Norwegian Continental Shelf’s Role in Shaping the Subsea Industry - and Perspectives for the Future

Sola, 31.01.2013 - Arild Selvig
Sales and Marketing Director
25 years of subsea history on NCS (1980-2005)
Kongsberg Våpenfabrikk – the early days
Consultancy Advice from 1973 about Subsea

... too little subsea expertise available to give a meaningful evaluation ...

... Subsea equipment is somewhat "glamorous" within the petroleum industry ...

... We recommend minium money to be invested over the next years ....
ELF North-East Frigg

First subsea installation on NCS
Gullfaks A Subsea

World’s first diverless subsea installation
Development of Subsea EH Control System; *Snorre Subsea*

Control Modules for Snorre SPS
Statfjord Satellite Project
HOST Technology Development Project
Ormen Lange; Long distance subsea-to-beach
Tordis SSB – World’s first commercial application of subsea processing
Emerging Subsea IOR Technologies

- Subsea Processing
- Condition Performance Monitoring
- Low-Cost intervention and side-track drilling
Next 25 years – where are we going?
Arctic Field Development Scenarios

Case 1: Very shallow water with seasonal ice cover - no icebergs (Ob Taz Bay case)

Case 2: Shallow water with ice cover - iceberg presence (Kara/Beaufort Sea)

Case 3: Medium water depth with ice cover - no icebergs (Sea of Okhotsk case)

Case 4: Medium water depth with no ice cover - possible iceberg presence

Case 5: Medium water with no ice cover - iceberg presence (Grand Banks case)

Case 6: Deep water with ice cover - iceberg presence (Baffin and Greenland case)

overtrawlability; long step out control and power - All Subsea (Barents Sea case)
Subsea IOR

New trees installed - X

Accumulated trees installed – X^2
Subsea IOR

Subsea Field Production Profile

- **EOR Potential**
- **Natural Production**

Annual Field Decline Rates

- **Onshore**
- **Shallow-water**
- **Deepwater**

**Implications**
- Increased opportunities to low-cost subsea drainage points
- Increased need for seabed pumping and/or processing
- Increased need for well interventions
- Increased need to perform preventive maintenance and refurbishment

Source: Cambridge Energy Research Associates (CERA); Jan 2008

Note: Includes natural decline plus EOR efforts

Onshore/Shallow water field declines lower due to EOR technologies
Subsea IOR Building Blocks

IOR

- Low cost drainage points

- Processing
  - Separation
  - Pumping/Boosting
  - Compression

- Subsea Service
  - Riserless Light Well Intervention
  - Production Management
  - Condition monitoring
  - Life of field services
Subsea Service - still a Fragmented Business Model
Subsea Service Value Chain

Drilling and Completion Support | Install | Operate and Manage | Maintain Production and Increase Recovery | Plug and Abandon

Subsea Service Platforms

Installation | Asset Management | Production Optimization | Equipment Intervention | Well Access
All Subsea – The Future Field Development Scenario
Subsea Technology R&D Ladder

- **2012**: Compact Secondary Water & Sand
- **2013**: Extended Process Controls
- **2014**: MPP 3MW-5K
- **2015**: Full Condition Monitoring and Predictive Maintenance
- **2016**: Compact Secondary Gas & Oil
- **2017**: Subsea Gas Compression
- **2018**: Distributed Power
- **2019**: Arctic - Under Ice
- **2020**: Full Subsea Based Development
Thus - the Subsea R&D Wishlist is still long ….

- Low-cost subsea drainage points
  - MPD systems in mature reservoirs (with significant pressure gradient variations)
- Cost-effective interventions
- Pumping, separation and compression on the seabed
  - Higher duty, secondary separation, heavy oil, deep-water systems
- Long-distance communications
- High-voltage power and transmission systems
  - Distributed power systems
  - Local power generation
- All-electric systems
- HPHT technologies
- 24/7 CPM and Production Management systems including centralised advice and support functions
Thank you for the attention