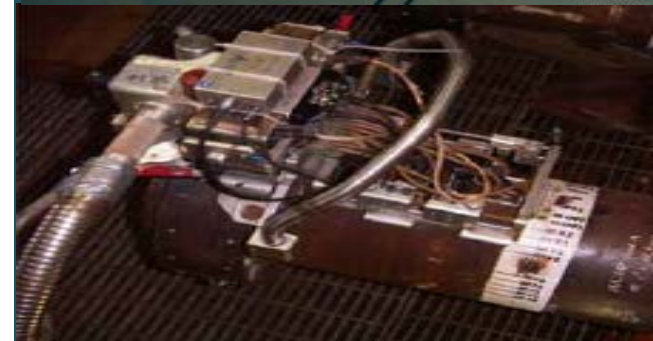
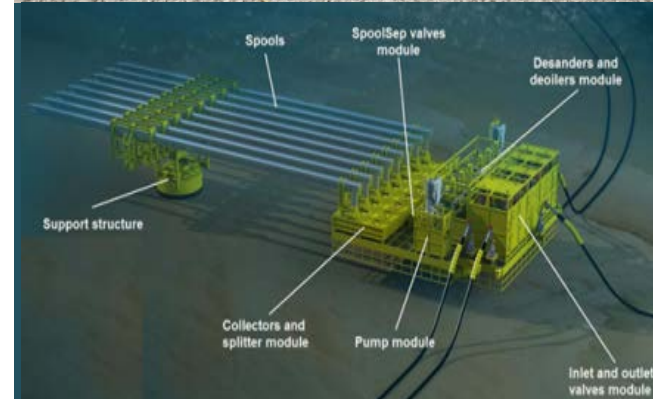
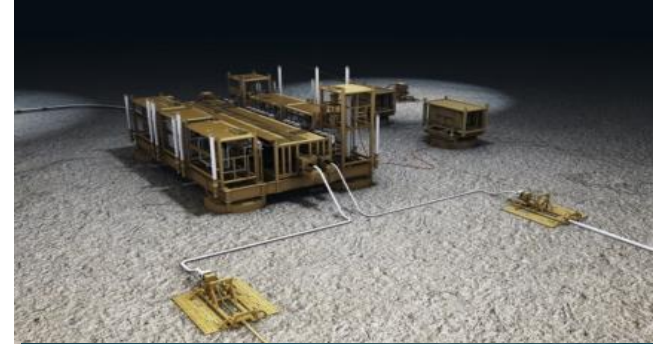


# FUTURE OF THE OFFSHORE: TECHNOLOGIES TO ENHANCE LONG TERM COMPETITIVENESS

J.P. Morgan's 'Future of the field' Roundtable Series  
14<sup>th</sup> June 2018



Giovanni Chiesa

Saipem E&C Offshore Division  
Head of Subsea Engineering &  
Underwater Technologies

