

U.S. CHEMICAL SAFETY BOARD

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MACONDO WELL/DEEPWATER HORIZON

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PUBLIC MEETING

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THURSDAY,
JUNE 5, 2014

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U.S. CHEMICAL SAFETY BOARD MEMBERS PRESENT:

RAFAEL MOURE-ERASO, Ph.D., Chairperson,
U.S. Chemical Safety Board
MARK GRIFFON, Member, U.S. Chemical Safety
Board*

STAFF PRESENT:

DONALD HOLMSTROM, Director, Western Regional
Office
RICHARD C. LOEB, General Counsel
CHERYL MacKENZIE, Investigator
MARY BETH MULCAHY, Investigator

*present via teleconference

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(time not provided)

CHAIRPERSON MOURE-ERASO: Good
afternoon, and welcome to this public meeting
of the U.S. Chemical Safety Board, the CSB.

I am Rafael Moure-Eraso,
Chairperson of the Board.

Joining me today via teleconference
from Australia is Board Member Mr. Mark
Griffon, who is over there. Also, sitting
with me at my left is Richard C. Loeb, CSB
General Counsel. I will be introducing later
the investigative panel.

The CSB is an independent, non-
regulatory, federal agency that investigates
major chemical accidents at fixed facilities.
The investigations examine all aspects of
chemical aspects, including physical causes
related to equipment design, as well as
(indiscernible due to accept) and regulations,
industry standards, and safety management
systems.

1 Ultimately, we issue safety
2 recommendations which are designed to prevent
3 similar accidents in the future. The purpose
4 of today's meeting is for the CSB
5 investigative team to present to the Board the
6 first two volumes of their investigation
7 report into the Macondo oil well blowout that
8 occurred in April 20, 2010, in the Gulf of
9 Mexico.

10 As you have seen in the copies of
11 our report, the CSB has dedicated this report
12 to the 11 men that lost their lives as a
13 result of the explosion and fire. I will now
14 remember their names by mentioning them. They
15 are Jason Anderson, Aaron Dale Burkeen, Donald
16 Clark, Stephen Ray Curtis, Gordon Jones, Roy
17 Wyatt Kemp, Karl Klepinger, Jr., Keith Blair
18 Manuel, Dewey A. Revette, Shane M. Roshto, and
19 Adam Weise.

20 At this time, I would like to have
21 a moment of silence to remember these 11
22 individuals.

1 (Moment of silence)

2 Thank you.

3 At this time, please allow me to go
4 over this afternoon agenda. Copies of the
5 agenda are in the front table at the entrance.

6 First, we are going to hear the
7 opening remarks of the Board. Then, we are
8 going to hear the official presentation of the
9 investigative team. And following the team's
10 presentation, the Board will be given an
11 opportunity to ask questions to the
12 investigative team. Thereafter, we will have
13 a public comment period, and then a vote on
14 approving or disapproving the draft report.

15 Before we begin, I'd like to point
16 out some safety information. Please take a
17 moment to note the location, to note the
18 locations of the exits and emergency exits of
19 this meeting room. There are the exits in the
20 back, and there are two exits on this side
21 that could be emergency exits as well as an
22 exit in this other side of the room.

1 I also ask that you please mute
2 cell phones, so that these proceedings are not
3 disturbed.

4 I will follow with my opening
5 remarks. On April 20, 2010, the blowout
6 preventer, the BOP, on the Deepwater Horizon
7 drilling rig that was intended to shut off the
8 flow of high-pressure oil and gas from the
9 Macondo well in the Gulf of Mexico failed to
10 seal the well.

11 The blowout caused explosions and
12 a fire in the Deepwater Horizon rig, leading
13 to the deaths of 11 persons on board, and
14 serious injuries to 17 others. Nearly 100
15 persons escaped from the burning rig, which
16 sank two days later, leaving the Macondo well
17 spewing oil and gas into the Gulf waters for
18 a total of 87 days. By that time, the
19 resulting oil spill was the largest in
20 offshore history.

21 The CSB examined this report, this
22 event, from a process safety perspective,

1 integrating fundamental safety concepts. That
2 is, the concept of the hierarchy of controls
3 and the concept of continuously driving rigs
4 as low as reasonably practicable.

5 While these approaches are not new
6 in the petrochemical world, or in other
7 offshore riggings around the globe, they are
8 not as commonplace in the U.S. outer
9 continental shelf.

10 Drilling continues to extend to new
11 depths and will operate in increasingly
12 challenging environments. The CSB report and
13 its key findings and recommendations are
14 intended to put the United States in a leading
15 role for improving well-controlled procedures
16 and practices. To maintain a leadership
17 position, the U.S. should adopt rigorous
18 management methods that go beyond current
19 industry good practices.

20 Today, the CSB investigators will
21 give an overview of the accident and describe
22 the technical factors that led to this

1 blowout. Following the technical
2 presentation, they will describe the proposed
3 recommendations for ensuring greater safety in
4 the future. I thank them, I thank our
5 investigative team, for their efforts. This
6 is a small team, and this has been one of many
7 large challenging projects they have been
8 juggling.

9 If anyone in the audience wishes to
10 comment publicly after the investigator's
11 presentation, please sign up on the yellow
12 sheet in the check-in area at the entrance,
13 and I will call your name at the appropriate
14 time.

15 I will first call those who have
16 signed up, and then open the floor up to
17 anyone who wishes to speak. Please note that
18 we will have to limit public comments to three
19 minutes each.

20 I will now recognize Mr. Mark
21 Griffon, CSB Board Member, for an opening
22 statement. Mr. Griffon.

1 MR. GRIFFON: Thank you, Mr.
2 Chairman. I hope my connection is okay.

3 I, first, would like to express my
4 condolences to the family and friends of those
5 who lost their lives in this tragedy. I am
6 glad to be participating here, or actually in
7 Sydney, Australia, to discuss the CSB's
8 initial report on the Macondo investigation.

9 I have been discussing this
10 incident with academics, workers, engineers,
11 and regulators around the world for several
12 years, including meetings over the last two
13 weeks in Australia.

14 Let there be no mistake, this
15 accident is not about workers making mistakes
16 or simply about equipment failing. It is
17 about organizational failures. If the lessons
18 are to be learned, they are not just lessons
19 for those involved in Macondo, but lessons for
20 the entire industry worldwide.

21 I think it is important to remember
22 why many urged the CSB to conduct this

1 investigation. In June -- in a June 8th
2 letter in 2010, Congressman Waxman asked the
3 CSB to conduct this investigation because "We
4 believe the CSB's past work on BP puts it in
5 a unique position to address questions about
6 BP's safety culture and practices."

7 The letter goes on to say that as
8 part of our investigation we ask that you
9 consider the following. Due to circumstances
10 and events leading up to the Deepwater Horizon
11 explosion reflect problems in BP's corporate
12 safety culture, what role, if any, did cost-
13 cutting and budgetary concerns play in BP's
14 decisions about well design and testing?

15 How did BP Transocean and other
16 contractors apply management of changed
17 programs to assess the consequences of
18 modifications to process, technology, and
19 equipment on the Deepwater Horizon oil rig, as
20 well as organizational changes, including
21 changes to personnel, training, and budget?
22 Did BP provide adequate oversight of the

1 contractors working on the well?

2 I hope these types of issues beyond
3 the blowout preventer are addressed in the
4 final two volumes of our investigation report.

5 I agree with Congressman Waxman that this is
6 the best place we can add value to the
7 learnings from this tragedy. As for the
8 reports being discussed tonight, I must first
9 say that I am disappointed with the internal
10 review process leading up to the release of
11 this report.

12 I received very interesting expert
13 review comments just days before the meeting,
14 and received a substantially revised final
15 report less than a week ago. After four years
16 of work to receive very thoughtful expert
17 comments only days before voting on our report
18 is unacceptable. This broken process, set up
19 as a norm by the Chairman and senior
20 management, has to stop.

21 As for the products being discussed
22 tonight, I am glad to see a focus on the

1 effective identification and management of
2 safety critical elements, technical
3 organizational, operational, not just the
4 blowout preventer. I do, however, agree with
5 some of our expert reviewers that the report
6 should have included more extensive discussion
7 of barriers other than the blowout preventer.

8 Second, the report we are
9 discussing tonight is not meant to be CSB's
10 regulatory analysis, and yet Volume 2 includes
11 many statements comparing the approach under
12 the U.S. regulatory regime currently in place,
13 and other regimes around the world, safety
14 case type regimes.

15 I note that some expert reviewers
16 also noted a lack of evidence supporting some
17 of these statements. I look forward to a full
18 analysis of the regulatory issues, including
19 how the different regulatory approaches have
20 affected the actual operational activities on
21 offshore facilities in Volume 3 of our report.

22 Let me close by saying I hope the

1 lessons of the Deepwater Horizon tragedy will
2 be transformative for offshore safety
3 worldwide. Industry must do everything they
4 can to prevent such a tragedy in the future.

5 Thank you.

6 CHAIRPERSON MOURE-ERASO: Thank you
7 very much for your statement, Board Member
8 Griffon.

9 At this time, we would like to
10 introduce the investigation team. I will
11 start by introducing the Western Office
12 Regional Director of the CSB, Mr. Donald
13 Holmstrom. Mr. Donald Holmstrom is the
14 Director of the WRO office in Denver,
15 Colorado. Mr. Holmstrom joined the CSB in
16 1999 and led and supervised a number of CSB
17 investigations, including the 2005 BP Texas
18 City refinery explosion and fire.

19 Prior to coming to the CSB, he
20 worked for 18 years in the oil refining
21 industry. He has extensive experience in
22 other refinery operations, process safety

1 management, occupational health and safety,
2 and incident investigation. I will ask Mr.
3 Holmstrom to introduce the members of the
4 investigative team and to proceed from here.
5 Mr. Holmstrom.

6 MR. HOLMSTROM: Thank you, Chairman
7 Moure-Eraso. Today I would like to introduce
8 here at the table the investigative team.
9 First of all, I would like to introduce Cheryl
10 MacKenzie. She is the team lead of the
11 Macondo investigation. Cheryl joined the CSB
12 in 2004, and she has been involved in numerous
13 CSB investigations and safety studies,
14 including the 2005 BP Texas City refinery
15 explosion.

16 Also up here at the podium is Mary
17 Beth Mulcahy. Mary Beth has a Ph.D. in
18 physical chemistry from the University of
19 Colorado in Boulder, and she has overseen many
20 of the technical aspects of our Macondo
21 investigation.

22 Also joining us is Stan Chrisman,

1 a CSB consultant. Stan has 38 years of
2 experience in petroleum drilling and
3 production.

4 With that, I would ask Cheryl
5 MacKenzie to start the presentation.

6 MS. MacKENZIE: Thank you, Mr.
7 Holmstrom. Thank you, Chairman Moure-Eraso
8 and Board Member Griffon. Good afternoon to
9 all of you. Thank you for coming here to hear
10 our findings and conclusions.

11 It has been four years since the
12 Macondo incident occurred, and there have been
13 many published reports that have described and
14 analyzed the events of April 20, 2010. So the
15 obvious question is: why another Macondo
16 report? Haven't all the lessons been learned?
17 The CSB has concluded no.

18 The CSB has carefully chosen issues
19 to address in the volumes of its reports that
20 have not been addressed by others or need
21 further development. This is certainly the
22 case here with the volumes we are presenting

1 today. The blowout preventer was examined in
2 three phases identified here in this visual as
3 preliminary, Phase 1, and Phase 2.

4 Most of the major reports, except
5 Transocean, were either published before the
6 final phase was completed or did not have
7 access or address the full set of data.

8 Details that emerge in the third
9 phase of testing -- excuse me, in the second
10 phase of testing -- are imperative, as they
11 reveal latent failures that existed in the
12 Deepwater Horizon BOP before it was ever
13 deployed to the well head.

14 The CSB also conducted additional
15 testing, which further bolstered our findings
16 and analysis. All of this will be discussed
17 in more detail momentarily.

18 Ultimately, what our investigative
19 analysis shows is that the numerous technical
20 shortcomings in the hardware of the BOP were
21 manifestations of management system failures
22 that resulted in inadequate treatment of the

1 blowout preventer as a safety critical device.

2 It is important to note, as this
3 visual depicts, the success of technical
4 elements, the equipment and engineered
5 controls, depends highly upon organizational
6 and operational practices. These human and
7 organizational factors will be briefly
8 mentioned throughout our discussion today, but
9 will be addressed more thoroughly in
10 subsequent volumes of the CSB Macondo
11 investigation report.

12 So today we are going to give you
13 a quick incident overview and play the CSB's
14 newly developed animation, which details the
15 immediate events leading up to the fire and
16 explosion on the Deepwater Horizon.

17 This will introduce you to some of
18 the offshore terminology and will provide you
19 with an initial look at the key aspects of our
20 significant technical findings. We will then
21 go over specifics regarding our BOP technical
22 failure analysis, and we will go beyond the

1 events of April 20th and discuss the latent
2 safety management system deficiencies related
3 to the safety critical device.

4 We will wrap up with a discussion
5 of the role of regulations as they pertain to
6 the management of safety critical elements,
7 and then at that time we will present our
8 proposed recommendations for safety change to
9 the Board.

10 On April 20, 2010, the Deepwater
11 Horizon drilling rig, owned by TransOcean and
12 under contract by BP, experienced explosions
13 and fire at the Macondo well in the Gulf of
14 Mexico, resulting in 11 deaths, 17 critical
15 injuries, and the release of approximately
16 three to five million barrels of oil into the
17 Gulf.

18 At this time, I'd like to show you
19 our animation.

20 (Animation begins)

21 MALE VOICE: This is a model to
22 demonstrate the effect of pressure on pipe.

1 What we have is an ordinary piece of garden
2 sprinkler pipe, and we have it connected to an
3 air pump. When we put pressure on the pipe,
4 let's see what happens.

5 MS. MacKENZIE: Something else we
6 wanted to show you. That's -- it's on a CD.
7 It's on a CD. It wasn't a file that we gave
8 earlier.

9 All right. Well, we'll skip the
10 animation. Maybe if they find it, we can come
11 back to it. Yes, okay. Thank you.

12 (Pause)

13 Technology.

14 (Pause)

15 I can continue while -- go ahead?
16 I'll need the slides back, though.

17 MALE VOICE: April 20th, 2010, 11
18 workers died and 17 were seriously injured by
19 an explosion on the Deepwater Horizon, an
20 offshore drilling rig located approximately 50
21 miles off the coast of Louisiana. The rig
22 burned for two days, eventually sinking and

1 triggering the largest oil spill in U.S.
2 history, as oil and gas spewed up from the sea
3 floor.

4 The Deepwater Horizon had been
5 drilling an oil well in 5,000 feet of water in
6 an area of the Gulf of Mexico known as the
7 Macondo Prospect.

