CONTINUED SERVICE FORUM OUTPUT DOCUMENT V.1

"Continued Service of Deepwater Floating Production Systems"

Issue Date September 23, 2016

OFFSHORE OPERATORS COMMITTEE
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1 Forum Objective and Goals

With the new lower-for-longer oil price scenario, offshore operators are searching for cost savings and increased efficiency. Advancements in increased oil recovery technologies and explorations expand the commercial viability of many existing deepwater fields. These positive trends require offshore operators to identify ways to keep their aging floating structures on station up to, and in many cases, beyond their original projected design life. As a result, there is a growing need within industry for a recommended practice focused solely on the Structural Integrity Management (SIM) of floating structures that provides guidance in the development and implementation of SIM programs as well as guidance to assess the fitness-for-service of a floating structure (system or facility) over the original service life and beyond.

OOC with contribution from DeepStar hosted a one-day technical Forum to explore operators' approaches to continued service. The Forum also examined real-world case studies that highlight the successful integration of development of risk based SIM Program, assessment of longevity drivers, development of mitigation strategies, to enable the decision making about the continued service.

These technical sessions were followed by brief, interactive presentations on emerging new technologies with the potential to impact cost and efficiency. These are field-proven "young" technologies that have seen early success but lack the widespread exposure that leads to broad adoption.

The Forum was an interactive event. Attendees were invited to comment and discuss the relative merits of the framework proposed and the IRM technologies. Participants could take away a clearer idea of how the industry can succeed in reaching the goal of reliable continued service of deepwater floating production systems.

This Forum was intended to be beneficial to engineers, project managers, and regulatory professionals. Continuing education certificates were made available at the closing of the forum for those interested.

2 Planning Committee

This table contains the names and companies of those involved in the planning and organizing of this Forum.

Name	Company
Greg Kusinski	Chevron
Evan Zimmerman	Offshore Operators Committee
Jim Stear	Chevron
Milind Prabhu	Chevron
Sathish Balasubramanian	ExxonMobil
Marc Wagner	Shell
Jose Abadin	Chevron
Jack Kenney	Shell
Stephen Hodges	Shell
Dan Washington	AMOG Consulting
Robert Seah	Chevron
Craig Mullett	LLOG
KT Ma	Chevron
Russell Hoshman	BSEE
Robert Gordon	Marine Engineering Consulting, LLC
Dan Gallagher	Energo

3 Agenda

The 2016 Continued Service Forum was hosted by Anadarko Petroleum on August 31st. The agenda for the day is below.

7:00 – 8:00 **Registration / Breakfast**

8:00 – 8:15 **Opening, Welcome, Safety Brief**
- Welcome from the Chairs – Greg Kusinski, *Chevron* & Evan Zimmerman, *OOC*

8:15 – 9:00 **Introduction to the Overall API Framework**
- Scope – Jim Stear, *Chevron* (SC2 Chair)
- 2SIM Gathering Data / Evaluation / Strategy / Program - Jim Stear, *Chevron*
- Overall API Framework Layout of FEAT (Floating Evaluation & Assessment Team) to assess the IM of F, M, R. – Sathish Balasubramanian, ExxonMobil

9:00 – 10:00 **Operator Experiences: Case Studies and Interactive Discussion**
- Case Studies – Marc Wagner, *Shell* & Jose Abadin, *Chevron*
- Interactive Discussion

10:00 – 10:15 **BREAK**

10:15 – 11:30 **FSIM, MIM, RIM** (Presentation & Questions)
- FSIM – Jack Kenney, *Shell*
- RIM – Stephen Hodges, *Shell*
- MIM - Dan Washington, *AMOG Consulting*

11:30 – 12:30 **LUNCH (30 minutes) Keynote –** Mike Beattie, *Anadarko*

12:30 – 1:30 **Regulatory Perspective Panel**
- Paul Versowsky, *BSEE*, Chief, Office of Structural and Technical Support
- Russell Hoshman, *BSEE*, Technical Advisor, GOM Regional Field Operations
- Capt. Josh Reynolds, *USCG*, District 8 OCMI

