

**Panel No. 3: What manufacturing, test, maintenance, and certification requirements should be established to ensure the operability and reliability of BOP equipment?**

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- *Tri Canh Le, Director of Mechanical Design and Subsea, Diamond Offshore Drilling*
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- *Jeff Sattler, Sr. Vice President Engineering, West Engineering*

This panel and going to address the life cycle of BOP's. The question for the panel is what manufacturing test, maintenance, and certification requirements should be established to ensure the reliability of BOP Equipment? The moderator Mr. Harish Patel is a manager for drilling and production for the *American Bureau of Shipping*. He is responsible for the validation of new technology and the development of requirements for the classification and certification of technology used in marine applications. He has 24 years of experience related to the design of a proven BOP used in the offshore industry. He has a master's in mechanical engineering from Stevens Institute of Technology.

Thank you, and good morning, everybody. We appreciate the opportunity to present our view. As we heard in the morning from Ken Salazar, there are major topics that we need to address, and one is how we will maintain. We listened to the design side in the previous panel. When you design something now, you have to manufacture and maintain and operate. We are going to talk about how we will manufacture and operate. This panel represents a wide number of speakers. We have API here which brings the codes and standards which will address how to maintain, inspect, and test. And then we have Western Union. You will be able to see their view. I was third introduced in the first speaker. Our first speaker is very known in the industry. Moving in drilling operations in various parts of the world. He has drilled the various deep water wells. He has been a member of the Board of Government and Center for the Office of Safety. The member of the board of directors for the conference. He is a member on the executive committee and board of directors. Please welcome Moe Plaisance for his presentation. [applause]

Hello. Contrary to popular opinion, I am not dead. I am here. I have not retired yet either. My presentation this morning is going to deal with the topic -- it is going to look a lot like the new s53 because that is where we got it from. We took part in the 53 rewrite group, and we are proud of the work that Frank and the rest of the team did. It is certainly a great start to where we need to be. Not knowing what we were going to see

here, I think it will look a lot like 53. We will talk about re-deployment, and testing, during well operations, inspection and maintenance, pre-deployment, and at a specific time frame, one to five years, and certification requirements. Let's talk about pre-deployment. Some of the older rigs are constrained by height, you cannot join the lower marine rising package and the lower BOP Package. You have to bring them under the seller debt, stack them under the road. We have been able to do some testing using inflatable packers and other things. These are things that we will have to define and test. As Dr. McCarthy was saying, we have done a lot on pressure testing. We have not looked at worst case scenarios. We have not looked at some of the other things that were mentioned today, but it is something we can work on. Capability of blind shear rams and operators for the plans to drill pipe. Suitability and shearer ability are extremely important to all of us and that is why we're here, to talk about it. We have to work with all the manufacturers to see where we can best meet the requirements as they come down the pike. I was under the first mandate to extend BOP testing from seven days, which was in place from the Santa Barbara issue, to 14 days. We looked at reliability; it was a pretty basic reliability issues. We got about 1000 BOP tests, and it may have painted a pretty picture but it did not stack up all hell broke loose. I think we can work together in meeting those requirements. We think BOP testing of 21 days and allowing exceptions to that because of issues in the well or on the rig, especially safety issues, and those would be handled by management of the change scenario. We think that is the way to go. We certainly do not want to test with a pipe in the hole. We sure do not want a fishing job. And you want to test the small spike to be used in the whole section. Of course, now with variable rams, one set of variables may cover three sets of pipes that we use. Inspection and maintenance, we believe 100% in the tenets that were put up in 53 about inspection and maintenance. What we want is to have the specifications of what we want to do and we want the "how" to be something that we can work out, as we talked about this morning. There is talk about BOP's having to go in, completely taking them apart, take them off the rig. Director Watson at OTC asked me a question and said, do the BOP's stay with the rig throughout its life? I said, yes, sir. They are like my grandfather and his axe. He has had this axe for 35 years, has changed the handle three times and the head twice. [laughter] takes a little while, it will sink in. We have planned maintenance schedules, we have replaceable wear pads, and we have done a lot of things that makes the difference. We still need the maintenance requirements. -- makes it easier. Taking a BOP down is labor-intensive; it has safety issues moving it, getting it into a shop. All the drivers that have to drive behind this heavy load, with the vehicle, and then we get it into the shop, and by that time if we have not wrecked a rain jacket or steal face, then you have weld repairs which we do have to put it in the oven, and there goes one life cycle from the thing. There are a lot of issues we need to look at. It is just not that easy to say, you take it in every time. What about failures in the mid? We have spare BOP's and other things that we can send out and basically we

