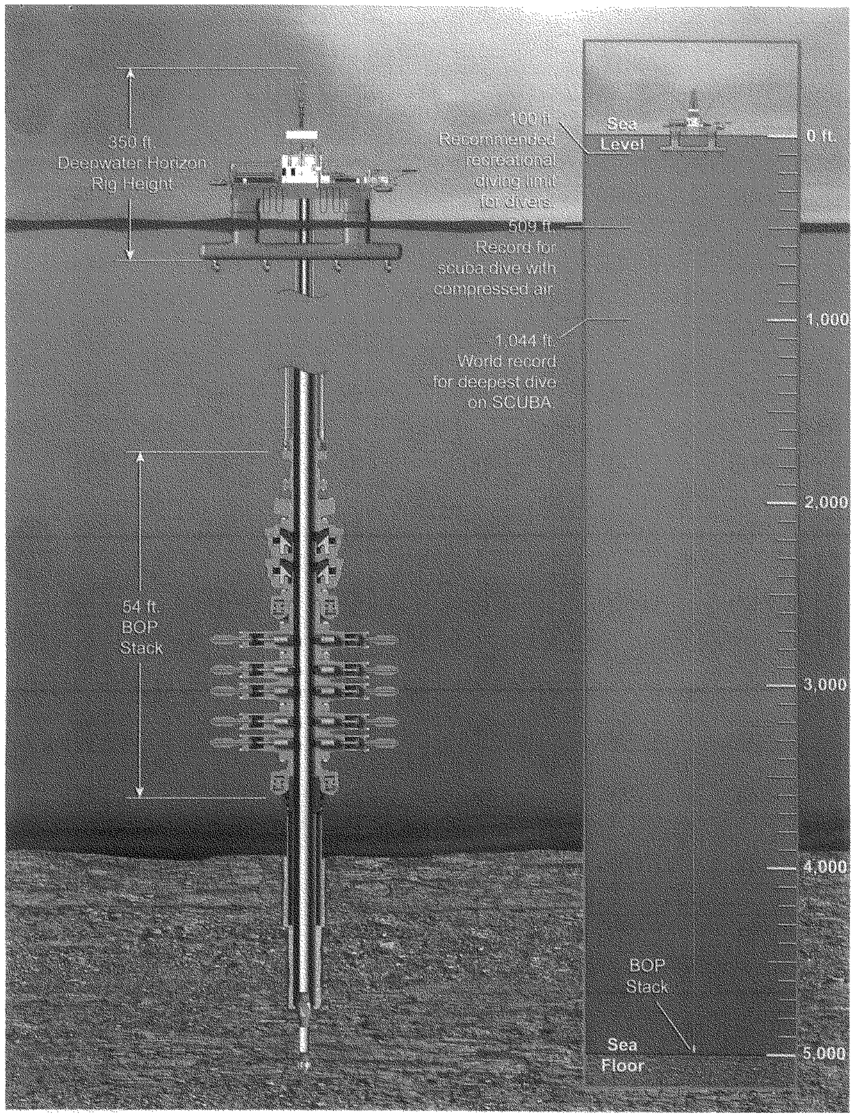
350 ft.
Deepwater Horizon
Rig Height
54 ft.
BOP
Stack
100 ft.
Recommended
recreational
diving limit
for divers.
509 ft.
Record for
scuba dive with
compressed air.
1,044 ft.
World record
for deepest dive
on SCUBA.
Sea
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Sea
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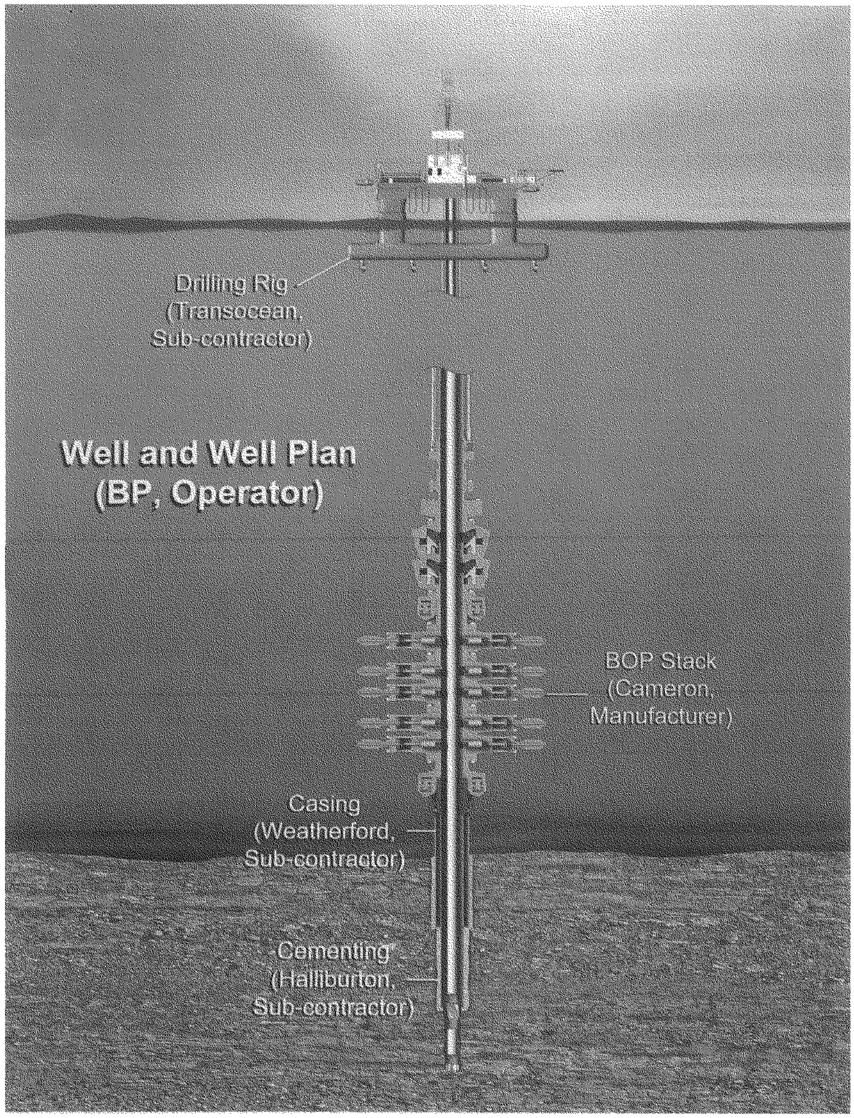
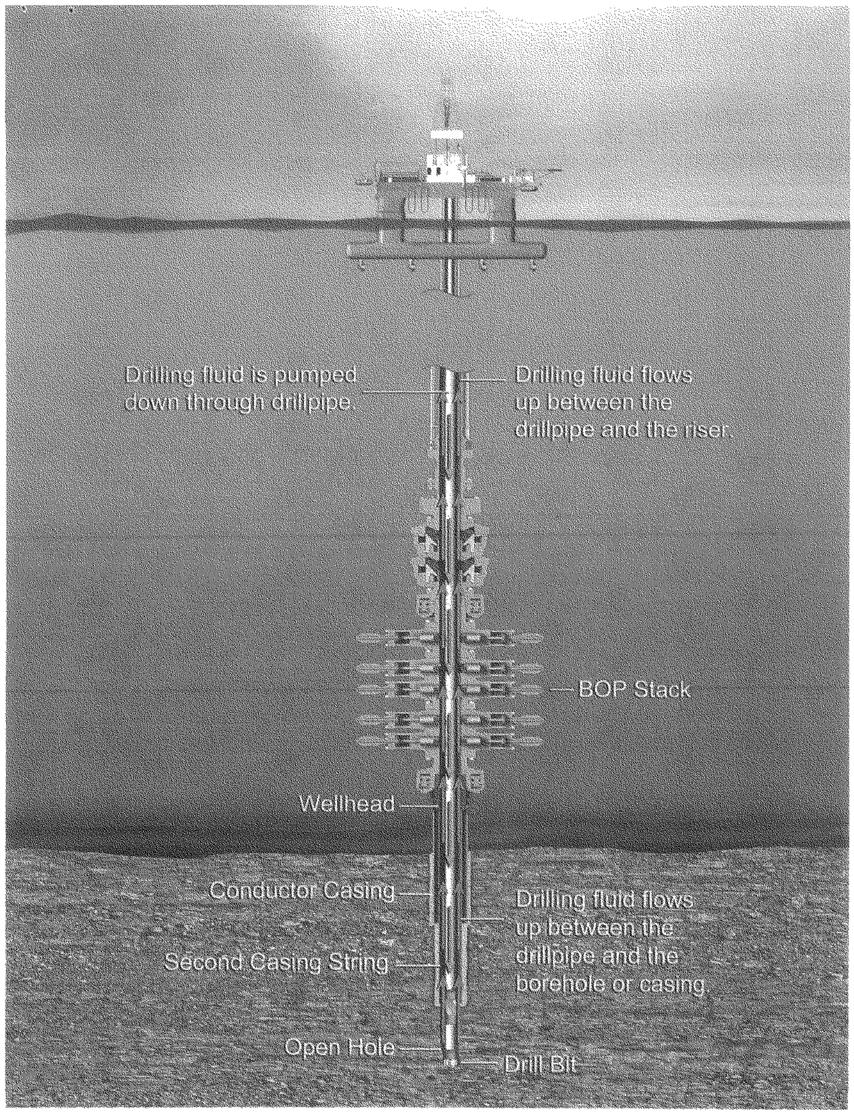
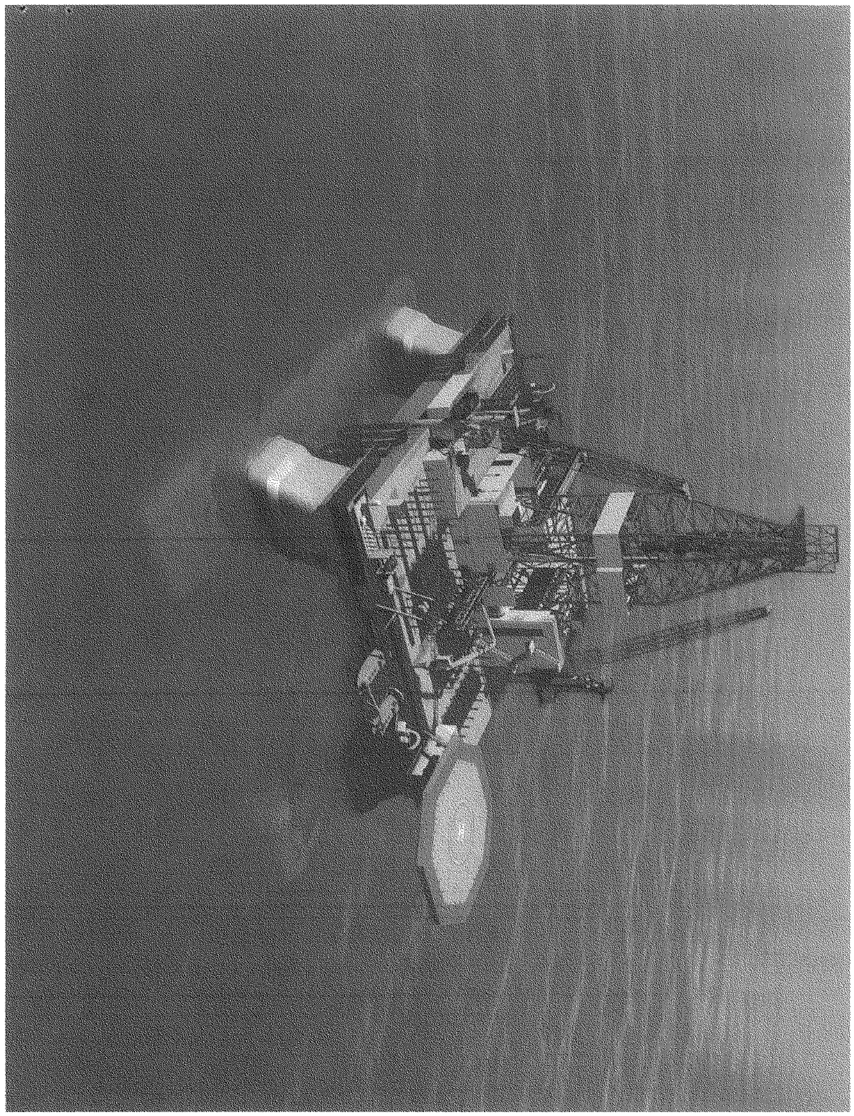
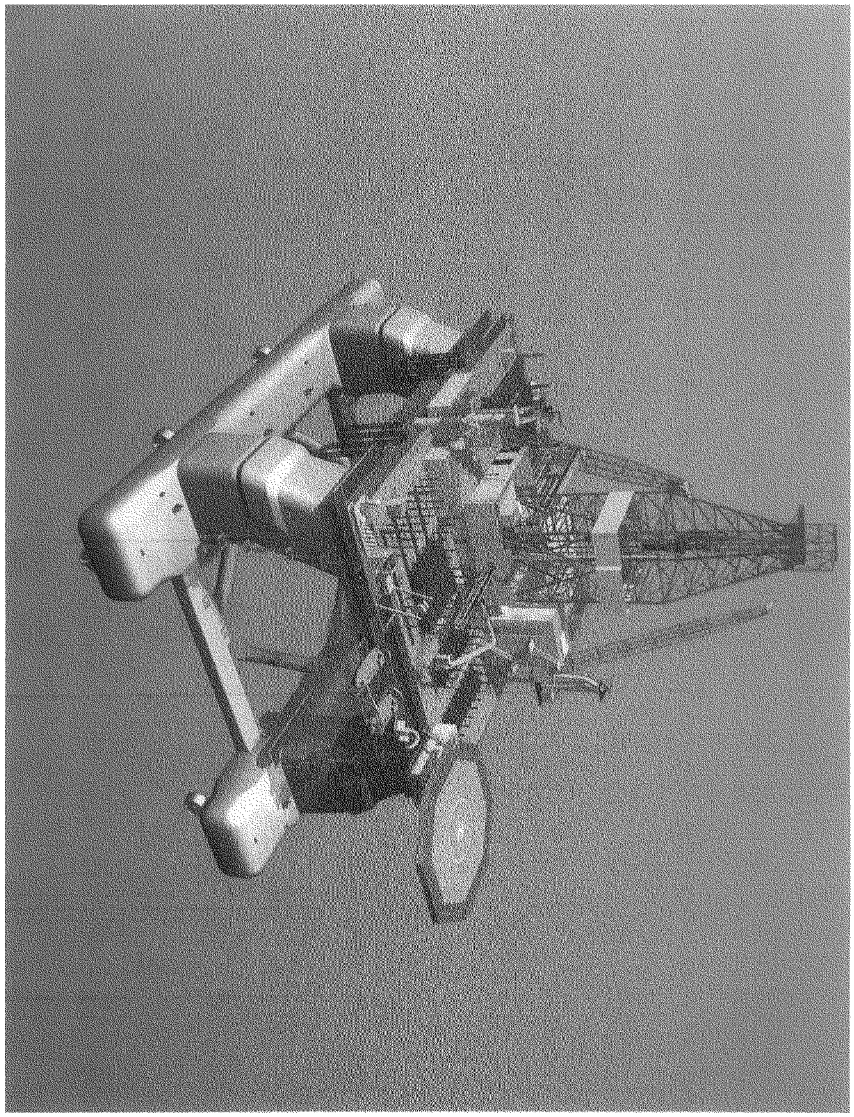

Drilling Rig
(Transocean,
Sub-contractor)
Well and Well Plan
(BP, Operator)
BOP Stack
(Cameron,
Manufacturer)
Casing
(Weatherford,
Sub-contractor)
Cementing
(Halliburton,
Sub-contractor)


Drilling fluid is pumped
down through drillpipe.
Drilling fluid flows
up between the
drillpipe and the riser.
BOP Stack
Wellhead
Conductor Casing
Drilling fluid flows
up between the
drillpipe and the
borehole or casing.
Second Casing String
Open Hole
Drill Bit





Mr. STUPAK. Thank you, Mr. Newman.

Mr. McKay, your opening statement, please.

**STATEMENT OF LAMAR McKAY**

Mr. McKAY. Chairman Waxman, Chairman Emeritus Dingell, Chairman Stupak, Ranking Member Burgess, members of the committee, my name is Lamar McKay and I am President of BP America.

We have experienced a tragic series of events. Three weeks ago tonight, 11 people were lost in an explosion and fire aboard the Transocean Deepwater Horizon rig, and 17 others were injured. My deepest sympathies go out to the families and friends who have suffered. This is a terrible loss and there is a huge enormous issue in the Gulf Coast. Those communities, lives and livelihoods are being affected.

Over the last few days, I have seen the response firsthand. I have seen the men and women on the front line. There is absolutely a deep and steadfast resolve to do all we humanly can to stop the leak, contain the spill, clean up the damage, and deal with the impacts, economic and environmental. As a responsible party under the Oil Pollution Act, we will carry out our responsibilities to mitigate the environmental and economic impact, and just to be very clear, the 75 million is irrelevant and we can talk about that later.

Our efforts are part of a Unified Comman that was established within hours of the accident, and it provides a structure, a structure for our work with the Department of Homeland Security, the Department of the Interior as well as Defense, Energy, OSHA and other Federal agencies, as well as affected State and local governments, and Transocean.

We are grateful for the involvement of President Obama and members of his Cabinet and for the leadership, direction, and resources they have provided. We are also grateful to the Governors, congressional members, State agencies, local agencies, and local communities of Mississippi, Alabama, Louisiana, Florida, and Texas.

I want to underscore that the global resources of BP are committed to this effort and have been from the outset. Nothing is being spared. Everyone understands the enormity of what lies ahead and is working to deliver an effective response at the wellhead, on the water, and on the shoreline.

Before I describe our round-the-clock efforts to respond to this series of events, I want to reiterate our commitment to find out what happened. Understanding what happened and why it happened is a complex process. We are cooperating with the joint investigation by the Departments of Homeland Security and Interior and investigations by Congress. In addition, BP has commissioned an internal investigation whose results we plan to share so we can all learn from these terrible events.

I want to be clear. It's inappropriate to draw any conclusions before all the facts are known. As we speak, our investigation team is locating and analyzing data, interviewing available witnesses and reviewing and assessing evidence. And today I think it's important to give you and the American public an idea of the questions we are asking. There are really two key sets of questions here and we are actively exploring both of those.

First, what caused the explosion and fire on board Transocean's Deepwater Horizon; second, why did Transocean's blowout preventer, the key failsafe mechanism, fail to shut in the well and release the rig?

With respect to the first question, the key issue we are examining is how hydrocarbons could have entered the wellbore. BP, as a leaseholder and operator of the well, hired Transocean to drill the well and fulfill their safety responsibilities. We do not know yet precisely what happened on the night of April 20, but what we do know is that there were anomalous pressure test readings prior to the explosion. These could have raised concerns about well control prior to the operation to replace mud with seawater in the well in preparation for setting the cement plug.

Through our investigation we hope to learn more about what happened and what was done in the hours before the explosion.

Apart from looking at the causes of the explosion, we are also examining why the blowout preventer, the BOP as it is called, did not work as the ultimate failsafe to seal the well and prevent an oil spill. Clearly the BOP remains a critical piece of equipment throughout all operations to ensure well control up until the time the well is sealed and a cement plug is placed and the well is temporarily abandoned.

We will continue full speed ahead with our investigation, keeping all lines of inquiry open until we find out what happened and why. At the same time, we are absolutely fully engaged 24 hours a day every second of the day in efforts to respond to these events.

Our subsea efforts to stop the flow of oil and secure the well involve four concurrent strategies. Activating the blowout preventer would be the preferred course since it stops or diminishes the flow at the source. Unfortunately, this has proved unsuccessful so far.

We are working on a containment system which will place enclosures or containment chambers atop the leaks and conduct flow to a ship at the surface. There have been technical challenges obviously. Engineers are now working to overcome these challenges.

We have begun to drill a first of two relief wells designed to intercept and permanently secure the original well. We began drilling the first relief well on May 2 and expect to begin the second relief well at the end of this week. This operation could take approximately 3 months.

A fourth effort, known as a top kill, uses a tube to inject a mixture of multi-sized particles directly into the blowout preventer to cap the well. It is a technique that has been used industrywide across the world but never in 5,000 feet of water.

On the open water we have 300 response vessels mobilized, 1 million feet of boom placed, 2.5 million feet sourced, and the supply chain geared up to sustainably boom what areas are necessary. We are also attacking the spill with biodegradable dispersants that were preapproved by the Coast Guard and the EPA. Those are being applied by planes and boats. We have also developed and tested a technique to apply dispersant at the leak point on the seabed. We have done three tests of that and we are waiting on the

EPA to decide if we can continuously use that dispersant, which we hope we can.

To protect the shoreline, we are implementing what the U.S. Coast Guard has called the most massive shoreline protection effort ever mounted in history. 13 staging areas are in place and over 4,000 volunteers have already been trained.

We recognize there are both environmental and economic impacts. BP will pay all necessary cleanup costs and is committed to paying legitimate claims for other loss and damages caused by the spill.

Tragic and unforeseen as the accident was, we must not lose sight of why BP and other energy companies are operating in the offshore, including the Gulf of Mexico. The Gulf provides one in three barrels of oil produced in the United States, a resource our economy requires.

BP and the entire energy industry are under no illusions about the challenge we face. We know that we will be judged. We will be judged by our response to this crisis.

We intend to do everything in our power to bring this well under control, to mitigate the environmental impact of the spill, and to address economic claims in a responsible manner.

No resource available to this company will be spared. I can assure you that we and the entire oil and gas industry will learn from this terrible event. We will emerge from it stronger, smarter, and safer.

Thank you for the opportunity to appear before you today. I will be happy to answer your questions.

In addition, as you requested, I brought a technical expert with me, Mike Zangy, Vice President of Drilling and on the modifications, Congressman Burgess, I was referring to yesterday, I need to know if the modifications that we encountered on interventions while this response was going on, were those the only modifications that were made in 2005.

[The prepared statement of Mr. McKay follows:]

**House Energy & Commerce Committee**

**Subcommittee on Oversight & Investigations**

**Wednesday, May 12, 2010[1]**

**Written Testimony**

**Lamar McKay**

**Chairman & President, BP America**

Chairman Stupak, Ranking Member Burgess, members of the committee, I am Lamar McKay, Chairman and President of BP America.

We have all experienced a tragic series of events.

I want to be clear from the outset that we will not rest until the well is under control. As a responsible party under the Oil Pollution Act, we will carry out our responsibilities to mitigate the environmental and economic impacts of this incident.

We – and, indeed, the entire energy sector as a whole - are determined to understand what happened, why it happened, take the learnings from this incident, and make the changes necessary to make our company and our industry stronger and safer. We understand that the world is watching and that we and our industry colleagues will be judged by how we respond to these events.

Three weeks ago yesterday, eleven people were lost in an explosion and fire aboard the Transocean Deepwater Horizon drilling rig, and seventeen others were injured. My deepest sympathies go out to the families and friends who have suffered such a terrible loss and to those in Gulf Coast communities whose lives and livelihoods are being impacted.

This was a horrendous accident. We are all devastated by this. It has profoundly touched our employees, their families, our partners, customers, those in the surrounding areas and those in government with whom we are working. There has been tremendous shock that such an accident could have happened, and great sorrow for the lives lost and the injuries sustained. The safety of our

[1] The data described throughout this testimony is accurate to the best of my knowledge as of 8am Monday, May 10, 2010, when this testimony was prepared. The information that we have continues to develop as our response to the incident continues.

employees and our contractors and the safety of the environment are always our first priorities.

Even as we absorb the human dimensions of this tragedy, I want to underscore our intense determination to do everything humanly possible to minimize the environmental and economic impacts of the resulting oil spill on the Gulf Coast. From the outset, the global resources of BP have been engaged. Nothing is being spared. We are fully committed to the response.

And from the beginning, we have never been alone. On the night of the accident, the Coast Guard helped rescue the 115 survivors from the rig. The list of casualties could easily have been longer without the professionalism and dedication of the Coast Guard.

Even before the Transocean Deepwater Horizon sank on the morning of April 22nd, a Unified Command structure was established, as provided by federal regulations. Currently led by the National Incident Commander, Admiral Thad Allen, the Unified Command provides a structure for BP's work with the Coast Guard, the Minerals Management Service and Transocean, among others.

Immediately following the explosion, in coordination with the Unified Command, BP began mobilizing oil spill response resources including skimmers, storage barges, tugs, aircraft, dispersant, and open-water and near shore boom.

Working together with federal and state governments under the umbrella of the Unified Command, BP's team of operational and technical experts is coordinating with many agencies, organizations and companies. These include the Departments of Energy, Interior, Homeland Security and Defense, National Oceanic and Atmospheric Administration (NOAA), US Fish & Wildlife Service (USFW), National Marine Fisheries Service (NMFS), EPA, OSHA, Gulf Coast state environmental and wildlife agencies, the Marine Spill Response Corporation (an oil spill response consortium), as well as numerous state, city, parish and county agencies.

As Coast Guard Rear Admiral Mary Landry noted on April 28: "BP is being appropriately forward leaning in bringing all the resources to bear to control this spill."

The industry as a whole has responded in full support. Among the resources that have been made available:

- Drilling and technical experts who are helping determine solutions to stopping the spill and mitigating its impact, including specialists in the areas of subsea wells, environmental science and emergency response;

- Technical advice on blowout preventers, dispersant application, well construction and containment options;
- Additional drilling rigs to serve as staging areas for equipment and responders, more remotely operated vehicles (ROVs) for deep underwater work, barges, support vessels and additional aircraft, as well as training and working space for the Unified Command.

**The actions we're taking**

As Chairman and President of BP America, I am part of an executive team that reports directly to our Global CEO, Tony Hayward. I am BP's lead representative in the US and am responsible for broad oversight and connectivity across all of our US-based businesses.

BP itself has committed tremendous global resources to the effort. Among many other tasks, they are helping to train and organize the more than 10,000 citizen volunteers who have come forward to offer their services.

Indeed, we have received a great many offers of help and assistance. The outpouring of support from government, industry, businesses and private citizens has truly been humbling and inspiring. It is remarkable to watch people come together in crisis.

Our efforts are focused on two overarching goals:

- Stopping the flow of oil; and
- Minimizing the impact on the environment.

**Subsea efforts to secure the well**

Our subsea efforts to stop the flow of oil and secure the well have involved four concurrent strategies:

- Working to activate the blow-out preventer (BOP) on the well using submersible ROVs. This would be the preferred course of action, since it would stop or diminish the flow at the source on the ocean floor. Unfortunately, this effort has so far not proved successful.
- Work continues on a subsea oil recovery plan using a containment system, placing large enclosures or containment chambers atop the leaks and conducting flow from the ocean floor to a ship at the surface through a pipe. As we anticipated, however, there have been technical challenges. This system has never been used before at 5,000 feet. Engineers are now working to see if these challenges can be overcome.

- We have begun to drill the first of two relief wells to permanently secure the well. These wells are designed to intercept the original MC252 #1 well. Once this is accomplished, a specialized heavy fluid will be injected into the well bore to stop the flow of oil and allow work to be carried out to permanently cap the existing well. On Sunday, May 2nd, we began drilling the first of these wells. A second drillship will mobilize to the area to begin the second relief well later this week. This relief well operation could take approximately three months.

- A fourth effort is known as a "top kill." It is a proven industry technique for capping wells and has been used worldwide, but never in 5000 feet of water. It uses a tube to inject a mixture of multi-sized particles directly into the blowout preventer. The attempt to do this could take two or three weeks to accomplish.

We have succeeded in stopping the flow from one of the three existing leak points on the damaged well. While this may not affect the overall flow rate, it should reduce the complexity of the situation to be dealt with on the seabed.

**Attacking the spill**

We are attacking the spill on two fronts: in the open water and on the shoreline, through the activation of our pre-approved spill response plans.

- **On the water**

On the open water, we have mobilized a fleet of 294 response vessels, including skimmers, storage barges, tugs, and other vessels. The Hoss barge, the world's largest skimming vessel, has been onsite since April 25. In addition, there are 15, 210-foot Marine Spill Response Corporation Oil Spill Response Vessels, which each have the capacity to collect, separate, and store 4000 barrels of oil. To date, over 97,000 barrels of oil and water mix have been recovered.

Also on the open water, we are attacking the spill area with Coast Guard-approved biodegradable dispersants, which are being applied from both planes and boats. Dispersants are soap-like products which help the oil to break up and disperse in the water, which, in turn, helps speed natural degradation.

Thirty-seven aircraft, both fixed-wing and helicopters, are now supporting the response effort. Over 444,000 gallons of dispersant have been applied on the surface and more than 180,000 gallons are available. Typically, about 2,100 gallons of dispersant is needed to treat 1,000 barrels of oil.

To ensure that adequate supplies of dispersant will be available for surface and subsea application, the manufacturer has stepped up the manufacturing process, and existing supplies are being sourced from all over the world. The cooperation of industry partners has been superb and that is deeply, deeply appreciated.

We have also developed and tested a technique to apply dispersant at the leak point on the seabed. As far as we are aware, this is the first documented attempt to apply dispersant at the source. Early evidence suggests that the test has been impactful, and we are working with NOAA, EPA, and other agencies to refine and improve the technique. EPA is carefully monitoring the impact of dispersant and is analyzing its potential impact on the environment and options for possible future use.

- **Actions to protect the shoreline**

Near the shoreline, we are implementing with great urgency oil spill response contingency plans to protect sensitive areas. According to the Coast Guard, the result is the most massive shoreline protection effort ever mounted.

To ensure rapid implementation of state contingency plans, we announced last week that we would make available grants of $25 million to Louisiana, Mississippi, Alabama, and Florida.

To date, we have about one million feet of boom deployed in an effort to contain the spill and protect the coastal shoreline, and another 1.3 million feet are available. The Department of Defense is helping to airlift boom to wherever it is needed across the Gulf coast.

Incident Command Posts have been or are being established at:

- **Alabama:** Mobile;
- **Florida:** St. Petersburg;
- **Louisiana:** Robert and Houma.

Thirteen staging areas are also in place to help protect the shoreline:

- **Alabama:** Theodore, Orange Beach and Dauphin Island;
- **Florida:** Panama City and Pensacola.
- **Louisiana:** Grand Isle, Venice, Shell Beach, Slidell, Cocodrie;
- **Mississippi:** Pascagoula, Biloxi and Pass Christian;

Highly mobile, shallow draft skimmers are also staged along the coast ready to attack the oil where it approaches the shoreline.

Wildlife clean-up stations are being mobilized, and pre-impact baseline assessment and beach clean-up will be carried out where possible. Rapid response teams are ready to deploy to any affected areas to assess the type and quantity of oiling, so the most effective cleaning strategies can be applied.

A toll-free number has been established to report oiled or injured wildlife, and the public is being urged not to attempt to help injured or oiled animals, but to report any sightings via the toll-free number.

Contingency plans for waste management to prevent secondary contamination are also being implemented.

Over 10,000 personnel are now engaged in the response, including shoreline defense and community outreach.

Additional resources, both people and equipment, continue to arrive for staging throughout the Gulf states in preparation for deployment should they be needed.

**Communication, community outreach, & engaging volunteers**

We are also making every effort to keep the public and government officials informed of what is happening.

BP executives have regularly briefed the President's Cabinet and National Security Council team, members of Congress, the governors and attorneys general of the Gulf Coast states, and many local officials.

On the ground, in the states and local communities, we are working with numerous organizations such as fishing associations, local businesses, parks, wildlife and environmental organizations, educational institutions, medical and emergency establishments, local media, and the general public.

BP is leading volunteer efforts in preparation for shoreline clean-up. We have and will continue to help recruit and deploy volunteers, many of whom are being compensated for their efforts, to affected areas. More than 14,000 calls from volunteers offering their help have been received and over 4,000 volunteers have been trained thus far.

Volunteer activities at this time are focused on clearing the beaches of existing debris and placing protective boom along the shoreline. Our "adopt a boom" program is proving very successful in engaging local fishermen in the response. More than 600 fishing vessels are signed up to deploy boom and assist with the response.

There are five BP community-outreach sites engaging, training, and preparing volunteers:

- **Alabama:** Mobile;
- **Florida:** Pensacola;
- **Louisiana:** Venice
- **Mississippi**: Pascagoula and Biloxi.

A phone line has been established for potential volunteers to register their interest in assisting the response effort.

**Coping with economic impacts**

We recognize that beyond the environmental impacts there are also economic impacts on the people of the Gulf Coast states. BP will pay all necessary clean up costs and is committed to paying legitimate claims for other loss and damages caused by the spill.

We have put in place a BP Claims Process. All claimants are being directed to a toll-free number and a website and will be assigned to experienced adjusters who will assist them in making their claim.

As an alternative, claimants can visit one of BP's Community Outreach Centers or claims centers.

The process is being expedited to make immediate payments to those who have experienced a loss of income, while the overall claim is more fully evaluated. As of today, we have paid out approximately $3.5 million.

**Commitment to investigate what happened**

BP is one of the lease holders and the operator of this exploration well. As operator, BP hired Transocean to conduct the well drilling operations. Transocean owned the Deepwater Horizon drilling rig and its equipment, including the blowout preventer.

The questions we all want answered are: What happened on the seabed and aboard the Deepwater Horizon and why did these things happen?

A full answer to those questions will have to await the outcome of a joint investigation by the Departments of Homeland Security and Interior, investigation by Congress, and an independent internal investigation that BP is conducting.

BP's investigation into the cause of this accident is being led by a senior BP executive from outside the affected business. The team has more than 40 people. The investigation is ongoing and has not yet reached conclusions about incident cause. We intend to share the results of our findings so that our industry and our regulators can benefit from the lessons learned.

Investigations take time, of course, in order to ensure that the root cause of the failure is fully understood. But let me give you an idea of the questions that BP and the entire energy industry, are asking:

- What caused the explosion and fire?
- And why did the blowout preventer fail?

Only seven of the 126 onboard the Deepwater Horizon were BP employees, so we have only some of the story, but we are working to piece together what happened from meticulous review of the records of rig operations that we have as well as information from those witnesses to whom we have access. We are looking at our own actions and those of our contractors, as is the Marine Board.

We are looking at why the blowout preventer did not work because that was to be the fail-safe in case of an accident. The blowout preventer is a 450-ton piece of equipment that sits on top of the wellhead during drilling operations. It contains valves that can be closed remotely if pressure causes fluids such as oil or natural gas to enter the well and threaten the drilling rig. By closing this valve, the drilling crew can regain control of the well.

Blowout preventers are used on every oil and gas well drilled in the world today. They are carefully and deliberately designed with multiple levels of redundancy and are regularly tested. If they don't pass the test, they are not used.

The systems are intended to fail-closed and be fail-safe; sadly and for reasons we do not yet understand, in this case, they were not. Transocean's blowout preventer failed to operate.

All of us urgently want to understand how this vital piece of equipment and its built-in redundancy systems failed and what measures are required to prevent this from ever happening again. In this endeavor, you will have the full support of BP as well as, I am sure, the rest of the industry.

**Energy policy remains critical**

Tragic and unforeseen as this accident was, we must not lose sight of why BP and other energy companies are operating in the offshore, including the Gulf of Mexico. The Gulf is one of the world's great energy producing basins, providing one in four barrels of oil produced in the United States. That is a resource that powers America and the world every day, one our economy requires.

**Conclusion**

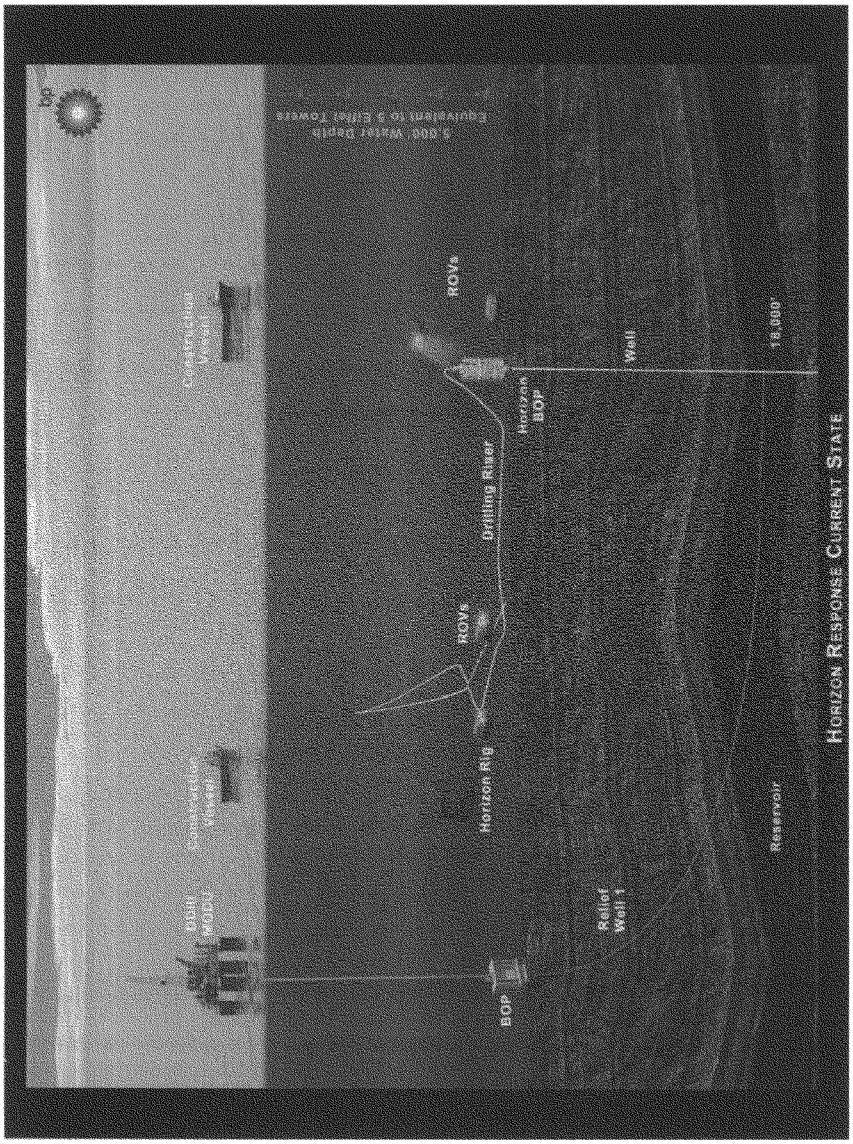
But before we can think about the future, we have to deal with the immediate challenge of today.

BP is under no illusions about the seriousness of the situation we face. In the last three weeks, the eyes of the world have been upon us. President Obama and members of his Cabinet have visited the Gulf region and made clear their expectations of BP and our industry. So have members of Congress, as well as the general public.

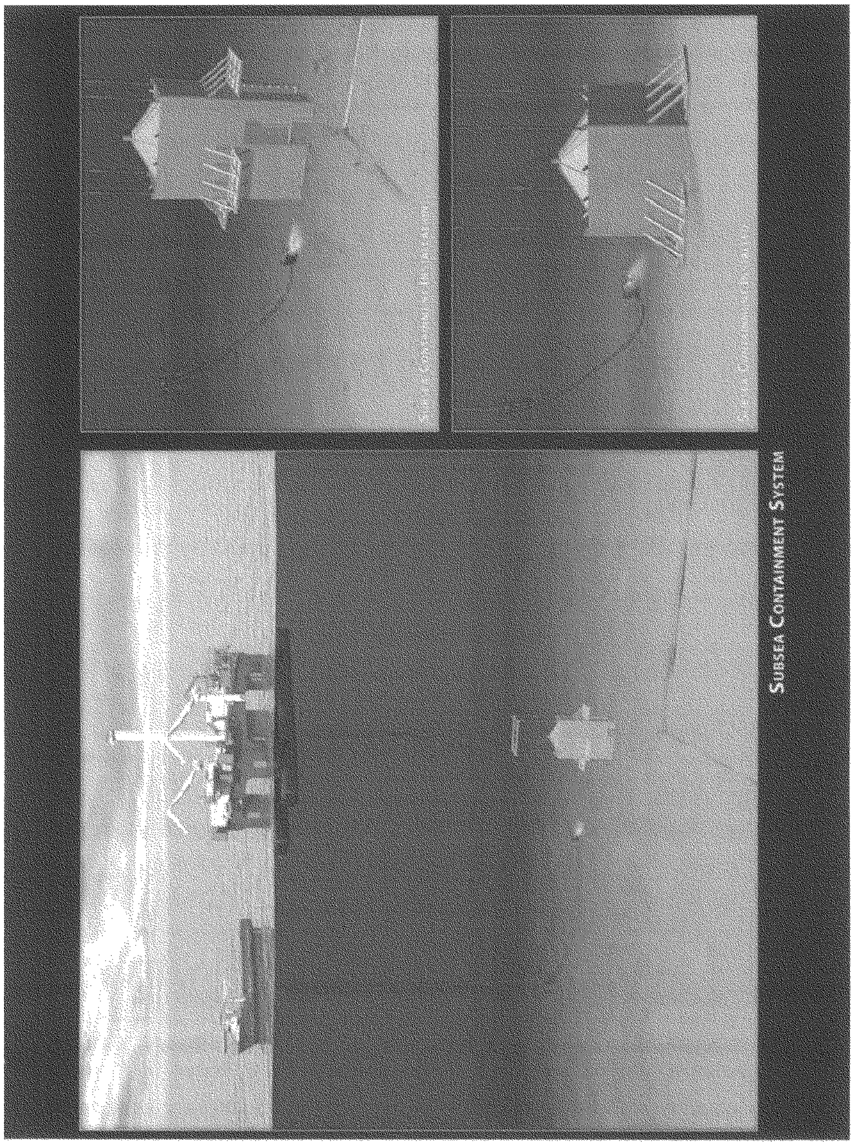
We intend to do everything within our power to bring this well under control, to mitigate the environmental impact of the spill and to address economic claims in a responsible manner.

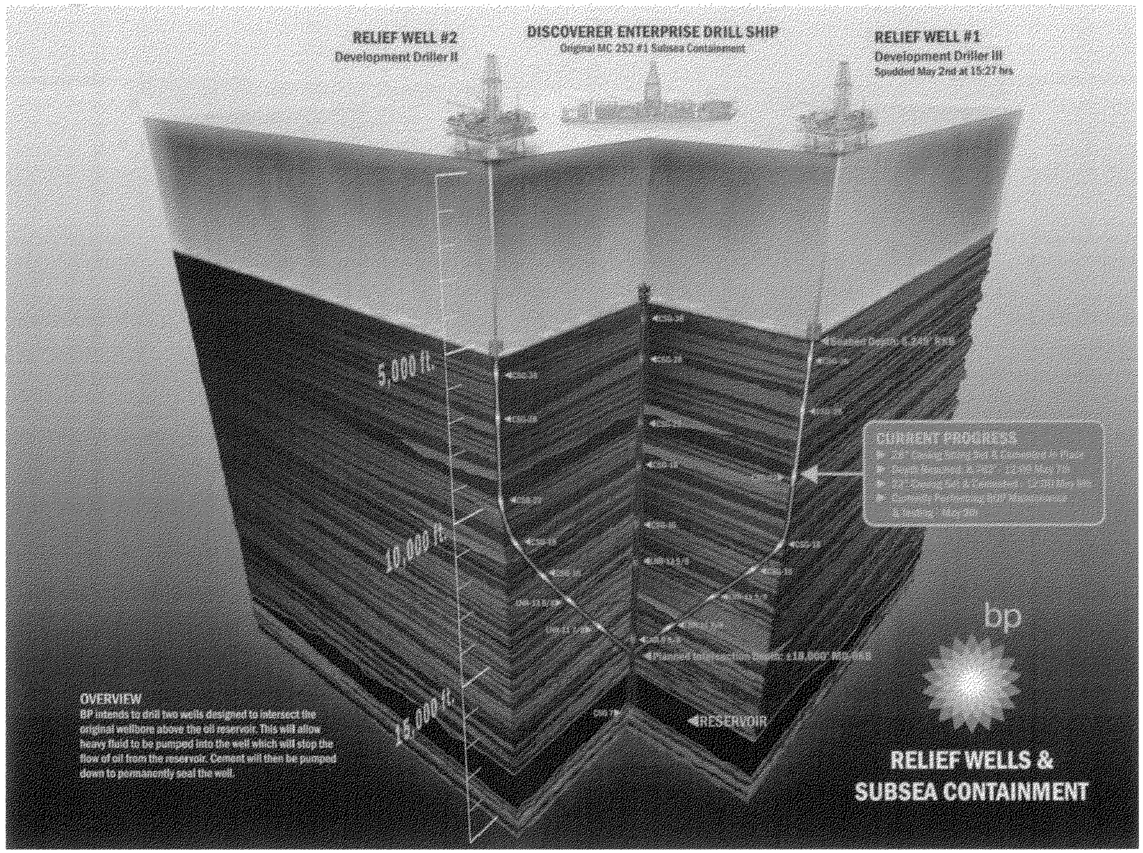
Any organization can show the world its best side when things are going well. It is in adversity that we truly see what they are made of.

We know that we will be judged by our response to this crisis. No resource available to this company will be spared. I can assure you that we and the entire industry will learn from this terrible event, and emerge from it stronger, smarter and safer.



Drill MODU
Construction Vessel
Construction Vessel
5,000' Water Depth
Equivalent to 5 Eiffel Towers
BOP
Horizon Rig
ROVs
Drilling Riser
Horizon BOP
ROVs
Well
18,000'
Relief Well 1
Reservoir
Horizon Response Current State


SUBSEA CONTAINMENT SYSTEM


RELIEF WELL #2
Development Driller II
DISCOVERER ENTERPRISE DRILL SHIP
Original MC 252 #1 Subsea Containment
RELIEF WELL #1
Development Driller III
Spudded May 2nd at 15:27 hrs
5,000 ft.
10,000 ft.
15,000 ft.
CURRENT PROGRESS
RESERVOIR
OVERVIEW
BP intends to drill two wells designed to intersect the original wellbore above the oil reservoir. This will allow heavy fluid to be pumped into the well which will stop the flow of oil from the reservoir. Cement will then be pumped down to permanently seal the well.
bp
RELIEF WELLS &
SUBSEA CONTAINMENT

Mr. STUPAK. Thank you, Mr. McKay. We should note that Mrs. Myrick, a member of the full committee, is with us. I'm sure she will have some questions when we get to the question period. Thanks for joining us, Sue.

And Mr. Probert, your opening statement, please, sir.

**STATEMENT OF TIM PROBERT**

Mr. PROBERT. Chairman Stupak, Ranking Member Burgess, and members of the subcommittee, thank you for inviting Halliburton to testify. We will continue to work with you and your staff to collect factual data that will enable an understanding of what took place and what we collectively can do to ensure that domestic oil and gas production is undertaken in the safest, most environmentally responsible manner possible.

The catastrophic blowout and the spread of oil in the Gulf of Mexico are tragic events for everyone. On behalf of the entire Halliburton family, we extend our heartfelt sympathy to the families, friends, and colleagues of the 11 people who lost their lives and those workers who were injured in the tragedy.

As we hope you can appreciate, neither Halliburton nor any other party can make a judgment or offer any credible theories about what happened until, at a minimum, the well owner has interviewed everyone on the Deepwater Horizon to recreate the daily log of activities for April 20. In the absence of that information, no one should rush to judgment. However, there are three things that could be said with certainty: One, that the casing shoe was cemented 20 hours prior to the tragic accident; two, it is premature to say that the root cause of the event was the catastrophic failure of the casing or cement; and, three, had the BOP functioned as expected this catastrophe would not have happened.

With respect to the Mississippi Canyon 252 well, Halliburton and many other companies were contracted by the well owner to provide products and services. Halliburton provided cementing, mud logging, directional drilling, and real-time data acquisition and data delivery services for key personnel on board the rig and on shore. However, contrary to press reports, Halliburton did not provide casing, wellheads, or seal assemblies.

Since the blowout, Halliburton has been working at the direction of the well owner to assist in the efforts to bring the well under control. This includes intervention support to help secure the damaged well and assistance in drilling two relief wells.

At the outset, I need to emphasize that Halliburton is a service provider to the well owner. It's contractually bound to comply with the well owner's instructions on all matters relating to the performance of all work-related activities.

The construction of a deepwater well is a complex operation involving performance of many tasks by many parties. While the well owner's representative has ultimate authority for planning and approving activities on the rig, the drilling contractor performs and directs much of the daily activity.

Cement can be used to isolate formation fluids, to prevent movement of these fluids between formations, and to bond and support the steel casing. There are many external factors which affect the design and execution of the cement job, and these include the variability of the whole geometry, the relative location of hydrocarbon zones, and the hydrocarbon content of associated drilling fluids.

The centralizer placement on the production casing, the drilling fluid conditioning program prior to cementing, and the cement slurry and placement design use of this well were implemented as directed by the well owner. By design, no continuous cement column was installed throughout the entire wellbore.

Approximately 20 hours prior to the catastrophic loss of well control, Halliburton had completed the cementing of the ninth and final production casing string in accordance with the well program, which would have been approved by the MMS.

Following the placement of the cement slurry, the casing seal assembly was set in the casing hanger. As required by the MMS and as directed by the well owner, a positive pressure test was then conducted to demonstrate the integrity of the production casing string. The results of the positive test were reviewed by the well owner, and the decision was made to proceed with well program.

The next step was the performance of a negative pressure test conducted by the drilling contractor at the direction of the well owner and in accordance with MMS requirements. This tests the integrity of the casing seal assembly. We understand that Halliburton was instructed to record drill pipe pressure during this test. After being advised by the drilling contractor that the negative test had been completed, Halliburton's cementing personnel were placed on standby.

We understand that the drilling contractor then replaced the dense drilling fluid in the riser with lighter seawater prior to the planned placement of the final cement plug. The drilling fluid was transferred directly to a work boat.

The final cement plug would have been installed inside the production string and enabled the planned temporary abandonment of the well, but prior to reaching that point in the well construction plan that Halliburton personnel would have been directed to set the plug, the catastrophic incident occurred.

Halliburton is confident that the cementing work on the Mississippi Canyon 252 well was completed in accordance with the requirements of the Well Owners Well Construction Plan.

To amplify before closing, and to amplify, respectfully, to a comment made earlier by Representative DeGette, the MMS did indeed conduct a survey which indicated that cementing was a factor in 18 of 39 well control incidents over an approximate 10-year period in the Gulf of Mexico. I should point out that only one of these incidents occurred in water depths over 400 feet.

Thank you for the opportunity to share Halliburton's views. I look forward to answering your questions.

Mr. STUPAK. Thank you.

[The prepared statement of Mr. Probert follows:]

Prepared Statement

Tim Probert
President, Global Business Lines and
Chief Health, Safety and Environmental Officer
Halliburton

Before the

Subcommittee on Oversight and Investigations
Committee on Energy and Commerce
U.S. House

May 12, 2010

Chairman Stupak, Ranking Member Burgess, and Members of the Subcommittee:

Thank you for the opportunity to share my company's perspective as you review issues related to the explosion that occurred on the Deepwater Horizon drilling rig and the resulting oil spill in the U.S. Gulf of Mexico. Halliburton looks forward to continuing to work with you, your colleagues, and your staff to understand what happened and what we collectively can do in the future to ensure that oil and gas production in the United States is undertaken in the safest, most environmentally responsible manner possible.

At the outset, I want to assure you and your colleagues that Halliburton has and will continue to fully support, and cooperate with, the ongoing investigations into how and why this tragic event happened. We have already made our senior personnel available to brief Members and staff and we have produced thousands of pages of documents in support of current investigations. Halliburton had four employees stationed on the rig at the time of the accident. They returned to shore safely and each has and will continue to be made available to assist the investigative efforts. We are mindful, however, that Halliburton cannot make any judgment or offer any theories about what happened until at a minimum the well owner has completed interviewing everyone on board to re-create the daily log of activities, including those that occurred after we successfully completed the cementing operations of the production casing string.

The April 20th catastrophic blowout, explosions and fire of the Deepwater Horizon rig and the spread of oil in the Gulf of Mexico are tragic events for everyone connected to the situation. The deaths and injuries to personnel working in our industry cannot be forgotten. Halliburton extends its heartfelt sympathy to the families, friends and colleagues of the 11 people who lost their lives and those workers injured in the tragedy.

*Background on Halliburton*

As a global leader in oilfield services, Halliburton has been providing a variety of services to the oil and natural gas exploration and production industry for more than 90 years. Halliburton's areas of activity are primarily in the upstream oil and gas industry. They include providing products and services for clients throughout the life cycle of the hydrocarbon reservoir--from locating hydrocarbons and managing geological data, to directional drilling and formation evaluation, well construction and completion, to optimizing production through the life of the field. The company is also engaged in developing and providing technologies for carbon sequestration and we are a service provider to the geothermal energy industry.

Halliburton is the largest cementing service and material provider in the oil and gas industry. Halliburton provides zonal isolation and engineering solutions for the life of a well. The company safely conducts thousands of successful well service operations each year and is committed to continuously improve its performance. The company views safety and environmental performance as critical to its success and these are core elements of our corporate culture. Halliburton has much to offer to help our nation meet its energy security needs.

With respect to the Mississippi Canyon 252 well, Halliburton was contracted by the well owner to perform a variety of services on the rig. These included cementing, mud logging, directional drilling, and measurement-while-drilling services. In addition, Halliburton provided selected real-time drilling and rig data acquisition and transmission services to key personnel both on board the Deepwater Horizon and at various onshore locations.

*Halliburton's Participation in the Remediation Efforts on Mississippi Canyon 252 Well*

Since the blowout, Halliburton has been working at the direction of the well owner to provide assistance in the effort to bring the well under control. This includes intervention support to help secure the damaged well and planning and services associated with drilling relief well operations.

Halliburton has deployed survey management experts to assist in planning the path of the relief wells and has mobilized its technology group to work in collaboration with another industry partner to combine our technologies, in an effort to develop an integrated ranging system to expedite the intersection of the original well.

*Operations Preceding the Catastrophic Loss of Well Control on Mississippi Canyon 252 Well*

I need to start this section with an important statement of disclosure. Halliburton, as a service provider to the well owner, is contractually bound to comply with the well owner's instructions on all matters relating to the performance of all work-related activities. It is also important to understand the roles and responsibilities of the various parties involved in the construction of a well. The construction of a deep water well is a complex operation involving the performance of numerous tasks by multiple parties led by the well owner's representative, who has the ultimate authority for decisions on how and when various activities are conducted.

Attached to this testimony is an illustration showing the approximate depths and positions of the casing and liner strings set in this well. In addition, the approximate position of the various cement placements is illustrated, which is consistent with the well design. It should be noted that cement is used at specific designated spots and is not designed to be a complete barrier through the entire wellbore.

Cement can be used to isolate formation fluids, to prevent movement of these fluids between formations and to bond and support the casing. A mixture of cement, water and chemicals is combined in a slurry that can be pumped into position around the outside of steel liners and casing. There are many external factors that impact the design and execution of a cement job. These include the variability in the hole geometry, relative location of hydrocarbon zones, hydrocarbon content and the prior condition of the wellbore and associated fluids as determined by the drilling fluid provider. Casing strings are typically run with devices to centralize the casing concentrically in the wellbore and prevent incomplete displacement of drilling fluid, or "channeling".

While every effort is made to complete a cement job with the highest levels of mechanical and hydraulic integrity, the above mentioned well conditions may prevent this. Confirming cement integrity after placement would require the well owner to direct the wireline provider to obtain cement evaluation logs. Based on the findings of these logs, the well owner can elect to perform remedial action by perforating the casing and "squeezing" cement into remaining voids to improve the integrity of the original cement.

The centralizer placement on the production casing, the drilling fluid conditioning program prior to cementing and the cement slurry and placement design used for this well were implemented as directed by the well owner. However, as shown in the attached diagram, by design there is no continuous cement column throughout the entire wellbore.

Approximately 20 hours prior to the catastrophic loss of well control, Halliburton had completed the cementing of the ninth and final production casing string in accordance with the well program.

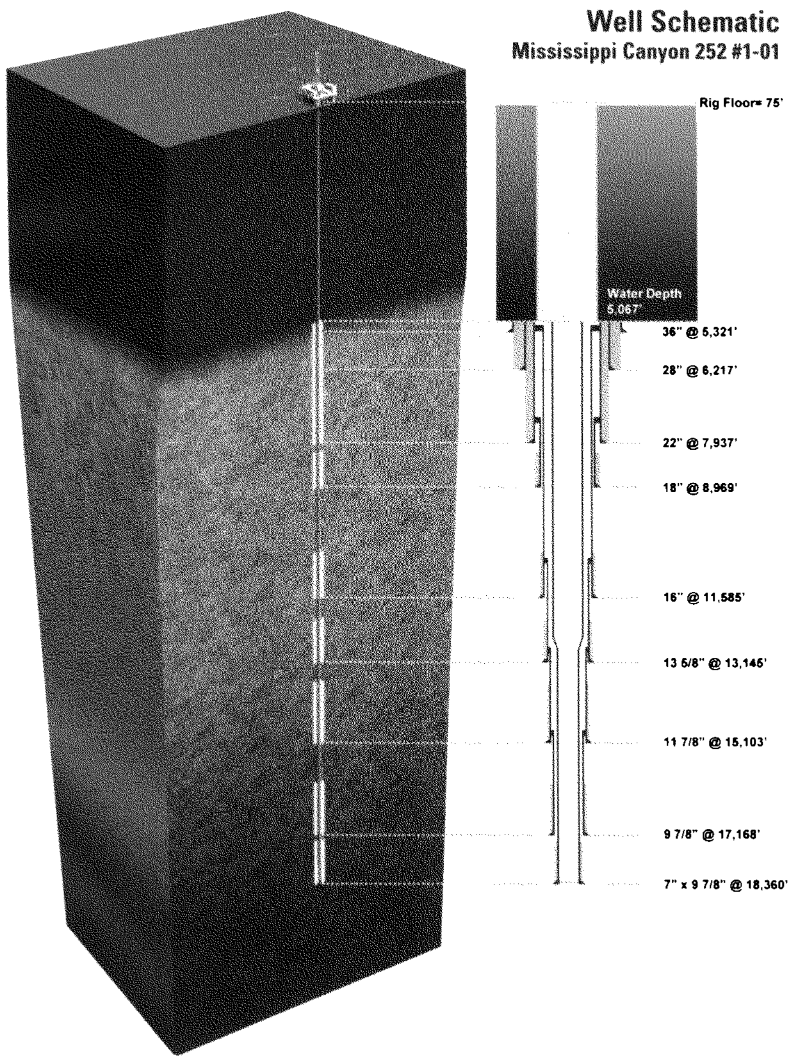
Following the placement of 51 barrels of cement slurry, the casing seal assembly was set in the casing hanger. In accordance with accepted industry practice, as required by MMS and as directed by the well owner, a positive pressure test was then conducted to demonstrate the integrity of the production casing string. The results of the positive test were reviewed by the well owner and the decision was made to proceed with the well program.

The next step included the performance of a "negative" pressure test, which tests the integrity of the casing seal assembly and is conducted by the drilling contractor at the direction of the well owner and in accordance with MMS requirements. We understand that Halliburton was instructed to record drill pipe pressure during this test until Halliburton's cementing personnel were advised by the drilling contractor that the negative pressure test had been completed, and were placed on standby.

We understand that the drilling contractor then proceeded to displace the riser with seawater prior to the planned placement of the final cement plug, which would have been installed inside the production string and enabled the planned temporary abandonment of the well. Prior to the point in the well construction plan that the Halliburton personnel would have set the final cement plug, the catastrophic incident occurred. As a result, the final cement plug was never set.

Halliburton is confident that the cementing work on the Mississippi Canyon 252 well was completed in accordance with the requirements of the well owner's well construction plan.

Thank you for the opportunity to share our views.


Well Schematic
Mississippi Canyon 252 #1-01
Rig Floor= 75'
Water Depth
5,067'
36" @ 5,321'
28" @ 6,217'
22" @ 7,937'
18" @ 8,969'
16" @ 11,585'
13 5/8" @ 13,145'
11 7/8" @ 15,103'
9 7/8" @ 17,168'
7" x 9 7/8" @ 18,360'

Mr. STUPAK. Mr. Moore, your opening statement, please, sir.

**STATEMENT OF JACK MOORE**

Mr. MOORE. Chairman Stupak, Ranking Member Burgess, Chairman Waxman, Chairman Emeritus Dingell, Ranking Member Barton, members of the committee, good morning. I am Jack Moore, President and CEO or Cameron International Corporation, and I appreciate the opportunity to be here for this hearing on what is truly a tragic event.

What word about our company; Cameron is based in Houston, Texas, and is a leading provider of equipment and services to the energy industry worldwide. We have 11 different operating divisions, and approximately 18,000 employees in more than 300 locations worldwide. We have worked with our customers for over 120 years to design, manufacture, and service products that help them safely find, develop, produce and transport oil and gas.

The Cameron product used by the Deepwater Horizon is called a blowout preventer, or a BOP, a product that Cameron actually invented in the 1920s. A BOP allows our customers to control the pressure in a well while being drilled. We have over 400 BOP stacks operating offshore, and 130 are operating in deep water. Each individual BOP stack is made of components specified by our customers, is configured to their specific operating specifications, and is manufactured and tested in accordance with industry standards. Our BOPs have a very long history of reliable performance, including performance in some of the harshest operating conditions in the word. The BOP stack on the Deepwater Horizon was operating in 5,000 feet of water.