1:30 – 1:45 **Implementation of Continued Service Plans - Short term and long term targets, difficulties, and uncertainties**
- Introduction – Robert Seah, *Chevron* & Craig Mullett, *LLOG*

1:45 – 1:55 **Break / Setup Interactive Session**

1:55 – 3:30 **Interactive Discussion - Short term and long term targets, difficulties, and uncertainties**
- Interactive Kickoff – Evan Zimmerman, *OOC*
- Group Discussions: Risers, Mooring, Floaters – Facilitators present where RPs stand now capture gaps, strengths, opportunities
  - Mooring – KT Ma, *Chevron*
  - Risers – Stephen Hodges, *Shell*
  - Floaters – Jack Kenney, *Shell*

3:30 – 4:00 **Summary / Action Items / Deliverables / Adjourn**

4 Forum Highlights

In this section are the presentation materials and questions and answers sessions.

4.1 Presentation Materials

The released presentations are available on the Offshore Operators Committee website (http://oocmain.theooc.us/continuedservice.html) and the DeepStar website (*provide link*).

4.2 Presentation Q&A

The speakers provided opportunities for questions and answers and these are captured below.

4.2.1 (After Operator Experiences) Did you reassess the fatigue?

For the hull, no, no detailed analysis. We did increase the inspection intensity.

4.2.2 Joint question: based on performing the risk assessment and not undergoing additional hull/riser assessment, what are the drivers to conduct the additional analyses that you performed?

Updating ISIP plans… Wanted to go through full analysis on top tension risers and SCRs – do they need to increase frequency? Things like that.

4.2.3 You identified the corrosion risk… please elaborate how you're mitigating?

We are measuring yearly, looking at strength. Fatigue hasn't been an issue yet.

4.2.4 I have a question about the mooring replacement – what kind of criteria do you use to place the Mooring chain? My question is focused on the timing because the fatigue degradation is really high. Do you target by 2018 or 2028 to replace that four to 10 chains?

A: Right now our analysis is indicating 2023 is where we meet that 0.6 utilization factor on the I can't recall what mooring number that is, but that's what we're looking at right now but there's some other ones beyond 2023. Initially we looked at it conservative, for the financial impact, we looked at replacing all 14 because we were using some conservative estimates on corrosion – finding the worst measurement. Now we've refined that and found more data, so 2023 is our first replacement if necessary.

4.2.5 Lessons learned?

A: In regards to mooring (?) corrosion, our specific specs call for an additional allowance that happened a few years back.

4.2.6 So in our interactions with regulatory agencies, a number of agents, we've been told there's no regulations, no guidance, for how to do a continued service assessment. I guess my impression was that these documents were going to help provide guidance to industry on how to conduct continued service assessment. How do you foresee these documents being used in that regard, thinking of them as a reference, for a verification or something like that?

A: We are providing answers to what sort of data you'll be needing to have in place – we've got a section of the document that deals with how to get into an integrity management program going forward, guidance on how to do a place long condition assessment, so that's establish what the current condition of your facility is, what likely failure modes it might experience through life, and take you through the process of how you would control that. There's also some

guidance on how to do an assessment for the mooring system where you've identified anomalies - where you've got corrosion or damage to a mooring line, what does that mean and how do I assess it? Again with the view to: what does that mean for the risk of my mooring system at the moment and how will that progress/digress through life? Those are the issues are really key to how you handle a Continued Service argument with respect to the mooring system, because you need to understand how that mooring is going to degrade over time, and your risk of failure might increase over time, and ultimately that will come back into some kind of decision about whether or when you need to replace particular mooring lines or components within that mooring system. I was talking about the example before with Chevron where they've got accelerated corrosion in the splash zone, that's exactly the sort of degradation that will drive that kind of decision, that's something we're setting out to address, and something that we have put material within the document that will assist with that, and we look forward to feedback.

4.2.7 Do you have any plans to make a call to the operators as we retire risers to get those to a common place, or put them in a database where we can do testing or investigation on those?