# TODAY'S PRESENTATION

1

STRATEGY AND VISION

2

CAPEX EFFICIENCY

3

EXECUTION EFFICIENCY

4

OPEX EFFICIENCY

5

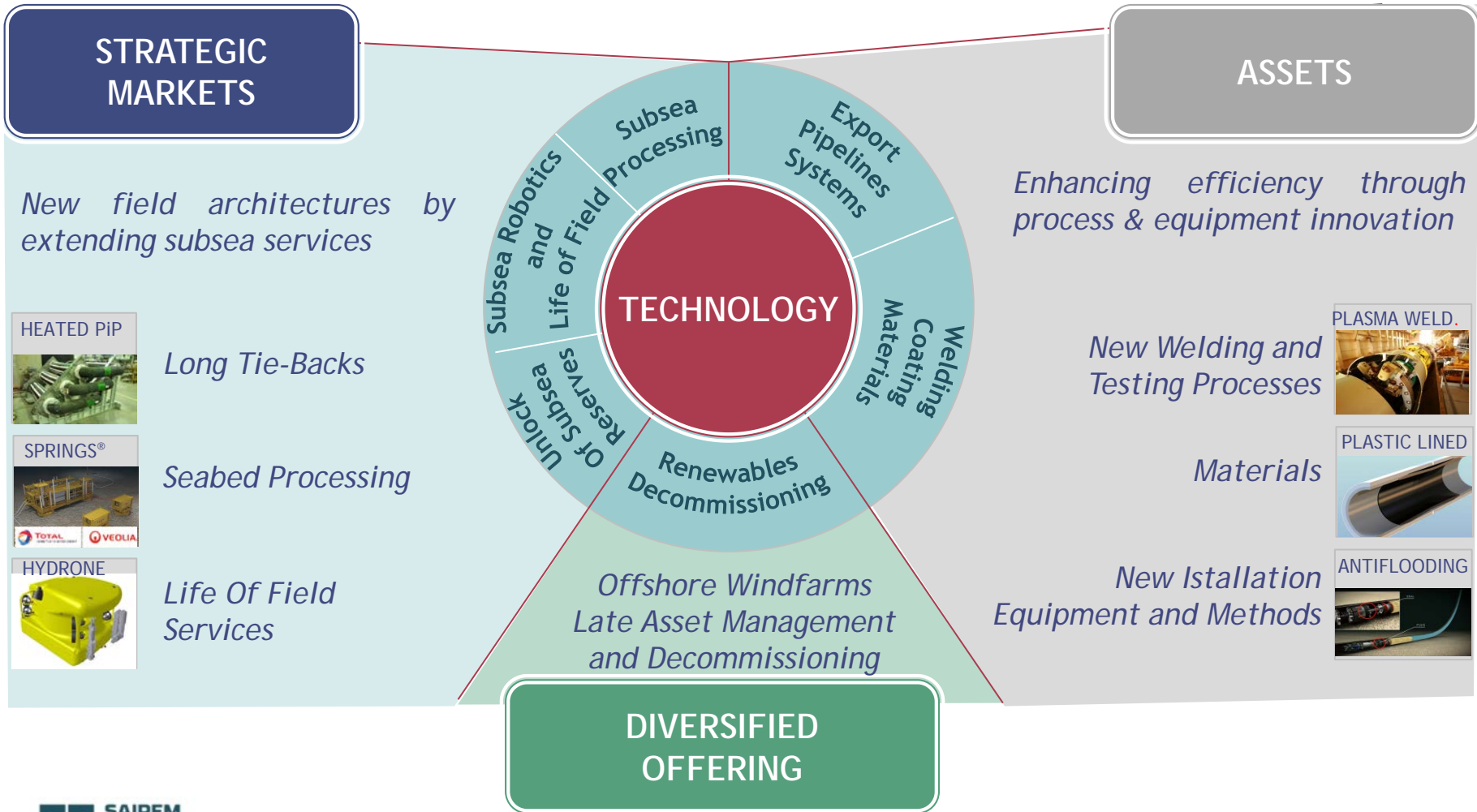
CLOSING REMARKS



## STRATEGY AND VISION

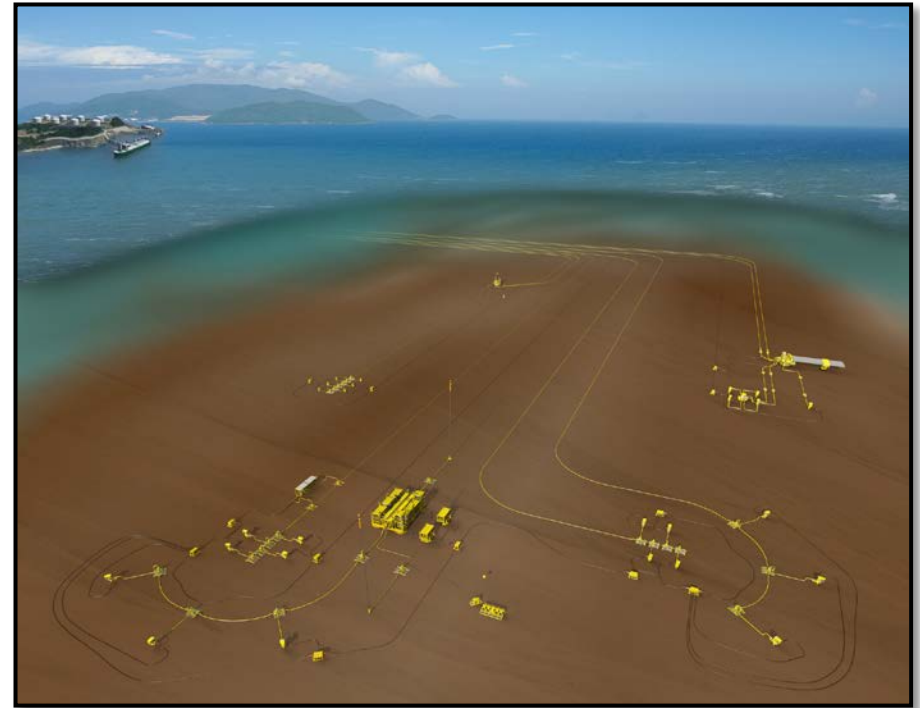
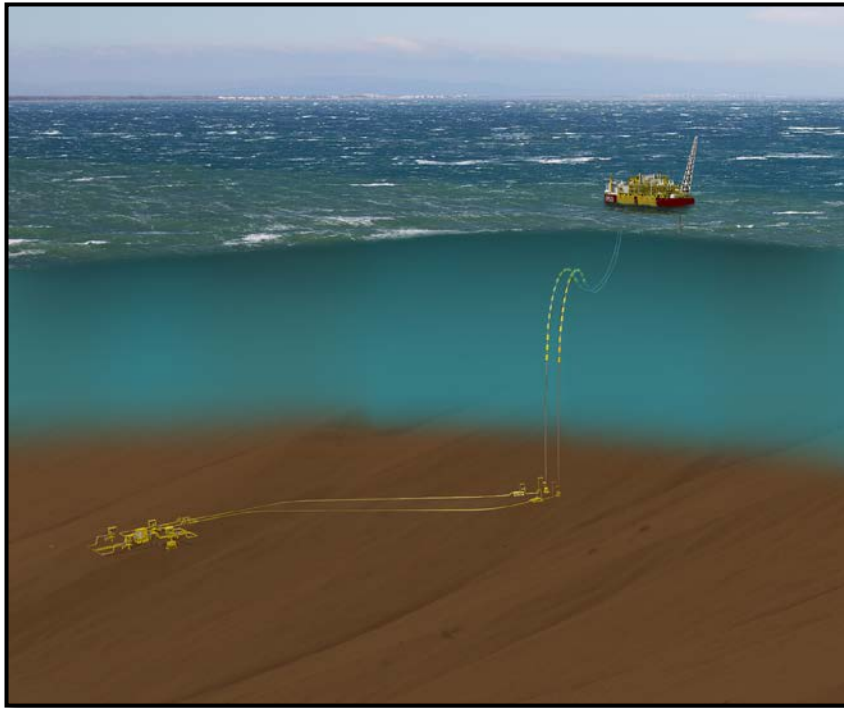
# E&C OFFSHORE - STRATEGIC TECHNOLOGY TARGETS

## INNOVATION for GLOBAL SOLUTIONS



# THE SUBSEA-TO-SHORE LONG TERM VISION

*Moving Topside Operations onto Seabed*



- Moving Subsea is a Key for Cost Reduction
- Technology Innovation to Enable Seabed Production Operations

# THE SUBSEA-TO-SHORE LONG TERM VISION

## *Opportunities & Challenges*

Cost Reduction through Novel Field Development Schemes based on:

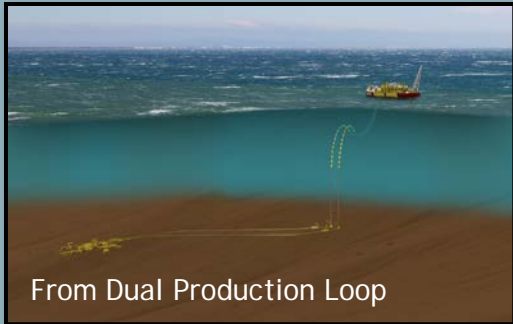
- Longer Tie-backs to Onshore Receiving Facilities or to Existing Floating Hubs with Simplified Gathering and Transportation Systems
- Assurance of Production Delivery over Longer Distances
- No In-Field Surface Support for Auxiliary Functions
- Smarter Subsea Systems for Reduced Communication to/from Shore
- SPS - URF Integration, Standardization of Interfaces and Open Framework Strategy