have zeroed out that component. What I am saying is which was delineated earlier, tell us what you want and let us figure out how to do it. To me, that is the most important tenet that we will get out of this. Again, inspection and maintenance, one to five years? It should not be prescriptive to the nth degree that we're talking about it. Certification requirements. We have worked with the certification requirements with the initial drilling rule. We talked about the certification and verification issues that were put in to allow us to get by and through the moratorium. I do not think any of us here have any problem with meeting all of these requirements. I am sure my CEO would not have liked me to say that, but we do not. We can meet these requirements, we just need to be given time to do it, and we need to be given time to initiate. Chalk is a good friend of mine. He has an order book that is more than full. He will not take us down. I am sure you will take it, I'm sure, but we are trying to get this thing done. We have to remember, we are building new rigs all over the world. The land rig business has gone completely desert. The same machines that turn out the big BOP's turn on the land BOP's. There is a huge factor of getting our equipment in, worked on, and meeting some of these things. If we can short cut this and still meet the intent and requirement that is the way we need to go. I have been chasing drilling rigs all over the world for 45 years. My dad did it before me and my grandfather before him. I have four brothers. All of us worked in the industry. One of them is a geologist, so he has more money than the rest of us. I love this industry. My son worked in it. It has been a very tough couple of years, but i can stand up here and say from a personal and from the company point of view at Diamond Offshore, you want to be part of a solution and do what is best for our country, our people, and for the world. We are active all over the world. Whatever comes about here will influence what happens there. Thank you. I will be glad to answer questions once we are through. [applause]

Our next speaker will be John with API. John joined API in 1975. John has been in the industry for the last 25 years and has a Business Management degree. He has been involved in various programs with API. He is involved in the certification program and a training program also. Please welcome John. [applause]

Thank you. I appreciate it. I appreciate the opportunity to get in front of everybody today to give an overview of our API monogram program. Several of you probably know about the program, being in the industry, and what we're doing with BOP Certification and licensing for the program. Before I get started, one slot on a global services industry is we are in the independent part of the API. We are the part that doesn't do any of the lobbying or advocacy side of what we are known for, at least inside the beltway. We do the work that we are known for around the world, and that is

the training and certifications, standards that we sell, industry statistics that we put together, the events and conferences we work on for the industry. My group has about 60 employees. We are hoping to have some new areas. We contract with 140 different auditors around the world to do the audits that we need to make sure manufacturing is done properly and in accordance with API standards. We have an office in DC, where the headquarters are, but we have offices in Houston, Dubai, Singapore, and Beijing. We have quick certification programs. Today, I will focus my attention on the company-based certification, the rehab. We publish standards and sell those, over 600 that we maintain, have been doing it since 1924. We have 100 events this year and we also published eight rotating statistics products. I will focus my attention on the monogram program because that is what we're talking about here today, at least in terms of certification and verification that manufacturers are making or permit properly in accordance with API standards. Monogram program has been around since 1924. Actually, it started the same year that API started to develop standards, started publishing standards. It has changed a lot since that time, of course, but it encompasses most of API's upstream standards, include some of the refinery standards, and also some supply chain standards, where we are getting the raw materials to make the equipment that goes into making BOP's and other things. The idea is to help promote the manufacturing of safe, reliable, interchangeable equipment, so that when our company is operating around world, whether it is in the Gulf of Mexico or onshore, they can choose from a manufacturer that has gone through our process and they have been audited to make sure that they can make that important decision with API standards. We have 4000 licensed facilities among the world. About 80% of all of the licensees we have are outside of the U.S. As you can see, about 70 different kinds of standards that we do audits for. BOP's are included in that. We will do an audit, depending on the type of facility it is, on an annual basis for up to every three years, depending on what kind of license they have with API. This year alone, we will conduct 3500 audits of manufacturers around the world. It is a massive undertaking to get this work done on an annual basis. The foundation of the monogram program is called the API specification to one. You have all heard, I'm sure about ISO standards specification. This takes that standard and builds and after 41 Alamanca on top of that hour of particular concern to the oil and gas industry. This standard is maintained by a committee, one of the API's hundreds of committees, to maintain our standards. The committee is made up of the manufacturers, oil companies, the various auditors, the people with experience with quality management systems and manufacturing the equipment. I know Director Watson mentioned earlier today how we need to have stricter controls over how we operate offshore. That is actually one of the things that Q1 does, goes above and beyond the ISO standards and actually has extra controls for the prevention and use of non-conforming to prevent. This requires annual management reviews and internal audits. I will not read all those extra controls, but these are extra