A: I think those absolutely have to be part of the program and we are going out retrieving one of our earliest production SCR's late this year to the margins POP (?), unfortunately _(DOPs?)__ are quite kind to risers. But we've got in place about five wells from the touchdown area, a couple from the very benign mid-section, and hopefully one from the flex joint for exactly that reason and we are will be absolutely open to sharing the results of that in a way that we can in terms of anti-trust but we will find the right way and the right place to do that. Yes, absolutely, that's a great point, certainly strongly encourage us as an industry to find the right and responsible ways to share that kind of data. And there's some JIPs being hashed out in the industry right now and really appreciate the whole contracting side of the business, engineering firms that are really thinking about this stuff: One of them is to pull together data from measurements that have been taken from various operators of SCRs (this particular one has to do with SCRs and dampening), turns out there are several data sets out there, so how do we pool those in a JIP format so we can come to some conclusions, that hopefully conclude that we are grossly underestimating dampening in these particular scenarios, which may change our view. All these things are out there, and if folks have data or ideas on what to do with data and want to go pounding doors to gather data, absolutely, and if there's ways as we go forward, if we pull anything out of service, ways to get that into the industry view, obviously with anti-trust, I support.

4.2.8 On the interface with umbilical's, where do they fall within RIM, MIM, and FSIM and where do umbilical's supports fail fall in terms of those?

A: A full tube is structural in nature, and the structural elements certainly fall under FSIM, the umbilical itself, sort of falls in RIM, we've agreed to take it, if it has hydrocarbon in it. If it doesn't have hydrocarbon in it, it's not so much a hazard as it is an operating risk – I think that's a later conversation with 17-E folks, because we're certainly not qualified to talk about damage to tubes, we're qualified in the 2RD realm, the riser cast group - the dynamic motions of that riser, but when you get into construction of it and other things, it's probably a phase 2 or 3 piece. The structural support of that, having said that, is clearly in there. Where it gets exceptionally gray is when you have a riser in the pull tube, which the number and other platforms have, where the pull tube acts part of the stress joint, if you will. Those are both things that we will need to test against what we come up with and see, does it fit? Can an operator follow these processes around that? Again, coming back to establishing a good, sound process, ought to allow us to bring new and unique things into the process without needing to write it into the standard but if there is something truly unique that we can add to the standard that "hey this is really important

for analyzing this" then obviously we can do that. But that will be part of the "beta testing" if you will.

4.2.9 *I'm not sure where the subsea structures today will end up being?*

A: Today is out with this whole effort – where 2017 goes is a future conversation. Why is it out with the effort? Because I think we are wanting to subsequently initiate this. But really addressing the higher risk pieces. // Add to that: we have had a couple of conversations with these informally, with the folks from BSEE 17, there is an awareness that we are pushing ahead here, but as far as formally tying in BSEE 17 to these activities, so far we haven't taken that step yet. We need to get down in writing what we know, and understand, and a framework, and it's easier to have that conversation. One of the trick points that we got focused on, in the first few months, is those kind of questions, we got wound off into scope – how will we deal with complex things? And we need to get unstuck and understand the basic process then go around the fringes. But if we can't answer the question about how to deal with a dual casing production riser, then we need to get after that before what are we going to do with umbilical's. So bear with us, there's a lot of stuff on the fringes that we want to deal with but instead I'm hoping we can worry about the stuff in the middle first.

4.2.10 *Phase 1 will it cover pipe SCRs? Will one of your red boxes be inspection and monitor?*

A: It will say "Inspect and monitor" but it's not going to tell you how to go inside – current methods, that's kind of up to the operators understanding of those methods. We're not going to go to the extent to prescribe – now in Phase 2 if that's a real problem and we need to develop technology or develop mechanisms for dealing with it but in my mind, it's steel, its fatigue, you analyze it with methods in 2RD and you inspect it with your inspection methods, and you deduce your corrosion and fatigue from that.