# **TECHNOLOGIES ENABLING CAPEX EFFICIENCY**

# CAPEX EFFICIENCY TECHNOLOGIES (1/3)

## Pipelines

### NEW PRODUCTION SCHEMES



Maturity: Under Qualification

### HEATED PIPE IN PIPE

- Sliding Pipe-in-Pipe (J & S lay)
- Large Bore Flowlines



## Novel Development Schemes

### LOCAL HEATING

Induction Heating during Production



Maturity: Under Qualification



# CAPEX EFFICIENCY TECHNOLOGIES (2/3)

## Processing

### SPRINGS®

- Development in Partnership with Total and Veolia
- Subsea Seawater Desulfatation



Maturity: Under Industrial Qualification

## Novel Development Schemes


### SpoolSep Liquid/Liquid Separation

- Horizontal Pipes Working in Parallel
- Gravity Separation
- Produced Water Treatment in Partnership with Veolia



Maturity: Under System Qualification

### Multipipe Gas/Liquid Separation

- Vertical Pipes working in Parallel
- Gravity Separation
- Slug Capacity
- Separation of CO2 in Dense Phase
- Hi-SEP Development 




Maturity: Available


# CAPEX EFFICIENCY TECHNOLOGIES (3/3)

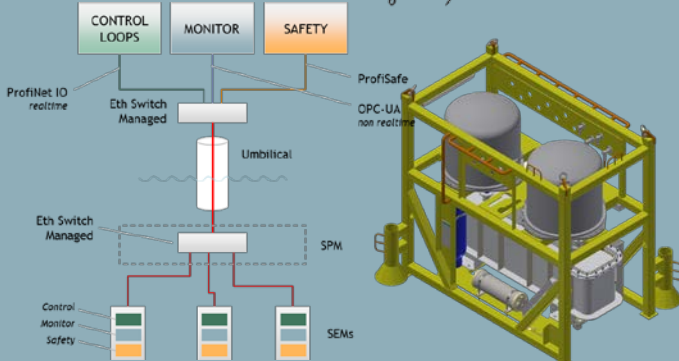
## Controls & Electric

**SMART Control**



**SUBSEA BUS™**  
*Ingenuity for life*





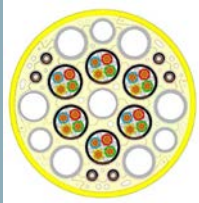
- Development and Qualification of a Subsea Control System based on a OPEN FRAMEWORK
- Extendable Platform of Software and Hardware Components
- Completion of System Qualification by End 2018

Maturity: Under Qualification


## Novel Development Schemes

**All Electric**


- Substitute Hydraulic Power with Electric Power for Valves Actuation
- Simplification of Umbilical Cross Section and Integration of Power & Telecommunication




Conventional X-Section  
LV Quads/Hydraulics/FO/Chem



All-Electric  
LV Quads/FO/Chem



Integrated DC-FO  
Chem/FO



Chem / Power Distr.  
DC-FO / HV Power

Maturity: Available / DC-FO Offered

# **TECHNOLOGIES ENABLING EXECUTION EFFICIENCY**

# EXECUTION EFFICIENCY

## Opportunities & Challenges

- Fast Track Shared Approach
- Early Engagement
- Efficient Selection of Technical and Technological Solutions