As soon as Cameron was notified of the Deepwater Horizon incident, we mobilized a team of our best drilling system specialists to work with BP in transition to assist in shutting this well in. Since that time, we have been working around the o'clock to assist in this effort, and we will continue to provide all the necessary resources at our disposal until this well is shut in.

It is far too early to draw conclusions about how the incident occurred, but every one of us at Cameron, myself, and I think this industry is mindful of the tragic loss of life that occurred, and likewise, the impact to the environment and to the commercial impact that it will have.

Cameron and I understand the need to discover the facts relating to what went wrong and to do all that is possible to prevent the occurrence of such an incident in the future. I am accompanied today by my colleague, David McWhorter, who is our vice president of engineering and quality for your drilling systems group to be at your disposal for answers. Thank you for letting us be here today.

[The prepared statement of Mr. Moore follows:]

***United States House of Representatives***
***Committee on Energy and Commerce***
***Subcommittee on Oversight and Investigations***

Written statement of Jack B. Moore,
President and CEO of Cameron International Corporation

May 12, 2010

I am Jack Moore, President and CEO of Cameron International Corporation. I have been with Cameron for 11 years and have over 30 years of experience in the oilfield service industry.

I appreciate the opportunity to be here today for this very important hearing on what is truly a tragic event. Since the day of the incident, we have been lending our assistance. We will continue to work with everyone involved to understand what and how this happened.

Cameron is based in Houston Texas and is a leading provider of equipment and services to the energy industry worldwide, with 11 different operating divisions and approximately 18,000 employees in more than 300 locations. We have worked with our customers for over 120 years to design, manufacture and service products that help them safely find, develop, produce and transport oil and gas.

The Cameron product used by the Deepwater Horizon is called a "blow out preventer" or "BOP," a product that Cameron actually invented in the 1920's, that allows our customers to control the pressure in a well while being drilled. There are over 2,500 Cameron BOP's operating around the world today, both onshore and offshore. We have over 400 BOP stacks operating offshore, of which 130 are operating in deep water. Each individual BOP stack is made up of components specified by our customers, is configured to their specific operating specifications, and is tested and manufactured in accordance with industry standards and applicable regulations.

Our BOP's have a very long history of reliable performance, including performance in some of the harshest operating conditions in the world. In support of our commitment to our products' on-going performance, we maintain a system of safety alerts and product advisories that keep our customers abreast of the latest information about our products.

As soon as Cameron was notified of this incident, we mobilized a team of our best drilling systems specialists to work with BP and Transocean to assist in shutting this well in. We also mobilized teams from our sub-sea, surface and valves divisions to assist BP and its partners in the alternative methods they are deploying to contain the flow from the well. We have been working around the clock to assist in this effort, and we will continue to provide all of the resources at our disposal until the well is shut in.

It is far too early to draw conclusions about how the incident occurred. The present challenges involved in determining causes are many, in particular, from our standpoint, the inability to examine the Deepwater Horizon's BOP. Everyone of us is mindful of the personal, environmental and commercial concerns associated with this incident. We understand the need to discover the facts relating to what went wrong and to do all that is possible to prevent the occurrence of such an incident in the future.

Mr. STUPAK. Thank you, Mr. Moore.

It should be noted for members that we asked each of our witnesses to have a technical expert with them to help in answering any technical questions. To our witnesses, you may consult with your technical experts before responding to questions, and if we get to a point where your expert needs to answer directly, then we will have them sworn in and hear from them directly, but otherwise, we will look to you for the answers.

So with that, let's begin our questions. We will go 5 minutes this first round.

Mr. Waxman, would you like to begin, please?

Mr. WAXMAN. Yes. Thank you very much, Mr. Chairman.

I want to return to a point that I raised in my opening statement, and that was the question about a series of pressure tests performed on the well before the blowout took place.

My understanding is that there are two types of pressure tests. A positive test involves adding fluids into the well to exert additional pressure. This tells the well operator whether fluids can flow from the well into the surrounding formations. A negative pressure test is a reverse; it removes some of that pressure in the well, creating an inward or upward force from the pressure differential. That would be used to defect flow into the well through a breach in the cement or the casing. Both tests are important, and failure of either test can suggest a failure of the seals or the well's integrity.

Mr. Newman, am I right in my understanding of the significance of these two tests?

Mr. NEWMAN. Chairman Waxman, I would agree with your assessment, that the successful performance of those tests is critical to understanding the condition and the integrity of the casing and cement, and a negative response, a negative outcome for either one of those tests would indicate that there are potential problems.

Mr. STUPAK. Mr. McKay and Mr. Probert, do you agree with that?

Mr. MCKAY. Yes, I do.

Mr. PROBERT.Yes.

Mr. WAXMAN. I understand that the well passed positive pressure tests on the morning of April 20, 2010, but I also understand that when negative performance tests were performed later that day, starting around 5 p.m., there were anomalous results. Let's go back to the document entitled "What We Know," which was put out by BP. It says, "After 16½ hours waiting on the cement, a test was performed on the well bore below the blowout preventer." And then it says, "During this test, 1,400 PSI was observed on the drill pipe while zero PSI was observed on the kill and the choke lines."

Mr. Newman, can you explain what a 1,400-pound discrepancy in the negative pressure test might signify and what its importance might be?

Mr. NEWMAN. The indication of 1,400 PSI on the drill pipe would indicate that there was pressure in the well bore being registered on the pressure gauge attached to the drill pipe. The absence of pressure on the choke and kill line would indicate a discrepancy between the well bore pressure being measured by the drill pipe and the annulus pressure being measured by the choke and kill line.

Mr. WAXMAN. And what significance does that have?

Mr. NEWMAN. The significance of the discrepancy between the two pressures would lead to a conclusion that there was something happening in the well bore that shouldn't be happening.

Mr. WAXMAN. And Mr. McKay and Mr. Probert, do you agree?

Mr. MCKAY. I think it is obviously difficult to speculate, but I do think that discrepancy is critical in the investigation. We will have to tear that apart piece by piece, absolutely.

Mr. WAXMAN. And Mr. Probert?

Mr. PROBERT. We don't have knowledge of the sort of mechanical——

Mr. WAXMAN. I'm just asking if that explanation of a differential is accurate?

Mr. PROBERT. Yes, I would say so.

Mr. WAXMAN. Now, Mr. McKay, Mr. Dupree from BP told us on Monday, he said the results were not satisfactory, and he said they were a possible warning that gas was seeping into the well and building up pressure inside the bore hole. Mr. Dupree, is your senior official responsible for operations in the Gulf of Mexico? Do you agree with his assessment?

Mr. MCKAY. Mr. Dupree has been working on the crisis 20 hours a day. I wasn't sitting in on the meeting that you're referring to, so I wasn't privy to that review. What I would say is 1,400 PSI on the drill pipe and no PSI on the choke and kill lines indicates something should be investigated, absolutely.

Mr. WAXMAN. Well, the anomalies in the pressure testing present a significant question that should be thoroughly investigated. Just hours before the explosion, tests on the well returned results that signaled a possible well failure and the influx of gas up the wall. Yet it appears that the companies did not suspend well operations, and now 11 workers are dead and the Gulf Coast region faces catastrophic environmental damages. We need to know if that is the case and why it was the case. And it appears from Mr. Dupree's statements to our staff that that was the result of the test, the negative test that was taken.

Thank you, Mr. Chairman. I yield back my time.

Mr. STUPAK. Mr. Barton for questions?

Mr. BARTON. Thank you, Mr. Chairman.

I have watched the testimony in my office as I did other work, so I have listened to the opening statements and to the members' questions and the members' opening statements. So I have been participating by video.

My first question is generally to the panel. Do any of you allege that the incident that occurred should not have been foreseen, that it was of such a catastrophic nature that the equipment and the technology should not have contained it? Do you understand what I'm asking? OK. I see absolutely no response.

Mr. MCKAY. Could I respond?

Mr. BARTON. Let me rephrase it. Does anybody here believe that the blowout preventer and the technology employed and the procedures, if they had worked properly, could not have prevented the spill?

Mr. NEWMAN. Representative Barton, it's important to understand the design constraints of a blowout preventer. A blowout preventer is not designed to close around significant debris. A blowout preventer is designed to close around drill pipe and most sizes of casing. But without knowing exactly what's inside the blowout preventer today, it is difficult to conclude that the blowout preventer wasn't subjected to conditions that exceed its design constraints.

Mr. BARTON. Well, I am a supporter of OCS drilling. I am a registered professional engineer, I'm not a petroleum engineer, I'm not a geologist. But my assumption is, in order to get a permit to drill you have to show the MMS that you will put equipment on site and drill the well in such a fashion that you can handle expected problems. And there have been millions of oil wells drilled and gas wells, there have been tens of thousands of gas wells drilled in the Gulf. It has to be a design parameter that you could have a catastrophic pressure release—or a blowout, to use the common term. I would think that your blowout preventer and your technology, your casing should be designed to handle that. Am I wrong?

The gentleman who is the President of Cameron, it's your blowout preventer. This isn't a volcano that exploded around this well. I mean, we don't know what happened, but my assumption is—and if my assumption is wrong, then we have to reassess the entire OCS drilling program—that if the technology had worked and the people had responded or had time enough to respond, even though you had the accident, it would have been contained, it would have been shut off. Am I wrong about that?

Mr. MOORE. Well, we don't know what happened. I think that's what everyone here is trying to learn. And until we know what happens with this investigation, we will not be able to answer whether the blowout preventer that was there was functioning for that particular purpose. Our blowout preventers are built and designed to do specific things. We do know that they will not shear and seal casing, that we know. But they will shear and seal drill pipes.

Mr. BARTON. But when you get a permit from the MMS—I guess this would go to the President of BP—you do have to show that if you have some sort of a pressure release, you can prevent it escaping into the environment, don't you?

Mr. MCKAY. Yes. I believe the permit requires a well construction plan that also requires the blowout preventer that's provided by the contractor with a permit. And to answer your question, I think that, in effect, the well design, the procedures that were used, and the functioning of the equipment are going to be the mainstays of this investigation. And we do expect those to work, absolutely.

Mr. BARTON. It's my understanding that the blowout preventer equipment is still intact, that it is not—while it may be clogged up or it may not be properly installed or connected in terms of the activation mechanism, that it's not been damaged. So it just hasn't worked properly, but it isn't like it's been bent or deformed or impaired; is that correct?

Mr. NEWMAN. There are no outward, external indications of significant damage, but I would caution the committee that the blowout preventer, as a result of what's happened, particularly the sinking of the vessel, the blowout preventer was subjected to significant stress.

Mr. BARTON. I see that my time has expired.

We're going to do another round; is that right, Mr. Chairman?

Mr. STUPAK. Yes, Mr. Barton. I think we will probably go at least another round.

Well, let me ask this, the term blowout protector—and I've spent a little bit of time on it—I mean, a blowout protector, like here's your pipe, what it's supposed to do is really squeeze it off; if something goes wrong, it just squeezes off like a straw, you just squeeze it, you pinch it so nothing can go up. Is that correct, Mr. Moore? Is that basically correct?

Mr. MOORE. Correct.

Mr. STUPAK. OK. I point out four ways in my testimony where this blowout protector could not be working. Number one, there were modifications that BP indicates they didn't know about—Transocean said no, they know about it 5 years ago. There was a hydraulic leak. That would not have enough pressure in there so that you could pinch this off if that hydraulic leak is serious enough; is that correct, Mr. Moore?

Mr. MOORE. That would be a cause, we're not sure.

Mr. STUPAK. And you also indicated that, when you get these joints here, if these joints are in the BOP, the blowout protector, it won't cut a joint; is that correct?

Mr. MOORE. If those joints are in a shear ram, they will not cut.

Mr. STUPAK. All right. And then also the dead man switch, besides the design, all three of them having to give off, even the battery in this case, the one control panel we did find, the battery wasn't working, correct?

Mr. MOORE. That's what we were led to believe, yes.

Mr. STUPAK. OK. So let me ask this; this was a 2001 blowout protector for this well?

Mr. MOORE. Correct, it was built in 2001.

Mr. STUPAK. All right. And in 2003, 2004, there were new regulations that came in for blowout protectors, were there not, Mr. Moore?

Mr. MOORE. In terms of shearing capacity?

Mr. STUPAK. Shearing capacity in particular, yes.

Mr. MOORE. Yes.

Mr. STUPAK. In fact, doesn't section 250.416(e) indicate that now it requires the lessee—in this case, BP—to provide information that shows that the blind shear or shear rams installed in the BOP stack are capable of shearing the drill pipe in the hole under maximum anticipated surface pressures; is that correct?

Mr. MOORE. I am not aware of that particular article.

Mr. STUPAK. How about you, Mr. McKay, since you're the lessee in this case. Is it supposed to make sure that the rams can shear this pipe?

Mr. MCKAY. I'm not personally familiar with the article you're quoting.

Mr. STUPAK. OK. I'm talking about the rules in the Minerals Management Service rules and regulations that came out in 2003. Mr. Newman, are you familiar with those?

Mr. NEWMAN. I believe, Chairman, you're referring to the Code of Federal Regulations 30, subsection 250, yes, sir, I'm familiar with those.

Mr. STUPAK. And you're supposed to be able to cut this thing in half in case there's an accident, right?

Mr. NEWMAN. Blind shear rams are supposed to be able to shear the tubular, yes, sir.

Mr. STUPAK. OK. And what kind of testing did you, Transocean, or BP do to make a determination that the shear rams were satisfactory and could cut this pipe if something happened? Did you do any testing?

Mr. NEWMAN. In terms of confirming the capability of the shear rams——

Mr. STUPAK. Correct, which you're required under 250416(e).

Mr. NEWMAN. We rely on the test data, which is provided by Cameron.

Mr. STUPAK. OK. But test data is just really pressure, nothing to do with the make sure you have your hydraulics. There was nothing in there to make sure all the valves were tight, to make sure the hydraulic fluid wasn't leaking out, was there?

Mr. NEWMAN. There are regular tests performed on the BOP, while the BOP is on the rig prior to its deployment.

Mr. STUPAK. While it's on the rig, OK.

Mr. NEWMAN. And then regularly, while the BOP is deployed on the seabed.

Mr. STUPAK. Right. In fact, section 446(b) says every 3 days, weather permitting, you must go down and look at the BOP on the sea floor, does it not?

Mr. NEWMAN. I believe that's correct, Chairman.

Mr. STUPAK. OK. Did you do that in this case?

Mr. NEWMAN. This is an ROV—remote operated vehicle—contracted by BP and located on the rig, and it's out there for that purpose.

Mr. STUPAK. OK. And did it perform any tests on the BOP that was sitting on the sea floor?

Mr. NEWMAN. The only test the ROV would perform in that situation, Chairman, is a visual inspection, an observation of the BOP.

Mr. STUPAK. How about something as simple as—or then there's no shear test that's performed on the sea floor, right? There's no shear testing performed on the sea floor to cut this baby.

Mr. NEWMAN. During the progress of well construction operations and the routine testing that is performed, there is no test where the shear rams are actually subjected to a shearing test.

Mr. STUPAK. So the ROV really just goes down and takes a look at it.

Mr. NEWMAN. It observes the external observation of the BOP.

Mr. STUPAK. OK. Is there any test that tests to make sure the batteries are working so you can view your kill switch that actually shut this thing down?

Mr. NEWMAN. Because the electronic signals which transmit back and forth between the rig and the BOP control system happen continuously, there would be an indication if the batteries were dead, on the BOP there would be an indication of that on the rig.

Mr. STUPAK. So you're saying you don't have to test it because as long as the electrical lines are working, that would indicate whether or not the batteries are fully charged?

Mr. NEWMAN. That's correct.

Mr. STUPAK. Well, in this case, in the one control panel that we were able to take a look at, the battery was supposed to be at 27 amps, it was at 18 amps. Did any of your testing show that it was under the 27 amps required?

Mr. NEWMAN. I don't have any indication, Chairman, that the tests would have indicated that the charge in the batteries had dropped from 27 to 18.

Mr. STUPAK. Would you have documents that would show what the amps of these batteries were? Do you have any kind of records that would show that?

Mr. NEWMAN. Unfortunately, Chairman, those records would have gone down with the rig.

Mr. STUPAK. So then we have to take the word of those who looked at this control panel that the battery was basically dead and the dead man switch would not work, correct? You have no records to dispute that, right?

Mr. NEWMAN. I have no records.

Mr. STUPAK. OK. My time is up.

Mr. Burgess, 5 minutes for questioning. We will do a second round.

Mr. BURGESS. Thank you, Mr. Chairman.

Mr. McKay, just to kind of get back to some of the specifics of the modifications of the protector are what we know from tab four in the evidence binder, modifications that have been discovered in the blowout protector system. Can you give us the specific modifications that were discovered in the BOP system?

Mr. MCKAY. What I was referring to yesterday is, while we were doing ROV—remote operated vehicle—interventions as the crisis has unfolded, we discovered that there were modifications made. I don't know personally whether those were the exact modifications that Mr. Newman referenced that were done in 2005 or they were additional ones. I think that's a very, very important piece of the investigation. We found leaking hoses and. You know, the diagrams that we were using real-time did not match the blowout preventer, so that's——

Mr. BURGESS. Well, Mr. Newman, if I understood him correctly, suggested that those modifications were requested and were paid for by BP. So it should be possible—those records wouldn't have gone down with the ship, would they? We should be able to get that paper trail at some point established, should we not, if there were modifications that were requested?

Mr. NEWMAN. I have looked at the agreement that was signed between Transocean and BP, so yes, we have a copy of that.

Mr. BURGESS. And you will make that available to the committee?

Mr. NEWMAN. Yes, sir.

Mr. BURGESS. And Mr. McKay, will you look at your records and help us with trying to define that?

Mr. MCKAY. Absolutely.

Mr. BURGESS. Let me just ask a question. Mr. Waxman was asking about the negative pressure test. One side read 1,400 PSI, the other side read zero. What should the other side have read if the pressure test had been absolutely perfect?

Mr. McKAY. The way I understand the configuration that was hydraulically connected such that the pressures on the choking kill line and the drill pipe should have been the same.

Mr. BURGESS. Identical pressures. So that, and I'm just a layman, but that would indicate some obstruction that would not allow pressure to be transmitted from the drill line to the kill line, or vice versa.

Mr. McKAY. Yes. I can't speculate as to why, but they should have been reading the same from the way they are hydraulically connected, from what I understand.

Mr. BURGESS. OK. And going back to the previous issue, committee staffers have been told by your staff, Mr. McKay, that when BP attempted to operate one of the blowout protector variable rams underwater, the device was either mislabeled or not labeled in the way that they anticipated; is that correct?

Mr. McKAY. That is correct. I don't know if that has anything to do with the modifications we requested or not or whether they are different modifications, but it is correct.

Mr. BURGESS. Do you think that BP approved the modification?

Mr. McKAY. I don't know. That's going to be a central part of the investigation to understand what modifications were made.

Mr. BURGESS. If it was just mislabeled, you wouldn't have approved a mislabeling, would you, at BP?

Mr. McKAY. We wouldn't have been involved in the labeling of them, no.

Mr. BURGESS. So is there any reason why management wouldn't be aware of this? Why the labeling, why the discrepancy would exist?

Mr. McKAY. Are you asking me?

Mr. BURGESS. Yes, sir. Don't you have oversight over what happens at——

Mr. McKAY. Transocean owns those blowout preventers——

Mr. BURGESS. But you have oversight over Transocean in that regard.

Mr. McKAY. They are our contractor, yes.

Mr. BURGESS. I talked to the Governor's office yesterday—I didn't talk to the Governor, but I talked to some of his folks. And Mr. McKay, let me just ask you, they are really concerned that they've got a coastline, because of indentations and excrescences that is much longer than you would think just looking at, as the crow flies on the Louisiana coast, they've got 7,700 miles of estuaries and coastline. There is no way in the world that they have enough boom to manage the problems that they are facing. They tell us that they are having difficulty getting BP to authorize purchase of additional boom and manufacturer of additional boom. It seems to me this should be all hands on deck, get the boom locally, get it from global sources, but wherever we can, let's get the boom put into position and not go scrambling for it once the oil comes ashore. Can you help me with that? Why is the Governor's office feeling like they don't have an adequate supply of boom?

Mr. McKAY. We are accessing, as I said earlier, we've got 1.1 million feet deployed, we've got 2.4 million more feet coming, and this is under Unified Area Command as far as deployment under the Coast Guard's direction. So we have a supply chain cranked up to supply boom as well.

Mr. BURGESS. Well, just if I can suggest, I think there needs to be—I was impressed when we went down there last week, the cooperation between the BP and the Coast Guard and Unified Command. I've got no complaints about what I was seeing. But the Governor feels that—or at least the person I was talking to at the Governor's office feels that they don't have the ability to start the production line on that boom and they're going to need a lot more than what they have.

Mr. MCKAY. I will do two things; one, I will check on that and make absolutely sure. Number two, I know of no limits from BP about getting stuff done in terms of boom or anything else.

Mr. BURGESS. I appreciate your assurance that you will check on that personally.

The other thing is they don't have the ratio of liaisons to the number of parishes. There might be one liaison for eight parishes. That's not satisfactory. There needs to be a one-to-one relationship of the liaison to the parishes that are affected.

Mr. MCKAY. OK. Thank you.

Mr. STUPAK. The time has expired.

Mr. Markey, 5 minutes for questions, please.

Mr. MARKEY. Thank you, Mr. Chairman.

Mr. McKay, on Friday, I flew over the spill and I saw a vast area of ocean covered in oil. This is oil from the Gulf. And we now see thousands of square miles with this awful sludge. And although the spill started about 50 miles offshore, it has now reached the Louisiana coastline.

You are saying to us that BP is doing everything in its power to ensure that this spill is being stopped and that you currently estimate that the leaking is 5,000 barrels of oil per day into the Gulf. But this isn't the only rig that BP operates in the Gulf. In its Oil Response Plan for the Gulf of Mexico, BP identified a worst case scenario for exploratory well explosion from offshore drilling in the Gulf of Mexico as a leak that would release 250,000 barrels of oil per day into the ocean about 30 miles off the coast of Louisiana. The specific exploration plan that you provided to regulators for the Horizon well states, "Since BP Exploration and Production Incorporated has the capability to responded to the appropriate worst case spill scenario, I hereby certify that BP Exploration and Production Incorporated has the capability to respond to the maximum extent practicable to a worst case discharge."

So right now, Deepwater Horizon well is leaking an estimated 5,000 barrels per day, about 2 percent of the worst case scenario of 250,000 barrels, which your company assured the government, the American people, that it was capable of addressing in the Gulf. So if BP is already using every available resource to combat this spill of 5,000 barrels per day and it can't stop this spill from worsening, then I can't understand how in the world you can certify that you have the capability to respond to a spill of 250,000 barrels per day.

Mr. McKay, you had better rethink your certification for a worst case spill of 250,000 barrels per day. Can you really say now, as you sit here, that that certification is accurate, that you can respond to a daily spill of 250,000 barrels per day?

Mr. MCKAY. What I would say is that we are responding with three drilling rigs. A surface response plan that was in place, detailed and is the largest that has ever been put in place——

Mr. MARKEY. Are you saying to us that you would use exactly the same resources for a spill of 5,000 barrels per day, which is what we have now, as you would for a spill of 250,000 barrels a day?

Mr. MCKAY. Each spill would be specific. This particular one is complicated that the emergency dissect did not work on top of the blowout preventer, so we are still connected with a riser that's 4,300 feet long. We cannot get another blowout preventer on top of it right now, which would be the normal course in something like "normal," but something you could do if the riser was——

Mr. MARKEY. I understand that. But right now, BP is scrambling to find enough booms. You're going to use nylons and hair to soak up the oil. I can only conclude that you really don't have the resources to respond to a spill of 250,000 barrels. And there are wells all over the Gulf that are ticking time bombs that could result in spills of 250,000 barrels per day; do you really think that you can certify, again, today that you could respond to a spill of 250,000 barrels per day?

Mr. MCKAY. As I said, we're doing everything we can. I believe that we will learn things through this, there's no doubt. And I believe that those certifications will be with the knowledge that we have——

Mr. MARKEY. I just wish that you had a little more humility here today, an admission that you don't have. Last week, you tried to plug the leaks with a huge dome, which failed when it froze up. Now we're reading about a small top hat dome. If that fails, the solution looking increasingly desperate to plug the leak with a junk shot of golf balls and old tires and knotted ropes, soaking up some of the oil with hair and nylons. Each of your companies has represented itself as technology leaders in deepwater oil and gas exploration, and each of you now is flailing about, with no clue about how you're going to get out of the mess that you've gotten yourselves into. Top hats, golf balls, tires, hair, nylons, these are not the response actions of companies who are prepared for the worst case scenario accident and capable of carrying out that response plan.

The American people expect your companies to have a technological response to this disaster on par with the Apollo Project, not Project Runway, and that's what they're seeing night after night. You need to do better, and you need to prepare for a worst case scenario for the ticking time bomb that could be out there somewhere off the coast of the United States.

Thank you, Mr. Chairman.

Mr. STUPAK. Thank you, Mr. Markey.

Mr. Sullivan for questions, please.

Mr. SULLIVAN. I thank you, Mr. Chairman.

This is a big mess. I realize that for you guys it's tough to answer these questions. You're probably, if not already going to sue each other, they will be suing you. There is going to be litigation for years on this. A lot of money is involved. And so I understand that it's tough to answer these questions.

It's easy to beat up on people when they're down in this situation, and so I'm not going to do that, I'm going to focus on something different, even though I think it's bad. We're going to find out who did this, who's responsible. The investigation will be ongoing and we'll deal with that then.

But I would like to really focus on the solution right now. We can focus on the problem all day long, it's not going to get us anywhere. Someone is responsible, find it out, but let's focus on the solution.

I would just like to ask you, Mr. Newman, Mr. McKay, have you ever dealt with a blowout of this magnitude in the Gulf ever before, or even close?

Mr. NEWMAN. We have never dealt with a blowout of this magnitude in the Gulf of Mexico before.

Mr. MCKAY. No.

Mr. SULLIVAN. Both of you are involved in that it's your rig, you're drilling, you're working together, he's a contractor. On the rig, who's quarterbacking the situation right now, who's in charge? It's his rig, so you have—what do they call them, installation managers on the rigs, or offshore installation managers? If he says something, can you override him? How is that working?

Mr. NEWMAN. The offshore installation manager on a Transocean vessel is the senior most transition individual out there. That individual is responsible for the overall safety of the personnel and the vessel.

Mr. SULLIVAN. And what if Mr. McKay says something—do you accept that?

Mr. MCKAY. Yes.

Mr. SULLIVAN. OK. And also, I know you've got a lot going on on the rig, there's people out there in harm's way working feverishly to get this to stop. Also, we talked about the golf balls and hair and all that. I know there are sophisticated efforts going on. Could either of you—Mr. McKay, I guess you—elaborate on what is going on onshore? Do you have a command center? What is that command center doing? Are they working 24/7? Have you tapped into the industry, other companies, experts, the brightest in the world? What kind of technologies are they using? Are there video feeds from the floor there? What kind of stuff is going on?

Mr. MCKAY. We have several command centers. The source control is in Houston, and we have over 160 companies working wish us across the industry, including our colleagues and partners, as well as our competitors. We have the Department of Defense, we have the Navy, we have Sandia Labs. We have the brightest scientific minds in the world in these type of situations working on it 24/7. We have the highest technology in the world working this. As I said, we have three different drilling vessels, Transocean drilling vessels. We have 16 submarines operating continuously in some way or another, eight around the blowout preventer.

This junk shot is actually a very sophisticated operation, a manifold has been constructed to be utilized in 5,000 feet of water, it's never been done. The Koffer Dam was on the hand, we had that Koffer Dam for shallow water. It's been utilized in Deepwater. It has hydrate problems as people know.

On the surface, we're using technology with the latest dispersants. We are using subsea dispersal, which we think is extremely effective from initial tests, and we would like to get continuous injection going on that. It is extremely high-tech, and the best minds in the world are working it 24/7.

Mr. SULLIVAN. And all these companies here and others are involved as we speak?

Mr. MCKAY. That's right.

Mr. SULLIVAN. Are you drilling wells right now to go into two of them, I guess?

Mr. MCKAY. We're drilling two relief wells right now. Well, one has started, the other will start this weekend.

Mr. SULLIVAN. And I guess the Koffer or the cap was plan A; would you say that?

Mr. MCKAY. The Koffer Dam had hydrate problems, so we are working on a secondary plan for subsea containment right now.

Mr. SULLIVAN. So do you have a variety of plans going on multiple approaches right now in case one fails?

Mr. MCKAY. Really quickly, we have different levels. We are attacking at the subsurface with the permanent securing with the relief wells. We have the blowout preventer, which is top kill is what we call it. Then we have the containment and collection systems subsea. We have several things working on that. And then we have the aggressive on-the-surface attack, which is trying to fight it as far offshore and then protect the shoreline, then clean up whatever gets to shore.

Mr. SULLIVAN. When do you think this is going to stop?

Mr. MCKAY. Well, we're working every second to get it stopped as fast as possible. There are viable options being worked that could work in the next few days to a couple of weeks, and then ultimately the permanent securing would be up to 3 months or so.

Mr. SULLIVAN. And those wells you're drilling right now, how are those going to plug this well? How would that do it?

Mr. MCKAY. We will drill and intersect the well just above or right into the reservoir Horizon and pump heavy weight to kill fluid, to kill that well.

Mr. SULLIVAN. And that could take, you said, two months?

Mr. MCKAY. It probably will take about three months to get there in terms of the relief well.

Mr. SULLIVAN. And that would work, that would work if you were there right now——

Mr. MCKAY. It's the normal way to kill a blowout around the world, it will permanently secure it, yes.

Mr. SULLIVAN. Thank you. I don't have any more questions.

Mr. STUPAK. Mr. Braley for questions, please.

Mr. BRALEY. Gentlemen, I want to focus on the last two minutes at the Deepwater Horizon well right before the explosion that triggered this catastrophic event because when I go over this accident in my head, I try to understand what was in place to protect the workers from a sudden event like this blowout. I would like to talk about what happened just before the explosion. Can we bring up the Halliburton data screen on screen at this point?

Mr. Probert, you testified that part of your function on this particular well was to provide real-time data collection; is that correct?

Mr. PROBERT. That's correct.

Mr. BRALEY. And your company produced this particular chart to us as part of the contract you had with BP to perform monitoring of the mud and other data on this rig; is that your understanding?

Mr. PROBERT. That's correct.

Mr. BRALEY. Are you generally familiar with how this type of a chart is used in well monitoring?

Mr. PROBERT. Generally, yes.

Mr. BRALEY. Generally. What this chart shows is what was happening inside the well and on the rig in the final two hours before the explosion. And if you look, this chart is broken down into time intervals that are recorded, beginning at 2010, which would have been 8:10 p.m. That evening, correct?

Mr. STUPAK. Mr. Braley, if I may, it's Exhibit Number 5. There should be an exhibit book there if you want to look at it, Mr. Probert. Hopefully that helps you out a little bit. It's Exhibit Number 5.

Go ahead.

Mr. BRALEY. So this covers a data interval from 2010, or 8:10 p.m., on April 20 to 2150, which would have been 9:50 that evening. Is that the time frame we're talking about?

Mr. PROBERT. It would appear to be so, yes.

Mr. BRALEY. And if you look at this chart, there are several abnormal-appearing entries where a line dramatically goes vertical during a time interval between 2146 and 2148. Do you see that?

Mr. PROBERT. I see that.

Mr. BRALEY. And what this suggests is that the pressure in the standpipe at that moment shot up from 500 PSI—pounds per square inch—to almost 3,500 PSI in the space of about 2 minutes, and that was immediately before the explosion, correct?

Mr. PROBERT. That is immediately before the contact was lost with the rig, yes.

Mr. BRALEY. Right. So Mr. Probert, this is your company's data. What does this tell us?

Mr. PROBERT.What it says is that at some point within 2 minutes or so of the loss of the transmission that there was a significant increase in standpipe pressure.

Mr. BRALEY. All right. And what's the significance of that to people monitoring this well for safety and security reasons?

Mr. PROBERT. The significance of this to all parties who would have had access to this data, and also standard gauges which are present on the rig would show that this would be a significant red flag.

Mr. BRALEY. And in addition to gauges and this printout, are there any other type of built-in safety devices that would trigger a shutdown of the rig?

Mr. PROBERT. I would have to defer that question to Mr. Newman as to whether or not there are any shutdown processes on the rig.

Mr. BRALEY. All right. Mr. Newman, are you prepared to answer that question?

Mr. NEWMAN. If you could rephrase the question for me, Representative, I would be happy to take a shot at it.

Mr. BRALEY. Have you ever had surgery, Mr. Newman?

Mr. NEWMAN. I have had surgery.

Mr. BRALEY. And right when you're undergoing anesthesia, one of the last things that happens before you're put under is they put a pulse oximeter on your finger to monitor your oxygen saturation level. Do you remember that, a little device that goes over your finger?

Mr. NEWMAN. The surgery I underwent, sir, was a bit traumatic and I was effectively incapacitated in advance of the surgery, so I don't remember.

Mr. BRALEY. All right. Just accept for the purpose of my question that's what happens to most people, that they actually do monitor your oxygen saturation because they don't want you to die on the operating table.

Mr. NEWMAN. I'll take your word for it, sir.

Mr. BRALEY. And there are built into that machine that the anesthesiologist uses alarm defaults. When your saturation level gets to a certain level that it's considered hypoxic, everybody in that operating room needs to know that, OK.

My question for you is, in this particular setting, what type of alarm bells, whistles, alerts, other than a pressure gauge, do people working on that rig have available to them to tell them they've got a catastrophic problem that's unfolding?

Mr. NEWMAN. Well, there are a number of early warning indicators that are present on a drilling rig that would alarm for the individuals who are monitoring those to give them an indication. Which particular alarms would have been triggered in this instance depends on exactly what was happening, and I don't know the answer to the question about exactly what was happening.

Mr. BRALEY. How do we find out that information? How are those alarms recorded? What logs are kept? And what additional information do we know to get to the bottom of what was transpiring on that rig?

Mr. NEWMAN. The alarms are monitored on the rig through what we refer to as VMS, a vessel management system. Those alarms are logged and a record is kept of that, but that VMS exists only on the rig, it's not transmitted off the rig. And so the VMS system, along with the logs of the VMS system, would have gone down with the vessel.

Mr. BRALEY. So you have no mirrored back-up data device so that that information is recorded at some other location than on the rig itself?

Mr. NEWMAN. We do not have real-time, off-rig monitoring of what's going on on the vessel.

Mr. BRALEY. Do you think that's a failure in the fail-safe system that is currently used within the industry to help understand the events of a catastrophe like this and learn from it?

Mr. NEWMAN. Because the decisions regarding continuation of the drilling operations or suspension of the drilling operations are typically taken at the rig site, the first place we want those alarms present is at the rig site.

Mr. BRALEY. But you're aware that technology exists—it's used every day in businesses all over the country—where as soon as a bit of information is recorded at a central location, it is can be immediately recorded at a distant site just to avoid this type of catastrophe from preventing that information from being lost forever.

Mr. NEWMAN. I am aware of that technology existing, and in fact, the reason we have the records you're showing us now is because that technology was employed on this particular operation.

Mr. BRALEY. For this function that we're seeing on this chart, but not the other recorded data that you've described in your testimony.

Mr. NEWMAN. Not a real-time replication of the alarm logs.

Mr. BRALEY. All right. Thank you.

Mr. STUPAK. Mr. Griffith, do you have questions?

Mr. GRIFFITH. Thank you, Mr. Chairman.

What would have led to the discrepancy between the blowout protector and the plans or the diagrams of the blowout protector, or the differences? And if, in fact, there was a difference, was it a factor in whether or not this well could have been capped immediately?

Mr. MOORE. Congressman, do you want me to respond to that?

Mr. GRIFFITH. Please, Mr. Moore.

Mr. MOORE. We were first aware of those changes when we were in the crisis room with BP when we were trying to function the blowout preventer. But honestly, we do not know whether those would have any impact on whether the BOP would function under the circumstances it was put in. We just don't have enough information yet to know the answer to that.

Mr. GRIFFITH. Thank you.

How long had the Horizon been operating?

Mr. NEWMAN. The Deepwater Horizon went into service in 2002.

Mr. GRIFFITH. So it's been operating safely for a good while?

Mr. NEWMAN. The Horizon has drilled approximately 72 wells over that eight-year history.

Mr. GRIFFITH. And at the ocean floor, at about 5,000 feet, which is approximately 1 mile, you continued down another 13,000 feet, another 2.5 miles to the reservoir; is that accurate?

Mr. NEWMAN. That is an accurate description of the well geometry, yes.

Mr. GRIFFITH. So this rig has had an exemplary safety record in a sense as far as its ability to drill and recover natural resources; is that fair?

Mr. NEWMAN. I think that is a very fair assessment, Congressman. The Deepwater Horizon had a seven-year history with no loss time accidents. The Deepwater Horizon, in its past, set the record for deepwater operations for a semi-submersible. And the Deepwater Horizon currently holds the record for the deepest well ever drilled in the industry.

Mr. GRIFFITH. So we've got a piece of engineering that has been fairly successful. And so as we hear testimony and questions about what red flags went up as the gentleman referred to an oxygen saturation. Over a period of years, the safety mechanisms and the correction mechanisms on this piece of equipment, or this well, have been significantly tried and found to be successful in most cases. And I guess my question, or my statement, would be that there is probably going to be a series of facts that all came together at a certain time that led to this tragedy.

And we, of course, are well aware of how things can happen after the fact and we can point fingers and, goodness gracious, America has lived through 9/11 to go back over all the things we could have done to keep that from happening. Things seem to have happened all at an opportune time and the stars lined up. So we're really interested in your future as far as drilling is concerned, and what is being done on other wells around the Nation and internationally to double-check and see if all our proper safeguards are in place?

Mr. McKay.

Mr. MCKAY. I can say that in our international rig fleet, we have notified and increased the scrutiny under the—on the blowout preventers, we've incrementally added some testing to it to make sure the ROV on board the ships will be able to actuate the blowout preventer, should it need to. And we've recommended, and given some ideas to the MMS on what maybe could be considered to enhance at least preparation and testing around these things.

Mr. GRIFFITH. In the reservoir that you were tapping into, the dynamics, the hydraulic and the fluid dynamics of that reservoir, do those change significantly over time as pressures change, or is that pretty well a known and constant fact, or is it a variable on a day-to-day basis?

Mr. MCKAY. On this particular reservoir?

Mr. GRIFFITH. Yes.

Mr. MCKAY. This particular reservoir, we don't have much data on it. Generally, reservoirs are different at different depths and different pressures so you can encounter them in different ways. The characteristics of this reservoir is difficult because we don't have any measurements on it in terms of pressure. But just so everyone understands, it was not a particularly difficult well in the sense of its pressure. It was not a very much overpressured well.

Mr. GRIFFITH. Thank you, Mr. Chairman. I yield back my time.

Mr. STUPAK. Ms. DeGette for questions, please.

Ms. DEGETTE. Thank you so much, Mr. Chairman.

Mr. Probert, I was a little curious, listening to your opening statement, that you felt compelled to respond to my opening statement when I talked about the MMS study that said nearly half of all blowouts in the Gulf since 1992 were due to faulty cementing. The good news, you said, is only one of those incidents occurred in water depths over 400 feet. So I've got a couple questions.

First of all, how many of the wells drilled in the Gulf over this period were at depths over 400 feet?

Mr. PROBERT. I think if I can provide some clarity to that——

Ms. DEGETTE. No, I'd like a short answer, please. How many wells were over 400 feet?

Mr. PROBERT. I don't have that data. That data is available from the MMS, though. If you would like me to get it, I will get it.

Ms. DEGETTE. Was it many of them or few of them?

Mr. PROBERT. I do not know without reference to——

Ms. DEGETTE. You don't know. So are you saying that since there was only one blowout incident at depths of over 400 feet, you think there is no risk for cementing for deepwater drilling?

Mr. PROBERT. No. I think what I was trying to point out, because the subject of our study here clearly is deepwater Gulf of Mexico, I was trying to provide a reference point for the committee with respect to the data which the MMS has provided to us——

Ms. DEGETTE. So what you're saying is that there still could be a risk, that it's not just because it's over 400 feet, right?

Mr. PROBERT. I'm sorry?

Ms. DEGETTE. You're saying that there still could be faulty cementing over 400 feet, yes or no?

Mr. PROBERT. I am simply replying to——

Ms. DEGETTE. Yes or no?

Mr. PROBERT. No, I am simply replying to——

Ms. DEGETTE. Thank you. Now, are you arguing that cementing is actually safer at offshore wells with depths over 400 feet?

Mr. PROBERT. I'm sorry, I didn't understand your question.

Ms. DEGETTE. Are you arguing that cementing is actually safer at offshore wells with depths over 400 feet?

Mr. PROBERT. I would say the information would suggest that, yes.

Ms. DEGETTE. It is safer?

Mr. PROBERT. According to the statistics, yes, from the MMS.

Ms. DEGETTE. Because there have been few leaks?

Mr. PROBERT. No. It's a function of the depth of the water and what causes and how the well construction processes are undertaken between deep water and shallow water.

Ms. DEGETTE. OK. So you don't think we should then worry about the cement at the deeper water?

Mr. PROBERT. That is not what I said.

Ms. DEGETTE. OK. And I do agree with you on one point. The point I agree with you on is there are very few accidents, and that's the good news. But the bad news is that if there is an accident in this case, if there is faulty cement, if there are other problems, then the results of that are catastrophic. Would you not agree with that? Yes or no?

Mr. PROBERT. To the extent that cementing was an issue, if you're referring to this particular incident——

Ms. DEGETTE. Would you agree that if there is a leak, that the catastrophic results are such that even though there are very few accidents, we should try to avoid those, yes or no?

Mr. PROBERT. I do not agree with your assertion, no.

Ms. DEGETTE. You don't agree with that. OK.

So it's a risk that we should be willing to take?

Mr. PROBERT. I'm sorry that I'm not getting—you'll have to restate your question.

Ms. DEGETTE. Well, let me move on then.

You said that both positive and negative pressure tests were conducted on the cementing job in your testimony. Several experts have stated that a cement bond log test might have additional indicated additional weaknesses such as that the cement had not hardened properly. So I want to ask you, was a cement bond log test conducted at this well, yes or no?

Mr. PROBERT. To the best of my knowledge, the——

Ms. DEGETTE. Yes or no?

Mr. PROBERT. Well, to the best of my knowledge, the well owner did not request a cement bond log.

Ms. DEGETTE. No. Is it true that a cement bond log would provide assurance of the integrity of the cement bond?

Mr. PROBERT. The cement bond log is certainly the only realistic way of assessing the bond of——

Ms. DEGETTE. So that answer would be yes, correct?

Mr. PROBERT. Correct.

Ms. DEGETTE. Mr. McKay, is it BP's standard practice to only use basic pressure tests to evaluate a cement job?

Mr. MCKAY. I can't speak directly to this particular well, but what I can say is cement bond——

Ms. DEGETTE. I didn't ask you, I asked you your standard practice. Is it BP's standard practice to only use basic pressure tests to evaluate a cement job?

Mr. MCKAY. I believe every well is engineered individually, so I can't answer a standard practice for this type of well.

Ms. DEGETTE. So your answer is you don't know?

Mr. MCKAY. Can I check with my technical expert?

Ms. DEGETTE. Absolutely. And Mr. Chairman, if he could supplement his answer, I would appreciate that.

Mr. MCKAY. Cement bond logs are not required on every well. They are utilized when there is an indication of a problem.

Ms. DEGETTE. Why did BP not pay for a bond log test on this well?

Mr. MCKAY. Because the better way to test are positive and negative tests. A bond log is an inference of bond, not an actual test of bond.

Ms. DEGETTE. OK. Thank you very much.

Mr. STUPAK. Thank you, Ms. DeGette.

Ms. Sutton for questions, please.

Ms. SUTTON. Thank you, Mr. Chairman. I have a lot of questions, so please stick to the question, and if you don't know the answer, just say I don't know and we'll move on.

What was BP's operating budget in 2009?

Mr. MCKAY. Operating budget where, worldwide?

Ms. SUTTON. Sure, worldwide.

Mr. MCKAY. We spent about $20 billion in investment capital.

Ms. SUTTON. And what percentage of that 2009 budget was devoted to safety and preventative measures related to deepwater spills, do you know?

Mr. MCKAY. I don't know.

Ms. SUTTON. OK. How much does BP invest in research and development in the management of deepwater spills; do you know that?

Mr. MCKAY. I don't have a number.

Ms. SUTTON. OK. How many deepwater wells does BP operate in the Gulf?

Mr. MCKAY. I don't know the number of wells, but quite a few.

Ms. SUTTON. Well, quite a few is a very vague term. Can you give us any indication?

Mr. MCKAY. Can I give you an indication? There's been several thousand deepwater wells drilled in the world, and we've been in about 30 percent of them.

Ms. SUTTON. OK. And how many on the Outer Continental Shelf, do you have a better idea there?

Mr. McKAY. We are only in the deep water on the Outer Continental Shelf.

Ms. SUTTON. How many of those deepwater wells are operated by platforms leased from Transocean?

Mr. McKAY. Currently, we have three Transocean rigs working.

Ms. SUTTON. OK. What actions have been taken currently to ensure that this is not a systematic failure in regard to the operations of the platforms in a similar situation?

Mr. McKAY. What we've done, as I said earlier, we've instituted some tests, incremental tests on blowout preventers, and we've asked for any modifications that may have been made in the history or the problem of the blowout preventer?

Ms. SUTTON. OK. So testing and asking about modifications, that's the sum total.

OK. What is your spill response capability right now on the Outer Continental Shelf? I know we heard a little bit of discussion about this, but——

Mr. McKAY. We have 300 skimmers and other professional vessels first response to operating. We have 1 million feet of boom deployed. We have 2.4 million being staged or accessed around the coast. And we have a supply chain being ramped up to be able to sustainably supply 200,000 to 300,000 feet a week.

Ms. SUTTON. OK. What blowout safety devices do you have on the oil rigs in the North Sea?

Mr. McKAY. I have not worked in North Sea in a long time, but similar blowout preventers for the water depth condition and the reservoir conditions that are utilized in the North Sea.

Ms. SUTTON. Well, when you say similar, that's different than the way I understand it, so I'd like a little clarification because my question would be, why don't we use the same thing in the Gulf? So clarify that for me.

And what is your contingency plan for these wells in the depth of the water if the depth of the water causes a question of how to stop the leak? What is the contingency plan? We have heard a lot about things we are trying now, but what is the contingency plan?

Mr. McKAY. We have a spill response plan that's filed with the government and it sits underneath the national contingency plan and the one gulf plan. That indicates the equipment that's around the Gulf Coast to be utilized and new priorities, and the organizational structure to utilize. That has formed the foundation of this, and it was approved last June, 2009.

Ms. SUTTON. Will BP now keep Koffer Dams on the coasts of all their platforms to increase the response time in the face of such a disaster?

Mr. McKAY. I think as we learn the lessons from this, I do think there will be subsea intervention capability that will need to be looked at for the industry as well as ourselves, yes.

Ms. SUTTON. OK. Mr. McKay, BP has stated—and I think you did hear today—that you will pay for all legitimate claims resulting from the spill. What does BP define as a legitimate claim?

Mr. McKAY. We have been very clear that we will pay for all legitimate claims. And legitimate claims are folks who are impacted or business that are impacted and there is a substantiation of impact. And that is a legitimate claim.

Ms. SUTTON. So does that include the loss of profits for fishing and tourism?

Mr. MCKAY. Yes.

Ms. SUTTON. And will BP commit to exempting itself from any cap and their financial responsibility for damages resulting from this spill?

Mr. MCKAY. Yes, we've talked. No cap.

Ms. SUTTON. BP has stated that they are very positive that the relief wells will work. Do you concur, that's what they said?

Mr. MCKAY. Yes, we're confident that they will work.

Ms. SUTTON. OK. How many attempts did it take for the relief wells drilled in the Montara spill to work?

Mr. MCKAY. I am not familiar with the details of that. I've heard multiple relief wells.

Ms. SUTTON. Four, I believe. Does BP expect to have the same difficulty and delays in drilling the relief well for a far deeper well? You can understand why I ask the question.

Mr. MCKAY. We do not expect that, but we have the capacity to sidetrack these wells. They are set up to be able to have multiple attempts.

Ms. SUTTON. And as I said, Mr. Chairman, I have a lot more questions for the rest of our presenters and I will hold them for the second round.

Mr. STUPAK. Very good. We will be going a second round.

Ms. Schakowsky for questions, please.

Ms. SCHAKOWSKY. Time was a critical element in this disaster. It's possible that a rapid response on the deck of the rig could have prevented the catastrophe that continues today and a faster response by BP and Transocean might have reduced the size of the leak or cut it off faster.

We learned during the course of our investigation that, again, the critical modifications—we've talked about modifications—to the blowout preventer may have delayed significantly the response and might have been responsible for the failure of the device.

Mr. McKay, your company documents describe modifications that were made to the blowout preventer device. We were told by James Dupree, who runs your Gulf of Mexico operations, that you found major modifications to the system, in one case, a module that was supposed to be connected to a critical piece of equipment called a bore ram—that is designed to seal tight any piece of pipe in the well—was instead connected to a test ram that does not function in an emergency situation.

Do you agree with that finding?

Mr. MCKAY. I was not in that review, but I know that's what Mr. Dupree said, and he should know, yes.

Ms. SCHAKOWSKY. So, yes?

In another case, two independent controls for rams were wired into a single control, possibly increasing the risk of failure. Is that correct?

Mr. MCKAY. If that's what Mr. Dupree said, that's what he discovered with Transocean and Cameron and other folks in the intervention.

Ms. SCHAKOWSKY. My understanding is that because of these modifications, you lost nearly 24 hours attempting to activate the controls on the bore ram; is that correct?

Mr. MCKAY. We discovered leaks and other things, the modifications that didn't match the drawings, as we were doing these interventions and it did delay things, yes.

Ms. SCHAKOWSKY. So a useless test ram—I am quoting now from the chairman—not the variable bore ram had been connected to the socket that was supposed to activate the variable bore ram. So this was a useful test ram that you spent 24 hours trying to get at, right?

Mr. MCKAY. If that's what Mr. Dupree said.

Ms. SCHAKOWSKY. So my understanding that this time is essential in an emergency response like this, when oil and gas are surging through the blowout preventer, it acts like a sandblaster I'm told, and can degrade the rubber seals on the bore ram. If you can't activate it quickly, the seals may not function properly; is that correct? And could this delay have an impact on the response?

Mr. MCKAY. I think that is a question for Mr. Moore or Mr. Newman. I don't know.

Ms. SCHAKOWSKY. Mr. Moore, you made the blowout preventer. Is it true?

Mr. MOORE. Correct. Depending on what's flowing through that well, it could have abrasive materials that could take the elastomer elements and destroy them.

Ms. SCHAKOWSKY. So a 24-hour delay allowing the sand and stuff to come out could do that?

Mr. MOORE. Depending on what's in it. I'm not aware of what materials are in the flow area, so it would depend on what's in it.

Ms. SCHAKOWSKY. But it could.

Mr. MOORE. It could.

Ms. SCHAKOWSKY. So Mr. Newman, no one on this panel has actually owned up to making mistakes during this hearing, but the failure to connect the bore ram to the control module, that seems like a mistake to me. Do you agree that this was a mistake, and that you are concerned about possible implications of the mistake on the response?

Mr. NEWMAN. If I could clarify your question, Congresswoman.

Ms. SCHAKOWSKY. I think it was a pretty clear question. Is this a mistake that was made that the bore ram was not connected to the control module; is that a mistake?

Mr. NEWMAN. In the original configuration, when the BOP system was delivered from Cameron, the ROV port was connected to the lower-most ram cavity. It is, today, connected to the lower-most ram cavity.

Ms. SCHAKOWSKY. Was it a mistake that it was connected to a useless—in this case, useless test ram in terms of preventing the disaster? This is a very simple question. Someone clearly made a mistake. Was this a mistake?

Mr. NEWMAN. In the event that the ROV port is connected to the lower-most ram cavity and the lower-most ram cavity is outfitted with a BOP test ram, that will not serve to restrict or seal off the flow of hydrocarbons from the well.

Ms. SCHAKOWSKY. So in that case, having it connected to that, would that be a mistake?

Mr. NEWMAN. It would be a mistake to rely on that in a well controlled situation, yes.

Ms. SCHAKOWSKY. Thank you.

So I have very serious concerns about the modifications that were made. Transocean has made modifications to the blowout preventer and could not provide BP with accurate specifications when it matters most. We don't know yet if these modifications actually caused the failure, but what we do know is that they caused delays in trying stop the oil spill and identify its cause, which is very, very serious.

Thank you, Mr. Chairman.

Mr. STUPAK. That concludes questions of all the members of the subcommittee. There are members of the full committee who have been here and we appreciate them being here throughout this hearing. We will turn to them for questions before we start round two. We do plan on doing round two of questions.

Mr. Scalise for questions, please, 5 minutes.

Mr. SCALISE. Thank you, Mr. Chairman, as well as Ranking Member Burgess, for allowing me to ask questions to the panel.

We, of course, all in south Louisiana are fighting every day to not only do what we can to urge and push BP and all the parties involved to stop this oil from leaking into the Gulf of Mexico, but also to prevent it from coming into our marshlands and our seafood beds that are such a vital part of Louisiana's culture. And clearly, as we look at all of the things that are involved in the working coast that the Gulf of Mexico and south Louisiana is, it's not just an area where 80 percent of all the continental drilling and exploration is done for the United States, but it's also an area where many people make their livelihoods in the seafood industry, and that's all at risk right now.

And it's another reason that it really underscores why those of us in south Louisiana have been pushing to get our fair share of royalties. We don't get that same share of royalties for the drilling that's done off of our coast as every other state gets, and this is a glaring example of why it's so critical that we do get to finally participate in the revenue sharing and not wait until 2017, but do that immediately because this has an impact on our livelihood.

I have a number of questions for the panel that I am going to get into. I also have a number of questions for MMS, which I wish we had the opportunity to ask as well. We had a closed hearing where they were asked some questions, but unfortunately they've never participated in any public hearing. I've asked them for a number of documents that they've yet to get me on exemptions that have been granted on various processes related to the Horizon, as well as other exemptions that they've given in the past.

But let me ask you, Mr. McKay, can you tell me how many exemptions were requested for all the activities related to this well and how many were granted by MMS?

Mr. MCKAY. I'm not sure I know what you mean by exemptions.

Mr. SCALISE. Exemptions to various processes. It's my understanding that you were given exemptions on environmental impact studies.

Mr. McKAY. Can I explain that real quick? The categorical exclusion that's talked about is because environmental impact statements have already been done. They're done with the lease sale by the government.

Mr. SCALISE. So did you not get an exemption on that?

Mr. McKAY. You file for a categorical exclusion because those environmental assessments have been done, yes, and we did——

Mr. SCALISE. So you did file for that and you were granted that by MMS?

Mr. McKAY. Yes.

Mr. SCALISE. OK. Were there any other exclusions or exemptions that you filed through MMS for this particular well?

Mr. McKAY. Not that I know of, but I may not know of everything.

Mr. SCALISE. And as you find out any of them, please get those to me. I have asked that same information from MMS, I have yet to receive it. So hopefully they will be forthcoming in that as well.

Mr. Moore, the BOP, that is so in question here, there have been a number of studies done. I've got a study that goes back to 1999 that was performed for MMS. There is another study in 2004 that was done for MMS that describe various problems with blowout preventers, not just in the Outer Continental Shelf, but also looking at other places around the world where they are used in deep water. Are you familiar, first of all, with these studies?

Mr. MOORE. Our teams are familiar with those studies, yes.

Mr. SCALISE. Have you all made any changes in the design of the blowout preventer over the years as these deficiencies have been identified?

Mr. MOORE. Well, most of those reports cover the results of testing in the field, which is very regimented, and its component failures that would result from—it could be maintenance, it could be just the life of—you've got a blowout preventer that has over 100,000 moving parts. They do, from time to time, have to be serviced and replaced. So that's what those testing of components——

Mr. SCALISE. Serviced and replaced, but in terms of design—and let me read you one section. This is the 1999 study on page 13. It said, "It was decided not to pull the BOP to repair the failure after MMS had granted a waiver. The failures in question were typically failures in components that were backed up by another component in the BOP stack."

So what it seems to indicate is, because there are multiple redundant systems, if they found a problem in the BOP they would just say, well, there's other redundancies, so don't worry about that problem because something else will catch it. That doesn't seem to me to be a good process to handle a problem with a BOP, if you've got five redundant systems and one of them fails to say, well, we've got four others. It seems to me you would go and fix that problem.

Mr. MOORE. Well, I think those problems are repaired when the stacks are put back to surface if it's a deepwater stack.

Mr. SCALISE. It didn't seem to be the case in this one, but I'll move on to my next question.

I will move on to—whether it's Mr. Newman or McKay. How many times were operations shut down on the BP Horizon, the drilling that was done on the Horizon in relation to this well? Do you know how many times operations were shut down because of various problems? I will start with Mr. Newman and then ask Mr. McKay.

Mr. MCKAY. Ever?

Mr. NEWMAN. During the life of the Mississippi Canyon 252 well, I don't have a record of how many times operations were suspended.

Mr. SCALISE. Mr. McKay.

Mr. MCKAY. I'm sorry, I don't know.

Mr. SCALISE. Well, let me ask you about a few specific problems.

There was a story in The Times Picayune, New Orleans newspaper, yesterday that goes into detail, they actually started interviewing some of the people that were working on the well, talked about problems that go back to weeks prior to the explosion. They said, A constant theme is that gas kicks were more frequent in this oil field than others that the crews had worked on and members were concerned. "One gas kick that occurred as they got down towards the bottom of the hole approximately 10,000 feet below the floor had such a large kick that they had to shut down operations. They were concerned about spark sources on the rig at the surface, so they had to shut it down because there was so much gas coming out of the rig and they were afraid of the explosion.

Now, are you familiar—that was, according to this report, a few weeks prior to——

Mr. STUPAK. Mr. Scalise, this will have to be your last question.

Mr. SCALISE. Do you know about that shutdown, and can you give me a list of all of times that this rig was shut down due to various problems prior to the explosion?

And thank you, Mr. Chairman.

Mr. STUPAK. We will look forward to information at a later time. And you may want to put that in writing because we will have 10 days after this hearing to submit further questions in writing.

Now a member of subcommittee, Mr. Green, for questions, 5 minutes, please.

Mr. GREEN. Thank you, Mr. Chairman.

Mr. Newman, it has recently been reported that some of the Transocean workers that were rescued from the drilling platform were told to sign statements denying they were hurt or witnessed the blast before they were allowed to contact their families and leave and literally were just rescued. Additionally, in Mr. McKay's testimony, he mentions how BP is speaking to those witnesses saying they have "access to." Can you comment on the statements that these employees were forced to take and is there a copy we could see?

Mr. NEWMAN. We absolutely will provide the copy of the statements. And I can categorically deny that they were forced to sign.

Mr. GREEN. Well, we're just going by press reports, that's why you all are here today. And believe me, we know sometimes it's not always accurate.

Will Transocean make all these workers that were on the rig at the time of the explosion fully available to investigators?

Mr. NEWMAN. Congressman, we want to understand what happened just as badly as Congress does, and we will make anything available that will help in understanding what happened.

Mr. GREEN. OK, I appreciate that.

Mr. Newman, Halliburton maintains that their sea personnel were instructed to record the drill pipe pressure test, but that the drilling operator told them that the negative pressure test had already been completed and they were put on standby. The drilling contractor then proceeded to displace the riser with seawater. Is it common for the drilling contractor to perform the duties of the subcontractor, and why did it happen in this case?

Mr. NEWMAN. I don't believe that the drilling contractor in this case, Transocean, performed the duties of any other subcontractor.

Mr. GREEN. OK. Mr. McKay, in your testimony, you acknowledge that BP, as one of the leaseholders and the operator of the exploration well, has acknowledged its responsible and will clean up and will pay all legitimate claims. And I know just from experience, nobody can afford to drill those wells without partners. There has been a report in the press that other minority leaseholders Anadarko and Mitsui oil exploration; is that correct?

Mr. MCKAY. That is correct.

Mr. GREEN. OK. Mr. Probert, you said that contrary to early reports, the final cement plug in the well was not set and the plug would have been the final barrier before the well would have been temporarily suspended; is that correct?

Mr. PROBERT. That's correct. It would have been necessary to set that plug before the blowout preventer could have been removed and the well secured.

Mr. GREEN. And you said that the Deepwater Horizon rig met or exceeded the number of safety devices required by the Federal Government, including an independent method of making the blowout preventer function correct. Is that correct? The method of making the blowout preventer function.

Mr. PROBERT. I think that may be best directed at Mr. Newman.

Mr. GREEN. OK. Mr. Newman.

