

# Subsea Production Market and Industry Teaming

Presented by:

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Endeavor Management

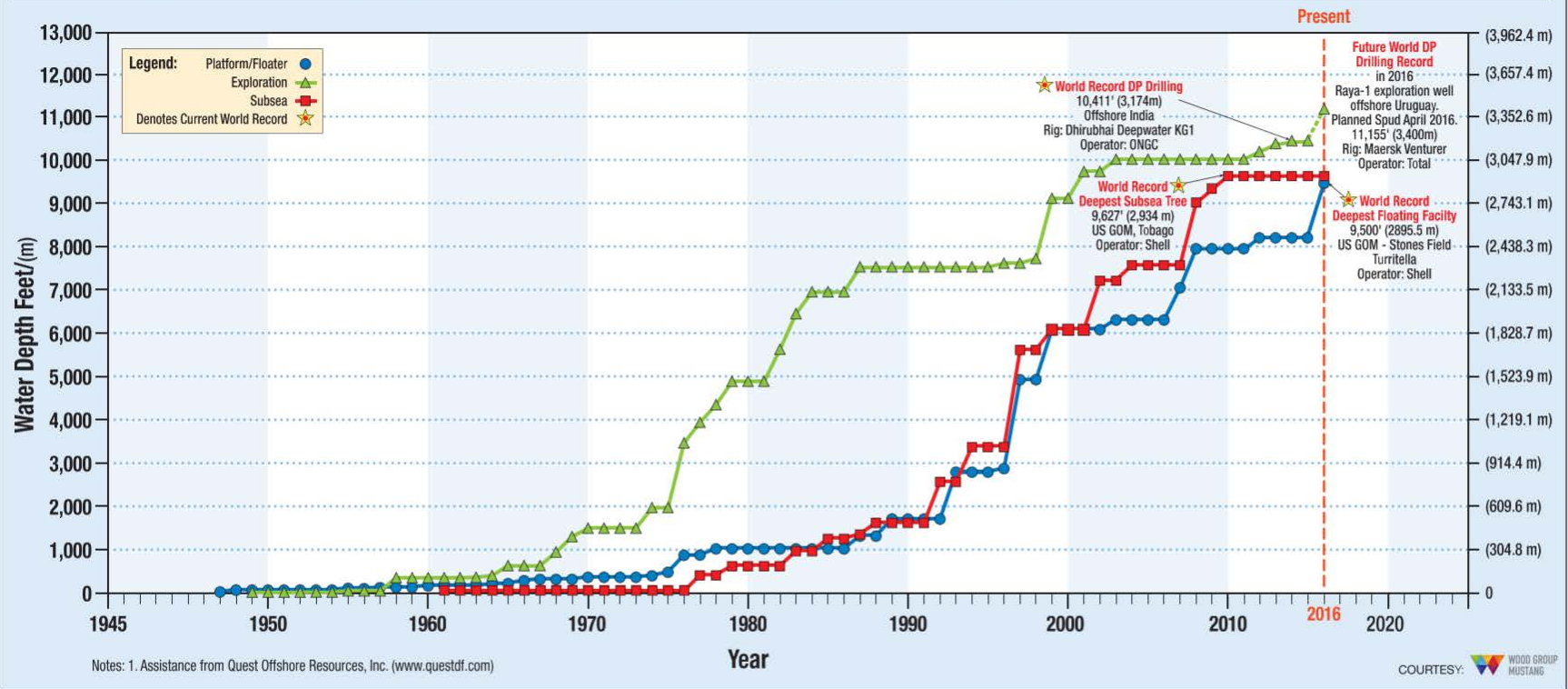
**February 28, 2017**

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# Worldwide Progression of Water Depth Capabilities for Offshore Drilling & Production

Worldwide Progression of Water Depth Capabilities for Offshore Drilling & Production (Data as of March 2016)



1. Deepwater drilling began long before we had production capability
2. New drilling record of 11,155 ft. set offshore Uruguay in April 2016
3. New floating production record of 9,500 ft. set at Stones project in GOM in Sept, 2016

Courtesy of Offshore Magazine,  
Data as of March 2016

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# Subsea Market Segment Overview

- Subsea is a growing subset of the offshore oil and gas industry which includes:
  - Field architecture planning and systems design
  - Hardware design and manufacturing
  - Installation activities, including vessel design and operation
  - Project management and offshore project supervision
  - Operators (oil and gas companies), especially those who are continually pushing the envelope using subsea
- Subsea is still a relatively young industry and will be a significant industry segment for the future, especially for deepwater.

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# Subsea Acronyms

## Subsea Production Systems (SPS)

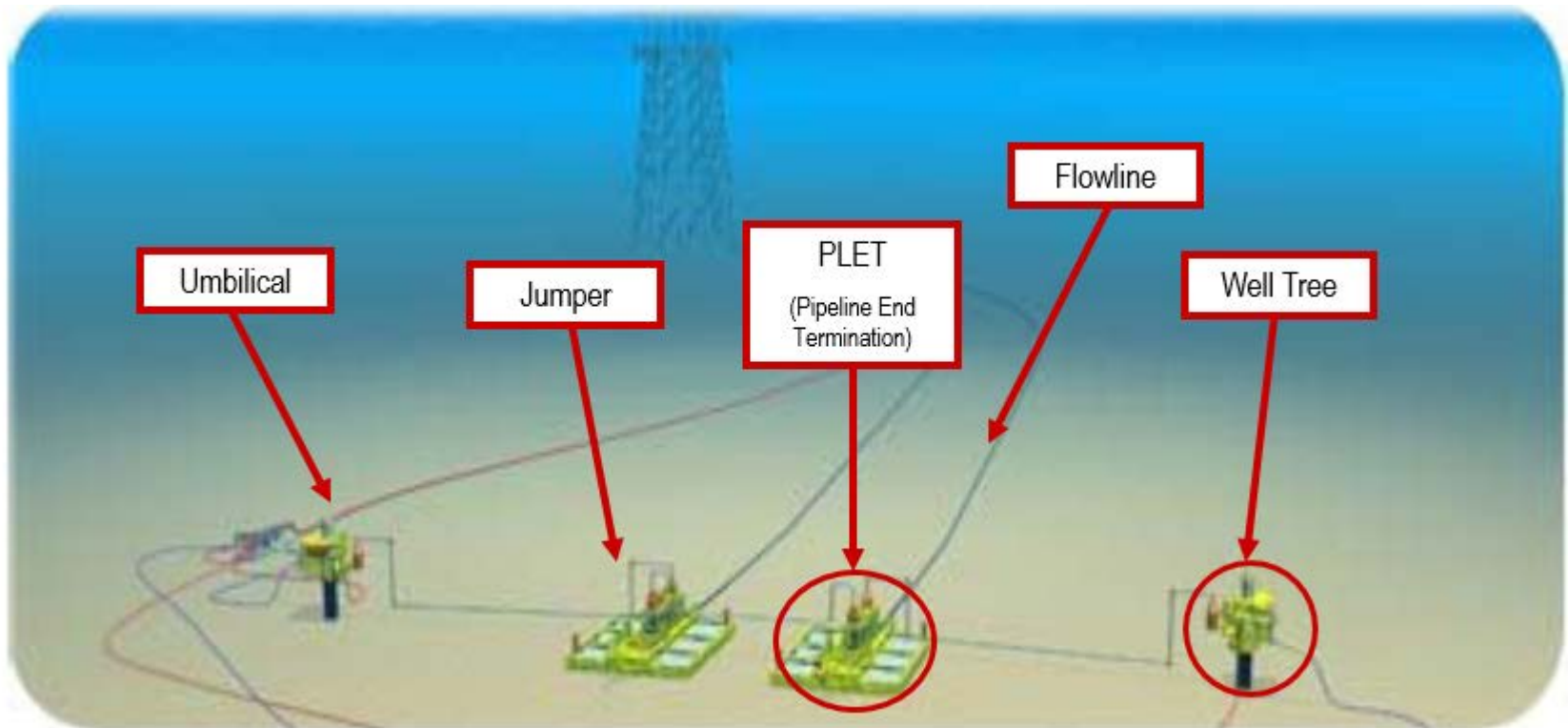
- Subsea Christmas Trees
- Manifolds
- Subsea Processing Systems
- Control Systems

## SURF

- Subsea (Hardware-PLEMs, PLETs, Jumpers)
- Umbilicals
- Risers
- Flowlines

# Example of a Small Subsea Project

Petrobras Cottonwood (2200 ft water depth)