4.2.11 *Relative to original design fabrication records, can we assume that if it has a COI, that's already been approved and we don't have to revisit that?*

A: In non-ideal situations we will have to try to figure out how to handle those things where we don't know what we've got. Each individual case will have to be looked at separately and decided on what's needed.

4.2.12 *But if it's already gone through the CBA process, for the original design/fabrication, I would hope we wouldn't have to revisit those types of documents.*

A: I'm thinking more in terms of extending beyond what was originally designed, so if someone is going to extend something beyond, I'd like to know the materials properties, it's something I've done before with other things, something as simple as a higher yield or it's a different CO2D property, then you can make different assumptions.

4.2.13 *2 questions that are related, first one is, you mentioned inspecting the uninspectable, can the life of something be extended without being inspected (for an uninspectable component)?*

A: I'll leave that up to you guys… I'll say that, then I'll say "yes", if you go back and you find out that the conditions you designed for were less stringent than the conditions you were living in, we probably can do something, we've heard that several times today, that's what I'm thinking of there. The issue of "I don't know what it's like, the corrosion" I'm going to leave that up there, it's

scary, huh? Even in terms of not as a government regulator but as an operator – we're going to go through a storm and we don't know the condition of the flex joint or that riser.

4.2.14 Second part: in most cases when you're designing something, the factor of safety is tied to whether or not something can be inspected or not, there's typically an aspect of factor of safety that's related to that. So if something becomes inspectable, what are your thoughts on reducing the factor of safety associated with the future design of that component?

A: If it's inspectable, you can change the factor of safety, if it can be inspected. It's bothersome to me, as an engineer, that a component design for a 30-year design life with a safety factor of 10 leaves a 270 years of potential fatigue life on the table. We need to address some of that in what we're doing here.

4.2.15 You have touched on original design life, (inaudible) used to be, what 20 years now it's 50 years, that number, extending the life, beyond the number that was (inaudible), how do you look at that?

A: We're talking about a floating offshore structure that has a lot of dynamic response, it's a little more scary to me than a fixed structural platform which, you know, I told the story, if you've heard it before, close your ears, but when I left Chevron, we pulled out a structure that the drawings were dated the year of my birth, and I was 65 years old at the time, but we'd been inspecting it, and we knew there were no cracks on it, so a fixed offshore platform has a, and it was probably designed with a 20 year life, but we know that because we have information on it, kind of like why am I asking for this information on these components we're removing, because we want to start an understanding of how they're (inaudible). So what can it be extended to? If I take somebody's platform and I look at it and say, "Does this platform need post-Hurricane Katrina criteria?" If George did it, and was conservative, it might. If Bill did it, and he wasn't, it won't. So you have to go back and get that original data we were talking about and see what it was, to make a decision on how far I can extend something.

4.2.16 I've heard people mention inspectable as it relates to SFE's (?), what is inspectable, as it relates to a (inaudible)?

A: There are a lot of answers for that, one is "I've got to be able to touch it, feel it, kiss it? Everything. Get a real good grip on it. I've got to have access – probably non-destructive testing. Just to see it, visually, is it corroding, does it have cracks in it? That's important and that's what I call inspectable. Something that's inside something; that I can't get to, I can't look at it, that I can't determine if it's corroded or if there are cracks in it, I'm making that kind of difference is that the answer you're looking for? [Inaudible response from questioner] Those are the kind of things that can be addressed in Phase 2. Phase 1 to me was from the first part of my presentation, "What do I know about my structure? What do I have in my records?" I've been managing this thing, I've been fixing it, and so its integrity is solid. Then I wind up looking at those uninspectable things, and I've got to figure out how I want to deal with that, I look at that as Phase 2 of RIM, FSIM, etc.

4.2.17 In the design basis, there's design life, then original design phase when you assess all the design, but you most likely have calculated [inaudible] life that exceeds design life. If life exceeds original design basis, if it lasts longer than the components design…

A: There are multiple components to any offshore facility, the design life of that facility is the shortest design. If this is going to reach its design life of 20 years and the rest of the structure

has 1000 years, well its 20 years so what are your choices? I replace the component. Maybe it's expensive, but it's better than replacing the entire facility, or the cost of losing the whole facility and having to pick it up from the bottom, or it doing damage to other people in the area because it broke free.