8 In 2010, the CSB launched an
9 investigation to examine the technical,
10 organizational, and regulatory factors that
11 contributed to the accident. During the
12 investigation, the CSB made new findings about
13 why a key piece of safety equipment, the
14 Deepwater Horizon's blowout preventer, failed
15 to seal the well during the emergency.

16 These new findings help explain why
17 the accident was so devastating, and the CSB
18 cautioned that other blowout preventers
19 currently in use could fail in similar ways.

20 Drilling an offshore well involves
21 creating a pathway between the drilling rig
22 and oil and gas reservoirs trapped beneath the

1 sea floor. A deep whole or a well bore is
2 drilled through layers of sub-sea rock and
3 sediment. These rocky layers can contain
4 trapped water, crude oil, and natural gas
5 under pressure.

6 An unplanned flow of these well
7 fluids into the well bore, known in the
8 industry as a kick, can be dangerous. Without
9 careful management, a kick can lead to a
10 blowout, the uncontrolled release of flammable
11 oil and gas from the well. A blowout can be
12 catastrophic, since oil and gas reaching the
13 drilling rig can quickly find an ignition
14 switch, leading to a fire or explosion,
15 endangering the lives of the drilling crew.

16 To prevent kicks, drillers pump a
17 dense slurry called drilling mud into the well
18 creating a barrier between the undersea oil
19 and gas and the piping that leads to the rig.
20 If this mud barrier fails, or is somehow
21 removed, the safety of the drilling crew
22 depends on a critical piece of equipment

1 located on the sea floor called the blowout
2 prevent, or BOP.

3 The BOP is a complex electrically
4 and hydraulically powered device that is
5 essential for controlling the well, and, in an
6 emergency situation, preventing a disaster on
7 the platform high above on the sea surface.
8 The BOP is connected to the rig by a large
9 diameter pipe called a riser. If a kick
10 occurs, the blowout preventer is designed to
11 prevent flammable oil and gas from traveling
12 up the riser to the drilling rig. This is
13 done by sealing the area around the drill pipe
14 known as the annular space.

15 To do this, the crew can manually
16 close pipe rams and donut-shaped rubber
17 devices known as annular preventers. If those
18 devices should fail to work, the last resort
19 is a pair of sharp metal blades, which form a
20 blind shear ram designed to cut the drill pipe
21 and seal the well. The blind shear ram can be
22 activated manually or by automated emergency

1 systems.

2 At approximately 8:45 p.m. on
3 April 20th, 2010, a kick occurred in the
4 Macondo well. Oil and gas entered the well
5 bore undetected, eventually passing above the
6 blowout preventer and traveling quickly up the
7 riser toward the Deepwater Horizon and the 126
8 people onboard.

9 Just after 9:40 p.m., drilling mud
10 forced upwards by the rising oil and gas
11 suddenly blew out onto the rig. Crew members
12 responded by closing the upper annular
13 preventer in the BOP. However, this did not
14 seal the well as intended and flammable oil
15 and gas continued to flow into the riser
16 toward the rig.

17 Next, the crew closed a pipe ram.
18 This successfully closed the annular space and
19 sealed the well, but tragically this proved to
20 be only a temporary fix. Oil and gas that
21 were already above the pipe ram continued to
22 flow inexorably toward the Deepwater Horizon.

1 At approximately 9:49 p.m., the flammable
2 hydrocarbons found an ignition source. The
3 first explosions shook the Deepwater Horizon.

4 As the oil and gas escaped the
5 riser onto the rig, the pressure dropped in
6 the annular space above the pipe ram, but at
7 the same time the pressure in the drill pipe
8 climbed substantially. The drill pipe was
9 closed at the top, but oil and gas continued
10 to flow in from the reservoir below. After
11 extensive analysis, the CSB concluded that
12 this large difference in pressure likely
13 caused the drill pipe to buckle, essentially
14 bending the pipe off center inside the blowout
15 preventer.

16 The buckling pushed sections of the
17 drill pipe outside of the reach of the blind
18 shear ram blades. This would eventually prove
19 to be catastrophic. With the drill pipe
20 buckled, the explosion and subsequent loss of
21 electrical and hydraulic power from the rig
22 likely activated an automated system on the

1 blowout preventer known as the AMF/Deadman,
2 which closes the blind shear ram and cuts the
3 drill pipe. This emergency system is designed
4 to activate when electric power, hydraulic
5 pressure, and communications from the rig have
6 been lost.

7 The AMF/Deadman system was operated
8 by two redundant control systems on the BOP
9 known as the yellow pod and the blow pod. The
10 redundancy is supposed to increase the
11 reliability of the system in an emergency
12 situation. The yellow and blue pods worked
13 independently of each other, and were
14 comprised of identical enclosed computer
15 systems and sets of solenoid valves.

16 When activated, the solenoid valves
17 controlled important BOP functions, such as
18 closing the blind shear ram. If electrical
19 power from the rig was lost, as happened on
20 April 20th, 2010, both the yellow and blue
21 control pods contained backup 27-volt and
22 nine-volt batteries to power emergency

1 functions. The nine-volt batteries powered
2 computers that would activate the solenoid
3 valves, which were powered by the 27-volt
4 batteries.

5 However, evidence indicates the
6 blue pod had been miswired at some time before
7 the BOP was lowered onto the sea floor. This
8 caused the pod's 27-volt battery to drain and
9 made it impossible to operate the solenoid
10 valve for the blind shear ram on the night of
11 the accident. And within the redundant yellow
12 pod, the solenoid for the blind shear ram had
13 been miswired.

14 The solenoid valves were controlled
15 by two coils of electrical wire. These two
16 coils were designed to work in concert,
17 generating a magnetic field strong enough to
18 operate the valve. But within the miswired
19 solenoid valve, the two coils actually opposed
20 each other, leaving the valve paralyzed. Only
21 a third unplanned failure allowed the yellow
22 pod to operate.

1 On the night of the accident, one
2 of the nine-volt batteries that powered the
3 solenoid valve's computer had failed. As a
4 result, the affected computer system could not
5 initiate the command to energize the miswired
6 coil. Had both coils of the miswired solenoid
7 valve been energized, the two coils would have
8 generated opposing forces on the valve. The
9 solenoid valve would have remained closed, and
10 the blind shear ram would never have been
11 closed.

12 However, the failed battery
13 rendered one coil inoperable, and most likely
14 allowed the other coil to open the solenoid
15 valve by itself. This, in turn, initiated
16 closure of the blind shear ram. This should
17 have cut the drill pipe and sealed the well,
18 greatly reducing the impact of the accident.
19 But because the drill pipe was buckled and off
20 center inside the blowout preventer, it was
21 trapped and only partially cut. With the
22 failure of this last-ditch measure, there was

1 nothing left to stop the massive oil spill and
2 the destruction of the rig.

3 During its investigation, the CSB
4 identified a mechanism that likely caused the
5 drill pipe to be buckled around the time of
6 the explosion. This mechanism is called
7 effective compression. Although effective
8 compression had previously been noted as a
9 hazard in other drilling operations, it had
10 never been identified as a problem affecting
11 drill pipe during well operations.

12 Effective compression occurs
13 because although pipe may appear to be
14 perfectly straight, in fact it has minute
15 bends and irregularities invisible to the
16 naked eye. Along these bends, the side of the
17 pipe that is curved outward is slightly longer
18 and has more surface area than the other side.

19 When there is a large difference in
20 pressure between the inside and outside of the
21 pipe, as happened on April 20th, 2010, the
22 longer side of the pipe experiences a larger

1 bending force. Eventually, this force can
2 become great enough to buckle even heavy pipe.
3 This is an important finding, CSB
4 investigators said, because the same
5 conditions of differential pressure could
6 occur at other drilling rigs, even if a crew
7 successfully shuts in a well.

8 The CSB warned this could make
9 existing blowout preventer designs less
10 effective in emergency situations.

11 In the case of the Deepwater
12 Horizon accident, the buckled drill pipe
13 prevented the blind shear ram from sealing the
14 well. Oil and gas from the well flowed out of
15 the buckled drill pipe and into the Gulf of
16 Mexico for 87 days. A reported five million
17 barrels of oil eventually spilled, causing one
18 of the worst environmental disasters in United
19 States history.

20 (Video ends)

21 MS. MacKENZIE: These technical
22 findings reveal several new learnings critical

1 for safe drilling operations offshore and
2 applicable for everyone in the industry.

3 First -- the slides back. First,
4 as the animation depicts, we conclude that the
5 automatic emergency response system within the
6 blowout preventer, the AMF/Deadman, actuated
7 on the night of April 20th, activating a sharp
8 pair of blades called the blind shear ram to
9 seal the well.

10 Other reports have concluded the
11 AMF did not fire and that the blind shear ram
12 was activated two days later. Our technical
13 findings also have led us to conclude that the
14 buckling of the drill pipe was actually the
15 result of a mechanism not revealed by other
16 reports on the incident, a phenomenon known as
17 effective compression. This will be discussed
18 in more detail shortly.

19 What these technical findings and
20 conclusions mean for industry is that the
21 buckling of the drill pipe can actually occur
22 when a well is successfully shut in by the

1 drill crew and can remain undetected. This
2 hazard could impact even the best offshore
3 companies who are properly maintaining their
4 BOPs.

5 Our investigative analysis of the
6 technical failures also illustrate that
7 industry and regulatory practice for testing
8 of the rarely used AMF/Deadman emergency
9 system can give companies a false positive
10 result. The procedure for testing the AMF
11 actually masks potential failures in the
12 redundant components of the emergency system.

13 Thus, some of these components
14 meant to safely -- some of these components
15 meant to be safety redundancies to ensure
16 reliable functioning of the AMF may actually
17 fail during the test but remain undetected
18 until it is too late. This means that similar
19 deficiencies identified in the Deepwater
20 Horizon BOP could remain undetected in BOPs
21 today.

22 Overall, the numerous shortcomings

1 in the hardware of the BOP were manifestations
2 of the lack of an effective management system
3 to ensure the functioning of this and other
4 safety critical barriers. The CSB found a
5 documented inability to reliably shear the
6 drill pipe was used for an extended period
7 during the drilling process.

8 Knowing this risk, Transocean
9 planned a two-step workaround that actually
10 would have high likelihood of failure in the
11 event that the two emergency systems, the
12 AMF/Deadman and auto shear, were activated.
13 CSB also found inadequate safety management
14 practices resulting in undocumented and
15 inadequate BOP maintenance and inspection.

16 Ultimately, although industry
17 guidance and offshore safety regulations have
18 advanced safety after Macondo, more change is
19 needed to ensure that all safety critical
20 elements -- technical, operational, and
21 organizational -- are effectively managed
22 through the life cycle of their use.

1 I will now turn the presentation
2 over to Dr. Mulcahy, who will discuss the
3 technical failures in more detail.

4 DR. MULCAHY: Thank you. So
5 although I assume many people in this room are
6 familiar with the Macondo incident, I'm going
7 to step back and just give a couple of other
8 additional details that weren't covered in the
9 video. And then I'm going to step through the
10 technical findings, providing more detail than
11 was originally given in the video.

12 So the video mentioned two
13 different physical barriers, drilling mud that
14 was placed into the well, and also a blowout
15 preventer that was located at the well head.
16 There are also two other -- or three other
17 potential barriers that are in a well or used
18 in a well. The first is casing and the cement
19 that secures the casing to protect the walls
20 of the well bore, that help seal hydrocarbon-
21 bearing zones as the well bore is being
22 drilled.

1 Another one is drilling crews can
2 install bottom hole cement at the bottom of a
3 well, again, to seal hydrocarbon-bearing zones
4 so that there is not an ingress into the well.
5 And, finally, there is an option of installing
6 a surface cement plug -- again, another
7 physical barrier that can seal a well.

8 At Macondo, at the time of the
9 incident, the crews were in the process of
10 temporarily abandoning the well, which means
11 they were removing various equipment and
12 drilling mud with the intent of leaving the
13 well ready for a production facility to come
14 back later and process the hydrocarbons that
15 were found in the well.

16 As it turned out, the cement
17 barrier that had been placed at the bottom of
18 the well had been tested, but the test results
19 had been misinterpreted, and this erroneously
20 led the drilling crew to believe that they had
21 sealed the well when in fact they had not.
22 And this is -- believing this, they began the

1 process of displacing the drilling mud from
2 the well.

3 At the time of the incident, the
4 drilling mud was being removed. By removing
5 the drilling mud, the drilling crew was
6 removing one of the physical barriers that
7 could have prevented the ingress of
8 hydrocarbons into the well. The service
9 cement plug that had been planned as part of
10 the temporary abandonment process had not yet
11 been installed. As I mentioned previously,
12 the cement at the bottom of the well had
13 actually not been -- the integrity had not
14 been ensured, and the BOP at the well head was
15 in its open position.

16 So the timeline of events that day,
17 the CSB calculations and modeling, we predict
18 that at about 8:51 p.m. that evening the well
19 became underbalanced, meaning that
20 hydrocarbons from the well began to flow into
21 the well bore. A kick had begun. Over the
22 next 35 minutes, more hydrocarbons entered the

1 well until they finally surpassed or passed
2 above the BOP.

3 Once the hydrocarbons got -- pass
4 above the BOP, they have only one place to go
5 and that's the rig. There is no physical
6 means to stop them from making their way to
7 the rig. The best hope the crew can have is
8 to divert them to a safe location.

9 It wasn't, though, until 9:40 when
10 mud passed -- or exited onto the rig floor
11 that the crew was aware of the problem of the
12 kick that had occurred in the well. At
13 approximately 9:43, they closed the upper
14 annular, but that failed to seal the well.
15 That was followed shortly after at about 9:47
16 with the closing of the pipe ram, which we do
17 believe sealed the well. But this turned out
18 to only be temporary because at approximately
19 9:49 the explosions on the rig occurred.

20 After the efforts had been
21 completed to stop flow from the well, the BOP,
22 the Deepwater Horizon BOP, was recovered and

1 brought to a testing facility, and DNV was
2 contracted to do a forensic analysis of the
3 BOP. There was a lot of interest in people to
4 understanding why the BOP had not sealed the
5 well, particularly since it did have an
6 AMF/Deadman system.

7 The physical evidence showed one
8 very important aspect that has been well
9 documented and publicized. The BOP, if you
10 look at the image on the left, was designed to
11 seal a drill pipe that had been centered in
12 the well, but the physical evidence indicated
13 that it had not in fact been centered but was
14 off centered, and that is depicted in the
15 image on the right.

16 So that when the blind shear ram is
17 closed, a portion of the drill pipe was
18 outside of the shearing part of the rams, and
19 so it was actually squeezed and not completely
20 severed. And this eventually caused the blind
21 shear ram not to be able to close fully.