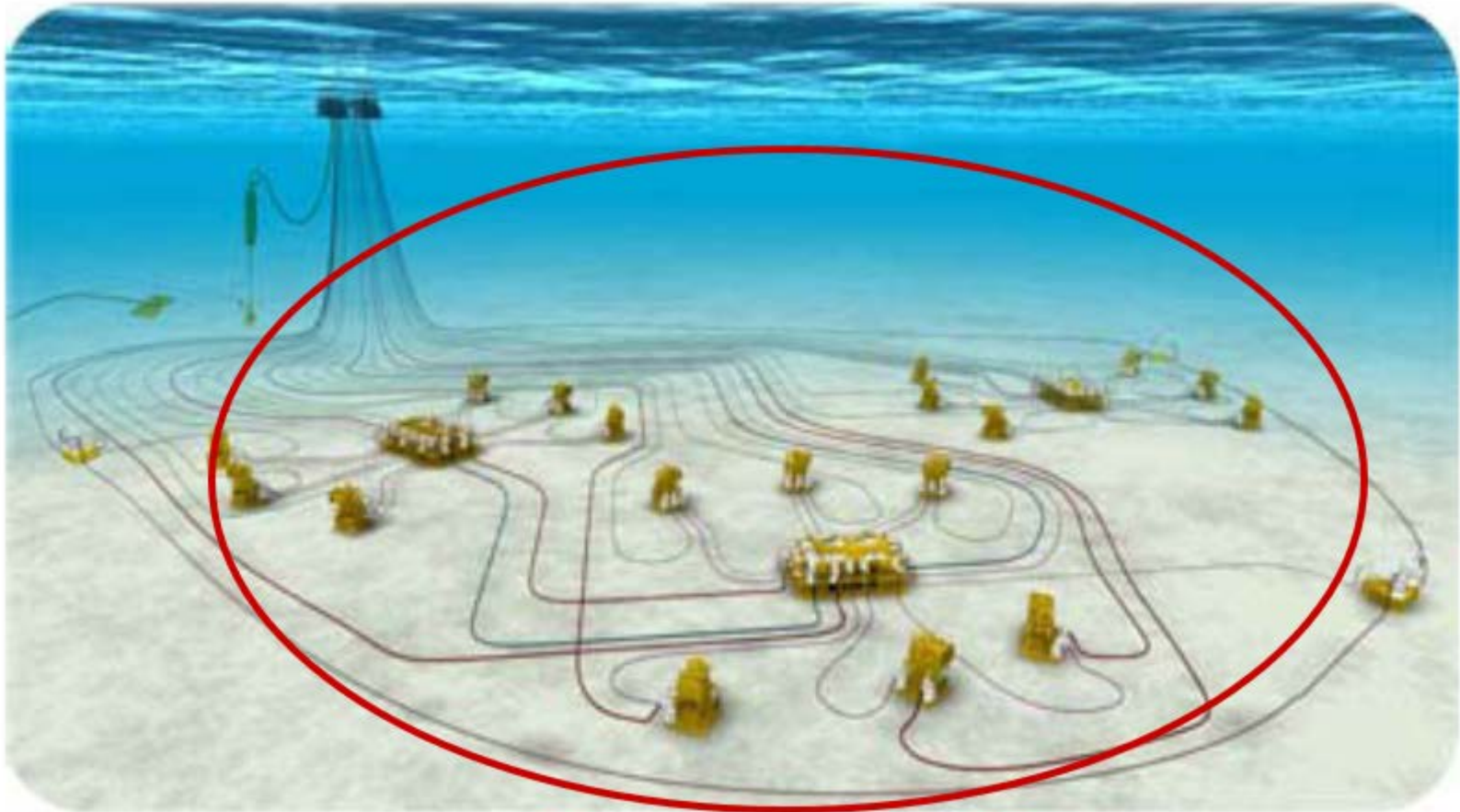


*Courtesy of FMC Technologies*

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# Example of a Large Subsea Project

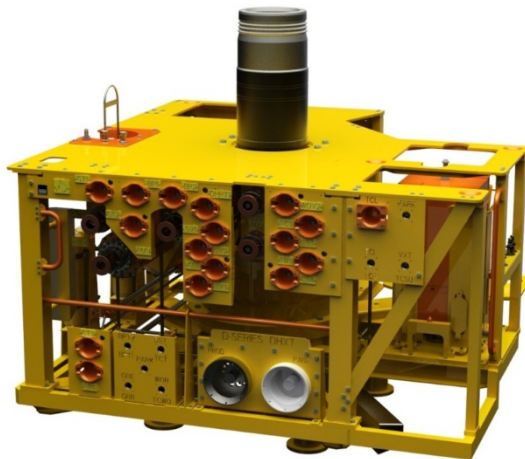
Petrobras Roncador (6600 ft water depth)



*Courtesy of FMC Technologies*

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# Two Types of Trees



**Horizontal**

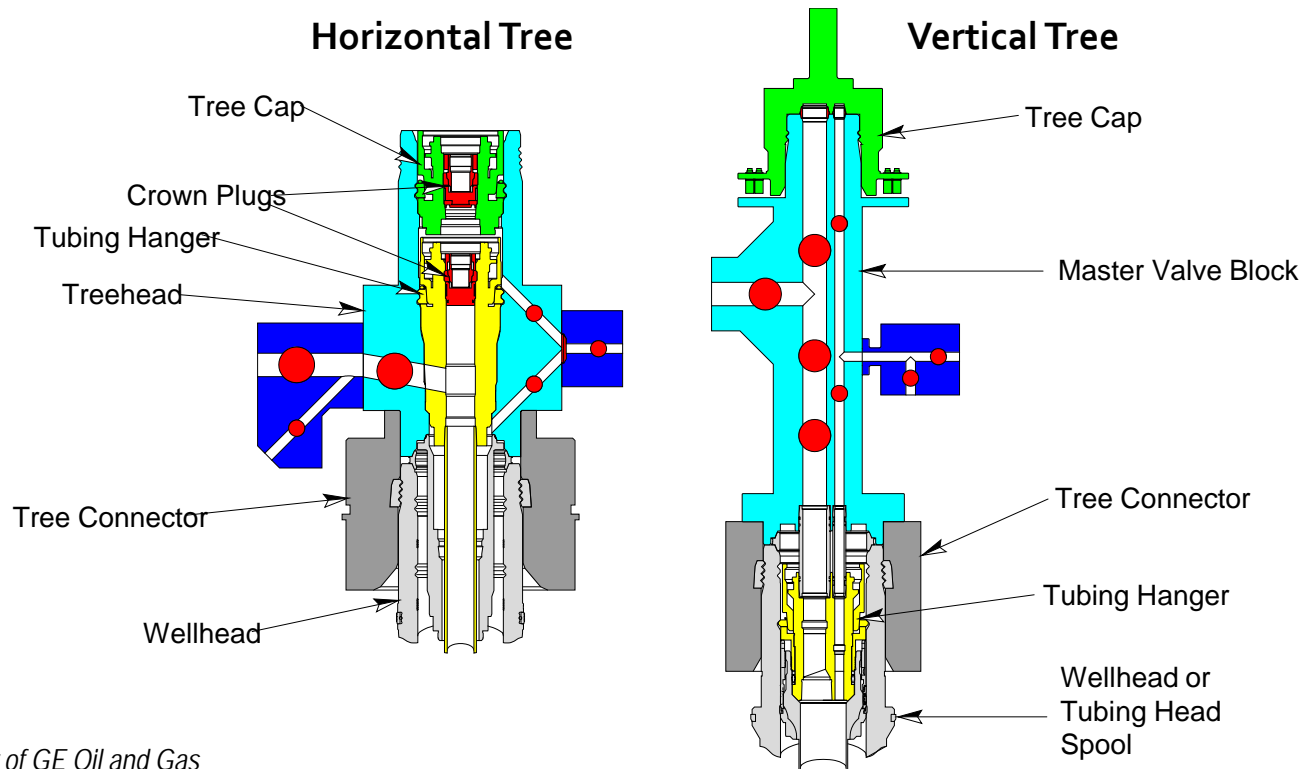


**Vertical**

*Courtesy of GE Oil and Gas*

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# Subsea Tree Configurations