4.2.18 Question not captured (to Coast Guard)

A: Our process is this, we're not really concerned with who owns it, there's another initiative I'm pushing about risk-based inspections, it could be the change of ownership flags in extra inspections, but currently, normally certificates are due at fixed intervals – so when it's time at the interval of that asset, it doesn't matter who owns it, or if it was sold since the last time the certificate was issued. We're going to look at what we think the service life was, and we're going to start to do this. So whoever owns it at the time will have to produce the things in the policy that shows they have a good integrity management program. So when you buy a floater make sure it has a good integrity management program, with good reference.

4.2.19 Could you elaborate a bit about the 5 year evaluation plan – what would that consist of?

A: It's not intended to be asking for a re-approval. It's intended to be, when you ask for life extension or continued service, you're going to put together an integrity management plan, you're going to submit it to the Coast Guard and BSEE and it's going to have all the wonderful things that you've been talking about, then we're going to say this is reasonable, makes sense, there might be some back and forth, new data measured, or a new aspect is part of the back and forth, but in the end, it's an accepted plan – THAT plan should have built into it, that every time we do a certificate renewal we're going to check all the things that we'd promised as part of the acceptance of the life extension. If we have a way we're going to monitor fatigue, I don't know what that is, maybe there's fancy data sensors, maybe there's inspections of skiffs with cracks, but it's definitely an integrity management that makes sense, it meets the 2FSIM that's going to be published soon, and we've all agreed this is what we're going to do. We'll inspect the next time it comes time to do a certificate, we're going to check "Well how did all that go? And what were the parameters for pass/fail? Are you still on the pass side?" But it's not a new plan, it's following the old plan, and based on the old plan, is there still continued service or not? Maybe you've established this is how you determine if the facility is reaching end of life and then along the way indicators pop up, and even though you hoped for 15 more years, you might only get 12 unless you do maintenance or replacement, or whatever.

4.2.20 What is your main interest in the platform cranes? I don't think it's an insurmountable task, I just wondered why you take a special interest.

A: I think there's a regulatory history there, but also a casualty history there. There are a lot of accidents, deaths there. It's really a marine operation, so we pay attention to it.

4.2.21 With regard to life saving appliances, is the office at Coast Guard headquarters responsible for approval. Are they tied into this life saving aspect? Are they aware of what they may be asked to do?

A: Yes, they need to be. There's a lot of internal Coast Guard reach back that occurs. There are groups that specialize and receive those approval requests from us. That's why it can take some time.

5 Interactive Session Results

This table contains the data collected by the attendees during the Interactive portion of the Forum. The attendees divided into three groups (Hull, Risers, and Mooring) to discuss equipment and technology gaps, highlights, and new ideas. They were then asked to vote on the issues of greatest concern. These results have been recorded and then prioritized according to votes tallied.

Sheet #	Hull	Risers	Mooring	Title	Description	# of Votes
57		x		Leverage Inspections of Out of Service Risers	1) Collect data from operators 2) JIP Mechanism to look at data from risers taken out of service: operators, engineers, etc. VS ILI before retrieval	**19**
9				Factor of Safety	Fatigue original floating system 10-20 year design life. Is FS 7 good for continued service 5-10 years? Utilization Factor or 0.6 for mooring lines (chain) this is for new designs. What can we use for existing designs for continued service another 5-10 years.	**18**
58		x		Inspecting the Uninspectable	ILI Tools: corrosion; AUT - weld inspection (reportable - sp) External Tools - critical areas only (focus) Indirect methods to complement (surveillance monitoring) Integrity Envelopes (e.g. similar to onshore API RP 584) Inspections from out of service risers	**16**
3			x	Corrosion of Chain	Corrosion on chain *(and wire to lesser extent) rope and rate thereof is not well understood	**13**
20			x	Things we would like to see	Ability to inspect through marine growth and sheathing on wire ropes	**13**
33	x		x	Lack of industry-wide failure/reliability database for hulls/mooring	For other systems (e.g., subsea components) failure data is anonymized and made available to operators to assist in predicting MTTF and reliability through electronic databases (e.g. OREDA) -hull and moorings don't have this type of database available so this data is siloed in each operator/consultant/class society	**13**