22 This physical evidence requires us

1 to consider two very important conditions that
2 we have to match in time. The first is we
3 have to identify what caused or what activated
4 the blind shear rams to close. And, very
5 importantly, we have to correlate that in time
6 with the buckling mechanism that caused the
7 drill pipe to become off center in the well.

8 We see that there are two most
9 likely situations. The first one is -- that
10 I have represented up here on the left -- is
11 the triggering of the AMF/Deadman system,
12 which is a fully automated system that can
13 trigger the well -- or trigger the closure of
14 the blind shear rams. And the second one is
15 the auto shear system. That normally is not
16 triggered unless a rig drifts offsite, but in
17 this case -- this is an image taken from an
18 ROV or remotely-operated vehicle, where they
19 were able to use a robotic arm to trigger the
20 auto shear mechanism.

21 So the Deadman system, there are
22 three conditions that must be met in order for

1 it to activate. The first is surface
2 electrical power and communications coming
3 from the rig have to be severed. Second,
4 there has to be a loss of communication
5 between the yellow and blue pods. And, third,
6 there has to be a loss of hydraulic pressure
7 coming from the rig.

8 We believe that the conditions that
9 were present by the initial explosions on the
10 rig likely established those conditions.

11 When we look at the auto shear, we
12 know from video evidence on April 22nd, 2010,
13 that the auto shear did likely trigger.
14 That's what it appears to look like when you
15 see the video.

16 But the triggering of the auto
17 shear on April 22nd does not preclude the
18 triggering of the blind shear rams originally
19 with the AMF/Deadman system. For reasons that
20 I will discuss shortly, we considered the most
21 likely scenario of the buckling led us to
22 examine more carefully the possibility of the

1 AMF/Deadman being the cause of the closing of
2 the blind shear ram.

3 So what I'm about to present is
4 highly dependent on data that was collected
5 during this Phase 2 testing of the Deepwater
6 Horizon BOP. The other major reports, BP's
7 report, the Chief Counsel report from the
8 Presidential Oil Spill Commission, DNV's
9 report, all of those reports were published
10 before this Phase 2 testing was completed.
11 And there was critical information, and people
12 have heard now about miswiring of a critical
13 solenoid. It was mentioned in the video.
14 That wasn't discovered until the Phase 2
15 testing was complete.

16 When you look at the JAT reports
17 and NAE reports, they also do not address the
18 battery issues and miswiring that were
19 identified during Phase 2 testing.

20 So I hope -- for everybody sitting
21 in the audience, we have two very detailed
22 technical analyses/appendices that we are

1 publishing with our report, and we have
2 summarized the findings more generally in our
3 main report. But all of those details, we
4 have tried to make that public, so that
5 everybody has access to them to consider.

6 So let me start with the blue pod.
7 I am -- there was a point-to-point wiring
8 check done of the blue pod SEMS, which are the
9 digital computers inside of the blue pod. And
10 what we found in Phase 2 testing was the
11 point-to-point wiring check did not match the
12 original manufacturer's drawings. So either
13 wires were broken, missing, or had been
14 disconnected at some point in the course of
15 the blue pod's life.

16 That miswiring would have had an
17 effect of establishing one of the two
18 conditions necessary for the AMF/Deadman to
19 fire, and that is loss of electrical power and
20 communication coming from the rig.

21 Now, if you look at the image on
22 the right, the cartoon shows a red box around

1 the wiring of the SEM. That miswiring would
2 not have prohibited the blind -- or any of the
3 solenoids from opening, as long as the 27-volt
4 battery was good. But once that condition was
5 set and the AMF/Deadman was turned on at the
6 rig, and that condition was detected by the
7 blue pod SEM, it would have started to try and
8 monitor for the loss of hydraulic fluid
9 pressure.

10 That process of doing that
11 monitoring would have put a drain on the
12 battery, and we believe by the time the
13 incident occurred that that 27-volt battery
14 would have been drained to a point that it
15 would not have been able to have provided
16 enough energy to allow the solenoid valves to
17 open from the blue pod.

18 This, then, leads us to believe
19 that the blue pod was not capable of
20 activating the blind shear ram and carrying
21 out the AMF/Deadman sequence on the day of the
22 incident.

1 So then we have to focus on the
2 yellow pod, and this is -- you saw in the
3 video that -- it animated how a solenoid
4 works, and I'll just repeat that briefly here.
5 The solenoids are designed with two redundant
6 metal coils that when current is run through
7 those coils that they produce a magnetic field
8 that then pulls up a plunger allowing
9 hydraulic fluid to flow through. It's the
10 flowing through this hydraulic fluid that then
11 triggers the closure of the blind shear ram as
12 one of the final steps of the AMF/Deadman
13 sequence.

14 The picture that you see on the
15 left is a picture that was taken while the
16 solenoid valve, Y103, responsible for closure
17 of the blind shear ram, was being
18 disassembled. And what you may not be able to
19 see clearly in the photo you should be able to
20 see more clearly in the cartoon at the right.

21 The wiring is supposed to be that
22 -- numbers one and three are supposed to be

1 white, and two and four are supposed to be
2 black. Whereas, if you look in the photo, you
3 can see that the opposite is true. And so
4 this was a miswired solenoid valve.

5 One of the key factors that I won't
6 go into detail here, but it's important, that
7 there was a lot -- there were published
8 results of testing of the individual solenoid
9 valve that came out as a result of Phase 1.
10 We learned from information gathered in Phase
11 2 that we had to reinterpret those results,
12 because the miswired solenoid valve could not
13 open.

14 And so we learned during Phase 2
15 that equipment that was being used to test the
16 solenoid valve in Phase 1 was not opening or
17 triggering the valve in the way that we
18 thought. So that's a pretty big -- that is a
19 big change from what you would have learned if
20 you had looked at Phase 2 and gone on to Phase
21 1.

22 Ultimately, what is important to

1 remember is that if all of the batteries in
2 the yellow pod were sound at the time of the
3 incident, this miswiring of the solenoid valve
4 would not have allowed the solenoid valve to
5 open. So if that had been the case, then the
6 yellow pod also would have been inoperable on
7 the day of the incident.

8 But we learned two things. When we
9 learned about the testing equipment and the
10 misunderstanding of how the testing equipment
11 worked in Phase 1, we realized that we had to
12 go back and reinterpret the results from
13 Phase 1. There was also information that came
14 out in Phase 2 through tests on the batteries
15 that we realized that the nine-volt -- one of
16 the nine-volt batteries in the yellow pod had
17 died, was almost completely drained. And it
18 was incapable of sending the command to open
19 up the solenoid valve.

20 What we also realized when we went
21 back and looked at Phase 1 is that there were
22 three successful AMF/Deadman tests that were

1 completed during Phase 1 testing. And we
2 started to wonder, how could that possibly
3 have occurred? Why would the battery have
4 stopped -- or why would the solenoid have
5 started opening during the AMF/Deadman test?

6 And we started thinking of analogy
7 of anybody in here who might have started a
8 car on a cold day. If you've ever had the
9 experience where you have gone out to your car
10 on a cold day, and you've tried to start your
11 engine and it turns over but the engine --
12 your car doesn't actually start, but if you
13 wait until later in the day and try it again,
14 your car will start.

15 This is because batteries are
16 affected by the temperature of the environment
17 in which they are performing. So we started
18 to consider the fact that the SEM pods that
19 were being tested at the Michoud facility
20 during Phase 1 testing were operating in
21 temperatures that were around 70 degrees
22 Fahrenheit.

1 The temperatures at the bottom of
2 the ocean are closer to freezing, so closer to
3 36 degrees Fahrenheit. And so we started to
4 consider that a battery that barely worked in
5 ambient temperatures that were surrounding the
6 pod at 70 degrees Fahrenheit we felt would
7 have an unlikely ability to function at 36
8 degrees Fahrenheit.

9 And we did battery calculations and
10 drain calculations to show that we believe
11 that the nine-volt battery on the day of the
12 incident had actually drained, one of them had
13 drained, the one that had died, but it in the
14 cold temperatures had drained sufficiently to
15 not be able to send the command to trigger the
16 blind shear ram to open.

17 With that in mind, we had to
18 consider -- we still -- we now believed we had
19 two likely scenarios of the AMF being
20 triggered, but now we need to correlate this
21 in time with the pipe actually being buckled.
22 So there are three different theories that we

1 considered. One of them is you could have
2 high flow rate going up through a drill pipe
3 that has at some point broken and lost
4 integrity at the top. Those forces, in
5 addition with forces pushing up on the bottom
6 of the drill pipe, could have caused it to --
7 could that have caused it to buckle, and that
8 is the image depicted on the left.

9 Then, we have the image on the
10 right. Another possibility is that -- there
11 was witness testimony that equipment holding
12 the drill pipe up at the top of the rig had
13 actually failed. If that were true, then all
14 of the weight of the drill pipe, plus that
15 equipment, would have been pressing down on
16 the pipe rams that were closed around the
17 drill pipe. That's the second possibility.

18 And then, the third possibility is
19 this possibility of effective compression that
20 was just introduced in the animation. After
21 looking at all of the evidence that we had,
22 and considering various options, we believe

1 the most likely scenario for pipe buckling
2 happened to be with effective compression,
3 which led us to choose the most likely
4 scenario of the AMF being triggered at the
5 time of the AMF/Deadman.

6 So pipe buckling is actually --
7 it's not a new phenomenon that the CSB is
8 putting forth. It is actually one that is
9 well recognized in the oil and gas industry.
10 What you're looking at here is a picture of a
11 buckled choke and kill line that was being
12 pressure tested back in the 90s. It was
13 being pressured up to 15,000 psi, and you can
14 see here that it is bowed or buckled.

15 If there is anybody in the room who
16 does casing design or pipeline designs, they
17 could probably attest to having to consider
18 this phenomena because it is a concern in both
19 of those areas. What we did notice is no one
20 has mentioned effective compression in the
21 terms of drill pipe during a well control
22 incident.

1 Part of this may be because this is
2 not a phenomena that is easily recognized if
3 you're on the drilling rig. There is no
4 instrumentation that will tell you directly
5 that you have drill pipe buckled in your BOP.

6 So this is a simple flowchart of
7 all the information I just presented to you.
8 We know that the annular preventer was
9 manually activated by the crew at 9:43 p.m.
10 approximately. They then followed that by
11 operating the pipe RAM, which we believe
12 sealed the well bore but caused a substantial
13 increase in pressure inside the drill pipe.
14 That also allowed pressure outside in the
15 annular space outside the drill pipe to drop
16 as that oil and gas in that area progressed up
17 towards the rig.

18 When this happened, when the pipe
19 RAM sealed, we now have the conditions
20 necessary, established, to have the pipe
21 buckled by effective compression. We then had
22 the explosion, which established the

1 conditions necessary for the AMF/Deadman
2 system to trigger. We believe that due to
3 miswiring in the blue plod the 27-volt battery
4 was drained by the time of the incident and
5 incapable of actuating the Deadman system.

6 We believe the yellow pod had one
7 SEM battery that was already compromised, and
8 that by operating in the colder temperatures
9 had pushed it to a point that it was no longer
10 able to send the commands to trigger one of
11 the coils. This, then, left the other coil
12 unopposed and able to activate and
13 successfully attempt to close the blind shear
14 ram.

15 Because the blind shear ram was
16 buckled in the drill pipe at the time of
17 actuation, the blind shear ram did not fully
18 close, and in fact punctured the drill pipe
19 and, in reality, reestablished the flow that
20 then continued.

21 So Ms. MacKenzie noticed at the
22 beginning of the presentation that many of

1 these shortcomings that we identify in the BOP
2 are really manifestations of safety management
3 system issues. So safety management systems,
4 in the words of other process safety experts,
5 one description is safety management systems
6 are recognized and accepted worldwide as the
7 best practice methods for managing risk.

8 Another expert has noted or
9 described safety management systems are those
10 that provide an organizational framework to
11 help manage critical safety barriers.

12 PSA has expanded this point and
13 described it a little more generally. They
14 say these barriers -- technical, operational
15 and/or organizational elements -- which
16 individually or collectively reduce
17 opportunities for specific error, hazard, or
18 accidents to occur, or which limits the
19 accidents drawbacks or harm.

20 So at the beginning when we
21 mentioned that the manifestations come out in
22 the technical equipment, what the PSA quote

1 that I just read really takes into account is
2 that all of these types of barriers,
3 operational barriers, organizational barriers,
4 and technical barriers, play off of one
5 another. And that is actually quite apparent
6 when you think about a piece of hardware
7 equipment like the BOP.

8 We have an action we want the BOP
9 to take. We may actively, manually activate
10 it on a rig, and we want to make sure that it
11 does not fail when needed, shown over there at
12 the right.

13 So we have barriers put in place to
14 make sure that that occurs. We try to
15 recognize design limitations that can be
16 identified during a hazard analysis to ensure
17 that the BOP is not put in a situation it
18 cannot handle. There are inspection and
19 maintenance programs that are put in place to
20 make sure BOP is capable of operating when
21 called up. And, finally, we have drilling
22 crew vigilance and response listed as a

1 barrier, because a BOP works best if it's not
2 closing on a flowing well.

3 All of these, or these three that
4 I have presented here, are examples of
5 organizational and operational barriers that
6 help ensure that the physical barrier, the
7 BOP, can actually function.

8 There is a quote that we borrowed
9 from BP. "Even the best barrier will not
10 achieve perfect reliability. It will have
11 holes. These holes can be latent or actively
12 opened or enlarged by the action or inaction
13 of people. The robustness of the barriers
14 changes with time and depends on factors
15 related to people, process, and plant." And
16 I skipped a line. "The holes can be latent or
17 actively opened or enlarged by action or
18 inaction of people."

19 We think this is a very apt quote
20 and why -- highlights why it is so important
21 to have a safety management system for your
22 safety critical elements. So I have shown up

1 here two definitions of a safety critical
2 element. First, it is a piece of equipment or
3 an organizational operational barrier whose
4 failure could cause or contribute to a major
5 accident event.

6 Or, secondly, it has a specific
7 purpose to limit the effects of a major
8 accident event. In this case, a BOP actually
9 plays both roles. It is intended to stop a
10 kick from progressing into a blowout, but it
11 also has emergency systems that are intended
12 to activate after an emergency situation has
13 occurred.

14 So we would like to present the
15 idea of looking at how to manage a safety
16 critical element like the BOP with this life
17 cycle approach that you see represented up on
18 the board.

19 The first step of this life cycle
20 approach is actually a hazard analysis to
21 identify, what are your safety critical
22 elements? We are talking about the BOP today,

1 but there are many other ones. So a hazard
2 analysis should identify all the sequence of
3 events that could lead -- in this case we are
4 talking about a kick that could then
5 potentially lead into a blowout.