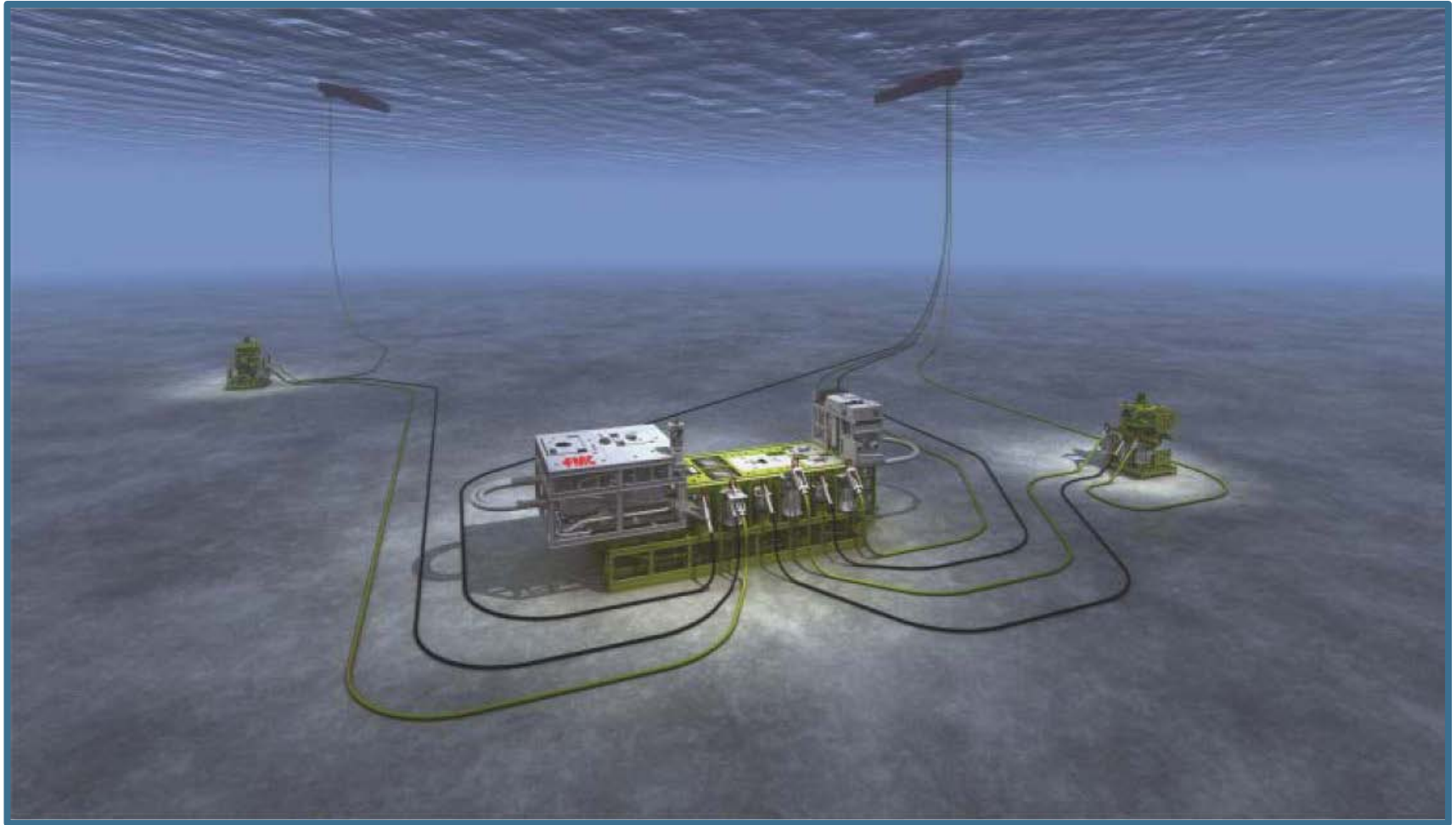


*Courtesy of GE Oil and Gas*

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# Subsea Processing Overview



Source: FMC Technologies

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# Types of Subsea Processing

- Subsea Boosting (including pumping)
  - Subsea Raw Water Injection
- Subsea Separation and Processing
- Subsea Gas Compression

# Benefits of Subsea Processing

- Increase a well's recovery rate to enhance project economics (greenfield and brownfield)
- Moves “boosting and processing” to the seafloor from the surface (platform or floating production system topside)
- Reduce topside weight
- Can allow production from subsea to shore

# Most Likely Subsea Processing Opportunities

- Deepwater-Generally in excess of 2000 ft
- Large Subsea Developments - Usually producing to a floating production system
- Major Oil Companies who have already tried subsea processing
- Geographic areas having the above criteria
  - Expected to be Brazil, GoM, W. Africa and North Sea

# Legacy Subsea Manufacturers

## Subsea Trees/Manifolds/Processing Systems

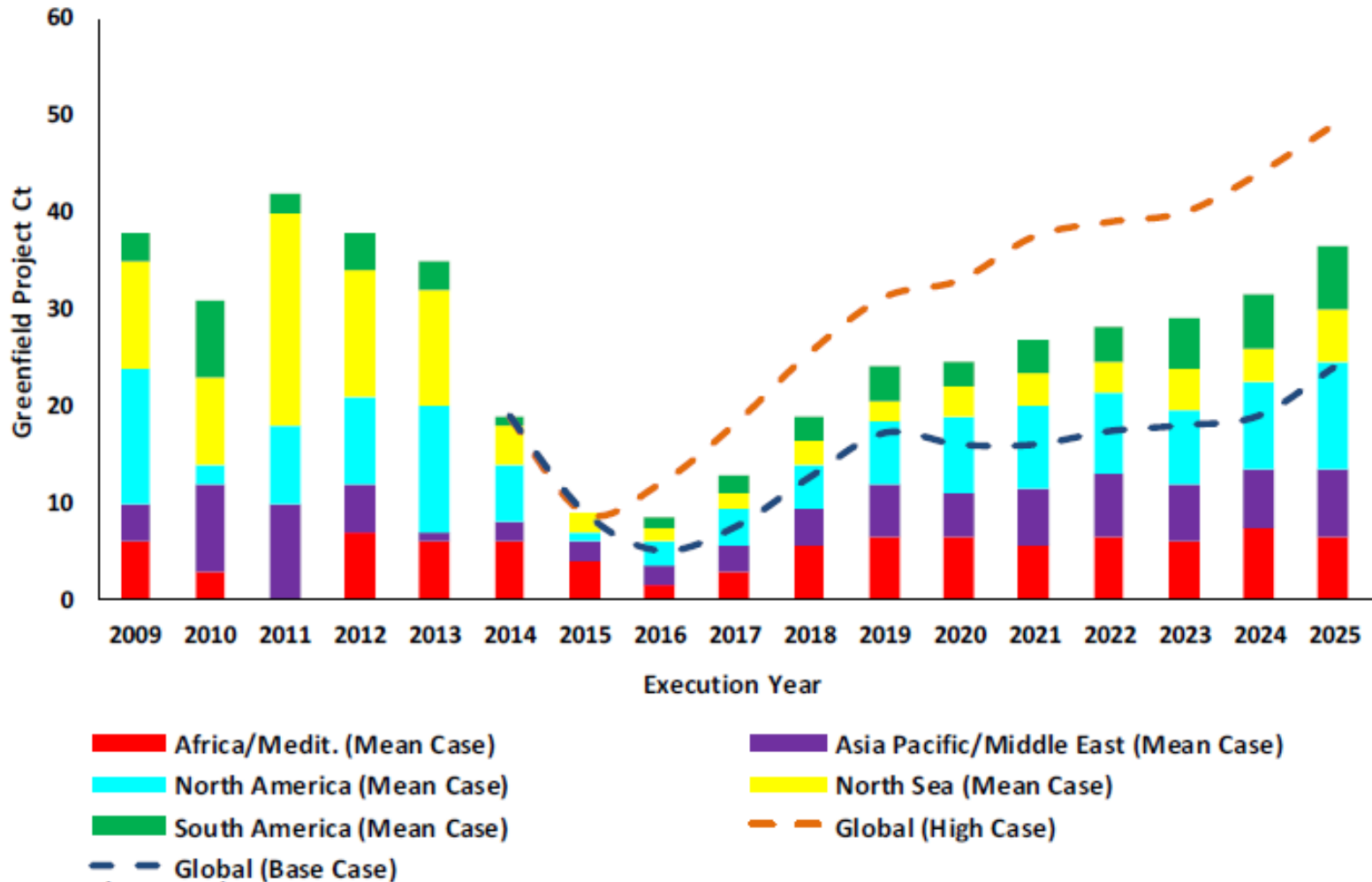
- Aker Solutions
- Dril-Quip
- FMC
- GE Oil and Gas (previously Vetco)
- OneSubsea (previously Cameron)

## Other

- Proserve
- Oceaneering

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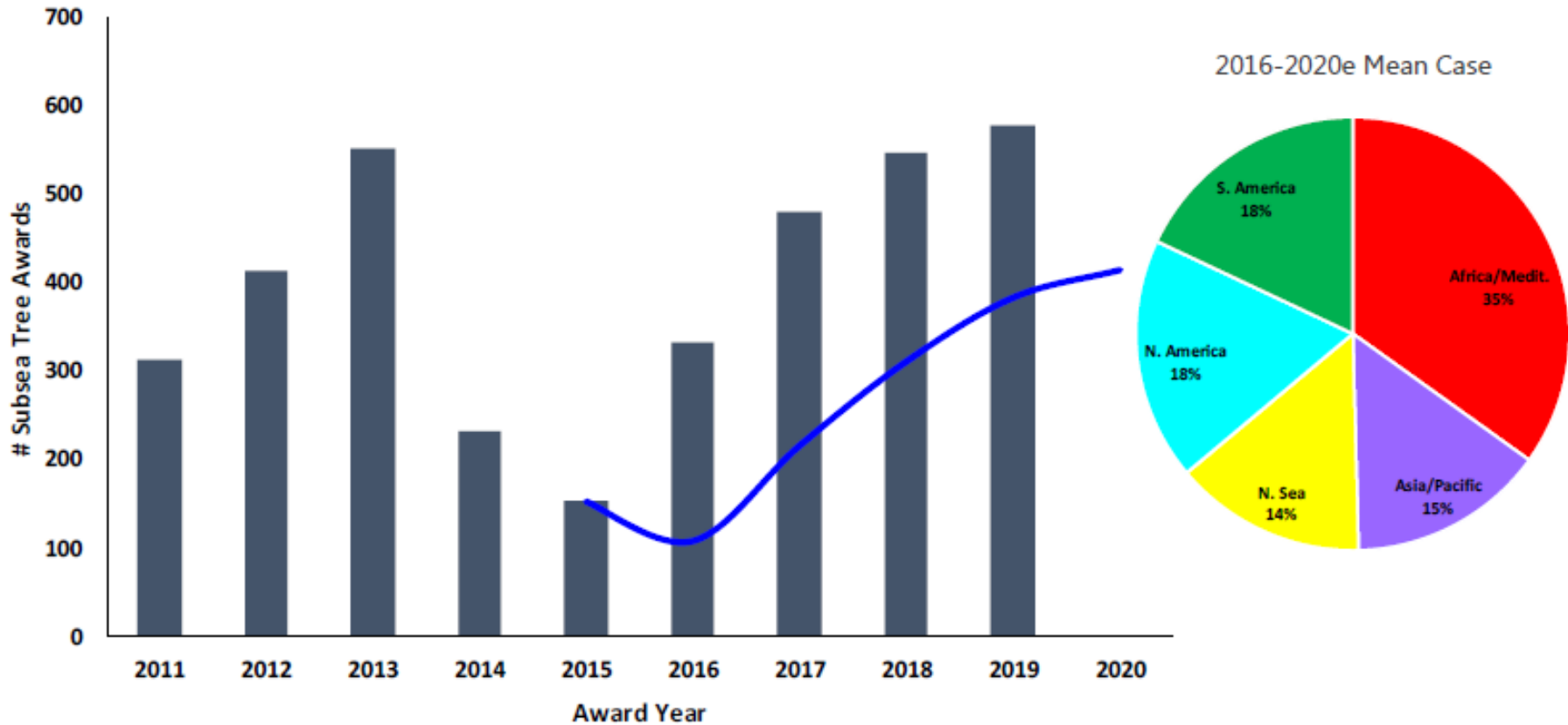
# Global Deepwater Project Executions - Greenfield