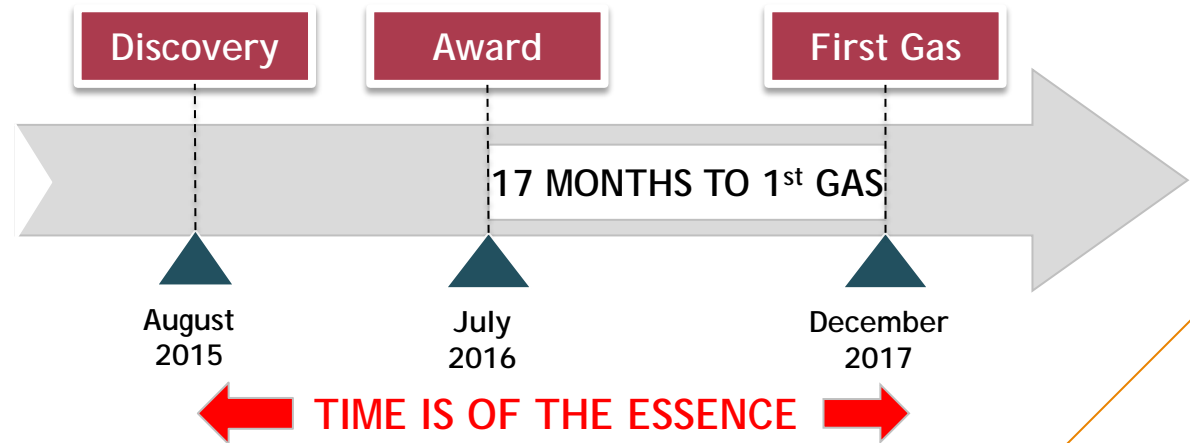
## New Model

- High Pipelay and Subsea Construction Productivity
- Automation
- De-Risking Offshore Operations

## ZOHR: A FIRST TIME EVER



Shortest Ever Time-to-Market



# EXECUTION EFFICIENCY TECHNOLOGIES (1/3)

## Welding

### Internal PLASMA Welding

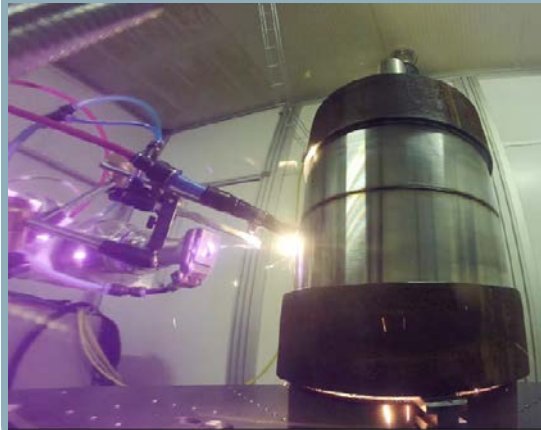
- Proprietary Game Changing Technology for CLAD Pipes Welding
- Internal Welding or Re-Melting of the ROOT Pass. Visual Inspection Capability
- S-Lay and J-Lay Application



Maturity: Available / Applied

### LASER Welding

- Single Pass Fully Automatic LASER Welding System
- A Step Change in Productivity, Automation and Repeatability
- Testing Underway

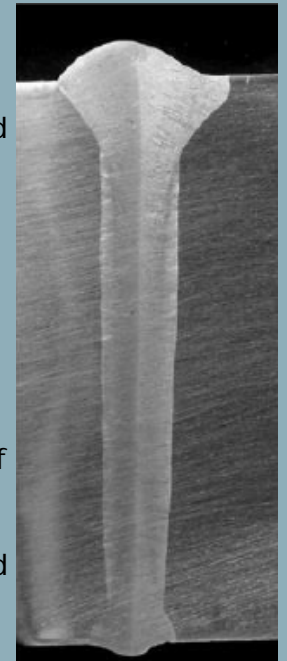


Maturity: Under Development & Testing

## Pipe Lay Productivity

### Electron Beam Welding

- High Energy Electrons Beamed to Joints to be Welded
- Potential High Productivity
- Technology Assessment and Qualification Ongoing also in the Framework of Technology Cooperation Agreement signed with Woodside



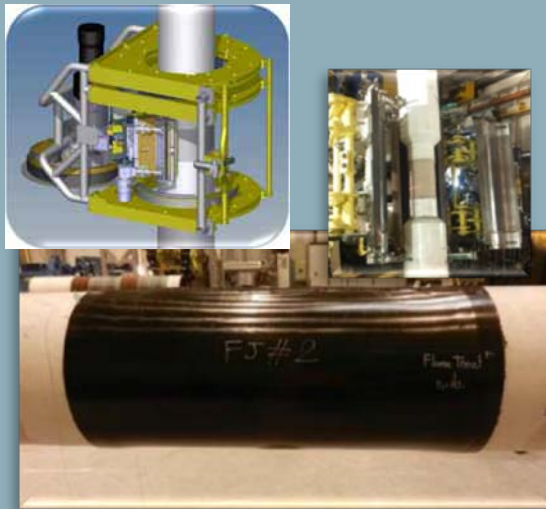
Maturity: Under Development

# EXECUTION EFFICIENCY TECHNOLOGIES (2/3)

## Remote Controls

### Field Joint Coating

- M1 Proprietary Technology & Equipment
- FJC Manipulators Equipment Remote Operation from Shore