6 Those sequence of events should be
7 clearly documented and include human -- any
8 potential human errors that may occur. If we
9 are going to designate something as a safety
10 critical element, a company might start with
11 a list that it has in a database somewhere.
12 But the important thing is to directly link
13 whatever you say is a safety critical element
14 to the major accidents that it is intended to
15 prevent.

16 Second we have listed is defining
17 a performance standard. So performance
18 standard is the basis for which a safety
19 critical element will prevent or mitigate a
20 major accident event. What we have listed
21 here is that a performance standard can
22 describe the functionality of a safety

1 critical element, what is it required to do.
2 It can describe its availability, what will
3 its performance duration time be required. It
4 can describe its reliability, how likely is it
5 to perform upon demand, its survivability,
6 what post-event role must have performed or
7 survived in order to be able to perform, and
8 then also its interactions with other systems,
9 so what other systems must be functional in
10 order for it to be able to function itself.

11 These performance standards can be
12 based on national or internationally
13 recognized industry standards, or companies
14 may also use other various methods or
15 technological solutions to determine and
16 define the performance requirements of their
17 safety critical elements.

18 So compliance with the performance
19 standard is the basis for assuring that a
20 safety critical element will act as a barrier
21 to a major accident event. These activities
22 are conducted, or these performance assurance

1 activities are conducted to ensure that the
2 safety critical element is functioning
3 appropriately and complying with the
4 performance standards that have previously
5 been set for that element.

6 And, finally, we list gap closure.
7 Gap closure is meant to encapsulate all the
8 methods employed by the companies to
9 continually monitor their safety critical
10 elements and actually improve upon them. So
11 I'm going to use the BOP as a specific example
12 to walk through this life cycle. And I'm
13 actually going to use an example that was not
14 in play on the day of the incident.

15 So we talk about that -- we mention
16 that you need to identify what your safety
17 critical elements are, and that should begin
18 with a hazard analysis. The hazard analysis
19 completed on the Deepwater Horizon did not
20 address the BOP's design limitations or
21 capabilities.

22 With that being said, what you see

1 here is an image of a daily drilling report
2 from the Deepwater Horizon. Highlighted in
3 that pink box over at the left is the drill
4 pipe size that was used on the Deepwater
5 Horizon. That drill pipe size of 6-5/8-inch
6 was not listed as being reliably shearable or
7 not specified as being reliably shearable by
8 Cameron, the manufacturer of the BOP.

9 Now, we know that -- that there
10 were transition employees who are aware of
11 this fact. This is an excerpt from an email
12 that was sent from one Transocean employee to
13 another, and it says, "How can I get the chart
14 attachment to change the color on the 4614 psi
15 for shearing the 6-5/8-inch drill pipe to red?
16 Would Cameron have to edit this chart? This
17 is what Rod wants. He says if we can't shear
18 it, then it should be in red."

19 So Transocean did have -- you could
20 call -- they did have a basic statement that
21 stated that the blind shear rams on the BOP
22 must be capable of shearing the highest grade

1 and heaviest drill pipe used on the rig and
2 sealing the well, and it must seal the well in
3 one operation.

4 But what we know happened was that
5 Transocean, aware of this problem of shearing
6 this heavier drill pipe that was used
7 throughout the drilling operation, that they
8 actually developed a two-step workaround. The
9 problem with this two-step workaround is it
10 would have worked for a system called the EDS,
11 where they had an option to close something
12 called the casing shear rams first and then
13 the blind shear rams.

14 The AMF system and the Auto-Shear
15 system, neither one of those had the
16 capability of pre-closing something called the
17 casing shear ram. So that means that they
18 didn't have that two-step process available to
19 them.

20 When we go back and we think about
21 a performance standard, one of the definitions
22 that we talked about is that you could

1 include, what were the interactions that your
2 safety critical elements had with other
3 systems? So even though the drilling crew
4 found a two-step process that would work for
5 the EDS system, what they didn't consider is
6 that it wouldn't work for the AMF system or
7 the Auto-Shear system.

8 So that brings us to gap closure,
9 and gap closure is about maintaining -- not
10 only maintaining performance of your safety
11 critical element over time but actually
12 improving upon it. So we talk about active
13 monitoring in the report, and active
14 monitoring is really something completed by
15 all levels of management. It is how they
16 continuously monitor work activities,
17 organizational and operational practices, and
18 systems that impact safety critical elements.

19 So this is formal and informal
20 inquiries. It's not an audit. It's not
21 checking to see that somebody has done what
22 they were supposed to do, but it is actually

1 increase and trying to check on the health of
2 the system. Was the two-step workaround
3 process -- was that part of Transocean's
4 organizational or operational goals? And, if
5 not, you would hope that management would be
6 engaging in conversations to discover what
7 those processes were, or what other
8 workarounds were being developed on the rig.

9 We also -- gap closure is about
10 looking at specifically the performance of the
11 BOP. There are mechanical integrity programs
12 that can be set up to ensure that adequate
13 testing, preventative maintenance, and other
14 activities are being conducted on the
15 equipment or the other safety critical
16 elements.

17 One final possibility is there is
18 a possibility of having an additional layer
19 that actually confirms that safety critical
20 elements are being managed effectively, and
21 that is having an independent, competent
22 person verify the activities that are being

1 completed. This is something Cheryl will talk
2 again about shortly, and we see already
3 happening with BOPs in current post-Macondo
4 regulations.

5 So I'm not going to walk through
6 all those steps, but I am going to point out
7 a few more other assurance activities that
8 were not conducted on the Deepwater Horizon
9 BOP.

10 The first one is there was a lack
11 of documentation of testing on the BOP's
12 AMF/Deadman system components. So there was
13 a miswired solenoid, and a natural question to
14 ask is, well, who miswired the solenoid? And
15 we actually can't answer that question. We
16 know from looking at documents from Transocean
17 that they don't know either. Was it rig crew?
18 Was it a contractor? Was it -- where was it
19 rebuilt? Who did the miswiring? We don't
20 know because that was never recorded.

21 Another testing that was not
22 recorded was testing of the solenoid valves,

1 both in documentation provided by Cameron, the
2 manufacturer, and also that Transocean had its
3 own procedure, instructed users who had
4 rewired or rebuild the solenoid valves to test
5 it, to test one coil, the second coil, and the
6 two coils together. It is impossible that
7 Y103, the solenoid valve responsible for
8 closing the blind shear ram in the yellow pod
9 could have passed that test.

10 While we were reviewing this, we
11 actually came across some interesting
12 observations about testing in general with
13 AMF/Deadman systems. So before the Macondo
14 incident, AMF/Deadman systems were not even
15 required on deepwater drilling rigs. Post-
16 Macondo, they are. So perhaps accordingly,
17 then, best industry practice guidance didn't
18 address testing of the AMF/Deadman systems.

19 Since that -- since Macondo, it
20 has, and there is some recommended testing
21 procedures in EPI-53, the fourth edition. So
22 that testing, what it does is it uses an

1 external piece of equipment that -- and they
2 -- to provide power to the SEMS or the AMF or
3 the control pods, and then also hydraulic
4 supply.

5 And what that test says to do is
6 two -- or, sorry, the API test says cut
7 hydraulics and electrical at the same time,
8 and check to make sure that your AMF/Deadman
9 system triggers. That procedure differs from
10 the procedure, at least for this BOP, provided
11 by Cameron. The manufacturer's procedure
12 recommends that you do it in a two-step
13 process.

14 In the first step, indicated up
15 here at the top of this diagram, you are to
16 cut power and communications first, and then
17 wait and ensure that the Deadman system does
18 not fire. And then you cut hydraulic
19 pressure, and you wait and you see that it
20 does fire.

21 Second set of tests, they tell you
22 to do the reverse now. Cut power and

1 communications, and wait and make sure the
2 Deadman system doesn't fire. Then, go back
3 and cut hydraulic pressure and wait and see
4 that the Deadman system fires.

5 So the testing or the miswiring
6 that we identified from the point-to-point
7 wiring checks found -- or conducted during
8 Phase 2 testing, this test would have caught
9 that miswiring. If the Deadman system
10 believed that it had already lost power and
11 communications from the rig because of the
12 wiring, or, in this case, the test equipment,
13 what would have happened when you turned off
14 the hydraulic pressure first and waited, the
15 Deadman system would have fired.

16 So had this test been done in this
17 way as opposed to turning off electrical and
18 hydraulic power at the same time, had it been
19 done sequentially, that miswiring would have
20 been detected by this test. And this is,
21 again, the test that is indicated by Cameron,
22 the manufacturer of the BOP.

1 There is another difficulty or
2 something I think we should -- that everybody
3 in the industry should consider when they
4 conduct tests by just cutting hydraulic and
5 electrical power at the same time. The
6 Deadman system is designed with redundancy.
7 It is designed that either the SEM-A, so the
8 computer A in the blue pod, or computer B in
9 the yellow -- or computer B in the blue pod,
10 or computer A in the yellow pod, or the
11 computer B in the yellow pod, any one of those
12 four systems should be able to trigger the
13 AMF/Deadman system.

14 So let's think about the Deepwater
15 Horizon system. We know that the yellow --
16 the two yellow systems could not have
17 triggered, miswired solenoid valve, assuming
18 that it had a good battery at the time. If
19 the 27-volt battery of the blue pod had been
20 good at the time that it was on the rig, it
21 actually would have passed the test and the
22 rig crew would have had no idea that two of

1 the systems were inadequate or unable to
2 perform that function.

3 There would have been a misplaced
4 confidence on this -- or a redundancy because
5 it actually wasn't verified. It is possible
6 you could have just one SEM pass -- or trigger
7 the AMF/Deadman system successfully, and all
8 of the other SEMS fail for whatever reason,
9 and the rig crew would have no idea. They
10 wouldn't know if one was functioning
11 successfully or all four.

12 For a system that is one of your
13 last-ditch attempts at preventing or
14 mitigating a major accident event, we feel
15 that this needs to be addressed, this
16 shortcoming needs to be addressed, because,
17 really, ultimately what it means is that the
18 same latent failures found on the Deepwater
19 Horizon BOP could conceivably pass current,
20 new industry-recommended AMF/Deadman system
21 testing today.

22 So I'm going to now turn the

1 presentation back over to Ms. MacKenzie.

2 MS. MacKENZIE: In the aftermath of
3 Macondo, a number of regulatory changes were
4 implemented, and industry standards and good
5 practice guidance was developed and revised.
6 These improvements should be commended for the
7 advancements made in efforts to improve
8 offshore safety.

9 One of the most significant changes
10 was the establishment of the safety and
11 environmental management systems, or SEMS
12 rule. The SEMS rule requires operators to
13 develop a safety and environmental management
14 system that incorporates several essential
15 elements, including hazard analysis,
16 management of change, mechanical integrity,
17 and many others.

18 The SEMS rule also generally
19 requires that the operator be responsible for
20 establishing goals and performance measures to
21 carry out an effective SEMS program. Yet the
22 SEMS rule lacks specific language focusing the

1 responsible party to identify and establish a
2 comprehensive safety management system for all
3 safety critical elements. These are the
4 technical, operational, and organizational
5 elements.

6 The rule also lacks a requirement
7 for the operator and drilling contractor to
8 reduce risk to a targeted level such as as low
9 as reasonably practicable. These gaps allow
10 companies to ineffectively manage their safety
11 critical elements and yet remain in compliance
12 with the regulations.

13 The components of the safety
14 management system life cycle approach for
15 safety critical elements, as this visual
16 depicts, are not explicitly required for all
17 safety critical elements. For example, within
18 the life cycle safety management system
19 approach is the identification of safety
20 critical elements.

21 As discussed earlier, this is
22 accomplished, first and foremost, through a

1 process of conducting a hazard analysis, yet
2 there is no requirement to identify and
3 document all safety critical elements as part
4 of that hazard analysis process.

5 Additionally, the hazard analysis
6 element of SEMS is not focused on targeted
7 risk reduction. Instead, the requirements are
8 activity-based where the hazards identified
9 must be managed, and any resulting
10 recommendations for mitigating or eliminating
11 the hazard must be resolved.

12 A system can be managed but managed
13 poorly. A recommendation can be resolved,
14 completed, or closed out, but the result may
15 not necessarily make things safer. Companies
16 could conduct a weak or inadequate hazard
17 analysis and not identify the appropriate
18 safety critical elements or operating
19 conditions of the safety critical elements,
20 and yet appear to be in compliance with the
21 regulation. This is something the CSB sees
22 again and again in its onshore investigations

1 as well.

2 The absence of targeted risk
3 reduction parallels findings in two specific
4 CSB incident investigations that have come out
5 recently on onshore facilities -- the Chevron
6 refinery fire in Richmond, California, and the
7 Tesoro Anacortes Refinery in Anacortes,
8 Washington.

9 While these onshore sites are
10 regulated by agencies other than BSEE, the
11 California Division of Occupational Safety and
12 Health, and the Washington State Department of
13 Labor and Industries, these are both state --
14 OSHA states -- the safety regulations parallel
15 the SEMS rule, both in the safety management
16 system framework of each, and that the onshore
17 and offshore regulations both lack targeted
18 risk reduction.

19 On August 6th, 2012, at the Chevron
20 refinery, a pipe containing flammable
21 hydrocarbon process fluids ruptured, resulting
22 in a large vapor cloud that ignited, sending

1 a large uncharacterized plume across Richmond.
2 Fifteen thousand people sought medical
3 attention from that incident.

4 On April 2nd, 2010, at the Tesoro
5 refinery, a heat exchanger catastrophically
6 ruptured, releasing highly flammable hydrogen
7 naphtha at more than 500 degrees Fahrenheit
8 into a process unit where seven workers were
9 located and fatally injured.

10 In both cases, known hazards were
11 not controlled for or mitigated sufficiently
12 to prevent the tragic accidents from
13 occurring. Yet both companies had conducted
14 the requisite hazard analysis activity
15 stipulated in the regulations. Both of these
16 CSB investigations have incident reports for
17 those who wish to have more details.

18 It is also -- it is significant to
19 note that U.S. offshore voluntary guidance
20 developed post-Macondo support a risk
21 reduction target. API Bulletin 97 provides
22 guidance on the information to be shared

1 between the operator and the drilling
2 contractor regarding well construction and
3 rig-specific operating guidelines.

4 The bulletin suggests that as part
5 of the well plan interface document, the risks
6 associated with implementation of the planned
7 well construction activities be identified,
8 and that the prevention and mitigation plans
9 be established for those identified risks in
10 order to reduce the possibility as low as
11 reasonably practical.

12 It goes on to state that these
13 identified risks and prevention mitigation
14 plans are to be communicated to all affected
15 personnel.