Source: Quest Subsea Database

# Near-Term Impact on Global Subsea Market

2016-2020e = Preliminary August 2016 Forecast\*



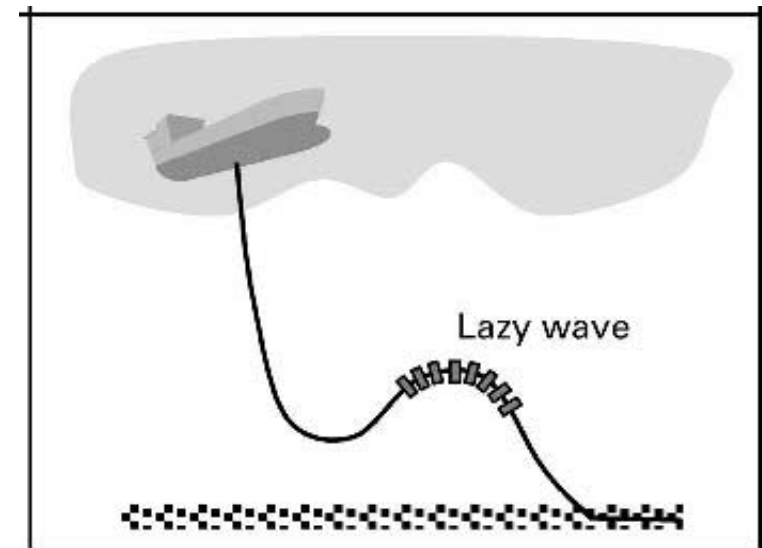
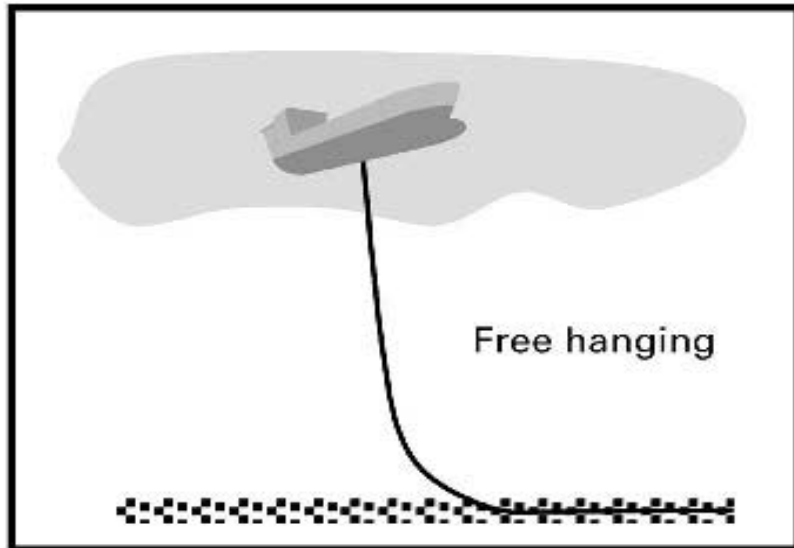
- 2016-2020e High, Mean and Case forecast represent preliminary revisions to May 2016 forecast and are subject to additional change prior to release or the Quest Subsea Database August 2016

■ Global Mean Case @ Q4 2014      — Global Mean Case (Prelim Aug 2016)

Source: Quest Subsea Database

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# Production Risers



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# Flexible Pipe Cross-Section



**Typical Flexible Riser Structure**

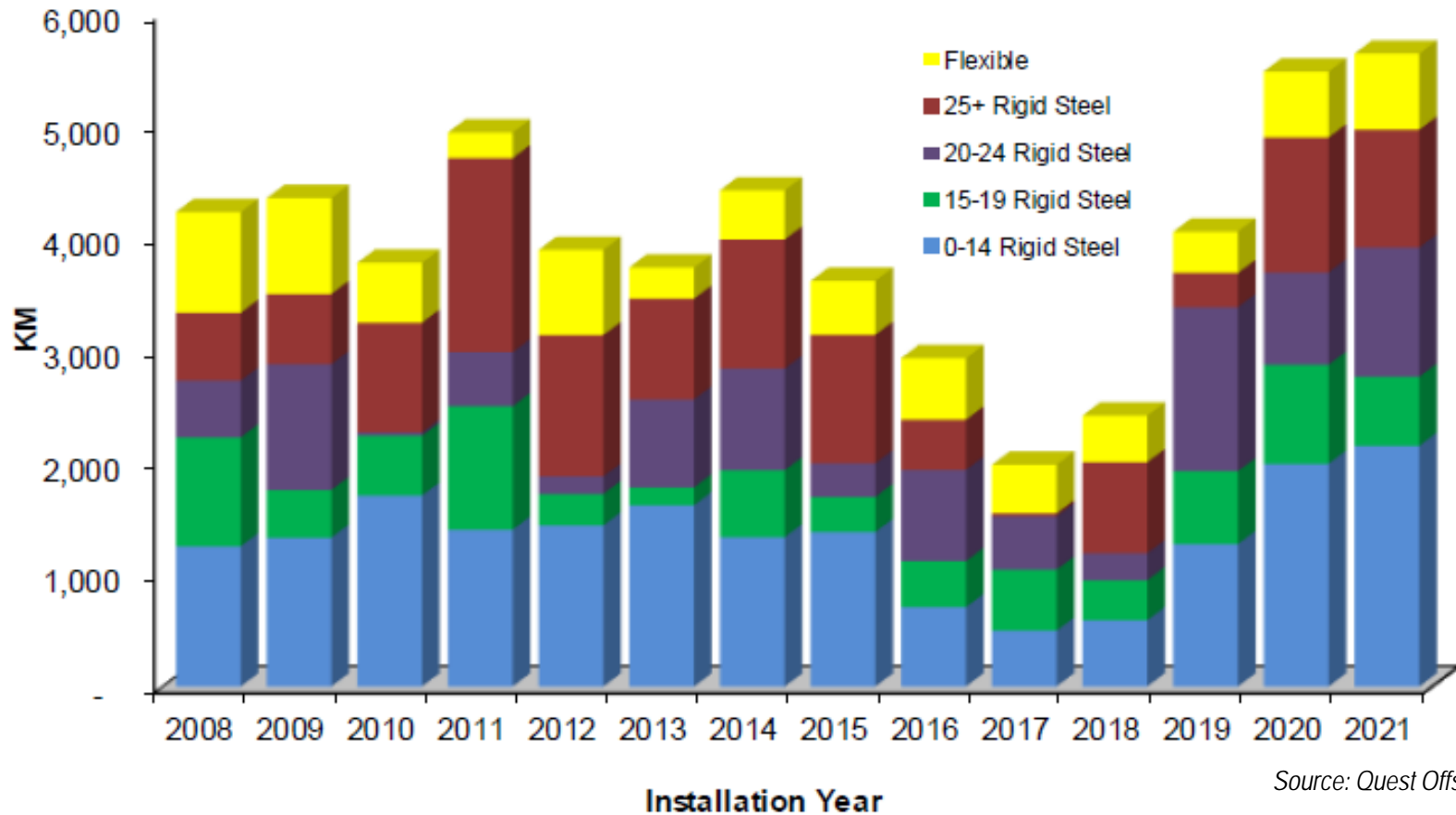
# Flexible Pipe Manufacturers

- TechnipFMC
- GE Oil & Gas (Wellstream)
- NOV (NKT)
- Magma

# Worldwide Pipeline Demand

2008 – 2021

*West Nile Delta, Shah Deniz Phase 2, Bardegg 2, Baronia and Rota 3 Pipeline installations contribute to 20-24" increase in 2016 & Iran Oman India Gas pipeline in 2019.*