controls and above and beyond the ISO standards that our committee finds are relevant and needed to make sure we have the right controls necessary to make equipment for the industry. You will see there is a laundry list of things that are very important for the manufacturing of the equipment. What does the monogram mean at the end of the day? We are providing a license to a manufacturer to stamp that logo into the side of an equipment, or nameplate, and that logo is a guarantee to API and the buyer, that piece of equipment has been made in accordance with standards and is guaranteed to meet every minimum requirement of that standard. A licensee can only use that mark on the side of the equipment if they have been audited to make sure their management systems meet Q1, that they have proven that they have the capability to manufacture equipment to the standard they have been provided a license for and they can only use it on equipment that needs of the standard requirements. The important part of this is, for the buyers especially, people tend to think of buyers as just oil and gas company owners, but some of the largest manufacturer equipment is for other large manufacturers. The composite list is our directory of certified manufacturers around the world. The hard copy version is as obsolete as next day. The useful version is online. These are the various a series of standards that we cover. I will not read all of these, but as you can see, each one of these series has a subset of other standards that helps to make up the different standard that we cover. Of course, what we're talking about today are the blow out preventers. Under that, the series 16 standards. You have heard several of those mentioned today. That is where 16a states under our standards. Just a brief review of how you go through the licensing process. You go through an application review. On the left, you will see various things required by API before we can get the process started. We will work back and forth with a manufacturer until they have the application in-house and proper. Documents reviewed to make sure that their document requires them to ensure they will meet all our Q1 expectations and specifications they will be licensed to before we spend any time and energy onsite. One of the things that we spend a lot of time on --I have been with API for 17 years-- we have done an incredible job in the last eight years of improving the types of auditors that we use, the experiences we need. We make sure we select auditors that have the background, in this case, drilling background, blow out manufacturing, and the audits. The auditing team will be typically two people for five, six days depending on the lessons they have. We will go through the audit, make sure all of the nonconformances are completed. We have an on-line system that is convenient for the manufacturers around world. " after they have proved to us they meet the licensing agreements, my term of agreements, monitoring requirements, Q1 requirements, we will grant them a license. We license BOP manufacturers, repairs, and re-manufacturers up to the third edition of 16a. In March 2007, we decided to withdraw the ability to apply for a repair and re-manufacturing license. They are withdrawn under API administrative concerns with what was going on with the licensees. We wanted to make sure the repair remanufacture

licensees had access to the original equipment manufacturers designs. It should come to no surprise that was a difficult thing for us to mandate and for them to get access to. Based on that critical element, we decided, there are not adequate controls in place for us to feel comfortable issuing licenses in this area, so we withdrew that. Obviously, we continue to license new manufacturing, but not repair or remanufacturing. We talked about the new standard that is being billed -- standard 53. June 14, closed on the 29th of last year. The second ballot was later last year, closing this year in January. Then we have to find a resolution scheduled for May 18, we just got finished doing. The major issues that were outstanding were allowance of risk assessment in lieu of two blind shear rams. An is option to allow the operator to use their internal exception process to deviate from the standards, we are trying to work these standards out. Last week, not only did we have a standard meeting about standard 53, but we also had a meeting on what could be specification 16ar. That will be addressing blow out preventer repair, remanufacture. There were about 60 people that attended. It will be a hotly contested, interested group working on that. We have a long way to go until we get to that point, but we may get into that after the publication of the document, where the API is more comfortable doing licensing to repair and remanufacturing, because that is important to this. Appreciate your time. Happy to take questions at the end of our conversation. [applause]