16 Furthermore, in August 2013, BSEE
17 proposed to amend and update an existing
18 regulation -- its oil and gas production
19 safety systems regulation -- that speaks to
20 the need for a life cycle approach to managing
21 safety critical equipment.

22 With a focus on production, this

1 rule is not applicable to drilling facilities
2 such as the Deepwater Horizon. However, the
3 proposed changes are significant because they
4 highlight the importance of conducting and
5 documenting a life cycle analysis of specific
6 safety and pollution prevention equipment.

7 And while this rule excludes the
8 BOP, a 2013 proposal explicitly requested
9 public comment on the possibility of requiring
10 a similar life cycle analysis of the BOP.

11 This demonstrates an
12 acknowledgement by the regulator of the
13 benefits of a life cycle safety management
14 system approach, albeit for a few specific
15 pieces of equipment.

16 The CSB concludes that all safety
17 critical elements require this approach for
18 the prevention of major accidents.

19 I would now like to ask Don
20 Holmstrom to share the proposed
21 recommendations.

22 MR. HOLMSTROM: Thank you, Cheryl

1 MacKenzie. The CSB makes recommendations, and
2 I'm going to read the draft recommendations,
3 subject to approval or voted by the Board that
4 came out of this -- the first two volumes of
5 our Macondo investigation. Once the
6 recommendations are voted on, the CSB has a
7 recommendations group that tracks the
8 recommendations until completion, so the CSB
9 doesn't just issue reports and moves on. We
10 have a mechanism similar to the National
11 Transportation Safety Board to issue
12 recommendations and track them to completion.
13 And the status of those recommendations is
14 also a vote of the Board, whether their open,
15 acceptable response; closed, acceptable
16 action; that's an evaluation by the staff and
17 a vote by the Board.

18 So we -- the recommendations are
19 the mechanism that drives safety change and
20 are very important to the Chemical Safety
21 Board.

22 The first draft recommendation this

1 evening is to the Bureau of Safety and
2 Environmental Enforcement, United States
3 Department of Interior. Augment 33 CFR
4 Section 250, Subpart S, to require the
5 responsible parties, including the leasee,
6 operator, and drilling contractor to
7 effectively manage all safety critical
8 elements, technical, operational, and
9 organizational, thereby ensuring their
10 effective operation and reducing major
11 accident risk to as low as reasonably
12 practical.

13 At a minimum, require the following
14 improvements. A, written identification of
15 all safety critical elements for offshore
16 operation through hazard analysis. This list
17 will be made available for audits and
18 inspections before and by the responsible
19 parties. External entities, e.g. independent
20 competent parties, third party auditors, and
21 the regulator, and it will be shared among the
22 leasee, operator, and drilling contractor.

1 Identifying all safety critical
2 elements shall ensure the establishment and
3 maintenance of effective safety barriers to
4 prevent major accidents.

5 B, documented performance
6 standards, as defined in Section 5.2 of the
7 Macondo investigation report, describing the
8 required performance of each safety critical
9 element, including its functionality,
10 availability, reliability, survivability, and
11 interactions with other systems.

12 C, augmentation of 30 CFR Section
13 250.1916, to include requirements for all
14 responsible parties, including contractors, to
15 conduct monitoring for continuous active
16 assurance of all identified safety critical
17 elements through each of the safety critical
18 element's life cycles.

19 Also, part of Recommendation R1 to
20 BSEE, documented independent verification
21 scheme for the identified safety critical
22 elements reported to, and it's subject to

1 review by the regulator where, one, the
2 dependent party meets BSEE criteria that
3 guarantees its competence and independence
4 from the company or facility for which it is
5 providing verification.

6 Two, the independent verification
7 occurs prior to commencement of the offshore
8 drilling or production activity and
9 periodically as defined by BSEE.

10 Three, all resulting assessments of
11 the independent verification activities will
12 be tracked in a formal records management
13 system.

14 And, four, corrective action shall
15 be taken to address negative verification
16 findings and non-compliance. Verified non-
17 compliance shall be tracked by the responsible
18 party as a process safety key performance
19 indicator and be used to drive continuous
20 improvement.

21 The next recommendation to BSEE,
22 R2, publish safety guidance to assist the

1 responsible parties in the fulfillment of
2 regulatory obligations stipulated in R1 for
3 the identification and effective management of
4 safety critical elements -- technical,
5 operational, and organizational -- with the
6 goal of reducing major accident risk to as low
7 as reasonably practical, including, but not
8 limited to, each of the identified minimum
9 requirements, which we identified in R1.

10 Recommendation Number 3 to the
11 American Petroleum Institute. Publish an
12 offshore exploration and production safety
13 standard for the identification and effective
14 management of safety critical elements,
15 technical, operational, and organizational,
16 with the goal of reducing major accident risk
17 to as low as reasonably practical, including,
18 but not limited to: A, development and
19 implementation of a safety critical element
20 management system that includes the minimum
21 necessary shall requirements in the standard
22 to establish and maintain effective safety

1 barriers and prevent major accidents.

2 B, methodologies for the
3 identification of safety critical elements;
4 and, two, the development of performance
5 standards of each safety critical element,
6 including its functionality, availability,
7 reliability, survivability, and interactions
8 with other systems.

9 C, establishment of assurance
10 schemes for continuous active monitoring of
11 all identified safety critical elements
12 throughout each safety critical element's life
13 cycle.

14 And, D, fulfillment of independent
15 verification requirements and use of those
16 verification activities to demonstrate
17 robustness of the safety critical element
18 management process.

19 And, E, development of process
20 safety key performance indicators pertaining
21 to the effective management of safety critical
22 elements to drive continuous improvement.

1 Recommendation Number R4 to the
2 American Petroleum Institute, revise blowout
3 prevention -- blowout preventer equipment
4 system for drilling wells, API Standard 53,
5 4th edition, to establish additional testing
6 or monitoring requirements that verify the
7 reliability of those individual redundant
8 blowout prevention systems that are separate
9 from the integrated system test currently
10 recommended.

11 This concludes our presentation,
12 and we will now welcome questions from the
13 Board.

14 Thank you.

15 CHAIRPERSON MOURE-ERASO: Thanks.
16 The next item on the agenda is questions from
17 the Board. I wonder if Mr. Griffon has some
18 questions that you would like to beam here to
19 the investigative team. Mr. Griffon?

20 MR. GRIFFON: Yes. Thank you, Mr.
21 Chairman. And thanks to the team for the
22 presentation. It is a bit difficult to

1 follow. There is a little delay with the
2 slides and the audio. But, anyway, so some of
3 my questions you may have covered in the
4 presentation, and I apologize, but maybe if
5 you can just expand or reiterate the points.

6 Just a couple of questions. One,
7 I just was wondering if we have any evidence
8 about what is being done at the operational
9 level and whether these global companies are
10 using completely different approaches to
11 managing safety critical elements in the Gulf
12 compared to around the world? And are there
13 any discrepancies of what is being done in the
14 Gulf versus other -- around the world for, you
15 know, these global companies?

16 MR. HOLMSTROM: I'll start it out.
17 This is Don Holmstrom. At the Chemical Safety
18 Board, we adopted practice I think similar to
19 the National Transportation Board and --
20 Safety Board in terms of our evaluation of
21 what practices are. We recognize there is a
22 wide range of practices, and then there is

1 standards and regulatory requirements.

2 And because of the fact that these
3 practices vary considerably from company to
4 company, we focus on making improvements to
5 what we can identify, which are the generally
6 accepted good practices, usually published by
7 a standard-setting body such as American
8 Petroleum Institute, National Fire Protection
9 Association, et cetera. And, obviously, there
10 is international standards that we have looked
11 at and regulatory systems thoroughly the
12 world.

13 So we examine those as sort of the
14 floor of practice and examine whether those
15 particular practices and regulations are
16 sufficient to have prevented the incident
17 occurring given what we have identified in our
18 investigation report.

19 So if one adopts the perspective of
20 minimal compliance, which is often the case in
21 CSB investigations, often when we are
22 investigating an incident it's not the

1 companies that are going above and beyond the
2 standards and regulations; it is often
3 somebody adopting a minimal compliance
4 approach.

5 And so if there's gaps in those
6 regulations, and people aren't following or
7 are not implementing -- only the regulations
8 and not going beyond those, and the incident
9 could occur given those gaps and weaknesses,
10 then we make recommendations for improvement.

11 So our typical approach is to
12 identify the practices in the incident that
13 we're investigating, and then look at
14 standards and regulations and see if those
15 need improvement to prevent -- especially when
16 you have a catastrophic incident with I think
17 what everyone would recognize as unacceptable
18 consequences for society, and certainly for
19 those people killed and injured, to prevent
20 that from occurring again.

21 PARTICIPANT: I would add that API-
22 53 is an international standard for BOP

1 management, and I suspect when the findings of
2 this report come out that people around the
3 world would be considering some of the points
4 that we have made in our report.

5 CHAIRPERSON MOURE-ERASO: Mr.
6 Griffon?

7 MR. GRIFFON: Thank you. Thank
8 you. And I guess for me it was just as much
9 a curiosity as a -- you know, I just was
10 trying to imagine whether these very large
11 companies would operate a certain way in one
12 area and then, you know, a more limited, less
13 rigorous approach, you know, just because
14 they're in another -- under another regulatory
15 regime. So it was as much of a curiosity as
16 anything.

17 But let me ask the second part,
18 which is going into the SEMS a bit, and I
19 think, Cheryl, I -- this is probably something
20 that you may have even covered or touched on,
21 so maybe just to clarify for me.

22 I think it's in Section 6.1 of the

1 report that I wondered if you could describe
2 a little further maybe what BSEE is doing with
3 regard to the SEMS regs. It seems that they
4 have some language at least that is very
5 similar to what we are recommending with
6 regard to safety critical element programs.

7 My sense, and I'm certainly no
8 expert on this regulation, but my sense is
9 that it's probably limited to equipment, not
10 other -- not the broader systems that you
11 talked about. Can you just explain for me
12 further what SEMS -- what is sort of covered
13 in the SEMS approach now and where the
14 deficiencies lie in our view and the
15 justification for our Recommendation R1?

16 MS. MacKENZIE: Sure. Yes. So a
17 subsequent volume of this investigation will
18 be looking at regulatory issues, and we look
19 at SEMS a lot more in-depth in that one -- not
20 just for safety critical elements but beyond
21 that.

22 In this case, regarding safety

1 critical elements, it does speak to safety
2 critical equipment, and specifically we
3 highlighted in our report about the need to
4 look at safety critical tasks, the
5 operational/organizational elements that are
6 safety critical for safe operation and
7 prevention of major accidents.

8 The language of SEMS, as we tried
9 to quickly point out in this presentation,
10 allows, without a risk reduction target and
11 some of the language that is used within it,
12 it can allow some -- allow a company, a poor
13 performer, a bad actor, those that we
14 typically have to investigate, to fulfill the
15 requirements on paper and yet perform safety
16 management systems activities in a less-than-
17 stellar or inadequate manner.

18 And when comparing that language in
19 SEMS to regulatory regulations in other
20 offshore regions, we can see distinct
21 differences in the requirements put forward on
22 the -- those creating the risk. And because

1 of that, we wanted to -- safety management
2 systems, it's in a safety -- excuse me, safety
3 critical elements is a safety management
4 system in and of itself. And it requires a
5 distinct and explicit requirement in the
6 regulations.

7 DR. MULCAHY: I think I would add
8 to that, too -- and this is Mary Beth speaking
9 -- we know already that BSEE has implemented
10 regulations to have third parties look at the
11 BOPs. But the BOP may not be the cause of the
12 next major accident event in the offshore
13 drilling industry.

14 So we know that there are other
15 systems, the fire suppression systems,
16 diverter systems, that are not receiving the
17 same attention or not given the same attention
18 by the regulations, whereas the approach that
19 we recommend would require it for all safety
20 critical elements.

21 MR. HOLMSTROM: One additional
22 point, Board Member Griffon, I would raise is

1 that in SEMS, I'll use the example of the
2 hazard analysis. When we say it's more
3 activity-based than goal-setting, typically in
4 a goal-setting regime you have a goal to, you
5 know, prevent accidents or the goal to control
6 hazards. And in the SEMS element on hazard
7 analysis criteria, 1911, it talks about
8 managing hazard versus an activity.

9 This is different than the language
10 used for example in the process safety
11 management standard, which we also believe
12 lacks a specific risk target. But the PSM
13 standard, which applies to onshore process
14 facilities, like refineries and chemical
15 plants, requires the control of hazards.

16 So SEMS, on the other hand, only
17 talks about manage them, which is an activity
18 and is not a goal-based approach.

19 The other thing on recommendations
20 relative to hazard analysis that talks about
21 resolving recommendations, it doesn't
22 establish a goal to resolve recommendations to

1 ensure the prevention of incidents, et cetera.
2 It just talks about resolving recommendations.

3 As we all know, those of us that
4 have participated in hazard analysis, like Haz
5 Ops, often you resolve a recommendation by not
6 addressing it or deciding not to take the
7 action that is recommended by the Haz Op team.
8 That is often -- or can be, you know, an
9 acceptable approach. So using the word
10 "resolve" doesn't -- is not goal-based. It's
11 activity-based. And so we have a specific
12 problem with that, because this is intended to
13 be goal-based, goal-setting-based regulatory
14 activity, but the language used is not goal-
15 setting.

16 MR. GRIFFON: Thank you. I'll turn
17 it back to the Chair.

18 CHAIRPERSON MOURE-ERASO: Okay.
19 Thank you, Mr. Griffon.

20 I only have one question that I
21 direct to anybody on the panel, the
22 investigative panel. The recommendations that

1 were made are basically to Department of
2 Interior, to BSEE, to ask BSEE to require
3 offshore operators to manage all safety
4 critical elements requiring improvements or
5 current practices, I could presume.

6 After you were able to conduct your
7 investigation and evaluate other regimes in
8 other countries, and look at what has been
9 done in the United States, in your opinion, do
10 you think that the U.S. offshore operations
11 have the capabilities to implement the
12 improvements that are being recommended?

13 MS. MacKENZIE: Yes. You know, as
14 I had said in the presentation, I think that
15 we can all agree that great change has
16 happened offshore since Macondo. A number of
17 new regulation standards, good practice
18 guidance, have resulted, and that is
19 definitely taking us many strides forward in
20 advances in safety.

21 After SEMS came out, SEMS II came
22 out, which were amendments that further

1 strengthened SEMS, and that is why in R1 we
2 make the recommendation to BSEE to amend SEMS,
3 because we feel that this is a way that they
4 can add on to the great start with SEMS, and
5 include a safety critical element management
6 system requirement to ensure that these
7 important elements are managed effectively
8 offshore.