Mr. NEWMAN. The blowout preventer and the BOP control system on the Deepwater Horizon were fitted with a number of methods of activating the BOP. Manual activation from the rig, and where the regulations required two independent stations, Horizon was actually fitted with three independent stations. In addition, to manual activation, the blowout preventer control system on the Horizon was fitted with two automatic response systems, one of which the industry refers to as a dead man, and the other one is referred to as an auto share. Those are two systems under certain conditions the BOP will automatically respond. And the BOP was also fitted with ROV intervention, remote operated vehicle intervention.

Mr. GREEN. OK. And I understand there are lots of redundancies. Also, the benefit of representing east Harris County, I have lots of unofficial consultants who are chemical engineers, and there are lots of redundancies built in. And you confirmed that the blowout preventer device, that it was supposed to shut off the oil flow on the ocean floor, but it did fail.

Mr. NEWMAN. It has not been effective in shutting off the flow.

Mr. GREEN. OK. Thank you.

And then you go on in your testimony to say that there's no reason to believe that the blowout preventer wouldn't work, and there might have been clog by debris shooting up from the well; is that correct?

Mr. NEWMAN. I believe that's a possibility that needs to be investigated.

Mr. GREEN. Now I understand your argument that the well has been sealed with casing and cement, and within a few days the blowout protection would have been removed. And according to you at that point, the well barriers, the cement and casing were responsible for controlling any pressure from the reservoir, so the BOP's failure could not be held responsible; is that a statement you made?

Mr. NEWMAN. The ineffectiveness of the BOP to control the flow was not the root cause of the event.

Mr. GREEN. OK. So the cement plug would have to be set before the blowout prevention could be removed.

Mr. NEWMAN. Setting a cement plug is a normal process of abandoning the well.

Mr. GREEN. OK. And I know it's too soon to know exactly what happened with the blowout prevention, but there are lots of redundancies. And again, this is not the first well we've drilled in deep water in the Gulf of Mexico. And some folks I know in the industry maintain that even with the debris, the blowout protection should have still worked, after all, it's a secondary means of controlling pressure if it the drilling mud is inadequate. Is that generally correct, it should have worked, the blowout preventer?

Mr. NEWMAN. Provided that the BOP was asked to function within its designed specifications, there is no reason to believe that it would not have worked within its design specifications.

Mr. GREEN. OK. Mr. Cameron, would you like to comment?

Mr. MOORE. I would agree with his comments.

Mr. GREEN. Thank you, Mr. Chairman, for your time.

Mr. STUPAK. Thank you, Mr. Green.

Mr. Newman and Mr. McKay, Mr. Scalise had asked a question, the minority would like to see if you guys can answer it.

His last question was, 6 weeks ago, according to The Times Picayune newspaper, that 6 weeks ago there was a gas kick and the operations were shut down. Do you have any information on that shutdown when you had the gas kick about six weeks ago?

Is that a fair assessment of your question?

Mr. McKay, do you have any information on that?

Mr. MCKAY. I'm not aware of that, but we will get the data to the committee.

Mr. STUPAK. Mr. Newman?

Mr. NEWMAN. I'm not familiar with the specific circumstances of that particular incident.

Mr. STUPAK. OK. Then I would next turn to Mr. Stearns for questions as a member of the full committee, 5 minutes, please.

Mr. STEARNS. Mr. Chairman, thank you very much for allowing me to participate even though I'm not on the subcommittee.

Mr. McKay, I'm just going to ask you a basic question. I was down there and we saw that the Sombrero did not work and we saw that you started the slant drilling. Here is a basic question; when will you cap that well? What is your best guess?

Mr. MCKAY. We have multiple efforts underway. I can't give you a deterministic—we have multiple efforts that we are working simultaneously.

Mr. STEARNS. Well, are you going to cap in it in 90 days? Yes or no?

Mr. MCKAY. I believe the relief well will be down in roughly 90 days.

Mr. STEARNS. So you think you'll cap it in 90 days with the slant drilling?

Mr. MCKAY. With the relief wells, or sooner with other methods.

Mr. STEARNS. What other methods?

Mr. MCKAY. We're still working on the blowout preventer itself and trying to do a top skill, which could be successful. But we are also trying to get a containment system subsea——

Mr. STEARNS. So your best guess is within 90 days that you will close this rig of the evacuation of all the gasoline; that's your best guess.

Mr. MCKAY. I believe that or better.

Mr. STEARNS. Now you're in a room all alone, just you and the Governor of Florida, and he asks you this question, he says, when is your best estimate of when it will hit the Florida coast, what would you say?

Mr. MCKAY. I don't have any estimates of it hitting the Florida coast. I don't know.

Mr. STEARNS. Do you think it will ever hit the Florida coast in these 90 days that you predict that they will be closing the oil?

Mr. MCKAY. I don't have a way of predicting that. All I can say is that we're trying get a containment system in so that that oil is collected before——

Mr. STEARNS. Well, let's take a worst case scenario. As I understand, the wind doesn't have an impact, it's basically the current. Is there a worst case scenario where it could hit the Florida coast?

Mr. MCKAY. That is a possibility. That's why we are organizing to be able to do it——

Mr. STEARNS. Let's say it's a possibility. If you had to be a betting man, would you say it would hit the Florida coast in 90 days?

Mr. MCKAY. I'm not speculating on that. We're doing everything we can to make sure it doesn't.

Mr. STEARNS. A constituent sent me a little video, it showed a large basin of water, and they poured oil into it. They took blue hay and other types of hay and they dropped it into it, and in about 1½ minutes it absorbed all of the oil in the basin of water.

What is the possibility—can you drop hay in the area, they take the hay out, and then it becomes fuel. Why couldn't you have just dropped something to absorb all that oil instantly to give you more time to make decisions? Have you ever thought of that?

Mr. MCKAY. Yes. Some of that absorbent-type material will be used in the near shore and the beach area.

Mr. STEARNS. Yes, but you could have dropped it right on the site, then take barges out, pick it all up, it absorbs all the oil off the top, and then you could have made the oil into things that you could actually burn. Had that ever occurred to you folks?

Mr. MCKAY. We are in the Unified Area Command with the Coast Guard, and I don't believe that is as scalable as it needs to be for the farthest offshore.

Mr. STEARNS. If it was a good idea, do you need the Federal Government to approve it or can you do it on your own?

Mr. MCKAY. Well, we work together with the Federal Government under the Unified Area Command and every decision is authorized by the Unified Area Command.

Mr. STEARNS. In tab 11 of page 7–1, in its application to explore to site, BP—do you want to get that tab, or do you just want me to read it to you? It reports it has the capability to respond to spills of 300,000 barrels per day. This is you folks telling us that you have the capability to respond adequately to spills of 300,000 barrels a day. It's on page 7–1, section 7.0. This is our oil spill information graph worse case scenario—this is you talking, worse case scenario—and you say volumes uncontrolled blowout per day, 300,000 barrels per day. Is that correct, the information in here? Do you still stand by?

Mr. MCKAY. I see that.

Mr. STEARNS. OK. What is the current spill per day today?

Mr. MCKAY. The current estimate is 5,000 barrels a day.

Mr. STEARNS. So basically that's 60 times less than you say the worse case scenario that you can adequately respond to; is that correct?

Mr. MCKAY. That is the math, yes.

Mr. STEARNS. So, why are you having so much trouble responding to this when even by your own literature, you're saying you could handle up to 300,000 barrels a day, you have something that is 60 times less, and yet this thing is starting to hit the Chandelier coast in Louisiana, with a possibility it might even be hitting Alabama and possibly going to Florida. So why can't you have an adequate response even when your worse case scenario says you can handle up to 300,000 barrels per day?

Mr. MCKAY. This particular incident is very difficult because we've got a——

Mr. STEARNS. This says worst case scenario, these are your words.

Mr. MCKAY. The mechanical configuration of this is very difficult. And the relief efforts that we're doing include three drilling rigs that are working simultaneously to try to contain and stop this.

Mr. STEARNS. So you're saying today's situation is more than a worst case scenario that you outlined in your report to us?

Mr. MCKAY. No, I'm not saying that.

Mr. STEARNS. Well, you see why I am puzzled why you folks are sitting here saying you don't have control when your worst case scenario said you can handle 300,000 barrels a day.

Mr. BARTON. Would the gentleman yield for a clarification?

Mr. STEARNS. Yes.

Mr. BARTON. Is the reason you think you can handle a 300,000 barrel a day worst case because the assumption is the blowout prevention actually works?

Mr. MCKAY. It's part of the assumption in dealing with this.

Mr. BARTON. Thank you, Mr. Stearns.

Mr. STEARNS. I appreciate the Chairman. The only thing I would conclude is that I assume in the worst case scenario that that would be part of the worst case scenario. So that's the only concern I have.

Thank you, Mr. Chairman.

Mr. BRALEY [presiding]. The chair recognizes the gentleman from Vermont for 5 minutes.

Mr. WELCH. Thank you, Mr. Chairman.

As we all know, we were told that what could never happen did happen. We were told that if the unimaginable happened, we had a fail-safe mechanism that would make certain there would be no harm. And of course, the tragedy is that these assurances proved wrong. And we are learning one of the reasons that they are wrong, drillers have been relying on the device known as the blowout preventer. And in theory, it's designed to shear off the pipe and completely close the well, as you all well know, in the event of a catastrophe like Deepwater Horizon.

Mr. McKay, I want to quote from your testimony. You say, and I quote, "The blowout preventer was to be fail-safe in case of an accident." Is that correct, you were counting on that blowout preventer as the last line of defense?

Mr. MCKAY. That is considered the last line of defense, yes.

Mr. WELCH. OK. I want to ask you about that and the basis for that reliance.

As you know, we received a document that was part of our investigation called the Blowout Preventer Assurance Analysis. This is something that you had, BP had. It was commissioned in March of 2001. The risk assessment of the blowout preventer of the Horizon rig identifies 260 different failure modes. In this it says, Specifically includes over 20 that pose high or very high risk on the BOP. It describes the potential failure of the blowout preventer to unlatch from the rise, the failure of rams to close, the failure to shear pipe as examples of the many possible, quote, high consequence failures of the blowout preventer. And these are exactly the type of problems that led to the uncontrolled leak in the Deepwater Horizon.

So the question I have is, if BP had a report that it commissioned for review of the safety mechanism of the blowout preventer and it contains 260 failure modes, under what construction of the English language is a device with 260 failure modes fail-safe?

Mr. MCKAY. I'm sorry, I'm not familiar with that report. Is that a BP requested report?

Mr. WELCH. It's an RB Falcon Deepwater Horizon BOP Assurance Report that's dated March, 2001. It literally lays out failure modes.

Mr. MCKAY. That may be a Transocean report.

Mr. WELCH. Well, we'll get that to you because what it does specifically outline are anticipated problems with the blowout preventer.

Mr. WELCH. We also learned about our critical problems with the blowout preventers. One problem is we understand they can't cut joints in the drill pipe and, as I understand it, those are referred to as tool joints.

Mr. Moore, you made this blowout preventer. And let me ask is it correct that it was not designed to cut joints in the drill pipe?

Mr. MOORE. No, it is not.

Mr. WELCH. So this is not a minor risk, because we've been told that the pipe joints can take up to about 10 percent of the pipe's length. Does that sound about right to you?

Mr. MOORE. That's correct.

Mr. WELCH. So basically we have got a blowout preventer that won't work on 10 percent of the mechanism it's supposed to operate on.

There were multiple failures that led to the disaster in the Gulf, and one of the most critical, obviously, was that the blowout preventer on the Deepwater Horizon just didn't work, and BP and Transocean were relying on the device as if it was the ultimate failsafe even though there was a report in March of 2001 outlining 260 separate failure modes. And obviously we are all now left, most importantly the folks who live in the Gulf region, to deal forever with the consequences of this catastrophe.

Mr. Chairman, I yield back.

Mr. BRALEY. The chair now recognizes the gentleman from Louisiana, Mr. Melancon, for 5 minutes.

Mr. MELANCON. Thank you, Mr. Chairman. I appreciate the opportunity to ask some questions.

First, let me start by saying my condolences to the families of the 11 victims. We are all regretful of such an incident. On the lighter side, Mr. Moore, I understand your son Daniel is engaged and I understand his friends are even accepting and saying he got a good catch. So being a father-in-law a good catch is a great phenomenon even during these troubled times.

I have been a pro oil and gas person here, and I want to thank my colleagues on both sides of the aisle that have refrained from saying "I told you so" because I have been a defender of offshore drilling. I think the record for shallow water offshore drilling speaks for itself. I think it's very good, it's very reliable. I think this accident demonstrates that maybe our government and former minerals management, in working with the industry, that we have to figure out what do we need to do to do this better because I can't in all good, with a good heart, encourage the continuation of deepwater until I know that all safety precautions are there, that all backup systems are there, that all systems will work under the conditions, whether it's depth, temperature, or whatever.

So moving forward, I guess one of the questions I have got is, when you went to apply for the Deepwater Horizon and you received a categorical exclusion from the NEEP in 2009, what is the process by which you secured this exclusion? In retrospect, should we have looked at it even more? Was this an exclusion that as companies you knew you always had that option, even though the law said, didn't say exclusions were viable or acceptable? Was it a commonplace thing?

I think that would be more for Mr. McKay and Mr. Newman.

Mr. MCKAY. To the categorical exclusion that relies on the environmental impact statements that the MMS and the government has done for the lease sale itself and smaller areas within that lease sale, an environmental assessment is done specifically for those areas by the government, and the industry generally uses those environmental assessments in their permit and files an environmental statement with those. So it's used, it's common, yes.

Mr. MELANCON. Is that where as I understand it the comment came that we are 50 miles off, we will have no impact, because as you know my concern is the estuaries and the marshlands of south Louisiana that I grew up hunting and fishing in, and while my heart is heavy, I know those folks that make their living and actually live in those marshes, the frustration, the helplessness that they are feeling. So should that have been, in good conscious, something that, is that a negotiated thing between the companies and MMS?

Mr. MCKAY. No. It's not negotiated. I think through all of this we are going to learn a lot and need to look at the qualifications and the regulations and the permits that are required to do work. I will acknowledge that. This is not something that is unusual. It's utilizing environmental assessments that have been done, and it's in a conventional sense. Conventional sense may not be right, unfortunately.

Mr. MELANCON. As I said, I guess at the depth, and we have got a whole new animal we are dealing with and we need to do to know what it is and better.

Mr. Chairman, I guess my question to the chair would be is there some method—my concern right now, especially after what happened in Colorado I think a year or so ago, brought to light with MMS some ability for the committee to get an independent auditor, investigator, inspector general or something to look into how we do this and to make some recommendations so that this never happens again to anyone in this country, much less this world. We are the United States, and I would have thought if this was going to happen it would have been in maybe a South African continent or some third world country that just looked the other way or said, if there is still such a thing, and I'm sure there is, as kickbacks but that would have happened there and not here in the United States. And of course having come through Katrina, Rita, Gustav, Ike and now Horizon, it's just I guess the anxiety is building on south Louisiana as though there is a bull's eye on us.

And I'm running out of time. I have one other quick question but thank you very much I turn back my time.

Mr. STUPAK [presiding]. Thank you, Mr. Melancon. This is the first of many hearings we will have on this issue and all avenues will be explored.

Mrs. Blackburn, 5 minutes for questions, please, member of the subcommittee.

Mrs. BLACKBURN. Yes, thank you, Mr. Chairman. I appreciate that.

And Mr. McKay, I wanted to talk with you on a couple of things. One, people that have come down from the Federal Government, do they have an understanding of offshore drilling? Do they have any real world experience in that that has proven helpful or have you had to kind of give them a tutorial or an understanding of that process?

Mr. MCKAY. Well, I think it's in different categories for different folks. A lot of people are learning a lot about the oil business and the technology and issues that are being dealt with. Coast Guard, obviously we drill with the Coast Guard. They have been involved in lots of things in the Gulf Coast around the oil business for many, many years, so they are very familiar with what they are doing. Other government agencies, the MMS, are very familiar with what we're doing obviously. Other government agencies are learning to be honest, learning and understanding and trying to help.

Mrs. BLACKBURN. I also want to ask you very quickly because we have limited time, and if you want to do some of this and submit it in writing, that's fine, your protocol for capping a well, if you can just step through that and was that protocol explicitly followed in this case?

Mr. MCKAY. I think we will need to get back to you as part of the investigation, what was the procedure, how valid was it, would it have worked, the design, et cetera, then was it followed correctly and then what decisions were made critically between when some of the signals were that we may be in a well control event.

Mrs. BLACKBURN. And then on the controlled burns. I know you started some of the controlled burns and there were some days the weather wasn't good. How much did you—how many days did you use the controlled burns? If you eliminated those, why did you make that decision?

Mr. MCKAY. It's weather dependent, and it's been used when the weather permits, and we think it's a very valid tool, and we are trying to use it when we can but we have not had the weather available to use it as much as we would like.

Mrs. BLACKBURN. OK. And let's see, Mr. Moore, the BOP system that you discussed, what is the best secondary BOP system? You talked a little bit about what you had developed, then what is the best secondary system? How often is it used? Is there anything else for a well that has a history of producing a lot of gas, like it's my understanding that this one did. And what is the best secondary or alternative plan for that?

Mr. MOORE. Other than using a BOP?

Mrs. BLACKBURN. Yes.

Mr. MOORE. I know of no other one. There are several ways to control a well obviously when it's being drilled through various processes. Mud is obviously the biggest one.

Mrs. BLACKBURN. So what you're saying is what was being used is considered the best and the only way to address this?

Mr. MOORE. I think there are numbers of ways to control the flow of a well when you're drilling it. As I said mud systems are the most, I think most common. BOPs are put in a situation where they must close on a flowing well when certain controls are lost. And provided they are maintained, provided that they are activated, and provided there is nothing put into the flow path that it can't close on, they are pretty reliable, very reliable.

Mrs. BLACKBURN. And Mr. Newman, I had one question for you. When the explosion first occurred, were your SWAT teams notified and how quickly were they on the scene?

Mr. NEWMAN. If I could just clarify for the Congresswoman what a SWAT team is. This is a team that we use when the BOP is on surface, on the rig, in between wells, and they are there to provide additional support to the normal complement of rig crew for conducting the thorough program of between wells maintenance that is performed on the BOP. So in this particular situation where the BOP remains on bottom, the SWAT team, in terms of providing actual onsite expertise, what they have done is mobilized to the offshore operations. So they are providing support and guidance to the remote operated vehicle operators as they continue to attempt to manipulate and intervene on the BOP.

We have members of that same expertise or function providing support to BP in their WestLake facility in Houston and similarly in our own continuing crisis response team in our offices in Houston.

Mrs. BLACKBURN. So as soon as word came to you that there was a need, you all were in action?

Mr. NEWMAN. Absolutely.

Mrs. BLACKBURN. Thank you, sir. I yield back.

Mr. STUPAK. Mr. Dingell for questions, please, member of the subcommittee.

Mr. DINGELL. Mr. Chairman, I thank you. Mr. McKay, how much has BP spent on the response so far?

Mr. MCKAY. I don't have an accurate number.

Mr. DINGELL. Would you submit that for the record?

Mr. MCKAY. Yes.

Mr. DINGELL. How much do you anticipate that BP will spend before this matter is over?

Mr. MCKAY. I don't know.

Mr. DINGELL. This is a question for all witnesses.

Was the blowout preventer modified in any way, yes or no?

Mr. NEWMAN. The blowout preventer has been modified since it was delivered from Cameron in 2001.

Mr. DINGELL. You say it was to be specific for the particular installation? Is that what you're telling me?

Mr. NEWMAN. The blowout preventer was modified. It was modified in 2005 as a result of an agreement between Transocean and BP. It was modified at BP's request and at BP's expense.

Mr. DINGELL. Why was it modified? And how was it modified? You and Mr. McKay will be wanting to answer that question.

Mr. MCKAY. I'm not sure of the details of that modification. I think the investigation should look into that as well as whether there were any other modifications made other than that.

Mr. DINGELL. Were the modifications entirely in accord with the manufacturer's instructions or were they at variance with the manufacturer's instructions?

Mr. MCKAY. I don't know.

Mr. DINGELL. Sir, do you know?

Mr. NEWMAN. The modifications to the Cameron BOP that were performed in 2005 utilized Cameron equipment. They were done under the direction of BP and in coordination with oversight from the MMS.

Mr. DINGELL. This is for all witnesses, yes or no, were there shear rams installed, and were they tested to ensure functionalities at the depths of this particular well? Yes or no.

Mr. NEWMAN. The BOP is outfitted with two sets of shear rams, one of which is referred to as a super shear ram, and the other is referred to as a blind shear ram.

Mr. DINGELL. Mr. McKay.

Mr. MCKAY. I don't know.

Mr. DINGELL. Next witness, sir, please?

Mr. MOORE. Yes. Mr. Newman is correct.

Mr. DINGELL. Did the Deepwater have a backup remote trigger to activate the blowout preventer? Yes or no.

Mr. NEWMAN. The answer to that question, Congressman, is yes. The BOP system on the Deepwater Horizon was fitted with two automatic backup response systems, one of which the industry refers to as a deadman and the other one the industry refers to as an auto shear. Both of those systems were fitted on the Deepwater Horizon's BOP control system.

Mr. DINGELL. Thank you. Do the other witnesses agree with that statement?

Mr. MCKAY. Yes.

Mr. MOORE. Yes.

Mr. DINGELL. Now, Mr. McKay and Mr. Probert, was the cement used in this case the same chemical makeup as the cement used by Halliburton for other wells? Yes or no.

Mr. PROBERT. Yes, this type of cement had been used in approximately 100 applications in the Gulf of Mexico.

Mr. DINGELL. Mr. McKay?

Mr. MCKAY. I don't know.

Mr. DINGELL. For all witnesses, were the survivors of the explosions asked to sign medical or legal liability waivers after the explosion? Yes or no.

Mr. NEWMAN. The documents that the Transocean survivors of the incident were asked to sign were categorically not waivers.

Mr. DINGELL. Mr. McKay.

Mr. MCKAY. For the BP employees, no.

Mr. DINGELL. Next witness.

Mr. PROBERT. No.

Mr. DINGELL. Next witness.

Mr. MOORE. Congressman, we had no one on the rig.

Mr. DINGELL. Now, it is my understanding, gentlemen, and this is for all of the witnesses, if you please, it is my understanding that local fishermen have been contacted by your companies to help with the cleanup in different ways.

Have these contractors been asked to sign any kind of liability waiver?

Mr. MCKAY. We are the—a responsible party that's operating the clean up efforts with the Coast Guard. There was originally a standard form that was put out, I have lost track of time, a couple weeks ago, that was a problem. That was torn up, started over, and no. So your practical answer is no. And that was fixed right after.

Mr. DINGELL. So the answer to that question is no?

Mr. MCKAY. They are not signing liability waivers.

Mr. DINGELL. Is that a categorical or a qualified no?

Mr. MCKAY. I believe it is a categorical.

Mr. DINGELL. Very good. Now I have a curiosity. I had intended to ask, did the Minerals Management Service exempt BP's lease on the well from an Environmental Impact Statement as required by NEPA? BP apparently requested that exemption?

Mr. MCKAY. There's a categorical exclusion that was utilized that makes use of the government's Environmental Impact Statement that's done with the lease sale, and then the government's environmental assessments that are done by grid and smaller area within that lease sale, and those are utilized with the permit.

Mr. DINGELL. Thank you, Mr. Chairman.

Mr. STUPAK. Thank you. Ms. Castor for questions, please.

Ms. CASTOR. Thank you, Mr. Chairman.

Mr. McKay, in your testimony, you state that BP recognizes that beyond the environmental impact there are also economic impacts to the people of the Gulf Coast States, BP will pay all necessary cleanup costs and is committed to paying legitimate claims for other loss and damages caused by the spill, and that you are determined to do everything humanly possible to minimize the environmental and economic impacts of the resulting oil disaster.

Now in Florida, the Deepwater Horizon disaster is causing losses and damages to our most important industries, to our tourism industry, to the fishing industry, vacations are being canceled, hotels don't know what to do, they are very scared. This is having a devastating impact on the hardworking people of Florida like the other Gulf Coast States.

So when you state that BP is committed to taking responsibility for paying claims, are you willing to begin a high level dialogue with the political leadership of the State of Florida to talk about ameliorating and addressing the impacts on our industries?

Mr. MCKAY. Yes.

Ms. CASTOR. Mr. McKay, is there anyone who now works for BP America or BP parent or any BP subsidiary who previously worked for the U.S. Department of Interior and/or MMS?

Mr. MCKAY. I believe so, yes.

Ms. CASTOR. Who is that?

Mr. MCKAY. I believe Jim Grant worked for the MMS.

Ms. CASTOR. In what role?

Mr. MCKAY. In what role for the MMS? I'm not sure.

Ms. CASTOR. Could you answer that question in detail for the committee moving forward, go through your records and see?

Mr. MCKAY. Yes.

Ms. CASTOR. And what about vice versa, is there anyone currently employed by the Department of the Interior or MMS or who previously worked for BP America or BP parent or subsidiary?

Mr. MCKAY. I know of one person. I'm not sure if they are still employed but they were, yes.

Ms. CASTOR. Who is that?

Mr. MCKAY. Sylvia Baca.

Ms. CASTOR. In what role?

Mr. MCKAY. I don't know. I don't know what her role is exactly.

Ms. CASTOR. So you will get that information to this committee.

Mr. MCKAY. I'll get that to you.

Ms. CASTOR. Mr. Newman and Mr. Probert, same question except substitute Transocean and/or Halliburton.

Mr. NEWMAN. I'm not aware of anybody, but we can certainly check our records and confirm.

Mr. PROBERT. Neither am I aware of anyone, but we will certainly check our records for you.

Ms. CASTOR. Thank you very much.

I want to ask question about how the blowout preventer was tested. Mr. Newman, in your testimony, you say that the blowout preventer was tested regularly and found to be functional, is this correct?

Mr. NEWMAN. Yes.

Ms. CASTOR. Mr. Newman, I want to read to you a document that we obtained late last night. This document is from February 10 and is labeled as the Deepwater Horizon blowout preventer subsea test. We have been told that there were additional tests conducted after this February test in March and April but they went down with the rig. So this February test is the last detailed information we currently have on subsea testing of the blowout preventer.

In particular, I want you to focus on the test for their casing shear rams. There are no test results here. And it actually says, do not function as per exemption.

Mr. Newman, what does this mean?

Mr. NEWMAN. I'm not familiar with the particular exemption that would be in place, so I can't comment right now.

Ms. CASTOR. What does it mean when the document states casing shear rams open?

Mr. NEWMAN. Casing shear rams open would be the test that would be performed to confirm that the casing shear rams do in fact open, so the shear rams retract.

Ms. CASTOR. And same thing for closed, same explanation. So what does it mean when it says, do not function, do not function as per exemption.

Mr. NEWMAN. I believe that it means as part of this test, those casing shear rams are not functioned.

Ms. CASTOR. So I want to be fair. My understanding is that there is evidence that the casing shear rams worked, so this failure to test may not have had an effect on the response, but it is indicative of the problems with the testing regime.

Do you want to comment on that?

We have other documents that discuss the testing of the blowout preventer, and one is a document prepared by BP on April 27 after the blowout, 1 week after the explosion. I would like to bring that up on the screen. This document makes a number of key points about problems with the BOP test. It states BOP stack emergency systems are not typically tested once the BOP stack is on the seabed.

It also says that the subsea testing of the emergency systems would show whether the system will work when installed and showed that there were no leaks that would diminish system integrity.

Mr. Newman, what is your reaction to this document?

Mr. NEWMAN. While the BOP is on the surface, prior to being deployed for well operations, all of the systems on the BOP are tested, including simulation of the conditions that would trigger the automatic functions on the BOP control system.

Ms. CASTOR. So were the emergency systems of the blowout preventer tested after the device was installed on the seabed?

Mr. NEWMAN. Those systems are not tested once the BOP system is on the seabed.

Ms. CASTOR. Why not?

Mr. NEWMAN. If we could talk about the auto shear function. The auto shear function——

Ms. CASTOR. I'm a little over my time, Mr. Chairman.

Mr. NEWMAN. If we could talk about the auto shear function. The auto shear function is installed on the BOP control system to simulate the disconnection between the lower portion of the BOP stack and the Lower Marine Riser Package. So these are two sets of components that come together, and taken together they constitute the entirety of the BOP stack. The auto shear function is designed to activate when the Lower Marine Riser Package inadvertently disconnects from the BOP, the lower BOP. There is a way to do that subsea, but it introduces significant risk in the well construction operations. Disconnecting the LMRP inadvertently from the BOP is not an expected, not a normal part of the well construction process. It's an emergency response. And so testing that emergency response while the BOP is on the seabed would introduce significant risk.

Ms. CASTOR. Thank you very much.

Thank you, Mr. Chairman.

Mr. DINGELL. Thank you. Mr. Inslee for questions, please.

Mr. INSLEE. Thank you. Mr. McKay, would you agree that the industry ought to be using the best available technology to avoid these cataclysmic blowouts?

Mr. MCKAY. Yes.

Mr. INSLEE. Now I'm told that other places in the world—let me back up for a moment. We've learned through some of the investigation that a possible source of failure was the failure for an activation signal in some sense to be given to the blowout preventer. I don't think that's been categorically proven, but there is some suggestion that that's what happened, from some interruption of the connection to the activation switch. We are advised that in other places in the world, in Norway and Brazil, an acoustically triggered switch is available that is remote to the rig so that it's not dependent on a physical linkage between the blowout preventer and the rig, that it receives an acoustic signal of a blowout occurring and immediately sends, through I believe a sonar system, to activate the blowout preventer. And the safety that seems to me commonsense, in the sense it's not dependent on a physical connection as this one was, and that physical connection may have been interrupted in the explosion in, in a blowout, to me that seems to be another inherent safety feature that is used in other countries.

Was that system used in this particular rig?

Mr. MCKAY. I'm not a blowout preventer expert and maybe these guys can answer as well, but I think it's something that needs to be looked at. As I understand it, the acoustic signaling is not always applicable in some of the places like the deepwater Gulf of Mexico. We did have redundant systems here to try to trigger the blowout preventer, including physical manual intervention——

Mr. INSLEE. I understand that. I guess those all depend on a physical connection to the rig platform.

Mr. MCKAY. Or the lack of.

Mr. INSLEE. Or the lack of. This one has a remote system, and it seems to be used by giving you an additional redundancy if you will. Let's just be clear. Was that system in place in this rig? Does anybody have a suggestion that it was? No one is shaking their head yes. So we are assuming there was no acoustical activated trigger.

Now assuming that, and I will just ask Mr. McKay, assuming that this acoustically triggered system would have provided an added layer of redundancy that could operate even in the absence of any physical connection between the blowout preventer and the rig, would BP be willing to accept that technology as the best available technology?

Mr. MCKAY. We would absolutely accept anything that would improve upon what we have in terms of redundancy. So I would ask some of the experts that. But we would be willing to do that if that looks like it would help anything, yes.

Mr. INSLEE. And was that ever considered by British Petroleum to require that in its operations at any time?

Mr. MCKAY. I don't know.

Mr. INSLEE. Could you find that out and let us know?

Do any of the other witnesses have information about that as to whether or not the acoustically triggered device was ever considered by British Petroleum? Do you have any information, any of the other witnesses?

Mr. MOORE. I would not.

Mr. PROBERT. No information, no.

Mr. NEWMAN. I don't think it would be appropriate for me to comment on what BP may or may not have considered.

Mr. INSLEE. Well, we will look forward to your letting us know Mr. McKay. There have been some press reports that the cost dissuaded British Petroleum from installing this additional safety mechanism. So we will be interested to see what you find out in your review.

I want to ask about the capability of the shearing system. And I have to just tell you as a layperson, I have been disturbed by the lack of reliability of this system from what I've been able to look at. I'm looking at a document, it's a study done for the U.S. Minerals Management Service by West Engineering Services of December 2002, and the report suggests that they tested several of these blowout preventers and said if you would take in—if operational considerations of the initial drilling program were accounted for, shearing success dropped to 3 of 6, 50 percent. Fifty percent is not something that gives you huge confidence.

The report goes on to say West, that is the contractor here who did the investigation, West is unaware of any regulatory requirements that state the obvious, that the BOP must be capable of shearing pipe planned for use in the current drilling program. Apparently there's no regulatory requirement that there's been a demonstration of a particular BOP to shear a particular pipe of a particular metallurgical situation. Is that accurate?

Mr. Moore, you might be the one most knowledgeable to that.

Mr. MOORE. Let me respond to that because Cameron took the position on this in 2007 with a study that we did with our own information on shearing capabilities where we plotted across a matrix of low, medium and high shear rates to shear certain size drill pipe.

We took the top end of that. We took the maximum range in which shear pipe should be sheared because sheared pipe is different strengths at different hardnesses so it's not altogether exactly consistent.

Mr. INSLEE. Thank you. I appreciate that, Mr. Moore.

I have one quick question I want to ask Mr. McKay.

Mr. McKay, on September 14, 2009, BP sent a letter to the U.S. Department of the Interior Minerals Management and you said, quote, while BP is supportive of companies having a system in place to reduce risks, accidents, injuries and spills, we are not supportive of the extensive proscriptive regulations as proposed in this rule. That's signed by Richard Morrison, Vice President, GOM Production.

Do you plan on revisiting that position by BP in light of this incident?

Mr. MCKAY. I think everything we learn in this incident will be relevant in terms of what regulations should be going forward.

Mr. INSLEE. I appreciate that. I will be introducing a bill here shortly that will require the use of best available technologies. It's motivated in part because of the absence of this particular safety device, this acoustic device we're talking about. So I would appreciate your consideration.

Thank you.

Mr. STUPAK. Thank you, Mr. Inslee.

Mrs. Capps for questions, please.

Mrs. CAPPS. Thank you very much, Mr. Chairman. And thank you for testifying today, each of you.

To date, more than 1 million feet of barrier absorbent boom has been deployed along shorelines in the Gulf and in the open water.

I guess I should acknowledge first that I'm from Santa Barbara. My district represents the central coast of California, and I was a resident in Santa Barbara with my young family in 1969. I know a bit about absorbent boom.

Over 3,000 gallons of oil dispersant has been applied from the air. This is a newer technology than I'm familiar with, and nearly a mile underwater.

And controlled burns have been used to ignite oil on the ocean's surface, which we have seen in the past.

These measures sound impressive, but I would like to hear from our witnesses about their efficacy.

Mr. Newman, your company produced a document to the committee that outlines the advantages and disadvantages of different cleanup strategies. It's at tab 9 of your document binder.

On the first page of the document, in a section that examines the strategy of using floating boom to contain oil, the last point warns that, quote, and this is a quote from that document, the recovery rate of oil under the best circumstances rarely exceeds 15 percent, and I can actually give testimony to that fact, it's the same technology that was used in 1969 in Santa Barbara off the coast.

Mr. Newman, am I reading this document correctly? Is the best case scenario for boom collection really only 15 percent of spilled oil?

Mr. NEWMAN. Based on the information that I have reviewed since the incident occurred, I believe that that percentage is directionally accurate, yes.

Mrs. CAPPS. And that's one of our best technologies that we have available at this time. It's not a very impressive rate of recovery. But more disturbing is the fact that the rest of the proposed techniques are not particularly effective either.

The plan cautions that chemical dispersant, and I quote, must be used within the first 24 hours to be effective and that in situ burning, quote, and I quote, causes air pollution, and again another quote, may leave tarry residue that will wash up on the shorelines or sink to the bottom.

The plan also warns, in all capital letters, and this is another quote from the plan, experience has shown that shoreline cleanup operations often cause more environmental damage than if the oil were left alone.

I think it's really so shocking to me, having lived through this in my community in 1969, that's 40-plus years ago, and as was given in an opening statement, it's more than 100 years since the first offshore drilling was done along my coastline, that this multibillion dollar oil exploration industry has not come up with more effective strategies to contain the damage from a leaking deepsea well. The technologies, I know others have said this, the technologies have been perfected to get down there and to go after it.

Why, and I'm going to ask the rest of you with whatever time remains, why was there not equivalent technology developed to clean up after a spill, whether a small spill or a huge spill, at the very same time using some of the profits that have been generated in each of the companies that you represent?

The cost of doing it now, after the fact, is a cost that you will bear. But there is no way you will come close to bearing the cost that our Nation will bear, the shrimpers, the oyster folks, all of the people, and not to mention untold disasters that lie ahead day after day after day.

I represent a coast with oil drilling. We are still drilling. The same Platform A that drilled and spilled in 1969 is pumping oil today, 20 platforms off the coast in my district. Each spill, and there are many of them, and they are unique, the environment in the Gulf is extremely complex, and we don't understand yet how these systems interact with and respond to oil, these complex coastal areas that we treasure.

And I hope that this topic is something we will continue to explore in future hearings.

And with 10 seconds, I would like to see if one of you has any further comment to make.

Mr. MCKAY. I would just comment we are working very closely with all the government agencies, EPA, Coast Guard. The Coast Guard deals with spills all over our coastal areas all over the country. We are using the best available technology at scale. This is the largest effort that has ever been put together. So we believe we are using the best technology and if we have any other ideas——

Mrs. CAPPS. But you never had any until it happened.

Mr. MCKAY. Well, we have been drilling with the Coast Guard for years.

Mrs. CAPPS. Did you develop technologies for dealing with this?

Mr. MCKAY. Not individual technologies for this, no.

Mrs. CAPPS. I rest my case.

Mr. STUPAK. Thank you.

Mr. Engel for questions, please. We have three votes, but let's get these questions in.

Mr. ENGEL. Thank you, Mr. Chairman.

Gentlemen, yesterday there was testimony, as you know, before the Senate and what came out of there was a bunch of finger pointing. Everybody pointed a finger at somebody else. Everybody was making excuses and alibis. And the American public is obviously outraged. I'm outraged. It's very difficult to believe a lot of the things that we are hearing.

I want to ask some very basic questions because we have gone through a lot of the technical things, and we have gone on and on. Generally, we have been told for the past several years in Congress that offshore drilling is safe, that we needn't worry about what happens; if there is any kind of an accident, don't worry because there are backup systems and there is a backup system for the backup system. And then we find out that none of this is true.

If there have been improvements in drilling techniques through the years, why apparently have there been no corresponding improvements in preventing oil spills? Or is it, is it there simply is no ironclad way to prevent spills like these in the future? Is that what you're telling us?

Mr. McKay.

Mr. MCKAY. This has been an unprecedented event. In the Gulf of Mexico alone there have been over 42,000 wells drilled in the past 50 years, and this is an unprecedented event. We have got to learn what caused this and what to do to make sure this doesn't happen again. We are dedicated to do that, and I know the committee is as well.

All I can say is the industry has been safe and clean for quite a while, and this is an unprecedented event we've got to figure out.

Mr. ENGEL. But Mr. McKay, I will bet that I could dig up congressional testimony after the Exxon Valdez mess where people literally said the same thing that you're just saying now, that this is a once-in-a-lifetime thing, it cannot happen again. We were told it cannot happen again, what happened up in Alaska in 1989.

So why should we believe you any more than we could have believed those people that told us the same thing after the Exxon Valdez spill in Alaska?

Mr. MCKAY. My confidence is because I think we are going to figure out what caused this, both the events that caused the explosion as well as why the blowout preventer didn't work. I think we will solve this and that will allow us to be safer going forward.

Mr. ENGEL. Would any other gentlemen care to comment?

Mr. PROBERT. I think all of us are committed to trying to find out what did take place and put the steps in place that are necessary to make this a safer—safer and sounder future for us in terms of oil and gas exploration.

Mr. ENGEL. There is currently a $75 million liability cap and I understand, Mr. McKay, you said BP has not adhered to that, you're going higher, is that true?

Mr. McKAY. That's true. We'll go over that if needed, absolutely.

Mr. ENGEL. Should the cap be raised? I know Senator Menendez has introduced legislation to raise it to $10 billion. Should we just lift the cap? Is that something Congress should consider?

Mr. McKAY. I was asked that question yesterday. I don't know the specifics of that legislation, and I would just say it's not relevant in this case.

Mr. ENGEL. We have an 8-cent a barrel tax assessed to oil companies, and proceeds go into a cleanup service. Should that tax be modified and should that money be spent differently?

Mr. McKAY. I think that will just have to be reviewed in the context of what we learn through this.

Mr. ENGEL. How about an administration proposal to split the Minerals Management Service into two parts, one with oversight responsibilities for the oil industry, and another of it would provide drilling leases and collect Federal royalties on the operations? Do you have any comments on that, or support it, oppose it, and why?

Mr. McKAY. I don't have any specific comments on that.

Mr. ENGEL. Anybody else?

Mr. PROBERT. No specific comments other than to say that that is not an unusual process in a number of foreign jurisdictions.

Mr. ENGEL. I just want to say in conclusion that I'm just really agitated and aggravated. Nobody in this room, and certainly the four of you didn't want this to happen. Nobody wanted this to happen. This is a terrible tragedy. But when we get assurances from the oil industry year in and year out that this cannot happen and that we should drill, baby, drill and we should keep expanding the drilling, and then the worst actually happens, I just don't know how we could ever believe anything that we hear from the oil industry. It just boggles my mind as to how this could happen. And 20 years from now there will be another Congress sitting here, and there will be another oil spill and they will be saying the same things that you gentlemen are saying now. I am not convinced and frankly I am very, very angry.

I yield back, Mr. Chairman.

Mr. STUPAK. Thank you, Mr. Engel. We will start a second round of questions. I know we have votes but I am going to try to at least get a first set of questions and then we will break for votes and we'll come back.

Mr. Newman, Ms. Castor was asking a number of questions about the blowout preventer and testing on the surface, the sea surface. And it says that the testing of the emergency systems would show whether the system will work when installed in hull and show that there were no leaks that would diminish the system's integrity.

BP, in a memo of April 27, has recommendations. It says that the risk in testing emergency systems and subsea testing are manageable and BP recommends these systems be tested in the future. I'm glad that BP is recommending improved testing going forward. But my question is, this testing, what is done on the BOP for testing when it's on the sea floor?

Mr. NEWMAN. If I could clarify the response to the question. A BOP is an immense piece of equipment. It's about 55 feet tall, it's about 20 feet square, it weighs over 300 tons. It's a combination of a number of valves that are intended to close off the wellbore, and it's got over 100 other smaller valves that function——

Mr. STUPAK. I realize all that. It's 45 tons. I realize all that. What testing is done when it's on the sea floor?

Mr. NEWMAN. Component by component, we work our way up to ensure that the function closes and that it will hold pressure. Those are the required tests that are conducted every 2 weeks to confirm that the system functions and that it will hold pressure. In the intervening 7 days, there is another set of tests which serve to confirm that the system still functions.

Mr. STUPAK. And that's just pressure tested, you don't check for the valves to see if they are leaking, right? Like we have here, we have a leaking valve here right?

Mr. NEWMAN. Those tests would confirm whether or not the system has any leaks in it as well.

Mr. STUPAK. So this leaky valve, this hydraulic leaking valve that I brought up earlier in my opening statement and asked questions about, you're saying your tests would have shown that?

Mr. NEWMAN. Absolutely.

Mr. STUPAK. Then, Mr. Newman, in this thing, Cameron officials told us the problem was someone overlooked the tightening of a fitting, all these other fittings on the hydraulic system were snug, but this one had not been tightened and it was like several turns backed off. So how can you explain how is this possible that one valve, if your testing was there it would have shown that one valve was leaking, would it not?

Mr. NEWMAN. If that one valve was leaking during the testing, the testing would have demonstrated that. The document that I was handed a few minute ago, which is a record of a BOP function test, you will see that the gallon counts are recorded to the first decimal point, which is a very accurate record.

Mr. STUPAK. That's the pressure. I'm talking about the emergency testing, like the deadman switch and these rams. What would you do to test those when it's on the floor? What is the emergence for the emergency testing? If something goes wrong, what tests should you be doing?

Mr. NEWMAN. What the auto sheer function and the deadman function do is serve to activate the BOP. They operate the control system, and they close the valves. So the independent testing that we conduct on a regular basis confirms the same thing.

Mr. STUPAK. How about the emergency power source? That's where we found the leaky valve, the loose fitting, the emergency power source. Was that checked?

Mr. NEWMAN. The emergency power source?

Mr. STUPAK. For the hydraulic line.

Mr. NEWMAN. That's a terminology that I'm unfamiliar with, Congressman, so I can't tell you specifically that would be in reference to.

Mr. STUPAK. Mr. Moore, am I correct there is an emergency power system that could be checked while it's on the sub floor?

Mr. MOORE. Would this be the system that sits in the SIM, it's kind of like the brain that——

Mr. STUPAK. Control, yes.

Mr. MOORE. I'm not sure of how that would be tested by Transocean, Congressman.

Mr. STUPAK. Would your technical guy, Mr. McWhorter, know the answer to that?

Mr. MOORE. We can surely ask him.

Mr. STUPAK. Go ahead. I have got to ask you to raise your right hand and take the oath.

[Witness sworn.]

Mr. STUPAK. Please state your name for the record and who you work for?

Mr. MCWHORTER. David McWhorter. I work for Cameron.

Mr. STUPAK. I'm sorry.

Mr. MCWHORTER. Could you repeat the question?

Mr. STUPAK. Sure. State your name for the record and who you work for.

Mr. MCWHORTER. David McWhorter. I work for Cameron International.

Mr. STUPAK. Now there's a hydraulic power source. You want to explain that to us, how you do the energy testing and shut things down?

Mr. MCWHORTER. I believe you were referring to the subsea accumulator banks, which is where the hydraulic energy in effect is stored for emergency operations.

Mr. STUPAK. Yes. What testing can be done to check that when it's on the sea floor?

Mr. MCWHORTER. On the sea floor? You can fire that function.

Mr. STUPAK. How do you fire that function?

Mr. MCWHORTER. Push a button on the surface.

Mr. STUPAK. Is that a test that would impair the jeopardy of the blowout protector while it's on the sea floor?

Mr. MCWHORTER. It would depend what would be in the wellbore at the time the test was conducted.

Mr. STUPAK. And this is one of the tests that was not done here in this; you have no record of this test ever being done, do you?

Mr. MCWHORTER. We have no records of any tests, sir.

Mr. STUPAK. Do you have any tests of that record being done where they do go down and push the right button to see if the hydraulic line worked in the emergency?

Mr. NEWMAN. If Mr. McWhorter is talking about the subsea accumulators, these are large bottles that are attached to the BOP. They contain hydraulic fluid at pressure. Those systems are recharged using the surface system. If there were a leak in the subsea accumulators, that would require that the surface system be regularly operating to recharge the leak. That would be recorded as a volumetric leak, and there is no record of that.

Mr. STUPAK. Is there any record that you even tested it, that you pressed that button?

Mr. NEWMAN. There is no way to test the subsea accumulator system.

Mr. STUPAK. Well, after the explosion, you did go and push into this little valve or dye test, you pushed the button it didn't work. That's when you did the dye test, correct? And that's when the dye test showed there was a hydraulic leak and that the fitting was very loose, correct?

Mr. NEWMAN. During the post-explosion intervention efforts, a number of operations were conducted on the BOP where the remote operated vehicles, through a variety of configurations, supplied hydraulic power to the system. During one of those operations, we did not see the anticipated pressure response. In response to that indication we conducted troubleshooting operations, and those troubleshooting operations identified a leak on the system.

Mr. STUPAK. And the leak was because the valve wasn't screwed on tightly, put it laymen's term, right?

Mr. NEWMAN. I believe that's correct, yes.

Mr. STUPAK. Is that correct, Mr. McWhorter?

Mr. MCWHORTER. There was a leak that was discovered subsea, yes, sir.

Mr. STUPAK. Any reason why it couldn't be discovered before——

Mr. MCWHORTER. I really——

Mr. STUPAK. Other than the test not being done?

Mr. MCWHORTER. There's probably a number of reasons, sir.

Mr. STUPAK. Our time is up. We have votes.

One more question. Mr. McKay, in answer to Mr. Sullivan's question, you said the best way to stop this is a BOP, right? That's your top kill, I think your exact words were.

Mr. MCKAY. Yes. That is one of the big options, yes, absolutely.

Mr. STUPAK. Is there any way to put auto BOP on this?

Mr. MCKAY. Yes, we've been trying to get diagnostic determination inside that BOP to understand what's happening, understand why that pressure has dropped.

Mr. STUPAK. You'd have to take that riser off and put another one on top?

Mr. MCKAY. Yes, that is a potential and we're working hard on that.

Mr. STUPAK. And once you take that riser off, it's possible you could have greater oil and gas gushing up through the hole, right?

Mr. MCKAY. That's exactly right, but that's why we're getting a diagnostic where we are using gamma rays and pressure measurements, and we are making progress in understanding.

Mr. STUPAK. If that riser came off and starts gushing up even greater than what it's doing right now, can you get a BOP back on there?

Mr. MCKAY. Well, that's one of the issues that we're working.

Mr. STUPAK. My time is up and when we come back Mr. Burgess will have questions. We will stay in recess for a half hour. We have three votes. Gentlemen, we will see you in a half hour. We are in recess.

[Recess.]

Mr. STUPAK. We will reconvene the committee hearing in the Subcommittee on Oversight and Investigations and our hearing. I remind the witnesses they are under oath.

When we left, I believe, Mr. Burgess, it was your turn for questions on round two. If you would, please. And Mr. Moore will be here in a minute.

Mr. BURGESS. Thank you, Mr. Chairman.

Mr. McKay, you made reference in answer to an earlier question that the Obama administration, the White House and the Cabinet had been helpful during this event. Is that a fair statement? Do I remember you saying that correctly?

Mr. MCKAY. Yes. I think I said the administration and his Cabinet, yes.

Mr. BURGESS. Have you been to the White House since the accident occurred?

Mr. MCKAY. Yes. I have not seen the President, but I've met with Secretary Napolitano and Secretary Salazar and other administration officials, yes.

Mr. BURGESS. Mr. Chairman, could I ask that the White House make available to us any minutes or notes or e-mails that would be relevant to that meeting?

Mr. STUPAK. Well, as the gentleman knows, he can ask. I am not guaranteeing what kind of response you're going to get, but yes, you can ask.

Mr. BURGESS. Well, I just think it would be helpful. Were you the only executive of an oil company who was there, or was this a collaborative response from many people who work in the industry to try to help solve the problem?

Mr. MCKAY. The meetings that I'm talking about were myself and Tony Hayward, both of us, BP.

Mr. BURGESS. Are you aware of any other meetings that have occurred with executives of other companies?

Mr. MCKAY. I'm not aware on this particular issue.

Mr. BURGESS. Can I ask you when that meeting occurred?

Mr. MCKAY. There have been several over the three-week period that we've been in——

Mr. BURGESS. When would the first meeting have been?

Mr. MCKAY. Within the first week of the accident, I believe.

Mr. BURGESS. And that information, Mr. Chairman, should be available to us with White House logs, if they will furnish us that information. Do I understand that correctly?

Mr. STUPAK. Well, again, Mr. Burgess, as you know, because you've used the procedure before, I put the request in writing, we will submit it to the White House and we will see what happens. I'm not sure of the extent of the discussions and what is appropriate and what is not. I know when we speak about energy or energy policy, there has been some reluctance of the courts because under the Cheney Energy——

Mr. WAXMAN. Will the gentleman yield?

Mr. BURGESS. No, because my time is limited.

Mr. STUPAK. I will give you back an extra 30 seconds.

Mr. BURGESS. Yes, I know you will. Thank you. It would just be helpful to us, and we will put that in writing.

Aside from Secretary Napolitano and Secretary Salazar, I assume the Department of Interior was present. Were there White House personnel present as well, Chief of Staff, Deputy Chief of Staff?

Mr. MCKAY. No.

Mr. BURGESS. Just people from the agency?

Mr. MCKAY. There were other—Carol Browner——

Mr. BURGESS. Well, certainly, to the extent that these involved agency personnel, Department of Interior, Department of Homeland Security, we, as the oversight body of this Congress, should have the ability to get that information. In my understanding, that should not be covered under executive privilege, so I will make that request.

Mr. STUPAK. Will the gentleman yield if you're going to make a request, because it's going to come through me, and I'd like to have a clarification from you.

Mr. BURGESS. If the chairman will yield me an additional minute.

Mr. STUPAK. I will yield you an additional minute, you betcha.

Mr. WAXMAN. What does the gentleman wish to request? The log of these visitors and the fact that they were at the White House meeting with people within the administration?

Mr. BURGESS. Yes. And I would like to know what was discussed.

Mr. WAXMAN. Well, I don't know that you're entitled to that, but the White House already posts its logs as to who comes in and meets with the—this is something we didn't have in the previous administrations. They do have a posting of the log, and you can easily find out who came in from the outside and who met with people in the White House. I don't know why you would be entitled to have the discussions or notes or anything like that. I don't know what the precedent is for asking that.

Mr. BURGESS. Mr. Chairman, it may have occurred to you we're having a great deal of difficulty getting to the actual causation. This is the second hearing. We had one closed hearing last week, this is an open hearing, but we are really having a lot of difficulty getting to causation, there's a lot of people talking past each other. And I just think if there was a frank discussion at the White House, that we might benefit from the information that was exchanged that day.

Mr. WAXMAN. Will the gentleman yield? I will certainly take it under advisement.

Mr. BURGESS. I thank the Chairman for the consideration.

I'm not sure if I'm going to pronounce your name correctly, Mr. Probert or Probert?

Mr. PROBERT. Probert.

Mr. BURGESS. Mr. Moore obviously deals with the blowout protector, but I think if I understand the situation correctly, the blowout protector is not the primary control of the well, that would actually be the material in the drill shaft itself, mud, that would be the primary control; is that correct?

Mr. PROBERT. Yes, that would be correct.

Mr. BURGESS. And you, in your testimony, talked about—and it intrigued me because it was the same thing I read in the New Orleans paper last Friday, that there was a removal of the drilling mud from the stack, the initial plug, one cement plug had been placed, the drilling mud was removed and replaced with seawater, and before the second plug was placed the accident occurred. Is that correct?

Mr. PROBERT. The process was, first of all, to do a positive test, which was conducted by Transocean. The second procedure was then to do a negative test, which was also conducted by Transocean but requires removing some of the drilling fluid, at least from the drill pipe. And subsequently, after a successful negative test, to the extent the test was successful, then they would go ahead and evacuate or replace the drilling fluid in the riser with seawater in advance of setting the plug, and then ultimately pulling off the well. And I would defer to Mr. Newman if I have any part of that process incorrect.

Mr. BURGESS. Well, reported in the Times-Picayune last Friday, there was concern that the drilling mud was removed at a point prior to when it normally would have been removed and replaced with seawater. Is that an error on the part of the paper reporting that?

Mr. PROBERT. No, I think the question in point that was raised—and it was raised in testimony yesterday—was that when you replace the drilling fluid in the riser with seawater, you reduce the density, effect the density significantly. And had there not been a successful negative test, then that would clearly be a situation which would be problematic for the well since you're reducing the hydrostatic pressure on the well.

Mr. BURGESS. But the test wasn't successful.

Mr. PROBERT. I have no knowledge of that.

Mr. BURGESS. Does anybody have any knowledge of that? That's the negative test, 1,400 PSI applied to the drill stack and no pressure recorded in the dead man's cutoff, or whatever it is. Is that a positive test or a negative? I got the impression that was not a good result; is that correct?

Mr. NEWMAN. The actual results of the test, Congressman, were first reported to me by Chairman Waxman today in Chairman Waxman's statement. And to my knowledge, prior to this hearing I was not aware of the results. I think Chairman Waxman alluded to some confusion with respect to those test results, and that is what I know about the test results.

Mr. BURGESS. But if I am understanding Mr. Probert correctly, if the test was not the expected result, that it maybe not be a good idea to pull off the drilling mud and reduce the hydrostatic pressure on the column over the drill shaft. Did I understand your statement correctly about that?

Well, you said if the test was correct, then it wouldn't be a problem to reduce the hydrostatic pressure by removing the mud, but the test wasn't correct, mud was still removed, is that a problem with what subsequently happened? And Mr. McKay, feel free to enter into the discussion.

Mr. MCKAY. What I believe is there were discrepancies, it appears, in that negative test where you had 1,400 PSI on the drill pipe and zero on the choke and kill lines. I think the investigation needs to look hard at how that information was either disseminated, used, and decisions made off of it, And who and what decisions were made after that point?

Mr. BURGESS. What would be drilling best practice if you encountered an anomaly like that test? To go ahead and remove the mud, or to wait until we found out what the problem was and corrected the problem?

Mr. MCKAY. I can't speculate on that individual situation. I really do think this is one of the key things the investigation is going to have to look at.

Mr. BURGESS. Do you think it would ever be OK to remove the hydrostatic pressure on the column of mud if the test was not satisfactory?

Mr. MCKAY. I'm sorry?

Mr. BURGESS. Would it ever be OK to remove that hydrostatic pressure of the mud column if that test wasn't satisfactory? Would there ever be a reason to say, oh, it's OK, go ahead and do that because we do it all the time?

Mr. MCKAY. I haven't seen all the data, I just can't speculate on that, I just really can't.

Mr. BURGESS. Thank you, Mr. Chairman.

Mr. STUPAK. Chairman Waxman for questions, please.

Mr. WAXMAN. Thank you very much, Mr. Chairman.

I want to go back to this issue as well, the question of the negative pressure test that we discussed earlier and the discrepancies of the negative pressure test that was performed on the well on the day of the blowout. And all of you seem to agree that this would be a significant issue and it would be a central question in the investigation. But I have a document—I think it's been given to you, Mr. McKay, it's an e-mail—I thought it had been given to you in advance—and the e-mail talks about the testing procedures. Can you tell me whether these procedures were followed on the 20th?

Mr. MCKAY. I cannot tell you whether they were followed.

Mr. WAXMAN. And the last line of the document—and by the way, this is an e-mail, an internal e-mail from BP and it indicates the things that would be done if there was a negative test that showed a discrepancy. And the last line says, We would send to Houston for confirmation plod on charts sent to Houston for confirmation. I assume this refers to BP's office in Houston?

Mr. MCKAY. I would imagine so.

Mr. WAXMAN. Were the test results sent to Houston for confirmation before you resumed well operations on the 20th of April?

Mr. MCKAY. It looks like, to me—and I have to examine this—this looks like to me this is after the last plug would have been set. We would have to review this. But I don't know if it was sent to Houston or not, that last plug didn't get sent.

Mr. WAXMAN. Well, this e-mail sets out the procedure, as I understand it, for BP when you have a problem with that negative test. They indicate the things that should be done, and the last one is you would send it to Houston. Do you know whether the results were sent to Houston before the well was back in operation?

Mr. MCKAY. I don't believe so. I believe the explosion occurred before number six happened.

Mr. WAXMAN. So is it fair to say you don't believe that the officials in Houston approved the resumption of the operations of the well.

Mr. MCKAY. I don't know.

Mr. WAXMAN. Was MMS involved in these decisions, to your knowledge?

Mr. MCKAY. I don't know.

Mr. WAXMAN. There have been reports that shortly before the blowout, BP began displacing drilling mud with seawater. Do you know if that's accurate?

Mr. McKAY. That's what I've been told, but I haven't reviewed it.

Mr. WAXMAN. Did BP's office in Houston approve this procedure? Did they sign off on the decision to displace mud with seawater after the negative pressure test discrepancy?

Mr. McKAY. I don't know.

Mr. WAXMAN. Do you know whether MMS signed off on this procedure?

Mr. McKAY. I'm not familiar with the procedure, nor am I familiar with who may have or may not have signed off on it.

Mr. WAXMAN. You're not familiar with the procedure itself within BP on how to deal with a negative test?

Mr. McKAY. Not on this particular well, no.

Mr. WAXMAN. You have a technical expert with you, could you ask your technical expert for information in this regard?

Mr. McKAY. Yes. Could you repeat the question, please?

Mr. WAXMAN. Well, I wanted to know if this document sets out the procedure within BP when there is a negative test that indicates there is a problem. And I also want to know if the BP office in Houston approved this procedure and whether they signed off on the decision to displace mud with seawater after negative pressure test discrepancy?

Mr. McKAY. What my expert has told me is that this procedure looks like it would have been used with the MMS procedure, the sundry procedure. He doesn't know, nor do I know, whether this was confirmed to Houston. What I would say reading this, it looks like it's a procedure to get through the setting of the last plug after a successful negative test.

Mr. WAXMAN. After a successful negative test.

Mr. McKAY. Well, that's the way it looks to me.

Mr. WAXMAN. I see. So after a successful negative test, you would contact Houston to have them sign off on the well getting started up?

Mr. McKAY. "Send to Houston for confirmation" looks like the last step after the final cement plug is set, which never happened.

Mr. WAXMAN. Why did it not happen.

Mr. McKAY. I don't know. That's what we all need to know.

Mr. WAXMAN. I would like you to get for the record the information as to whether Houston was notified, whether Houston approved the procedure, whether they signed off on the decision to displace mud with seawater after the negative pressure test discrepancy, and whether MMS signed off on this procedure. Am I correct in assuming your technical expert believed that MMS had to sign off on this as well; do you know?

Mr. McKAY. The temporary abandonment sundry notice would have a broad procedure that the MMS would have signed off on.

Mr. WAXMAN. A broad procedure.

Mr. McKAY. Well, I can't say if this matches that or it's——

Mr. WAXMAN. Well, if you can get us more information for the record, I would appreciate it.