4			x	Fabrication of Mooring Components (Manufacturing Defects)	QC of component fab (e.g. heat treating, etc.)	**11**
54		x		Fatigue S.F.	Already happened vs. future (1. Understanding of partial SF that lead to 10… 2. Use measurement data, etc. to understand SF's) Consequence: based (sp) approach / Full scarle ftg to failure testing… Low amplified clamming (sp) - calibration to measured data (?)	**11**
17			X	State Inspection	Device that cleans marine growth and follows with photogramatic/laser measurements to enable 3D model of chain and wire with high degree of accuracy (TECHNOLOGY)	**8**
12	x			Non-Structural Life Extension Issues	Where does BSEE/USCG request extension issues associated with non-structural issues (safety devices in shut down systems as an example) and can FSIM include general call that other disciplines point to.	**7**
31			x	Inexpensive and more reliable line breakage/ line monitoring system		**7**
1	x	x	x	Determining Appropriate Criteria for Assessment vs. Design	We can resolve uncertainty using measurements, inspections, etc. in original design analysis, yet still apply design factors for strength and fatigue	**5**
35				Clarify continuing service vs Life Extension	Longer Life, i.e. 20 years or only 5 years?	**5**
43	x			Develop Ultimate limit state analysis methodology for floater	Helps assess robustness of design	**5**

59		x		Single Point Failures (HIGHLIGHT)	1) Top of riser - people risk, platform risk 2) Corrosion management / Protection A) Guided wave magnetometry B) Large stand-off magnetometry C) 2RD based on pristine pipe (what do you do with corroded pipe? E.g. API 579 and how do you assure Fit For Service of corroded pipe? Corrosion accelerated fatigue? Effectiveness of CI's Prese... (??)	**5**
21			x		Improved in-situ / in-place damage assessment (TECHNOLOGY)	**4**
44			x	Better Fatigue estimates of corroded chain	ABS JIP ongoing	**4**
2	x			Air Gap Requirements	What is the acceptance criteria for negative air gaps for survival events?	**3**
26	x			Technology development of inspecting the "uninspectable" components	Pipe in Pipe; Tendon flex elements; Tendon bottom connectors; Buoyancy cans on spars (moon pool); pull tubes on spars in center of hull; bending shoes/ wear blocks on hull/ mooring systems	**3**
36				Weight management / control / stability (TECHNOLOGY)	How to reestablish VCG (ex. TLPs)	**3**
49			x	New Advances in in-place inspection techniques	Photogrammetry, lasers, etc.	**3**
6			x	Trencing around mooring piles	Leeward line behavior - trenching and rope compression: line dynamics disturbs soil/loosens it and starts trenching (leads to anchor capacity decline and compression fatigue in wire)	**2**
8	x	x	x		Can improved analysis techniques be applied retroactively to original design to prove we have required factor of safety for "x" years beyond original design	**2**