9 CHAIRPERSON MOURE-ERASO: All
10 right. We are doing very well with time. So
11 I think before we enter into the next item of
12 the agenda, the public comments, I am going to
13 take a --

14 (Brief break)

15 CHAIRPERSON MOURE-ERASO: We
16 continue with the program.

17 Before, I would like observe that
18 here on the table in front of the table of the
19 panel we have some examples of solenoids and
20 part of the equipment that we are talking
21 about in the report, if somebody would like to
22 physically examine them.

1 On the agenda, we have this part
2 reserved for public comments. I would like
3 very much to keep the length of the comments
4 to three minutes. There is a lot of people
5 that are on the list that would like to talk,
6 and any extension over three minutes that you
7 are doing, you are taking away from the time
8 of other people, and that we want to keep the
9 proceedings fair.

10 I am going to ask Mr. Richard Loeb,
11 the CSB General Counsel, to lead this part of
12 the public comments. So, Mr. Loeb.

13 MR. LOEB: Thank you, Mr. Chairman.
14 Normally, Daniel Horowitz, our Managing
15 Director, takes this role, so forgive me if I
16 have not been practiced and schooled the way
17 that he has, but I will do my best. But I am
18 learning that the toughest part of this, just
19 reading the list, is some of you, or I guess
20 maybe all of you, should have become
21 physicians, because it's like reading a
22 prescription. I can't quite get it, but I

1 will do my best.

2 If I mispronounce your name or your
3 affiliation, I would ask that all of you when
4 you come up to the microphone, which is up at
5 the front towards the panelists, that you
6 state your name and spell your last name, and
7 state your affiliation, because this meeting
8 is being transcribed.

9 So the first speaker is Holly
10 Hopkins from the American Petroleum Institute.

11 MS. HOPKINS: Hi. Good evening. In
12 the interest of time, I'm just going to read
13 a shortened statement. But if I can submit
14 the whole statement for the record, that would
15 be appreciated.

16 Good evening. My name is Holly
17 Hopkins, and I'm a Senior Policy Advisor in
18 Upstream and Industry Operations at the
19 American Petroleum Institute. API appreciates
20 the opportunity to provide verbal comments at
21 the U.S. Chemical Safety and Hazard
22 Investigation Board's public meeting on the

1 first two volumes of the CSB report on the
2 April 2010 Macondo incident.

3 API represents more than 600
4 companies involved in all aspects of the oil
5 and natural gas industry, including
6 exploration and production, refining,
7 marketing, pipeline, and marine transporters,
8 as well as service and supply companies that
9 support all segments of the industry.

10 API and our members are
11 significantly affected by the efforts of the
12 CSB and are highly -- and are regularly called
13 upon to respond to and implement the CSB
14 recommendations.

15 The oil and natural gas industry is
16 committed to operating in a safe and
17 responsible manner while minimizing our impact
18 on the environment. Protecting the health and
19 safety of our workers, our contractors, and
20 our neighbors is a more imperative and a core
21 value for our industry.

22 No incident is acceptable. Our

1 industry takes every incident seriously.
2 Continued vigilance is essential in helping to
3 prevent future incidents. We agree with Board
4 Member Griffon's comments on the review
5 process and the inadequate time given to
6 review the report and provide comments. While
7 API has not had the opportunity to fully
8 review Volumes 1 and 2 of this report, or its
9 proposed recommendations, we do have the
10 following general comments.

11 The CSB analysis in Volume 2 is
12 focused solely on the BOP, but fails to
13 acknowledge the entire system and the systems-
14 based approach that is essential for sale
15 operations. Despite the focus on the BOP and
16 its technical detail, the report draws
17 conclusions and recommendations related to the
18 entire offshore operating system without
19 presenting a legitimate analysis.

20 The significant safety strides that
21 are directly related to implementation of a
22 systems-based approach must be referenced in

1 the report if the report is going to draw
2 conclusions and make recommendations beyond
3 the BOP failure analysis technical findings.

4 API requests the opportunity to
5 submit documents that describe the tremendous
6 progress made by the industry on offshore
7 safety and specifically on progress made on
8 systems-based approach to the CSB.

9 Additionally, there are many
10 comments throughout Volume 2 that compare the
11 U.S. and European regulatory approaches. As
12 API has stated in prior public comments,
13 industry is fully committed to safe
14 operations, both onshore and offshore. This
15 is particularly evident in the standards and
16 programs developed by the industry,
17 specifically Recommended Practice 75 on SEMS
18 and the SEMS resources and initiatives of the
19 Center for Offshore Safety.

20 The U.S. requires SEMS for offshore
21 operations, and the program includes third-
22 party audits. Nothing has been presented by

1 the CSB to support a sudden shift to the
2 safety case regime. In other words, the CSB
3 has not demonstrated how a safety case regime
4 will result in a higher level of safety and
5 actual operations over a fully functional and
6 properly managed safety environmental
7 management system, such as described in API
8 Recommended Practice 75.

9 Additionally, all the specific
10 terms and concepts mentioned in the CSB
11 recommendation are included in the SEMS, and
12 were in fact commonly in practice before the
13 SEM regulatory requirement.

14 In the four years since the Macondo
15 incident, and CSB began its investigation, the
16 oil and natural gas industry has methodically
17 examined every aspect of offshore safety
18 measures and operations to identify potential
19 improvements in spill prevention,
20 intervention, safety management, and response
21 capabilities.

22 The process started immediately

1 after the 2010 spill when industry, in
2 cooperation with federal regulators, launched
3 a systematic and comprehensive review. We
4 convened four joint industry task forces to
5 scrutinize all facets of the offshore drilling
6 process, from equipment and operating
7 procedures to subsidy well control and oil
8 spill response.

9 Working with the U.S. Department of
10 Interior, as well as the Presidential Oil
11 Spill Commission, industry experts developed
12 new recommendations and standards that guide
13 operations in both deep and shallow water
14 exploration.

15 Drawing on lessons learned from
16 Macondo, we revised existing standards and
17 created several new ones, including standards
18 dealing with well design, cementing, blot
19 prevention, subsidy equipment for capping
20 wells, and protection for oil spill response
21 workers.

22 One of the first recommendations

1 implemented was boosting rapid subsidy
2 response capability for well containment.
3 Thanks to the establishment in 2010 of new
4 collaborative containment companies, state-of-
5 the-art containment technology can be deployed
6 quickly in the event of a spill.

7 The Center for Offshore Safety was
8 created in 2011 to promote the highest level
9 of safety for offshore drilling completions
10 and operations, fully dedicated to safety
11 management and safety culture, as recommended
12 in the Presidential Commission Report.

13 The Center works with the
14 independent third party auditors and
15 government regulators to reinforce the
16 industry safety culture, support good, safety
17 management audit tools and audit practices,
18 and ensure good operational safety practices
19 are communicated throughout the industry.

20 The Bureau of Safety and
21 Environmental Enforcement has already adopted
22 three of the Center's guidelines in its own

1 regulations. The Safety Bureau is one of the
2 three new agencies formed from the
3 reorganization of the federal former Minerals
4 Management Service in response to Macondo, and
5 in recent congressional testimony the Safety
6 Bureau's Director, Brian Salerno, stated that
7 25 of the 33 BP Deepwater Horizon Commission
8 recommendations have been addressed or are
9 being addressed through ongoing initiatives
10 including rulemakings.

11 Offshore development is an
12 important element in realizing our full
13 potential as an energy superpower. Even one
14 incident is too many, and the oil and gas --
15 natural gas industry has dedicated the past
16 four years to using the lessons learned from
17 Macondo to enhance safety and operational
18 practices.

19 To quote the co-chairs of the
20 Presidential Oil Spill Commission, offshore
21 drilling is safer than it was four years ago,
22 because industry and the government are

1 working together to improve spill prevention
2 and response, implementing new rules, and
3 fostering a strong culture of safety within
4 the industry.

5 In closing, any incident is both
6 one too many and a powerful incident for API
7 and industry to improve training, operating
8 procedures, technology, and industry
9 standards. Our thoughts will always remain
10 with the families of all those who lost their
11 lives in this tragic incident, and we stand
12 ready to continue to work with government
13 regulators to improve safety.

14 Thank you.

15 MR. LOEB: Thank you, Ms. Hopkins.

16 Our next speaker is Charlie
17 Williams, and could you state your affiliation
18 when you're up at the mike.

19 MR. WILLIAMS: So I'm going to do
20 an abbreviated version as well. So good
21 evening. My name is Charlie Williams. I'm
22 Executive Director for the Center for Offshore

1 Safety. COS appreciates the opportunity to
2 provide verbal comments to the U.S. Chemical
3 Safety Enhancement and Investigation Board's
4 public meeting on the first two volumes of the
5 CSB report on the April 20, 2010, Macondo
6 incident.

7 No incident is acceptable. Our
8 industry takes every incident seriously.
9 Continued vigilance is essential to helping
10 prevent future incidents. The COS was
11 established by the industry to ensure that our
12 commitment to improvement continues and that
13 there is a single group singularly focused on
14 SEMS, and that there is a group that is
15 responsive to the Presidential Commission's
16 recommendations on safety and safety culture.

17 The industry is committed to
18 ensuring that SEMS is a continuous learning
19 and enhancement process. Thus, a key mission
20 of the COS is enabling the sharing of industry
21 knowledge of SEMS and safety. These learnings
22 will be based on SEMS audits, safety

1 performance indicators, and learning from
2 incidence data that includes near misses. The
3 SEMS audits are done by independent third
4 party auditors.

5 While COS has not had an
6 opportunity to fully review Volumes 1 and 2 of
7 the report, or its proposed recommendations,
8 we do have the following general comments.
9 The CSB analysis in Volume 2 is focused on the
10 BOP and, in particular, the technical aspects
11 of the BOPs. Yet well control in particular,
12 and safe operations in general, or an entire
13 system of technology, people, and processes,
14 and, thus, a systems-based approach is
15 essential for safe operations.

16 The focus could not be just on the
17 equipment. The report itself notes that many
18 safety systems processes were done at Macondo,
19 like hazard analysis, barrier analysis, and
20 management of change. Thus, the report should
21 do more to analyze these safety management
22 processes and make recommendations on how they

1 could be enhanced and made more effective.

2 Yet the majority of the report is
3 on the technical details of a single piece of
4 equipment. Significant strides in safety are
5 directly related to implementation of systems-
6 based approaches, SEMS, and operationalizing
7 these systems in the field. There is no
8 discussion or recognition of the significant
9 SEMS enhancements in work by the industry, the
10 regulator, and the industry organization. COS
11 requests the opportunity to submit documents
12 to CSB that describe the COS SEMS progress
13 made by the industry regarding offshore
14 safety.

15 SEMS II is a regulatory
16 requirement. COS documents in API-RP 75 are
17 referenced in the regulations. And audits and
18 reporting on SEMS is required. The CSB
19 recommends a sudden shift away from SEMS
20 without clear explanation and analysis of why
21 or how another system will be more effective.
22 We believe that all the ideas, concepts,

1 practices, and benefits of other forms of
2 safety management currently exist in SEMS and
3 the regulation.

4 SEMS and SEMS-A is being
5 implemented and enhanced offshore, has
6 benefits of being an active learning and
7 feedback safety management system with a focus
8 on being fully operationalized and
9 continuously benefiting the work and staff in
10 the field.

11 Additionally, SEMS has the benefits
12 of focusing on managing barriers, taking a
13 systematic approach to all parts of offshore
14 safety, and active monitoring. SEMS also has
15 both internal auditing and auditing and
16 verification required by regulation and done
17 by third parties. Significantly SEMS focuses
18 on the importance of leadership and the
19 interaction of leadership with staff to
20 deliver the safety culture we want.

21 We feel that the efforts going
22 forward should be put into continuous learning

1 and enhancement of SEMS. We feel that an
2 important contribution of the CSB report will
3 be the analysis and recommendations on how
4 SEMS and SEMS processes that have been and are
5 in place can be more effective.

6 In closing, any incident one -- any
7 incident is both one too many and a powerful
8 incentive for COS and the industry to improve
9 SEMS and learning processes, skills and
10 knowledge, operating procedures and standards,
11 and the effectiveness and measures and audits.

12 Our thoughts will always remain
13 with the families and all of those who lost
14 their lives in this tragic accident, and we
15 stand ready to continue to work with the
16 government regulators to improve safety.

17 Thank you.

18 MR. LOEB: Thank you for your
19 comments, Mr. Williams.

20 Our next speaker is Mr. Kenneth
21 Arnold of the Society of Petroleum Engineers.

22 MR. ARNOLD: Hello. My name is

1 Kenneth Arnold. That's A-R-N-O-L-D. I'm
2 representing the Society of Petroleum
3 Engineers, and I was also one of the three
4 reviewers who submitted our peer review of the
5 report last Tuesday, which I suspect didn't
6 make it into the final version, but I just got
7 the final version and I haven't seen how you
8 address the comments.

9 The CSB asked the Society of
10 Petroleum Engineers to do a peer review on the
11 May 5th draft. As you may know, SPE is not an
12 advocacy organization, but is a professional
13 society of individual engineers and
14 scientists. Our mission is to provide
15 networking and knowledge-sharing opportunities
16 for our global membership, and we represent
17 ourselves and not our individual companies.

18 We commend the CSB for completing
19 such a comprehensive review of this tragic
20 incident, and share your hope that the
21 learnings can be adopted by operators,
22 drilling companies, and service companies in

1 the future, to prevent recurrence. We were
2 able to send the draft to three SPE members
3 who are recognized experts in the field for
4 their review, but we could not perform a full
5 SPE Board-approved peer review in the one week
6 that was allotted to us.

7 On May 27th, SPE submitted the
8 comments from the independent reviewers
9 dealing what these three individuals thought
10 were serious problems with these volumes.
11 Some common themes in the feedback emerged.

12 First, the team believed that the
13 CSB has done a good job at explaining the
14 technical issues of the solenoids and the
15 buckling of the drill pipe that has not been
16 adequately addressed in the past.

17 Two, there are many comments in the
18 volumes that compare the U.S. and European
19 regulatory frameworks that the team believed
20 warrant more evaluation and examples to prove
21 the contention that a redirection of the U.S.
22 regulatory framework to require identification

1 specifically of SCEs and MAEs and verbiage to
2 prove a LARP will result in a higher level of
3 safety in actual operations.

4 The individual reviewers did not
5 think this point was valid at all. The full
6 comments include specific examples of where
7 the report has failed to prove this point in
8 Volumes 1 and 2.

9 The team believed that there are
10 some important items and assumptions that may
11 be technically incorrect, and that the CSB
12 should consider these before publishing the
13 final report. Specifics of these items are
14 included in the full comments which we
15 submitted to you on May 27th.