Thank you, John, for the nice information on the manufacturing and quality control. Our next speaker will be Don Jacobson. He is the Senior Vice President of industry and government at Mobil Corp.. Don has been in the industry for the last 38 years. -- Noble Corporation. Don is a member of the governing board of the offshore Energy Safety Advisory Committee chartered by Secretary of the Interior Ken Salazar. He is a key member. He is also a member of the Options Safety Center in Houston. Welcome, Don. [applause]

Thank you. Happy to be here. Thank you to BSEE for having this. A bit more advance notice would be helpful next time, but we are happy to contribute. I have a handful of slides. One is my get out of jail card. Today's challenge -- you saw that we would be talking about manufacturing and maintenance and certification. I will try to touch on all three but leave certification comments to Jeff, who will follow me. Before getting into it, you heard from the previous panel region we have a panel after lunch -- about what we can do with new designs. We have a pretty complicated kit already. Tom Hunter asked that we make it reliable, repeatable, upgradable, repairable, understandable, and affordable. We have a task ahead of us. Some of the comments from the previous panel about defining what we wanted to do and to be specific about

the function is critically important, because this is complicated. As far as manufacturer, it would be good to have adequate manufacturer to talk about it, but I will make a couple of comments. You heard about API standards. We have compliance safety standards. We support at 100%. Deputy Secretary Hayes asked questions about how we can do this together. We have the API work group to work through this, and we have to make use of that. The next points about manufacturing being robust on QA/QC, manufacture and assembly, materials testing. If you look at the success of the nuclear program, one of the tenants of the program is focusing on this QA/QC, making sure they have the right materials and manufacturing. Certainly, certification and thorough documentation. As they get into many aspects, it is important to maintain that. I agree with Moe on API standard 53. Our maintenance program and policies are dovetailing in with the requirements there. We have issued a policy. The first bullet you can see. Getting all of the plan minutes between wells, even at the expense of downtime. The way the industry has progressed, we normally have an allotted time for maintenance. Beyond that, depending on contract can be downtime. No revenue for contractors. We think it is important to do this. Our contractual situation will catch up, but we are going to be putting a stake in the ground to do what is required, and to make it mandatory. It is not that we think it is better to do it this time, and another would be more prescriptive about it. It applies to our floating fleet around the world, regardless of jurisdiction. We have issued subsea standards, and this specifies what is required at the end the well maintenance. It is about maintaining that certification of compliance and doing the right maintenance cycles of our rigs. There are a lot of times that we want to change something. Being rigorous with the management and change process for the system changes. You heard Tom Hunter present a question this morning about do we understand what the equipment is down at the seafloor. We have to maintain that documentation throughout its life. We get specific about what we want to test prior to -- and I have a slide on that. Also, how do we get management behind it, supporting it, taking ownership for the subsea kit, from the CEO's office to the engineer on the rig? Part of that is doing a rigorous audit program. Pre-deployment testing -- Moe mentioned a number of things built into 53. Just to give some more flavor or color to it, doing complete valve testing and choked and kill lines, making sure that we have a number of connections, making sure that they all function, we actually do a visual on ram closure from bottom up. You have to do that to see your position. Everything from bolt pods to bolt panels. All valves, we make sure that we check it, but we also make sure that we have proper functioning and closure. Of course ROV intervention. Chuck had a great slide of some of the things being built into those capabilities. Making sure those are tested. This is before we go. Then a rigorous set of pressure testing. Testing rams flows, lock positions, making sure that we have progressed tests. This takes time, something that the industry is responding to, and this is what we need to do offshore. In addition to this, I mentioned, once we get on bottom, we do a set of required testing that

is a lot more rigorous than it was before. The industry has done a great job of responding already to what we learned from the Deepwater Horizon event. Some of the standardization of BOP's, at API standard 53 workgroup, and how they are different on the critical to this -- the fifth panel is about training and learning the elements. The subsea capabilities, this is a complex kit. We need skilled people out there to do it. There are periods where the staff is wet. There is a lot to do. We have a few experienced people go to engineering outfits we are bringing on board. It's just comprehensive training and development. We have improvement plans. There is an ongoing assessment program. Our subsea engineers, there is a curriculum they go through. Also to help us train, but to help the industry, technically when it stacks are down, they are down for a long periods of time. You might have a subsea engineer who does not see a stack low for a year. We go out and have an additional team comes in to support the effort. It ensures that some of this critical means that is required -- there is a lot of effort going on. Yes. I appreciate the time. [applause]

