Statoil

Statoil is an international energy company with operations in 36 countries. Building on 40 years of experience from oil and gas production on the Norwegian continental shelf, we are committed to accommodating the world’s energy needs in a responsible manner, applying technology and creating innovative business solutions.
First new investment for New Energy Solutions

**Exploration**
- Exploit prolific basins
- Test impact opportunities
- Access at scale

**Development & Production**
- Safe and secure operations
- Drive cost and capital efficiency
- Capitalise on technology and operating experience

**Midstream & marketing**
- Leverage European gas position
- Onshore access to premium markets
- Exploit global trading competence

**Portfolio management**
- Realise value
- Sharpen our upstream profile
- Strengthen execution and financial resilience

**New Energy Solutions**
- Build a distinct growth portfolio of profitable new, non-oil and gas options
- Identify and develop business models to drive demand for our core products
What is Hywind?

• A standard offshore wind turbine placed on a ballasted steel substructure and anchored to the seabed
  - Conventional technology used in a new way
  - Simple substructure construction that enables mass production
  - Inshore assembly reduces time and risk of offshore operations
  - Beneficial motion characteristics and blade pitch control to dampen out motions

• Statoil-owned technology

• From idea in 2001 to full scale prototype in 2009.
Hywind Demo – In operation since 2009

- 2.3MW WTG
- Located 10km off Norwegian coast at 200m water depth
- In operation since September 2009
- Produced 50 GWh since start-up
- Capacity factor (overall) 41.4%
- Maximum wind speed of ca.44m/s and maximum wave height of ca.19m
- Performance has been good
Hywind Scotland - Project objectives

Demonstrate cost-efficient and low risk solutions for commercial scale parks

- Test multiple units in park-configuration
- Verify up-scaled design
- Optimize assembly and installation
- Verify reliability and availability of optimized multi-turbine concept
- Mobilize supply chain
Hywind Scotland Pilot Park

• Agreement for Lease entered into 30 October 2013.
• Planning Permission granted July 2015
• Marine License granted October 2015
• Firm Grid connection agreement Q4 2015

• Start Onshore Construction: Q2 2016
• Start Offshore Construction: Q2 2017
• Final commissioning: Q4 2017
Hywind Scotland test park at a glance

- Electrical switchgear plant
- Export cable
- 5 x 6MW WTG units
- Mooring system
- Inter array cables
## Hywind Scotland Pilot Park

**Project introduction**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Hywind Scotland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installed capacity (5 WTGs)</td>
<td>30 MW</td>
</tr>
<tr>
<td>Area (sea level)</td>
<td>~4 km²</td>
</tr>
<tr>
<td>Water depth</td>
<td>95-120 m</td>
</tr>
<tr>
<td>Average wind speed (@100 m)</td>
<td>10.1 m/s</td>
</tr>
<tr>
<td>Mean waves, Hs</td>
<td>1.8 m</td>
</tr>
<tr>
<td>Offshore export cable length</td>
<td>Ca. 30 km</td>
</tr>
<tr>
<td>Onshore cable length</td>
<td>Ca. 2-3 km</td>
</tr>
<tr>
<td>Transmission voltage</td>
<td>33 kV (no OFTO)</td>
</tr>
<tr>
<td>Grid connection</td>
<td>Peterhead, Grange</td>
</tr>
<tr>
<td>Mooring</td>
<td>Pre-laid chains</td>
</tr>
<tr>
<td>Anchor</td>
<td>Suction</td>
</tr>
<tr>
<td>Operational base</td>
<td>Peterhead</td>
</tr>
<tr>
<td>Lifetime/TQP</td>
<td>20/5 years</td>
</tr>
</tbody>
</table>

![Map of Hywind Scotland Pilot Park](map.png)
Pilot Park Offshore Layout

Mooring line lengths: 700 – 900m
Distance between turbines: 1400m
Onshore Peterhead

Substation: Balmoor Industrial Estate

Cable corridor: Formatine and Buchan Way → crossing Queen Rd → outskirt of Morrsions to Barclay Park

Landfall: HDD underneath Georg Rd
Landfall

- Horizontal Directional Drilling (HDD) entering at Barclay Park and exiting at approximately -14m LAT.
  - Drill rig located approximately 150m from the foreshore, approx. 600m total duct length
  - Drill and install a 400mm duct

Onshore Cable Route

- Summary:
  - Length: 1500 m
  - Typical Trench: 0.6 x 1.2m
  - Ducted system
  - Fiber optic communication cable
Substation

- Site preparation, removal of vegetation, topsoil and weak spots, import of compacted hardcore
- Building services; connection to existing utility systems (water, drainage, EL)
- 2.4m perimeter fence
- Buildings design:
  - Concrete floor
  - Steel frame structure and concrete block walls
  - 20x12m, 6m height
  - Office, LVAC, Switchgear room etc

- Outdoor reactor and transformer
- Landscaping
- Construction time: 10 months
Supply chain
The procurement process

- Specific Strategy incl. Pre-qualification
- Invitation to Tender
- Evaluation
- Award
- Manage agreement
# Contract Awards