Thank you, Mr. Chairman.

Mr. STUPAK. Thank you, Mr. Chairman.

Mr. Barton for questions, please.

Mr. BARTON. I thank you, Chairman. And I thank our witnesses for continuing to be here.

I want to take a little bit different tact this round of questions. I think what Chairman Waxman just asked was very appropriate. I think those were good questions, and I think they deserve thoughtful responses.

But I want to take a little bit broader view. My first question, does each of you at the panel support drilling in our coastal waters? Is there anybody who thinks we ought to suspend drilling in the Outer Continental Shelf because of this accident? Say yes or no or nod your head, give something.

Mr. NEWMAN. Congressman, I think a pause, similar to what Secretary Salazar has asked for, I think a pause is prudent to reassess ongoing operations in the Gulf of Mexico. But I believe that energy is so important to our economy, and the Gulf of Mexico is a domestic source of that energy, that I believe that continued drilling in the Outer Continental Shelf is fundamental to the U.S. economy.

Mr. BARTON. Do you all support drilling in the ultra deep gulf?

Mr. MCKAY. I have confidence we're going to figure out what happened here, and that if there are improvements—and there probably will be some—that need to be made will be made. And I have confidence that the deep water and the ultra deep water can be developed, and it's important to be developed.

Mr. BARTON. If this accident had occurred onshore under exactly the same scenario, you had a well that was a 20,000-foot well that had the capability to produce somewhere between 50,000 and 100,000 barrels per day, and in the switching it over, getting it ready for production you had an unexplained event that caused a blowout, would that event onshore be fixed by now? If everything was the same except it wasn't in 5,000 feet of water, it was onshore Texas or Louisiana, would you have the well under control by now?

Mr. MCKAY. Let me try that. I think intervention is easier onshore obviously because you can get people and equipment around it easier than 5,000 feet of water. But there have been blowouts onshore that require relief wells to be drilled. So I don't think you can automatically say onshore would be easy and offshore it's not. I mean, relief wells are things that have to be used sometimes onshore.

Mr. BARTON. But the likelihood is that the complicating factor in trying to cap it, stop it, staunch it is that you're 5,000 feet down and you're operating everything with remote-controlled submarines; is that not correct?

Mr. MCKAY. As Commandant Allen has said, you have no ability to have human intervention at 5,000 feet.

Mr. BARTON. Has any Federal official in a position of authority offered any suggestion that has not been accepted? In other words, we've had lots of members say that you guys are just dopes that you haven't figured out what to do about it yet, that any good college petroleum engineering class ought to be able to figure out what to do and get it done. Has anybody in the Coast Guard, the Department of Interior, the Minerals Management Service, the Office of the President, the Office of the Vice President, has anybody offered a suggestion that you all have rejected on what to do to solve this problem?

Mr. McKAY. I'm not aware of any suggestions that we haven't been able to take in or to materially change what we're doing. This response is of massive dimension with technical experts from all over the world working, including the government. And there have been no incremental solutions or other parallel paths that I know of to pursue.

Mr. BARTON. Well, I've only visited the site one time and we went to the Command Center for about a 1 hour briefing. But my analysis is that there is excellent cooperation between the Federal Government and the private sector, and that the Coast Guard, the Admiral who's the onsite commander is making sure that everybody does the best possible work together. And that this is not a case where the Federal Government and the private sector are in an adversarial situation. It seems to me that there is excellent cooperation. Do you all agree with that? Everybody?

Mr. McKAY. I do.

Mr. BARTON. I want to put this in perspective, Mr. Chairman, before I have to yield back my time.

This accident, as far as we know, is releasing 5,000 barrels a day into the Gulf of Mexico, it's been doing so for approximately 3 weeks, that's a little over 100,000 barrels. The largest spill in the Gulf of Mexico today was a spill off the coast of Mexico. It produced 90,000 barrels a day for 9 months—90,000 barrels a day for 9 months.

Exxon Valdez was a tanker that ran aground in Alaska. That was a supertanker that was 300,000 to 400,000 barrels of oil. So far this spill has produced a little over 100,000 barrels. Now, that, in and of itself, is a significant spill. It is a nontrivial accident, but it is nowhere near yet the order of magnitude of other accidents that have happened around the world.

There is a natural seepage in the oceans around the United States on an annual basis of 4 million barrels a year. There is an annual seepage worldwide of over 40 million barrels of oil per year. So while this is an accident, it is nontrivial, it is not of the catastrophic consequences that some in the mainstream media have made it out to be. If we work together—and this subcommittee is doing an excellent job of getting the facts on the table for the American people—there is no reason that in the next—hopefully in the next week or so, but certainly in the next 2 months, we will stop the oil from flowing, we will come up with new best practices, and if necessary new technology and new legislation to prevent this in the future.

With that, Mr. Chairman, I yield back.

Mr. STUPAK. Thank you, Mr. Barton.

Mr. Braley for questions, please.

Mr. BRALEY. Thank you, Mr. Chairman.

My math certainly is not as good as the ranking member's because he is, after all, an engineer, but the briefing we received, we were informed that these relief wells could take 90 days to complete. And if that is the case and we are not able to cap off the flow of oil and it gets worse, then we will easily, in the next 90-day period, exceed the quantity of oil that was spilled by the Exxon

Valdez. It is not a trivial problem to the people living and who get their livelihood from the Gulf Coast.

Mr. McKay, we have been reassured by the Federal Government—and you stated today—that BP will pay all necessary cleanup costs and is committed to paying all legitimate economic damages associated with this spill.

Is BP self-insured for all of these items of loss and damage?

Mr. MCKAY. Yes.

Mr. BRALEY. So your corporation will be on the hook, it has not insured any of that risk or reinsured any of that risk; is that correct?

Mr. MCKAY. That's correct.

Mr. BRALEY. One of the things I am concerned about is reports that have come out recently, Mr. Newman, specifically a National Public Radio broadcast dealing with efforts by your company to compel Deepwater Horizon crew members to sign forms the day after the accident stating they suffered no injuries from the incident or the evacuation. And yesterday, the committee staff was allowed to review several of those signed forms and I want to read for you the key passage for the record.

The form states, "I was not a witness to the incident requiring the evacuation and have no firsthand or personal knowledge regarding the incident. I was not injured as a result of the incident or the evacuation." Is it your understanding that was the language in the forms that were presented to your employees?

Mr. NEWMAN. That is the language on those forms, Congressman.

Mr. BRALEY. Are you aware of any information given to those employees before they were asked to sign those forms?

Mr. NEWMAN. Between the time the individuals arrived onshore and the time they were presented with those forms, there was a tremendous amount of information provided to our employees in the form of support, medical care, clothing, food, hotel rooms, discussion with them about how we were going to facilitate their travel——

Mr. BRALEY. OK. Let me cut you off because my question goes to the language in this document. Was there a briefing given to them about what was the intent of the form and why they were being asked to sign it?

Mr. NEWMAN. Because I wasn't there, Congressman, I can't tell you exactly——

Mr. BRALEY. Who gave them these forms to sign?

Mr. NEWMAN. That would have been presented by the support team that Transocean mobilized to Louisiana to facilitate the onshore assistance of those individuals as they came in from the rig.

Mr. BRALEY. How do we get the names of the individuals that were on that support team?

Mr. NEWMAN. We can provide that to you.

Mr. BRALEY. OK. It says in the form, "I was not a witness to the incident." What was the incident that was referred to in these forms?

Mr. NEWMAN. The incident would have been the well control problem on the rig floor and the subsequent explosions.

Mr. BRALEY. All right. Given that description of the incident, there were no witnesses to the incident, were there?

Mr. NEWMAN. There are no remaining Transocean individuals alive who were on the rig floor at the time of the event, I don't believe so.

Mr. BRALEY. Right. And when it says, "No firsthand or personal knowledge regarding the incident," did anybody explain to these employees what that meant?

Mr. NEWMAN. Again, Congressman, because I wasn't there, I'm not sure exactly what was explained to the individuals.

Mr. BRALEY. Well, the press reports indicate that the crew members who survived the explosion spent somewhere between 12 to 15 hours on a nearby vessel as they watched the rig burn. And after the survivors made it to shore, your company escorted them to a hotel for questioning. These men, many of whom were exhausted, potentially traumatized, and desperate to contact their loved ones, had to decide whether or not to sign that form before going home.

Do you know, Mr. Newman, whether these employees were allowed to consult with their personal physicians, counselors, or attorneys before they signed those forms?

Mr. NEWMAN. Congressman, the Transocean employees were not forced to sign the form.

Mr. BRALEY. That is not my question. My question was, were they allowed to consult with a physician, a counselor, or their attorneys before they signed this statement?

Mr. NEWMAN. Because some individuals didn't sign the statement until a week or so after the event, they could have had consultation with anybody they chose to have consultation with.

Mr. BRALEY. How many individuals waited a week or so after the event to sign the form?

Mr. NEWMAN. I don't know that, but we can provide that to you.

Mr. BRALEY. Please do. They also interviewed one of the Deepwater crew members, a Christopher Choy, who did sign the Transocean form. He says that he was angry because he wasn't able to talk to his physician or attorney. And let me tell you what his experience was. He saw multiple explosions and flames coming out of the rig. He saw men pile into one lifeboat while two others burned. He saw his friends and coworkers with burning flesh and broken bones. He lived through this disaster and saw those things that I hope you and I never have to experience in our life.

Can you tell us why he was asked to sign a statement that he had no firsthand or personal knowledge regarding the incident after experiencing that?

Mr. NEWMAN. One of our concerns in the aftermath of this event, Congressman, is to conduct as thorough a fact-finding exercise as we can, and part of the facilitation of that fact-finding exercise is to identify individuals who might have helpful knowledge.

Mr. BRALEY. And wouldn't you agree with me that a reasonable interpretation of the words "firsthand or personal knowledge regarding the incident" might mean people who had witnessed the aftermath of that explosion and the impact that it had on employees who were working on that rig?

Mr. NEWMAN. I'm not sure I can—do you want to engage in a debate about the terminology of personal knowledge?

Mr. BRALEY. I'm not trying to engage in a debate, I'm just asking you if that wouldn't be a reasonable understanding that someone who had witnessed the things that Mr. Choy described would have firsthand or personal knowledge regarding the incident.

Mr. NEWMAN. That might be true.

Mr. BRALEY. I yield back.

Mr. STUPAK. Thank you.

Ms. DeGette for questions, please.

Ms. DEGETTE. Thank you very much, Mr. Chairman.

Mr. Newman, many of the independent experts who looked at the initial reports from the oil spill came to the same conclusion, which was that the failure of the cementing process was likely a cause of the blowout. And you said in your statement that we know, quote, with certainty that on April 20 there was a, quote, sudden catastrophic failure of the cement, the casing, or both. How, in your opinion, do we know that the cementing or casing or both failed?

Mr. NEWMAN. Congresswoman, the reservoir that we believe is flowing hydrocarbons is located 13,000 feet below the seabed. The pathway from the reservoir to the seabed should have been barriered off by cement and/or casing. In other words, in order for the hydrocarbon to get from 13,000 feet below the seabed to the seabed you have to have a failure of one or both of those barrier mechanisms.

Ms. DEGETTE. Right. OK. Let me ask you this; who is responsible for determining the specifications for the cementing? Do you know?

Mr. McKay.

Mr. MCKAY. I'm speculating, but we would write a spec for what type of casing and the hole conditions, and we would look to Halliburton, in this case, to help with the cement design.

Ms. DEGETTE. So you would do the specifications and then they would modify them as needed; is that correct?

Mr. MCKAY. We would tell them what we want cemented, the type of casing, the hole conditions.

Ms. DEGETTE. Mr. Probert, I wanted to ask you; Halliburton is the largest cementing provider for the oil and gas industry, including both offshore and onshore drilling. Are the techniques that Halliburton uses to cement offshore wells similar to those it uses for onshore oil and gas cementing?

Mr. PROBERT. It is really, in many respects, a function of the individual well. While the basic principles are the same, obviously a deep and challenging well like this would be cemented quite differently than a well that would be onshore.

Ms. DEGETTE. So there is some difference not just onshore and offshore, but from well to well, correct?

Mr. PROBERT. Yes. Each well has a unique program.

Ms. DEGETTE. Mr. Moore, I wanted to talk to you a few minutes about the emergency systems on the blowout preventer stack that Cameron International assembled. It seemed to me like several things might have gone wrong that could have been prevented.

Chairman Stupak referred in his statement to the report that several crew members witnessed the emergency disconnect system being engaged. The EDS was supposed to close the shear ramps and disengage the riser from the well, but the EDS did not work because neither of these things happened. So my question is, Cameron doesn't dispute that someone on the Deepwater Horizon pressed a button for the emergency system, does it?

Mr. MOORE. No, we don't.

Ms. DEGETTE. And my understanding is that your technical experts think that something else went wrong. One possibility is that communications between the blowout preventer and the Deepwater Horizon were destroyed before the system fully engaged. Can you explain briefly how this would have prevented the emergency system from functioning?

Mr. MOORE. Well, the control pods that function the blowout preventers is electrically actuated, and then that sends a signal down to the control pods, which then——

Ms. DEGETTE. A timed signal, right?

Mr. MOORE. Well, it's instantaneous. And so if you lose that electrical connection to the pod, then that signal would not make it.

Ms. DEGETTE. My understanding is that the EDS button wouldn't be hit unless the situation was dire, and that would require the communication lines to be intact for another full minute to function. That doesn't seem to anticipate the type of emergency that happened on the Deepwater Horizon, so I want to ask you about another part of the system that might have failed. And that is the emergency disconnect system had a dead man switch, that it would automatically close the shear rams and seal the well if something goes wrong, even if the emergency button is not pressed.

We were told by Cameron during interviews that in order for the dead man switch to activate, three things had to happen: The communications had to fail; the hydraulics had to fail; and the electrical power had to fail; is that correct, Mr. Moore?

Mr. MOORE. That is correct. The dead man system is really designed to function when the riser parts from the wellhead.

Ms. DEGETTE. Right. Now, your engineering expert told us that it's possible the dead man switch did not activate immediately after the explosion because the hydraulic line could have remained intact; is that correct?

Mr. MOORE. That could be a possibility.

Ms. DEGETTE. Now, Mr. Moore, here's the important question then; shouldn't the dead man switch be designated to automatically seal a well once a catastrophic event happens like the kind of incident that occurred on Deepwater Horizon?

Mr. MOORE. Well, I'll just repeat that it was designed to function when the riser parts. If the riser is still attached and there is a control line still attached, then it could allow that function to not——

Ms. DEGETTE. Right, but in this situation everything failed, and yet the dead man switch didn't activate immediately.

Mr. MOORE. Well, the riser was still connected to the Horizon rig for a couple of days, I believe.

Ms. DEGETTE. So you don't think it should be designed to automatically seal the well if there is a catastrophic situation like this?

Mr. MOORE. I think that's something we have to look at.

Ms. DEGETTE. Yes, I think so too. Thank you very much.

Mr. Chairman, I just want to say one last thing, which is, I didn't want to get into a big argument with Mr. Probert about the liability. I felt that the witnesses were a little more forthcoming today about willingness to clean up the situation, but I was dismayed in his testimony when he talked about deflecting blame from Halliburton by saying that they were simply following BP's well construction plan. Because it seems to me that with all of these systems, it's obvious there was a catastrophic failure and it might have been systemic on every level.

And so I'm hoping every player here works collaboratively with each other, not just to clean up and pay for these damages, but to identify how it happened, whether it was a perfect storm, or whatever it was, because otherwise we can't have that faith as we move forward, as I said in my opening statement, we can't have that faith in supporting offshore drilling until we know how we can prevent those failures because while they are rare, they are devastating.

Thank you.

Mr. PROBERT. If I could just respond and say we are committed to working closely with all parties to ensure that we understand exactly what took place, whatever it may be, and use this as a basis for improving the safety of operations going forward.

Mr. STUPAK. Thank you.

Ms. Sutton for questions, please.

Before you begin, Mr. Scalise has asked that the article he referred to from the Times-Picayune, Gas Surge Shut Well a Couple of Weeks Before Gulf Oil Spill, that be made part of the record. Without objection. And if you want to deliver it to the witnesses. He may follow it up with some questions, so I thought I would give you guys a chance to at least take a look at it.

Ms. Sutton for questions, 5 minutes, please.

Ms. SUTTON. Thank you, Mr. Chairman.

I just have to start with some clarification.

Mr. Newman, following up on my colleague, Representative Braley's, line of questions and about the statements that people were asked to sign shortly after the incident—can we have that statement again on the screen? Can somebody pull that up?

My question to you is this; are you telling us in this committee and the American people that this statement and asking people to sign this shortly after this unbelievable event had happened in their lives, that you were trying to find out the facts rather than trying to limit your liability, and this is the statement that was used to try and find out the facts?

Mr. NEWMAN. With all due respect, Congresswoman, there is absolutely no limitation of liability in any of those statements.

Ms. SUTTON. So my question to you is then that this statement was offered to these employees because it was an attempt to find out the facts. Is that your testimony?

Mr. NEWMAN. In the immediate aftermath of the event, Congresswoman, our first concern was on the health and well-being of our people. We mobilized a team to south Louisiana to meet our people as they came——

Ms. SUTTON. It's just really a yes or no question.

Mr. NEWMAN. It had nothing to do with limiting our liability.

Ms. SUTTON. OK. So, again, the question was, are you telling us that this statement, you asked them to sign it because you were trying to investigate the facts, and this is the statement you used to further that?

Mr. NEWMAN. A statement identifying——

Ms. SUTTON. It's just a yes or no question.

Mr. NEWMAN. A statement identifying individuals who might have helpful information would be part of the initial——

Ms. SUTTON. Let's move on. Since you're not going to answer the question, I will take your failure to answer the question as the answer to the question.

Can you tell me, do you operate rigs off of Norway or Brazil?

Mr. NEWMAN. We do operate rigs in Norway and Brazil.

Ms. SUTTON. What kind of a blowout safety system do your rigs in other parts of the world have? Can you share that with us?

Mr. NEWMAN. Rigs around the world have blowout prevention equipment similar to what was employed on the Deepwater Horizon. The control systems in two regulatory regimes, Norway and Canada, the control systems require an acoustic backup system as well.

Ms. SUTTON. OK. So I understand. So how much would a duplicate blowout preventer cost, can you tell me that?

Mr. NEWMAN. A duplicate blowout preventer, the entire system?

Ms. SUTTON. Yes. How much would that cost?

Mr. NEWMAN. I haven't quoted one recently, my guess is they would be in the realm of $15 million.

Ms. SUTTON. OK. Let me move on to Halliburton and Mr. Probert.

In an incident last year, there was a well blown out near Australia, I mentioned it earlier in my questions to Mr. McKay, the Montara spill. What caused that blowout?

Mr. PROBERT. There is a commission of an inquiry which is underway for the Montara blowout in Australia in the Timor Sea. The commission hasn't produced its findings, in fact, I think they just finished gathering evidence about 3 or 4 days ago.

Ms. SUTTON. So we don't know yet?

Mr. PROBERT. So we don't know yet.

Ms. SUTTON. Was Halliburton involved in the well cementing?

Mr. PROBERT. We were involved in the well cementing. But what we do know from the public testimony is that a 5-month period elapsed between the time the cementing was completed and that the well control issue took place. We also know from the testimony that the well owner in this particular case did not put a surface plug in place to protect the well when the blowout preventer was removed, nor did they put a corrosion cap on top of the well. So the well was left open to the elements for about 5 months. So I think the inquiry is what we all need to look to to find out exactly——

Ms. SUTTON. So is it possible that there is a relationship to the causes of each of these blowouts, in your opinion?

Mr. PROBERT. It's impossible to say until we get details from the inquiry, but it seems unlikely that there's a link.

Ms. SUTTON. Does the testing of cement change with the increasing depth of wells?

Mr. PROBERT. Well, there are more casing strings which are run, as you have seen from the schematic on this well, there were actually nine that were run, casing and liner strings. And so each one of those is tested. The first eight are tested in a slightly different fashion because we dry out afterwards because we are going to——

Ms. SUTTON. I am just asking about in relation to the depth of the wells, was the testing changed?

Mr. PROBERT. I would say as a result of the number of pieces of casing, yes.

Ms. SUTTON. OK. And just let me clarify one other thing.

Our distinguished colleague, the ranking member of the full committee, had mentioned that he thought that perhaps you had been presented as some dolts because you don't know what to do in the aftermath of this incident. But I would just say, to the contrary, you were certainly capable of figuring out how to develop and drill and profit from it, but what we're concerned about, what I'm concerned about is that you didn't figure out, for whatever reason—and I haven't heard a good reason yet—about how to do it safely so as to prevent this kind of disaster.

And the final question I have is, at the beginning of the Bush administration, there were closed meetings—and I'm glad Mr. Burgess reminded me of this—held by Vice President Cheney to discuss issues related to energy policy. I know that BP participated in those from previous testimony. Were any of the other companies, did they have representatives in those meetings? And can you just share with me whether or not you know if there was any discussion of trying to find ways to responsibly prevent this kind of disaster?

Mr. NEWMAN. I don't know whether or not Transocean was a participant in that. I think it would be very easy for us to confirm that for the committee.

Mr. MOORE. I'm not aware that Cameron was either, but we can confirm it?

Mr. PROBERT. I have no knowledge either, but again, we'll look into it and let you know.

Ms. SUTTON. Thank you, Mr. Chairman.

Mr. STUPAK. Thank you.

Mr. Scalise, 5 minutes for questions, please.

Mr. SCALISE. Thank you, again, Mr. Chairman.

I gave you all a copy of the article that's titled "Gas Surge Shut Well A Couple of Weeks Before Gulf Oil Spill." That was from yesterday. If you could take a look at that because I still want to get those answers about not only the time that's mentioned in that article, but how many times total that well was shut down.

I also want to refer, yesterday there was a hearing in New Orleans, an investigation that's underway as well as some of the ones that are happening here, but there was testimony there, and I guess one of the supply ships, the Bankston, I guess supplied the Horizon, there was testimony by the First Mate of the Bankston who said that weeks before the accident, they had to clear mud off the rig because of what they heard was a "loss of circulation." Are you familiar with that incident where there was mud that had to be cleared off of the rig?

Mr. McKay or Mr. Newman.

Mr. MCKAY. I'm not aware of that.

Mr. SCALISE. I mean, this was a public hearing yesterday, an investigation into this. I would imagine somebody at BP was monitoring this.

Mr. MCKAY. I'm sure they were, I'm just not aware.

Mr. SCALISE. Does your technical expert have any information on that?

Mr. MCKAY. No.

Mr. SCALISE. Well, get me whatever you have on it.

Mr. Newman.

Mr. NEWMAN. I'm not familiar with the details of that event, no.

Mr. SCALISE. And I would be happy to provide that article as well. But this was a hearing and investigation into this incident that happened yesterday. I would hope somebody at Transocean and BP know about this and can answer questions about this because this goes to the heart of were there a series of problems prior to the explosion that weren't being dealt with? And of course if you can't answer it, somebody at BP, somebody at Transocean is going to know about this, get me all of that information.

But also I want to know, what safety changes were made after this one or multiple shutdowns occurred? Because if a shutdown occurs, that's not something that's supposed to happen, especially if mud is coming out because you're not controlling the flow of the natural gas. It's a well that's been described here, this was a very difficult well, not a typical well. And these are people who were working on this well saying this.

You all should know about this because there are other wells that are out there, but if there is a well that is not a typical well that's causing problems, I would imagine you would take other safety precautions to address that. Maybe you didn't. But you need to get me that information as well as the number of times it was shut down, what safety changes were made after those problems were recognized.

So moving on. It seems like—and this is something else that's discussed in the first article I gave you—it seems like there was a disagreement, it's described here as a heated disagreement between BP, Transocean, and Halliburton regarding the process of removing the mud and putting in the seawater. And this was described as being prior to the cement being completed.

Now, first of all, I will let each of the three parties that are mentioned here, Mr. Newman, do you know about a disagreement between the parties on what is the best way to install or to remove the mud and when to remove the mud and how much to remove? Were you all in agreement?

Mr. NEWMAN. Congressman, I'm not aware of any disagreement. The first reference to any confusion with respect to what was happening on the rig I learned of during Chairman Waxman's opening comments today.

Mr. SCALISE. OK. Mr. McKay.

Mr. MCKAY. Same thing, that's the first I had heard of that.

Mr. SCALISE. Mr. Probert.

Mr. PROBERT. Halliburton would not normally be involved in that process, so I can't imagine there would be any disagreement.

Mr. SCALISE. Well, again, I mean, there are people who were on that rig saying that this heated disagreement occurred. Is it a standard protocol, then, for the process that was used to remove the mud and replace it with seawater, is this a permitted process? Did you have to follow a plan for just how that process was going to go? Because clearly there were some problems, and it could be one of the main problems in relation to the explosion. Is this a standard process for when to remove the mud or is it something that you all kind of decide as you are there on the spot?

I will go again, Mr. Newman.

Mr. NEWMAN. Displacing the riser with seawater to recover the drilling mud is a normal part of the well abandonment process.

Mr. SCALISE. So it's not something that should be disagreed upon by the parties involved?

Mr. NEWMAN. The displacement of the riser to seawater should not be a subject of disagreement. That is part of the normal processes of abandoning the well.

Mr. SCALISE. Mr. McKay.

Mr. MCKAY. I believe the procedure is part of the Temporary Abandonment Sundry Notice that's filed with the MMS.

Mr. SCALISE. So there should have been a standard protocol filed with MMS on the displacement procedure?

Mr. MCKAY. I believe that the procedure would be filed with the Temporary Abandonment Sundry Notice, yes.

Mr. SCALISE. OK. And if you could give me a copy of that as well. And then, Mr. Probert, if you know of any disagreement there, or just is that a standard process?

Mr. PROBERT. I believe it's part of a standard process.

Mr. SCALISE. OK. And Mr. McKay, was that the point where you were when the explosion occurred? Do you know exactly where in the process, what operation was being performed on the rig at the time of the explosion?

Mr. MCKAY. I don't know the exact time. I mean, this is what the investigation is working on. We have an investigation that started gathering the information that you're—some of it is witness accounts that we haven't been able to talk to yet.

Mr. SCALISE. And finally, I'm out of time now, but a final question. In terms of the process of paying the fishermen and all others whose livelihoods are directly impacted by their inability to go and earn a living right now because of this, what is the process for getting them reimbursed? Clearly, there are a lot of people that are very nervous, one more week, two more weeks might be the difference between them going bankrupt or having their house foreclosed. What is that process, and what kind of assurance can you give that those people directly impacted will be able to be made whole in a quick, reasonable amount of time?

Mr. MCKAY. We have a process underway to meet people's needs on the coast immediately. We've got claims, numbers to call. We've actually got community centers to visit as well. We've paid out I think over 1,000 claims already, and most of it is to fishermen who aren't working and need it for their cash flow. That's where our emphasis has been so far.

Mr. SCALISE. OK. If you can provide that process to the committee as well.

Thank you, Mr. Chairman. I yield back.

Mr. STUPAK. Thank you, Mr. Scalise.

Mr. Burgess and I have a few more questions and we will wrap up this hearing. So let's go one more round, five minutes each.

Mr. Newman, I would like to ask you about the Risk and Hazard Analysis that your company performed regarding a blowout preventer. Four days in August of 2003, Transocean personnel examined every possible hazard on the Deepwater Horizon rig to figure out what could possibly lead to a major accident. Transocean evaluated the safety of the BOP and found out that even though BOPs had failed in the past, the likelihood of a BOP failure was low because it was not a frequent occurrence. Transocean then rated the severity of a BOP failure as extremely severe, which means the risk could result in multiple fatalities or a massive oil spill.

So Mr. Newman, your staff knew several years ago that the BOP component failure would inflict major damage on your crew, your company, and the environment. So my question is why wouldn't you do more to protect against a BOP failure?

If I put your company's risk analysis on the screen and tab 7 in the book there, if you want to look at it, it's the last page of tab 7 of that document, the environmental catastrophe taking place now is one of those predicted as possible by your experts. First, it says possible blowout with possible multiple fatalities and possible loss of rig; second, possible environmental impact.

The preventative measures listed here included testing, inspections, and maintenance.

Yet today, as I mentioned in my opening and has been mentioned a couple of times today, we learned that the BOP had a hydraulic, leaky hydraulic system, dead battery, and a configuration or design that actually interfered with the BOP safety features.

So Mr. Newman, if you knew the risk, did the company take the necessary safeguards for the BOP? Isn't there something more you could have done to make sure, knowing the extreme severity of an accident, that you could have made sure the BOP was working properly?

Mr. NEWMAN. Mr. Chairman, over the last several years we have continued to improve our maintenance practices with respect to blowout preventers and we have continued to apply rigorous and strict testing protocols on a regular basis that would identify any failure.

Mr. STUPAK. What about because we heard a lot about the deadman switch, just the batteries, do you have any test developed so you can test the batteries to make sure that they're going to work so if everything else fails the batteries will still work and we can close those rams and shear this baby off?

Mr. NEWMAN. We test the batteries when the BOP is on the surface.

Mr. STUPAK. On the surface but not when it's in the water. When was this BOP put in the water?

Mr. NEWMAN. I believe it was put in the water in the first week of February.

Mr. STUPAK. So that would be about 2 or 3 months. I guess my question is this: When you get done with this BOP, let's say we didn't have this be a problem, do you use BOPs over and over?

Mr. NEWMAN. Yes.

Mr. STUPAK. This is 2001 this BOP was manufactured. Have they improved since, 2010? In the last 9 years have we had improvements in the BOPs to make more safeguards so we don't have these failures of leaky valves and dead batteries and to make sure they work? Do we have new, improved BOPs?

Mr. NEWMAN. The technology that was developed in the late 1990s, when the industry first built rigs capable of operating in 10,000 feet of water, is largely the same as what's employed today.

Mr. STUPAK. Do you have new, improved ones, Mr. Moore?

Mr. MOORE. Congressman, over a 10-year period, yes, things do evolve. But we built our stacks to last 20 to 30 years if properly maintained and used in the environment in which they are designed for.

Mr. STUPAK. Let me ask you this because it came up earlier, acoustic BOP would be a redundancy system. Knowing what we know about this accident, if we had an acoustic BOP as a redundant system, would that have worked, would that have shut off, pinched off this pipe so we wouldn't have this oil coming out?

Mr. NEWMAN. The answer to that question, Mr. Chairman, depends on what's inside the BOP. If the BOP is somehow being prevented from functioning correctly, then another means of activating the BOP would not have offered any improvement.

Mr. STUPAK. Would an acoustic BOP be stacked or would it be off, somehow off the side to crimp this pipe? How would that work?

Mr. NEWMAN. What we're talking about, Mr. Chairman, is an acoustic control system. It is another means of activating the BOP. It's not another BOP. It's simply another means of activating the BOP. But here in order to activate this BOP, testimony has been that they probably hit the button on the rig when they realized there was a problem going on, right? They hit the button to activate the BOP. And you had to sever the communication, the power, and the hydraulic lines. Two out of three we know didn't work. The communications and power were cut. The hydraulic lines are still intact, therefore the deadman switch didn't work, correct?

Mr. MOORE. We're not sure the hydraulic line was severed. But if it wasn't, it would not know to——

Mr. STUPAK. But even if it wasn't with the acoustics on there, would that have shut down this BOP?

Mr. MOORE. It would be a method to shut it down, if there wasn't anything inside that BOP it couldn't, it wasn't——

Mr. STUPAK. We will not know that until we get the BOP off?

Mr. MOORE. We will not know that until we see it.

Mr. STUPAK. Mr. McKay, we asked for your risk registry, and I know you said you would get it, we still haven't received it. Would you see that we get your risk registry for Gulf organizations; would you please provide that to us?

Mr. MCKAY. Yes.

Mr. STUPAK. Mr. Burgess, 5 minutes for questions please.

Mr. BURGESS. Thank you, Mr. Chairman.

Lois Capps was asking some questions about the work that's gone on in the last 30 years as far as the mitigation of a spill when it happens. Now, there's a dispersant that is being or was being injected, placed on the water and also being injected at the site of the spill. That dispersant, is that new or is that something that's been around for a while?

And anyone, feel free to answer that.

Mr. MCKAY. This technology is new. I mean this is the first time it has been used at any scale and——

Mr. BURGESS. Who has been responsible for the development of that product?

Mr. MCKAY. Well, Nalco I believe it's Nalco is the manufacturer, Nalco Chemical.

Mr. BURGESS. Now, I guess I'm a little confused. Did the EPA, you all approached the EPA for permission to use the dispersant below the surface. How long did it take to get the approval to use that?

Mr. MCKAY. Well, we've requested several attempts, and there have been three tests. The last one ended yesterday, I think at 4:00 something in the morning. That was a 24-hour test. It looks like the impact of it was really good. We have asked for the EPA to allow us to continue. I don't know as of yet if we've gotten the approval, but we are ready to go on continuous injection.

Mr. BURGESS. Typically how long does it take to get EPA approval to use a new material like that?

Mr. MCKAY. I don't know.

Mr. BURGESS. I know of a college in my district back in Denton, Texas, University of North Texas, does a lot of research on nano materials and they've got what they call noble-metal nanoparticles as well as porous metal organic frameworks that can absorb petroleum selectively and to a large differential. Are you guys looking at using anything along those lines?

Mr. MCKAY. Absolutely. I think it was a bit misleading earlier on technology. This industry has massively, massively scaled up for oil spill response in the Gulf Coast using all technologies.

Mr. BURGESS. Right, and it doesn't have to be hay bales shot over the Gulf, there are large scale, the ability to do large scale dispersion——

Mr. MCKAY. Massive amount of equipment in the Gulf Coast.

Mr. BURGESS. Let me just—going back to the tab pressure differential for a moment, Mr. McKay, Mr. Newman, either one of you. Would you get, a lot of what has happened today or a lot of the questions that come up today relate to who is in charge. I guess, Mr. Newman, really it is Transocean, the offshore operations manager, whatever it's called, that is the person ultimately in charge of everything on the rig, that's the captain of the ship, right?

Mr. NEWMAN. If I can clarify that, Congressman, the offshore drilling rig is a complex piece of equipment. There's a hotel out there to provide accommodation for the workers when they're not working, there's a power plant on the rig——

Mr. BURGESS. But somebody is ultimately in charge of the decisions, is there not?

Mr. NEWMAN. The offshore installation manager is ultimately responsible for the maintenance of the rig, for the material handling operations of the rig, for the conditions of the hotel on the rig. The offshore installation manager cedes decision-making to the customer representative when it comes to decisions that respect the wellbore.

Mr. BURGESS. So when you have got an anomalous result on that pressure differential, is it ever appropriate, and really Mr. Newman or Mr. McKay, either one of you can answer this, is it ever appropriate to seek the advice or permission, what is the role of the Minerals Management Service when something like that occurs?

Mr. MCKAY. I don't know in a specific situation like that.

Mr. BURGESS. We're going to override an anomalous result and remove the drilling mud, which is the primary protector. Even before the blowout protector, it is the primary protector of the well blowing out. Would you have ever consulted with any regulator at the Federal level or is that just not done?

Mr. MCKAY. I can't speculate on when a Federal regulator would be contacted, whether that situation would apply or not. I don't know. The investigation is going to determine a lot of this.

Mr. BURGESS. But I guess that is really a question that is going to have to be answered. And Mr. Chairman, you know, it just brings us back to where I started this morning. We're going to have multiple hearings on this, I suspect, and at some point we have got to involve Department of the Interior, Department of Homeland Security, Minerals Management Service. We have got to involve these individuals. Now the name Carol Browner came up, the White House's energy czar; it would be very interesting to have her come talk to us as well. We need to get the information and it is unfortunately going to involve getting the administration to be cooperative with this committee for a change.

So just with that caveat in mind, I'll yield back the balance of my time and thank you for and our witnesses for a very productive hearing today.

Mr. STUPAK. Thank you, Mr. Burgess.

As you know, I don't believe in doing one hearing. I will get into an issue and we will have further hearings here, and the administration, it may be appropriate at another hearing to have them here, including the Minerals Management Service, and the administration on this issue and all the issues that have been before this subcommittee and this Congress has been cooperative. Even some document requests you have sent in the past have been, was worked out between us. So we will continue to work on it.

Mr. Scalise, any questions?

Mr. SCALISE. Just first, on all of the information that I had asked from the panel, if they could get that to the full committee as well and——

Mr. STUPAK. Correct, and I would just maybe follow them up with written questions, too. As I will say in a few minutes, we have 10 days for further follow-up questions.

Mr. SCALISE. I'd be happy to. Thank you, Mr. Chairman.

Mr. BURGESS. Mr. Chairman, could I ask that materials on both sides that were actually made available to the committee be made available to the committee staff as well?

Mr. STUPAK. Yes. No objection. All information that has been available, it has all been shared equally thus far. If there is anything further or something you don't think was there, please let us know and we will make sure it's there.

Let me ask one more question, Mr. Moore, if I may. The lessons we learned thus far about what worked and what didn't work with the BOP, the blowout preventer, do you, the Cameron company, do you think the design changes should be made to BOPs and should there be modifications to the existing BOPs in service now?

Mr. MOORE. I'm not sure, Congressman. I think we need to see what happened to that BOP. I think it would be, to change something that's not broke, we don't know what happened. We do know that we're going to have to look at a lot of different things differently going forward in terms of how we move forward in this industry.

Mr. STUPAK. Well, look at that design one just so you know, you had your communications, your hydraulics and the power, the power, seems all three have to be severed before it will work, I think one or two before it would work.

Mr. MOORE. Well, the design, as I said, of that was to function when you lose the riser from the BOP.

Mr. STUPAK. We didn't lose the riser here.

Mr. MOORE. We didn't lose the riser here. So we learned something. And Cameron is committed to make the changes, to working with our customers and working with the industry to move forward.

Mr. STUPAK. Well, thank you. Thank you to all the witnesses. I know it's been a long day, and this is not an easy subject and it's just beginning, and we are in the early stages. There will be more questions and answers, I'm sure, and unfortunately to the people who lost their lives our hearts go out to them, their families and co-workers. So I thank you for being here.

That concludes our questioning. I want to thank all of our witnesses for coming today and for your testimony. The committee rules provide that members have 10 days to submit additional questions for the record.

I ask unanimous consent that contents of our document binder be entered in the record provided that the committee staff may redact any information that is business proprietary, relates to privacy concerns or is law enforcement sensitive. Without objection, documents will be entered into the record.

[The information appears at the conclusion of the hearing.]

Mr. STUPAK. That concludes our hearing. The meeting of the subcommittee is adjourned.

[Whereupon, at 4:00 p.m., the subcommittee was adjourned.]

[The prepared statement of Ms. Schakowsky follows:]

[Material submitted for inclusion in the record follows:]

Statement of Representative Schakowsky
Oversight and Investigations Hearing "Inquiry into the Deepwater Horizon Gulf Coast Oil Spill."

Thank you Mr. Chairman for yielding and holding today's important hearing.

Last month, we were reminded once again, of the tremendous cost of our nation's reliance on foreign oil to meet our energy needs. The oil spill in the Gulf Coast is not only a human tragedy, leading to the loss of 11 lives, but also an environmental catastrophe, spewing hundreds of thousands of crude oil into the Gulf each day.

I want to express my sympathy and support not only to the families of those brave workers who perished, but also to everyone who lives and or works in the Gulf region.

The Deepwater Horizon spill is a devastating reminder that the United States must pass a comprehensive energy strategy that weans our nation off of oil and spurs development of cleaner renewable sources like wind, solar and biofeuls. If we fail to pass such reform, I have no doubt that tragedies like this one will continue occur. We must not forget that this spill comes on the heels of another tragedy, which took on April 5th at a mine in West Virginia where 29 workers were killed in an explosion.

But the point of today's hearing is to learn more about the events that led to the spill at the Deepwater Horizon site. Before us today are representatives of four companies who have worked at the site, including British Petroleum the company that currently operates the lease to drill there.

I look forward to hearing their testimony, and hope that today's hearing will be productive. I watched yesterday's Senate hearing and was troubled by the fact that the testimony appeared to be more about placing blame on one another, rather than ensuring that a spill like this never happens again.

Again, thank you Mr. Chairman for holding today's hearing. I yield back the balance of my time…

**What We Know**

- Before, during or after the cement job, an undetected influx of hydrocarbons entered the wellbore;
- The 9 7/8" casing was tested; the 9 7/8" casing hanger packoff was set and tested; and the entire system was tested;
- After 16.5 hours waiting on cement, a test was performed on the wellbore below the Blowout Preventer (BOP);
- During this test, 1,400 psi was observed on the drill pipe while 0 psi was observed on the kill and the choke lines;
- Following the test, hydrocarbons were unknowingly circulated to surface while displacing the riser with seawater;
- As hydrocarbons rose to the surface, they expanded, further reducing the hydrostatic pressure. The well flowed and witness account suggest that the Annular Preventer in the BOP and the Diverter were activated;
- An explosion occurred, followed by a power failure;
- Witness accounts suggest that the Emergency Disconnect System was activated;
- The rig was evacuated;
- The BOP system failed to work as intended. Flow was not contained and the Lower Marine Riser Package did not disconnect;
- Modifications have been discovered in the BOP system;
- Leaks have been discovered in the BOP hydraulics system;
- BP launched an investigation which is ongoing.

**Investigation Themes**

- Cementing – design and execution;
- Casing – design and installation;
- Casing Hanger – design and installation
- BOP – configuration, maintenance and operation;
- Well Control Practices.

What Could Have Happened

1. Before or during the cement job, an influx of hydrocarbon enters the wellbore.

2. Influx is circulated during cement job to wellhead and BOP.

3. 9-7/8" casing hanger packoff set and positively tested to 6500 psi.

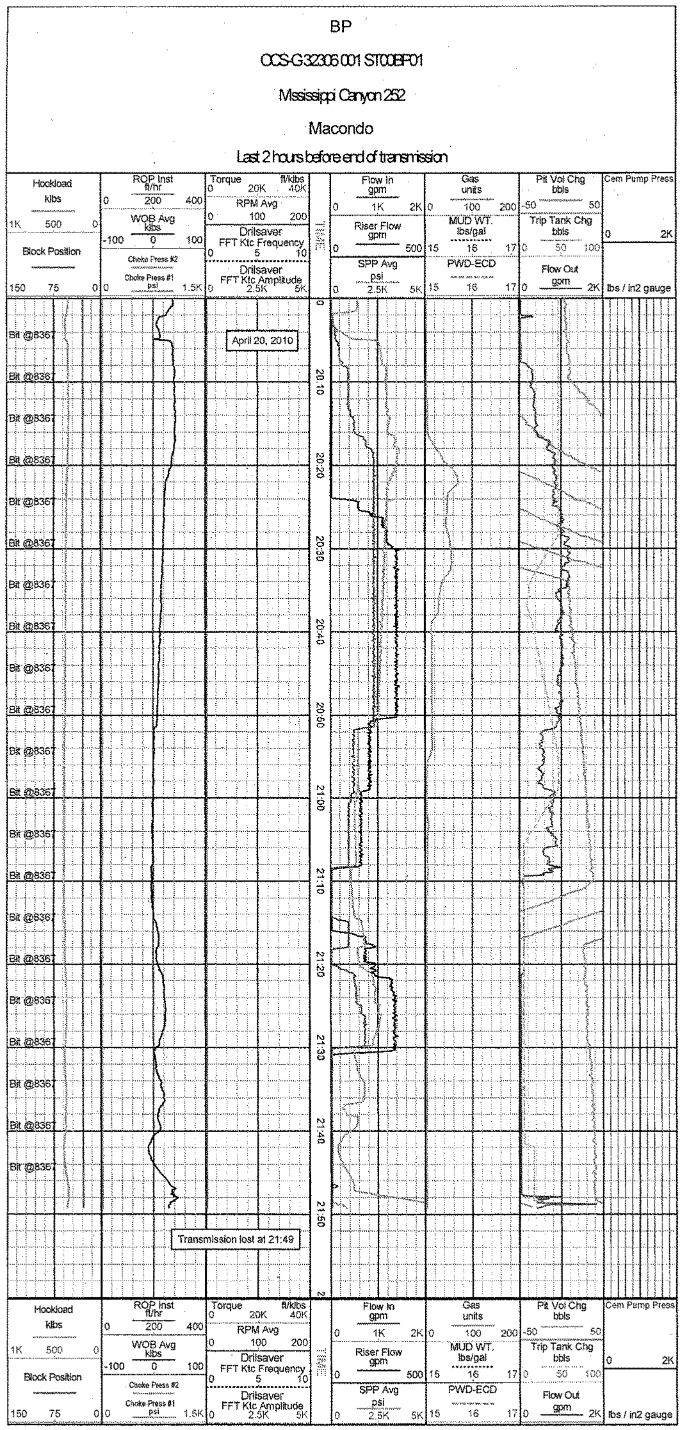
4. After 16.5 hours waiting on cement, a negative test performed on wellbore below BOP. (~ 1400 psi differential pressure on 9-7/8" casing hanger packoff and ~ 2350 psi on double valve float collar)

5. Packoff leaks allowing hydrocarbon to enter wellbore below BOP. 1400 psi shut in pressure observed on drill pipe (no flow or pressure observed on kill line)

6. Hydrocarbon below BOP is unknowingly circulated to surface while finishing displacing the riser.

7. As hydrocarbon rises to surface, gas break out of solution further reduces hydrostatic pressure in well. Well begin to flow, BOPs and Emergency Disconnect System (EDS) activated but failed.

8. Packoff continues to leak allowing further influx from bottom.


BP
OCS-G 32306 001 ST00BP01
Mississippi Canyon 252
Macondo
Last 2 hours before end of transmission
Hookload klbs
Block Position
ROP Inst ft/hr
WOB Avg klbs
Choke Press #2
Choke Press #1 psi
Torque ft/klbs
RPM Avg
Drilsaver FFT Ktc Frequency
Drilsaver FFT Ktc Amplitude
TIME
Flow In gpm
Riser Flow gpm
SPP Avg psi
Gas units
MUD WT. lbs/gal
PWD-ECD
Pit Vol Chg bbls
Trip Tank Chg bbls
Flow Out gpm
Cem Pump Press
lbs / in2 gauge
April 20, 2010
Bit @8367
20:10
20:20
20:30
20:40
20:50
21:00
21:10
21:20
21:30
21:40
21:50
Transmission lost at 21:49

NO 512100-000034-0 DAILY DRILLING REPORT REPORT NO. 34

| LEASE | | API WELL NUMBER | WATER DEPTH | DATE |
|---|---|---|---|---|
| OCSG032306 | MC 252 #1 ST00 BP01 | 608174116901 | 4992 | 20 Apr 2010 |
| OPERATOR: BP Exploration | | CONTRACTOR: Transocean | | RIG NO.: Deepwater Horizon |
| SIGNATURE OF OPERATOR'S REPRESENTATIVE | | SIGNATURE OF CONTRACTOR'S TOOL PUSHER | | |

| D.P. SIZE | WEIGHT | GRADE | TOOL JT O.D. | TYPE THREAD | STRING NO. | PUMP NO. | PUMP MANUFACTURER | TYPE | STROKE LENGTH |
|---|---|---|---|---|---|---|---|---|---|
| 6.625 | 32 | S-135 | 8.38 | 6.625 FH | | 1 | Continental Emsco | Triplex | 15 |
| - | - | | - | - | - | 2 | Continental Emsco | Triplex | 15 |
| - | - | | - | - | - | 3 | Continental Emsco | Triplex | 15 |
| - | - | | - | - | - | 4 | Continental Emsco | Triplex | 15 |

## TIME DISTRIBUTION - HOURS

| CODE NO. - OPERATION | NIGHT | DAY |
|---|---|---|
| 1 Rig Up and Tear Down | | |
| 2 Drill Actual | | |
| 3 Reaming | | |
| 4 Coring | | |
| 5 Condition Mud & Circulate | 10 | 23 |
| 6 Trips | 18 | 15 |
| 7 Lubricate Rig | | |
| 8 Repair Rig | | |
| 9 Cut Off Drilling Line | | |
| 10 Deviation Survey | | |
| 11 Wire Line Logs | | |
| 12 Run Casing & Cement | 80 | 85 |
| 13 Wait On Cement | | |
| 14 Nipple Up B.O.P. | | |
| 15 Test B.O.P. | | 55 |
| 16 Drill Stem Test | | |
| 17 Plug Back | | |
| 18 Squeeze Cement | | |
| 19 Fishing | | |
| 20 Dir. Work | | |
| 21 Other | | |
| 22 | | |
| 23 | | |
| COMPLETION A Perforating | | |
| B Tubing Trips | | |
| C Treating | | |
| D Swabbing | | |
| E Testing | | |
| F | | |
| G | | |
| H | | |
| TOTALS | 120 | 32 |

DAYWORK TIME SUMMARY (OFFICE USE ONLY)

| | | |
|---|---|---|
| Hours w/ Contr. D.P. | | |
| Hours w/ Opr. D.P. | | |
| Hours Without D.P. | | |
| Hours Standby | | |
| TOTAL DAYWORK | | |
| NO. OF DAYS FROM SPUD | | |
| CUMULATIVE ROTATING HOURS | | |
| DAILY MUD COST | | |
| TOTAL MUD COST | | |

## NIGHT TOUR

### DRILLING ASSEMBLY

| NO. | ITEM | LENGTH |
|---|---|---|
| 0 | 26 Jts of 3 1/2" Tubing | 817.770 |
| 0 | CROSSOVER | 1.830 |
| 0 | CROSSOVER | 1.660 |
| 0 | STANDS D.P. | 0.000 |
| 0 | SINGLES D.P. | 0.000 |
| 0 | KELLY DOWN | 0.000 |
| 0 | TOTAL | 821.260 |
| WT. OF STRING | | 0.00 |

### BIT RECORD

| | | |
|---|---|---|
| BIT NO. | | |
| SIZE | | |
| IADC CODE | | |
| MANUFACTURER | | |
| TYPE | | |
| SERIAL NO. | | |
| JETS | | |
| TFA | | |
| DEPTH OUT | | |
| DEPTH IN | | |
| TOTAL DRILLED | | |
| TOTAL HOURS | | |

CUTTING STRUCTURE: INNER | OUTER | DULL CHAR | LOCATION | BEARINGS/SEALS | GAGE | OTHER DULL CHAR | REASON PULLED

### MUD RECORD

TIME | WEIGHT | PRESSURE GRADIENT | FUNNEL VISCOSITY | PV/YP | GEL STRENGTH | FLUID LOSS | pH | SOLIDS

MUD & CHEMICALS ADDED: TYPE | AMOUNT | TYPE | AMOUNT

REMARKS NO INCIDENTS REPORTED. NO POLLUTION SIGHTED. TEST DP ALARMS. VISUALLY INSPECTED DIVERTER AND SLIP JOINT. HELD PRE-JOB SAFETY MEETING WITH CREW. VERIFIED CROWN SAVER AND FLOOR SAVER. SWIVEL PACKING HOURS 546. JAR HOUR 47.5 METAL ON DITCH MAGNETS 0 OZ.

JAR HOURS 47.5 DRILLER Burgess, Micah Brandon

## DAY TOUR

### DRILLING ASSEMBLY

| NO. | ITEM | LENGTH |
|---|---|---|
| 0 | 26 Jts of 3 1/2" Tubing | 817.770 |
| 0 | CROSSOVER | 1.830 |
| 0 | CROSSOVER | 1.660 |
| 0 | STANDS D.P. | 0.000 |
| 0 | SINGLES D.P. | 0.000 |
| 0 | KELLY DOWN | 0.000 |
| 0 | TOTAL | 821.260 |
| WT. OF STRING | | 0.00 |

### BIT RECORD

| | |
|---|---|
| BIT NO. | 0 |
| SIZE | 8.5 |
| IADC CODE | |
| MANUFACTURER | HUGHES |
| TYPE | HC406ZC |
| SERIAL NO. | |
| JETS | 4 X 14 |
| TFA | .601 |
| DEPTH OUT | 0 |
| DEPTH IN | 0 |
| TOTAL DRILLED | 0.00 |
| TOTAL HOURS | 0.00 |

CUTTING STRUCTURE: INNER | OUTER | DULL CHAR | LOCATION | BEARINGS/SEALS | GAGE | OTHER DULL CHAR | REASON PULLED

### MUD RECORD

TIME | WEIGHT | PRESSURE GRADIENT | FUNNEL VISCOSITY | PV/YP | GEL STRENGTH | FLUID LOSS | pH | SOLIDS

MUD & CHEMICALS ADDED: TYPE | AMOUNT | TYPE | AMOUNT

REMARKS NO INCIDENTS REPORTED. NO POLLUTION SIGHTED. TEST DP ALARMS. VISUALLY INSPECTED DIVERTER AND SLIP JOINT. HELD PRE-JOB SAFETY MEETING WITH CREW. VERIFIED CROWN SAVER AND FLOOR SAVER. SWIVEL PACKING HOURS 544.0. JAR HOUR 47.5 METAL ON DITCH MAGNETS 0 OZ.

JAR HOURS 47.5

NO 512100-000034-0 DAILY DRILLING REPORT REPORT NO 34

| FIELD OR DISTRICT | COUNTY | STATE / COUNTRY | WIRE LINE RECORD |
|---|---|---|---|
| MISSISSIPPI | OFFSHORE | Louisiana - United States | SIZE 2; NO. LINES 14; LENGTH SLIPPED 100; LENGTH CUT OFF 200.00; PRESENT LENGTH 1280; WEAR OR TRIPS SINCE LAST CUT 5420.00; CUMULATIVE WEAR OR TRIPS 298185.00 |

| DEPTH INTERVAL FROM | TO | PUMP PRESSURE | PUMP NO. 1 LINER | S.P.M. | PUMP NO. 2 LINER | S.P.M. | PUMP NO. 3 LINER | S.P.M. | PUMP NO. 4 LINER | S.P.M. | TOTAL PUMP OUTPUT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5058.00 | 5058.00 | 1000 | 6 | 0 | 6 | 50 | 6 | 0 | 6 | 0 | 285 GPM |
| 0.00 | 0.00 | | | | | | | | | | |
| 0.00 | 0.00 | | | | | | | | | | |

| TIME LOG FROM | TO | ELAPSED TIME | CODE NO. | DETAILS OF OPERATIONS IN SEQUENCE AND REMARKS |
|---|---|---|---|---|
| 00:00 | 00:30 | 0H30M | 12 | (M) (On) CONTINUE DISPLACING CEMENT WITH 727 BBLS OF 14.0 PPG MUD. WITH 4,138 STKS/ 553 BBLS PUMPED TOP PLUG WENT THROUGH X-O WITH 800 PSI. BOTTOM PLUG LANDED WITH 673 BBLS PUMPED AT 2,302 PSI. WITH 727 BBLS PUMPED, BUMPED TOP PLUG WITH 740 PSI OVER CIRCULATING PRESSURE. BLED PRESSURE OFF, BLED BACK 8 BBLS. FLOATS HOLDING. CEMENT IN PLACE AT 12:28 HRS |
| 00:30 | 01:00 | 0H30M | 12 | (M) (On) RELEASE DRIL-QUIP RUNNING TOOL AND SET SEAL ASSEMBLY AT 5,038'. SLACK OFF TO 300K HOOKLOAD. MAKE 6 TURNS TO RIGHT. SET SEAL ASSEMBLY WITH 300K HOOKLOAD. MONITOR WELL ON TRIP TANK. WELL STATIC. |
| 01:00 | 02:00 | 1H0M | 12 | (M) (On) BREAK CIRCULATION DOWN KILL LINE. HALLIBURTON TEST LINES TO 11,000 PSI. GOOD TEST. CLOSED UPPER PIPE RAMS. HALLIBURTON PRESSURE TEST SEAL ASSEMBLY TO 4,000 PSI HOLD FOR 30 SEC. PRESSURE UP TO 10,000 PSI HOLD FOR 10 SEC. BLED PRESSURE OFF TO 6,500 PSI HOLD FOR 5 MINUTES |
| 02:00 | 02:30 | 0H30M | 12 | (M) (On) SHEAR OUT OF SEAL ASSEMBLY WITH 85 K OVER STRING WEIGHT. CIRCULATE 10 MINUTES TO FLUSH OUT HANGER. MONITOR ACTIVE SYSTEM FOR GAINS AND LOSSES |
| 02:30 | 03:00 | 0H30M | 12 | (M) (On) SLACK OFF TO 335 HOOKLOAD. CLOSE UPPER PIPE RAMS. HALLIBURTON PRESSURE UP ON SEAL ASSEMBLY TO 10,000 PSI FOR 10 SEC. BLED OFF TO 6,500 PSI. HOLD FOR 5 MINUTES |
| 03:00 | 03:30 | 0H30M | 12 | (M) (On) RIG DOWN CHIKSAN LINES AND LAY DOWN CEMENT KELLY. MONITOR WELL ON TRIP TANK. WELL STATIC |
| 03:30 | 04:00 | 0H30M | 12 | (M) (On) PULL OUT OF THE HOLE WITH FROM 8,059' TO 4,770'. MONITOR DISPLACEMENT ON TRIP TANK. |
| 04:00 | 05:00 | 1H0M | 5 | (M) (On) DROP FOAM WIPER BALL AND CIRCULATE 1 1/2" TIMES THE DRILL PIPE VOLUME. PUMPED 30 BBLS OF 16.3 PPG SLUG. MONITOR ACTIVE SYSTEM FOR GAINS AND LOSSES. |
| 05:00 | 06:30 | 1H30M | 12 | (M) (On) PULL OUT OF THE HOLE WITH LANDING STRING FROM 4,770' TO 51'. MONITOR DISPLACEMENT ON TRIP TANK. |
| 06:30 | 07:00 | 0H30M | 12 | (M) (On) LAY DOWN DRIL-QUIP RUNNING TOOL FROM 51' TO SURFACE. MONITOR DISPLACEMENT ON TRIP TANK. |
| 07:00 | 07:30 | 0H30M | 12 | (M) (On) CLEAN AND CLEAR RIG FLOOR. MONITOR WELL ON TRIP TANK. WELL STATIC |
| 07:30 | 08:00 | 0H30M | 6 | (M) (On) HELD PRE-JOB MEETING WITH CREW ON RIGGING UP AND RUNNING 3 1/2" TUBING. MONITOR WELL ON TRIP TANK. WELL STATIC |
| DEPTH | | | | Shoe TVD: 17107 / Shoe Press: 1500 / Test MW: 14.3 / Equiv MW: 15.8 |

| TIME LOG FROM | TO | ELAPSED TIME | CODE NO. | DETAILS OF OPERATIONS IN SEQUENCE AND REMARKS |
|---|---|---|---|---|
| 12:00 | 12:30 | 0H30M | 6 | (M) (On) HELD PRE-TASK MEETING ON RUNNING IN HOLE WITH DRILL PIPE. MONITOR WELL ON TRIP TANK WELL STATIC |
| 12:30 | 13:30 | 1H0M | 6 | (M) (On) CONTINUE TO RUN IN HOLE WITH 3 1/2" TUBING FROM 4,317' TO 8,367'. MONITOR PIPE DISPLACEMENT ON TRIP TANK. |
| 13:30 | 14:00 | 0H30M | 12 | (M) (On) PICK-UP TEST KELLY AND RIG UP CHICKSAN LINES @ 8,367'. MONITOR WELL ON TRIP TANK WELL STATIC |
| 14:00 | 14:30 | 0H30M | 15 | (M) (On) HALLIBURTON BREAK CIRCULATION AND TEST LINES TO 3,000 PSI ( GOOD TEST). MONITOR WELL ON TRIP TANK WELL STATIC |
| 14:30 | 15:00 | 0H30M | 5 | (M) (On) HOLD PRE TASK MEETING ON DISPLACE BOOST, CHOKE AND KILL @ 8,367'. MONITOR WELL ON TRIP TANK WELL STATIC |
| DEPTH | | | | Shoe TVD: 17107 / Shoe Press: 1500 / Test MW: 14.3 / Equiv MW: 15.8 |

NO 512100-000034-0 DAILY DRILLING REPORT REPORT NO. 34

| FIELD OR DISTRICT | COUNTY | STATE / COUNTRY | WIRE LINE RECORD | REEL NO. |
|---|---|---|---|---|
| MISSISSIPPI | OFFSHORE | Louisiana / United States | | |

| Wire line record | |
|---|---|
| SIZE | 2 |
| NO. LINES | 14 |
| LENGTH SLIPPED | 100 |
| LENGTH CUT OFF | 200.00 |
| PRESENT LENGTH | 1230 |
| WEAR OR TRIPS SINCE LAST CUT | 8429.00 |
| CUMULATIVE WEAR OR TRIPS | 252185.00 |

| DEPTH INTERVAL FROM | TO | ROTARY TABLE SPEED | PUMP PRESSURE | PUMP NO. 1 LINER | S.P.M. | PUMP NO. 2 LINER | S.P.M. | PUMP NO. 3 LINER | S.P.M. | PUMP NO. 4 LINER | S.P.M. | TOTAL PUMP OUTPUT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5059.00 | 5059.00 | / | 1000 | 0 | 0 | 0 | 60 | 0 | 0 | 0 | 0 | 255 GPM |
| 0.00 | 0.00 | / | / | | | | | | | | | / |
| 0.00 | 0.00 | / | / | | | | | | | | | / |

| TIME LOG FROM | TO | ELAPSED TIME | CODE NO. | DETAILS OF OPERATIONS IN SEQUENCE AND REMARKS - (CONTINUATION) |
|---|---|---|---|---|
| 06:00 | 09:00 | 3H0M | 8 | (M) (Oh) PICK UP 3 1/2" TUBING FROM SURFACE TO 827'. MONITOR WELL ON TRIP TANK. WELL STATIC |
| 09:00 | 09:30 | 0H30M | 6 | (M) (Oh) RIG DOWN 3 1/2" TUBING HANDLING EQUIPMENT. MONITOR WELL ON TRIP TANK. WELL STATIC |
| 09:30 | 10:30 | 1H0M | 8 | (M) (Oh) RUN IN THE HOLE WITH 827' TO 4417'. MONITOR DISPLACEMENT ON TRIP TANK. WELL STATIC |
| 10:30 | 12:00 | 1H30M | 12 | (M) (Oh) CLOSED BLIND SHEAR RAMS. HALLIBURTON PERFORM CASING AND BLIND SHEAR RAM TEST DOWN KILL LINE TO 250 PSI LOW FOR 5 MINUTES AND 2,500 PSI HIGH FOR 30 MINUTES. BBLS PUMPED 6.5 BBLS, BBLS BLED BACK 6.5 BBLS. INITIAL SHUT IN PRESSURE 2,600 PSI. AFTER 30 MINUTES 2,520 PSI |

DEPTH

[illegible]

DEPTH

[illegible]

Confidential Treatment Requested by
Transocean Holdings LLC

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June 16, 2010

**VIA ELECTRONIC MAIL**

The Honorable Henry A. Waxman
Chairman, Committee on Energy and Commerce
U.S. House of Representatives
2125 Rayburn House Office Building
Washington, DC 20515

Dear Chairman Waxman:

Enclosed are narrative responses to the written questions for the record directed to Mr. Steven Newman from Subcommittee on Oversight and Investigations Members Parker Griffith, Robert E. Latta, and Steve Scalise in Chairman Waxman's June 2, 2010 letter.