Maturity: Available, Applied

### Automation

- Real Time Productivity Monitoring and “Engineered” Supervision onboard and from Shore of Pipelaying, Welding and FJC Operations

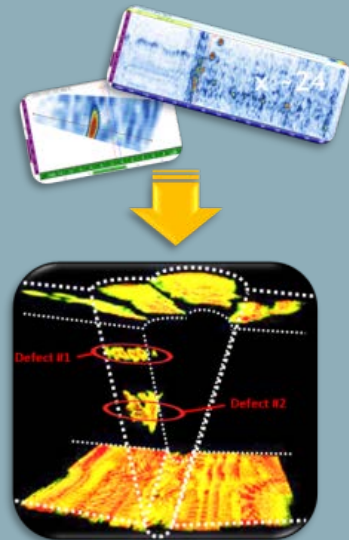


Maturity: Available, Applied

## Automation

### Digitalization

- Digitalization of NDT Inspection Analysis



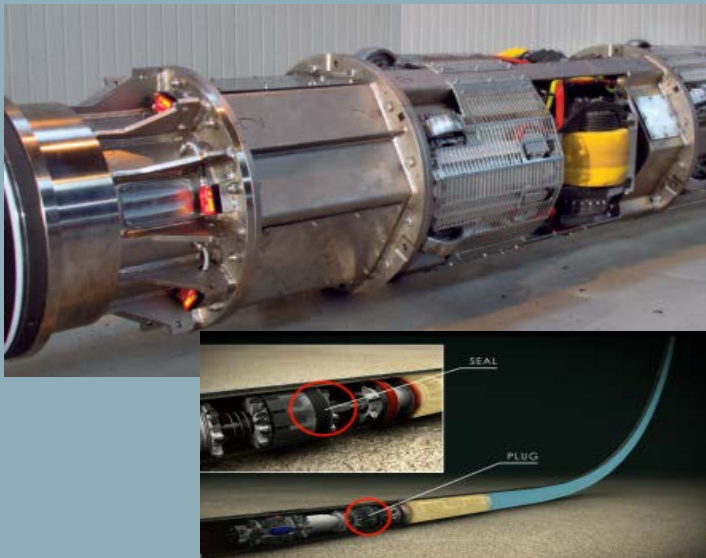
Maturity: Available, Applied

# EXECUTION EFFICIENCY TECHNOLOGIES (3/3)

## Integrity Tools

### Anti-Flooding System

- Plug prevention pipe flooding
- Autonomous system
- Wireless real time communication



Maturity: Available

## De-Risking

### IAU Integrated Acoustic Unit

- Non intrusive pipeline integrity monitoring during installation
- Real time localization of water & buckles using acoustic reflectometry



Maturity: Available

# **TECHNOLOGIES ENABLING OPEX EFFICIENCY**



# OPEX EFFICIENCY

## *Opportunities and Challenges*

### Lifecycle Support to Subsea Systems with Increased Functionalities through:

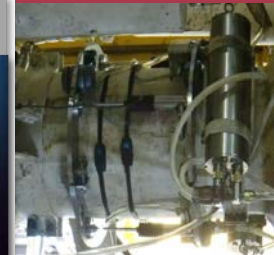
- Production Support
- Asset Integrity Assessment
- Condition Assessment
- Planned Maintenance and Intervention
- Emergency Intervention
- Take over of End of Life Operations as Duty Holders  
Decommissioning Plug and Abandonment, Facilities Removal and Disposal

#### Emergency Intervention



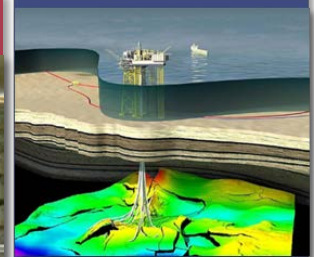
- Pipeline Repair
- Cargo recovery
- Damage containment
- Oil Spill Response
- Offset Well capping