Thank you, Don, for a very good presentation. Our next presenter is Mr. Jeffrey Cutler. He has been working in this industry for over 30 years. For the last 13 years, he has been the Senior Vice President for engineering on the compliance sides of the business. Jeff is also a part of the joint industry task force. Please welcome Jeff. [applause]

Top performance -- top performers. I think that is what we all want. It is heartening to me to see the level of agreement we have here. We have come a long way. We have a long way to go. One of the things i want to do is to challenge you as i speak to think about two things. The first one is consistency. The second one is measured ability. As i make these comments, think about those two items. I may speak more quickly than I usually do. Quite quickly, we will look at what the current status is and what issues that I see. Speaking more about the project Dr. McCarthy referenced, we can see here a variety of liabilities -- in comparison with former studies -- that both measure kinds of failure, as well as including data from almost all wells that were drilled in the 2004 to 2006 time frame. You see the tremendous increase in failure. I agree with Dr. McCarthy these represent best case scenarios in terms of failure scenarios. We realize that our standard testing has resulted in much more reliable equipment. The real key here is the variants. First, I would like to point out the note at the bottom that insures 45% of the rigs showed no associated failures at all in the timeframe. That is three years with no failures. The flip side of that is if you look at the range of those that did have failures; you will realize the failures are on the high side 8 in 50 days -- high side of 8 in 50 days down to the low side. The study was originally designed to study what

those failures were. Based on the fact that we thought the record keeping was in some cases suspect, meaning they were as much as five years or six years old. Based on statistics, we thought it was largely dependent on the people. Obviously, we have class as an existing standard. We have API, also in the area of specifications as well as recommended practices. We also have private standards. And we have regulatory standards. And of course, we've seen the number of times and hear these are generally considered. The reason I bring up these different standards is because each of them can play a part in current compliance and verification. Specifically, who verifies components? Each of them is capable to provide verification according to the current regulations. I think there are some particular problems with that. As an example, if you look at the historical focus, as they have been more focused with understanding pressure containment as well as failures for loaded and that sort of thing. If you read a certain class as acceptable for a class society, it does not tell you can move from one place to another. It just appears to a performance standard. Also, there is a clause that we fit into. The selection of the verify error depends very much so on licenses for the operator. As a professional company, I might imagine a company registered in New York City that has inspections by the letter of the law might be qualified. So, that relates to the confidence requirements. I am not going to cover that here right now. We will be required to verify BOP for everyone. One thing I will mention it, and I will only mention it briefly here, west's verification standard was developed as a result of the procedures that have been information for the -- information for the last 20 years. We look at standards that relate to best industry practices. The big step for us is to decide what is mandatory for most. For most of the 26 years, we have been hired by our clients who desired recognition that they provide and evaluated service to help them achieve their objectives -- and evaluated service to help them achieve their objectives. One of the things that I have heard a number of times, and I agree wholeheartedly with, as it is difficult to verify as the system, and we think that will include controls, both electronic and hydraulic. And all of the people who are providing verification, I do not think they provide that same system assurance. One of the key things for regulators, I think, is to think about unintended consequences. First of all, there is the situation of redundancy. Everybody likes redundancy. At the same time, the question that we should address is the fact that the industry has embraced, as a result of the commercial agreements between equipment owners and the people, who use that equipment that we have always had, at least for a long time, have provided equipment that exceeds standards. Let me give a specific example. It is unusual to see a BOP Stack that does not have two annulars. There is a climate offshore today that starts from the supposition that if you have equipment, it must work. If you pull the BOP, it is a tricky situation if one of the two annulars does not work. People want to talk about more testing. I think more testing generally is to lead -- generally is good. Testing in and of itself is not deleterious on equipment. I am unaware of any studies on the deteriorating effect of testing. It is