16			x		Prestretched Polyester Prior to Mobilization for Install (TECHNOLOGY)	**2**
22			x		Clear Industry Guidance for Component Wear (Technology)	**2**
27				Uncertainty as it relates to safety factors		**2**
32	x			S.F.'s reduction based on quantified decreases in uncertainty		**2**
34				Finding the data/design/ops history	Over reliance on computer records; mix of electronic and hand; 2FSIM? Guidance on info gaps; dealing with non-inspectable items for LE	**2**
39	x			Tendon Inspection	1) Many tendon components and welds are designed as "uninspectable" with a safety factor of 10. If the condition of these components / welds must be verified for life extension, new ROV-deployed inspection technology is needed. 2) Related: if we DO have the technology to inspect, can we reduce the factor of safety to "inspectable" from "uninspectable"?	**2**
40				New Technology	For Argas/items/components that are non-inspectable, that minimize risk to facility/component	**2**
5			x	Leeward Line Dynamics	Compression and trenching	**1**
7			x	Accelerated Wear on Components in Fairleads	Fairlead design and maintenance/neglect can cause excess wear. Old fairleads/bending shoes were not designed well.	**1**
10				agreement of use of analysis, inspection, measured data in relationship to risk based approaches	There appears to be little agreement in exactly how risk based approaches should incorporate available tools (data, inspections and analyses) leading to confusion of how CS/LE can be justified	**1**

15				Missing Minimum	Original Design specs/drawings and maintenance. Revised operational parameters with age or trigger MOM? Uninspectability	**1**
19			x	Improved Break Strength Safety Factors	Among multiple components in a single line so that 1 component does not compromise the whole/entire mooring lines (is this what we mean?) The goal is to improve reliability through better design management of components.	**1**
28	x				Analysis accuracy and applicability; acceptability criteria for flaws; uncertainty "factor of safety"; ultimate strength methodology (robustness reqs); uniform regulations / standards (prescriptive/goal based); capturing near misses; definition of critical areas	**1**
29	x	x	x		"Condition" Assessment; design criteria; failures database - public?	**1**
37					Need to clarify or quantify the terms inspectable and critical for various platform components	**1**
38				Metocean Data - Access to Historic Data	Potential issue for purchased assets; use of historic data to forecast conditions in the future rather than using typical design criteria; degrading safety factor	**1**
42	x			Underwater Inspection	Need for better ROV/AOV Based Inspection tooling: - NDT - Cleaning (esp. at depth) - Miniaturization for smaller more nimble ROV's	**1**
46			x	DBPS & Line breakage detection system	Has been successfully implemented	**1**
51	x			Reassessment based on original design criteria?	i.e. Design code in effect at time of original design	**1**
53				Availability, Quality of original design 2) Missing Facility Monitoring Data		**1**

56		x		Unusual Loading Mechanics (?)	Hurricane Loop Current Topography Enhanced rossbey wres (??)	**1**
11	x	x	z	Is Crack detection and measurement required to extend the life of a component (tendons, risers, structure, etc.)	Subsea crack detection methods for full water depth of facility location	
13				Finding the data	Design: Ops History, overreliance on computer records; mix of electronic and hand. 2FSIM? Guidance on info gaps; dealing with non-inspectable items for LE	
14					Should ops rules be changing with age?	
18			x		Inexpensive and more reliable line breakage / line monitoring system (TECHNOLOGY)	
23			x		Clear Industry Guidance for out of plane bending fatigue (technology)	
24			x		Fairlead that solve out of plane bending fatigue problems (technology)(	
25			x		Better prediction of line tensions and behavior in squalls (not fully developed storm conditions) (technology)	
30	x				Inspection Technologies - improvements use of new technologies vs those available at time of design	
41				Is the 2% weight change limit on lightship variance applicable to all?	For facilities with high stability margins (e.g. spar) can that limit be extended?	
45			x	Improved Chain Stress Measurements	"Stress probe"	
47		x	x	REPSEA VIM JIP	Improved prediction of loads on moorings & risers	
48		x		Develop Tool to inspect and detect cracks in risers/ tendons from OD (?)		

50			x	Collection of Real World Corrosion Data	Has taken place in industry but we still need to share learnings with rest of industry (SCORCH JIP was good work)	
52				Offshore P/F "Fax" (Facts)	Like Carfax reports: 3rd party platform data tracker	
55		x		Change in Metocean criteria?	1) Are there simple ways to bridge to new criteria? 2) Platform motion (?) 3) Loop current: data, analysis, consequences chart included	

6 Forum Attendees

This list includes all those who were present at the Forum.