#### Asset Integrity



- Inspection
- Maintenance
- Life Extension
- Decommissioning

#### Production Support



- Reservoir surveillance
- Production monitoring
- Operations support

#### Environmental

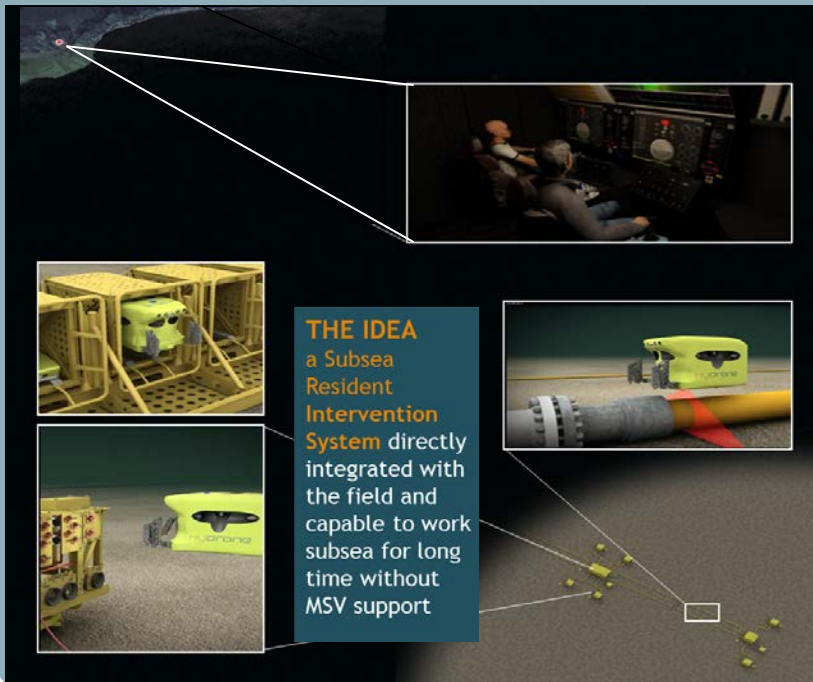


- Site Remediation
- Fauna preservation
- Seawater monitoring
- Env. data acquisition
- Geo- monitoring

# OPEX EFFICIENCY TECHNOLOGIES (1/3)

## Robotics

### HyDrone Technology Platform for Subsea Resident ROVs



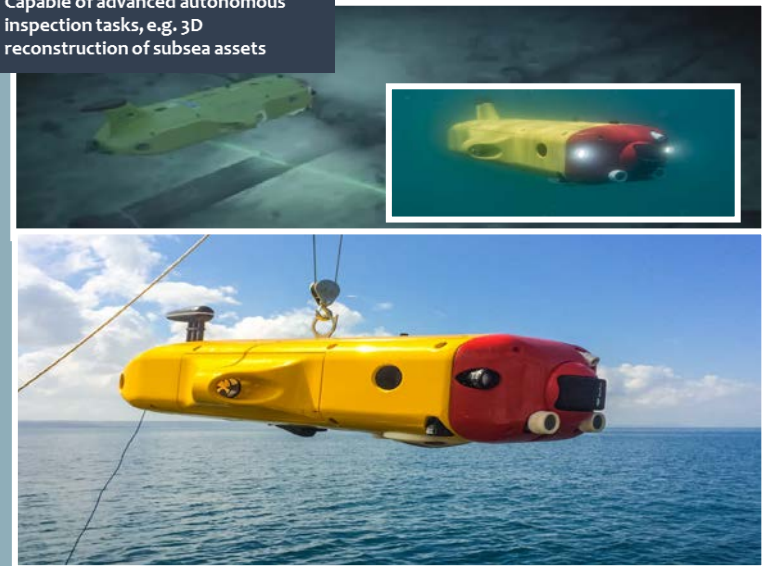
## Life of Field

### FLATFISH Technology

An innovative AUV designed to provide efficient and continuous Life of Field support to subsea field operations

Capable of advanced autonomous inspection tasks, e.g. 3D reconstruction of subsea assets