generally agreed in the industry that it equipment to continue to test it. On the issues I am going to cover quite quickly, I am not going to give answers. Rather, simply ask questions. I have been accused of many things, but not having an opinion is not one of them. What I will do is ask those questions and look for you to follow up on this. I will give you my considerations and the answer to your question. We talk about manufacturing standards and the fact that there are many more requirements than compromises. One of the key issues -- why we have standards? So when you purchase something, you know it will be consistent with minimum standards. At the same time, we recognize there are gaps. There is language in there that allows knowledge advances, which i think is critical. However, at the same time, there is no commentary about how you evaluate that advance, and it is left to the parties in question to make that statement this is real technology. There is no vetting of that against the standard. Talking about this systems, there is always the discussion of whether it is centralized or decentralized. Historically, we have always desired the accountability of responsibility down to the real management level. One of the things that results from that is that you have a group of experts, subject matter experts, making recommendations to the field that may or may not be implemented based on other criteria of the decision makers. So, there is the issue of control and how it relates to meet his activity versus activation on a fleet-level basis. I would like to restate that in a different way , the best ways are to maintain its standards. How many best ways are there to maintain standards? Is more better? That was a consistent message. Let's do more of this. More of that. Certainly, that is understandable. We talked about repair. There is not prepared standard. There was a point that was not passed and withdrew. The question is can the original manufacturer change? And if so, what are the criteria for that manufacturer? Similarly, on a parts side, the standard for equal or better parts? Who is to determine equal or better? Is it an OEM if it comes in a particular bad IT or not? I can argue both sides of that case. Someone might talk me out of it. Secondly, sometimes you upgrade equipment that are not available from the OEM. So, what if the equipment is discontinued? So, the question is we happy with the standards? [applause]

Thank you, Jeff. That was a nice overview from the certification perspective. And QA/QC nice questions. We have some time for the question and answer session. We have a few minutes. I will start the discussion. In the field, you do the maintenance. This is the group we have in the industry so we can continue improvements. The issue is to transport from the industry so everybody knows there is an issue.

That's a good question. [laughter]

I can only answer what we do in our organization. Whenever we have failures, we try to circulate that and ask for feedback. It is being able to track and quantify what type of failures we are having through the maintenance cycles we're going through. This is data we can make logical assumptions from.

yes?

Speaking really personally rather than just for API, I hope we do restore licensing into the program. We're working on a standard. There is really no time frame. We just discussed this last Thursday. It's known – I'm no BOP expert. The reality is, we have these things repaired and manufactured and looked at. If we're going to mandate testing and maintenance and requirements around manufacturing -- it did not work the last time. Need to make sure we lay it out where it works for everybody. So, the only way to do it, I think, at least one effective way is to set up a program where we are verifying our capabilities to do this. We're ratcheting up the requirements on our licensees, whether we are pulling samples from the shelves or test labs to make sure they are according to standards. I look forward to being able to license that in maybe a couple of years.

To build on Moe's comments, certainly when we have failures, we have discussions about, you know, can we operate safely? We have had discussions, proactive ones over the last year -- bringing BSEE back in.

One of the things that I would say is cut through the maintenance activities on rigs. I am not aware of very many discussions where people are happy to reduce the non-BOP maintenance on rigs. Almost all our studies have recommended less maintenance, for various reasons. And engineers look at high failures. Obviously, even with the data, there is great reluctance of people to reduce meanest as a general thing. If you can look at the performance of rigs on an individual basis -- I have heard it compare to whack a mole. Next thing you know, you have a different poorly-performing rig.

Thank you. Any questions from the floor? There is one over there.

Quick question. This is from the manufacturing perspective. If we want to replicate 200 psi of internal pressure at the manufacturer's facility?

We have not drilled that deep quite yet? But 5,000 feet of water --

5,000 feet of water. Did I say 25,000? Sorry.

That is the problem. I think there is one in the states that can do hyperbaric testing with significant pieces of equipment. That is the challenge.

The unit, the whole unit, is operating as an electrohydraulic -- 60 feet high. I'm assuming there is no hyperbaric chamber that is big enough to create that the external pressure?

