A Reflection on Subsea Technology Challenges and Solutions

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Growth in Primary Energy Demand

Global energy demand increases by one-third from 2010 to 2035, with China & India accounting for 50% of the growth

Source: IEA WEO 2011
Global Subsea Market

2200 subsea trees in next five years

Global Subsea Hardware Capex

Elements of Subsea Equipment

Source: Douglas Westwood Limited 2011
Heritage

- 1961 – the first xmas tree
- 1968 – the stacked tree
- 1960s – diver intervention
- 1970s – remote intervention
- 1986 – the first horizontal tree
- 1940s – earliest flexibles
- Today ...
  - 10,000ft remote operated trees
  - Complex flexibles with sensors
  - Divers and ROVs working together
- Future
  - ... subsea processing ... local power generation ... automation?
Industry Achievements

Photos Courtesy of Total & Statoil
Industry Achievements

Photos Courtesy of Technip & SeaBox AS
2011 Technology Challenges

Subsea Technology Challenge, June '11

Workshops held across the globe
Perth, WA
London, UK

Solutions under evaluation
2012 Technology Challenges

Annual Technology Conference, Sep ‘11

Defined requirement for Technology Roadmap definition exercise

September ’12, Aberdeen
Challenges Defined from 2011 Workshops

- Subsea Power
- Flow Assurance
- Subsea Separation
- Temperature Management
- Pipeline Integrity Management / Cost Reduction
- Low Cost Intervention
Remote Autonomous Wave (RAW) Power

Ocean Power Technologies

**PowerBuoy®** – Autonomous Ocean-Going Buoys that captures, stores and converts wave energy into clean electricity

**Persistent power to remote off-shore Oil & Gas installations** – On board energy storage and management provides capability for calm periods

**Funding Requested: £2,985k**
Subsea – Emerging Solutions

Tidal Energy Electrical Collection System

SMD Limited

Objective

The development of tools for optimisation of tidal turbine arrays.

Funding Requested: £344k
Subsea – Emerging Solutions

HV-MSDC Converter Module Demo

GE Oil and Gas Global Research/Converteam

Demonstrate AC/DC and DC/AC converter modules packaged in cylindrical vessels for a transmission voltage of +/- 40 kV DC

Funding Requested: £680k
Subsea – Emerging Solutions

Subsea Infrastructure Knowledge Base (SIKB)

Knowledge Reservoir

The SIKB will meet the need for an up-to-date, knowledge base for subsea engineers and provide a comprehensive single resource on new technology, best practices, lessons learned and case histories across the subsea spectrum.

Funding Requested: £210k
Actively Damped Heave Compensation for Subsea Operations

Eaton Corporation

Development and demonstration of a new load handling system with superior stability and accuracy for subsea operations in deep water

Funding Requested: £504k
Subsea – Emerging Solutions

Online HydraCHEK
Hydrafact Ltd

HydraCHEK® Technology
- hydrate inhibition monitoring system
- Project to develop an online version

Funding Requested: £284k
Conclusion

• Subsea market drivers are evident
• Challenge remains to improve recovery rates
• Subsea boosting and processing continue to emerge
  — will need to be robust, reliable and cost effective
• New subsea technologies are important for the future
• UK has a pre-eminent position in subsea technology
• Collaborate to define a national/global strategy
  — best international expertise and resources needed to achieve it
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