FlatFish  
JDA



# OPEX EFFICIENCY TECHNOLOGIES (2/3)

## Sensing

### Subsea Sensing Pods

#### DEMONSTRATED TECHNOLOGY

- In-situ Chemical Analysis
- Mass Spectrometry
- Trace Metals

#### UNDER DEVELOPMENT

- Bioacoustics
- Magnetometry
- Sediment Sampling
- Real time Pipe Tracking
- 3D Sonar
- Riser Inspection
- Data Harvesting



## Life of Field

### Condition Monitoring Technologies



Scarabeo8 (2017)  
Monitoring of  
Drilling Riser stress  
(retrofitted).

Saipem1000 (2012)  
Monitoring of  
Drilling Riser stress  
(retrofitted).

Sapinhoa Norte (2015)  
Monitoring of 8 off Production  
Risers and 2 off Gas Injection  
Risers on the top section



# OPEX EFFICIENCY TECHNOLOGIES (3/3)

## Emergency Intervention

### OIE (Offset Installation Equipment)





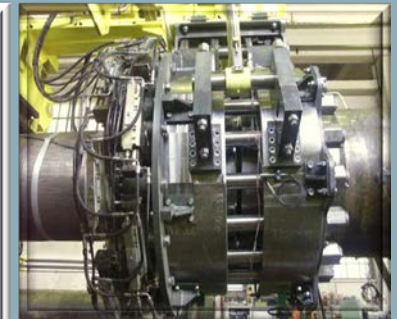


## Life of Field

### SIRCOS Pipeline Repair System



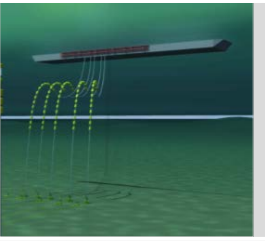
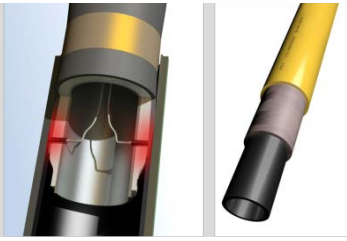
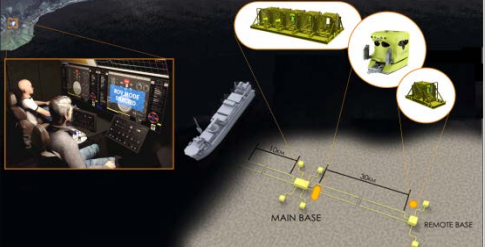
DOLPHIN	Qatar
NORDSTREAM	Baltic Sea
GREENSTREAM	Lybia-Sicily
TRANSMED	Algeria-Sicily
SAKHALIN	Russia



## **CLOSING REMARKS**

# CLOSING REMARKS

- New field architectures that combine different “building blocks”, some new and some existing
- To provide new added values to Clients, as the reduction of CAPEX and/or OPEX costs
- Early engagement with Clients is the way to exploit all the potential of such as architectures

WORK ON COSTS REDUCTION BY...	...changing Field architecture		...adopting new technologies	
<p>... bringing the surface equipment to seabed</p>		<ul style="list-style-type: none"> <li>■ SPRINGS™</li> <li>■ Multipipe</li> <li>■ Spoolsep</li> <li>■ Hisep™</li> </ul>		
<p>... introducing new fluid transport &amp; preservation techniques and/or eliminating some fluid transport/control lines (e.g. for long-tie backs)</p>			<ul style="list-style-type: none"> <li>■ EHT-PiP</li> <li>■ Local Heating</li> <li>■ DePressuRiser</li> <li>■ Subsea Chemicals</li> <li>■ All-Electric Field</li> </ul>	
<p>... introducing new products and materials for pipes</p>		<ul style="list-style-type: none"> <li>■ Single Independent Riser</li> <li>■ IPW for Clad pipes</li> <li>■ FBJ for Plastic Lined Pipes</li> <li>■ TCP pipes</li> </ul>		
<p>... imagining new ways to manage field operations</p>			<ul style="list-style-type: none"> <li>■ HyDrone platform</li> <li>■ Asset Integrity Management</li> <li>■ Production Monitoring</li> </ul>	