Please do not hesitate to contact me if you have any further questions.

Sincerely,

David L. Wochner

Attachment

cc: The Honorable Joe Barton
Ranking Member

**Enhanced Subsea Blow out Preventer (BOP) Stack Testing for Dynamically Positioned Rigs in the Gulf of Mexico**

**Purpose**
Subsea BOP stacks are critical safety equipment designed to secure a well in the event of flow. They are tested to ensure that they will function and secure the well. The testing process also confirms there are no leaks in the system that would diminish system integrity. This file note is to document current subsea BOP stack testing practices for dynamically positioned (DP) rigs, and identify areas of enhancement for Gulf of Mexico (GoM) operations.

**Standard Practices**
Current GoM Mineral Management Service (MMS) regulations require BOP stacks to be stump tested at surface with water, pressure tested once installed on the well and then every 14 days thereafter. There is no GoM MMS regulatory requirement to test the BOP emergency systems once the BOP stack is installed subsea.

Global industry practice before running a BOP stack to the wellhead at the mud line is to function and pressure test it on the rig deck. Where not required by regulation, this is done to avoid unnecessary downtime. The surface test is performed by installing the BOP stack on a test stump and hooking up the hydraulic and electric power and the control systems. Since the BOP stacks have two redundant pod systems, the surface tests include both pods. The function and pressure testing of the BOP stack is typically done using one pod and then it is only function tested using the other pod. This function test includes actuating the components, but not pressure testing them. In addition to function and pressure testing the normal operating functions on the BOP stack, the emergency systems are tested as well. These systems include:

- Deadman
- Autoshear
- Emergency Disconnect System
- Remote Operated Vehicle (ROV) access

BOP stack emergency systems are not typically tested once the BOP stack is on the seabed.

The following is a summary of the emergency systems and how tests are typically performed on the test stump at surface.

Deadman
- Designed to close programmed rams when BOP stack loses hydraulics and electrical power
- Tested at surface by cutting the power and hydraulics to the BOP stack and verifying the programmed rams have closed

Autoshear

- Designed to close programmed rams if the Lower Marine Riser Package (LMRP) has an unplanned separation from the BOP stack
- Tested by inducing a signal that simulates LMRP disconnect, then verifying the shuttle valves for the programmed rams work as designed. This can be done by "dry firing" (no hydraulic pressure) the system to verify the program is working and the shuttle valves operate. The Autoshear can be programmed to close the same rams as the Deadman.

Emergency Disconnect System (EDS)

- Designed to close programmed rams and disconnect the LMRP from the BOP stack
- The EDS system can be set for multiple scenarios (i.e. with or without drill pipe in the hole, running casing, etc.)
- Typically tested at surface by initiating the signal with no hydraulic pressure on the system to ensure the program is working as designed.

ROV Intervention

- A ROV stab panel is installed on the BOP stack to enable ROV intervention to operate select BOP functions
- The ROV system is tested by plugging in a stab to the panel and operating the functions. The pump rates at surface do not necessarily simulate what a ROV could produce subsea.

**Subsea BOP Stack Emergency System Testing**

As stated earlier, the reason to test the BOP stack once subsea is to ensure that the stack will work as designed to secure the well if required and to verify that there are no leaks in the system that would diminish system integrity. A minimum condition of success would include confirmation that the emergency systems will close the blind shear rams. This can be accomplished by activating the Deadman system. Also, verifying the ROV intervention system is operable will ensure redundancy of closing the blind shear rams and provide opportunity to function at least one other ram, typically a pipe ram.

The risk in testing the Deadman is that in cutting power and hydraulics to the BOP stack and relying on subsea battery power to operate, there could be a drain on the batteries. There is also a risk that the system will not re-start as designed and the LMRP would need to be pulled back to surface to enable repairs. Both of these are manageable risks.

There does not appear to be any significant risk in testing the ROV intervention system once the BOP stack is installed on the well. However, standard ROV systems can only pump seawater in the volumes required. Seawater is adequate as an emergency control fluid, but Stack-magic is preferred for normal operations. This will require retrofits to standard ROV systems.

Autoshear and EDS testing would include actuation of rams and involve disconnecting the LMRP. Testing LMRP release is not a critical operation to secure the well, could damage a connector and imports significant risk to the operation. Since the Deadman test would test the blind shear ram closing functions, it is not necessary to perform these additional tests at the seabed.

A key question arises if the Deadman and ROV intervention systems are tested on the wellhead at the mud line as visual confirmation of ram position is not possible. How do you know the systems worked as designed?

In the case of the Deadman system test, there are two indicators to determine the system worked as designed. Firstly, a ROV should see the control fluid vent as the rams are closed. The second indicator is the volume of fluid pumped to open the rams, which is counted at the BOP stack. If the volume pumped is as expected, it would be a reliable positive indication that the Deadman system operated as designed. There is not a way to get a false positive test.

When the ROV intervention system is tested, there is one current indicator to detect that the system worked as designed. As with the Deadman test, when the rams are opened, the volume of fluid pumped to perform the operation is counted at the BOP stack. If the volume pumped is as expected, this is positive indication the rams were closed by the ROV. A future consideration is to count the gallons the ROV pumps to close the rams, however it is unclear which ROVs have this capability and modification is likely required.

**Recommendation**
Short and long term actions are required to improve subsea BOP stack testing, reliability and intervention. The short term solution includes enhanced testing procedures when the BOP stack is installed on the well as described above. Long term solutions would include BOP stack system design modifications, improved operational practices and alternative solutions for contingency and intervention. These solutions will require input from operators, drilling and service contractors, and equipment manufacturers.

In order to ensure the BOP stack on a BP-operated DP rig in the GoM will function as designed to secure a well, the Deadman and ROV intervention ram closure systems will be tested when the BOP stack is installed subsea.

For the Development Driller III relief well, we will do a surface ROV intervention system test using the ROV pump and Stack-magic control fluid. To test the emergency system once the stack is connected to the wellhead subsea, we will test the Deadman.

Scott Sigurdson
VP Engineering, Drilling and Completions 4/27/10

## 1 DROPPING THE DRILLSTRING

A quick decision may have to be made by the Driller to drop the drillstring. The outcome of this "last resort" depends on the severity of the kick and the speed of execution of the correct procedure

Situations that may require the drillstring to be released include:

- If an internal blowout occurs and the shear rams cannot be used.
- If an internal blowout occurs when the drill collars are across the BOP
- As an alternative to the use of shear rams in the event of an internal blowout when drillpipe is in the stack.
- If the BOP develops a leak and no back-up is available.

It is important to be sure that the string will clear the BOP once it has been dropped (especially on a floating rig in deepwater).

### 1.1 RECOMMENDED PRACTICE FOR DROPPING DRILLSTRING

1 If the topdrive is connected, pick up the string as far as possible to position a tool joint three feet above the rotary table height.

2 Stop circulating. Set the slips and break the connection three times.

3 Pick up on the drillstring and remove the slips.

4 RIH until the tool joint is as far below the rotary table as possible

5 Select reverse on the topdrive, set the torque limiter to maximum and turn the topdrive at maximum RPM until the string separates

6 If this operation has to be carried out while tripping, and after following the above procedure the string has not parted, consideration should be given to using the annular BOP to hold the lower section of the drillstring.

### 1.2 RECOMMENDED PRACTICE FOR DROPPING DRILL COLLARS

1. Position the elevators (manual) near the rotary table and attach an air hoist to the latch. If air-operated elevators are in use, position so that at least one joint (but less than two) is above the rotary table.
2. Close the annular preventer with 1500 psi closing pressure to support the string weight. Where possible, consider closing both annulars.
3. Unlatch/open the elevators.

4 Open the annular preventer(s) and release the drill collars

5 Close the blind/shear rams, after string has had time to clear the BOP's.

6. Read and record shut-in pressure and pit gain

7 Great care should be taken to ensure safety of personnel during these operations.

## 2 SHEARING THE DRILLSTRING

Blind shear rams (BSR's) can be used to cut drillpipe and then act as blind rams in order to isolate the well.

Shearing the pipe is an operation that should be conducted only in exceptional circumstances and can be considered in the following situations:

- In preference to dropping the pipe in the event of an internal blowout.
- When it becomes necessary to move a floating rig off location at short notice.

When there is no pipe in the hole, the BSR's may be used as blind rams.

Most BSR's are designed to shear effectively only on the body of the drillpipe. Procedures for the use of BSR's must therefore ensure that there is no tool joint opposite the ram prior to shearing.

**NOTE: Some subsea BOP stacks have insufficient clearance between the upper pipe rams and the BSR to hang-off on the upper rams and shear the tube of the pipe.**

Rig personnel must know the capabilities (i.e what size and grade of pipe can be sheared) and operating parameters of the shear rams installed in the rig's BOP stack.

Optimum shearing characteristics are obtained when the pipe is stationary and under tension. It is recommended that the string weight be partially hung off prior to shearing. Hanging off the pipe also ensures that there is no tool joint opposite the shear rams. Maximum operating pressure should be used to shear the pipe.

### 2.1 RECOMMENDED PRACTICE

1. Space-out to ensure that there is no tool joint opposite the shear rams.
2. Close the hang-off rams and hang-off the string.

3. Ensure that the pipe above the hang-off rams remains in tension.
4. Close the shear rams at maximum accumulator pressure.
5. Monitor the well

## 3 DISCONNECTING LMRP

There are several situations that could arise during well control operations that may require disconnecting the LMRP and moving off the well:

- If high annulus pressures approach the rated working pressure of the BOP's or because of equipment failure
- Vessel movement due to adverse weather conditions (anchor chain or DP failure).
- Impending vessel collision or fire.

### 3.1 BULLHEAD AND EMERGENCY DISCONNECT

- Attempt to bullhead the kick back into the formation.
- If a drop in dart sub is in use, pump down (with kill mud, if available) the dart until it lands in the dart sub, while controlling annulus pressures.
- After the dart seats, bleed off drillpipe pressure and observe to see if dart is holding pressure.
- If the dart is holding pressure, close and lock lower pipe rams - assuming string is already hung off on designated hang-off pipe rams
- Displace riser with sea water
- Close all fail-safe valves.
- Shear pipe and lock the shear rams
- Disconnect lower marine riser package.
- Slack off guide line tensioners, where applicable.
- Move rig off location.

### 3.2 EMERGENCY DISCONNECT (NO BULLHEAD)

- Stop the well control operation.
- Stop pumping.
- Close all fail-safe valves.
- Close and lock lower pipe rams (assuming string is already hung off on the designated hang-off rams).
- Shear pipe and lock the shear rams.

- Disconnect lower marine riser package.
- Slack off the guidelines, if applicable, and move rig off location.

## 4 RECONNECTION FOLLOWING EMERGENCY DISCONNECT

- Move rig back to well site. Run and latch LMRP. Displace riser with kill mud and pressure test choke and kill lines. Do not use any preventers for well control operations until tested.
- Open kill line fail-safe valves and observe drillpipe pressure (there will be no pressure if dart is holding). If pressure is observed, either the dart is not holding (though kill procedures can continue) or consider the possibility that the string has been dropped. If this is the case, the choke and kill line pressures would be the same and the only well control options would involve the use of the Volumetric method or bullheading to kill the well.
- Open choke line fail-safe valves below lower pipe rams and observe casing pressure.
- Pump down kill line to ensure that circulation through dart is possible. Observe pressure increase on choke line gauge.
- If circulation is possible then continue to kill well using kill line gauge as drillpipe pressure and choke line gauge as casing pressure.

Be sure to re-establish circulating pressures as previous slow circulating rate figures will no longer apply.

- If circulation is impossible then consider bullheading or the Volumetric method.

## 5 BLOWOUT/UNDERGROUND BLOWOUT

Contingency planning must be prepared on the following basis.

**Stage 1 - Early Response:** Pre-determined operations that can be implemented regardless of the type of blowout, including preparations for abandoning the installation and mobilizing emergency/support services

**Stage 2 - Containment:** Operations designed to reduce the maximum possible damage, most of which occurs during the first 1-2 hours and depends on the type and severity of the blowout.

**Stage 3 - Control:** Requires the assistance of specialists and may involve some of the following services and disciplines:

- Well capping.
- Relief well planning.
- HP pumping vessels/equipment.
- Logistics.
- Operations support/contractor personnel.
- Pollution control.
- News/media interface
- Regulatory authority interface.
- Insurance adjusters.

An underground blowout occurs when formation fluids flow from one subsurface zone to another.

The majority of underground blowouts have been the result of fracturing a shallower, weaker zone when shutting in on a kick originating from a deeper, more highly pressured zone.

**If an underground flow is confirmed, the Operator Representative and the Rig Manager Performance must be notified immediately.**

The direction of flow is important when choosing a control procedure.

### 5.1 FLOW TO A FRACTURE ABOVE A HIGH PRESSURE ZONE

Figure 7 2 1. shows a decision tree for identifying and dealing with an underground blowout of this type. If an underground blowout is suspected, no attempt should be made to control the well using standard techniques. If the annulus is opened, reservoir fluids will be allowed to flow up the well to surface, thereby increasing surface pressures.

### 5.2 FLOW TO A FRACTURE/LOSS ZONE BELOW A HIGH PRESSURE ZONE

Flow down the wellbore from a high-pressure zone usually occurs when drilling into a naturally fractured, cavernous or structurally weak formation. The resultant losses reduce the hydrostatic head of the drilling fluid to such an extent that a permeable zone higher in the wellbore begins to flow.

When the well is shut-in, it is unlikely that any pressure will be recorded on either the drillpipe or the casing, although the casing pressure may increase if gas migrates up the annulus. Pumping mud down the annulus will prevent this rise in pressure.

Figure 7.2.2. shows the decision tree for identifying and dealing with an underground blowout of this type.

### 5.3 RECOGNIZING AN UNDERGROUND FLOW

**Indicators of underground flow**

- Loss of returns and erratic increases in annulus pressures while circulating out a kick as the mud in the annulus is lost to a fracture zone and replaced by more influx
- After shutting in the well, the build up of SIDPP and SICP will be interrupted by a sudden reduction in both as the formation fractures.
- Unstable or fluctuating SIDPP and SICP may result from the unsteady flow from one or more formations or from the fractured formation opening or closing in response to the changing pressures.
- In most cases, there will be little or no communication between the drillpipe and annulus. SIDPP may change without being reflected by the SICP and vice versa.
- Both SIDPP and SICP may fluctuate simultaneously or independently of each other.
- If the formation collapses around the drillstring the SICP may stabilize while the SIDPP continues to change.
- SIDPP may be greater than the SICP as a result of formation fluids entering the drillpipe.
- SIDPP may fall or go on vacuum if the mud U-tubes from the string and is not replaced by influx
- Perform a test to confirm whether or not the shut in well is a closed system. Pump a small amount of fluid down the drillpipe and if the DPP and SICP increase, the open hole is intact If neither the DPP nor the SICP increase then a fracture exists in the open hole.

### 5.4 KILL METHODS

The monitoring and recording of the initial drillpipe and casing pressures is important for selecting a method of killing the well. Although the drillpipe pressures may not provide a reading with which to accurately determine bottom hole pressure, they could indicate the minimum pressure required to control the kick (i.e. the maximum SIDPP seen prior to the formation breaking down would be used to calculate the minimum kill mud weight).

5.4.1 FLOW TO A FRACTURE ABOVE A HIGH PRESSURE ZONE

If readily available, consider running a temperature/noise log through the drillstring in order to locate the loss zone

**A. Heavy Pill**

- Calculate the minimum pressure required to control the kick using the highest SIDPP recorded.
- Select a range of densities for a heavy pill that, in combination with the existing mud weight, will provide the equivalent of the minimum hydrostatic pressure to control the kick.
- Calculate the height the pill will occupy in the annulus, convert it to a volume and mix three times the required amount to account for out of gauge hole and influx cutting.
- Displace (with the choke closed) the heavy pill down the pipe and into the annulus at as fast a rate as possible to reduce contamination by the influx.
- The original mud in the annulus must be conditioned to a density that will control the formation pressure at bottom and the heavy pill used to kill the well must be circulated out in stages in order to avoid re-fracturing the formation.
- Once the well is killed and losses have ceased, POOH and cement the fractured zone.

**B. Barite Plugs**

If the losses continue, spot a Barite plug on bottom of at least 500ft (150m) high and 3 ppg (360kg/ $m^3$, 0.36kg/l) heavier than current mud weight.

- The high density/fine particle size of Barite, when mixed with fresh water containing no suspension agent, enables the Barite to settle out rapidly when pumping ceases to form an impenetrable barrier that seals off the flowing zone.
- The surface mixing facilities and plug placement must be continuous and rapid If mixing or pumping is halted for even a short time, settling in the pits or plugging of the drillstring will occur.
- Barite plugs have the following advantages:
- They can be pumped through the bit and offer a reasonable chance of recovering the drillstring.
- The plug can be drilled easily if required.

Barite - Fresh Water Slurry Recipe (for 1 bbl/0 16 $m^3$)

| Required Density | Volume of Fresh Water | Weight of Barite |
|---|---|---|
| 18 ppg (2.15 kg/l) | 0 642 bbls (0.102 $m^3$) | 530 lbs (240 kg) |
| 20 ppg (2.40 kg/l) | 0 560 bbls (0.089 $m^3$) | 643 lbs (292 kg) |
| 21 ppg (2.51 kg/l) | 0.528 bbls (0 084 $m^3$) | 695 lbs (315 kg) |
| 22 ppg (2.63 kg/l) | 0.490 bbls (0 078 $m^3$) | 750 lbs (340 kg) |

A complex phosphate, such as sodium acid pyrophosphate (SAPP) or sodium hexametaphosphate, should be added to act as a thinner in case of contamination by mud in the annulus or by low quality barite. The concentration required is 0.7 ppb (2 kg/$m^3$).

**NOTE: Complex phosphates will thermally degrade if the down hole temperature exceeds 140°F (60°C). If this is the case, a mixture of lignosulphonate 0.4 ppb (1.14 kg/$m^3$) and caustic soda 0.25 ppb (0.71 kg/$m^3$) can be used instead.**

Optimum barite settling is achieved by adjusting the pH to 8-10 with 0.25 ppb (0.71 kg/$m^3$) of caustic soda.

Barite Diesel Oil Slurry Recipe (for 1 bbl/0.16 $m^3$):

(A barite plug derived from a barite - diesel oil slurry is preferred in oil based or invert emulsion muds. A barite · fresh water slurry can be used provided there is a diesel oil spacer ahead of and behind the slurry )

| Required Density | Volume of Diesel | Weight of Barite |
|---|---|---|
| 18 ppg (2.15 kg/l) | 0.610 bbls (0.097 $m^3$) | 572 lbs (259 kg) |
| 20 ppg (2.40 kg/l) | 0.541 bbls (0.086 $m^3$) | 679 lbs (308 kg) |
| 21 ppg (2.51 kg/l) | 0.503 bbls (0.080 $m^3$) | 730 lbs (331 kg) |
| 22 ppg (2.63 kg/l) | 0.471 bbls (0.075 $m^3$) | 781 lbs (354 kg) |

An oil wetting agent is added to increase the settling rate at a concentration of 5.0 ppb (14.0 kg/ $m^3$).

5.4.2 FLOW TO A FRACTURE/LOSS ZONE BELOW A HIGH PRESSURE ZONE

If readily available, consider running a temperature/noise log through the drillpipe to locate the loss zone.

- Keep pumping seawater down the annulus until a suitable LCM pill, polymer plug, cement slurry, or diesel-bentonite plug has been prepared.
- Mix and spot a diesel-bentonite 'gunk' plug (diesel, 400 ppb bentonite, 15 ppb of LCM) equal to or greater than the hole volume below the loss zone.
  - At a depth 100 ft (30 m) above the loss zone, pump 5 bbls (0.8 m$^3$) of diesel ahead of and behind the plug.
  - When the plug begins to exit the drillstring, close the annular preventer and pump mud into the annulus at 2 bbls/min (300 l/min) while displacing the plug at 4 bbls/min (600 l/min).
  - Once 50% of the plug has been displaced from the string, reduce the pump rates to 1 bbl/min (150 l/min) down the annulus and 2 bbls/min (300 l/min) down the drillstring.
  - Once 75% of the plug has been displaced from the string attempt a 'hesitation squeeze' with 100-500 psi (690-3450 kPa, 6 9-34.5 bar) surface pressure.
  - Under displace plug by 1 bbl, POOH, and allow plug 8-10 hours to set.
- Other Alternatives

*Cement loss zone (Refer to Section 8 Subsection 8 Item 6.4, Balanced Plug)*

*Figure 7.2.1, Decision Analysis for Flow to a Fracture or Loss Zone*

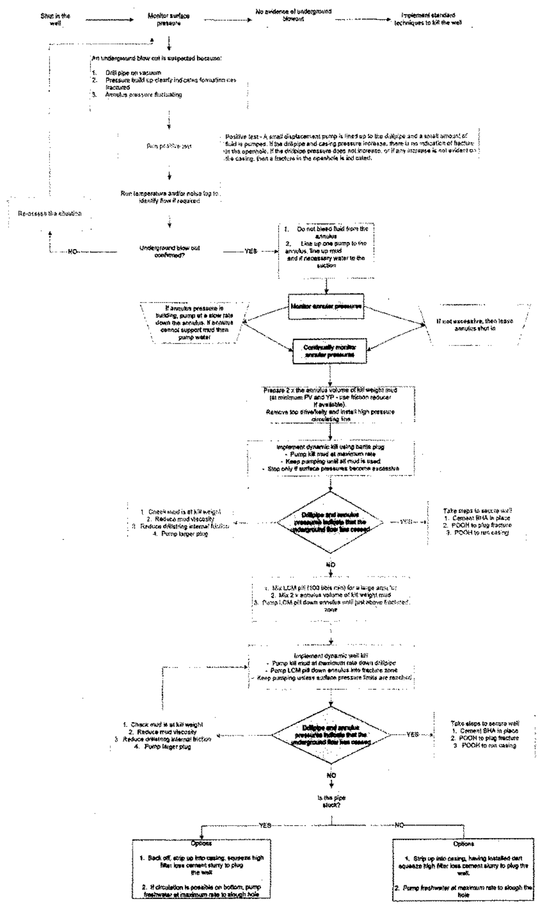
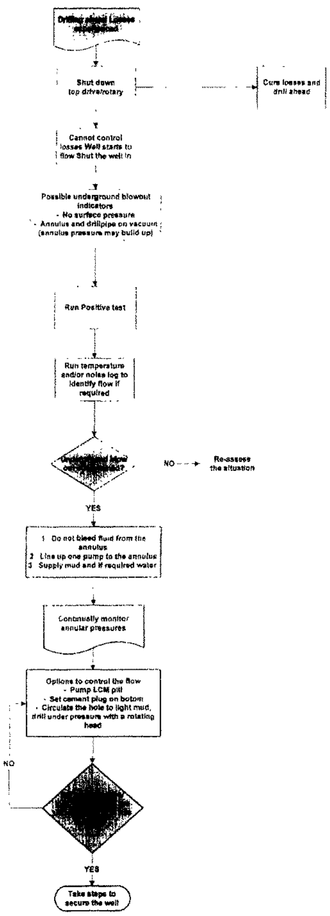


*Figure 7.2.2, Decision Analysis for Flow to a Fracture or Loss Zone Below a High Pressure Zone*



**RB FALCON**
**DEEPWATER HORIZON**
**BOP ASSURANCE ANALYIS**

**Deepwater Horizon BOP Assurance**

## A Report Prepared by

*WS ATKINS INC*

**on behalf of**

**RB Falcon**

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## WS Atkins Inc

***DOCUMENT ISSUE CONTROL SHEET***

RB Falcon

Deepwater Horizon BOP Assurance

| Issue | Date | Purpose | Rev. Desc. | Prepared | Checked | Approved |
|---|---|---|---|---|---|---|
| 1 | February 2001 | Internal revision for WS Atkins Review | 0 | JET | TB | JET |
| 2 | February 2001 | Copy for Client Review | 1 | JET | TB | JET |
| 3 | March 2001 | Final Report | 2 | JET | TB | JET |
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**EXECUTIVE SUMMARY**

An Integrated Project Team was convened on January 8th, 2001 to provide a high level of confidence that the BOP system on the Deepwater Horizon is a reliable and safe system. The following summarizes the work completed by the RB Falcon, BP, Cameron, TSF and WEST team:

- The rig specific failures were reviewed and discussed in detail. The result of the review was that several recommendations for enhanced maintenance, equipment and procedures were developed.
- The industry failures that relate to the equipment on the Deepwater Horizon BOP System were discussed in detail. The results of this review were that a few recommendations were suggested for improved maintenance, testing and equipment change out or modification.
- A risk assessment focused on reliability was completed. Engineering and operations personnel from RB Falcon, BP, Cameron, TSF and WEST identified 260 failure modes that could require pulling of the BOP or LMRP. It was found that malfunctions of regulators, solenoids, hoses, ST Locks, connectors, shuttle valves and autoshear circuitry were the predominant failures. Additionally, several reliability-improving recommendations were proposed. The recommendations were a combination of design modifications, equipment replacement, improved PM and procedures.
- The revised running BOP procedures should be reviewed and accepted for use on the Deepwater Horizon. The BOP hang-off and retrieval procedure should be revised in a similar manner to the revision that was completed on the BOP running procedure.
- The hazards identified during the HAZID analysis should be issued to the rig so that the individuals responsible for running the BOP can be reminded of the hazards and critical steps associated with running the BOP. This information can be used to evaluate the criticality of any changes in procedure that occur due to equipment malfunctions or time constraints while running the BOP.
- The Gap analysis performed revealed that the major difference between the Deepwater Horizon and the Discoverer Enterprise BOP Assurance Analysis was the level of PM review completed. The Deepwater Enterprise team reviewed PM's in detail to make sure that the BOP maintenance is sufficient to uncover the major failure modes identified during the analysis and to ensure that the maintenance is performed at the appropriate frequency (i.e. quarterly, between well, etc.) Individual procedures were not reviewed during the Discoverer Enterprise BOP Assurance Analysis. The predominant failures from both analyses were similar; solenoids, hoses, connectors, shuttle valves and ram locking mechanisms.

It is important that all the recommendations associated with this analysis be reviewed and acted upon by the appropriate managers within RB Falcon.

# 1. INTRODUCTION

## 1.1 Background

RB Falcon (RBF) has requested that WS Atkins Inc. perform a BOP Assurance Analysis of the Deepwater Horizon BOP System. The objective of the analysis is to evaluate the Horizon BOP and identify failure scenarios that lead to situations where the LMRP of BOP must be pulled and repaired (significant down time), and to review the BOP running, retrieval and handling procedures and identify hazards associated with the procedures. The lessons learned will be used to eliminate or minimize the consequence of system failures.

## 1.2 Scope of Work

In order to achieve the objectives of the analysis the following tasks were completed.

- Identify failure scenarios that require the LMRP or BOP to be pulled to the surface and repaired.
- Determine which modes of operation the failure scenarios identified affect.
- Perform a failure mode, effect and criticality analysis (FMECA) on each unique LMRP and BOP Function.
- Perform a HAZID on the Horizon BOP running, retrieval and handling procedures.

The analysis was performed in a three-step process. The methodology of the analysis is detailed in Section 3 of this report. The FMECA was limited to the subsea portions of the Deepwater Horizon BOP while the HAZID included the review of both surface and subsea portions of the system.

The analysis was carried out at the RB Falcon offices in Houston, Texas. The study was conducted between January 8 and January 15, 2001. The team members that participated in the study are listed in Table 1.1.

**Table 1.1: Team Members**

| Name | Company | E-mail |
|---|---|---|
| Russ Krohn | RBF | rkhron@rbfalcon.com |
| Matt Goulett | RBF | mgoulett@rbfalcon.com |
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## 2. SYSTEM DESCRIPTION

The multiplex control system uses both subsea and surface equipment to control the blowout preventer stack installed on the wellhead at the sea floor. The stack is in two sections: a lower stack connected to the wellhead and a retrievable upper stack (LMRP) connected to the lower stack. The major subsea units of the system are the subsea multiplex units, the electro/hydraulic control pods, and the retractable stabs. These units are mounted on the upper stack. In addition an accumulator system mounted on both the lower and upper stack.

The principle function of the BOP control system is to control, operate and monitor the various closing devices of the BOP stack. Although these closing devices are operated hydraulically, electrical signals control application of the hydraulic operating pressures. The multiplex BOP control system supplies both the hydraulic operating pressures and the electrical control signals in the manner described below. The accumulator pump unit develops the hydraulic pressures and routes them to the subsea control pod. Control panels at the surface originate the electrical control signals. The CCU encodes these signals and transmits them through electrical cables to the subsea multiplex unit where they are decoded and routed to the control pod. The decoded signals operate control devices that direct the hydraulic operating pressure to the selected stack functions.

General functions controlled by the multiplex BOP control systems are:

A. LMRP Functions
   1. Annular Preventer (Upper & Lower)
   2. Riser Connector
   3. Hydraulic Stabs
   4. Mud Boost Valve
   5. Bleed Valves

B. BOP Functions
   1. Blind Shear Ram
   2. Casing Shear Ram
   3. Upper Pipe Ram
   4. Middle Pipe Ram
   5. Lower Pipe Ram
   6. Stack Connector
   7. Choke & Kill Valves

In addition to the general control functions, the multiplex system also provides continuous control and monitoring of surface and subsea hydraulic pressures and fluid flow and displays status indications for the subsea electrical and electronic equipment.

The multiplex control system provides operational reliability through equipment redundancy. The two operational systems are designated yellow and blue. Each system is capable of operating all stack functions, but only one system is used at a time.

Both systems share the control panels at the CCU and Driller's Panel, and some of the electronic circuitry in the CCU Both systems also share the hydraulic power developed at the accumulator pump unit. There are, however, two separate cable reels and two complete sets of subsea units including the control pods, multiplex cables, subsea multiplex unit and retractable stabs. Although only one system is operational at a time, both systems receive hydraulic power and electrical control signals and switchover can be accomplished in minimum time.

## 3. METHODOLOGY

The objective of the analysis was to evaluate the Deepwater Horizon BOP and identify failure scenarios that lead to situations where the LMRP of BOP must be pulled and repaired (significant down time) and to review the BOP running, retrieval and handling procedures and identify hazards associated with the procedures. The lessons learned will be used to eliminate or minimize the consequence of system failures. This objective was achieved by performing the following task:

- Review the layout of the RBF BOP,
- Perform a risk assessment and FMECA of the Deepwater Horizon BOP.
- Review the BOP running, retrieval and handling procedures.
- Perform a HAZID on the deepwater Horizon BOP running, retrieval and handling procedures.

The analysis was performed in a three-phase process:

**Phase I**: During a brain storming session the team determined which failure scenarios lead to situations where the LMRP or BOP must be pulled and repaired. The results of the brainstorming session were evaluated to determine the relevance of the failure scenarios to each drilling operation mode. The results from this portion of the analysis were recorded in a table (see example Table 3.3) that lists the failure scenarios that lead to a pull of the LMRP or BOP. The table also details the operating modes that each failure scenario can affect. The main purpose of Phase I was to get the team members to agree on which failure scenarios require the LMRP or stack to be pulled.

**Phase II**: For each function identified in Phase I a failure mode, effect and criticality analysis (FMECA) was performed. The hydraulic and electrical diagrams were reviewed to determine which failure modes can lead to a loss of the function. The team was also asked to evaluate the cause; local effect, system effect, detection method, mitigation, frequency; consequence, risk rank, and recommendations for eliminating the failure or reducing the effects of the failure. The work performed in this phase of the analysis was also recorded on worksheets. The worksheet template is attached as Table 3.4 through Table 3.6.

**Phase III**: A HAZID was performed on the BOP running, retrieval and handling procedures. The detailed procedures were reviewed and the hazards associated with each step in the procedures were identified. The team was asked to identify the consequences, safeguards, recovery plan, and recommendations for each hazard identified. The work performed in this phase of the analysis was recorded on worksheets. The worksheet template is attached as Table 3.7.

Each failure identified was ranked according to the ranking system detailed in Table 3.1 and Table 3.2

**Table 3.1: Consequence**

| Consequence | Consequence Definition |
|---|---|
| Very High | Potential flow to environment |
| High | Pull BOP |
| Moderate | Pull LMRP |
| Low | Nuisance |

**Table 3.2: Frequency**

| Frequency | Frequency Definition |
|---|---|
| Very High | Frequent: Once every 4 months |
| High | Probable: Once every 8 months |
| Moderate | Possible: Once per year |
| Low | Unlikely: Once per 5 years |

The criticality analyses for each failure mode is determined by its placement within the matrix based on the frequency and consequence ratings. The matrix is presented in Figure 3.1. The most critical failure modes are represented by a "VH" (very high) in the upper right corner of the matrix, while the least critical failure modes will have an "L" (low) in the lower left corner of the matrix.

**Figure 3.1: Criticality Matrix**

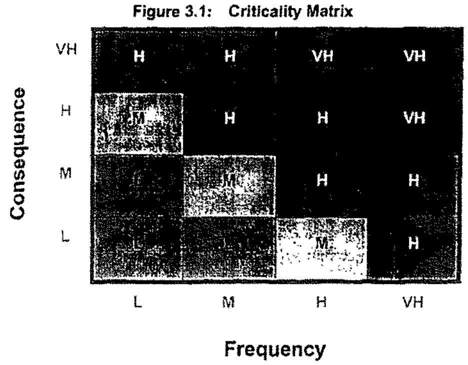

**Table 3.3: Phase I: Failure Scenario vs Operation Mode**

| FAILURE SCENARIO | | | Operation Mode | | | | |
|---|---|---|---|---|---|---|---|
| | | | Running/ Landing BOP | Drilling | Running Casing | Completion | Well Testing |
| LMRP | 1. | Loss of Riser (leak of: mud seal, boost line, choke & kill line, rigid conduit, flex joint, mux cables, etc.) | | | | | |
| | 2. | Loss of Annular (external leak) | | | | | |
| | 3. | Total loss of one pod | | | | | |
| | 4. | Loss of one critical function on one pod (not a major leak) | | | | | |
| | 5. | etc. | | | | | |
| | 6. | | | | | | |
| | 7. | | | | | | |
| BOP | 1 | Loss of Choke & Kill valve connection | | | | | |
| | 2 | Loss of shear ram | | | | | |
| | 3. | Loss of more than one pipe ram | | | | | |
| | 4. | Loss of one choke or kill valve outlet (fail to open) | | | | | |
| | 5. | etc. | | | | | |
| | 6. | | | | | | |
| | 7. | | | | | | |

Table 3.4: Step Three: FMECA Template

| | | |
|---|---|---|
| **FMECA Report Form** | System: Deepwater Horizon<br>Section : LMRP<br>Section No.: I | Section Description: |
| Rev. no.: 0<br>Date: 01/12/01 | Function Annular Preventer Open/Close<br>Function No.: 1 | Function Description: |

| Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking | | | Recommendation |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | F | C | R | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Table 3.5: FMECA Worksheet Headings

| | |
|---|---|
| **System:** | The system being analyzed. For this FMECA the Deepwater Horizon BOP is the system. |
| **Section:** | The name of the section (LMRP or BOP). |
| **Section No.:** | A Roman numeral used to identify the section. |
| **Section Description:** | A description of the section. |
| **Rev. no:** | The revision number for the worksheet. |
| **Date:** | The dates that the worksheets were filled out or revised. |
| **Function:** | The name/description of the function in the section. |
| **Function No.:** | The number of the above function. |
| **Function Description:** | A description of the function(s) of the component group. |





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**Table 3.6: FMECA Worksheet Columns**

| | |
|---|---|
| **Failure Mode:** | For each function failure modes are identified and recorded. A failure mode is defined as the manner by which a failure is revealed. All units are designed to fulfill one or more functions; a failure is thus defined as non-fulfillment of one or more of these functions. |
| **Causes:** | The possible failure mechanisms (corrosion, erosion, fatigue, etc.) that may produce the identified failure modes |
| **Local Failure Effect:** | The main effects of the identified failure modes on the localized parts. |
| **System Effect:** | The main effects of the identified failure modes on the primary function of the system and the resulting operational status of the system after the failure. |
| **Method of Detection:** | The various possibilities for detection of the identified failure modes. These may involve different alarms, testing, human perception, and so on. Some failures are called *evident failures*. Evident failures are detected instantly. Another type of failure is called the *hidden failure*. A hidden failure is normally detected only during testing of the unit. The failure mode "fail to start" of a pump with operational mode "standby" is an example of a hidden failure. |
| **Mitigation:** | Possible actions to correct the failure and restore the function or prevent serious consequences are then recorded. Actions that are likely to reduce the frequency of the failure modes are also recorded. |
| **Ranking:** | Failure modes will be ranked according to a broad classification using a 4 x 4-risk matrix. Frequency and Consequence categories as outlined in Tables 1 and 2 define the matrix. |
| **Recommendation:** | Action that the team recommends for reducing the effects or occurrence of the failure. |

Table 3.3.7: Phase III HAZID Template

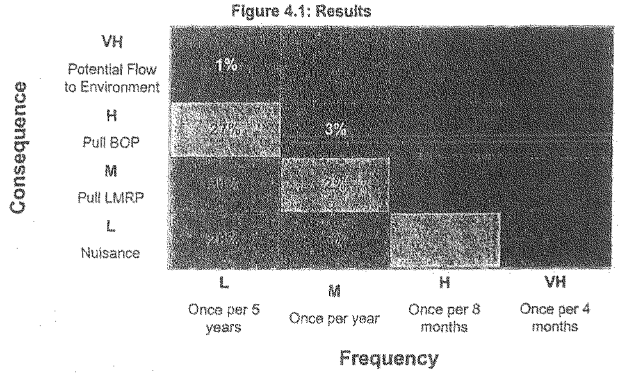
| | | |
|---|---|---|
| **HAZID Report Form** | System: Deepwater Horizon BOP<br>Procedure: Running BOP<br>Procedure No.: 1 | Rev. no.: 0<br>Date: [illegible] |

| Step of Procedure | Hazard | Consequence | Safeguard | Recovery Plan | Recommendation |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

## 4. RESULTS

The results of the analysis are detailed in this section of the report. Figure 4.1 details the results of the FMECA. The table shows the percentage of the total failures identified associated with each location in the risk matrix. A total of 260 failure modes were identified during the analysis.

**Figure 4.1: Results**




| Color | Category | % of Failure Modes in Category |
|---|---|---|
| | Very High Risk | 0% |
| | High Risk | 4% |
| | Moderate Risk | 29% |
| | Low Risk | 64% |

Note: 4% of the failures identified were not ranked. These failures were not ranked because they did not represent new issues that required ranking.

The failure scenarios that require the LMRP or BOP to be pulled are listed in Table 4.1. The information identified in the table is the information that the group agreed to on day one of the study. The table also details the modes of operation affected by the failure scenario.

The HAZID analysis was only completed on the running the BOP procedure; there was not sufficient time to complete the HAZID on the hang-off and retrieval procedure. However, the hazards identified for the running procedure will be similar to the hazards experienced when hanging-off or retrieving the BOP. Table 4.2 details the hazards associated with each step of the original running procedure. The numbers in the first column of the HAZID correspond with the step number identified in the original procedure.

**Table 4.1: Failure Scenario vs Operation Mode**

| | Failure Scenario | Operation Mode (Dynamic Positioning) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Running/ Landing BOP | Drilling | Running Casing | Completion | Well Testing | Logging | Cementing |
| Pull LMRP | 1. Leaking Riser Connector Seal (Main Tube) or Leaking Flex Joint | Difficult to detect. | Pull LMRP. | Complete casing run and then pull LMRP. | Secure well. Pull LMRP. | Secure well. Pull LMRP. | Secure well. Pull LMRP. | Complete cement job and then pull LMRP. |
| | 2. Leaking choke or kill line on riser | Pull BOP to point of leak. | Pull LMRP. | Complete casing run and then pull LMRP. | Secure well. Pull LMRP. | Secure well. Pull LMRP. | Difficult to detect. | Difficult to detect. |
| | 3. Leaking Rigid Conduit | Pull BOP to point of leak. | Pull LMRP. | Case-by-case depending on location of casing. Pull LMRP. | Secure well. Pull LMRP. | Secure well. Pull LMRP. | Secure well. Pull LMRP. | Complete cement job and then pull LMRP. |
| | 4. Damaged MUX cable (loss of one cable) | Pull BOP. | Secure well. Pull LMRP. | Complete casing run and then pull LMRP. | Secure well. Pull LMRP. | Secure well. Pull LMRP. | Secure well. Pull LMRP. | Complete cement job and then pull LMRP. |
| | 5. Leaking Mud Boost Line | Pull BOP to point of leak. | Continue and use choke or kill line as boost line. | Continue and use choke or kill line as boost line. | Continue and use choke or kill line as boost line. | Continue and use choke or kill line as boost line. | Continue and use choke or kill line as boost line. | Continue and use choke or kill line as boost line. |
| | 6. Leaking Hot Line (assuming hot line shut-down after BOP landing) | Pull BOP to point of leak. | | | | | | |

| | Failure Scenario | Operation Mode (Dynamic Positioning) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Running/ Landing BOP | Drilling | Running Casing | Completion | Well Testing | Logging | Cementing |
| Pull LMRP | 7. Loss of one Annular | Difficult to detect. | Continue. | Continue. | Continue. | Continue. | Continue. | Continue. |
| | 8. Bleed valve fails to open – Note: Well Control procedures will need to be reviewed and revised. | Difficult to detect. | Continue. | Continue. | Continue. | Continue. | Continue. | Continue. |
| | 9. Loss of one pod | Pull BOP. | Secure well. Pull LMRP. | Complete casing run and then pull LMRP. | Secure well. Pull LMRP. | Secure well. Pull LMRP. | Secure well. Pull LMRP. | Complete cement job and then pull LMRP. |
| | 10. Leaking Choke or Kill isolation valve | Pull BOP. | Continue. | Continue. | Continue. | Continue. | Continue. | Continue. |
| | 11. Leaking Choke or Kill Connector (Bore leak) | Difficult to detect. | Secure well and pull BOP. | Complete casing run and then pull BOP. | Secure well and pull BOP. | Secure well and pull BOP. | Secure well and pull BOP. | Complete cement job and then pull BOP. |
| | 12. Leaking LMRP Connector | Difficult to detect. | Secure well and pull BOP. | Complete casing run and then pull BOP. | Secure well and pull BOP. | Secure well and pull BOP. | Secure well and pull BOP. | Complete cement job and then pull BOP. |

| | Failure Scenario | Operation Mode (Dynamic Positioning) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Running/ Landing BOP | Drilling | Running Casing | Completion | Well Testing | Logging | Cementing |
| Pull BOP | 1. Loss of Blind Shear Ram | Difficult to detect. | Secure well and pull BOP. | Will only be detected during testing. | Will only be detected during testing. | Will only be detected during testing. | Will only be detected during testing. | Will only be detected during testing. |
| | 2. Loss of Casing Shear Ram | Difficult to detect. | Case-by-Case decision between BP & RBF. | Case-by-Case decision between BP & RBF. | Continue. | Continue. | Continue. | Continue. |
| | 3. Loss of Upper VBR (assuming tapered string not used) | Difficult to detect. | Continue. | Continue. | Case-by-case depending on tubing string. | Case-by-case depending on stack-up. | Continue. | Continue. |
| | 4. Loss of Upper VBR (assuming tapered string) | Difficult to detect. | Secure well and pull BOP. | Continue except when running liner. | Secure well and pull BOP. | Secure well and pull BOP. | Complete logging operation and then pull BOP. | Complete cement job and then pull BOP. |
| | 5. Loss of Middle VBR (assuming tapered string not used) | Difficult to detect. | Continue. | Continue. | Case-by-case depending on tubing string. | Case-by-case depending on stack-up. | Continue. | Continue. |
| | 6. Loss of Middle VBR (assuming tapered string) | Difficult to detect. | Secure well and pull BOP. | Continue except when running liner. | Secure well and pull BOP. | Secure well and pull BOP. | Complete logging operation then pull BOP. | Complete cement job then pull BOP. |
| | 7. Loss of Lower Pipe Ram | Difficult to detect. | Continue. | Continue. | Continue. | Continue. | Continue. | Continue. |

| | Failure Scenario | Operation Mode (Dynamic Positioning) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Running/ Landing BOP | Drilling | Running Casing | Completion | Well Testing | Logging | Cementing |
| Pull BOP | 8. Loss of more than one pipe ram | Difficult to detect. | Secure well and pull BOP. | Complete casing run then pull BOP. | Secure well and pull BOP. | Secure well and pull BOP. | Secure well and pull BOP. | Complete cement job then pull BOP. |
| | 9. Loss of upper choke outlet (one valve fails to open) | Difficult to detect. | Continue. | Continue. | Case-by-case depending on space out. | Case-by-case depending on space out. | Continue. | Continue. |
| | 10. Loss of lower choke outlet (one valve fails to open)<br>Note: Hang off procedures will need to be reviewed. | Difficult to detect. | Continue. | Continue. | Case-by-case depending on space out. | Case-by-case depending on space out. | Continue. | Continue. |
| | 11. Loss of upper kill outlet (one valve fails to open) | Difficult to detect. | Case-by-case. | Complete casing run then case-by-case for pull BOP. | Case-by-case depending on space out. | Case-by-case depending on space out. | Complete logging operation then case-by-case for pull BOP. | Complete cement job then case-by-case for pull BOP. |
| | 12. Loss of lower kill outlet (one valve fails to open) | Difficult to detect. | Continue. | Continue. | Case-by-case depending on space out. | Case-by-case depending on space out. | Continue. | Continue. |
| | 13. Leak at Wellhead Connector. | Difficult to detect. | Secure well and pull BOP. | Secure well and pull BOP. | Secure well and pull BOP. | Secure well and pull BOP. | Secure well and pull BOP. | Secure well and pull BOP. |

**NOTE: All scenarios subject to case-by-case evaluation when/if failures occur. Table evaluated assuming worst-case scenarios.**

**Table 4.2 Running BOP HAZID**

| HAZID Report Form | System: Deepwater Horizon BOP<br>Procedure: Running BOP<br>Procedure No.: I | Rev. no.: 1<br>Date [illegible]<br>"Procedure used in analysis is attached as *Appendix D*" |
|---|---|---|

| Step of Procedure | Hazard | Consequence | Safeguard | Recovery Plan | Recommendation |
|---|---|---|---|---|---|
| 1 | Wrong calculation of RKB to wellhead. | Run incorrect space out. | Rig confirms final RKB to wellhead. | Pull riser to pup joints and rerun with correct space out. | |
| | Failure to collect riser serial numbers. | Loss of PM data. | Action must be checked on Riser Running Sheet (Driller). | Ability to record data when riser pulled. | *Review procedure to ensure that Driller is able to personally confirm all information of Riser Running Sheet in timely fashion.* |
| 2 | Incorrect pressure setting. | Incorrect tension resulting in possible riser failure. | Information provided by Engineering. Error can be caught during riser running process. | Transfer weight slowly to tensioners. | |
| | Pressure gauge out of calibration. | Incorrect tension resulting in possible riser failure. | Multiple sources of pressure indication. PM. | Recalibrate gauge. | |
| 3 | Not prepared to run riser. | Additional time required. | Detailed checklist. Checklist reviewed by multiple parties. | Take time to prepare. | |
| 4 | Failure to correctly calibrate wrench torque. | Possible failure of connection. | PM. Training. Periodic checks. | Pull stack and rerun with correct torque. | *Consider adding gauge to manifold on rig floor.* |

| **HAZID Report Form** | System: Deepwater Horizon BOP<br>Procedure: Running BOP<br>Procedure No.: I | Rev no.: I<br>Date: 01/17/01<br>"Procedure used in analysis is attached as *Appendix D*" |
|---|---|---|

| Step of Procedure | Hazard | Consequence | Safeguard | Recovery Plan | Recommendatio |
|---|---|---|---|---|---|
| 5 | Vessel not offset. | Possibility of tagging wellhead with stack or dropped object. | BOP Running Procedure. (Captain) | Reposition the vessel. | |
| | DP system or positioning system not operational. | Unable to land stack. Possibility of tagging wellhead with stack. | Procedures. | | *Resolve philosophy – Parking lot issue #40.* |
| 6 | Inadequate communication. | High dynamic loads and other major problems. | Pre job meeting. PM of communication equipment. | Ability to suspend operations and correct communications. | *See Parking Lot Issue #39.* |
| 7 | Lack of preparation. | Downtime. No new issues. | | | |
| 8 | Setup with insufficient lifting capacity. | Dropped riser and / or BOP. | Ability to predict loads. | | *Use 1000 ton setup initially and change to 750 if considered prudent later.* |
| | Failure to pull mousehole. | Possible damage to mousehole, transporter and/or BOP. | Procedures. | Repair damaged equipment. | |
| | Failure to put cover over mousehole. | Personnel injury. | Procedures and training. Personnel awareness. | Trained medic on board. | |

| HAZID Report Form | System: Deepwater Horizon BOP<br>Procedure: Running BOP<br>Procedure No.: I | Rev. no.: 1<br>Date: 01/17/01<br>"Procedure used in analysis is attached as *Appendix D*" |
|---|---|---|

| Step of Procedure | Hazard | Consequence | Safeguard | Recovery Plan | Recommendation |
|---|---|---|---|---|---|
| 9 | Open rotary hole. | Personnel injury – potential loss of life. | Procedures and training. Personnel awareness. Area to be roped off. | Man overboard procedures. Fast rescue craft (FRC). Trained medic on board. | |
| 10 | Personnel injury. | No new issues. | Procedures and training. | | *Ensure that JSA exists.* |
| | Improper orientation of gimble spider. | Inability to properly plug in hydraulics. | Training. | Reorient gimble spider correctly. | |
| 11 | No or damaged wellhead connector ring gasket. | Wellhead leak. Possible roundtrip for stack. | Multiple checks. | Ability to replace gasket with ROV. | *Develop, review subsea checklist and ensure gasket inspection is on the checklist.* |
| 12 | Fail to put BOP control system in riser run mode. | Possible loss of stack. | Procedure and training. Multiple checks. | | |
| 13 | Failure to remove end cap. | Potential plugged line. | Procedures and training. Dedicated floorhand to inspect work. | Further inspection prior to stab. | *Ensure dedicated floorhand identified during JSA.* |
| | Trash in line not noticed. | Potential trash in line. | Procedures and training. Dedicated floorhand to inspect work. | Safeguards considered adequate. | *Verify riser flush at some point before being run.* |
| 14A | LMRP Connector not properly latched. | Possible loss of stack. | Procedure and training. PM. | | |

| HAZID Report Form | System: Deepwater Horizon BOP<br>Procedure: Running BOP<br>Procedure No.: I | Rev. no:<br>Date: 01/17/01<br>"Procedure used in analysis is attached as *Appendix D*" |
|---|---|---|

| Step of Procedure | Hazard | Consequence | Safeguard | Recovery Plan | Recommendation |
|---|---|---|---|---|---|
| 14B | Failure to contact Bridge. | Vessel out of trim. Potential for personnel injury or equipment damage. | Procedures. Pre-job meeting. Equipment properly secured and stowed. | Ability to re-ballast vessel. Medic on board. | |
| 14C | Heavy lifting. | Possible personnel injury. Damage to BOP or other equipment. | Training. PM. | Medic on board. Repair equipment. | *Develop procedure for moving BOP from storage area to BOP cart. Perform HAZID on this procedure.* |
| 14D | Damage of hoses or cables. | Damage to BOP control system. Downtime. | Training. Communication. Adequate personnel. | Ability to repair or replace hoses on board. Spare MUX cable on shore. | |
| | Obstruction on track. | Damage to BOP cart or obstructing equipment. Possible inability to run BOP due to cart damage. | Training. Communication. Adequate personnel. Adequate barrier along track (handrails). | Repair cart and/or BOP. | |
| | Pinch points. | Personnel injury. | Adequate barrier along track (handrails). Prejob meetings. | Medic on board. | |

| HAZID Report Form | System: Deepwater Horizon BOP<br>Procedure: Running BOP<br>Procedure No.: I | Rev no.: 1<br>Date: 01/17/01<br>"Procedure used in analysis is attached as *Appendix D*" |
|---|---|---|

| Step of Procedure | Hazard | Consequence | Safeguard | Recovery Plan | Recommendation |
|---|---|---|---|---|---|
| 14E | | | | | *Develop and review deck-handling procedure. (HAZID)* |
| 15 | Personnel injury. | No new issues. | | | |
| | Crossed operating hoses. | Opposite function and inability to latch. | Training. Function testing. | | *Install male and female quick disconnect opposite one another.* |
| | | | | | *Consider developing standard for hydraulic connections (e.g. open is male / close is female).* |
| 16 | RRT not properly latched. | Dropped riser. Possible damage to stack and other rig floor equipment. Personnel injury. | Rising stem is up and manually pinned. (Pin must be in to assure latch.) Procedures and training. Action checked off. | Spare hydraulic tool and manual tool. Medic on board. Repair equipment. | |
| | Faulty or missing seals. | Leaking connection at BOP. Downtime. | Procedures and training. Multiple checks. | Pull riser back to leak point if found during pressure test. | |
| 17 | Improper torque on makeup. | Potential to drop stack. | Procedures and training. PM on wrench. | Retrieve stack. | |

| HAZID Report Form | System: Deepwater Horizon BOP<br>Procedure: Running BOP<br>Procedure No.: I | Rev. no.: [illegible]<br>Date: 0[illegible]/17/01<br>"Procedure used in analysis is attached as *Appendix D*" |
|---|---|---|

| Step of Procedure | Hazard | Consequence | Safeguard | Recovery Plan | Recommendation |
|---|---|---|---|---|---|
| | Improper lubricant. | Potential to drop stack. | Procedures and training. | Retrieve stack. | |
| | Man-riding operations. Personnel working over water in confined spaces. | Man overboard. Personnel injury or loss of life. | PPE. FRC. Workvest. Permit-to-work. JSA. Communications. | Medic on board. | *Review man-riding procedures.* |
| | | | | | *Ensure installation of inertia reels.* |
| | Improper stabbing of first riser joint. | Damage to seal, seal surfaces, pins, etc. | Use of tailing arm. Proper communication between Drill Floor and Moonpool. | Replace damage equipment. | *Evaluate communication to ensure adequate for operations (equipment and processes – both visual and verbal).* |
| | | | | | *Ensure policy to investigate incidents (at the time they occur) if damage may have occurred. "When in doubt – check it out!"* |
| | Pinch points. | No new issues. | | | |

| HAZID Report Form | System: Deepwater Horizon BOP<br>Procedure: Running BOP<br>Procedure No.: I | Rev. no.: 1<br>Date: 01/17/01<br>"Procedure used in analysis is attached as *Appendix D*" |
|---|---|---|

| Step of Procedure | Hazard | Consequence | Safeguard | Recovery Plan | Recommendation |
|---|---|---|---|---|---|
| 18 | Hangup on cart. | Lift up cart. Potential damage to cart or BOP. | Adequate personnel in Moonpool. Good communication between Drill Floor and Moonpool. Retracting pins on BOP cart. | Slack off, evaluate and make repairs. | *Driller to confirm communication with Moonpool before picking up or slacking off.* |
| | | | | | *Develop standard communication signals between Driller and Drill Floor.* |
| | Pick up too far. | Damaged MUX cables. | Training and procedures. Good communication between Drill Floor and Moonpool. | Spare MUX cable on shore. | *Develop philosophy for placement of first MUX clamp.* |
| | Failure to note hook weight. | Inadequate information for tensioner management. | Procedures in place. | Opportunity to capture omission at each joint. | |
| | Failure to install MUX clamp or incorrect installation. | Damaged MUX cable and hot line. | Procedures and training. | Pull stack. Spare MUX cable on shore. | *Ensure proper training and supervision of MUX clamp installers.* |
| | Failure to record bullseye indication. | Possible confusion as to BOP angle at sea floor. | Procedures and checklists. | Inclinometers on stack. | |

| HAZID Report Form | System: Deepwater Horizon BOP | Rev no.: 1 |
|---|---|---|
| | Procedure: Running BOP | Date: 01/17/01 |
| | Procedure No.: | "Procedure used in analysis is attached as *Appendix D*" |

| Step of Procedure | Hazard | Consequence | Safeguard | Recovery Plan | Recommendation |
|---|---|---|---|---|---|
| | Failure to use under hull guide when needed. | Damage to BOP, vessel, other equipment. | Procedures. | | *Use under hull guide for BOP lateral support for every stack run. [Change Procedure?]* |
| 19 | Failure to rotate riser. | Downtime. | Procedures. | | *Verify how riser rotation is accomplished on the Nautilus including effects of under hull guidance. Review for hazards if necessary.* |
| | Hang up of lines during rotation. | Damage to lines and hoses. | Adequate personnel observing operation. | Repair and continue. | |
| | Rotating during rough seas. | Extended exposure to rough seas resulting in equipment damage. | Operating parameters. Adequate personnel observing operation. Weather forecasting ability. | Ability to pull stack and close guide system. | |
| | Failure to hydraulically lock spider. | Potential to drop BOP. | Procedures. Mechanical backup. Multiple hydraulic lines. | Recover BOP. | |
| 20 | Seawater in conduit. | Possible plugged rigid conduit. | Procedure. Training. Plan to flush conduit. | | |

| **HAZID Report Form** | System: Deepwater Horizon BOP<br>Procedure: Running BOP<br>Procedure No.: I | Rev. no.: 1<br>Date: 01/17/01<br>"Procedure used in analysis is attached as *Appendix D*" |
|---|---|---|

| Step of Procedure | Hazard | Consequence | Safeguard | Recovery Plan | Recommendation |
|---|---|---|---|---|---|
| | Failure to fill lines. | Delay in operation. No significant issue. | | | |
| 21 | Overpressure of booster line and conduit. | Damage booster line or rigid conduit. | Procedures. Lines color coded by pressure rating. | Pull and repair. | *Subsea eng. visually ensures correct connections before every test.* |
| | High pressure. | Possible personnel injury. | Rig floor cleared. Announcements made. Permit-to-work. | Medic on board. | |
| | BOP exposed to rough weather for extended period during test. | Potential damage to hoses and cables. | Operating parameters. Adequate personnel observing operation. Weather forecasting ability. | Ability to pull stack. | *Consider running two joints to lessen time BOP is in splash zone during rough weather.* |
| 22 | Failure to latch RRT. | Dropped BOP. Possible damage to stack and other rig floor equipment. Personnel injury. | Rising stem is up and manually pinned. (Pin must be in to assure latch.) Procedures and training. Action checked off. | Spare hydraulic tool and manual tool. Medic on board. Repair equipment. | *Ensure that DWH team develops rig specific riser running plan considering RRT, spider, communication plan and equipment.* |
| | Faulty seals. | No new issues. | | | |

| HAZID Report Form | System: Deepwater Horizon BOP | Rev no.: 1 |
|---|---|---|
| | Procedure: Running BOP | Date: 01/17/01 |
| | Procedure No.: I | "Procedure used in analysis is attached as *Appendix D*" |

| Step of Procedure | Hazard | Consequence | Safeguard | Recovery Plan | Recommendation |
|---|---|---|---|---|---|
| | Excessive dynamic loading. | Exceed lifting ratings or drop BOP. | Training. Monitor weight and environment during run. Weather forecasting. Vessel orientation. | | *Ensure that personnel have proper information and training.* |
| | Drawworks or hoisting system failure. | Potential to drop BOP. | Extensive review of braking system completed. Upgrades made. | | *Ensure that personnel have proper information and training.* |
| | Dropped objects from riser. (Floatation, bolts, etc.) | Potential personnel injury or loss of life. Possible equipment damage. | Inspection prior to lifting. PM. Procedures to clear area. All 316 SS hardware. | Medic on board. | *Also a greater concern when pulling / retrieving (additional safeguard of use of straps on damaged equipment when pulling). Also a concern in the Moonpool.* |
| 23 | Failure to test. | No new issues. | | | |
| 24 | Improper space out. | Delay in operation due to string being wrong length. | ROV. Compare riser counts. Bathymetry review. | Flush and repair if necessary. (Case-by-case.) | |

| HAZID Report Form | System: Deepwater Horizon BOP<br>Procedure: Running BOP<br>Procedure No.: I | Rev. no.: 1<br>Date: 01/17/01<br>"Procedure used in analysis is attached as *Appendix D*" |
|---|---|---|

| Step of Procedure | Hazard | Consequence | Safeguard | Recovery Plan | Recommendation |
|---|---|---|---|---|---|
| | Improper riser tally. | Delay in operation due to string being wrong length. | ROV. Compare riser counts. Bathymetry review. | Flush and repair if necessary. (Case-by-case.) | |
| | Note: Termination joint issues same as running riser. | No new issues. | | | |
| 25 | Failure to lock manual locks. | Potential to drop BOP. | Procedures. | Recover BOP. Backup telescopic joint. | |
| | Other telescopic joint issues same as running riser. | No new issues. | | | |
| 26 | High pressure. | No new issues. | | | |
| | Man-riding operations. Personnel working over water in confined spaces. | Man overboard. Personnel injury or loss of life. | PPE. FRC. Workvest. Permit-to-work. JSA. Communications. | Medic on board. | *Review man-riding procedures.* |
| | Improper connections. | No new issues. | | | |
| 27 | Failure to verify that wellhead connector is unlocked on ROV panel. | Inability to land stack. | Redundant ROVs available. | Repair ROV. | |
| 28 | Failure to install storm loops. | Damage to cables and hoses. | Procedure. Training. | Repair and replace. | |

| HAZID Report Form | System: Deepwater Horizon BOP<br>Procedure: Running BOP<br>Procedure No.: I | Rev. no.: 1<br>Date: 01/17/01<br>"Procedure used in analysis is attached as *Appendix D*" |
|---|---|---|

| Step of Procedure | Hazard | Consequence | Safeguard | Recovery Plan | Recommendation |
|---|---|---|---|---|---|
| 29 | No new issues for this step. | | | | *Note: telescopic joint to be referred to as 'slip joint' only.(Completed)* |
| 30 | No new issues for this step. | | | | |
| 31 | Heavy equipment moving under PLC control. | Possible personnel injury. Possible runaway equipment. | Ability to manual override and emergency stop. Handrails as barriers. Training and procedures. | Medic on board. | *Develop procedure including having personnel stationed at inline trip-saver panel.* |
| 32 | Man-riding and man over water. | No new issues. | | | |
| | Improper connections. | See previous. Plus - Bearing would not allow vessel change in heading without equipment damage. | See previous. Plus - Pump through lines before hook-up to check. Hoses coded and labeled. | Disconnect, pull, and reconnect. | *Check Bridge procedures to confirm that Drill Floor and subsea engineer are to be informed of changes in heading.* |
| | | | | | *Train Marine crew in operations of fluid bearings.* |
| 33 | No new issues. | | | | |

| | | |
|---|---|---|
| **HAZID Report Form** | System: Deepwater Horizon BOP<br>Procedure: Running BOP<br>Procedure No.: I | Rev. no.: 1<br>Date: 01/17/01<br>"Procedure used in analysis is attached as *Appendix D*" |

| Step of Procedure | Hazard | Consequence | Safeguard | Recovery Plan | Recommendation |
|---|---|---|---|---|---|
| 34 | Failure to be in Active Heave Mode when necessary. | Possible damage to wellhead and/or BOP | Procedures. Tensioners. Rig motion indication. Operational criteria. (OIM decision) | Pull and repair. | *Review operational criteria.* |
| 35 | Communication is a concern. No new issues. | | | | *Review procedures for LMRP running.* |
| | Insufficient weight on wellhead. | Possible inability to latch. | Procedures and training. Monitoring weight. | | *Ensure there is an observation window in funnel to confirm connector properly seated.* |
| 36 | Improper space out. | Restricted operating circle. Improper recoil. | Compare rod stroke physical vs. calculated. Multiple previous checks | Pull and correct space out. | |
| 37 | Improper setting of tensioner. | Possible buckling of riser. Possibly no liftoff of EDS. Possible damage to equipment. | Compare calculated vs. actual weights. Procedures and training. Regular monitoring. | Increase / decrease pressure as required. | |
| | Failure to put tensioner panel in 'remote' mode. | Anti- recoil is not activated. Possible equipment damage. | Procedures. | Ability to put panel in remote. | *Develop procedure and include step.* |

| HAZID Report Form | System: Deepwater Horizon BOP<br>Procedure: Running BOP<br>Procedure No.: 1 | Rev. no.:<br>Date: 01/17/01<br>"Procedure used in analysis is attached as *Appendix D*" |
|---|---|---|

| Step of Procedure | Hazard | Consequence | Safeguard | Recovery Plan | Recommendation |
|---|---|---|---|---|---|
| 38 | Insufficient overpull on wellhead. | Possibly not locked on wellhead. | Procedures. Well testing | Re-latch and re-test. | |
| 39 | Wellhead sinks. | Loss of wellhead. | Proper wellhead design and installation. | Case-by case. Possible new well. | |
| | Insufficient weight on wellhead. | Possible loss of wellhead and BOP when liftoff occurs. | Procedures. Proper wellhead design and installation. | Case-by case. Possible new well. | |
| 40 | Failure to lock in diverter. | Inability to use all function of diverter (software interlocks). | Procedures and testing. | Repair. | |
| 41 | Failure to set in 'Drilling' mode. | EDS, autoshear and deadman not active. | Procedure. | Set to 'Drilling' mode. | *Subsea engineer responsible for setting in 'Drilling' mode.* |
| | | | | | *Develop drilling mode checklist.* |
| 42 | Failure to displace fluid in rigid conduit. | Potential for trash in conduit resulting in damaged control system. | Procedures. Training. | Flush conduit. Possible pull LMRP. | |
| 43 | Heavy lifts. No new issues. | | | | |

| HAZID Report Form | System: Deepwater Horizon BOP<br>Procedure: Running BOP<br>Procedure No.: I | Rev no.: 1<br>Date: 01/17/01<br>"Procedure used in analysis is attached as *Appendix D*" |
|---|---|---|

| Step of Procedure | Hazard | Consequence | Safeguard | Recovery Plan | Recommendation |
|---|---|---|---|---|---|
| 44 | Overpressure during test. | Damage to well. | Procedures and training. Communication. | Possible re-spud of well. | |
| 45 | No new issues | | | | |
| 46 | No new issues. | | | | |

## 5. RECOMMENDATIONS

### 5.1 Recommendations

The following table represents the recommendations that were generated from the risk analysis. The table below details the recommendations that were generated as the result of reviewing specific failure modes. The majority of the risk identified are mitigated by the existing PM plan.