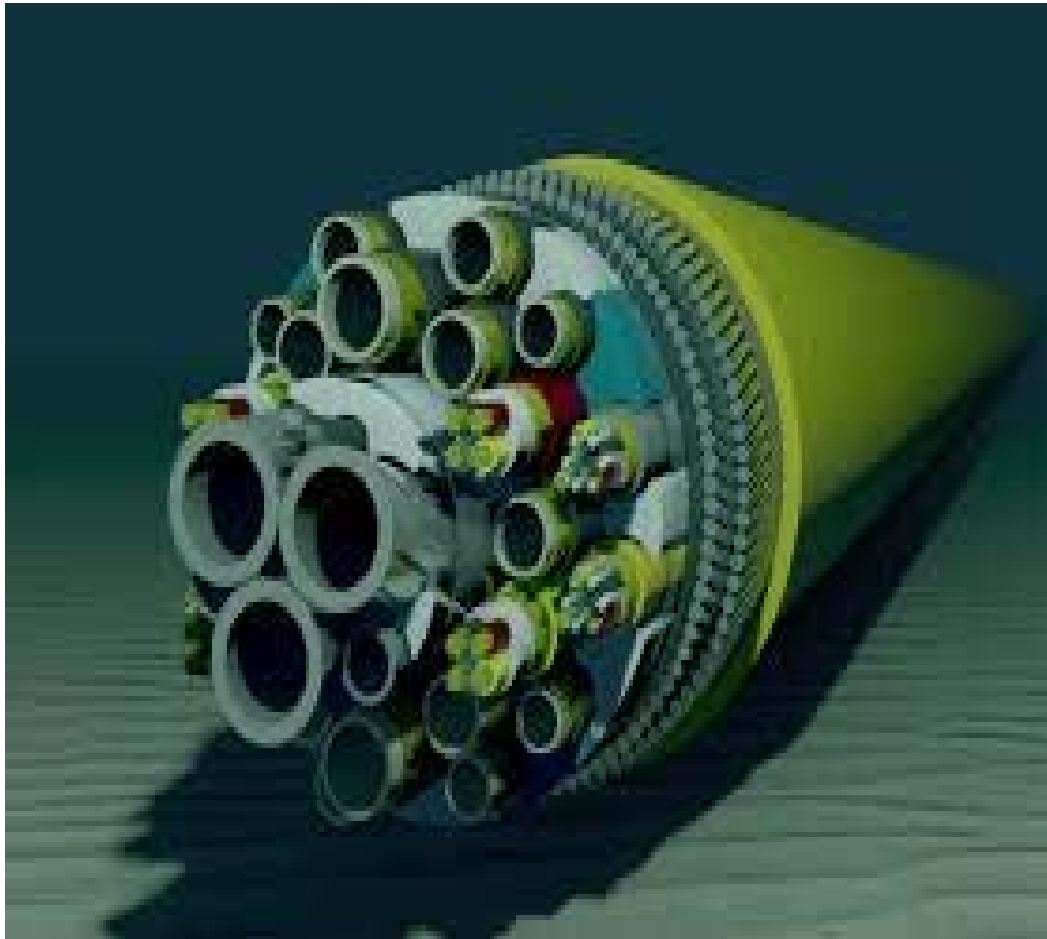


Source: Quest Offshore

Source: Quest Pipeline Prospective

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# Umbilical Cross-Section



Source: Technip

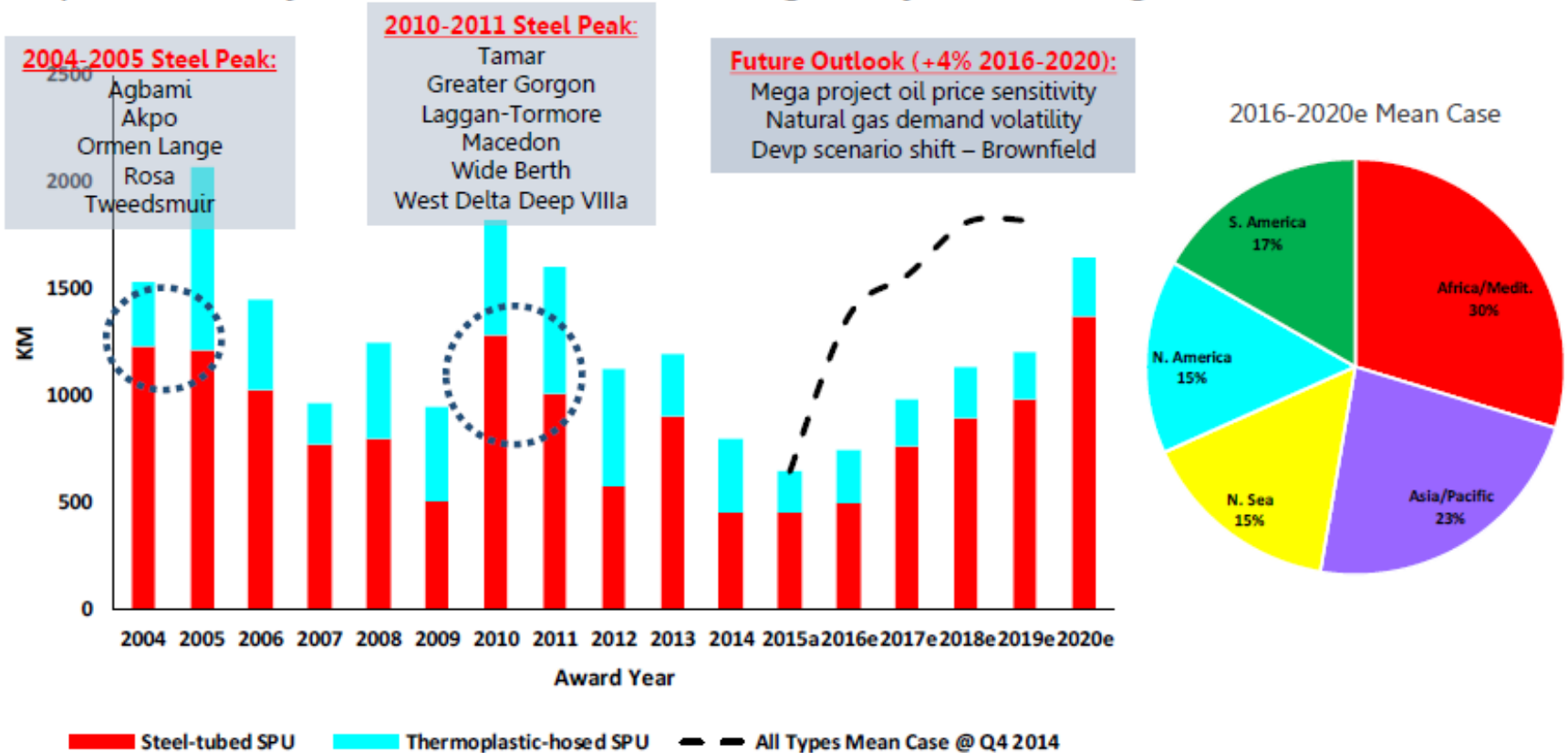
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# Umbilical Suppliers

- TechnipFMC (Duco)
- Oceaneering
- Nexans
- Alcatel
- JDR
- MFX

# Global Subsea Production Umbilical Demand

Optimum Project Mix Drives Peak – Mega Projects & Long Tiebacks (50+KM)\*



• 2016-2020e High, Mean and Case forecast represent preliminary revisions to May 2016 forecast and are subject to additional change prior to release or the Quest Subsea Database August 2016

Source: Quest Subsea Database

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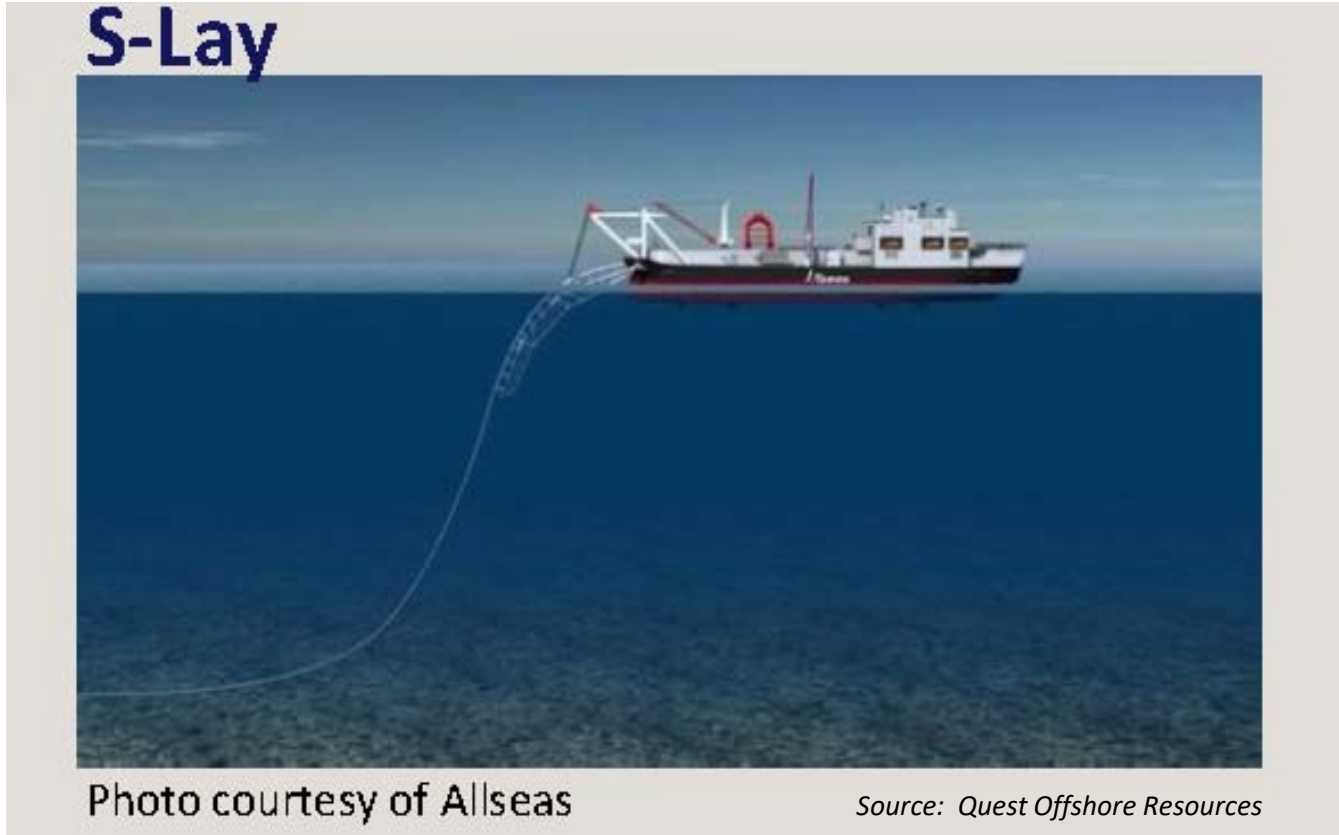
# Subsea Construction Vessels