Last Name	First Name	Company / Organization:
Andujar-Ferra	Loammi	ABS
Garcia	Sharon	ABS
Hua	David	ABS
Liu	Shewen	ABS
Simpson	Ian	ABS
Wang	Sue	ABS
Washington	Dan	AMOG Consulting
Beattie	Mike	Anadarko Petroleum Corporation
Van Scyoc	Karl	Anadarko Petroleum Corporation
Wittnebert	Jake	Anadarko Petroleum Corporation
Yiu	Flora	Anadarko Petroleum Corporation
Horton	Bryan	Arup
Poulos	Nancy	Athena Consulting Inc.
Russell	Mark	Athena Consulting Inc.
Tillman	Jason	Athena Consulting Inc.
Bangs	Adam	BHP Billiton Petroleum
Xia	Dingwu	BP / GoM Floating System Integrity
Versowsky	Paul	BSEE
Hoshman	Russell	BSEE, DOI
Deschamps	Rodney	Chevron
Ma	KT	Chevron
Seah	Robert	Chevron
Stear	James	Chevron
Kusinski	Greg	Chevron Energy Technology Company
Prabhu	Milind	Chevron Energy Technology Company
Abadin	Jose	Chevron USA - GOM

Gomes	Joe	Chevron, DeepStar
Warren	Laura	Clarus Subsea Integrity
Yu	Liang	ConocoPhillips
Malinowski	Grzegorz	DNV GL
Sharma	Partha	DNV GL
Lu	Jenny	DNVGL
Gallagher	Dan	Energo Engineering
Roberts	Craig	Energo Engineering
Balasubramanian	Sathish	ExxonMobil Production Company
Morse	Steve	Freeport McMoRan Oil & Gas
Beer	Paul	Freeport-McMoRan Oil & Gas
Landry	Paul	Freeport-McMoRan Oil & Gas
Meaux	Jerome	Freeport-McMoRan Oil & Gas
O'Neil	Chris	Freeport-McMoRan Oil & Gas
Ghoneim	Abdel	Frontier E&D
Nguyen	Phi	GE Oil & Gas
Cattell	Alan	Global Maritime
Morandi	Alberto	Global Maritime - Americas
Hidinger	Pam	Hidinger Offshore & Marine
Aggarwal	Rajiv	Independent Consultant
Irick	Matthew	intelliSIMS
Veselis	Todd	InterMoor Inc.
Longridge	Kent	InterMoor Inc.
Burk	Jim	JD Burk & Associates
Dice	Jeff	Jeff Dice Consulting LLC
Byrnes	Scott	LLOG
Mullett	Craig	LLOG
Hughes	Andrew	London Offshore Consultants
Marsh	Greg	MCOP/MII
Hogelin	Pat	Noble Energy
Webb	Tyler	Noble Energy
Ronan	Steven	Northwest Technical Solutions, LLC
Barbara	Angie	Offshore Operators Committee
Southworth	Greg	Offshore Operators Committee
Wolfgang	Rebecca	Offshore Operators Committee
Zimmerman	Evan	Offshore Operators Committee
Roland	Gregory	Petrobras America Inc.
Masson	Craig	RiserTec, Inc.
Cao	Peimin	SBM Offshore
Ford	Ben	SBM Offshore
Jordan	Randy	SBM Offshore
Hodges	Stephen	Shell

Kim	Minkwan	Shell
Wagner	Marc	Shell
Gonzalez	Carlos	Shell E&P
Kenney	Jack	Shell International
Maniar	Dilip	Stress Engineering Services, Inc.
Renzi	David	Stress Engineering Services, Inc.
Pinho	Scott	TanksALot
Robison	Scott	TanksALot
Reynolds	Capt. Josh	USCG D8
Gebara	Joseph	Vigilant Innovative Solutions Inc.
Murphy	Todd	W&T Offshore
Greig	Alan	W&T Offshore, Inc.
Converse	Robin	Williams
Gogu	Chandrasekhar	Williams
Park	YC	Williams
Cummins	Travis	Wood Group
Zwerneman	Farrel	Wood Group