<table>
<thead>
<tr>
<th>Contractor</th>
<th>Contract</th>
<th>Contract award</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aibel</td>
<td>FEED and Detail design of Substructure, Tower and Mooring System</td>
<td>Q3 2014</td>
</tr>
<tr>
<td>Siemens Wind Power</td>
<td>Wind Turbine Generator and Service Agreement</td>
<td>Q4 2014</td>
</tr>
<tr>
<td>Navantia/Windar</td>
<td>Substructure Fabrication</td>
<td>Q2 2015</td>
</tr>
<tr>
<td>Isleburn Ltd (Global Energy)</td>
<td>Suction Anchors Fabrication</td>
<td>Q4 2015</td>
</tr>
<tr>
<td>MacGregor Pusnes</td>
<td>Substructure Mooring Connection System Fabrication</td>
<td>Q4 2015</td>
</tr>
</tbody>
</table>
Some contracts, 2012 - 2015

• EIA, Environmental Impact Assessment: Xodus Group Ltd
• Risk assessment/workshop for BP pipeline in Buchan Deep, Xodus Group Ltd
• Concept Study of Onshore Electrical Infrastructure: Mott MacDonald Ltd
• Substructure Manufacturing Studies:
  - Global Energy Group
  - Burntisland Fabrications Ltd
  - Steel Engineering Ltd
• Landfall Study: Fugro GeoConsulting Ltd
• Floating Quay including Moorings at Assembly Site: Saipem UK Ltd
• Single lift Assembly Method Statement for Hywind Scotland: Saipem UK Ltd
• Trenching and burial risk assessment, UTEC Geomarine Ltd
• Feasibility Study: Scottish and Southern Energy (SSE)
• Aviation impact assessment study: Pager Power Ltd
• Buchan Air Defence Radar Modelling Report: Serco Ltd
• Electrical Contractor Assistance: WS Atkins International Ltd
## Planned Contract Awards

<table>
<thead>
<tr>
<th>Contract</th>
</tr>
</thead>
<tbody>
<tr>
<td>Export Cable and Infield Cables Fabrication</td>
</tr>
<tr>
<td>Offshore Cable Installation</td>
</tr>
<tr>
<td>Assembly Site</td>
</tr>
<tr>
<td>Marine Operations</td>
</tr>
<tr>
<td>Heavy Lift</td>
</tr>
<tr>
<td>Electrical System Infrastructure (ESI) including substation and cable onshore</td>
</tr>
<tr>
<td>Tower Fabrication</td>
</tr>
<tr>
<td>UXO Survey</td>
</tr>
<tr>
<td>Seabed Intervention, Ballasting</td>
</tr>
<tr>
<td>Mooring chains</td>
</tr>
</tbody>
</table>
Operations and Maintenance
Activity during the operational phase

• The main assumptions for work load related to Hywind Scotland Pilot park is as follows:
  − Normal O&M of the wind turbines will be performed by a team of turbine technicians travelling out with a crew transfer vessel
    • 15 days scheduled maintenance of the turbines per year
    • 50 days unforeseen visits to the turbines per year
  − Subsea inspections will be done about every second year
  − Maintenance of the onshore substation
Resource strategy

• A small base will be established in Peterhead
  − This will include office, warehouse and quay facilities
• A small team of wind turbine technicians and a crew transfer vessel will be stand-by during daytime in order to act when unforeseen failures occurs.
• One high performing crew transfer vessel (CTV) is needed due to the harsh weather conditions
• Control room and back-office functions will be covered by existing resources within the organisation or by the service provider
Possible location for local base in Peterhead
Typical Crew Transfer Vessel (CTV)

One high performing crew transfer vessel capable of transferring technicians on high sea states due to harsh weather conditions

Examples:
## Main contracts

<table>
<thead>
<tr>
<th>Contract</th>
<th>Contracting schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service of wind turbines</td>
<td>Signed with Siemens</td>
</tr>
<tr>
<td>Local base (office, warehouse and quay)</td>
<td>Under negotiations</td>
</tr>
<tr>
<td>Crew transfer vessel</td>
<td>Tendering Q2 2016</td>
</tr>
<tr>
<td>High Voltage (onshore substation and WTGs)</td>
<td>Q3 2016</td>
</tr>
<tr>
<td>Service of platform cranes</td>
<td>Q4 2016</td>
</tr>
<tr>
<td>Statutory inspections and certification</td>
<td>Q4 2016 / Q1 2017</td>
</tr>
<tr>
<td>Subsea inspections</td>
<td>During operation</td>
</tr>
<tr>
<td>Ancillary equipment and instrumentation</td>
<td>Q4 2016 / Q1 2017</td>
</tr>
<tr>
<td>Industry consumables, mechanical services etc.</td>
<td>Q4 2016 / Q1 2017</td>
</tr>
</tbody>
</table>

Note 1: Some of the scopes might be bundled
Note 2: Depending on the contract for the local base, there might be additional contracts related to the base
Thank You!!