Norway as a battery for Europe – prospects for supply of technology and services
Norwegian Renewable Energy Partners – INTPOW

Promoting Norwegian renewable energy capabilities internationally
What do we do?

Create networking possibilities to facilitate knowledge transfer and collaboration within Norwegian based RE companies

Arrange meetings, seminars and delegations with market participants and regulators to promote Partner capabilities

Offer advice and information on specific regional and technological markets and projects

Support the communication between the energy sector and the Government

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Hydro Power Markets
Priority: South East Europe with initial focus on Turkey
Secondary: Southern Africa (sub-Saharan Africa)

Offshore Wind Markets
Priority: North Sea with initial focus on UK-projects
Secondary: Asia, USA, North-Europe

Solar PV Market:
Priority: Southern Europe bordering the Mediterranean Sea
Secondary: Asia, USA, North Africa
Norway – An Energy Nation
Is offshore wind the New Oil?
Summary of the offshore wind energy market in the EU in 2010:

- Total installed capacity of 3,000 MW
- Annual installations of 1,100 MW
- Electricity production of 11 TWh
- Meeting 0.3% of total EU electricity demand
- Avoiding 7 Mt of CO₂ annually
- Annual investments in wind turbines of €2.5 billion

Summary of the offshore wind energy market in the EU in 2030:

- Total installed capacity of 150,000 MW
- Annual installations of 13,690 MW
- Electricity production of 563 TWh
- Meeting between 12.8% and 16.7% of total EU electricity demand
- Avoiding 292 Mt of CO₂ annually
- Annual investments in wind turbines of €16.5 billion
In 2009, the proportion of UK electricity generated from renewables was 5.5%. Installed electrical generating capacity of renewable sources rose by 19% in 2008, with a 49% increase in offshore wind capacity. In 2009 less due to the financial crisis.

According to the Chinese "Development Plan on Emerging Energies", offshore wind power is expected to reach 30 gigawatts, and coastal provinces were required to start drafting offshore wind-grid implementation plans.

US...
## Installed Offshore Wind in Europe

<table>
<thead>
<tr>
<th></th>
<th>Belgium</th>
<th>Denmark</th>
<th>Germany</th>
<th>United Kingdom</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>N° of farms</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>N° of foundations installed</td>
<td>12</td>
<td>15</td>
<td>24</td>
<td>112</td>
<td>163</td>
</tr>
<tr>
<td>N° of wind turbines installed</td>
<td>33 (99 MW)</td>
<td>81 (179 MW)</td>
<td>2 (10 MW)</td>
<td>147 (455 MW)</td>
<td>263 (743 MW)</td>
</tr>
<tr>
<td>MW fully connected to grid</td>
<td>0</td>
<td>115</td>
<td>30</td>
<td>188</td>
<td>333</td>
</tr>
<tr>
<td>Total MW of projects (once completed)</td>
<td>330 MW</td>
<td>207 MW</td>
<td>998 MW</td>
<td>2,437</td>
<td>3,972 MW</td>
</tr>
</tbody>
</table>

2.3 GW installed per June 2010

Kilde: EWEA
The North Sea Grid

Implications – for whom?
Today's planning mainly national logics

Technology for transmission
offshore VSC HVDC

A future meshed grid:
- Integration of offshore wind
- Electrification of oil & gas
- Power exchange

GB 33GW
NO ??
DK 1.5GW
NL 6.5GW
GB 22GW

Statnett

Norwegian Renewable Energy Partners
Statnett vision for 2020 onwards…
.. And a number of other concepts...
Benefiting the European electricity market

Securing supply
• Improve the connection between big load centres around the North Sea
• Reduce dependency on gas and oil from unstable regions
• Transmit indigenous offshore renewable electricity to where it can be used onshore
• Bypass onshore electricity transmission bottlenecks

Increasing the competition and Market opportunities
• Development of more interconnection between countries and power systems enhances trade and improves competition on the European energy market
• Increased possibilities for arbitrage and limitation of price spikes

Facilitating the integration of renewable energy
• Facilitation of large scale offshore wind power plants and other marine technologies
• Enabling wind power and other renewable power’s spatial smoothing effects, thus reducing variability and the resulting flexibility needs
• Connection to large hydropower capacity in Scandinavia, introducing flexibility in the power system for compensation of variability from wind power and other renewable power
• Contribution to Europe’s 2020 targets for renewables and CO2 emission reductions
The Challenges

• Cost
  – Financing

• Grid Technology
  – Solved?