16 The team acknowledges that some,
17 but certainly not all, of the comments
18 resulting from this initial review may be
19 addressed in Volumes 3 and 4. For this
20 reason, we feel that the volumes are so
21 interrelated that all four volumes are
22 required to paint the full picture.

1 It is possible that releasing the
2 Executive Summary and Volumes 1 and 2, before
3 releasing Volumes 3 and 4, would provide an
4 incomplete analysis that could lead to
5 inadequate and misguided actions.

6 Also, during the completion of
7 Volumes 3 and 4, it will probably be found
8 necessary to make revisions to Volumes 1 and
9 2 because of the interrelated nature.

10 In summary, SPE, as a technical
11 organization, believes these volumes of the
12 report should not be approved by the Board
13 until the questions raised by our reviewers
14 and others have been properly vetted and the
15 remaining volumes of the report are written,
16 reviewed, and vetted as well.

17 Thank you very much.

18 MR. LOEB: Thank you, Mr. Arnold.

19 The next speaker -- and thank you
20 so much for spelling your name and restating
21 your organizational affiliation -- is Rudolfo
22 Maya from Dupont.

1 MR. MAYA: No comment.

2 MR. LOEB: Oh. No comment? Okay?

3 Well, going down the list, it's Lillian
4 Espinosa, yes, of Deepwater Horizon Study
5 Group. But I may have misstated that, so
6 please when you reach the mike let us all
7 know.

8 MS. ESPINOSA: Yes. I had the
9 honor and privilege of being a member of the
10 Deepwater Horizon Study Group. And we
11 actually had some of the survivors in the
12 early hours long before the NBI inquiry.

13 So today I will probably come -- I
14 thought I was coming, you know, just to see
15 about Volume 1 or 2, but I realize now I am
16 here as much for the survivors, some of whom
17 thought about talking to CSB, but not sure
18 that they can trust it.

19 The manslaughter trial, the hearing
20 is July 9th, so, you know, this thing is not
21 over. One of my questions -- did you all go
22 over any of the evidence from Phase 1 and 2

1 from the civil trial? Cheryl, did you use any
2 evidence from Phase 1 and 2?

3 MS. MacKENZIE: Yes. Yes, yes.

4 MS. ESPINOSA: You know, my heart
5 says that maybe Ken Arnold is right. It would
6 be better to issue all four volumes. Like
7 trust is a really important thing.

8 And also, you know, I thought you
9 all were going to really focus on the human
10 factor. And I know this is just a technical
11 safety critical equipment, but I think it
12 would be such a greater impact if you issued
13 all four volumes.

14 MR. LOEB: Thank you very much, Ms.
15 Espinosa.

16 Our next speaker is Jacqueline
17 Weaver of the University of Houston Law
18 School.

19 MS. WEAVER: I thought that was
20 just a sign-in sheet.

21 MR. LOEB: Oh, well, yet another
22 one.

1 MS. WEAVER: (Inaudible)

2 MR. LOEB: Well, I don't know if
3 that was picked up, but the next speaker I
4 think is Darryl -- is it Fett of Total?

5 MR. FETT: Yeah. I started as one
6 that also thought it was a sign-up list, but
7 I greatly appreciate the opportunity to talk
8 to you guys, because -- well, first of all,
9 let me introduce myself. I'm Darryl Fett.
10 I'm with Total E&P USA.

11 About 25 years in the industry, and
12 I work in drilling and completions as senior
13 drilling and wells advisor. But a lot of my
14 background is fluids and cementing.

15 And just a disclaimer, I am
16 speaking on behalf of myself and my own
17 personal thoughts and opinions and not those
18 of my company.

19 I'd like to focus a bit -- there
20 was quite a lot of discussion in the report
21 and today about the last line of defense, but
22 I want to speak briefly on what should have

1 been and was designed to be the first line of
2 defense, and that's the cement job.

3 In the report, I want to refer to
4 page -- just for your records, to page 23,
5 where it defines the cement at the -- in the
6 annulus and the cement at the bottom of the
7 casing. In the presentation, it was also
8 referred to as sort of independent things --
9 cemented annulus as being one barrier, cement
10 at the bottom of the casing being another.

11 You specifically refer to it as the
12 shoe track. And just a bit of education
13 because this isn't the first report that has
14 referred to the shoe track cement as the
15 barrier that failed. It was not. The barrier
16 that failed was the primary cement, and they
17 are not two distinct systems anyway. It is
18 all pumped as one slurry, and it's referred to
19 the primary cement job.

20 The purpose of the shoe track
21 cement is not necessarily to prevent the flow
22 of anything into the well bore. The purpose

1 of the shoe track is it's a container that
2 captures contaminated cement from wiping the
3 casing with mud. So by design, it is supposed
4 to have contaminated -- be contaminated with
5 mud.

6 Therefore, it shouldn't be expected
7 to contain flow inside the casing. What it is
8 designed for is so that competent cement can
9 be in the annulus and prevent the flow of
10 hydrocarbons into the annulus in either
11 direction, up or down, depending on where the
12 flow path of the load may be. Hopefully, it
13 doesn't go anywhere, but there has been a lot
14 of reference to the failure of the shoe track
15 cement, and I'd really like to correct that in
16 future references to the failures of the
17 barriers.

18 One more thing. In your list on
19 page 18 of barriers, as well as the
20 presentation slide, you refer to all of the
21 types of barriers that we use, but there is
22 one -- there is two distinctions that I want

1 to make. You said cement placed at the bottom
2 of the well to seal a hydrocarbon-bearing
3 zone. Again, in context, I take that to mean
4 that you are talking about the shoe track
5 cement.

6 It is not placed there separately
7 than the primary job. If it's not, if you're
8 talking about a cement plug, which is a
9 separate operation, that is the type of
10 barrier that we place there inside the well
11 bore separately than the primary cement job.

12 There is also a key omission here.
13 There is a mechanical barrier, either bridge
14 plug, cement retainer, or there are several
15 names for them, but essentially they are steel
16 or composite material that is placed in the
17 well bore to act as another barrier.

18 And I have to comment the drilling
19 safety rule, there was one of the -- in my
20 opinion, one of the best new regulations is
21 that we have to place a mechanical barrier,
22 another mechanical barrier above what is

1 called our blow collar or our top plug in our
2 final casing string.

3 Just for the reason that I'm
4 talking about, is that that system that is
5 inside the casing at the end of a cement job
6 is never intended to prevent flow of
7 hydrocarbons. We normally drill it out
8 anyway. So in the final casing string you
9 have to put another mechanical barrier before
10 you put any negative load on it, and that's
11 why we do it, because it's another system.

12 So I would suggest maybe putting
13 cement plugs as another type of barrier that
14 we use.

15 Thank you.

16 MR. LOEB: Thank you. Thank you
17 very much, Mr. Fett.

18 Our next speaker is Ted Wilkerson.

19 MR. WILKERSON: No comment.

20 MR. LOEB: Oh, okay. We are going
21 through the list really quickly.

22 Dr. Malcolm Sharples of the

1 Offshore Risk and Technologies.

2 DR. SHARPLES: I, too, thought it
3 was a sign-up sheet. But given the
4 opportunity, I would like to compliment you on
5 this new piece of technical evidence that you
6 have brought to light. Very, very helpful.

7 I would also like to say I do agree
8 with some of the other speakers in that I
9 think this is a bigger issue, particularly the
10 issue of safety culture, which doesn't seem to
11 be addressed. And on the -- and in regard to
12 that, particularly the area of sort of social
13 psychology to group-think, and, you know, when
14 one keeps seeing recommendations to doing
15 HAZIDs (phonetic), a lot of the -- whether a
16 HAZID is good or not depends upon the people
17 that are there and their experience.

18 And quite often you end up with
19 HAZIDs being conducted on the basis that
20 people are in the room, but those people don't
21 necessarily have the depth of knowledge,
22 particularly of the incidence and accidents.

1 And I think that's an important area to do
2 something about.

3 I was curious why you just focused
4 on the BOP instead of things like the float
5 equipment, which also may have failed.
6 Perhaps that would have been a good thing to
7 look at, and perhaps no one seems much to have
8 focused on the regulation, which requires that
9 you -- you know, you have to pump something
10 down the well, like the lost circulation pill,
11 before you pump it overboard, which, as I
12 understand it, was one of the things that
13 blocked the kill line.

14 Nobody has talked much about that,
15 and whether repealing that requirement might
16 be a benefit in the future.

17 Thank you.

18 MR. LOEB: Thank you very much, Dr.
19 Sharples.

20 Our next speaker is John Morawetz
21 of the International Chemical Workers Union.
22 Welcome back, Mr. Morawetz.

1 MR. MORAWETZ: Always a pleasure.
2 Well, one, it is always a pleasure, and it's
3 always interesting to hear the reports from
4 various investigators or supervisors and the
5 Board. These are very serious incidents, and
6 the ones that you have tackled here has not
7 just an occupational angle, not just an angle
8 for a small town, but nationwide and worldwide
9 significance given the scale of the
10 environmental damage in the release of the oil
11 over such a large area over such a long period
12 of time.

13 I don't rise to speak to say that
14 I know much about this particular report or
15 the industry technically. I think it would be
16 just inappropriate for me to say that. But,
17 clearly, it was very interesting, I think this
18 is a public meeting for the laypeople to see
19 this report, to see that it's not quite so
20 simple. It's not just one thing that fails,
21 and it was educational to see the questions of
22 the solenoid failure, the battery, the

1 interactions, and I think that regardless of
2 the integral findings, seeing where things can
3 be put in place thoughtfully, that would
4 prevent these type of events from occurring,
5 I think is very important.

6 For instance, I am quite amazed
7 that -- if I got this right, that there is no
8 procedures for testing the batteries that are
9 placed 5,000 feet under the water, operate at
10 46 degrees Fahrenheit. I just find it
11 dumbfounding. I mean, you can set up a system
12 to see if it works, but that you don't say --
13 in that kind of situation that you don't test
14 it beforehand I find very strange.

15 And just another comment that what
16 we're doing here is trying to prevent a
17 similar thing from happening. I don't think
18 the Board is mandated to, nor should it, try
19 to pass judgment on a whole industry. And I
20 don't take your comments that you are doing
21 that. You are looking at a particular event,
22 trying to examine it, find the root causes,

1 and find recommendations.

2 I am a little bit troubled and torn
3 as to what to do in a report that I don't
4 think you have ever done before of two reports
5 and two more coming. I would just suggest
6 that there are a couple of ways to deal with
7 that. You could provisionally accept it
8 pending thoughtfulness on the part of the
9 Board and the staff to examine the comments
10 here today, and the written comments you
11 received. Or you could accept it and just
12 make changes later. It is a difficult
13 question given that there could be
14 interrelations between them.

15 But, anyway, thank you very much
16 for the presentations.

17 MR. LOEB: Thank you very much, Mr.
18 Morawetz.

19 We have one more in-person speaker.
20 I apologize. I just can't read your -- your
21 handwriting. From Transocean is all I can
22 read. Someone from Transocean? Okay. Well,

1 that may -- oh, I was about to go on to people
2 who may wish to speak who are not on the
3 speakers list. You are welcome to speak now,
4 subject to the --

5 MR. DAVIDSON: (Inaudible)

6 MR. LOEB: Yes, if you could, so we
7 could all hear you -- at the microphone, and
8 if you can spell your name, your last name
9 especially, and your affiliation, if you have
10 one.

11 MR. DAVIDSON: My name is Michael
12 Davidson. That's got to be the easiest name
13 in the world. And I work for Drill Science,
14 and I'm a petroleum engineer, and I want to
15 applaud you all for hiring Stan, he -- and
16 your report.

17 I think the determination of the
18 buckling is a very simple root cause. And
19 determining that -- identifying a safety
20 critical element I think is key as well. And
21 with that in mind, the BSEE put in the 30 --
22 in their final ruling in the 30 CFR 250 a

1 requirement for the very negative pressure
2 test that causes -- which it wasn't actually
3 required -- you can correct me if I'm wrong --
4 before. Now it is, but the safety critical
5 element that caused all this is not required.

6 So we are now required to do
7 something without the safety critical element,
8 so you nailed that one on the head. What I'm
9 referring to is the safety critical element
10 that would have prevented the buckling, and
11 also its absence would have prevented killing
12 the well even if the BOP had functioned. And
13 that is that the drill string, the depth
14 between the deepest untested barrier and the
15 drill string that would have killed the well
16 has to be minimized.

17 It was three miles above the
18 deepest untested barrier at the time of the
19 test. That is your safety critical element,
20 and I think I would encourage you to point
21 that out to the BSEE. And I'm a proponent of
22 the safety case. I think the safety case needs

1 to be tied to hazard levels and the safety
2 critical element that you brought. I never
3 even thought of that, but I think that's the
4 correct way to approach the safety case would
5 be hazard levels at different operational --
6 on the timeline.

7 And I think you briefly touched on
8 the fact that some of the operations need to
9 be certified or signed off on, and I think the
10 engineer that designed the negative pressure
11 test on the very next well needs to sign off
12 on it. And that's it.

13 MR. LOEB: Thank you, Mr. Davidson.

14 Is there anyone else in the
15 audience who has not made a comment who would
16 like to make a comment? In that case, I would
17 -- oh, we've got at least one more. We've got
18 at least one more. No, no, that's one of our
19 staff.

20 (Laughter)

21 Even with these bright lights, I
22 recognize them.

1 MR. GALLANDER: I'm going to be
2 like Van Morrison. He always starts his
3 concert off with his back to the group. Okay?
4 So my name is Frank Gallander. As of 4:00
5 this afternoon, I am a private citizen. Okay?

6 Now, I've got specific questions in
7 regard to the report that I'm going to go down
8 the line and ask these ladies and gentlemen
9 specifically for answers. And this has to do
10 with your report.

11 So I would like to go with the
12 easies first, and I will start off with Ms.
13 MacKenzie. You mentioned the pod, the
14 temperature outside the pod, was 36 degrees.
15 Do we know for a fact the temperature inside
16 the pod?

17 DR. MULCAHY: No, we don't, but we
18 can surmise. We have some evidence that has
19 come out of people discussing what they
20 thought the temperatures were, and we --

21 MR. GALLANDER: Based on?

22 DR. MULCAHY: Based on readings of

1 some vessel temperatures that were taken at
2 another time, and also based on somebody's
3 experience.

4 MR. GALLANDER: Okay. Because
5 sometimes the temperature inside gets warmer
6 because of the electronics and everything that
7 is involved.

8 DR. MULCAHY: Certainly.

9 MR. GALLANDER: So the 36 degrees,
10 the barrier life, and all this stuff, comes
11 into question, right?

12 DR. MULCAHY: Well, and point that
13 we -- I don't actually --

14 MR. GALLANDER: I think that's a
15 yes or no. Yes? No?

16 MR. LOEB: Excuse me.

17 MR. GALLANDER: The question --

18 MR. LOEB: Excuse me. I want to --
19 you are -- feel free to ask the staff
20 questions. This is not an interrogation of
21 the staff, however.