*Source: Technip*

# Pipeline Installation Methods

## S-Lay Pipeline Installation



During S-lay pipeline installation, pipe is eased off the stern of the vessel as the boat moves forward. The pipe is eased off the stern of the vessel as the boat moves forward. The pipe curves downward from the stern through the water until it reaches its final destination on the seafloor. As more pipe is welded in the line and eased off the boat, the pipe forms the shape of an "S" in the water.

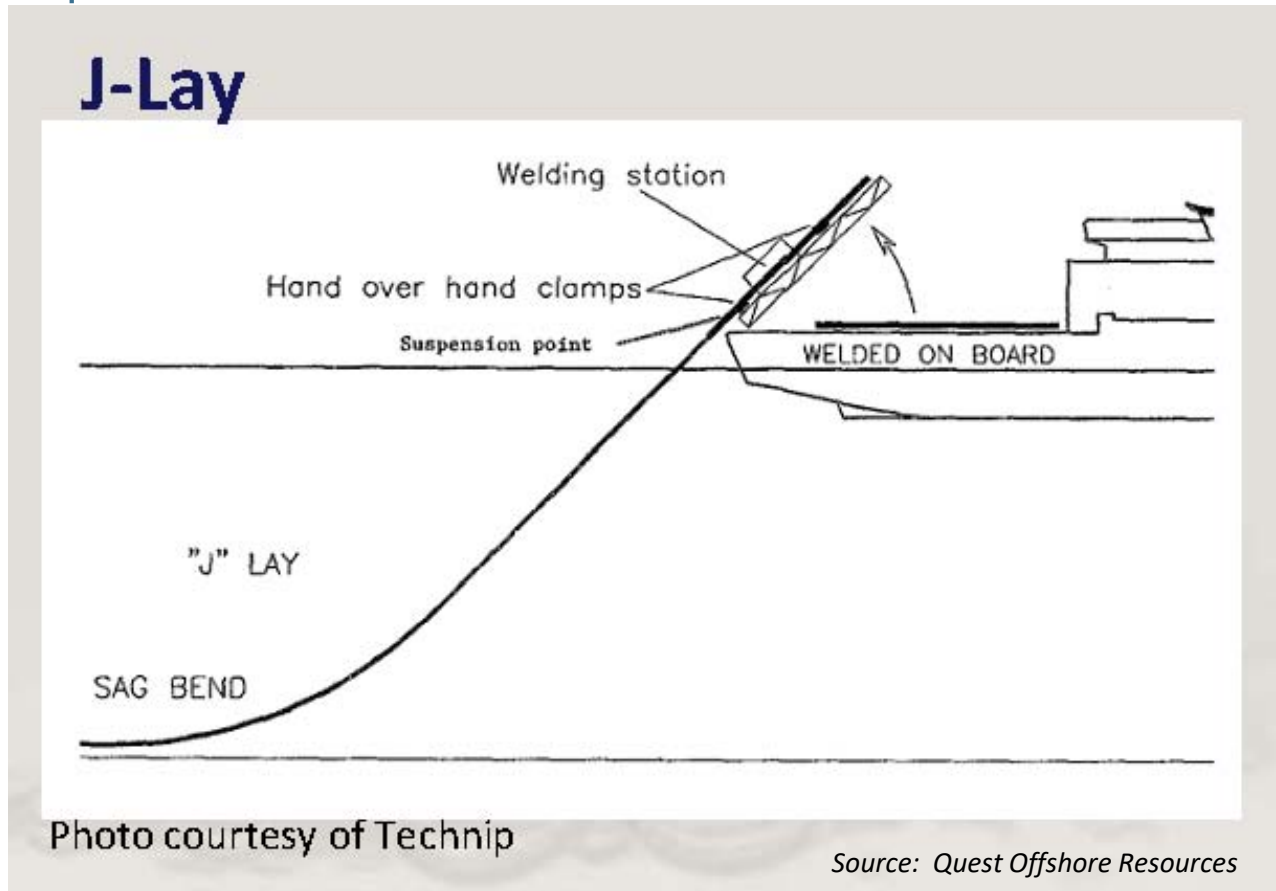
*Definition Source: Rigzone*

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# Pipeline Installation Methods

## J-Lay Pipeline Installation



J-lay pipeline installation puts less stress on the pipeline by inserting the pipeline in an almost vertical position. Pipe is lifted via a tall tower on the boat, and inserted into the sea. The pipe only curves once in J-lay installation, taking on the shape of a "J" under the water. The reduced stress on the pipe allows J-lay to work in deeper water depths.

Definition Source: Rigzone

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# Pipeline & Umbilical Installation Methods

## Reel Lay Pipeline Installation

### Reel Lay



Photo courtesy of McDermott

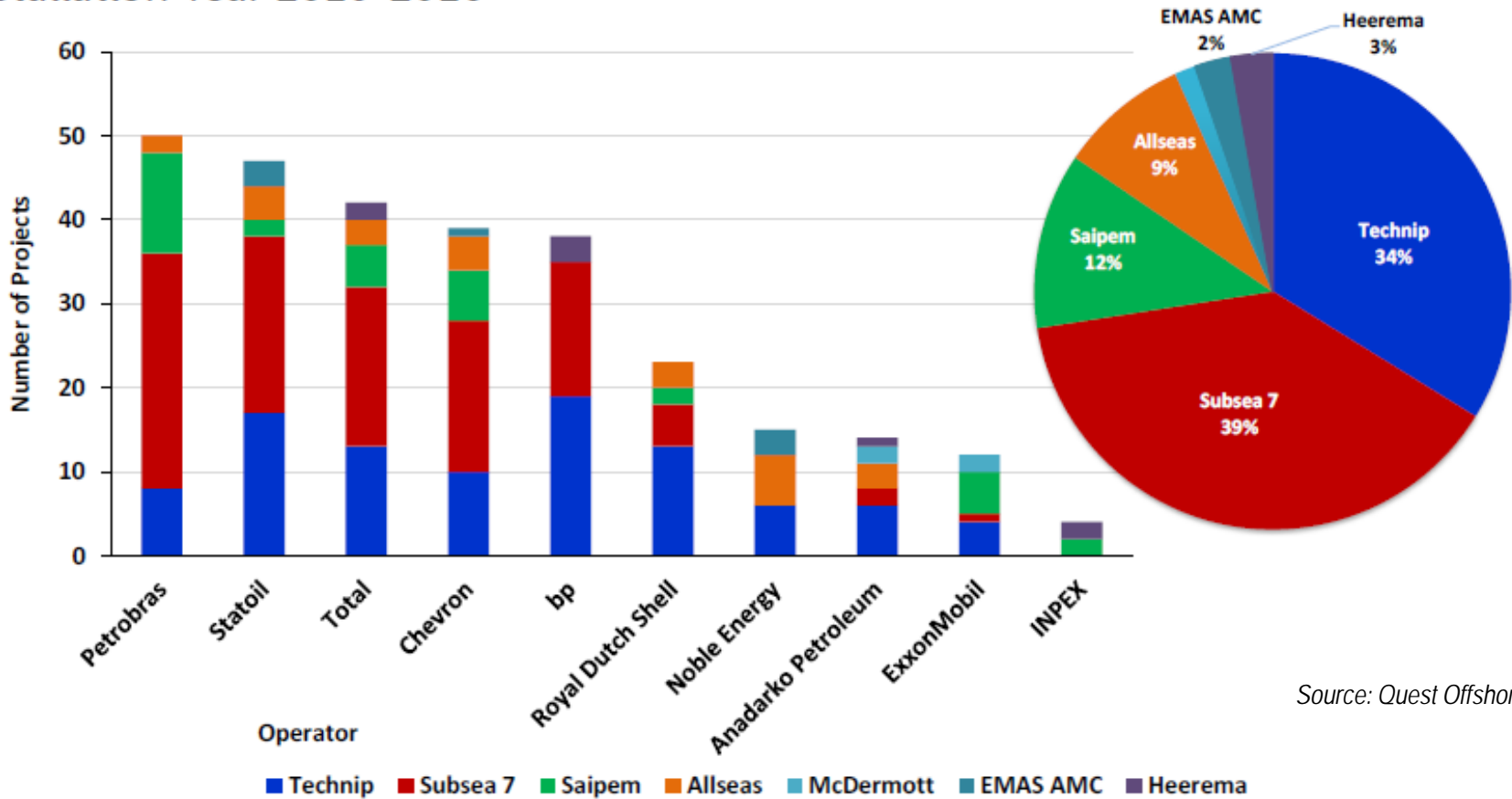
Source: Quest Offshore Resources

Reel barges contain a vertical or horizontal reel that the pipe is wrapped around. Reel barges are able to install both smaller diameter pipe and flexible pipe. Horizontal reel barges perform S-lay installation, while vertical reel barges can perform both S-lay and J-lay pipeline installation. Reel pipe is lifted from the dock to the vessel, and the pipe is simply rolled out as installation is performed.