#### 5.1.1 Very High Risk Recommendations

No very high-risk recommendations were made

#### 5.1.2 High Risk Recommendations

| | |
|---|---|
| **Recommendation (F/C/R)** | PM system to place emphasis on this shuttle valve due to the possible consequence of failure. (L/VH/H) |
| **Failure** | I.04 LMRP Connector – Failure to unlatch on demand |
| **Causes:** | Total shuttle valve failure (pod shuttle valve). |
| **Failure Effects:** | Fluid loss. Loss of primary unlatch (both pods). (Affects EDS – potential catastrophic effect) |
| **Mitigation:** | Rely on secondary unlatch, secure well and pull LMRP. PM. |
| **Proposed Actions:** | |

| | |
|---|---|
| **Recommendation (F/C/R)** | PM system to place emphasis on this shuttle valve due to the possible consequence of failure. (L/VH/H) |
| **Failure** | I.04 LMRP Connector – Failure to unlatch on demand |
| **Causes:** | Total shuttle valve failure (ROV shuttle valve – operating from ROV). |
| **Failure Effects:** | Fluid loss. Lose both primary and secondary unlatch before using ROV. Lose ROV unlatch. (Affects EDS – potential catastrophic effect) |
| **Mitigation:** | Rely on deadman and pull LMRP. OR Pull BOP. PM. |
| **Proposed Actions:** | |

| | |
|---|---|
| **Recommendation (F/C/R)** | Upgrades made by Cameron – ongoing monitoring. Include predictive testing procedure in PM. Cameron to submit written documentation confirming component numbers for all ST locks. (M/H/H) |
| **Failure** | II.01 Blind Shear Ram – Failure to open on demand<br>II.06 Pipe Ram– Failure to seal on demand |
| **Causes:** | Generalized ST lock failure. |
| **Failure Effects:** | Failure to open. Obstructed wellbore |
| **Mitigation:** | Secure well and pull BOP. PM. |
| **Proposed Actions:** | |

| | |
|---|---|
| **Recommendation (F/C/R)** | Review frequency rating after test of autoshear. (M/H/H) |
| **Failure** | II.02 Blind Shear Rams – Failure to close on demand<br>II.07 Pipe Ram – Failure to close on demand |
| **Causes:** | Autoshear inoperable. |
| **Failure Effects:** | Loss of autoshear system. Inability to shear in an unplanned disconnect. |
| **Mitigation:** | Secure well and pull BOP. PM. |
| **Proposed Actions:** | |

| | |
|---|---|
| **Recommendation (F/C/R)** | Follow up on wellhead connector upgrades. (M/H/H) |
| **Failure** | II.04 Wellhead Connector – Failure to unlatch on demand |
| **Causes:** | Hydrate or other debris. |
| **Failure Effects:** | Inability to unlatch. |
| **Mitigation:** | Use of methanol and warm fluids. Pull BOP. |
| **Proposed Actions:** | |

| | |
|---|---|
| **Recommendation (F/C/R)** | Consider to adding valve in place of 'Cut Me' tube. (M/H/H) |
| **Failure** | II.05 Wellhead Connector – Failure to primary unlatch on demand |
| **Causes:** | Failure of latch POCV to open. |
| **Failure Effects:** | Latch pressure not released. Unable to unlatch. |
| **Mitigation:** | Use 'Cut Me' tube via ROV. Pull BOP. |
| **Proposed Actions:** | |

### 5.1.3 Moderate criticality Recommendations

| | |
|---|---|
| **Recommendation (F/C/R)** | Ensure that operating parameters are adequate to prevent damage from LMRP strike or incidental contact. (L/H/M) |
| **Failure** | I.03 LMRP Connector – Failure to latch on demand |
| **Causes:** | Damage to hub on mandrel |
| **Failure Effects:** | Failure to latch. Unable to connect to BOP. |
| **Mitigation:** | Pull LMRP Secure well if necessary to pull BOP. |
| **Proposed Actions:** | |

| | |
|---|---|
| **Recommendation (F/C/R)** | Ensure proper installation of gasket before attempt to latch. (L/H/M) |
| **Failure** | I.03 LMRP Connector – Failure to seal on demand<br>II.04 Wellhead Connector – Failure to seal on demand |
| **Causes:** | Damaged seal surface (Mandrel/Wellhead). |
| **Failure Effects:** | Failure to seal. |
| **Mitigation:** | Secure well and pull BOP. PM and standard operating procedures. Visual inspection of wellhead |
| **Proposed Actions:** | |

| | |
|---|---|
| **Recommendation (F/C/R)** | Ensure procedures are followed. (L/H/M) |
| **Failure** | I.03 LMRP Connector – Failure to unlatch on demand |
| **Causes:** | Overpressure on latch. |
| **Failure Effects:** | Inability to unlatch. **(Potential loss of EDS)** |
| **Mitigation:** | Secure well and pull BOP. Proper training and procedures. |
| **Proposed Actions:** | |

| | |
|---|---|
| **Recommendation (F/C/R)** | Investigate need for hydrate measures for LMRP Connector. (L/H/M) |
| **Failure** | I.03 LMRP Connector – Failure to unlatch on demand<br>II.04 Wellhead Connector – Failure to unlatch on demand |
| **Causes:** | Hydrate or other debris.<br>Damaged indicator rods. |
| **Failure Effects:** | Inability to unlatch. |
| **Mitigation:** | Use of methanol and warm fluids. Possibly secure well and pull BOP. For damaged indictor rods – pull BOP |
| **Proposed Actions:** | |

| | |
|---|---|
| **Recommendation (F/C/R)** | Investigate failure mode with Cameron (Jacqueline Hsu). (L/H/M) |
| **Failure** | I.03 LMRP Connector – Failure to unlatch on demand |
| **Causes:** | Damaged indicator rods. |
| **Failure Effects:** | Inability to unlatch. |
| **Mitigation:** | Secure well and pull BOP. |
| **Proposed Actions:** | |

| | |
|---|---|
| **Recommendation (F/C/R)** | Follow up with TSF w/rt flexible hose testing. (M/M/M) |
| **Failure** | I.04 LMRP Connector - Failure to maintain proper latch pressure. (M/M/M) |
| **Causes:** | Failure of 1" Poly-flex hose. |
| **Failure Effects:** | Fluid loss. Inability to maintain latch pressure. Inability to maintain latch pressure. |
| **Mitigation:** | Switch to alternate pod. Possibly secure well and pull LMRP. PM. |
| **Proposed Actions:** | |

| | |
|---|---|
| **Recommendation (F/C/R)** | PM system to place emphasis on this shuttle valve due to the possible consequence of failure. (L/H/M) |
| **Failure** | I.04 LMRP Connector – Failure to unlatch on demand<br>II.05 Wellhead Connector – Failure of primary unlatch on demand |
| **Causes:** | Total shuttle valve failure (ROV shuttle valve – operating from ROV). |
| **Failure Effects:** | Loss of fluid. Lose both primary and secondary unlatch before using ROV. Lose ROV unlatch |
| **Mitigation:** | Pull BOP. PM. |
| **Proposed Actions:** | |

| | |
|---|---|
| **Recommendation (F/C/R)** | Ensure proper connection of PBOF cables as per procedures. (M/M/M) |
| **Failure** | I.05 SEM – Failure to fire solenoid |
| **Causes:** | Loss of pod PBOF cable and connectors. |
| **Failure Effects:** | Loss SEM (pod). Loss of pod. |
| **Mitigation:** | Rely on alternate pod. Secure well and pull LMRP. PM (visual inspection). |
| **Proposed Actions:** | |

| | |
|---|---|
| **Recommendation (F/C/R)** | Ensure proper connection of wet mat connectors as per procedures. (M/M/M) |
| **Failure** | I.05 SEM – Failure to fire solenoid |
| **Causes:** | Loss of Wet Mate connector |
| **Failure Effects:** | Ground. Loss of pod. |
| **Mitigation:** | Rely on alternate pod. Secure well and pull LMRP. PM (visual inspection). |
| **Proposed Actions:** | |

| | |
|---|---|
| **Recommendation (F/C/R)** | Ensure correct space out. Ensure pre-testing has been completed. (L/H/M) |
| **Failure** | II.01 Blind Shear Ram – Failure to shear on demand<br>II.06 Pipe Ram - Failure to shear on demand |
| **Causes:** | Attempting to shear inappropriate material. |
| **Failure Effects:** | Inability to cut. |
| **Mitigation:** | Reposition string and re-attempt cut. Pressure test. Pre-testing cut. |
| **Proposed Actions:** | |

| | |
|---|---|
| **Recommendation (F/C/R)** | Verify NDE frequency. (L/H/M) |
| **Failure** | II.01 Blind Shear Ram – Failure to seal on demand<br>II.06 Pipe Ram– Failure to seal on demand |
| **Causes:** | Damaged or defective ram block. |
| **Failure Effects:** | Inability to seal wellbore. |
| **Mitigation:** | Secure well and pull BOP. PM. |
| **Proposed Actions:** | |

| | |
|---|---|
| **Recommendation (F/C/R)** | Ensure clean wellbore. Follow policy of not tagging shear rams. (L/H/M) |
| **Failure** | II.01 Blind Shear Ram – Failure to seal on demand<br>II.06 Pipe Ram– Failure to seal on demand |
| **Causes:** | Damaged packers. |
| **Failure Effects:** | Inability to seal wellbore. |
| **Mitigation:** | Secure well and pull BOP. PM. |
| **Proposed Actions:** | |

| | |
|---|---|
| **Recommendation (F/C/R)** | Ensure that operating parameters are adequate to prevent damage from BOP strike or incidental contact. (L/H/M) |
| **Failure** | II.04 Wellhead Connector – Failure to latch on demand |
| **Causes:** | Damage to hub on wellhead |
| **Failure Effects:** | Failure to latch. Unable to connect to wellheaad. |
| **Mitigation:** | Pull BOP. |
| **Proposed Actions:** | |

| | |
|---|---|
| **Recommendation (F/C/R)** | Ensure procedures are followed. (L/H/M) |
| **Failure** | II.04 Wellhead Connector – Failure to unlatch on demand |
| **Causes:** | Overpressure on latch. |
| **Failure Effects:** | Inability to unlatch. |
| **Mitigation:** | Pull BOP. Employ ROV to overpressure. Proper training and procedures. |
| **Proposed Actions:** | |

| | |
|---|---|
| **Recommendation (F/C/R)** | Consider continually monitoring pilot pressure system health during completion, well testing and well control situations. (L/H/M) |
| **Failure** | II.05 Wellhead Connector – Failure to latch on demand<br>II.05 Wellhead Connector – Failure to maintain proper pressure on latch<br>II.05 Wellhead Connector - Failure to primary unlatch on demand. |
| **Causes:** | Regulator failure (catastrophic leak). |
| **Failure Effects:** | Loss of pilot/supply pressure. Loss of pod |
| **Mitigation:** | Switch to alternate pod. Pull BOP. |
| **Proposed Actions:** | |

| | |
|---|---|
| **Recommendation (F/C/R)** | Ensure that MOC process is in placed and followed. (Change of OEM spares / fluids) (L/H/M) |
| **Failure** | II.05 Wellhead Connector - Failure to primary unlatch on demand. |
| **Causes:** | Plugged filters. |
| **Failure Effects:** | Pass dirty fluid. Plugged solenoid valves. Loss of pod. |
| **Mitigation:** | Switch to alternate pod to secure well. Pull BOP. PM. Clean fluid practices. |
| **Proposed Actions:** | |

| | |
|---|---|
| **Recommendation (F/C/R)** | Ensure that PM and operating procedures address shuttle valve mounting and maintenance. (L/H/M) |
| **Failure** | II.05 Wellhead Connector - Failure to latch on demand |
| **Causes:** | Failure of receptacle tubing. |
| **Failure Effects:** | Fluid loss. Inability to latch from active pod. |
| **Mitigation:** | Pull BOP. PM. |
| **Proposed Actions:** | |

#### 5.1.4 Low Criticality Recommendations

| | |
|---|---|
| **Recommendation (F/C/R)** | Consider replacing packer between long duration wells. (M/L/L) |
| **Failure** | I. 01 Upper Annular Preventer – Failure to seal on demand |
| **Causes:** | Old or worn packing element |
| **Failure Effects:** | Inability to seal with annular, loss of upper annular. |
| **Mitigation:** | Open annular and switch to lower annular. Packer tested and visually inspected between wells. |
| **Proposed Actions:** | |

| | |
|---|---|
| **Recommendation (F/C/R)** | Consider drifting after surface test. (L/L/L) |
| **Failure** | 1.01 Upper Annular Preventer – Failure to open on demand |
| **Causes:** | Defective element. |
| **Failure Effects:** | Inability to fully open annular. Obstructed wellbore. Loss of annular |
| **Mitigation:** | Swedge open annular. Switch to lower annular. Surface test. |
| **Proposed Actions:** | |

| | |
|---|---|
| **Recommendation (F/C/R)** | Consider continually monitoring pilot pressure system health during completion, well testing and well control situations. (L/M/L) |
| **Failure** | I.02 Upper Annular Preventer failure to close on demand<br>I.02 Upper Annular Preventer failure to open on demand<br>I.04 LMRP Connector – Failure to latch on demand<br>I.04 LMRP Connector – Failure to maintain proper latch pressure<br>I.04 LMRP Connector – Failure to unlatch on demand<br>II.02 Blind Shear Ram – Failure to close on demand<br>II.02 Blind Shear Ram – Failure to open on demand<br>II.07 Pipe Ram – Failure to close on demand |
| **Causes:** | Regulator failure (catastrophic leak). |
| **Failure Effects:** | Loss of pilot/supply pressure. Loss of pod |
| **Mitigation:** | Switch to alternate pod. Isolate pod at conduit valve package. Pull LMRP. |
| **Proposed Actions:** | |

| | |
|---|---|
| **Recommendation (F/C/R)** | Ensure that MOC process is in placed and followed. (Change of OEM spares / fluids) (L/M/L) |
| **Failure** | I.02 Upper Annular Preventer failure to close on demand<br>I.02 Upper Annular Preventer failure to open on demand<br>I.04 LMRP Connector – Failure to latch on demand<br>I.04 LMRP Connector – Failure to maintain proper latch pressure<br>I.04 LMRP Connector – Failure to unlatch on demand<br>II.02 Blind Shear Ram – Failure to close on demand<br>II.02 Blind Shear Ram – Failure to open on demand<br>II.05 Wellhead Connector - Failure to latch on demand<br>II.05 Wellhead Connector - Failure to maintain proper latch pressure.<br>II.07 Pipe Ram – Failure to close on demand<br>II.07 Pipe Ram – Failure to open on demand |
| **Causes:** | Plugged filters. |
| **Failure Effects:** | Pass dirty fluid. Plugged solenoid valves. Loss of pod. |
| **Mitigation:** | Switch to alternate pod to secure well. Pull LMRP. PM. Clean fluid practices. |
| **Proposed Actions:** | |

| | |
|---|---|
| **Recommendation (F/C/R)** | Determine type of POCV in pod and if it is the upgrade – use to determine failure frequency. (Bolie resolved issue – frequency is 'L'.) (L/M/L) |
| **Failure** | I.02 Upper Annular Preventer failure to close on demand |
| **Causes:** | POCV stuck closed. |
| **Failure Effects:** | Loss of supply pressure. Loss of pod. |
| **Mitigation:** | Switch to alternate pod. Pull LMRP. |
| **Proposed Actions:** | |

| | |
|---|---|
| **Recommendation (F/C/R)** | Ensure that PM and operating procedures address shuttle valve mounting and maintenance. (L/L/L) |
| **Failure** | I.04 LMRP Connector – Failure to latch on demand |
| **Causes:** | Failure of receptacle tubing. |
| **Failure Effects:** | Fluid loss. Inability to latch from active pod. |
| **Mitigation:** | Block function and switch to alternate pod. PM. |
| **Proposed Actions:** | |

| | |
|---|---|
| **Recommendation (F/C/R)** | Cameron to investigate failure associated with solenoid. (LM/L) |
| **Failure** | I.04 LMRP Connector – Failure to maintain proper latch pressure |
| **Causes:** | Solenoid valve failure. |
| **Failure Effects:** | Fluid loss. Inability to maintain latch pressure from active pod. Inability to maintain latch pressure from active pod. |
| **Mitigation:** | Switch to alternate pod. Possibly secure well and pull LMRP. PM. |
| **Proposed Actions:** | |

| | |
|---|---|
| **Recommendation (F/C/R)** | Ensure procedures are updated in this situation. (L/L/L) |
| **Failure** | II.02 Blind Shear Ram – Failure to close on demand<br>II.07 Pipe Ram – Failure to close on demand |
| **Causes:** | Total shuttle valve failure (pod shuttle valve). |
| **Failure Effects:** | Fluid loss. Inability to close ram (low pressure) from both pods. |
| **Mitigation:** | Block function. Rely on high pressure or ROV shear. |
| **Proposed Actions:** | |

| | |
|---|---|
| **Recommendation (F/C/R)** | Follow up with TSF w/rt flexible hose testing. (M/L/L) |
| **Failure** | II.05 Wellhead Connector - Failure to maintain proper latch pressure. |
| **Causes:** | Failure of 1" Poly-flex hose. |
| **Failure Effects:** | Fluid loss. |
| **Mitigation:** | Block function and continue. PM. |
| **Proposed Actions:** | |

| | |
|---|---|
| **Recommendation (F/C/R)** | Cameron to investigate failure associated with solenoid. (L/L/L) |
| **Failure** | II.05 Wellhead Connector - Failure to maintain proper latch pressure. |
| **Causes:** | Solenoid valve failure. |
| **Failure Effects:** | Fluid loss. |
| **Mitigation:** | Block function and continue. PM. |
| **Proposed Actions:** | |

### 5.2 Parking Lot Issues

The issues listed below in Table 5.1 were placed on the parking lot list during the meeting. The issues listed in this section detail the additional concerns that were captured during the analysis that were not associated with a specific failure mode

**Table 5.1 Parking Lot Issues**

| # | Action | Responsible | Target date | Status |
|---|---|---|---|---|
| 1. | Follow up on Data Logging (Cycle Count) upgrade with Cameron. | Richard Coronado to report to Kevin Wink | Jan 10, 2001 | RBF to submit formal request to Cody Moffitt w/ Cameron Controls. |
| 2. | Provide DWHC drawings for for Risk Assessment. | Gary Leach | Jan 10, 2001 | Closed. Drawing received Jan. 9, 2001 |
| 3. | Review copy of previous FMEA to ensure that we are not repeating the existing study. | RBF & James Tidwell | Jan 10, 2001 | Closed. Original FMEA based on safety not operations availability. |
| 4. | Supply study team with updated deadman panel drawings. | RBF | Jan 8, 2001 | Closed. Copies supplied to team. |
| 5. | Determine secondary means of power for hydraulic system and report results to BP . | Drew Weathers | Jan 17, 2001 | |
| 6. | Provide drawing of Conduit Readback Panel. | Bolie Williams | Jan 9, 2001 | Closed. Drawing Provided to Kevin Wink and Gary Leach Jan 9, 2001 |
| 7. | Determine if loss of RCB will cause the loss of one pod. | Review During FMECA | Jan 11, 2001 | Need more details from Cameron. |
| 8. | Determine if RCB has been upgraded to latest Cameron design. | Richard Coronado to supply drawings. | Jan. 9, 2001 | Drawings supplied Jan. 9. 2001 |

| # | Action | Responsible | Target date | Status |
|---|---|---|---|---|
| 9. | Determine test frequency for testing riser while running BOP (first run and routine). | Gary Leach for first run, DWH Operations Team to determine frequency for routine tests via risk assessment | | Greg's industry review shows: 5 responses: 5 to 10 average, majority 10 (4 contractors, 1 manufacturer) "start with 5 if everything continues going great, go to 10. |
| 10. | Determine operation philosophy for the hot line (energized or not) once BOP landed. | Gary Leach to discuss with Cameron during Running/Retrieval review.<br>Greg Childs will review other operators philosophies and present | Jan. 11 2001 | – |
| 11. | Determine why gas bleed valve is located on lower annular (Philosophy question). | RBF | | Closed. Position paper used to make decision. |
| 12. | What is BP operation philosophy if bleed valve fails to open? | BP | | Closed. Continue Drilling |
| 13. | Ensure that procedure reflects operation philosophy in respect to isolation valve. | Ken Reed | Jan. 12, 2001 | Closed. Procedure reviewed. |

| # | Action | Responsible | Target date | Status |
|---|---|---|---|---|
| 14. | Ensure that lock pressure philosophy (collet connectors, and all connectors) and failure modes are reviewed during FMECA. | James Tidwell | Jan. 10, 2001 | Closed. Part of FMECA. |
| 15. | BP and RBF to review operation philosophy where casing shear is non-operational prior to drilling ahead and ahead of running casing. | BP/RBF | | Closed. Conclusion: continue all operations except for running casing where stack would be pulled (depends on casing size). |
| 16. | Get TSF standard Well Control procedures. | Ed Stidston to Gary Leach | Jan. 12, 2001 | |
| 17. | Team to catalog and prioritize "case-by-case" failure scenarios identified in analysis. | James Tidwell | Jan 12, 2001 | |
| 18. | Determine relief valve manufacturers for HPU. (Kratch quality is questionable). -- | Bolie Williams | Jan. 12, 2001 | |
| 19. | Identify pod pilot regulator model and (Deadband if possible) review failure modes. | Bolie Williams | Jan. 9, 2001 | Closed. Regulator has wide deadband. Correct regulators installed. |
| 20. | TSF to forward results of hose analysis to RBF team once analysis completed. | Ed Stidston | Jan. 31, 2001 | |

| # | Action | Responsible | Target date | Status |
|---|---|---|---|---|
| 21. | Determine if upgrade to Seacon PBOF has been installed on DWH. | Richard Coronado | Jan. 17, 2001 | |
| 22. | Find out from Cameron what differential pressure is allowed on AX, CX, and bonnet gaskets (outside to inside). Deepstar report may address this issue. | Bolie Williams<br><br>Dick Metcalf ( to get Deepstar report) | Jan. 12, 2001 | AX, CX, and bonnet gaskets are all rated for 0 psi external. A bonnet gasket is in development that can take 3,000 psi (preliminary number, still testing) |
| 23. | Verify ST lock capabilities for 3-1/2 to 6-5/8 VBRs on 6-5/8 pipe. | Bolie Williams | Jan. 12, 2001 | 18 ¾ 10K VBR is rated for 5 to 7 5/8. 18 ¾ 15K VBR is rated for full range w/ RAMLOCKS. With ST Locks, will not hold seal with no close pressure on 7 5/8 pipe and MAY hold pressure on 6 5/8 pipe. Will seal on all sizes WITH close pressure. |
| 24. | RBF requested that Cameron provide explanation of non-conformity process. RBF to work with Cameron to report and follow up on non-conformities. | Bolie Williams to work with John Wilson to clarify issue | | Bolie reported to John Wilson on 9 January, 2001 – Quality Manager of Cameron Controls (David Coe) to provide |
| 25. | Determine existing seal plate material. Determine if upgrade is required | Bolie Williams Gary Leach | Jan 31, 2001 | |

| # | Action | Responsible | Target date | Status |
|---|---|---|---|---|
| 26. | Update flow diagrams SK 122108-21-05 sheet 1 of 3 (vent and supply are connected on drawing)?. | Bolie Williams | Jan. 31, 2001 | |
| 27. | Get copy of EB-842M from Gary Leach to Subsea Engineer. (Lubrication of connector hob.) {– | Gary Leach | Jan. 12, 2001 | |
| 28. | Investigate indicator rod failures. Determine if potential to affect LMRP unlatch. | Jacqueline Hsu (Bolie Williams to coordinate) | | |
| 29. | Review EB687C and determine proper hold pressure. | Gary Leach | Jan. 10, 2001 | |
| 30. | Cameron to investigate failures associated with solenoids. | | | |
| 31. | Add hotline bypass lines to stack schematic. | Matt Goule | | |
| 32. | Develop complete drawing of rigid conduit flow path from the rigid conduit package through the pod and junction plates to a function. | Bolie Williams and Drew Weathers | | |
| 33. | Perform gap analysis between DWH and Enterprise study. Complete worksheets for pipe ram FMECA. | James Tidwell | | |

| # | Action | Responsible | Target date | Status |
|---|---|---|---|---|
| 34. | Review riser deck operations upon completion of Running / Retrieval review. | | | |
| 35. | RBF DWH (rig specific) riser operating procedures for tensionsers to be provided to Don Weisinger. | Bill Ambrose | Jan. 12, 2001 | |
| 36. | Review and formalize Rig specific BOP Pre-run checklist. | | | |
| 37. | RBF to supply BP with operational & maintenance policy for lifting equipment (sling, shackles, etc.). | Gary Leach | | |
| 38. | Include riser running load issues in Pre-planning / tech limit team building sessions. | Don Weisinger | | |
| 39. | Ensure that riser running load issue information is issued fleet wide (DP rigs) and that a copy is sent to BP. | Bill Ambrose | | |
| 40. | Determine acceptable weather conditions (DP rig) for landing the LMRP/BOP. | Don Weisinger, Bill Ambrose | | |
| 41. | Review procedures and processes and identify HAZIDs and Risk Assessments that need to be performed. | Russ Krohn | | |

| # | Action | Responsible | Target date | Status |
|---|---|---|---|---|
| 42. | RBF to provide operations manual (in relation to operational limits) to BP. | Russ Krohn | | |
| 43. | Develop philosophy and procedures for stand-by mode during planned storm disconnect. | Gary Leach, Russ Krohn | | |
| 44. | Consider having properly sized storm packer on board at all times. | Don Weisinger | | |
| 45. | RBF to provide BP with list of standard vessel procedures. | Kevin Wink | | |
| 46. | Ensure that written procedures have been developed, reviewed, and are available to the vessel. Ensure proper training in accordance with procedures. | Kevin Wink | | |

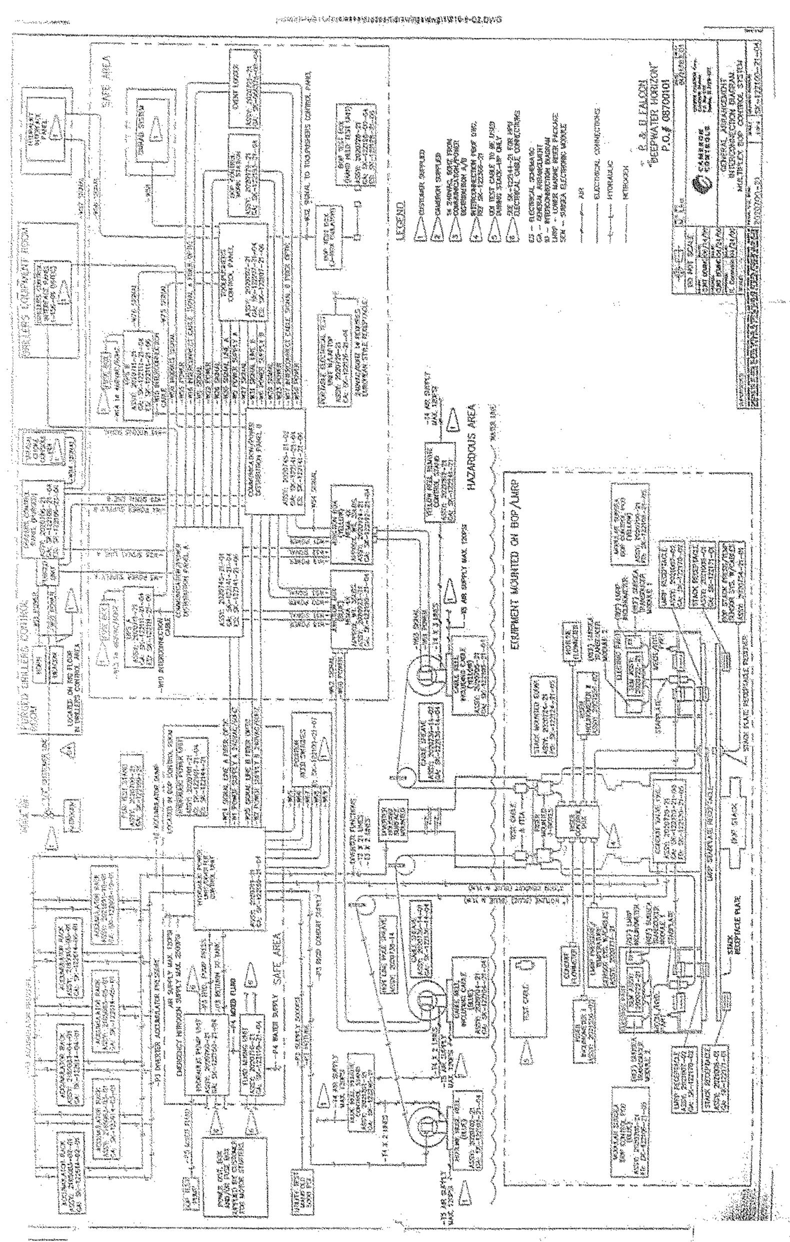
## 6. GAP ANALYSIS

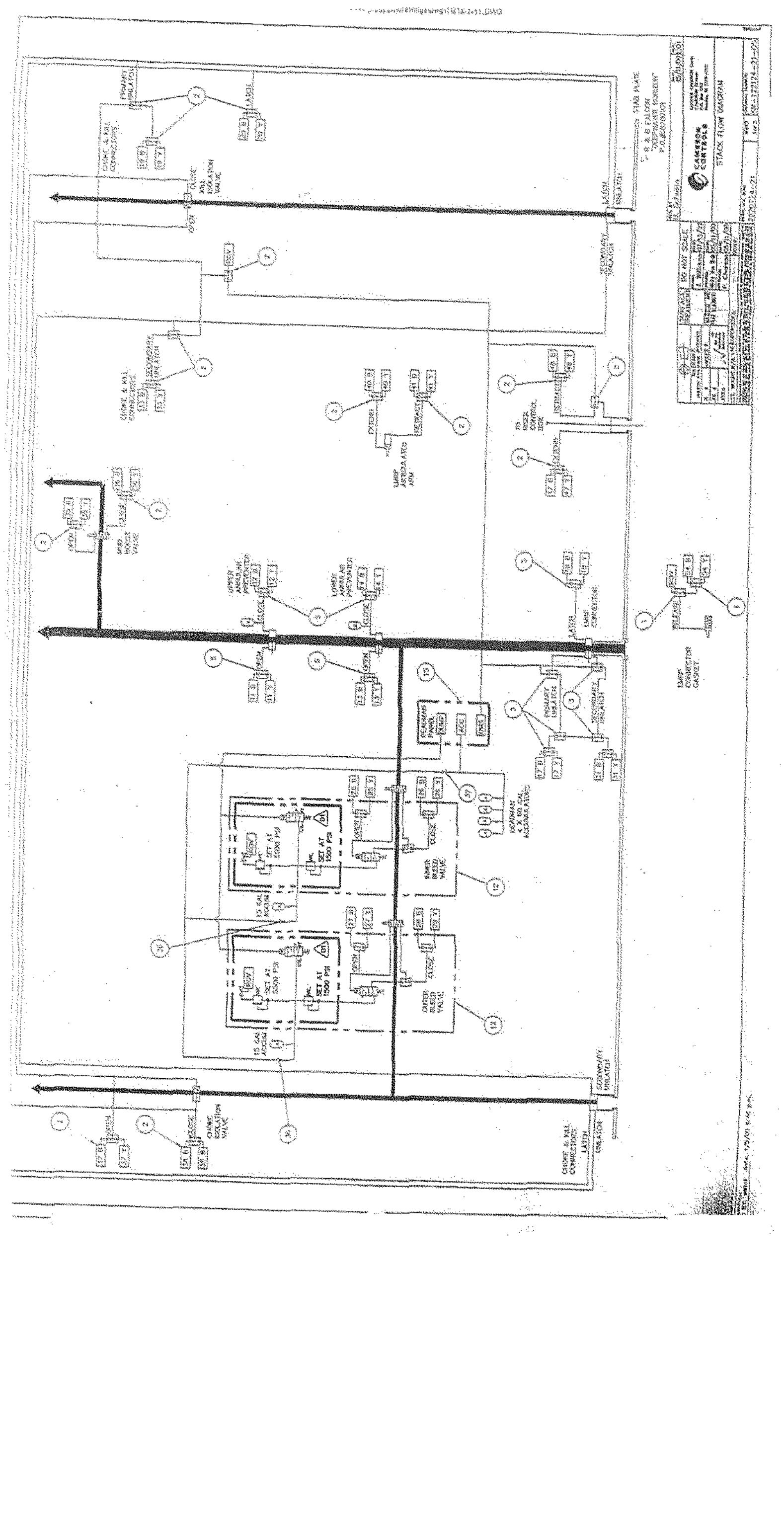
A thorough review of the Discoverer Enterprise BOP analysis was conducted upon completion of the Deepwater Enterprise BOP Assurance Analysis. The Gap analysis was conducted to see if major differences were observed in the results of the two analyses.

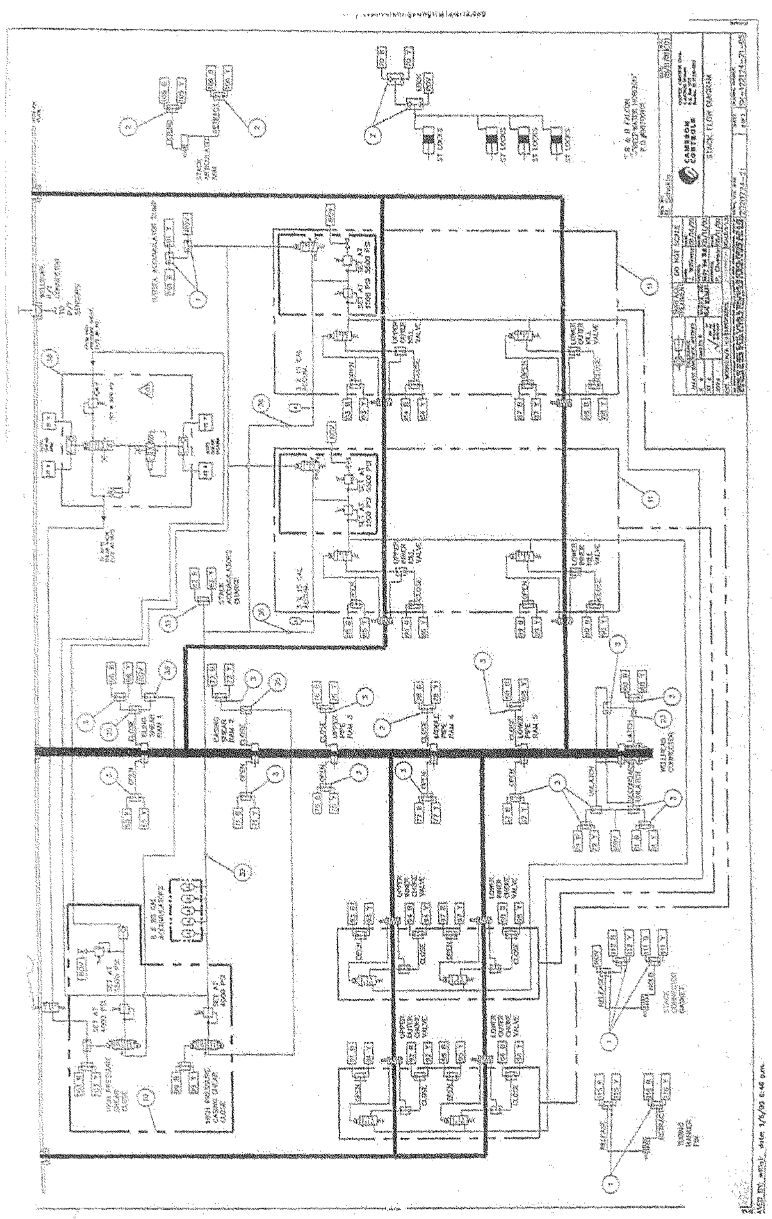
The Gap analysis performed revealed that the major difference between the Deepwater Horizon and the Discoverer Enterprise BOP Assurance Analysis was the level of PM review completed. The Deepwater Enterprise team reviewed PM's in detail to make sure that the BOP maintenance is sufficient to uncover the major failure modes identified during the analysis and to ensure that the maintenance is performed at the appropriate frequency (i.e. quarterly, between well, etc.). Individual procedures were not reviewed during the Discoverer Enterprise BOP Assurance Analysis. The predominant failures from both analyses were similar: solenoids, hoses, connectors, shuttle valves and ram locking mechanisms.

Appendix A

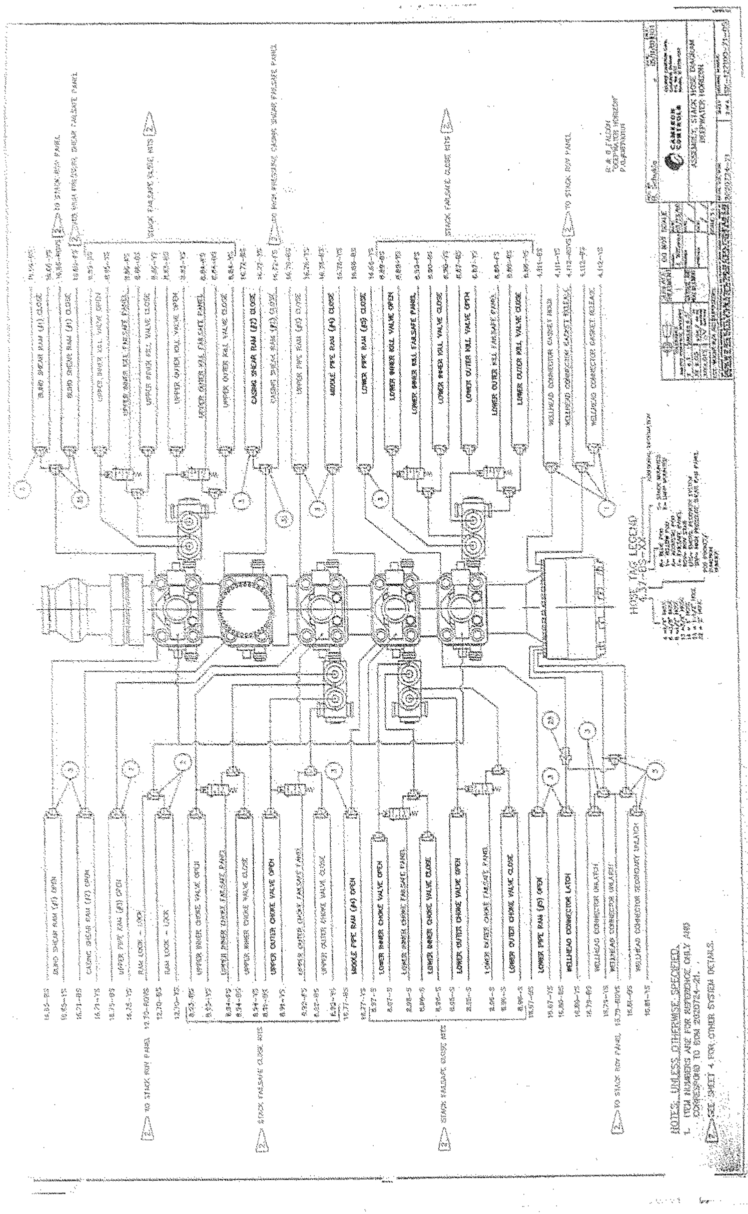
# APPENDIX A
# DRAWINGS

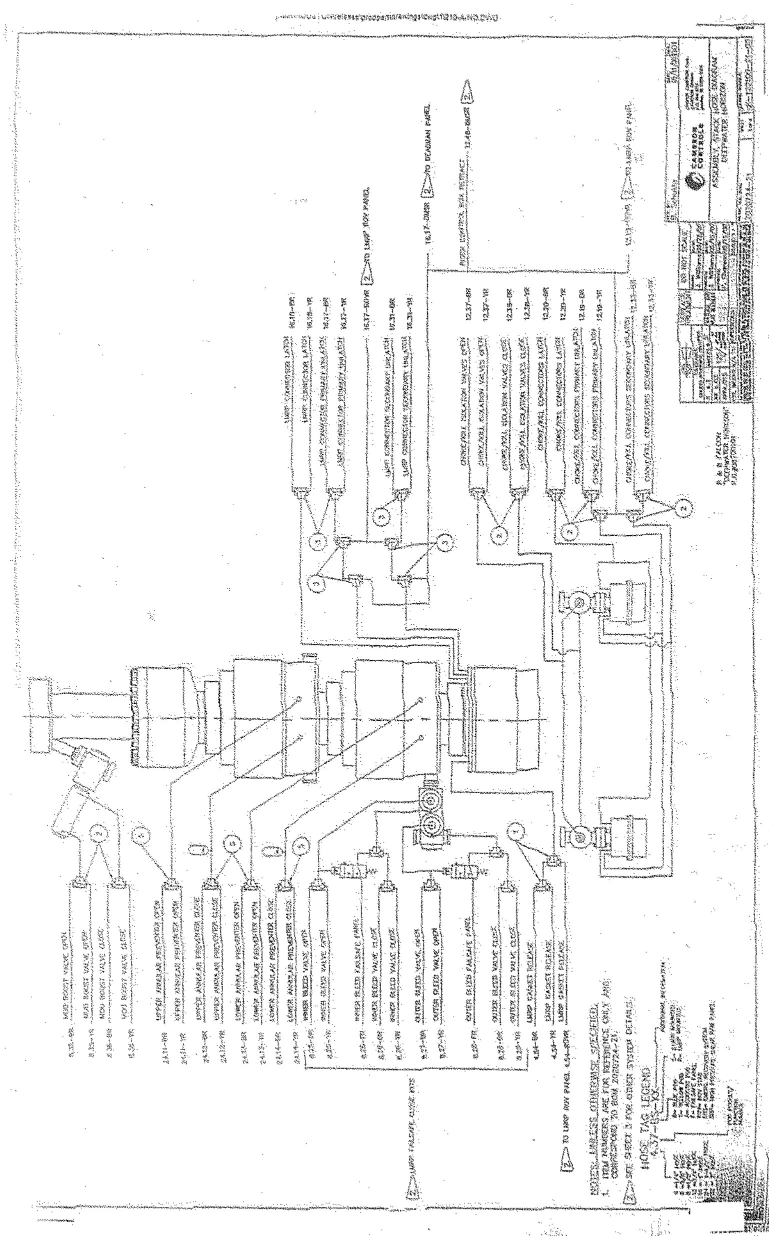

SAFE AREA
HAZARDOUS AREA
EQUIPMENT MOUNTED ON BOP/LMRP
LEGEND
"DEEPWATER HORIZON"



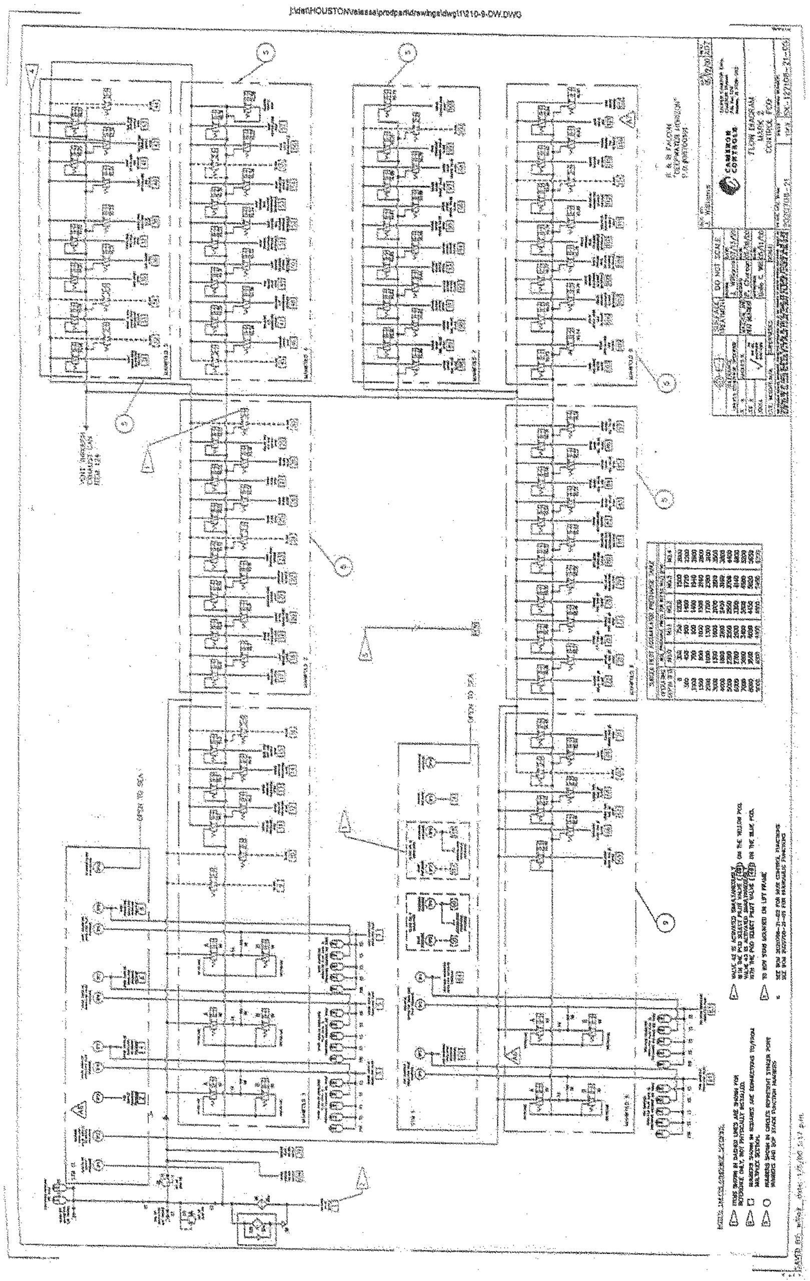


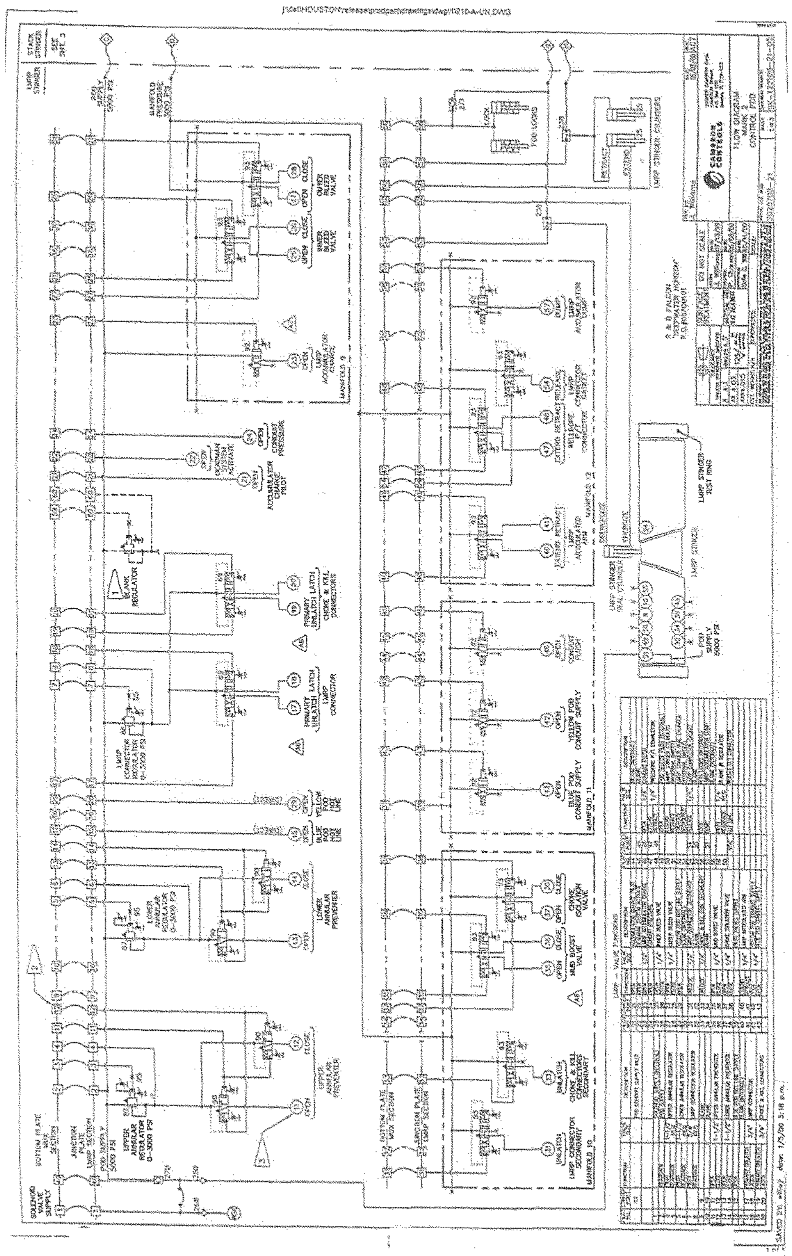
TRN-HCEC-00016705

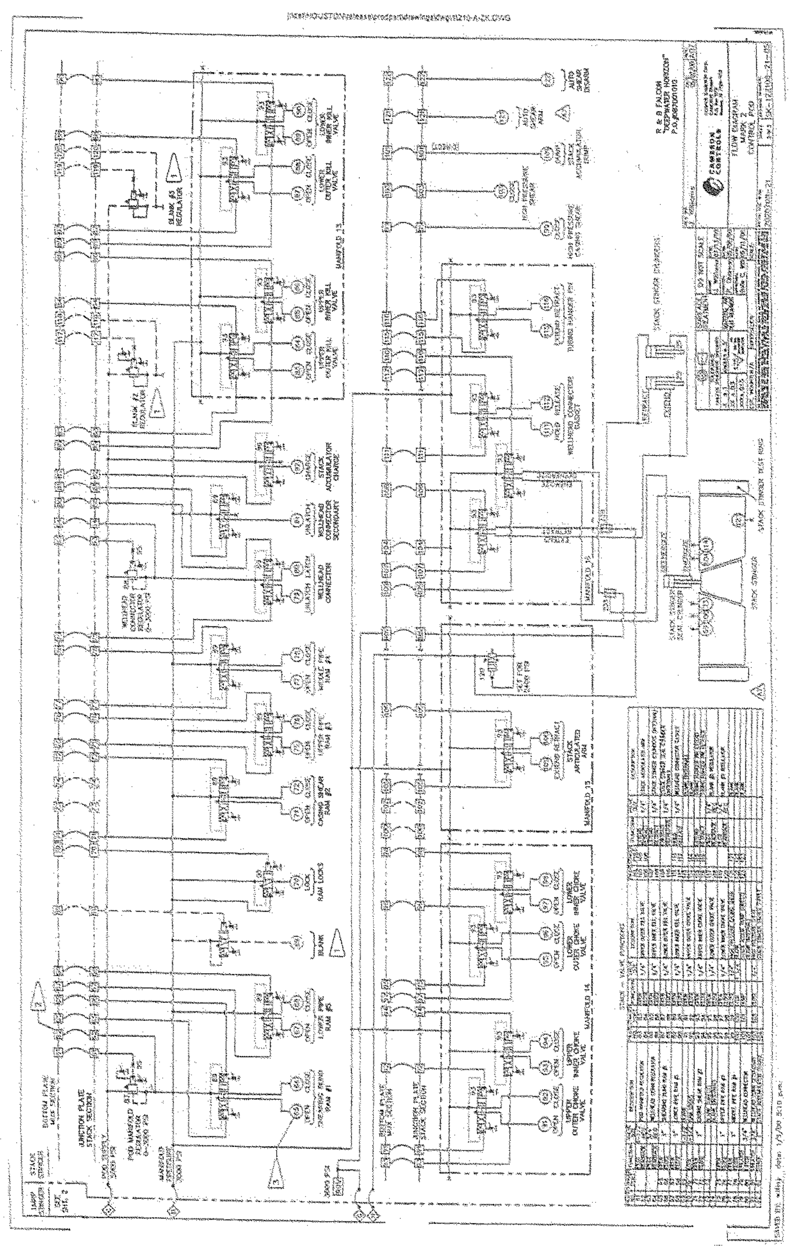




TRN-HCEC-00016707







Appendix B

# APPENDIX B
## FMECA WORKSHEETS

## APPENDIX B
## FMECA WORKSHEETS

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: LMRP<br>Section No.: [illegible] | Section Description: Houses annular, pods, mini-collet connector, [illegible] |
|---|---|---|
| Rev. no.: 1<br>Date: 01-17-01 | Function: [illegible]<br>Function No.: [illegible] | Function Description: [illegible] |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| A. | Failure to close on demand. | Blown seal. | Loss of fluid out vent ports. Inability to close annular. | Loss of system fluid. Loss of Upper Annular. | Constant flow on subsea flow meters. Possible visual indication via ROV. | Block function and switch to lower annular. Regular testing. | L | L | L | |
| B. | | Mechanical damage to internal components. | Inability to close annular. | Loss of Upper Annular. | Incorrect flow on flow meters. | Open annular and switch to lower annular. Function testing. | L | L | L | |
| C. | | Corrosion. | Inability to close annular. | Loss of Upper Annular. | Incorrect flow on flow meters. | Open annular and switch to lower annular. | L | L | L | |
| D. | Failure to seal on demand. | Old or worn packing element. | Inability to seal with annular. | Loss of Upper Annular. | Failed pressure test. Mud returns. | Open annular and switch to lower annular. Packer tested and visually inspected between wells. | M | L | L | *Consider replacing packer between long duration wells.* |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: [illegible]<br>Section No.: [illegible] | Section Description: Houses annulars, pods, mini-collet connector, [illegible] and various valves. |
|---|---|---|
| Rev. no.: [illegible]<br>Date: 01/17/01 | Function: Upper Annular [illegible]<br>Function No.: [illegible] | Function Description: Seals the wellbore on openhole, tubulars, and wireline. |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| E. | Failure to seal on demand. | Defective packing element. | Inability to seal with annular. | Loss of Upper Annular. | Failed pressure test. Mud returns. | Open annular and switch to lower annular. Packer visually inspected before installation. | L | L | L | |
| F. | | Closing on non-standard equipment. | Inability to seal with annular. | Potential loss of annular. | Failed pressure test. Mud returns. Unexpected flow meter reading. | Check space out. Retest annular and possibly switch to lower annular. Operational procedures and training of personnel. | L | L | L | |
| G. | | *Packer not fully energized.* | *Inability to seal with annular.* | *Potential loss of annular.* | *Failed pressure test. Mud returns. Unexpected flow meter reading.* | *Switch to lower annular.* | L | L | L | |
| H. | Failure to open on demand. | Defective element. | Inability to fully open annular. | Obstructed wellbore. Loss of annular. | Inability to pass tools through annular. Weight indication. | Swedge open annular. Switch to lower annular. Surface test. | L | L | L | *Consider drifting after surface test.* |