• International North Sea cooperation on North sea grid
  – Three working Groups established
    • Technology
    • Policy
    • Regulatory
Is it feasible?

- DC grids are feasible
- Regional DC grids can be built today – no technology gaps to be solved
- Interregional DC grids will be built in the near future – technology gaps are worked on
- Regulatory issues such as how to manage such new grids need to be solved
Europe’s battery?
The Norwegian benefits

- Balancing the Norwegian power demand
  - Increasing value of offshore wind power generation
- Better utilisation of hydro power storage capacity
  - Enhancing value of generation facilities
- Electrification of the oil & gas installations
  - Competitive?
- Trading opportunities
  - Stratkraft already the largest cross-border trader of power in Europe
- Supply of products and services
  - Cable
  - Engineering
  - Umbilicals - electricals
.. or supplier?
We are not about to give up on oil & gas………

……but to utilise our strong maritime and offshore expertise in this new and exiting market!
The Norwegian Offshore Wind Industry

Excellent offshore experience

- Advanced project development experience – RISK MANAGEMENT
- Logistics
- Installation
- O&M
- Environmental
- H&S
- Materials (steel & concrete)
- Innovative Financing – Debt, Equity, Venture Capital

Integrated numerical design tools

- Energy conversion systems
- Grid connection and system integration
- Operation and maintenance
- Wind and ocean conditions
- Offshore wind technology and innovative concepts
- Offshore deployment and operation
- Wind farm optimisation

Common themes: education, safety, environmental impact assessment and test facilities and infrastructure

Public technology development and industry support

- Innovation Norway, Enova
- Arena NOW, Arena Wind
Challenges to Norwegian Supply Chain

- Insecurity of market
- Lack of domestic market
- Fast growth
  - Lack of resources
  - Size and balance sheet
- Large number of contractors with developers preferring a strategy of multi-contracting
  - Need of large legal resources
  - But – emerging EPC contractors
- Cost requirements
  - Technology development
  - Industrialization
Trends

- Speed and lack of resource
- Needed offshore expertise finding its place in wind
- Cost and learning curves remain steep – innovations
- Value chain positioning business model
- Norwegian Statoil and Statkraft have taken project stakes - Forewind
- EPC, supply chain players take on crucial development role – The German connection?
- Partnering strategies - “compatimates”
INTPOW activities & initiatives

• Past:
  – Networking event in Turkey
  – Visit to Washington
  – State visit to South-Africa
  – INTPOW Solar Day
  – INTPOW 1st Offshore Wind Supply Chain Conference
  – EXPO 2010 Shanghai
  – RenewableUK Offshore Wind 2010
  – ONS 2010
  – Hydro 2010
  – Delegation to Turkey
  – DIREC – India
  – US DEC Video Conference
  – Visit to Ethiopia/Uganda
  – Offshore Wind coordination meeting

• In planning:
  – INTPOW Solar day
  – Offshore wind competence and supply chain mapping
  – EWEA 2011 – Brussels?
  – INTPOW’s 2nd offshore wind supply chain conference
  – Offshore Wind visit to Germany
  – UK Offshore wind supply chain charter – workshop with RenewableUK
  – Solar Valley visit and intersolar
  – Siemens/Vestas visits Denmark
  – Hydro 2011 – Praha
  – Offshore Wind UK 2011 - Liverpool
  – RenewableUK 2011 – Manchester
  – AWEA Offshore Wind - Baltimore
  – Offshore Wind 2011 Amsterdam

www.intpow.com
Thank you for your attention!

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