22 MR. GALLANDER: Oh, I'm --

1 MR. LOEB: Okay.

2 DR. MULCAHY: Well, it's -- I want
3 to be careful about just saying yes or no, and
4 there's a reason why.

5 MR. GALLANDER: Okay.

6 DR. MULCAHY: The pod operated at
7 -- it is going to -- the electronics will give
8 off heat, and the temperature will rise. The
9 environment of the actual battery is not 36
10 degrees or close -- you know, at freezing.
11 But there is a thermal difference, and the
12 ocean is a large heat sink. So it's also not
13 going to be warm at the surface at a 70-degree
14 Fahrenheit ambient temperature. It will be
15 warmer on the surface than it will be at the
16 -- on the sea floor.

17 MR. GALLANDER: Right. And that's
18 what I was going for.

19 DR. MULCAHY: Yeah.

20 MR. GALLANDER: But, you know, the
21 assumptions in the report was basically it was
22 36 degrees inside the pod where the batteries

1 were located.

2 DR. MULCAHY: That's actually not
3 correct. The assumption was not that it was
4 36 degrees inside the pod. On the outside of
5 the pod, it was 36 degrees. The full
6 technical analysis in the appendix is very
7 clear about that.

8 MR. GALLANDER: Okay. Well, I
9 haven't seen the appendix.

10 DR. MULCAHY: It addresses it in a
11 footnote. I can point it out to you before
12 you leave if you're interested.

13 MR. GALLANDER: Okay. Well, that
14 would be fine. I will go to the next question
15 to Dr. Mulcahy. Is that right?

16 MS. MacKENZIE: This is --

17 DR. MULCAHY: I'm Mary Beth
18 Mulcahy.

19 MR. GALLANDER: Oh, sorry. Okay.
20 Okay. I'll stay with you, then. So I'm going
21 to go through, and you mentioned Auto-
22 Shear/Deadman's, and AMF, and all this. So

1 there are three different systems out there.
2 There's the AMF, there's the Deadman/Auto-
3 Shear, referred to as the DMAS, and there is
4 the EHBU.

5 Each one of these are supplied by
6 each of the different major manufacturers. So
7 of these, how many of these manufacturers
8 require battery operation similar to the
9 system that you are evaluating? How many of
10 these have a system that is similar in their
11 design that require the use of batteries to
12 operate?

13 PARTICIPANT: Are we talking about
14 Macondo or just --

15 DR. MULCAHY: Yeah. Are you
16 talking about worldwide, or are you --

17 MR. GALLANDER: I'm talking about
18 Macondo.

19 DR. MULCAHY: -- talking about --

20 MR. GALLANDER: This knocks on to
21 the -- goes back to the regulations that --
22 which I'm going to lead to next. And it's not

1 an interrogation. I'm just asking for
2 clarity, because --

3 CHAIRPERSON MOURE-ERASO: Three
4 minutes.

5 MR. GALLANDER: -- and the reason
6 I'm asking -- okay. The reason I'm asking the
7 question is because the recommendations out of
8 the group was to go to the regulations about
9 stricter testing and all of this other stuff.

10 When I looked at that, I assumed
11 that the drive was to get all of them to test
12 it the same way you could test this one, but
13 they're not all the same is what I'm trying to
14 say.

15 DR. MULCAHY: No. So I think that
16 would -- if that was the impression, I
17 apologize that's what you took it as. So this
18 is -- we have analyzed a Cameron BOP. Other
19 BOP manufacturer don't even use the same
20 solenoid --

21 MR. CHRISMAN: The Mark II
22 specifically.

1 DR. MULCAHY: Yeah, the Mark II
2 specifically. Thank you, Stan. Other BOP
3 manufacturers don't use the same redundant
4 solenoid design. For example, part about
5 doing a hazard risk assessment with a targeted
6 risk reduction in the way that we recommended
7 is that we don't believe all BOPs should be
8 treated the same.

9 I find one of the more interesting
10 conversations in the report is the question
11 of, should you have two blind shear rams, or
12 should you not? So we are saying that
13 sometimes we think it is the safest choice,
14 and sometimes the risk assessment might
15 determine that it's not the safest. No
16 regulation is a one size fits all.

17 There are prescriptive regulations
18 that everyone should follow, but the goal of
19 a risk-based regulation or performance-based
20 is that people choose what is the safest for
21 their environment. Not all wells have the
22 same characteristics. This is not a one size

1 fits all solution, and that's why we don't
2 recommend a one size fits all solution in our
3 recommendations.

4 We expect you and want you to do
5 the hazard analysis for your specific well,
6 your BOP, do you have the rechargeable
7 batteries, do you not? Do you contract out
8 your rebuilding of your solenoids, or do you
9 do it in-house? This is not a one size fits
10 all. This is every individual operation needs
11 to be assessed.

12 MR. GALLANDER: Well, then -- okay.
13 Then the recommendations for the regulators
14 and stuff may have to be revisited because the
15 implied verbiage implies they are all equal is
16 what I read. And that was my point.

17 DR. MULCAHY: Thank you.

18 MR. GALLANDER: Okay.

19 DR. MULCAHY: I can certainly look
20 at that.

21 MR. GALLANDER: And I noticed -- I
22 noticed the video that you all had there,

1 while we were trying to find the slideshow and
2 everything, and I know we've had discussions
3 about this, but the excessive compression
4 discussion, did we look at the -- when you
5 looked at the excessive compression -- and
6 this is all through the report, and it's a
7 very telling statement, but when you look at
8 the excessive compression, on the 6-5/8, 32-
9 pound, looking at the wall thickness, how much
10 pressure it would have taken to achieve the
11 amount of compression, differential, and you
12 do have pressure because the annular was
13 closed and the ram was closed.

14 DR. MULCAHY: Yep.

15 MR. GALLANDER: How much pressure
16 did it take to go inside the pipe to actually
17 get that deflection to go that far?

18 DR. MULCAHY: It was the pressure
19 that was measured on the drill pipe. So we
20 used real drill pipe data that was transmitted
21 from the Deepwater Horizon and collected
22 onshore. That was the basis of the modeling

1 that we did.

2 MR. GALLANDER: Okay. So when you
3 did the modeling, then, you could see in that
4 20-foot section between the annular and the
5 ram, where it was closed, that you would get
6 that much excursion from the center weld bore
7 all the way up against the --

8 DR. MULCAHY: Yeah. I'll let you
9 answer that one, Stan.

10 MR. CHRISMAN: Oh. How much
11 excursion, do you get?

12 MR. GALLANDER: Yeah. From
13 vertical all the way against the well bore
14 side. Was that included?

15 MR. CHRISMAN: I can -- I think I
16 can answer that.

17 MR. GALLANDER: What kind of
18 pressure are we looking at seeing?

19 MR. CHRISMAN: First, what was
20 actually found was that -- at Michoud there
21 was a measurement of the dimples and
22 impressions in the pipe, and that is

1 documented in the DNV report. And that the
2 drill pipe was actually about a half-inch from
3 the BOP wall when it got trapped. That's what
4 actually happened.

5 In the finite element modeling, we
6 then attempted to see if we could make the
7 calculations match what we saw in the
8 evidence, and that is the report. I'll refer
9 you to get the details in the report. But
10 that's where we discovered that if the upper
11 pipe ram had been closed, as many had
12 originally assumed, including myself, the
13 drill pipe would not have been where we found
14 it.

15 The finite element modeling
16 predicts the deflection, and it created a
17 match if you assumed that the upper pipe ram
18 was open and the middle one was closed. So
19 the FEFA modeling calculates the deflection,
20 and I refer you to the report to see all of
21 the engineering details.

22 MR. GALLANDER: So all of the --

1 what was the pressure of the requirement to
2 get it to move that far? I mean, did we have
3 --

4 MR. CHRISMAN: The pressure -- oh,
5 I see your question. The pressure requirement
6 --

7 MR. GALLANDER: Did it ever to get
8 that pressure --

9 MR. CHRISMAN: -- to start
10 buckling, it's documented in the report, is --
11 in the Macondo case it was about -- to buckle,
12 it was about 7,000 psi in the drill pipe, and
13 1,500 psi outside. And that's in the report
14 in one of the tables.

15 MR. GALLANDER: Okay.

16 MR. CHRISMAN: If I misquote by 500
17 off, the report is right.

18 MR. LOEB: (Inaudible) I think
19 that's more than twice what anyone else got,
20 so I'm not really sure if this -- this is a
21 public comment session.

22 MR. GALLANDER: Okay.

1 MR. LOEB: And, you know, we have
2 allowed you to ask questions of the staff,
3 which is a bit unusual.

4 MR. GALLANDER: That was good. No,
5 no, no. I thought it was good. It was great
6 to be able to have this discussion.

7 MR. LOEB: Okay. Then, I hope that
8 -- that at least satisfied you for now.

9 MR. GALLANDER: Thanks.

10 DR. MULCAHY: But please come talk
11 to us afterwards.

12 MR. LOEB: Thank you very much.

13 Our last speaker is one of our
14 staff members, Hillary Cohen, our Director of
15 the Public Affairs Department. And she wishes
16 to put in the record two statements, one from
17 Senator Edward Markey of Massachusetts, and
18 Congressman Henry Waxman of California.

19 So please go ahead, Ms. Cohen.

20 MS. COHEN: Okay. I'll be reading
21 Senator Markey's statement first.

22 "Blowup preventers should be fail-

1 safe, not destined to fail. This report is
2 another data point in a long history of
3 drilling safety failures that were discovered
4 following BP's oil spill. The report further
5 highlights that other blowout preventers
6 currently being used by the oil industry in
7 offshore drilling could have the same types of
8 deficiencies that led to the BP spill.

9 "If the oil industry ignores or
10 dismisses this report, they will be ignoring
11 these potential ticking time bombs and the
12 safety reforms that could prevent another
13 tragic incident. We need stronger safety
14 standards that build on the improvements
15 already undertaken by the Obama
16 administration, and we need an oil industry
17 that is willing to reform their ways before
18 history repeats itself."

19 And this is from Representative
20 Waxman.

21 "I applaud the Chemical Safety
22 Board's exhaustive technical review of how the

1 Deepwater Horizon blowout preventer failed to
2 stop the tragic chain of events that killed 11
3 workers and caused untold environmental harm
4 in the Gulf of Mexico.

5 "The CSB investigation uncovered
6 new evidence showing that buckling of the
7 drill pipe rendered the blowout preventer
8 inoperable just minutes into the accident --
9 a finding that has safety implications for the
10 proper functioning of blowout preventers still
11 in use around the world. I urge regulators
12 and the oil industry to review the CSB's
13 investigative findings and take appropriate
14 action to ensure the safety of offshore oil
15 and gas development."

16 MR. LOEB: Thank you, Ms. Cohen.
17 I might add both statements were in under
18 three minutes, so that's much appreciated.

19 With that, I turn it back to the
20 Chairman.

21 CHAIRPERSON MOURE-ERASO: Okay.
22 The next issue on the agenda is to take a

1 Board vote on the report. And I am going to
2 ask -- I am going to make a motion that is as
3 follows. I move that the Chemical Safety
4 Board approve Investigation Report Number 210-
5 I05, Volumes 1 and 2, entitled Explosion and
6 Fire at the Macondo Well at the Deepwater
7 Horizon rig in the Mississippi Canyon of the
8 Gulf of Mexico that occurred on April 2010,
9 including our findings, recommendations, and
10 associated products, like videos contained in
11 the June 5, 2014, report.

12 Is there a second for this motion?

13 MR. GRIFFON: I second the motion,
14 Mr. Chairman. I also would like to make a
15 comment before we go to vote.

16 CHAIRPERSON MOURE-ERASO: Okay.
17 Yeah. We are open for discussion. So, Mr.
18 Griffon.

19 MR. GRIFFON: Okay. And I just
20 want to say I plan on voting for the report,
21 because I see the primary recommendation to
22 BSEE as enhancing the SEMS system. I do,

1 however, urge the team in finalizing the
2 regulatory analysis in Volume 3 of our report
3 to examine how the differences in regulatory
4 approaches affect performance and practices on
5 offshore facilities around the world.

6 I urge them to look beyond the
7 regulatory language to actual implementation
8 experience.

9 I also share some of the concerns
10 expressed by the public in our public comment
11 session about the CSB addressing other non-
12 technical causes of the incident. Obviously,
13 we had to make a decision of how to release
14 the report, but I certainly agree that we need
15 to finalize Volume 4, which is where I think
16 we will address many of these factors as soon
17 as possible.

18 And that's all I have. Thank you,
19 Mr. Chairman.

20 CHAIRPERSON MOURE-ERASO: Thank
21 you. So I call the question.

22 PARTICIPANT: Okay. I will ask --

1 I will record the vote, then. Mr. Griffon?

2 MR. GRIFFON: Yes.

3 PARTICIPANT: Okay. Thank you.

4 Mr. Chairman?

5 CHAIRPERSON MOURE-ERASO: Yes.

6 PARTICIPANT: In that case, the
7 report has -- and the motion has passed
8 unanimously.

9 Thank you.

10 CHAIRPERSON MOURE-ERASO: Thank you
11 very much.

12 In closing, I would like to say
13 that the report that we have just voted to
14 approve is comprehensive and far-reaching. I
15 believe it's a road map to vastly improve
16 safety in the U.S. offshore drilling industry.

17 The report makes a number of
18 recommendations to the U.S. Department of
19 Interior and to BSEE, and our findings raise
20 several functionality issues related to the
21 blowout preventer. Likewise, the CSB is
22 making a recommendation to the American

1 Petroleum Institute to create and publish
2 guidance for industry to establish an
3 effective management system for safety
4 critical elements.

5 Drilling continues to extend to new
6 depths, and we will operate in increasingly
7 challenging environments. The CSB report and
8 its key findings and recommendations are
9 intended to put the United States in a leading
10 role for improving well-controlled procedures
11 and practices.

12 To maintain a leadership position,
13 the U.S. should adopt rigorous management
14 methods that go beyond current industry good
15 practices.

16 Thank you for attending this CSB
17 public meeting, and this meeting is adjourned.

18 (Whereupon, the above-entitled
19 matter went off the record.)

20
21
22

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C E R T I F I C A T E

MATTER: Macondo Well/Deepwater Horizon
Public Meeting

DATE: 06-05-14

I hereby certify that the attached transcription of pages 1 to 169 inclusive are to the best of my belief and ability a true, accurate, and complete record of the above referenced proceedings as contained on the provided audio recording.

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