| | | |
|---|---|---|
| **FMECA Report Form** | System: Deepwater Horizon BOP<br>Section: [illegible]<br>Section No.: [illegible] | Section Description: Houses annulars, pods, mini-collet connector, LMRP connector, [illegible] system and [illegible] valves. |
| Rev. no.: 1<br>Date: 01/17/01 | Function: [illegible] Annular Preventer – Open/Close<br>Function No.: [illegible] | Function Description: Seals the wellbore on openhole, tubulars, and [illegible] |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| I. | Failure to open on demand. | Mechanical damage to internal components. | Inability to fully open annular. | Obstructed wellbore. Loss of annular. | Inability to pass tools through annular. Weight indication. | Secure well and pull LMRP. PM (Function and operator tests.) | L | M | L | |
| J. | | Corrosion. | Inability to fully open annular. | Obstructed wellbore. Loss of annular. | Inability to pass tools through annular. Weight indication. | Secure well and pull LMRP. | L | M | L | |
| K. | | Debris or obstruction. | Inability to fully open annular. | Obstructed wellbore. Loss of annular. | Inability to pass tools through annular. Weight indication. Low fluid count. | Secure well and pull LMRP. | L | M | L | |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: LMRP<br>Section No.: [illegible] | Section Description: Houses annulars, pods, mini-collet connector, MUX connector, deadman system and various valves. |
|---|---|---|
| Rev. no.: 1<br>Date: 01/17/01 | Function: Upper Annular [illegible] Hydraulics<br>Function No.: 02 | Function Description: Hydraulic circuit to operate annular. |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| A. | Failure to close on demand | Failure of surge circuit. | Fluid loss. Inability to close annular. | Loss of annular. | Fluid count. Eventual alarm. | Block function and switch to lower annular. PM. | L | L | L | |
| B. | | Total shuttle valve failure. | Fluid loss. Inability to close annular. | Loss of annular. | Fluid count. Eventual alarm. | Block function and switch to lower annular. PM. | L | L | L | |
| C. | | Failure of 1-1/2" hose. | Fluid loss. Inability to close annular from active pod. | Loss of function redundancy. | Fluid count. Eventual alarm. | Switch to alternate pod. PM. | L | L | L | |
| D. | | Failure of receptacle tubing. | Fluid loss. Inability to close annular from active pod. | Loss of function redundancy. | Fluid count. Eventual alarm. | Switch to alternate pod. PM. | L | L | L | |
| E. | | Failure of stinger seal. | Fluid loss. Inability to close annular from active pod. | Loss of function redundancy. | Fluid count. Eventual alarm. | Switch to alternate pod. PM. | L | L | L | |
| F. | | Shear seal valve failure (pilot side). | Inability to close annular. | Loss of function redundancy. | No flow count. No pressure drop on readback. | Switch to alternate pod. | L | L | L | |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: [illegible]<br>Section No.: [illegible] | Section Description: Houses annulars, pods, mini-collet connector, [illegible] and various valves. |
|---|---|---|
| Rev. no.: 1<br>Date: 01/17/01 | Function: [illegible] Hydraulics<br>Function No.: [illegible] | Function Description: Hydraulic circuitry to operate annular. |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| G. | Failure to close on demand | Solenoid valve failure. | Inability to close annular. | Loss of function redundancy. | No flow count. No pressure drop on readback. | Switch to alternate pod. | L | L | L | |
| H. | | Manual pilot regulator leak. | Fluid loss. | Fluid loss. | Increased pump operation. Excess fluid use. Visual indication with ROV. | No mitigation required – monitor situation. | L | L | L | |
| I. | | Total manual pilot regulator failure (catastrophic leak). | *Loss of pilot pressure.* | Loss of pod. | Low pilot readback pressure. | Switch to alternate pod. Isolate pod at conduit valve package. Pull LMRP. | L | M | L | *Consider continually monitoring pilot pressure system health during completion, well testing and well control situations.* |
| J. | | Deadband problem will be evaluated if determined that it exists. No Issue – no need to evaluate. | | | | | | | | |

| | | |
|---|---|---|
| **FMECA Report Form** | System: Deepwater Horizon BOP<br>Section: LMRP<br>Section No: [illegible] | Section Description: Houses annulars, pods, mini-collet connector, [illegible] for deadman system and various valves. |
| Rev. no.: 1<br>Date: 01/17/01 | Function: [illegible]<br>Function No.: [illegible] | Function Description: [illegible] operate annular. |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| K. | Failure to close on demand | Plugged filters. | Pass dirty fluid. | Plugged solenoid valves. Loss of pod. | Function failure. | Switch to alternate pod to secure well. Pull LMRP. PM. Clean fluid practices. | L | M | L | *Ensure that MOC process is in placed and followed. (Change of OEM spares / fluids)* |
| L. | | Plugged solenoid common vent. | Unable to close annular. | Loss of pod. | No fluid count. | Switch to alternate pod to secure well. Pull LMRP. PM. Clean fluid practices. | L | M | L | |
| M. | | Shear seal valve failure (supply side). | Inability to close annular. | Loss of function redundancy. | Unexpected flow count. Unexpected pressure drop on readback. | Block function. Switch to alternate pod. | L | L | L | |
| N. | | Upper annular regulator leak. | Fluid loss. | Fluid loss. | Increased pump operation. Excess fluid use. Visual indication with ROV. | No mitigation required – monitor situation. PM. | M | L | L | |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: [illegible]<br>Section No.: [illegible] | Section Description: Houses annulars, pods, mini collet connector [illegible] system and various valves. |
|---|---|---|
| Rev. no.: 1<br>Date: 01/17/01 | Function: Upper Annular [illegible]<br>Function No.: [illegible] | Function Description: Hydraulic circuitry to operate annular |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| O. | Failure to close on demand | Upper annular regulator failure (catastrophic leak – stuck wide open). | Loss of supply pressure. | Loss of pod. | Low supply readback pressure. Excessive fluid use. | Switch to alternate pod. Pull LMRP. | L | M | L | *Consider continually monitoring supply pressure system health during completion, well testing and well control situations. (High level recommendation.)* |
| P. | | POCV stuck closed. | Loss of supply pressure. | Loss of pod. | No supply readback pressure. No fluid use. | Switch to alternate pod. Pull LMRP. | L | M | L | Determine type of POCV in pod and if it is the upgrade – use to determine failure frequency. (Bolie resolved issue – frequency is 'L'.) |

| FMECA Report Form | System: Deepwater Horizon BOP | Section Description: Houses annulars, pods, mini-collet connector [illegible] |
|---|---|---|
| | Section: [illegible] | [illegible] |
| | Section No.: [illegible] | |
| Rev. no.: [illegible] | Function: Upper Annular [illegible] Hydraulics | Function Description: Hydraulic [illegible] to operate annular |
| Date: 01/17/01 | Function No.: 02 | |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| Q. | Failure to open on demand | Total shuttle valve failure. | Fluid loss. Possible inability to fully open annular. | Possibly obstructed wellbore. Loss of annular. | Fluid count. Eventual alarm. | Swedge open annular then block function and switch to lower annular. PM. | L | L | L | |
| R. | | Failure of 1-1/2" hose. | Fluid loss. Possible inability to fully open annular from active pod. | Loss of function redundancy. | Fluid count. Eventual alarm. | Switch to alternate pod. PM. | L | L | L | |
| S. | | Failure of receptacle tubing. | Fluid loss. Possible inability to fully open annular from active pod. | Loss of function redundancy. | Fluid count. Eventual alarm. | Switch to alternate pod. PM. | L | L | L | |
| T. | | Failure of stinger seal. | Fluid loss. Inability to open annular from active pod. | Loss of function redundancy. | Fluid count. Eventual alarm. | Switch to alternate pod. PM. | L | L | L | |
| U. | | Shear seal valve failure (pilot side). | Inability to open annular from active pod. | Loss of function redundancy. | No flow count. No pressure drop on readback. | Switch to alternate pod. | L | L | L | |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: LMRP<br>Section No.: [illegible] | Section Description: Houses annulars, pods, mini-collet connector, LMRP connector, deadman system and various valves. |
|---|---|---|
| Rev. no.: [illegible]<br>Date: 01/17/01 | Function: Open Annular Preventer – Hydraulics<br>Function No.: [illegible] | Function Description: Hydraulic circuitry to operate annular. |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| V. | Failure to open on demand | Solenoid valve failure. | Inability to open annular. | Loss of function redundancy. | No flow count. No pressure drop on readback. | Switch to alternate pod. | L | L | L | |
| W. | | Manual pilot regulator leak. | Fluid loss. | Fluid loss. | Increased pump operation. Excess fluid use. Visual indication with ROV. | No mitigation required -- monitor situation. | L | L | L | |
| X. | | Total manual pilot regulator failure (catastrophic leak). | Loss of pilot pressure. | Loss of pod. | Low pilot readback pressure. | Switch to alternate pod. Isolate pod at conduit valve package. Pull LMRP. | L | M | L | *Consider continually monitoring pilot pressure system health during completion, well testing and well control situations.* |
| Y. | | Plugged filters. | Pass dirty fluid. | Plugged solenoid valves. Loss of pod. | Function failure. | Switch to alternate pod to secure well. Pull LMRP. PM. Clean fluid practices. | L | M | L | *Ensure that MOC process is in placed and followed. (Change of OEM spares / fluids)* |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: [illegible]<br>Section No.: [illegible] | Section Description: Houses annulars, pods, mini-collet connector, [illegible] connector, [illegible] stem and various valves. |
|---|---|---|
| Rev. no.: 1<br>Date: 01/17/01 | Function: [illegible]<br>Function No.: [illegible] | Function Description: [illegible] to operate annular. |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| Z. | Failure to open on demand | Plugged solenoid common vent. | Unable to open annular. | Loss of pod. | No fluid count. | Switch to alternate pod to secure well. Pull LMRP. PM. Clean fluid practices. | L | M | L | |
| AA. | | Shear seal valve failure (supply side). | Inability to open annular. | Loss of function redundancy. | Unexpected flow count. Unexpected pressure drop on readback. | Block function. Switch to alternate pod. | L | L | L | |
| BB. | | Upper annular regulator leak. | Fluid loss. | Fluid loss. | Increased pump operation. Excess fluid use. Visual indication with ROV. | No mitigation required – monitor situation. PM. | M | L | L | |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: LMRP<br>Section No.: | Section Description: Houses annulars, pods, mini-collet connector, LMRP connector, deadman system and various valves |
|---|---|---|
| Rev. no.: 1<br>Date: 01/17/01 | Function: Upper Annular Pressure Hydraulics<br>Function No.: 02 | Function Description: Hydraulic circuitry to operate annular |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| CC. | Failure to open on demand | Upper annular regulator failure (catastrophic leak – stuck wide open). | Loss of supply pressure. | Loss of pod. | Low supply readback pressure. Excessive fluid use. | Switch to alternate pod. Pull LMRP. | L | M | L | *Consider continually monitoring supply pressure system health during completion, well testing and well control situations. (High-level recommendation.)* |
| DD. | | POCV stuck closed. | Loss of supply pressure. | Loss of pod. | No supply readback pressure. No fluid use. | Switch to alternate pod. Pull LMRP. | L | M | L | |
| EE. | Failure to seal on demand. | See 'Failure to Close on Demand' – No New Issues. | | | | | | | | |

**FMECA Report Form**

System: Deepwater Horizon BOP [illegible]
Section: [illegible]
Section No.: [illegible]
Section Description: [illegible]
Rev. no: [illegible]
Date: [illegible]
Function: [illegible]
Function No.: [illegible]
Function Description: [illegible] LMRP to BOP.

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| A. | Failure to latch on demand. | Seal failure. | Failure to latch. | Unable to connect to BOP. | Indicator rod. Unexpected flow. | Pull LMRP. PM. | L | M | L | |
| B. | | Mechanical damage to internal components. | Failure to latch. | Unable to connect to BOP. | Indicator rod. Unexpected flow. | Pull LMRP. PM. | L | M | L | |
| C. | | Debris. | Failure to latch. | Unable to connect to BOP. | Indicator rod. Unexpected flow. | Pull LMRP. PM. | L | M | L | |
| D. | | Damage to hub on mandrel. | Failure to latch. | Unable to connect to BOP. | Indicator rod. Unexpected flow. Visual inspection with ROV. | Pull LMRP Secure well if necessary to pull BOP. | L | H | M | *Ensure that operating parameters are adequate to prevent damage from LMRP strike or incidental contact.* |
| E. | | Corrosion. | Failure to latch. | Unable to connect to BOP. | Indicator rod. Unexpected flow. | Pull LMRP. PM. | L | M | L | |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: [illegible]<br>Section No.: [illegible] | Section Description: House annulars, pods, mini collet connector [illegible] |
|---|---|---|
| Rev. no.: 1<br>Date: 01/17/01 | Function: [illegible]<br>Function No.: [illegible] | Function Description: [illegible] |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| F. | Failure to seal on demand. | Improper or damaged gasket. | Failure to seal. | Failure to seal. | Failed pressure test. | Replace gasket and retest. | L | L | L | |
| G. | | Damaged seal surface (Connector). | Failure to seal. | Failure to seal. | Failed pressure test. | Pull LMRP. | L | M | L | |
| H. | | Damaged seal surface (Mandrel). | Failure to seal. | Failure to seal. | Failed pressure test. Possible visual indication with ROV. | Secure well and pull BOP. PM and standard operating procedures. | L | H | M | *Ensure proper installation of gasket before attempt to latch.* |
| I. | Failure to maintain latch pressure. | Seal Failure. | Loss of latch pressure. | Loss of hydraulic operating fluid. Potential for loss of wellbore fluids. | Unexpected flow at flow meter. Excessive use of hydraulic fluid. Visual indication with ROV. | Secure well and pull LMRP. | L | M | L | |
| J. | Failure to unlatch on demand. | Overpressure on latch. | Inability to unlatch. | Inability to unlatch. **(Potential loss of EDS)** | No or minimal flow. Failure evident. | Secure well and pull BOP. Proper training and procedures. | L | H | M | *Ensure procedures are followed.* |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: LMRP<br>Section No.: 1 | Section Description: House annulars, pods, mini-collet connector, [illegible] connector, [illegible] system and various valves. |
|---|---|---|
| Rev. no.: [illegible]<br>Date: 01/17/01 | Function: LMRP connector – Latch / Unlatch<br>Function No.: [illegible] | Function Description: Connect LMRP to BOP. |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| K. | Failure to unlatch on demand. | Hydrate or other debris. | Inability to unlatch. | Inability to unlatch. | No or minimal flow. Failure evident. | Use of methanol and warm fluids. Possibly secure well and pull BOP. | L | H | M | *Investigate need for hydrate measures for LMRP Connector.* |
| L. | | Damaged indicator rods. | Inability to unlatch. | Inability to unlatch. | Minimal flow. Failure evident. Second indicator flag would not travel full stroke. | Secure well and pull BOP. | L | H | M | *Investigate failure mode with Cameron (Jacqueline Hsu).* |
| M. | | Mechanical damage to internal components. | Inability to unlatch. | Inability to unlatch. | Minimal flow. Failure evident. Second indicator flag would not travel full stroke. | Secure well and pull BOP. PM. | L | H | M | |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: LMRP<br>Section No.: [illegible] | Section Description: House annulars, pods, mini-collet connector, LMRP connector, deadman system and various valves. |
|---|---|---|
| Rev. no.: 1<br>Date: 01/17/01 | Function: LMRP Connector [illegible]<br>Function No.: [illegible] | Function Description: Connects LMRP to BOP. |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| N. | Failure to unlatch on demand. | Corrosion. | Inability to unlatch. | Inability to unlatch. | Minimal flow. Failure evident. Second indicator flag would not travel full stroke. | Secure well and pull BOP. PM. | L | H | M | |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: LMRP<br>Section No.: 1 | Section Description: Houses annulars, pods, mini-collet connector, LMRP connector, deadman system and various valves. |
|---|---|---|
| Rev. no.: 1<br>Date: 01/17/01 | Function: [illegible]<br>Function No.: [illegible] | Function Description: Connect LMRP to BOP. |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| A. | Failure to latch on demand | Total shuttle valve failure. | Fluid loss. Inability to latch. | Inability to latch. | Fluid count. Indicator rod. | Pull LMRP. PM. | L | M | L | |
| B. | | Failure of 1" Poly-flex hose. | Fluid loss. Inability to latch from active pod. | Inability to latch from active pod. | Fluid count. Indicator rod. | Block function and switch to alternate pod. PM. | M | L | L | |
| C. | | Failure of receptacle tubing. | Fluid loss. Inability to latch from active pod. | Inability to latch from active pod. | Fluid count. Indicator rod. | Block function and switch to alternate pod. PM. | L | L | L | *Ensure that PM and operating procedures address shuttle valve mounting and maintenance.* |
| D. | | Failure of stinger seal. | Fluid loss. Inability to latch from active pod. | Inability to latch from active pod. | Fluid count. Indicator rod. | Block function and switch to alternate pod. PM. | L | L | L | |
| E. | | Shear seal valve failure (pilot side). | Inability to latch from active pod. | Loss of function redundancy. | No flow count. No pressure drop on readback. Indicator rod. | Switch to alternate pod. PM. | L | L | L | |

| | | |
|---|---|---|
| **FMECA Report Form** | System: Deepwater Horizon BOP<br>Section: [illegible]<br>Section No.: [illegible] | Section Description: Houses annulars, pods, mini-collet connector, LMRP connector, deadman system and various valves. |
| Rev. no.: 1<br>Date: 01-17-01 | Function: LMRP connector – [illegible]<br>Function No.: [illegible] | Function Description: Connects LMRP to BOP |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| F. | Failure to latch on demand | Solenoid valve failure. | Inability to latch from active pod. | Loss of function redundancy. | No flow count. No pressure drop on readback. Indicator rod. | Switch to alternate pod. PM. | L | L | L | |
| G. | | Manual pilot regulator leak. | Fluid loss. | Fluid loss. | Increased pump operation. Excess fluid use. Visual indication with ROV. | No mitigation required – monitor situation. | L | L | L | |
| H. | | Total manual pilot regulator failure (catastrophic leak). | Loss of pilot pressure. | Loss of pod. | Low pilot readback pressure. | Switch to alternate pod. Isolate pod at conduit valve package. Pull LMRP. | L | M | L | *Consider continually monitoring pilot pressure system health during completion, well testing and well control situations.* |
| I. | | Plugged filters. | Pass dirty fluid. | Plugged solenoid valves. Loss of pod. | Function failure. | Switch to alternate pod to secure well. Pull LMRP. PM. Clean fluid practices. | L | M | L | *Ensure that MOC process is in placed and followed. (Change of OEM spares / fluids)* |

| | | | |
|---|---|---|---|
| **FMECA Report Form** | System: Deepwater Horizon BOP<br>Section: [illegible]<br>Section No.: [illegible] | Section Description: Houses annulars, pods, mini-collet connector, [illegible] and various valves. | |
| Rev. no.: 1<br>Date: 01/17/01 | Function: LMRP Connector – Hydraulics<br>Function No.: 1.04 | Function Description: [illegible] LMRP to BOP | |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| J. | Failure to latch on demand | Plugged solenoid common vent. | Unable to close annular. | Loss of pod. | No fluid count. | Switch to alternate pod to secure well. Pull LMRP. PM. Clean fluid practices. | L | M | L | |
| K. | | Shear seal valve failure (supply side). | Inability to latch. | Loss of function redundancy. | Unexpected flow count. Unexpected pressure drop on readback. Indicator rod. | Block function. Switch to alternate pod. | L | L | L | |
| L. | | LMRP riser connector regulator leak. | Fluid loss. | Fluid loss. Possible effect to unlatch function. (Potential EDS effect) | Increased pump operation. Excess fluid use. Visual indication with ROV. | Switch pods. If leak effects EDS – pull LMRP. PM. | M | L | L | *Note: Regulator leak tolerance for LMRP connector lower than for annulus.* |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: LMRP<br>Section No.: [illegible] | Section Description: Houses annulars, pods, mini collet connector, LMRP connector, hydraulic system and various valves. |
|---|---|---|
| Rev. no.: 1<br>Date: 01/17/01 | Function: LMRP Connector – Hydraulics<br>Function No.: 14 | Function Description: Connects LMRP to BOP |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| M. | Failure to latch on demand | LMRP riser connector regulator failure (catastrophic leak – stuck wide open). | Loss of supply pressure. | Loss of pod. | Low supply readback pressure. Excessive fluid use. Indicator rod. | Switch to alternate pod. Pull LMRP. | L | M | L | *Consider continually monitoring supply pressure system health during completion, well testing and well control situations. (High level recommendation.)* |
| N. | | POCV stuck closed. | Loss of supply pressure. | Loss of pod. | No supply readback pressure. No fluid use. | Switch to alternate pod. Pull LMRP. | L | M | L | |
| O. | Failure to maintain proper latch pressure. | Failure of increase / decrease solenoid. | Inability to maintain proper latch pressure. | Possibility to impair unlatch and EDS. | Pressure readbacks. | Switch to alternate pod. | L | L | L | |
| P. | | Loss of regulator pilot pressure. | Inability to maintain adequate pilot pressure. | Loss of ability to latch / unlatch with active pod. | Pressure readbacks. | Switch to alternate pod. Secure well and pull LMRP. | L | M | L | |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: LMRP<br>Section No.: [illegible] | Section Description: Houses annulars, pods, mini-collet connector, [illegible] various valves |
|---|---|---|
| Rev. no.: 1<br>Date: 01/17/01 | Function: LMRP Connector - Hydraulics<br>Function No.: 04 | Function Description: Connects LMRP to BOP |

| # | Failure Mode | Causes | Local Failure Effects | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| Q. | Failure to maintain proper latch pressure. | Total shuttle valve failure. | Fluid loss. Inability to maintain latch pressure. | Inability to maintain latch pressure. | Fluid count. Pressure readbacks. | Secure well and pull LMRP. PM. | L | M | L | |
| R. | | Failure of 1" Poly-flex hose. | Fluid loss. Inability to maintain latch pressure. | Inability to maintain latch pressure. | Fluid count. Pressure readbacks. | Switch to alternate pod. Possibly secure well and pull LMRP. PM. | M | M | M | *Follow up with TSF w/rt flexible hose testing.* |
| S. | | Failure of receptacle tubing. | Fluid loss. Inability to maintain latch pressure from active pod. | Inability to maintain latch pressure from active pod. | Fluid count. Pressure readback. | Switch to alternate pod. Possibly secure well and pull LMRP. PM. | L | M | L | |
| T. | | Failure of stinger seal. | Fluid loss. Inability to maintain latch pressure from active pod. | Inability to maintain latch pressure from active pod. | Fluid count. Pressure readback. | Switch to alternate pod. Possibly secure well and pull LMRP. PM. | L | M | L | |
| U. | | Shear seal valve failure (pilot side). | Fluid loss. Inability to maintain latch pressure from active pod. | Inability to maintain latch pressure from active pod. | Fluid count. Pilot pressure readback. | Switch to alternate pod. Possibly secure well and pull LMRP. PM. | L | M | L | |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: LMRP<br>Section No.: [illegible] | Section Description: Houses annulars, pods, mini-collet connector, LMRP connector, [illegible] system and various valves. |
|---|---|---|
| Rev. no.: 1<br>Date: 01/17/01 | Function: LMRP Connector [illegible]<br>Function No.: [illegible] | Function Description: Connect LMRP to BOP |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| V. | Failure to maintain proper latch pressure. | Solenoid valve failure. | Fluid loss. Inability to maintain latch pressure from active pod. | Inability to maintain latch pressure from active pod. | Flow count. | Switch to alternate pod. Possibly secure well and pull LMRP. PM. | L | M | L | *Cameron to investigate failure associated with solenoid.* |
| W. | | Manual pilot regulator leak. | Fluid loss. | Fluid loss. | Increased pump operation. Excess fluid use. Visual indication with ROV. | No mitigation required – monitor situation. | L | L | L | |
| X. | | Total manual pilot regulator failure (catastrophic leak). | Loss of pilot pressure. | Loss of pod. | Low pilot readback pressure. | Switch to alternate pod. Isolate pod at conduit valve package. Pull LMRP. | L | M | L | *Consider continually monitoring pilot pressure system health during completion, well testing and well control situations.* |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: LMRP<br>Section No.: [illegible] | Section Description: Houses annulars, pods, mini-collet connector, LMRP connector, [illegible] and various valves. |
|---|---|---|
| Rev. no.: 1<br>Date: 01/17/01 | Function: LMRP Connector – Hydraulics<br>Function No.: [illegible] | Function Description: Connects LMRP to BOP. |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| Y. | Failure to maintain proper latch pressure. | Plugged filters. | Pass dirty fluid. | Plugged solenoid valves. Loss of pod. | Function failure. | Switch to alternate pod to secure well. Pull LMRP. PM. Clean fluid practices. | L | M | L | *Ensure that MOC process is in placed and followed. (Change of OEM spares / fluids)* |
| Z. | | Shear seal valve failure (supply side). | Inability to maintain latch pressure. | Inability to maintain latch pressure. **(Affects EDS)** | Unexpected flow count. Unexpected pressure drop on readback. | Switch to alternate pod. Secure well and pull LMRP. PM. | L | M | L | |
| AA. | | LMRP riser connector regulator leak. | Fluid loss. | Fluid loss. Possible effect to unlatch function. **(Potential EDS effect)** | Increased pump operation. Excess fluid use. Visual indication with ROV. | Switch pods. If leak effects EDS – pull LMRP. PM. | M | L | L | *Note: Regulator leak tolerance for LMRP connector lower than for annulus.* |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: LMRP<br>Section No.: 1 | Section Description: Houses annulars, pods, mini-collet connector, LMRP connector, deadman system and various valves. |
|---|---|---|
| Rev. no.: 1<br>Date: 01/17/01 | Function: LMRP Connector – Hydraulics<br>Function No.: 05 | Function Description: Connects LMRP to BOP. |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| BB. | Failure to maintain proper latch pressure. | LMRP riser connector regulator failure (catastrophic leak – stuck wide open). | Loss of supply pressure. | Loss of pod. | Low supply readback pressure. Excessive fluid use. Indicator rod. | Switch to alternate pod. Pull LMRP. | L | M | L | *Consider continually monitoring supply pressure system health during completion, well testing and well control situations. (High level recommendation.)* |
| CC. | | POCV stuck closed. | Loss of supply pressure. | Loss of pod. | No supply readback *pressure. No* fluid use. | Switch to alternate pod. Pull *LMRP*. | L | M | L | |
| DD. | Failure to unlatch on demand. | Total shuttle valve failure (pod shuttle *valve*). | Fluid loss. Loss of primary unlatch. | Loss of primary unlatch (both pods). | Failure detected on demand. Indicator rod. *Fluid count.* | Rely on secondary unlatch, secure *well and pull* LMRP. PM. | L | M | L | |

| **FMECA Report Form** | System: Deepwater Horizon BOP<br>Section: LMRP<br>Section No.: [illegible] | Section Description: Houses annulars, pods, mini-collet connector, LMRP connector, deadman system and various valves. |
|---|---|---|
| Rev. no.: [illegible]<br>Date: 01/17/01 | Function: LMRP Connector – Hydraulic<br>Function No.: [illegible] | Function Description: Connects LMRP to BOP. |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| EE. | Failure to unlatch on demand. | Total shuttle valve failure (pod shuttle valve). | Fluid loss. Loss of primary unlatch. | (Affects EDS – potential catastrophic effect) | Failure evident. | | L | VH | H | PM system to place emphasis on this shuttle valve due to the possible consequence of failure. |
| FF. | | Total shuttle valve failure (ROV shuttle valve – operating from pod). | Loss of fluid. | Lose either primary or secondary unlatch. Lose ROV unlatch. | Indicator rod. Fluid count. | Rely on available unlatch circuit or deadaman. Pull LMRP. PM. | L | M | L | |
| GG. | | Total shuttle valve failure (ROV shuttle valve – operating from ROV). | Loss of fluid. | Lose both primary and secondary unlatch before using ROV. Lose ROV unlatch. | Indicator rod. Fluid count. | Rely on deadman and pull LMRP. OR Pull BOP. PM. | L | H | M | PM system to place emphasis on this shuttle valve due to the possible consequence of failure. |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: [illegible]<br>Section No. [illegible] | Section Description: Houses annulars, pods, mini collet connector, [illegible] various valves |
|---|---|---|
| Rev. no.: 1<br>Date: 01/17/01 | Function: [illegible] Hydraulic<br>Function No. 304 | Function Description: [illegible] LMRP to BOP |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| HH. | Failure to unlatch on demand. | Total shuttle valve failure (ROV shuttle valve – operating from ROV). | Loss of fluid. | (Affects EDS – potential catastrophic effect) | Failure evident. | | L | VH | H | PM system to place emphasis on this shuttle valve due to the possible consequence of failure. |
| II. | | Total shuttle valve failure (deadman shuttle valve – operating thru pod). | Loss of fluid. | Loss and ROV and deadman for both pods. Loss of either primary or secondary unlatch from active pod. | Fluid count. Indicator rods. | Rely on available unlatch circuit. Pull LMRP. | L | M | L | |
| JJ. | | Total shuttle *valve failure* (deadman shuttle valve – operating thru deadman or ROV). | Loss of fluid. | Loss of ability to *unlatch.* | Failure evident. | Secure well and *pull BOP.* | L | H | M | As previous. |
| KK. | | *Failure of 1"* hose (blue or yellow). Add B/Y designation to rest of report. | *Fluid loss.* Inability to primary unlatch from active pod. | *Loss of function* redundancy. | *Fluid count.* Eventual alarm. | *Switch to* secondary unlatch on active pod. Eventually pull LMRP. PM. | *M* | *M* | *M* | As previous. |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: LMRP<br>Section No.: 3 | Section Description: Houses annulars, pods, mini-collet connector, LMRP connector, deadman system and various valves |
|---|---|---|
| Rev. no.: 1<br>Date: 01/17/01 | Function: LMRP connector - Hydraulics<br>Function No.: 04 | Function Description: Connects LMRP to BOP |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| LL. | Failure to unlatch on demand. | Failure of receptacle tubing. | Fluid loss. Inability to primary unlatch from active pod. | Loss of function redundancy. | Fluid count. Eventual alarm. | Switch to secondary unlatch on active pod. Eventually pull *LMRP. PM.* | L | M | L | |
| MM | | Failure of stinger seal. | Fluid loss. Inability to primary unlatch from active pod. | Loss of function redundancy. | Fluid count. Eventual alarm. | Switch to secondary unlatch on active pod. Eventually pull LMRP. PM. | L | M | L | |
| NN. | | Shear seal valve failure (pilot side). | Fluid loss. Inability to primary unlatch from active pod. | Loss of function redundancy. | No flow count. No pressure drop on readback. | Switch to secondary unlatch on active pod. Eventually pull LMRP. PM. | L | M | L | |
| OO. | | Solenoid valve failure. | Fluid loss. Inability to primary unlatch from active pod. | Loss of function redundancy. | No flow count. No pressure drop on readback. | Switch to secondary unlatch on active pod. Eventually pull LMRP. PM. | L | M | L | |
| PP. | | Manual pilot *regulator leak.* | Fluid loss. | Fluid loss. | Increased pump *operation.* Excess fluid use. Visual indication with ROV. | No mitigation required – monitor situation. | L | L | L | |

| FMECA Report Form | System: Deepwater Horizon BOP | Section Description: Houses annulars, pods, mini-collet connector, LMRP connector, deadman system and various valves. |
|---|---|---|
| Rev. no.: 1 | Section: LMRP | |
| Date: 01/17/01 | Section No.: 2 | |
| | Function: LMRP Connector - Hydraulics | Function Description: Connects LMRP to BOP |
| | Function No.: 04 | |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| QQ. | Failure to unlatch on demand. | Total manual pilot regulator failure (catastrophic leak). | Loss of pilot pressure. | Loss of pod. | Low pilot readback pressure. | Switch to alternate pod. Isolate pod at conduit valve package. *Pull* LMRP. | L | M | L | Consider continually monitoring pilot pressure system health during completion, well testing and well control situations. |
| RR. | | Plugged filters. | Pass dirty fluid. | Plugged solenoid valves. Loss of pod. | Function failure. | Switch to alternate pod to secure well. Pull LMRP. PM. Clean fluid *practices.* | L | M | L | Ensure that MOC process is in placed and followed. (Change of *OEM* spares / fluids) |
| SS. | | Plugged solenoid common vent. | Unable to open annular. | Loss of pod. | No fluid count. | Switch to alternate pod to secure well. Pull LMRP. PM. *Clean fluid* practices. | L | M | L | |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: LMRP<br>Section No.: [illegible] | Section Description: Houses annulars, pods, mini-collet connector, LMRP connector, deadman system and various valves. |
|---|---|---|
| Rev. no.: [illegible]<br>Date: 01/17/01 | Function: LMRP Connector – Hydraulics [illegible]<br>Function No.: 04 [illegible] | Function Description: Connects LMRP to BOP. |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| TT. | Failure to unlatch on demand. | Shear seal valve failure (supply side). | Inability to primary unlatch on active pod. | Loss of function redundancy. Loss of secondary unlatch in active pod. | Unexpected flow count. Unexpected pressure drop on readback. | Block functions. Switch to alternate pod. Pull LMRP. | L | M | L | |
| UU. | | LMRP connector regulator leak. | Fluid loss. | Fluid loss. | Increased pump operation. Excess fluid use. Visual indication with ROV. | No mitigation required – monitor situation. PM. | M | L | L | Add note about tolerance – see latch. |
| VV. | | LMRP connector regulator failure (catastrophic leak – stuck wide open). | Loss of supply pressure. | Loss of pod. | Low supply readback pressure. Excessive fluid use | Switch to alternate pod. Pull LMRP. | L | M | L | Consider continually monitoring supply pressure system health during completion, well testing and well control situations. (High level recommendation.) |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: LMRP<br>Section No.: [illegible] | Section Description: House, annulars, pods, mini-collet connector, [illegible] connector, [illegible] system and various valves |
|---|---|---|
| Rev. no.: [illegible]<br>Date: 01/17/01 | Function: LMRP Connector [illegible]<br>Function No.: 204 | Function Description: Connect LMRP to BOP |

| # | Failure Mode | Causes | Local Failure Effect | System Effects | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| W | Failure to unlatch on demand. | POCV stuck closed. | Loss of supply pressure. | Loss of pod. | No supply readback pressure. No fluid use | Switch to alternate pod. Pull LMRP. | L | M | L | |
| XX. | Failure to seal on demand. | See Closed – No New Issues. | | | | | | | | |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: LMRP<br>Section No.: 01 | Section Description: Houses annulars, pods, mini-collet connector, LMRP connector, deadman system and various valves. |
|---|---|---|
| Rev. no.: 1<br>Date: 01/17/01 | Function: SEM<br>Function No.: 05 | Function Description: Convert electrical signals to hydraulic signals |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | C | R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| A. | Failure to fire solenoid | Water ingress to solenoid valve electronics *(including cable* and Pie connector). | Inability to fire valve. | Loss of single function from one pod. | Alarm at panel. | (see individual solenoid function worksheets for *mitigations* and rankings) | | | | |
| B. | | Complete SEM failure. | Loss of pod. | Loss of pod redundancy. | Alarms. | Switch to alternate pod. Secure well and pull LMRP. | L | M | L | |
| C. | | Loss of SEMA or SEMB. | Loss of redundancy in active pod. | Loss of redundancy in single pod. | Alarm. | Automatic switch to alternate SEM(A or B). Monitor situation. | L | L | L | |
| D. | | Loss of pod PBOF cable and connectors. | Loss SEM (pod). | Loss of pod. | Alarms. | Rely on alternate pod. Secure well and pull LMRP. PM (visual inspection). | M | M | M | *Ensure proper connection of PBOF cables as per procedures.* |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: LMRP<br>Section No.: [illegible] | Section Description: Houses annulars, pods, mini-collet connector, LMRP connector, deadman system and various valves. |
|---|---|---|
| Rev. no.: 1<br>Date: 01/17/01 | Function: SEM<br>Function No.: 05 | Function Description: Convert electrical signals to hydraulic signals. |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| E. | Failure to fire solenoid | Loss of Wet Mate connector. | Ground. | Loss of pod. | Alarms. | Rely on alternate pod. Secure well and pull LMRP. PM (visual inspection). | M | M | M | *Ensure proper connection of wet mat connectors as per procedures.* |
| F. | | J-box failure. | Ground. | Loss of pod. | Alarms. | Rely on alternate pod. Secure well and pull LMRP. PM (visual inspection). | L | M | L | |
| G. | | Loss of FITA (Field Installable Termination Assembly). | Ground. | Loss of pod. | Alarms. | Rely on alternate pod. Secure well and pull LMRP. PM (visual inspection). | L | M | L | |
| H. | | Loss of Riser Control Box (RCB). | Unable to evaluate with information on hand. | | | | | | | *Waiting on evaluation from Cameron.* |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: LMRP<br>Section No.: 1 | Section Description: Houses annulars, pods, mini-collet connector, MUX connectors, deadman system and various valves. |
|---|---|---|
| Rev. no.: 1<br>Date: 01/17/01 | Function: Conduit valve package<br>Function No.: 06 | Function Description: Hydraulic supply to pods. |

| # | Failure Mode | Causes | Local Failure Effects | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| A. | Loss of Yellow / Blue pod conduit supply | Loss of conduit. | Loss of supply. | Loss of conduit supply to both pods. | No/low flow on meter. No/low pressure on meter. | Secure well and pull LMRP. PM. | L | M | L | |
| B. | | POCV failure. | Loss of supply to single pod. | Loss pod. | Sluggish response or no supply. | Secure well and pull LMRP. Emergency use via hot line. PM. | L | M | L | |
| C. | | POCV pilot shuttle valve failure. | Loss of supply to single pod. | Loss pod. | Sluggish response or no supply. | Secure well and pull LMRP. Emergency use via hot line. PM. | L | M | L | |
| D. | | Conduit flush *valve fails open.* | Loss of supply. | Loss of conduit *supply to both* pods. | No/low flow on meter. No/low pressure on meter. | Jump ROV and continue operations. PM. | L | L | L | |
| E. | Loss of Yellow / Blue hot line supply | Loss before or during running. | Loss of pressure. | System reliant on trapped pressure in 10 gal. accumulator. | Excessive flow at surface. | Case-by-case depending on stage of operation. Possibility of pulling LMRP. | L | M | L | *BOP will be brought to the surface with the LMRP.* |

| **FMECA Report Form** | System: Deepwater Horizon BOP<br>Section: LMRP<br>Section No.: [illegible] | Section Description: Houses annulars, pods, mini-collet connector, [illegible] |
|---|---|---|
| Rev. no.: 1<br>Date: 01/17/01 | Function: [illegible]<br>Function No.: [illegible] | Function Description: Hydraulic supply to pods. |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| F. | Loss of Yellow / Blue hot line *supply* | Loss after latching. | Loss of hot line pressure. | Loss of backup pressure. | Difficult to detect (if hot line not active) or excessive flow (if hot line active). | Note situation and continue operation. | L | L | L | |
| G. | Loss of Rigid conduit flush | POCV or pilot failure. | Unable to directly flush rigid conduit. | Possibility to plug filters. | No conduit flush action. | Flush through pods and continue. | L | L | L | |
| H. | Loss of Conduit readback | Failure of unbalanced shuttle valve or associated hose. | Loss of conduit readback. | 1 of 3 conditions satisfied for deadman. | Difficult to detect. Possibly noticed on event logger (low readback). | Secure well and pull LMRP. | L | M | L | |

| **FMECA Report Form** | **System:** Deepwater Horizon BOP<br>**Section:** BOP<br>**Section No.:** [illegible] | **Section Description:** Houses rams, shears, accumulators, wellhead [illegible] |
|---|---|---|
| **Rev. no.:** 1<br>**Date:** 01/17/01 | **Function:** Blind Shear Ram [illegible]<br>Shear<br>**Function No.:** [illegible] | **Function Description:** Shear and secure well |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| A. | Failure to close | Blown seal. | Possible incomplete closing. | Loss of blind shear ram. | Excessive fluid count. No weight loss on indicator. | Secure well and pull BOP. PM. | L | H | M | |
| B. | | Mechanical damage to internal components. | Possible incomplete closing. | Loss of blind shear ram. | Unexpected fluid count. No weight loss on indicator. | Secure well and pull BOP. PM. | L | H | M | |
| C. | | Corrosion. | Possible incomplete closing. | Loss of blind shear ram. | Unexpected fluid count. No weight loss on indicator. | Secure well and pull BOP. PM. | L | H | M | |
| D. | | Debris. | Possible incomplete closing. | Loss of blind shear ram. | Unexpected fluid count. No weight loss on indicator. | Clear obstruction and continue operation. | L | L | L | |
| E. | Failure to shear on demand | Damaged blades. | Inability to cut. | Inability to cut. | Unexpected fluid count. No weight loss on indicator. | Secure well and pull BOP. PM. | L | H | M | |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: [illegible]<br>Section No.: [illegible] | Section Description: Houses rams, shears, accumulators, wellhead connector, stack valves, etc. |
|---|---|---|
| Rev. no.: 1<br>Date: [illegible] | Function: [illegible] Shear<br>Function No.: [illegible] | Function Description: Shear and secure well [illegible] |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| F. | Failure to shear on demand | Defective blades. | Inability to cut. | Inability to cut. | Unexpected fluid count. No weight loss on indicator. | Secure well and pull BOP. PM. | L | H | M | |
| G. | | Attempting to shear inappropriate material. | Inability to cut. | Inability to cut. | Unexpected fluid count. No weight loss on indicator. | Reposition string and re-attempt cut. Pressure test. Pre-testing cut. | L | H | M | *Ensure correct space out. Ensure pre-testing has been completed.* |
| H. | Failure to seal on demand | Damaged or defective ram block. | Inability to seal wellbore. | Inability to seal wellbore. | Wellbore flow or failed pressure test. | Secure well and pull BOP. PM. | L | H | M | *Verify NDE frequency.* |
| I. | | Damaged packers. | Inability to seal wellbore. | Inability to seal wellbore. | Wellbore flow or failed pressure test. | Secure well and pull BOP. PM. | L | H | M | *Ensure clean wellbore. Follow policy of not tagging shear rams.* |
| J. | | Inadequate fold over and closure of fish. | Inability to seal wellbore. | Inability to seal wellbore. | Wellbore flow or failed pressure test. | Secure well and pull BOP. | L | H | M | |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: BOP<br>Section No.: 01 | Section Description: Houses rams, shears, accumulators, wellhead [illegible] |
|---|---|---|
| Rev. no.: 1<br>Date: 01/17/01 | Function: Blind Shear Ram [illegible] Close<br>Shear<br>Function No.: 01 | Function Description: Shear and secure well. |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| K. | Failure to open on demand. | Blown seal. | Possible incomplete or slow opening. | Possibly obstructed wellbore. | Unexpected fluid count. | Cycle until fully open. Then secure well and pull BOP. PM. | L | H | M | |
| L. | | Mechanical damage to internal components. | Possible incomplete or slow opening. | Possibly obstructed wellbore. | Unexpected fluid count. | Secure well and pull BOP. PM. | L | H | M | |
| M. | | Corrosion. | Possible incomplete or slow opening. | Possibly obstructed wellbore. | Unexpected fluid count. | Secure well and pull BOP. PM. | L | H | M | |
| N. | | Debris. | Possible incomplete or slow opening. | Possibly obstructed wellbore. | Unexpected fluid count. | Attempt to clear. Secure well and pull BOP. Well maintenance. | L | H | M | |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: BOP<br>Section No.: [illegible] | Section Description: Houses rams, shears, accumulators, wellhead connector, [illegible] valves, etc. |
|---|---|---|
| Rev. no.: [illegible]<br>Date: 01/17/01 | Function: Blind Shear Rams – Open/Close/Shear<br>Function No.: [illegible] | Function Description: Shear and secure well. |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| O. | Failure to open on demand. | Generalized ST lock failure. | Failure to open. | Obstructed wellbore. | No fluid count. | Secure well and pull BOP. PM. | M | H | H | *Upgrades made by Cameron – ongoing monitoring.*<br><br>*Include predictive testing procedure in PM.*<br><br>*Cameron to submit written documentation confirming component numbers for all ST locks.* |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: BOP<br>Section No.: 1 | Section Description: Houses rams, shears, accumulators, wellhead connector, stack [illegible] |
|---|---|---|
| Rev. no.: 1<br>Date: 01/17/01 | Function: Blind Shear Rams - Hydraulics<br>Function No.: [illegible] | Function Description: Shear and secure well |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| A. | Failure to close on demand **(HP Panel)** | Failure of sequence valve. | Premature locking attempts. | Closing with tail rod damage. | Difficult to detect. | Secure well and pull BOP. PM. | L | H | M | |
| B. | | Total shuttle valve failure (ram shuttle valve). | Fluid loss. Inability to close ram. | Loss of ram. | Fluid count. | Secure well and pull BOP. PM. | L | H | M | |
| C. | | Total shuttle valve failure (pod shuttle valve). | Fluid loss. Inability to close ram (low pressure) from both pods. | Inability to close ram (low pressure) from both pods. | Fluid count. | Block function. Rely on high pressure or ROV shear. | L | L | L | *Ensure procedures are updated in this situation.* |
| D. | | Total shuttle valve failure (ROV/HP shuttle valve.). | Fluid loss. | Significant loss of ability to shear. Lose ad ability to close with ROV. Loss of EDS. | Fluid count. Visual indication with ROV. | Increase low pressure. Secure well and pull BOP. PM. | L | H | M | |
| E. | | Failure of 1" hose from shuttle valve to panel. | Fluid loss. | Significant loss of ability to shear. Loss of EDS. | Fluid count. Visual indication with ROV. | Increase low pressure. Secure well and pull BOP. PM. | M | H | H | *See previous. (TSF hose study)* |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: BOP<br>Section No.: 11 | Section Description: Houses rams, shears, accumulators, wellhead connector, stack valves, etc. |
|---|---|---|
| Rev. no.: 1<br>Date: 01/17/01 | Function: Blind Shear Rams - Hydraulics<br>Function No.: [illegible] | Function Description: Shear and secure well. |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| F. | Failure to close on demand **(HP Panel)** | Failure of tubing in HP panel. | Fluid loss. | Significant loss of ability to shear. Loss of EDS. | Fluid count. Visual indication with ROV. | Increase low pressure. Secure well and pull BOP. PM. | L | H | M | |
| G. | | Shear seal valve failure (pilot side). | Inability to close HP shear. | Significant loss of ability to shear. Loss of EDS. | No flow count. No pressure drop on readback. | Increase low pressure. Secure well and pull BOP. PM. | L | H | M | |
| H. | | Pilot shuttle valve failure. | Inability to close HP shear. | Significant loss of ability to shear. Loss of EDS. | No flow count. No pressure drop on readback. | Increase low pressure. Secure well and pull BOP. PM. | L | H | M | |
| I. | | Pod pilot shuttle valve. | Inability to close HP shear. | Significant loss of ability to shear. Loss of EDS. | No flow count. No pressure drop on readback. | Increase low pressure. Secure well and pull BOP. PM. | L | H | M | |
| J. | | Failure of receptacle tubing and stinger seal. | Fluid loss. Inability to close HP shear from active pod. | Loss of function redundancy. | Fluid count. Eventual alarm. | Switch to alternate pod. Secure well and pull BOP. PM. | L | H | M | |
| K. | | Shear seal valve (in pod) failure (pilot side). | Fluid loss. Inability to close HP shear from active pod. | Loss of function redundancy. | No flow count. No pressure drop on readback. | Switch to alternate pod. Secure well and pull LMRP. PM. | L | M | L | |

| EMECA Report Form | System: Deepwater Horizon BOP<br>Section: BOP<br>Section No.: II | Section Description: Houses rams, shears, accumulators, wellhead connector, stack valves etc. |
|---|---|---|
| Rev. no.: 1<br>Date: 01/17/01 | Function: Fluid Systems [illegible] Hydraulics<br>Function No.: 02 | Function Description: Shear and secure well. |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| L. | Failure to close on demand **(Pod)** | Solenoid valve (in pod) failure. | Fluid loss. Inability to close HP shear from active pod. | Loss of function redundancy. | No flow count. No pressure drop on readback. | Switch to alternate pod. Secure well and pull LMRP. PM. | L | M | L | |
| M. | | Manual pilot regulator leak. | Fluid loss. | Fluid loss. | Increased pump operation. Excess fluid use. Visual indication with ROV. | No mitigation required – monitor situation. | L | L | L | |
| N. | | Total manual pilot regulator failure (catastrophic leak). | Loss of pilot pressure. | Loss of pod. | Low pilot readback pressure. | Switch to alternate pod. Isolate pod at conduit valve package. Pull LMRP. | L | M | L | *Consider continually monitoring pilot pressure system health during completion, well testing and well control situations.* |

| | | |
|---|---|---|
| **FMECA Report Form** | System: Deepwater Horizon BOP<br>Section: BOP<br>Section No.: II | Section Description: Houses rams, shears, accumulators, wellhead connector, stack valves, etc. |
| Rev. no.: 1<br>Date: 01/17/01 | Function: [illegible]<br>Function No.: 02 | Function Description: Shear and secure well. |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| O. | Failure to close on demand **(Pod)** | | | | | | | | | |
| P. | | Plugged filters. | Pass dirty fluid. | Plugged solenoid valves. Loss of pod. | Function failure. | Switch to alternate pod to secure well. Pull LMRP. PM. Clean fluid practices. | L | M | L | *Ensure that MOC process is in placed and followed. (Change of OEM spares / fluids)* |
| Q. | | Plugged solenoid common vent. | Unable to close ram. | Loss of pod. | No fluid count. | Switch to alternate pod to secure well. Pull LMRP. PM. Clean fluid practices. | L | M | L | |
| R. | | Shear seal valve (in pod) failure (supply side). | Reduced ability to HP shear with active pod. | Loss of function redundancy. | Minimal unexpected flow count. Unexpected pressure drop on readback. | Secure well and pull LMRP. PM. | L | M | L | |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: BOP<br>Section No.: [illegible] | Section Description: Houses rams, shears, accumulators, wellhead connector, stack valves, etc. |
|---|---|---|
| Rev. no.: 1<br>Date: 01/17/01 | Function: Blind Shear Rams - Hydraulics<br>Function No.: [illegible] | Function Description: Shear and secure well. |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| S. | Failure to close on demand **(Pod)** | Manual pilot regulator – no new issues. | | | | | | | | |
| T. | | HP shear seal valve failure (supply) | Inability to close HP shear. | Significant loss of ability to shear. Loss of EDS. | Unexpected flow count. | Increase low pressure. Secure well and pull BOP. PM. | L | H | M | |
| U. | | HP shear regulator leak. | Fluid loss. | Fluid loss. | Increased pump operation. Excess fluid use. Visual indication with ROV. | No mitigation required – monitor situation. PM. | M | L | L | |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: BOP<br>Section No.: II | Section Description: Houses rams, shears, accumulators, wellhead connector, stack valves, etc. |
|---|---|---|
| Rev. no.: 1<br>Date: 01/17/01 | Function: Blind Shear Rams - Hydraulics<br>Function No.: 02 | Function Description: Shear and secure well |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| V. | Failure to close on demand **(Pod)** | HP shear regulator failure (catastrophic leak – stuck wide open). | Loss of supply pressure for HP shear. | Loss of HP shear. Loss of EDS, autoshear, deadman. Loss HP casing shear. | Excessive fluid use. | Increase low pressure. Secure well and pull BOP. PM. | L | H | M | *Consider continually monitoring supply pressure system health during completion, well testing and well control situations. (High level recommendation.)* |
| W. | | Dump valve failure. | Loss of supply pressure for HP shear. | Loss of HP shear. Loss of EDS, autoshear, deadman. Loss HP casing shear. | Excessive fluid use. | Increase low pressure. Secure well and pull BOP. PM. | L | H | M | |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: BOP<br>Section No.: 1 | Section Description: Houses rams, shears, accumulators, wellhead connector, stack valves, etc. |
|---|---|---|
| Rev. no.: 1<br>Date: 01/17/01 | Function: Blind Shear Rams, Hydraulics<br>Function No.: 02 | Function Description: Shear and secure well |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| X. | Failure to close on demand **(Pod)** | Relief valve failure. | Loss of supply pressure for HP shear. | Loss of HP shear. Loss of EDS, autoshear, deadman. Loss HP casing shear. | Excessive fluid use. | Close ROV valve. PM. | L | L | L | |
| Y. | | Accumulator leak. | Loss of supply pressure for HP shear. | Loss of HP shear. Loss of EDS, autoshear, deadman. Loss HP casing shear. | Excessive fluid use. | Increase low pressure. Secure well and pull BOP. PM. | L | H | M | |
| Z. | | Total stacked accumulator charge shuttle valve (#82) failure. | Loss of ability to recharge accumulators. | Loss of ability to shear (any method) more than once. | Fluid count. Eventual alarm. | Block function. Secure well and pull BOP. PM. | L | H | M | |
| AA. | | Autoshear inoperable. | Loss of autoshear system. | Inability to shear in an unplanned disconnect. | Flow count. | Secure well and pull BOP. PM. | M | H | H | *Review frequency rating after test of autoshear.* |
| BB. | Failure to lock on demand. | Failure of sequence valve tubing / hose. | Fluid loss. | Failure to lock. (Successfully close) | Fluid count. Visual indication with ROV. | Maintain closing pressure on rams, secure well and pull BOP. PM. | L | H | M | |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: Item<br>Section No.: II | Section Description: Houses rams, shears, accumulators, wellhead connector, stack valves, etc. |
|---|---|---|
| Rev. no.: 1<br>Date: 01/17/01 | Function: Blind Shear Ram – Hydraulics<br>Function No.: 02 | Function Description: Shear and secure well |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigations | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| CC. | Failure to lock on demand. | Same Issues as failure to close on demand | | | | | | | | |
| DD. | Failure to open on demand | Failure of sequence cap (and tubing). | Fail to open rams or mechanical damage to rods and ST locks. | Fail to open rams or mechanical damage to rods and ST locks. | Flow count. | Secure well and pull BOP. PM. | L | H | M | |
| EE. | | Shuttle valve failure. | Fluid loss. Inability to open rams. | Inability to open rams. | Flow count. | Secure well and pull BOP. PM. | L | H | M | |
| FF. | | Failure of 1" hose. | Fluid loss. Possible inability to fully open ram from active pod. | Loss of function redundancy. | Fluid count. Eventual alarm. | Switch to alternate pod. Secure well and pull BOP. PM. | M | H | H | *Follow up with TSF w/rt flexible hose testing.* |
| GG. | | Failure of *receptacle* tubing or stinger seal. | Fluid loss. *Possible inability* to fully open ram from active pod. | Loss of function *redundancy.* | Fluid count. *Eventual alarm.* | Switch to *alternate pod.* Secure well and pull BOP. PM. | L | H | M | |
| HH. | | | | | | | | | | |
| II. | | Shear seal valve failure (pilot side). | Inability to open ram from active pod. | Loss of function redundancy. | No flow count. No pressure drop on readback. | Switch to alternate pod. Secure well and pull LMRP. PM. | L | M | L | |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: BOP<br>Section No.: 1 | Section Description: Houses rams, shears, accumulators, wellhead connector, kill valves, etc. |
|---|---|---|
| Rev. no.: 1<br>Date: 01/17/01 | Function: Blind Shear Ram – Hydraulics<br>Function No.: [illegible] | Function Description: Shear and secure well |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| JJ. | Failure to open on demand | Solenoid valve failure. | Inability to open ram. | Loss of function redundancy. | No flow count. No pressure drop on readback. | Switch to alternate pod. Secure well and pull LMRP. PM. | L | M | L | |
| KK. | | *Manual pilot* regulator leak. | *Fluid loss.* | *Fluid loss.* | Increased pump operation. Excess fluid use. Visual indication with ROV. | No mitigation required -- monitor situation. | L | L | L | |
| LL. | | Total manual pilot regulator failure (catastrophic leak). | Loss of pilot pressure. | Loss of pod. | Low pilot readback pressure. | Switch to alternate pod. Isolate pod at conduit valve package. Pull LMRP. | L | M | L | *Consider continually monitoring pilot pressure system health during completion, well testing and well control situations.* |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: [illegible]<br>Section No.: [illegible] | Section Description: Houses rams, shears, accumulators, wellhead connector, stack valves etc. |
|---|---|---|
| Rev. no.: 1<br>Date: 01/17/01 | Function: Blind Shear Rams [illegible]<br>Function No.: [illegible] | Function Description: Shear and secure well. |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking P | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| MM | Failure to open on demand | Plugged filters. | Pass dirty fluid. | Plugged solenoid valves. Loss of pod. | Function failure. | Switch to alternate pod to secure well. Pull LMRP. PM. Clean fluid practices. | L | M | L | *Ensure that MOC process is in placed and followed. (Change of OEM spares / fluids)* |
| *NN.* | | *Plugged solenoid* common vent. | *Unable to open* ram. | *Loss of pod.* | *No fluid count.* | *Switch to* alternate pod to secure well. Pull LMRP. PM. Clean fluid practices. | L | M | L | |
| OO. | | Shear seal valve failure (supply side). | Inability to open ram. | Loss of function redundancy. | Unexpected flow count. Unexpected pressure drop on readback. | Block function. Switch to alternate pod. Secure well pull LMRP. PM | L | M | L | |
| PP. | | Pod manifold regulator leak. | Fluid loss. | Fluid loss. | Increased pump operation. Excess fluid use. Visual indication with ROV. | No mitigation required – monitor situation. PM. | M | L | L | |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: BOP<br>Section No.: II | Section Description: Houses rams, shears, accumulators, wellhead connector, stack valves etc. |
|---|---|---|
| Rev. no.: 1<br>Date: 01/17/01 | Function: Blind Shear Ram Hydraulics<br>Function No.: 02 | Function Description: Shear and secure well. |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| QQ. | Failure to open on demand | Pod manifold regulator failure (catastrophic leak – stuck wide open). | Loss of supply pressure. | Loss of pod. | Low supply readback pressure. Excessive fluid use. | Switch to alternate pod. Pull LMRP. | L | M | L | *Consider continually monitoring supply pressure system health during completion, well testing and well control situations. (High level recommendation.)* |
| RR. | | POCV stuck closed. | Loss of supply pressure. | Loss of pod. | No supply readback pressure. No fluid use. | Switch to alternate pod. Pull LMRP. | L | M | L | |
| SS. | Failure to seal / shear on demand. | See 'Failure to Close on Demand' – No New Issues. | | | | | | | | |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: BOP<br>Section No.: [illegible] | Section Description: Houses rams, shears, accumulators, wellhead connector, stack valves etc. |
|---|---|---|
| Rev. no.: [illegible]<br>Date: 01/17/01 | Function: [illegible] Open / Close<br>Function No.: [illegible] | Function Description: Typical kill or choke valve with fail-safe close [illegible] |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking L | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| A. | Failure to open on demand. | Blown seal. | Inability to open valve. | Loss of outlet. | Unable to circulate. Fluid count. Visual indication by ROV. | Rely on alternate outlet. PM. | L | L | L | |
| B. | | Mechanical damage to internal components. | Inability to open valve. | Loss of outlet. | Unable to circulate. Fluid count. Visual indication by ROV. | Rely on alternate outlet. PM. | L | L | L | |
| C. | | Corrosion. | Inability to open valve. | Loss of outlet. | Unable to circulate. Fluid count. Visual indication by ROV. | Rely on alternate outlet. PM. | L | L | L | |
| D. | | Debris in bore. | Inability to open valve. | Loss of outlet. | Unable to circulate. Fluid count. Visual indication by ROV. | Rely on alternate outlet. | L | L | L | |
| E. | *Failure to* close on demand. | *Mechanical* damage to internal components. | *Inability to close* valve. | *Loss of* redundancy at outlet. | Fluid count. | Note situation and switch to alternate outlet. | L | L | L | |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: BOP<br>Section No.: [illegible] | Section Description: Houses rams, shears, accumulators, wellhead connector, stack valves, etc. |
|---|---|---|
| Rev. no.: 1<br>Date: 01/17/01 | Function: Upper inner kill valve – fail close<br>Function No.: 03 | Function Description: Typical kill or choke valve with fail-safe close [illegible] |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | C | R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| F. | Failure to close on demand. | Corrosion. | Inability to close valve. | Loss of redundancy at outlet. | Fluid count. | Note situation and switch to alternate outlet. | L | L | L | |
| G. | | Debris or physical obstruction. | Inability to close both valves. | Loss of outlet. | Fluid count. | Switch to alternate outlet. Possible pull of BOP. | L | H | M | *Consequences depend on which outlet affected – refer to failure scenarios* |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: BOP<br>Section No.: 1 | Section Description: Houses rams, shears, accumulators, wellhead connector, stack valves, [illegible] |
|---|---|---|
| Rev. no.: 1<br>Date: 01/17/01 | Function: [illegible] hydraulics<br>Function No.: [illegible] | Function Description: Typical kill or choke valve with fail safe close [illegible] |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| A. | Failure to close on demand (with wellbore pressure) | Failure of failsafe shuttle valve. | Loss of hydraulic assist close. | Inability to hydraulically close valve. | Unexpected flow. | Rely on alternate valve. PM. | L | L | L | |
| B. | | Failure of pod shuttle valve. | Loss of hydraulic assist close from pod. | Loss of some redundancy. | Unexpected flow. | Block function and rely on alternate valve. PM | L | L | L | |
| C. | | No further new issues | | | | | | | | |
| D. | Failure to failsafe close | Loss of return spring on shear seal valve | Loss of hydraulic assist close from failsafe kit. | Loss of hydraulic assist close from failsafe kit. | Difficult to detect. | Note situation and continue operation. PM. | L | L | L | |
| E. | | Failure of manual set regulator. | Loss of failsafe panel and inner / outer wing valves. | Loss of fluid. Loss of failsafe panel. | Fluid count. | Secure well and pull BOP. PM. | L | H | M | |
| F. | | Failure of relief valve. | Loss of failsafe panel and inner / outer wing valves. | Loss of fluid. Loss of failsafe panel. | Fluid count. | Close valve with ROV intervention and continue. PM. | M | L | L | |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: BOP<br>Section No.: [illegible] | Section Description: Houses rams, shears, accumulators, wellhead connector, stack valves etc. |
|---|---|---|
| Rev. no.: 1<br>Date: 01/17/01 | Function: [illegible] valve – Hydraulics<br>Function No.: [illegible] | Function Description: Typical kill or choke valve with fail-safe close kit. |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| G. | Failure to failsafe close | Failure of dump valve. | Loss of failsafe panel and inner / outer wing valves. | Loss of fluid. Loss of failsafe panel. | Fluid count. | Secure well and pull BOP. PM. | L | H | M | |
| H. | | Loss of accumulator charge. (on bleed valve only) | Potential loss of supply to failsafe close valve. | Loss of failsafe panel. | Difficult to detect. | Rely on spring, alternate valve, pod. | L | L | L | |
| I. | Failure to open on demand | Failure of shuttle valve. | Loss of ability to open. | Loss of ability to open. Loss of outlet. | Unexpected flow. | Rely on alternate outlet. PM. | L | L | L | *Consequence varies depending on outlet – see chart.* |
| J. | | Failure of pilot on shear seal valve. | Unable to shift valve. | Reduced ability to open. Lose outlet. | Unexpected flow. | Switch to alternate outlet. | L | L | L | *Consequence varies depending on outlet – see chart.* |
| K. | | Hose failure. | Unable to shift valve. | Lose ability to open. Lose outlet. | Unexpected flow. | Switch to alternate outlet. | L | L | L | *Consequence varies depending on outlet – see chart.* |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: BOP<br>Section No.: 1 | Section Description: Houses rams, shears, accumulators, wellhead [illegible] |
|---|---|---|
| Rev. no.: 1<br>Date: 01/17/01 | Function: [illegible]<br>Function No.: [illegible] | Function Description: Connect BOP to Wellhead |