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# Top 10 Operators All Types Pipelines – Project Count

Installation Year 2010-2016



Source: Quest Offshore

Source: Quest Marine Construction Vessels

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# Major Subsea Construction Vessel Owners

- Subsea 7: Approx. 27 Active Vessels (divested 4 chartered and 8 owned as of early 2016)
- Technip: Approx. 21 Active Vessels (divested 8 in 2015 and 2016)
- Saipem: Scrapped 4 vessels
- Allseas
- Emas Chiyoda
- McDermott
- Heerema

*Source: Quest Marine Construction Vessels*

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# Subsea Well Intervention

- The number of subsea wells continue to grow and the age of all wells becomes greater each day
- Increased recovery from all wells, especially subsea, is becoming a key focus and sometimes a mandate (Norway)
- Operators are looking for lower cost options in well intervention
- Larger intervention vessels with more robust capabilities can provide services not available in the past
- Teaming of key players in the industry are offering new capabilities
  - FTO (FMC and Chouest)
  - OneSubsea with Helix
  - Offshore Drilling Companies and ??????

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Time to Team ?

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# Extreme teaming !



Source: Upstream

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# Industry Collaboration

*Seeking Design, Cost, & Execution Synergy across the Offshore Supply Chain*

**OneSubsea**  
A Cameron & Schlumberger Company

**Schlumberger**

**CAMERON**

OneSubsea Joint Venture  
Integrated Subsea Production Systems & Well Design

**BAKER HUGHES**

**AkerSolutions**

Global Alliance Agreement  
Subsea Production, Processing, Well Completions, Artificial Lift

**SAIPEM**

**AkerSolutions**

Cooperation Agreement  
Subsea Technology & EPCI Cooperation

**EMAS**

**CHIYODA CORPORATION**

Emas Chiyoda Subsea JV  
Offshore EPCI, Conceptual, and FEED Studies

**Technip**

**HEEREMA**

Global Alliance Agreement  
Ultra-Deepwater EPCI

**OneSubsea**  
A Cameron & Schlumberger Company

**Schlumberger**

**HELIX**

Global Alliance Agreement  
Subsea Well Intervention

**OneSubsea**  
A Cameron & Schlumberger Company

**subsea 7**

Global Alliance Agreement  
Integrated Subsea & SURF development solutions

**KBR**

**subsea 7**

Global Alliance Agreement  
Subsea Concept, FEED Engineering & Design

**Schlumberger**

**Petrofac**

Co-Operation Agreement  
Production Services & Production Enhancement

**CHIYODA CORPORATION**

**xodus GROUP**

**SAIPEM**

Xodus Subsea Joint Venture  
Global Subsea Engineering (FEED, Eng, Consultancy)

**FORSYS SUBSEA**

**FMC Technologies**

**Technip**

Forsys Subsea Joint Venture  
Integrated Subsea, SURF Systems & Field Design

**io**

**GE Oil & Gas**

**MEDERHOLT**

io Consulting Joint Venture  
SURF & Field Design, FEED Studies

**2012 - 2013**

**2014**

**2015**

Courtesy of Subsea 7

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# Most Recent Combinations (2016 and 2017)

- Technip and FMC Merger
- GE Oil & Gas and Baker Hughes
  - What about Aker Solutions/ Baker Hughes Alliance?
  - Still teamed with McDermott?
  - io still intact ?
- Do they remain independent ?
  - Oceaneering
  - Dril-Quip
  - Proserve

# OneSubsea, Subsea 7 form alliance

- OneSubsea and Subsea 7 entered into an agreement to form a non-incorporated alliance to design, develop and deliver integrated subsea development solutions for the oil and gas industry.
- The duo will focus on combining subsurface expertise, subsea production systems (SPS), subsea processing systems, subsea umbilicals, risers and flowlines systems (SURF), and life-of-field services.

Source: <http://www.oedigital.com/component/k2/item/9725-onesubsea-subsea-7-form-alliance>  
July 13, 2015

The logo for Endeavor, featuring the word "Endeavor" in a blue serif font. Below the text is a solid red horizontal bar.

# TechnipFMC Begins Operations as a Combined Company

January 17, 2017

- TechnipFMC (NYSE and Euronext: FTI) announced that it is operating as a unified, combined company following completion of the merger of FMC Technologies and Technip.
- The combined company can boost efficiency, lower costs, and accelerate schedules.
- Formed through the combination of two market leaders with complementary capabilities and technologies, the company builds on early involvement and integrated solutions to simplify field architectures and decision-making.
- Uniquely positioned to deliver greater efficiency across project lifecycles from concept to project delivery and beyond.

<http://www.technipfmc.com/en/media/press-releases>

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# TechnipFMC ROV

A TechnipFMC Remotely Operated Vehicle (ROV) is deployed to provide subsea services. Might they focus on the ROV operations segment to compete with Oceaneering?



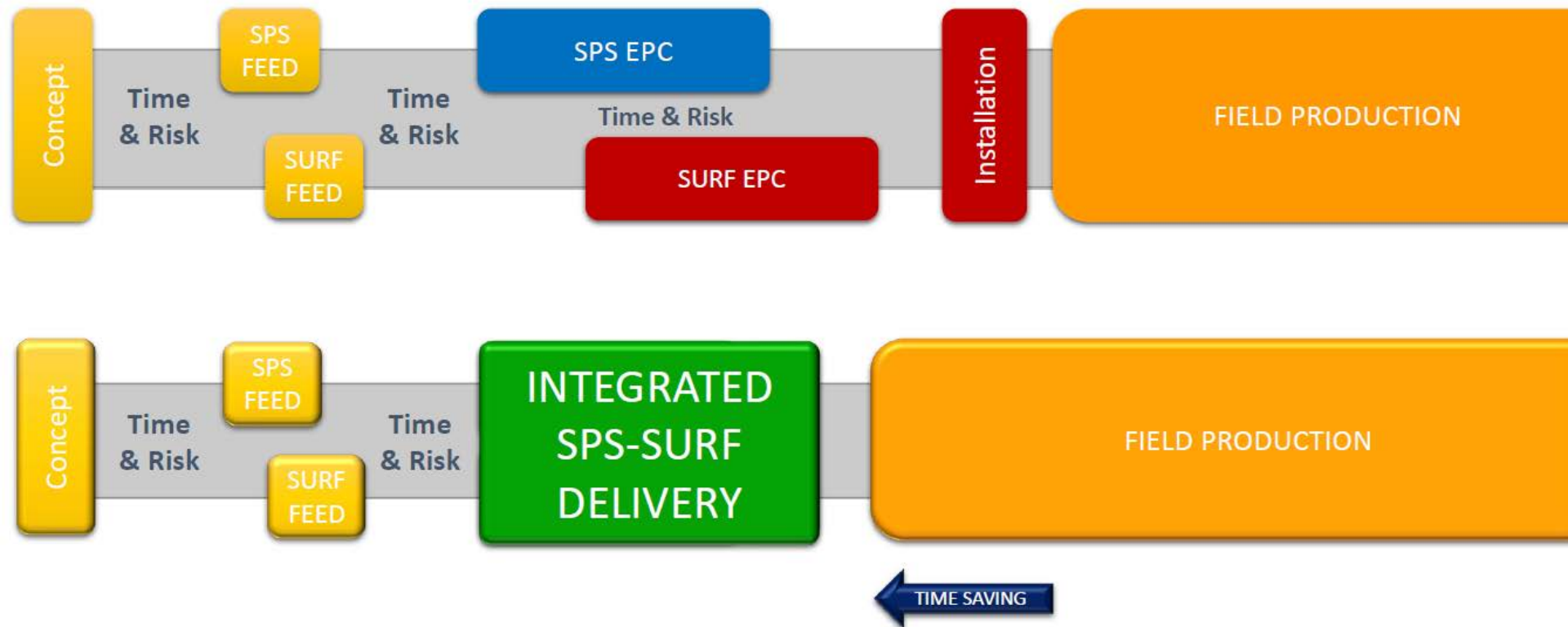
Source: © TechnipFPC plc

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# Improved field development planning (new and brownfield)

