Status Offshore Vind – Muligheter for norsk leverandør industri i driftsfasen

Frokostseminar Havvind, 2017-08-24
Portfolio – High activity level in 2017

SHERINGHAM SHOAL - UK

DUDGEON - UK

HYWIND SCOTLAND

ARKONA - GERMANY

DOGGER BANK - UK

NEW YORK - US
The potential of floating wind

- Virtually unlimited resources
- Site flexibility
- Standardized foundations
- Environmental benefits

![Map of potential floating wind projects around the world](image)

**Illustrative only:** based on water depths, wind conditions and potential large markets.

- **UTILITIES**
- **BIG CITIES**
- **ISLANDS**
- **OIL AND GAS**
Reduce costs and build scale

Costs

LOCE (illustrative)

<table>
<thead>
<tr>
<th>Category</th>
<th>Base case</th>
<th>Target 2020</th>
<th>Target 2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operations</td>
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<tr>
<td>Yield</td>
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<tr>
<td>Substructure</td>
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<tr>
<td>Supply chain</td>
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<tr>
<td>Infrastructure</td>
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<tr>
<td>Installation</td>
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<tr>
<td>WTG</td>
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<tr>
<td>Cost reductions</td>
<td></td>
<td>40-50%</td>
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</tbody>
</table>

Deployment

Scalability critical for market success
Collaboration is critical to succeed

Customer

Supplier

Developer

Risk/reward sharing
Benefits of Offshore Wind Investments

65% of investments in offshore wind can benefit local suppliers

Manning for Installation and Operation can contribute significantly to employment
Operation is 60 FTE in 20 years

Norwegian industry well position to contribute in certain O&M areas based on synergies from O&G.
Offshore Wind O&M – An opportunity for the Norwegian Industry
Vessels

ESVAGT NJORD

General:
- Owner: ESVAGT A/S
- Flag: Danish
- Homeport: Esbjerg
- Built: 2016 by Havyard Ship Technology, Norway
- Design: Havyard 832 SOV Design
Inspections with Drones

- Vessels
- Opportunity for Norwegian Supply Chain
- Subsea Inspections
- Forecasting Service
- Monitoring and Instrumentation

15 august 2017
Classification: Internal © Statoil ASA
# Subsea Inspection (Example Monopile)

<table>
<thead>
<tr>
<th>External Inspections</th>
<th>Internal Inspections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shallow water (current, waves) often accompanied by low visibility</td>
<td>“Closed” and narrow environment with limited accessibility</td>
</tr>
<tr>
<td>Typical O&amp;G work class ROV not suitable</td>
<td>Portability of inspection device</td>
</tr>
<tr>
<td>Dimensions: Ø 6-8m, 80-90mm wall thickness</td>
<td>Connection between TP and monopile as challenging area</td>
</tr>
<tr>
<td></td>
<td>Grouted Connection</td>
</tr>
<tr>
<td></td>
<td>Bolted Connection</td>
</tr>
</tbody>
</table>

Dimensions: Ø 6-8m, 80-90mm wall thickness

Grouted Connection

Bolted Connection

Source: Garrad Hassan and Partners Ltd
Subsea Inspection Competition (link)

Aim
Finding new ways to inspect offshore wind substructures

Who
Innovators with inspection technologies that can provide information and data on grout integrity and welds for both monopiles and jackets

Winners
Test technology on installed foundations and receive hands-on mentoring and advice from the nine OWA industry partners
Status Offshore Vind – Muligheter for norsk leverandør industri i driftsfasen

Andrea Eugster
Arne Eik

www.statoil.com