| # | Failure Mode | Cause | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking L | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| A. | Failure to latch on demand. | Seal failure. | Failure to latch. | Unable to connect to wellhead. | Indicator rod. Unexpected flow. | Pull BOP. PM. | L | H | M | |
| B. | | Mechanical damage to internal components. | Failure to latch. | Unable to connect to wellhead. | Indicator rod. Unexpected flow. | Pull BOP. PM. | L | H | M | |
| C. | | Debris. | Failure to latch. | Unable to connect to wellhead. | Indicator rod. Unexpected flow. | Pull BOP. PM. | L | H | M | |
| D. | | Damage to hub on wellhead. | Failure to latch. | Unable to connect to wellhead. | Indicator rod. Unexpected flow. Visual inspection with ROV. | Pull BOP. | L | H | M | *Ensure that operating parameters are adequate to prevent damage from BOP strike or incidental contact.* |
| E. | | Corrosion. | Failure to latch. | Unable to connect to wellhead. | Indicator rod. Unexpected flow. | Pull BOP. PM. | L | H | M | |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: BOP<br>Section No.: 1 | Section Description: Houses rams, shears, accumulators, wellhead connector, stack, [illegible] etc. |
|---|---|---|
| Rev. no.: [illegible]<br>Date: 01/17/01 | Function: Wellhead Connector – Latch / Unlatch<br>Function No.: 04 | Function Description: Connects BOP to Wellhead |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| F. | Failure to seal on demand. | Improper or damaged gasket. | Failure to seal. | Failure to seal. | Failed pressure test. | Replace gasket and retest. | L | L | L | |
| G. | | Damaged seal surface (Connector). | Failure to seal. | Failure to seal. | Failed pressure test. | Pull BOP. PM. | L | H | M | |
| H. | | Damaged seal surface (Wellhead). | Failure to seal. | Failure to seal. | Failed pressure test. Possible visual indication with ROV. | Pull BOP. Visual inspection of wellhead. | L | H | M | *Ensure proper installation of gasket before attempt to latch.* |
| I. | Failure to maintain latch pressure. | Seal Failure. | Loss of latch pressure. | Loss of hydraulic operating fluid. Potential for loss of wellbore fluids. | Unexpected flow at flow meter. Excessive use of hydraulic fluid. Visual indication with ROV. | Secure well and pull BOP. PM. | L | H | M | |
| J. | Failure to unlatch on demand. | Overpressure on latch. | Inability to unlatch. | Inability to unlatch. | No or minimal flow. Failure evident. | Pull BOP. Employ ROV to overpressure. Proper training and procedures. | L | H | M | *Ensure procedures are followed.* |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: BOP<br>Section No.: [illegible] | Section Description: Houses rams, shears, accumulators, wellhead [illegible] |
|---|---|---|
| Rev no.: 1<br>Date: 01/17/01 | Function: Wellhead Connector [illegible] Unlatch<br>Function No.: [illegible] | Function Description: Connects BOP to Wellhead |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking P | C | R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| K. | Failure to unlatch on demand. | Hydrate or other debris. | Inability to unlatch. | Inability to unlatch. | No or minimal flow. Failure evident. | Use of methanol and warm fluids. Pull BOP. | M | H | H | *Follow up on wellhead connector upgrades.* |
| L. | | Damaged indicator rods. | Inability to unlatch. | Inability to unlatch. | Minimal flow. Failure evident. Second indicator flag would not travel full stroke. | Pull BOP. | L | H | M | *Investigate failure mode with Cameron (Jacqueline Hsu).* |
| M. | | Mechanical damage to internal components. | Inability to unlatch. | Inability to unlatch. | Minimal flow. Failure evident. Second indicator flag would not travel full stroke. | Pull BOP. PM. | L | H | M | |
| N. | | Corrosion. | Inability to unlatch. | Inability to unlatch. | Minimal flow. Failure evident. Second indicator flag would not travel full stroke. | Pull BOP. PM. | L | H | M | |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: BOP<br>Section No.: II | Section Description: Houses rams, shears, accumulators, wellhead connector, stack valves etc. |
|---|---|---|
| Rev. no.: 1<br>Date: 01/17/01 | Function: Wellhead Connector - Hydraulics<br>Function No.: 05 | Function Description: Connects BOP to Wellhead |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| A. | Failure to latch on demand | Failure of POCV (external leak). | Fluid loss. Possible inability to latch. | Possible inability to latch. | Fluid count. Indicator rod. Visual indication with ROV. | Pull BOP. PM. | L | H | M | |
| B. | | Total shuttle valve failure. | Fluid loss. Inability to latch. | Inability to latch. | Fluid count. Indicator rod. | Pull BOP. PM. | L | H | M | |
| C. | | Failure of 1" Poly-flex hose. | Fluid loss. Inability to latch from active pod. | Inability to latch from active pod. | Fluid count. Indicator rod. | Pull BOP. PM. | M | H | H | |
| D. | | Failure of receptacle tubing. | Fluid loss. Inability to latch from active pod. | Inability to latch from active pod. | Fluid count. Indicator rod. | Pull BOP. PM. | L | H | M | *Ensure that PM and operating procedures address shuttle valve mounting and maintenance.* |
| E. | | Failure of stinger seal. | Fluid loss. Inability to latch from active pod. | Inability to latch from active pod. | Fluid count. Indicator rod. | Pull BOP. PM. | L | H | M | |
| F. | | Shear seal valve failure (pilot side). | Inability to latch from active pod. | Loss of function redundancy. | No flow count. No pressure drop on readback. Indicator rod. | Pull BOP. PM. | L | H | M | |

| **FMECA Report Form** | System: Deepwater Horizon BOP<br>Section [illegible]<br>Section No.: [illegible] | Section Description: Houses rams, shears, accumulators, wellhead [illegible] |
|---|---|---|
| Rev. no.: [illegible]<br>Date: 01/17/01 | Function: [illegible]<br>Function No.: [illegible] | Function Description: Connects BOP to wellhead [illegible] |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| G. | Failure to latch on demand | Solenoid valve failure. | Inability to latch from active pod. | Loss of function redundancy. | No flow count. No pressure drop on readback. Indicator rod. | Pull BOP. PM. | L | H | M | |
| H. | | *Manual pilot* regulator leak. | *Fluid loss.* | *Fluid loss.* | Increased pump operation. Excess fluid use. Visual indication with ROV. | No mitigation required – monitor situation. | L | L | L | |
| I. | | Total manual pilot regulator failure (catastrophic leak). | Loss of pilot pressure. | Loss of pod. | Low pilot readback pressure. | Pull BOP. PM. | L | M | L | *Consider continually monitoring pilot pressure system health during completion, well testing and well control situations.* |
| J. | | Plugged filters. | Pass dirty fluid. | Plugged solenoid valves. Loss of pod. | Function failure. | Pull BOP. PM. Clean fluid practices. | L | M | L | *Ensure that MOC process is in placed and followed. (Change of OEM spares / fluids)* |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: Stack<br>Section No.: [illegible] | Section Description: Houses rams, shears, accumulators, wellhead connector [illegible] |
|---|---|---|
| Rev. no.: [illegible]<br>Date: 01-17-01 | Function: [illegible]<br>Function No.: [illegible] | Function Description: [illegible] wellhead [illegible] |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| K. | Failure to latch on demand | Plugged solenoid common vent. | Unable to latch. | Loss of pod. | No fluid count. | Pull BOP. PM. Clean fluid practices. | L | M | L | |
| L. | | Shear seal valve failure (supply side). | Inability to latch. | Loss of function redundancy. | Unexpected flow count. Unexpected pressure drop on readback. Indicator rod. | Pull BOP. PM. | L | M | L | |
| M. | | Wellhead connector regulator leak. | Fluid loss. | Fluid loss. Possible effect to unlatch function. | Increased pump operation. Excess fluid use. Visual indication with ROV. | Switch pods. PM. | M | L | L | *Note: Regulator leak tolerance for wellhead connector lower than for annulus.* |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: BOP<br>Section No.: II | Section Description: Houses rams, shears, accumulators, wellhead connector, stack valves, etc. |
|---|---|---|
| Rev. no.: 1<br>Date: 01/17/01 | Function: Wellhead connector [illegible]<br>Function No.: 08 | Function Description: Connect BOP to Wellhead |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| N. | Failure to latch on demand | Wellhead connector regulator failure (catastrophic leak – stuck wide open). | Loss of supply pressure. | Loss of pod. | Low supply readback pressure. Excessive fluid use. Indicator rod. | Pull BOP. PM. | L | M | L | *Consider continually monitoring supply pressure system health during completion, well testing and well control situations. (High level recommendation.)* |
| O. | | POCV stuck closed. | Loss of supply pressure. | Loss of pod. | No supply readback pressure. No fluid use. | Pull BOP. PM. | L | M | L | |
| P. | Failure to maintain proper latch pressure. | Failure of increase / decrease solenoid. | Inability to maintain proper latch pressure. | Possibility to impair unlatch. | Pressure readbacks. | Switch to alternate pod. | L | L | L | |
| Q. | | Loss of wellhead connector regulator pilot pressure. | Inability to maintain adequate pilot pressure. | Loss of ability to latch / primary unlatch with active pod. | Pressure readbacks. | Switch to alternate pod. | L | L | L | |

| FMECA Report Form | System: Deepwater Horizon BOP | Section Description: Houses rams, shears, accumulators, wellhead connector, stack [illegible] |
|---|---|---|
| | Section: BOP | |
| | Section No.: II | |
| Rev. no.: 1 | Function: Wellhead Connector – Hydraulics | Function Description: Connects BOP to Wellhead |
| Date: 01/17/01 | Function No.: 05 | |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| R. | Failure to maintain proper latch pressure. | Total POCV failure. | Fluid loss. Inability to maintain latch pressure. | Inability to maintain latch pressure. | Fluid count. Pressure readbacks. | Secure well and pull BOP. PM. | L | H | M | |
| S. | | Failure of 1" Poly-flex hose. | Fluid loss. | Fluid loss, | Fluid count. Pressure readbacks. | Block function and continue. PM. | M | L | L | *Follow up with TSF w/rt flexible hose testing.* |
| T. | | Failure of receptacle tubing. | Fluid loss. | Fluid loss, | Fluid count. Pressure readbacks. | Block function and continue. PM. | L | L | L | |
| U. | | Failure of stinger seal. | Fluid loss. | Fluid loss, | Fluid count. Pressure readbacks. | Block function and continue. PM. | L | L | L | |
| V. | | Shear seal valve failure (total pilot side failure). | Fluid loss. | Possible inability to primary unlatch from active pod. | Fluid count. Pilot pressure readback. | Switch to alternate pod. Monitor and continue. PM. | L | L | L | |
| W. | | Solenoid valve failure. | Fluid loss. | Fluid loss, | Fluid count. Pressure readbacks. | Block function and continue. PM. | L | L | L | *Cameron to investigate failure associated with solenoid.* |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: BOP<br>Section No.: 1 | Section Description: Houses rams, shears, accumulators, wellhead connector, stack valves, etc. |
|---|---|---|
| Rev. no.: 1<br>Date: 01/17/01 | Function: Wellhead Connector – Hydraulics<br>Function No.: 65 | Function Description: Connects BOP to Wellhead |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| X. | Failure to maintain proper latch pressure. | Manual pilot regulator leak. | Fluid loss. | Fluid loss. | Increased pump operation. Excess fluid use. Visual indication with ROV. | No mitigation required – monitor situation. | L | L | L | |
| Y. | | Total manual pilot regulator failure (catastrophic leak). | Loss of pilot pressure. | Loss of pod. | Low pilot readback pressure. | Switch to alternate pod. Isolate pod at conduit valve package. Pull LMRP. | L | M | L | *Consider continually monitoring pilot pressure system health during completion, well testing and well control situations.* |
| Z. | | Plugged filters. | Pass dirty fluid. | Plugged solenoid valves. Loss of pod. | Function failure. | Switch to alternate pod to secure well. Pull LMRP. PM. Clean fluid practices. | L | M | L | *Ensure that MOC process is in placed and followed. (Change of OEM spares / fluids)* |

| | | | |
|---|---|---|---|
| **FMECA Report Form** | **System:** Deepwater Horizon BOP<br>**Section:** BOP<br>**Section No.:** 11 | **Section Description:** Houses rams, shears, accumulators, wellhead connector, stack valves etc. | |
| **Rev. no.:** [illegible]<br>**Date:** 01/17/01 | **Function:** Wellhead Connector – Hydraulics<br>**Function No.:** 05 | **Function Description:** Connects BOP to Wellhead. | |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| AA. | Failure to maintain proper latch pressure. | Shear seal valve failure (supply side). | Fluid loss. | Inability to primary unlatch from active pod. | Unexpected flow count. Unexpected pressure drop on readback. | Switch to alternate pod. Monitor and continue. PM. | L | L | L | |
| BB. | | Wellhead connector regulator leak. | Fluid loss. | Inability to primary unlatch from active pod. | Increased pump operation. Excess fluid use. Visual indication with ROV. | Switch pods. Monitor and continue. PM. | M | L | L | *Note: Regulator leak tolerance for wellhaead connector lower than for annulus.* |
| CC. | | Wellhead connector regulator failure (catastrophic leak – stuck wide open). | Loss of supply pressure. | Loss of pod. | Low supply readback pressure. Excessive fluid use. Indicator rod. | Switch to alternate pod. Pull LMRP. | L | M | L | *Consider continually monitoring supply pressure system health during completion, well testing and well control situations. (High level recommendation.)* |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: BOP<br>Section No.: II | Section Description: Houses rams, shears, accumulators, wellhead connector, stack valves, etc. |
|---|---|---|
| Rev. no.: 1<br>Date: 01/17/01 | Function: Wellhead Connector – Hydraulics<br>Function No.: 05 | Function Description: Connects BOP to Wellhead |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| DD. | Failure to maintain proper latch pressure. | POCV stuck closed. | Loss of supply pressure. | Loss of pod. | No supply readback pressure. No fluid use. | Switch to alternate pod. Pull LMRP. | L | M | L | |
| EE. | Failure to primary unlatch on demand. | Failure of latch POCV to open. | Latch pressure not released. | Unable to unlatch. | No flow. Indicator rod. | Use 'Cut Me' tube via ROV. Pull BOP. | M | H | H | *Consider to adding valve in place of 'Cut Me' tube.* |
| FF. | | Total shuttle valve failure (pod shuttle valve). | Fluid loss. Loss of primary unlatch. | Loss of primary unlatch (both pods). | Failure detected on demand. Indicator rod. Fluid count. | Rely on secondary unlatch and ROV unlatch, secure well and pull BOP. PM. | L | H | M | |
| GG. | | Total shuttle valve failure (ROV shuttle valve – operating from pod). | Loss of fluid. | Lose primary unlatch from pod. Lose ROV unlatch. | Indicator rod. Fluid count. | Rely on secondary unlatch circuit. Pull BOP. PM. | L | H | M | |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: BOP<br>Section No.: [illegible] | Section Description: Houses rams, shears, accumulators, wellhead [illegible] |
|---|---|---|
| Rev. no.: 1<br>Date: 01/17/01 | Function: Wellhead Connector - Hydraulics<br>Function No.: 0[illegible] | Function Description: Connects BOP to Wellhead |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| HH. | Failure to primary unlatch on demand. | Total shuttle valve failure (ROV shuttle valve – operating from ROV). | Loss of fluid. | Lose both primary and secondary unlatch before using ROV. Lose ROV unlatch. | Indicator rod. Fluid count. | Pull BOP. PM. | L | H | M | *PM system to place emphasis on this shuttle valve due to the possible consequence of failure.* |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: BOP<br>Section No.: 1 | Section Description: Houses rams, shears, accumulators, wellhead connector, stack valves, etc. |
|---|---|---|
| Rev. no.: 1<br>Date: 01/17/01 | Function: Wellhead Connector - Hydraulic<br>Function No.: 05 | Function Description: Connects BOP to Wellhead |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| II. | Failure to primary unlatch on demand. | Failure of 1" hose (blue or yellow). | Fluid loss. Inability to primary unlatch from active pod. | Loss of function redundancy. | Fluid count. Eventual alarm. | Switch to secondary unlatch on active pod. PM. | M | L | L | *Follow up with TSF w/rt flexible hose testing.* |
| JJ. | | *Failure of* receptacle tubing. | Fluid loss. Inability to primary unlatch from active pod. | Loss of function redundancy. | Fluid count. Eventual alarm. | Switch to secondary unlatch on active pod. PM. | L | L | L | |
| KK. | | Failure of stinger seal. | Fluid loss. Inability to primary unlatch from active pod. | Loss of function redundancy. | Fluid count. Eventual alarm. | Switch to secondary unlatch on active pod. PM. | L | L | L | |
| LL. | | Shear seal valve failure (pilot side). | Fluid loss. Inability to primary unlatch from active pod. | Loss of Primary latch and unlatch on active pod. | No flow count. No pressure drop on readback. | Switch to secondary unlatch on active pod. PM. | L | L | L | |
| MM | | Solenoid valve failure. | Fluid loss. Inability to primary unlatch from active pod. | Loss of function redundancy. | Fluid count. Eventual alarm. | Switch to secondary unlatch on active pod. PM. | L | L | L | |
| NN. | | Manual pilot regulator leak. | Fluid loss. | Fluid loss. | Increased pump operation. Excess fluid use. Visual indication with ROV. | No mitigation required – monitor situation. | L | L | L | |

| | | |
|---|---|---|
| **FMECA Report Form** | System: Deepwater Horizon BOP<br>Section: BOPs<br>Section No.: [illegible] | Section Description: Houses rams, shears, accumulators, wellhead connector, stack valves, etc. |
| Rev. no.: 1<br>Date: 01/17/01 | Function: Wellhead connector – Hydraulics<br>Function No.: 20 | Function Description: Connects BOP to wellhead |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| OO. | Failure to primary unlatch on demand. | Total manual pilot regulator failure (catastrophic leak). | Loss of pilot pressure. | Loss of pod. | Low pilot readback pressure. | Switch to alternate pod. Isolate pod at conduit valve package. Pull BOP. | L | H | M | *Consider continually monitoring pilot pressure system health during completion, well testing and well control situations.* |
| PP. | | Plugged filters. | Pass dirty fluid. | Plugged solenoid valves. Loss of pod. | Function failure. | Switch to alternate pod to secure well. Pull BOP. PM. Clean fluid practices. | L | H | M | *Ensure that MOC process is in placed and followed. (Change of OEM spares / fluids)* |
| QQ. | | Plugged solenoid common vent. | Unable to unlatch. | Loss of pod. | No fluid count. | Switch to alternate pod to secure well. Pull BOP. PM. Clean fluid practices. | L | H | M | |

| FMECA Report Form | System: Deepwater Horizon BOP<br>Section: BOP<br>Section No.: [illegible] | Section Description: Houses rams, shears, accumulators, wellhead connector, [illegible] |
|---|---|---|
| Rev. no.: 1<br>Date: 01/17/01 | Function: Wellhead Connector – Hydraulic<br>Function No.: [illegible] | Function Description: Connects [illegible] to Wellhead |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| RR. | Failure to primary unlatch on demand. | Shear seal valve failure (supply side). | Inability to primary unlatch and latch on active pod. | Loss of function redundancy. | Unexpected flow count. Unexpected pressure drop on readback. | Block functions. Switch to alternate pod. Pull BOP. | L | H | M | |
| SS. | | Wellhead connector regulator leak. | Inability to primary unlatch and latch on active pod. | Loss of function redundancy. | Unexpected flow count. Unexpected pressure drop on readback. | Block functions. Switch to alternate pod. Monitor and continue. | L | L | L | *Note: Regulator leak tolerance for wellhaead connector lower than for annulus.* |
| TT. | | Wellhead connector regulator failure (catastrophic leak -- stuck wide open). | Loss of supply pressure. | Loss of pod. | Low supply readback pressure. Excessive fluid use | Switch to alternate pod. Pull BOP. | L | H | M | *Consider continually monitoring supply pressure system health during completion, well testing and well control situations. (High level recommendation.)* |

| **FMECA Report Form** | **System:** Deepwater Horizon BOP<br>**Section:** BOP<br>**Section No.:** 41 | **Section Description:** Houses rams, shears, accumulators, wellhead connector, stack, valves, etc. |
|---|---|---|
| **Rev. no.:** 1<br>**Date:** 01/17/01 | **Function:** Wellhead connector – Hydraulics<br>**Function No.:** 105 | **Function Description:** Connects BOP to Wellhead |

| # | Failure Mode | Causes | Local Failure Effect | System Effect | Method of Detection | Mitigation | Ranking F | Ranking C | Ranking R | Recommendation |
|---|---|---|---|---|---|---|---|---|---|---|
| UU. | Failure to primary unlatch on demand. | POCV stuck closed. | Loss of supply pressure. | Loss of pod. | No supply readback pressure. No fluid use | Switch to alternate pod. Pull BOP. | L | H | M | |
| VV. | Failure to seal on demand. | See Closed – No New Issues. | | | | | | | | |

Appendix C

# APPENDIX C
## LESSONES LEARNED INDUSTRY

| Anomalies or Industry Failures List<br>Compiled by WEST Hou Inc. |
|---|
| Note: The anomalies are divided by system/component and subdivided by manufacturer where applicable. The listing should not be considered all inclusive. The majority of the anomalies listed have received adequate repairs and/or required replacements. |
| **Control System** |
| Control Fluid Cleanliness |
| High Flow Rates in Control Systems and Damage to Components |
| Potential Single Point Failures in Remotely-Mounted Shuttle Valves |
| ROV Systems Fault |
| Inadequately Sized Relief Valves on Cameron HPU Systems |
| Leaking Cameron Celle HPU Relief Valves |
| HPU Relief Valves Failing |
| Breakers on Cameron HPU System |
| Drift Off Due to Failure of the Differential Global Positioning System |
| Incorrect Seal Kits |
| Gilmore Shuttle Valves Oscillating |
| Gilmore Shuttle Valve Switchback (shuttle shifts toward the opposite pod) |
| Gilmore Shuttle Valves Wash Out of O-ring |
| Cameron 1/2" Unbalanced Shuttle Valves Failure in Seats |
| Cameron 1/2" Unbalanced Shuttle Valves Hydrostatic Lock |
| Cameron 1/4" Manual Regulator - Pressure Surges and Spikes |
| Corrosion in Cameron Regulators and Directional Control Valves |
| Cameron 350 Bar Pressure Transducer Failures |
| Cameron Ceramic Seal Seats Cracking in Pod Valves and Regulators |
| Cameron 3/4" and 1 1/2" Pilot Operated Check Valves Leaking |
| Cameron Flow Meter |
| Cameron Quick Dump Valves Losing O-rings |
| Cameron Solenoid Valve - Discontinuation of Solenoid Type 15 |
| Cameron Solenoids and Water Ingress |
| Water Ingress into MUX Cable Caused Loss of Pressure Read-Back |

| Anomalies or Industry Failures List<br>Compiled by WEST Hou Inc. |
|---|
| Cameron 1/4", 3-Position Pod Valve Leaks |
| Cameron 1/4", 2-Position Pod Valves Shear Seal Spring Problem |
| Cameron 3/4", 4-way, 2-Position Valve Not Cycling |
| Cameron 1" Pod Control Valves Leaking |
| Cameron MUX Pod Start-up Valve and Premature Closing |
| Cameron Pod Damage by Shock Loading |
| Cameron LMRP Mini Pod Dual 1/4" Retractable Connector Leaks |
| Hard Piping on BOP Stack Failed |
| Parker Polyflex Hose Failures |
| Usable Accumulator Volume in Deepwater and Corrections for Gas Compressibility |
| Hydrasun Hose Fittings and Potential Leaking |
| Cameron Accumulator Floats Hanging Up Surface and Subsea |
| Cameron Accumulators - Sinking Floats in Nitrogen Systems Subsea |
| Low Pressure Ratings of Seacon Connectors on Cameron MUX Systems |
| Cameron Subsea Electronic Module (SEM) Corrosion |
| Incorrect Operation of Subsea Electronic Module (SEM) |
| Cameron Subsea Electronic Module (SEM) Overheating |
| Cameron MUX SEM Software Updates |
| Leaking Cable to Cameron Riser Control Box (RCB) |
| Timing Errors in EDS Resulting in Damaged Cameron Pod Seals |
| Cameron Accidental EDS Activation |
| Shaffer Lower Stack Receiver Leak |
| Shaffer Secondary Unlock Shuttle Valves Failure to Unlock |
| Shaffer Hydraulic System Component Failures |
| Shaffer Supply Regulator Leaking |
| Shaffer Shear Ram SPM Valve and Damage During Surface Testing |
| Shaffer SPM Valve Problems |
| Shaffer DDV Fluid Tips |
| Shaffer Jacking Cylinder Gland Nut Failure |
| Shaffer Pressure Transducers Reading Out of Range |

| Anomalies or Industry Failures List<br>Compiled by WEST Hou Inc. |
|---|
| Shaffer Connector Regulator Failure |
| Shaffer CMC Speed Control Valve |
| FMC Ball Valves in Shaffer MUX Systems |
| Shaffer SPM Valve Spools and Maintenance Requirements |
| Shaffer MUX Direct Drive Valves and Trapped Hydrostatic Pressure |
| Failure of MUX Cable Connection in Shaffer MUX System |
| Seacon MUX Cable Connectors on Shaffer MUX Systems |
| Fluid Leakage from MUX Cable in Shaffer MUX System |
| Faulty Tubing on New Shaffer Pod |
| MUX Pod System Electronic Architecture (SEA) Failure on Shaffer MUX Systems |
| Shaffer Alarms on Cimplicity/NT Operator Interface Terminals |
| Shaffer Pod Block Configuration and Inability to De-energize Functions |
| ONX OIT (Operator Interface Terminal) Screen Lock-up on Shaffer MUX Systems |
| Lack of Control Panel Stops and Possible EDS Activation on ABB Seatec System |
| Oil Air Accumulator Failure of Bladders |
| **Annular BOPs** |
| Cameron DL Annulars - Intrusion of Salt Water Through Weepholes |
| Shaffer 18 3/4" 10K Spherical - Packing Element Damage and Performance |
| Shaffer 18 3/4" 5K Annular Failure to Test on 5 1/2" Pipe |
| **Ram BOPs** |
| Cameron TL Bonnet Seal Leaks |
| Corrosion of Wellbore and Hydraulic Seal Areas in BOP Bonnets |
| Cameron 3 1/2" x 7 5/8" 10K TL Flexpacker Problems |
| Cameron TL BOP Bonnet Operating Cylinder with Flaking Chrome Plating |
| Loose Connecting Rod Button on Cameron TL BOP |
| Increased Shear Pressure Requirements in Deepwater |
| Cameron Shearing Blind Ram Failure to Wellbore Pressure |
| Cameron 18 3/4" 10K Dual V Shear Rams Failure to Test |
| Cameron 18 3/4" 15K Dual V Shear Rams Failure to Test |

| Anomalies or Industry Failures List<br>Compiled by WEST Hou Inc. |
|---|
| Cameron Casing Shear Ram Bolts |
| Cameron 15K TL Casing Shear Rams and Trapped Debris |
| Cameron Casing Shear Rams and Damage to Blades |
| Cameron Casing Shear Rams Delay of Closure |
| ST Lock Testing on Cameron Variable Bore Rams |
| Cameron ST Lock Difficulties |
| Slip-Eze Bearings in Cameron ST Locks |
| Failure of Lubricomp Bearings on ST Locks |
| Cameron Sequence Valve for TL Rams with RamLocks and ST Locks |
| Cameron ST Lock Springs Installed Incorrectly in the Sequence Caps |
| Cameron TL Rams with RamLocks - Constricted Movement of Operating Piston |
| Hydril Ram Bonnet Seal Carrier |
| *Hydril 18 3/4" 15K Blind Shear Ram Failure to Seal due to Shearing of a Bolt in the MPL* |
| Hydril MPL Locks - Slip-Eze Bearings and Overhauling Nuts |
| Shaffer SLX BOPs and Potential Collapse of Door Seal Cartridge |
| Shaffer V Shear Ram Failure to Wellbore Test |
| Shaffer V Shear Rams and *Replacement Bolts* |
| Blind Shear Rams on a Shaffer 18 3/4" 15K BOP |
| Shaffer UltraLocks Performance |
| Shaffer UltraLock II Not Unlocking |
| Stewart & Stevenson *QLS Shear 18 3/4" 15K Shear Rams* |
| Stewart & Stevenson 18 3/4" 15K QLS Variable Bore Rams |
| Stewart & Stevenson 18 3/4" 15K QLS Automatic Locking System |
| **Connectors and Gaskets** |
| Hydrates Formation in Deepwater and Difficulty of Failure to Unlatch |
| Choke/Kill Connection Release Problems |
| MMS Regulations for Accidental Disconnect of Riser |
| Cameron AX Gasket Out of Tolerance |
| Cameron CX Gaskets Issues |

| Anomalies or Industry Failures List<br>Compiled by WEST Hou Inc. |
|---|
| Bent Cameron AX Gasket Retaining Pins |
| Cameron Mini Collet Connector and AX Replacement |
| Alignment Problems Between LMRP and Stack |
| Cameron Type HC Connectors Failure to Disconnect |
| Cameron Type HC Connectors - Coated Actuator Piston |
| Cameron HC Connector Backdriving |
| Hydril Hydraulic Choke/Kill Connector Failure to Extend |
| Vetco HAR H-4 Bent VX Gasket Retaining Pins |
| Vetco H-4 LMRP Connector Difficulties to Unlatch |
| High Strength Studs and Hydrogen Embrittlement |
| **Valves and Choke/Kill Systems** |
| WOM Magnum Valve, 15,000 psi mwp Extrusion of O-rings |
| WOM Valves and Broken Operator Springs |
| Lead-filled Target Flanges and Retention Issues |
| Copper State Hose Failure |
| Goodall Hose Construction |
| Shaffer 3 1/16" 15K Type HB Valve Bonnet Gasket Failures |
| Shaffer Hydraulic Retractable Choke and Kill Connector Primary Unlock Failure |
| Shaffer Mud Boost Valve |
| Shaffer 15,000 psi HB Valves Leaking |
| **Riser Systems** |
| Choke and Kill Line Pin Hard Facing Flaking Off |
| Riser Hydraulic Line Pin Corrosion and Control Fluid Cleanliness (M-C-22) |
| Cracks in Telescopic Joint Tensioner Rings |
| Dropped Stack-Vetco BT-4 Packer Housing Bolt Failure |
| Dropped Stack-Cameron Outer Barrel Failure |
| Shaffer DT-2 Riser Locking Dog Assembly Retaining Screw Replacement |
| Shaffer DT-2 Riser Telescopic Joint Latching Dogs Misalignment |
| Shaffer Riser Tensioner Ring Damage |

| Anomalies or Industry Failures List<br>Compiled by WEST Hou Inc. |
|---|
| Riser Spider Gimbal |
| Interchangeability of Vetco Type MR Dog-Type Riser |
| Stewart and Stevenson SSQR-F Riser Nickel Plating Flaking |
| Stewart and Stevenson SSQR-F Riser Non-stress Relieved Welds |
| **Stack Frames** |
| LMRP Disconnect Angle Limitations |
| Collapse of BOP Stack Frame Member |

# APPENDIX D
# REVISED RUNNING BOP PROCEDURE

Reviewed by HAZID Team, January 2001,Revised 011701

# 3.1.1.11 - Run Riser and BOP Procedure

## General Information

**Applies To:** Deepwater Horizon
**Revision Date:** January 2001 - HAZID
**Approving Authority:** Rig Manager
**Purpose / Objective:**
To deploy the blow out preventer stack on the subsea casing wellhead, safely and with no adverse environmental affects, providing a means of well control and riser system for drilling fluid returns during drilling operations.
The blow out preventer (BOP) stack consists of two basic sections: A lower stack with a wellhead connector, (5) five ram-type preventers and a lower marine riser package (LMRP) with a riser connector (to attach to the lower BOP), and (2) two annular preventers and a flex joint. The BOP stack is the first line of defense for controlling "kicks" experienced with a well.
The BOP stack is run on joints of riser with a telescopic joint (slip joint) and diverter at the top. The marine riser tensioners support the weight of the LMRP, riser and outer barrel of the slip joint once the BOP stack is landed.
**References:**
R&B Falcon Accident Prevention Bulletins 02-93, 01-93.
HSE Manual Sections
3.6 - Safety Harnesses/Reels/Lines
3.8 - Life Saving Equipment
4.3 - Pneumatic Tools
4.22 - Blowout Prevention Equipment
R&B Falcon Operational Policy #21 - Subsea BOP Deployment & Retrieval
Cameron Operations Manual
Material Requirements
Safety Precautions
**Verification / Reporting Requirements:**

**Job Positions Involved:**
Installation Manager (IM), Toolpusher, Subsea Engineer, Driller, Assistant Driller, Derrickman, Floorman, Crane Operator, Deck Crew

**Summary:**
The riser running procedure will differ, between the various types of drilling units operated by R&B Falcon Corporation. The important points for a successful operation include:

1. Ensure the riser lifting equipment, slings, shackles, and tag lines, conform to the safe working load requirements.
2. Ensure the riser hydraulic riser running tool (RRT) is seated correctly, and the retaining dogs fully engaged. If using manual RRT, torque as per the manufacturer's specification.
3. Ensure the tailing in, and restraining lines are rated for the specific task.
4. Check all "O" rings, gaskets and pin and box connections for defects.

**Procedure:**

**Preparation: (starts in skate)**

1. Confirm, space out from RKB to the wellhead, and calculate the riser string for the slip joint to be in mid stroke, when the BOP is latched. Make a riser run tally and give copies to the Driller and

Reviewed by HAZID Team, January 2001,Revised 011701

Crane operators. Ensure riser joint serial numbers are recorded so days in service can be tracked.

2. Charge all APV and ensure all MRT pistons are full stroke and pressure adjusted for water depth with seawater in riser. Consult the riser tension program/analysis.
3. Confirm that the Subsea Engineer is prepared to run riser.,
4. Ensure spare riser components (choke, kill, booster, rigid conduit seals etc.) and lubricants are available on the rig floor, with impact and torque wrenches,. Ensure the wrenches are set at 22,500 ft/lbs of torque for make up for riser bolts – check periodically.
5. Confirm the vessel is offset, to the wellhead, preferably downstream, and positioning systems are fully operational.
6. Inform the Bridge of the ongoing operation. Insure good communications between the Driller, rig floor, crane operator and MUX reel operator in Moon pool, this is a must for a smooth operation. Ensure Marine Crew and Drill Crew are aware how changes in heading can affect load. Communicate at intervals.
7. Rig floor to have riser bolts, never-seize, slings, shackles, snatch blocks, torque wrenches, etc., ready. Crane operator to have all saddles removed and all shackles and slings ready to run riser. Have as much ready prior to starting job as possible.
8. Change out the links and elevators, for the 1000-ton capacity equipment and remove the mouse hole. Dependent on water depth and riser configuration, it may be possible to park the TDS and rig for 750-ton equipment.
9. Remove master bushing and outer ring from rotary table. This should not be done until riser gimbal is on rig floor and ready to install so the rotary opening is not left uncovered for longer than necessary.
10. Install the riser spider and gimbal and test functions same, install spider access stairs & handrails
11. *Insure BOP has a new proper Wellhead Connector ring gasket.*
12. Place BOP control system in riser run mode (refer to riser run mode sheet in subsea computer).

**Running Riser BOP:**

Note: Deadman system should be inactive during the running of the BOP and Riser & Auto Shear Function should be in Disarm on Drillers Panel, Initiate Deadman & Auto- Shear Function after BOP is landed and all systems confirmed.

13. *Remove auxiliary line protectors and inspect riser choke/kill/booster, and rigid conduit lines for* trash and / or damaged or missing seals prior to job. High pressure wash down of all auxiliary lines, if not done previously.
14. **A.** Visual inspection LMRP Connector indicator. **B.** Call Bridge before: **C.** Move BOP from BOP storage area to BOP cart. **D.** Move BOP cart to well center. , **E.** Set first joint of riser on the riser cart.
15. Pickup hydraulic riser running tool, confirm proper operation and note hook weight.
16. Pickup first bare joint of riser & make sure RRT is "Fully" Latched *(driller to visually confirm and* check off on riser running sheet) before picking and noting hook weight. **Note: this applies to all joints of riser that is lifted off riser skate & riser spider before picking up.** Visually inspect the choke, kill, booster and rigid conduit seals and pin seals. Have spares for riser joints on the rig floor throughout the job.
17. Lower joint to the BOP riser flex joint and make up bolts to 22,500 ft/lbs torque. Lower one torque wrench from rig floor to personnel on walk around at riser flex joint. Use never-seize only on all riser bolts, do not use copper coat. Periodically check wrench settings.
18. Visual inspection of LMRP Connector indicator. Pickup riser and BOP from the transporter, note hook weight. Retract pins and move cart back, install landing and return to work position. Install MUX clamps at each connection. Get bullseye indicators reading and record.(Note before lowering BOP depending on weather condition Under hull guide system will be used)
19. Turn BOP 90 degrees counter clockwise and land first joint on spider. Ensure spider hydraulic lock pins are engaged (via visual indication). Notify control room that BOP is in water.
20. Fill choke, kill, and booster lines with seawater. **Fill rigid conduit with fresh water only.**
21. Subsea engineer to confirm proper hook up before test. Test choke, kill, booster, and rigid conduit lines according to operator test procedures after first joint is in water. **(NOTE: Booster**

**Line & Ridged Conduit Line DO NOTE EXCEED 5000 PSI)** Number of joints run between test will be determined by IM.

22. Continue running riser noting , all information is filled out on the riser run sheet.
    - RRT fully latched
    - Seals intact and lubricated.
    - Weight
23. After running the desired number of riser joints, test,
24. Ensure correct riser tally, then pick up the Termination joint and run.
25. Pick up slip joint (ensure manual locks are activated). Note weight and make up to termination joint
26. Lower the termination joint to the BOP transporter level and connect goosenecks to termination joint. Pressure test all goosenecks.(ensure all personal are clear of the area before testing) **Also do Not Exceed 5000 PSI on Boost Line & Ridged Conduit Line**.
27. ROV inspect BOP & Wellhead and have the ROV verify that W/H connector is unlocked on ROV panel
28. Put the storm loops in the MUX cables and hotline hose.
29. Land slip joint below the packing element in riser spider (unlock manual locks) and stroke out inner barrel using hot line to unlock latching dogs on outer barrel. Note weight.
30. Lower slip joint down to load bearing area on slip joint. Make sure fluid bearing housing is above locking pin cylinder on load ring before skidding tensioners to well center
31. Notify Bridge and skid the Riser Tensioners to well center
32. Close the tensioner Load Ring around the slip joint. And lock the load ring. Verify that indicator is out and locking pin cylinder is locked. Connect hydraulic, air, and lubricating lines to the slip joint and fluid bearing hose
33. Lower the slip joint down.
34. Before moving rig over well depending on current weather condition it might be necessary to be on compensator (ACTIVE HEAVE MODE)
35. Slack off riser string set 100,000 lbs on wellhead and latch onto wellhead. Notify Bridge that BOP connected to wellhead – Drill Floor to be notified of all heading changes.
36. Check for correct space out. (MRT rod stroke)
37. Insure tensioning system is set. Per riser tensioner program. Set anti-recoil at tensioner panel to 'Remote' mode. Verify BOP is latched with fluid gallon count and visual with ROV at wellhead connector indicator flag on ROV panel.
38. Note weight indicator after tensioners have taken full weight; apply approx. 50 to 75 thousand pounds overpull on wellhead to insure connector is locked onto wellhead. Weight on wellhead and overpull will be determined by IM and Company Representative.
39. Set wet weight of BOP on well head to insure structural pipe will support BOP (check with IM and Company Man).
40. Makeup diverter flex joint to inner barrel of slip joint. Land and lock in diverter.
41. Set BOP control system in drilling mode.
42. Displace rigid conduit with mixed BOP fluid. (2 times volume)
43. Rig down riser equipment.
44. Close upper shear rams and pressure test. (Check with Company Man & IM to determine pressure for test)
45. Open upper shear rams.
46. Test BOP according to test sheet and Operator test pressure chart.

**POST-HEARING QUESTIONS FOR THE RECORD**
**TRANSOCEAN LTD.**
**INQUIRY INTO THE *DEEPWATER HORIZON* GULF COAST OIL SPILL**
**MAY 12, 2010**

**QUESTIONS FROM REPRESENTATIVE GRIFFITH**

1. How do you anticipate implementing findings of the investigation into currently operational wells and future exploration?

   Transocean has assembled an investigative team to determine what caused the *Deepwater Horizon* explosion, a team that includes dedicated Transocean and other industry experts. That investigation is ongoing. Transocean is committed to working hard to understand what caused this incident and what might be improved. We will implement whatever recommendations come out of that analysis. Until we know exactly what happened on April 20, 2010, the real sequence of events, and what recommendations will be made, it is difficult to speculate about how Transocean may implement any findings.

2. Throughout testimony, several investigations are mentioned. How long do you anticipate these investigations will last?

   The Transocean investigation is gathering information, some of which is not available to Transocean. Transocean has provided the Committee with documents and analysis relating to the investigation. An interim report was provided to the Committee on June 14, 2010, and has been published to the Committee's website.

3. Do you have similar operations in deepwater environments? Can you address any similar or different safety concerns that you have encountered?

   Transocean operates in deepwater environments around the world. We maintain a consistent standard of policies and procedures, maintenance practices, and operating practices across the global Transocean fleet. In the aftermath of this incident, we have continued to follow Transocean policies and procedures around the world. Until we find out what happened and determine what might be improved following the incident, it is difficult to pinpoint any safety concerns that may have arisen elsewhere that may be related to any concerns posed by the events of April 20.

4. You address the functions of the players in drilling contracts in your testimony. In your opinion, what can be done in the future to facilitate Operator and sub-contractor joint responsibility?

   Under applicable statutes, drilling contracts, and industry practice, the responsibility of each party reflects its relative control, investment, and ownership of the well and the hydrocarbons. The Operator identifies its target location, secures a lease from the United States, develops the well plan, applies for a permit, selects its contractors, and owns and takes the production from the well. Contractors selected by the Operator contract to perform specific services for a negotiated fee. A system of joint responsibility for the well would be a fundamental change in the structure of offshore oil and gas operations.

5. How do you think that responsibility should be allocated? Should it be different depending on contract or an industry standard?

   Under applicable statutes, drilling contracts, and industry practice, the responsibility of each party reflects its relative control, investment, and ownership of the well and the hydrocarbons. The Operator identifies its target location, secures a lease from the United States, develops the well plan, applies for a permit, selects its contractors, and owns and takes the production from the well. Contractors selected by the Operator contract to perform specific services for a negotiated fee. A system of joint responsibility for the well would be a fundamental change in the structure of offshore oil and gas operations.

6. In your testimony, you identify the cement, the casing, or both to clearly be the "root cause of the occurrence." What, if anything can be done to protect in the future if there is a cement or casing issue that causes pressure to be released from the reservoir?

   Until we know exactly what happened on April 20, 2010 and the real sequence of events, it is difficult to speculate about what specifically might be done in the future to prevent pressure being released from the reservoir in the event of a cement or casing issue.

**QUESTIONS FROM REPRESENTATIVE LATTA**

1. How many people does your company currently employ in the United States?

   Transocean currently employs 4,497 persons in the United States.

2. How many operational rigs does Transocean currently have within the waters of the United States? Also, does Transocean have the largest amount of rigs among your competitors here in the United States?

   Fourteen drilling rigs owned by various subsidiaries of Transocean Ltd. are operating in waters of the United States. Among competitors, Transocean has the largest number of deepwater rigs in the Gulf of Mexico.

3. Since 2005 how many federal investigations have been opened into the safety and environmental problems on drilling rigs owned by Transocean?

   With the exception of the current investigations related to the April 20, 2010 explosion, we do not believe that any Transocean drilling rig has been the subject of U.S. federal safety or environmental investigation.

4. What is Transocean's current safety record, as measured by injuries per hour worked?

Transocean has maintained a strong safety record in the Gulf of Mexico and throughout the world. Transocean has never – and will never – compromise on safety. In 2009, Transocean recorded its best ever Total Recordable Incident Rate (TRIR). In 2009, we achieved a worldwide TRIR of 0.77 incidents per 200,000 man hours. Thirty-eight (38) rigs had zero TRIR (no recordable incidents) and sixty-seven (67) rigs had zero lost time accidents. Four (4) rigs achieved our safety vision of zero incidents. The *Deepwater Horizon* had a seven-year history with no lost time accidents.

5. Is Transocean's safety record better than the overall industry average, and how do you compare to other deepwater drilling companies in the United States?

   Transocean does not compare itself to other deepwater drilling companies directly because each company records, classifies, and categorizes incidents differently. Accordingly, such comparisons could be inaccurate or misleading.

   The IADC publishes incident rates for drilling companies in U.S. waters. These IADC rates reflect the number of recordable incidents or lost time incidents per 200,000 man hours. Notably, however, these statistics do not distinguish between deepwater and shallow water drilling.

   Comparing the IADC rates for U.S. waters to comparable Transocean rates, in 2009, Transocean's rates were generally consistent with the IADC industry rates. In the first quarter of 2010, Transocean far outperformed the industry by demonstrating incident rates significantly below the IADC rates for drilling companies in U.S. waters.

6. How is Transocean helping the families of those 11 loved ones who passed away on the *Deepwater Horizon*, and also those who were injured?

   The families of the nine Transocean employees who passed away in the *Deepwater Horizon* explosion continue to receive full pay and benefits at this time. All injured crew and those receiving ongoing counseling (45 in total) continue to receive full pay and benefits, in addition to any statutory benefits that may be owed under workers compensation, the Jones Act, or the Longshore and Harbor Workers Compensation Act. All uninjured crew aboard the *Deepwater Horizon* not currently receiving counseling (25 in total) also continue to receive full pay and benefits.

   The families of all nine Transocean employees who passed away were advised shortly after the event that the Company was interested in and available to sit down with them, as soon as they felt ready and able to discuss their financial futures and potential settlement of their claims. We are currently having these discussions with some families and hope to do the same with all the families and their counsel. No approach by any family or their representative to have settlement discussions has been rejected by the Company. With respect to injured employees and their families, the Company is willing to discuss settlement of any injury claim at any time.

Most of the Transocean crew lost personal possessions in the incident, and compensation for these lost items has been offered by the Company. Almost all of these individuals accepted the Company's offer, including those who are represented by attorneys and have lawsuits pending, and the families of the employees who passed away. Compensation for lost possessions was also offered to the Transocean employees who were onshore at the time of the incident, but may have left some possessions onboard. Almost all of these persons also have accepted the Company's offer of compensation for that personal property.

**QUESTIONS FROM REPRESENTATIVE SCALISE**

1. How many times were operations shut down on the *Deepwater Horizon* rig prior to the explosion on April 20, 2010?

   Prior to the April 20, 2010 explosion, drilling operations were suspended and there was a partial evacuation of the *Deepwater Horizon* on one occasion. On May 26, 2008, the *Deepwater Horizon* was partially evacuated after taking on water during drilling operations for BP at the Freedom No. 2 well. At approximately 5:30 p.m., an alarm in the starboard forward pump room notified crew members of water ingress in the pump room and a thruster room, causing the vessel to list two degrees starboard forward side. As counter-ballasting measures began, 77 non-essential personnel were transferred to a standby vessel while 61 remained onboard. The Coast Guard, among other authorities, was immediately notified of the incident. By 10:50 pm, the vessel was stabilized and all personnel were brought back on board.

2. What safety changes were made following these shut downs, if any?

   An investigation immediately commenced to determine the cause of the vessel taking on water. The cause was an inadvertent opening of the overboard discharge valve and a series of ballast valves as a result of routine maintenance, which allowed water to enter the pump and thruster rooms. We reinforced our focus on task planning to improve control of routine maintenance tasks.

3. It has been reported that there was a serious disagreement over the decision to remove the heavy drilling mud and replace it with sea water. Who made this decision? Was there a serious disagreement?

   Based on our information, there was not a disagreement about the decision to displace the drilling mud with seawater. It is our understanding from testimony to the U.S. Coast Guard that there was a discussion between Jimmy Harrell of Transocean, the OIM, and Bob Kaluza, the BP Well Site Leader, and Donald Vidrine, the BP Company Man, on April 19th. Based on that testimony, we understand that Mr. Harrell was presented with a new or revised plan by BP that did not include a negative pressure test. Mr. Harrell insisted that a negative pressure test be conducted. After discussion, the negative pressure test was conducted. It is normal practice to remove the drilling mud from the riser prior to disconnecting the riser from the well, and that would have been part of the logical sequence of events during abandonment of the well. The timing is determined by the Operator and may be set forth in the well plan.

4. Is there a uniform industry practice for the process and timing regarding the displacement of mud with seawater?

   Displacing drilling mud with sea water is a normal and, in fact, required step in the abandonment process (*See* 30 CFR 250.442(e)). Standard industry practice is to not displace drilling mud with sea water until the Operator is confident that the cement and casing are adequate barriers to contain pressure from the reservoir.

5. It has been reported by the media and mentioned at Congressional hearings that mud had to be cleared off the rig six weeks prior to the explosion because of a loss of circulation. Are these reports accurate? If so, was this a warning sign that something was wrong with the rig, and of what would eventually occur on April 20, 2010?

   Transocean has no information to support such a report. However, we know that during the course of drilling at this location, there were four events during which well control operations were successfully conducted. Those operations would have involved the use of drilling mud. Our investigation reflects that the Transocean employees acted appropriately, and those events would not suggest or imply that there was any problem with the rig; to the contrary, the well control equipment and the drilling crew successfully addressed well control issues.

6. You stated during the hearing that there would have been procedure on file with MMS for removing heavy drilling mud and replacing it with sea water. Can you please provide a copy of this procedure?

   The filings of procedures with the MMS are the responsibility of BP in its role as the Operator. We have not been able to locate a copy of this procedure.

**HALLIBURTON**

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**Robert Moran**
Vice President, Government Affairs

June 14, 2010

Via Email

The Honorable Henry A. Waxman
Chairman
Committee on Energy and Commerce
Room 316 Ford House Office Building
Washington, DC 20515-6115

and

The Honorable Bart Stupak
Chairman
Subcommittee on Oversight and Investigations
Room 316 Ford House Office Building
Washington, DC 20515-6115

Re: May 12 Hearing on Deepwater Horizon Catastrophe

Dear Chairman Waxman and Chairman Stupak:

Please find attached the responses of Tim Probert of Halliburton to the Questions for the Hearing Record.

Please do not hesitate to contact me or our outside counsel (Jeffrey L. Turner of Patton Boggs LLP) if you have any questions.

Sincerely,

Robert J. Moran

cc: The Honorable Joe Barton
The Honorable Michael Burgess

**RESPONSES OF TIM PROBERT, HALLIBURTON**

**TO**

**MAY 12 HEARING QUESTIONS FOR THE RECORD**

**SUBCOMMITTEE ON OVERSIGHT AND INVESTIGATIONS**
**HOUSE ENERGY AND COMMERCE COMMITTEE**

**The Honorable Parker Griffith**

1. How do you anticipate implementing findings of the investigation into currently operational wells and future exploration?

   Response: Until the root cause of the Mississippi Canyon Block 252 Well number 1 incident is identified, Halliburton cannot speculate on actions that may be taken on currently operational wells and future exploration.

2. Throughout testimony, several investigations are mentioned. How long do you anticipate these investigations will last?

   Response: Halliburton cannot offer an opinion in this area.

3. Do you have similar operations in deepwater environments? Can you address any similar or different safety concerns that you have encountered?

   Response: Halliburton has extensive experience operating in similar deepwater environments. Our work in deepwater has been conducted with very positive safety results.

4. In your testimony, you state that Halliburton is confident that cementing work was done in accordance with the well owner's construction plan. Is there any type of documentation done by the owner after cementing is done for verification purposes? Or is this the responsibility of Halliburton as a sub-contractor?

   Response: Well integrity tests and all documentation including cement evaluation are the responsibility of the well owner.

5. What, if anything can be done to protect in the future if there is a cement or casing issue that causes pressure to be released from the reservoir?

   Response: Industry well control theory identifies that the well owner must maintain multiple effective barriers to the reservoir during well construction, well completion, and well production operations.

6. According to the New York Times on Tuesday May 11, 2010, "Halliburton, the contractor for the cementing job on the Deepwater Horizon well that blew on April 20, used a type of nitrogen-charged cement to close off the bottom of the well, 13,000 feet below the sea bed. The nitrogen gas was blended into regular cement to make a substance that was puffier and lighter than the cement generally used in oil drilling.

   Experts said this type of cement can form a stronger bond in certain types of rock, but is also more difficult to use than standard cement, requiring great care in mixing and application.

   A supervisor on the rig has said he had not seen nitrogen cement used before in the deepest part of a well, and investigators are examining whether it contributed to the catastrophic explosion."

   a. Can you comment on what types of cement mixtures are used to plug varying well types?

      Response: There are a variety of industry-recognized cementing solutions available for plugging wells. Foam cementing is a commonly used solution in the oil and gas industry.

   b. Is there generally a standard cement mixture that BP or the drilling industry as a whole uses?

      Response: There are a variety of industry-recognized cementing solutions available for plugging wells.

   c. Can you comment on what situations bring forth the use of different cement mixtures?

      Response: A variety of well conditions (depth, temperature, pressure, economics and other) are considered when designing a cement mixture. Foam cement helps improve mud displacement, helps prevent migration of well fluids, and helps protect the formation.

**The Honorable Steve Scalise**

1. It has been reported that a new type of cement was being used for the seal of the blowout preventer. Was the application process documented and permitted?

    a. The cement used in the Mississippi Canyon Block 252 well is common and recognized in the industry. All application and permitting requirements are the responsibility of the well owner. Halliburton did not take part in that process.

2. It has been reported that there was a serious disagreement over the decision to remove the heavy drilling mud and replace it with sea water. Who made this decision? Was there a serious disagreement?

    a. Halliburton was contracted to provide cementing, directional drilling and measurement-while-drilling services. The decision to remove drilling mud and replace it with sea water was not within Halliburton's scope of work. Halliburton did not participate in that decision.

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CAMERON

June 16, 2010

The Honorable R. Parker Griffith
Committee on Energy and Commerce
House of Representatives
Congress of the United States
2125 Rayburn House Office Building
Washington, DC 20515-6115

Dear Congressman Griffith:

I write in response to your questions communicated to me by Chairman Waxman in his June 2, 2010 letter. Our responses to those questions are as follows:

1. *How do you anticipate implementing findings of the investigation into currently operational wells and future explorations?*

   Cameron provides flow equipment products, systems and services to worldwide oil, gas and process industries, but does not itself design, drill or operate wells. Our customers design the wells; they frequently specify the equipment that will be used to drill and produce those wells; and they operate the Cameron-provided equipment.

   Because Cameron is an equipment provider, it does not, strictly speaking, have the ability to make changes in any currently operational wells and it cannot direct the structure of future drilling operations.

   What Cameron can do is the following: First, it will continue its practice of informing its customers of improvements in the safety and performance of our products through regular issuance of Safety Alerts, Engineering Bulletins and Product Alerts. If a safety improvement is identified, a Safety Alert will be sent via certified mail and email to all known users and posted on our Transact Website for customers

   Second, once results of the various investigations are known, Cameron may obtain new information that can be assessed for purposes of studying, and potentially implementing, improvements in the design of Cameron products. Cameron will review the results of such investigations with great care and consider any relevant information in the context of future design and manufacture of Cameron products.

Chairman Henry A. Waxman
June 16, 2010

2. *Throughout testimony, several investigations are mentioned. How long do you anticipate these investigations will last?*

   Cameron is presently aware of investigations or inquiries into this matter by the Department of Justice, the Department of Homeland Security (U.S. Coast Guard), the Department of the Interior (Minerals Management Service) and numerous Congressional Committees. It is impossible even to estimate how long so many investigations/inquiries may take. Furthermore, Cameron has no clear sense at this time of when the BOP will be recovered to the surface. For that reason, too, it is impossible to have even a rough idea of how long the investigations and inquiries will last.

3. *Do you have similar operations in deepwater environments? Can you address any similar or different safety concerns that you have encountered?*

   Strictly speaking, Cameron does not itself have "operations in deepwater environments." However, Cameron does provide equipment to the companies that do. We are currently aware of approximately 130 Cameron supplied BOP's operating in deepwater environments. In the category of safety concerns, I note that a Cameron-supplied BOP was in place on the Ixtoc 1 drilling platform from which there was a serious spill in 1979. As we understand it, in the Ixtoc case the blowout preventer was unable to shear the drilling pipe because the shear rams encountered a drill collar in the BOP's shear ram cavity. It was well-known in the drilling industry that the BOP shear rams were not designed to cut drill collars, which are too big to be sheared.

4. *Of the 2500 BOPs you mention in your testimony, how many are involved in deepwater projects?*

   As note in my response to Question 3 above, we currently know of approximately 130 Cameron-supplied BOP's operating in water depths of more than 1,000 feet.

Cameron deeply mourns the loss of life and damage to our Gulf Coast environment. The whole oil and gas industry, as well as Cameron, needs to learn as many lessons as possible from this tragedy so that we can continue to meet the United States' energy needs in a safe and secure manner. If we can assist your inquiry further, please contact me or our counsel, Emmet T. Flood, Williams & Connolly LLP, at (202) 434-5300.

Sincerely,

Jack B. Moore
President and Chief Executive Officer