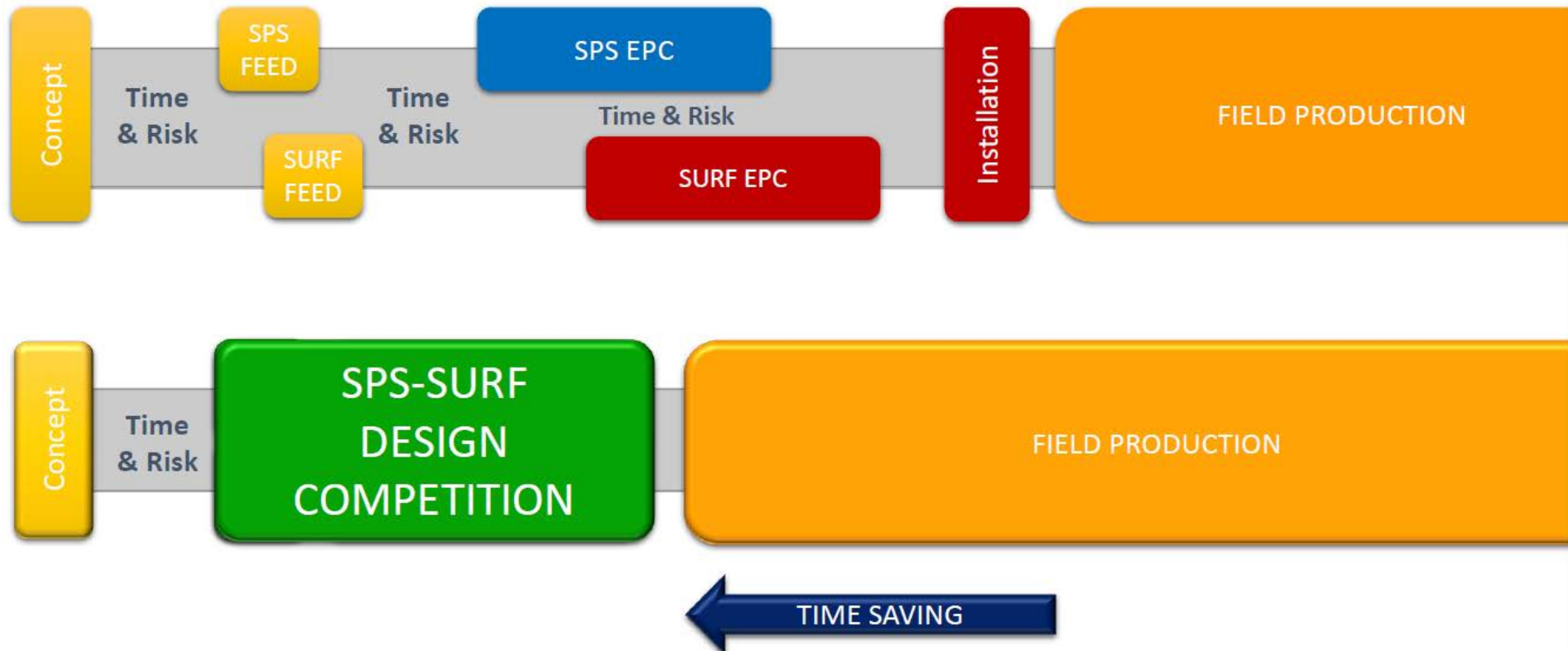
- Reduce Capex and Opex
- Increase recovery of oil and gas reserves
- Minimize interfaces between suppliers and installers
- Most new offshore fields are focused on deepwater which means floating production systems and subsea wells
- Teaming of key players in the industry is offering new combined capabilities.

# Principal Effects of Subsea Alliances



Courtesy of Subsea 7

# Principal Effects of Subsea Alliances



Courtesy of Subsea 7

# Where is the Potential Value to Projects

Shorter schedule?

Lower cost?

Increased recovery?

More production?

Better predictability?





# What are the Key Issues?

Trust between partners

Client culture

Risk sharing between partners

*Courtesy of Subsea 7*

Contractual Alignment of client and contractor goals



# The Simplistic Perspective

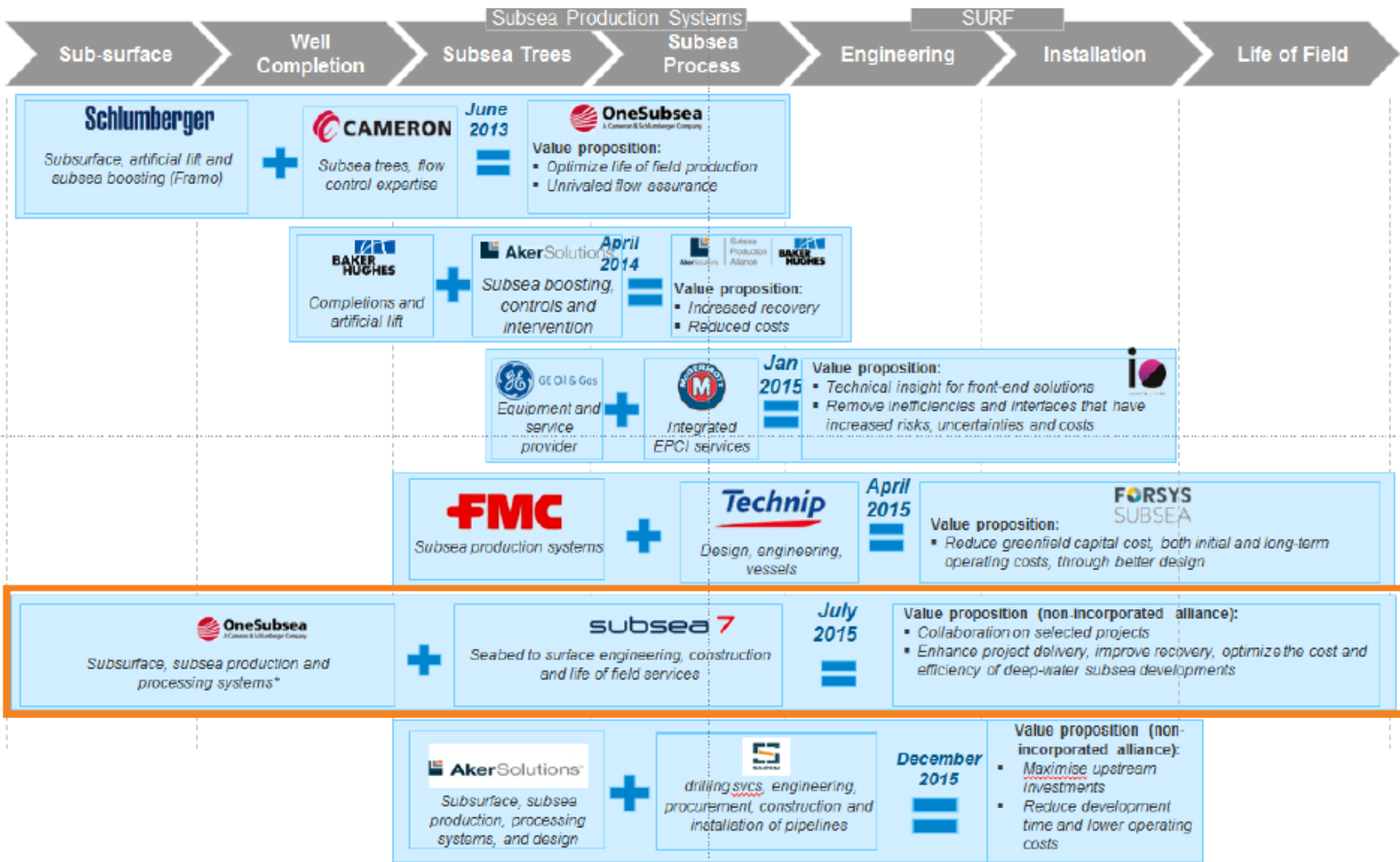
Who is best placed to manage the SPS-SURF interface?

Can we afford to continue working as we have until now?

Courtesy of Subsea 7



# SPS-SURF Alliances



Courtesy of Subsea 7

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\*OneSubsea has also initiated a JV with Chevron in order to develop subsea systems for HPHT fields.

# A Focus on Economic Outcomes

- Adaption to new economic paradigm is underway within suppliers and contractors
  - And operators?
- Early indications illustrate significant value improvement
  - Cost, Schedule, Operability and Predictability
- Improvements need to be sustainable (cultural shift)
- Market receptivity will be fueled by trust

*Courtesy of Subsea 7*

# Subsea Market Segment Summary

- New Order Volume Low
  - Operators are into the second year of severely depressed award activity as they continue to re-assess projects, reduce cost and adjust to a lower-for-longer oil price.
- Re-Designing Subsea
  - Collaboration & Consolidation within the supply chain to concentrate efforts of innovative solutions
  - Phased Projects to reduce and space out capital commitment and add transparency to project queue
  - Brownfield Support through infill drilling, IMR and subsea processing will increase in importance as in-place infrastructure ages and processing capacity is realized
- Life Extension/Life of Field Opportunities Exist
  - Install-base of subsea infrastructure remains in place and as time goes by, the need to extend life or engage end of life services will grow

*Source: Quest Subsea Database*

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