Not to the. -- not today.

There is one question over there?

I am with shell. I would like to refer to something Moe said earlier. "tell us what you want." I think if Moe could expand on what I think you were saying. And think what you were saying was, tell us what you would like us to achieve, and let us use our capabilities and our technology to solve that problem. You know, part of this workshop's purpose is to collect information on BOP Performance and capability, but I think part of it is to understand what these regulations are supposed to look like. The history of rulemaking has been rather on the restrictive side since Macondo. My question to the panel is how might the regulations look with BOP's and well control?

That was well said. Again, define the objective and turn us loose. My first "deepwater" rig was a 1950. We have progressed to 12,000 feet. In the early multiplex systems in 1977, we put the first multiplex system in. I guess the key is, there are many ways to skin that cat. We are fortunate to be in United Kingdom area. We started to see the difference between prescription and go set performance issues. We can achieve what everybody wants. And don't box us in too much.

Just to add to that, I think Tom Hunter mentioned this morning, the government's role, to deal with the "what" rather than the "how". I think we have dealt with the technical capabilities. There is an opportunity to work together to define the "what". There has to be a strong industry influence. And I think being able to -- if you go down the prescription route, it is very hard to change from that. It is slow and cumbersome and will not keep up with technology. You have to design a system that specifies what we really need. What performance criteria will be based on, and then just let us get after it. And we can solve the issues.

I think this is one of the greatest technical problems of our time. If you go to different industry conferences, one of the common things is people, all these things that we're talking about doing is coming to require more people, more technical staff, more trained, advanced technology and focus. At the issue is in order to do that, we have to understand priorities. We all have to do this right now, but we simply do not have the staff to do it. It is particularly difficult under this performance regime, which is more difficult to understand. "do the right thing." how do I audit against "to the right thing"?

While you were getting up to the mic, Jeff, I would argue that there's a lot of definition for the "what". It is not a free for all.

I agree. I am in favor of our performance-based standard. It is just more difficult to deal with.

Nick with Noble Energy. I think Jeff had a great point with testing, the amount of testing we're doing and the impact on the system has -- system as a whole. We are testing every single functionality. 14 days ago, we did pressure tests on every part of the stack. Every seven days we are testing functions and testing functions again. So, I guess my question -- before we pass any more regulation, are we going to put any more science behind testing. I will tell you from my personal experience, we are used to seeing more test failures and site pools. What I have gotten from that is reliability is decreasing. Getting back to what we were saying earlier, we want to see more functionality out of the stack. So, how can we move forward?

Thank you. I think that is just a statement he made.

I don't know -- it's a good -- i really can answer that. I don't know if there are any plans for a testing program. Maybe that is something that needs to be looked at a little bit more, how the benefits are done. Think about it. Jeff?

I absolutely agree we need to do more testing. One of the patterns we talked about earlier is how many pieces of equipment of this type are in service today? They test them to failure. The fact of the matter is, we are talking about hundreds of pieces of equipment here that makes the statistical analysis very difficult. Not saying we can or shouldn't do that. We have to keep in mind the reality of the number of the universe of installed equipment that we have.

This has to do with requirements. We have heard mention of requirements -- portability, reliability, granular performance system. How do we make sure that the environments are verified for the intended functionality or some quantifiable value, while also being graded for the worst-case scenarios?

ok. [laughter]

Do you have any valve manufacturers around? But i think this is more to the manufacturer. --

I will take a stab at that. With the things we can take steps in improving is the transparency in the transfer of information. One of the things that has been particularly problematic is what exactly is the equipment designed to do from a controls perspective? Generally speaking, i would characterize something like the light on your car that says "check engine." that is just not acceptable. We cannot afford to have a check engine light and have to figure out what it is not doing. Recently, we have an issue where the particular manufacturer had a solution to a failure, automatically invoking emergency disconnect switch. I have not met anybody come up once they learned of that, but that was a good idea for that particular failure. What other things are in particular software that we do not know about? I think the transparency of information as it relates to making decisions one way and another.

Thank you. How can you verify the requirements are addressed? It is hard to see it that is done. Thank you.