Presentation for Japanese Companies
MAKE/IDK Japan Wind Power Roadshow

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Why Denmark?

• Denmark is the global center for wind turbine business and technology development – onshore and offshore

• Favourable framework conditions with supportive and stable political climate

• Experienced expert wind power engineers

• First class test facilities

• Prototype test centres

• Access to an excellent wind energy supply chain

• Easy to recruit new talents from universities
Danish Energy Policy Milestones

The government’s energy policy milestones up to 2050

In order to secure 100 pct. renewable energy in 2050 the government has several energy policy milestones in the years 2020, 2030 and 2035. These milestones are each a step in the right direction, securing progress towards 2050.

<table>
<thead>
<tr>
<th>2020</th>
<th>2030</th>
<th>2035</th>
<th>2050</th>
</tr>
</thead>
<tbody>
<tr>
<td>Half of the traditional consumptions of electricity is covered by wind power</td>
<td>Coal is phased out from Danish power plants</td>
<td>The electricity and heat supply covered by renewable energy</td>
<td>All energy supply – electricity, heat, industry and transport – is covered by renewable energy</td>
</tr>
<tr>
<td></td>
<td>Oil burners phased out</td>
<td></td>
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</table>

The initiatives up to 2020 will result in a greenhouse gas reduction by 35 pct. in relation to 1990.

- Plan for built-out in the long run
- Stable and transparent subsidies
7 of top 10 wind turbine OEM’s have presence in Denmark

... and a lot of international suppliers

From Japan we have MHI, Mikipulley and Mitsubishi Rayon JV with Fiberline = Advanced Pultrusion
Overview of the Danish Offshore Wind Power Industry

- Raw Materials
- Intermediate goods
- Component Mfg
- Wind Turbine Design and Assembly
- Planning & Design (EPC)
- Installation
- Asset ownership
- O&M

- Towers
- Blades
- Control & Brake systems
- Offshore Substations
- Offshore foundations
- Subsea Cables

- Siemens
- MHI Vestas Offshore Wind
- SEMCO
- Envision
- Vestas

- A2 SEA
- DONG Energy
- SWIRE BLUE OCEAN
- Vattenfall
- Fred. Olsen Windcarrier
- e-on
- CT Offshore
- Sub C
- Total Wind

- Including excellent supportive universities, test centres and engineering companies

- DTU Wind Energy
- Department of Wind Energy
Offshore Wind Power cost is coming down

<table>
<thead>
<tr>
<th>Park</th>
<th>Country</th>
<th>Tender/Year in operation</th>
<th>Wind Park Size (MW)</th>
<th>Price (CFD) (EUR/MWh)</th>
<th>Duration (FLH/years)</th>
</tr>
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<tbody>
<tr>
<td>Horns Rev II</td>
<td>DK</td>
<td>2009</td>
<td>209</td>
<td>69</td>
<td>50,000</td>
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<tr>
<td>Rødsand 2</td>
<td>DK</td>
<td>2010</td>
<td>207</td>
<td>84</td>
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<tr>
<td>Anholt</td>
<td>DK</td>
<td>2011/2013</td>
<td>400</td>
<td>140</td>
<td>50,000</td>
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<tr>
<td>Horns Rev III</td>
<td>DK</td>
<td>2015/2020</td>
<td>400</td>
<td>103</td>
<td>50,000/10-12</td>
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<td>Borsele 1-2</td>
<td>NL</td>
<td>2016/</td>
<td>700</td>
<td>72.7</td>
<td>/15</td>
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<tr>
<td>Nearshore (*)</td>
<td>DK</td>
<td>2016/2020</td>
<td>350</td>
<td>63.3</td>
<td>50,000/10-12</td>
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<tr>
<td>Kriegers Flak</td>
<td>DK</td>
<td>2016/2022</td>
<td>600</td>
<td>49.9</td>
<td>50,000/10-12</td>
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<tr>
<td>Borsele 3-4</td>
<td>NL</td>
<td>2016/</td>
<td>680</td>
<td>54.5</td>
<td>/15</td>
</tr>
</tbody>
</table>

(*) Nearshore including grid connection to shore
Proximity and short distances between the various players

- Production
- Universities
- Integration
- R&D
- Suppliers
- Customers
Expansion of Prototype Facilities in Østerild and Høvsøre

Østerild - National Testcenter for large wind turbines
Denmark’s National prototype test sites for offshore turbines up to 250 metres height. 7 test stands. Siemens, Vestas, Envision Energy, EDF/GE.

Expansion of test centre with 3 test stand put forward by government in January 2017. Height up to 330 metres at centre test stands. EIA in 2017. In operation in 2018

Høvsøre – Teststation for large wind turbines
National Test site for turbines up to 165 metres tip height. 5 test stands. Vestas, Siemens, Nordex/Acciona.

Other Test Facility Investments

**DTU Wind Tunnel**
Denmarks National Wind tunnel
86 mio. DKK investment,
Finalised in May 2017
Up to 105 m/s in windspeed
Combined measurement of aerodynamics and noise

**LORC**
LORC tests and demonstrates technology for harvesting renewable energy offshore. The Lindoe Nacelle Testing offers Functional tests and Highly Accelerated Lifetime Testing (HALT). The HALT tester will be finalised in mid 2017.

www.vindenergi.dtu.dk/Forskning/Forskningsfaciliteter/Vindtunnel
www.lorc.dk/test-center/lorc-nacelle-testing
The Danish Wind Power Value Chain Represents an Attractive Cluster for Entry to the Northern European Offshore Market

- COMPETITIVE DRIVERS
  - Market Position
  - Policy Support
  - Offshore Wind Market
  - R&D Centers and test facilities
  - Grid Integration Expertise
  - Specialized Education Wind Power
  - Human Resources
  - Know How & Technology

- SUPPORT MECHANISMS
  - CENTRAL LOCATION FOR EUROPEAN MARKET
  - EXPERIENCED VALUE CHAIN WITH CO-OPERATIVE APPROACH
  - EXPERIENCED PEOPLE WITH WIND POWER KNOWLEDGE
  - EXCELLENT R&D CENTERS
Business Opportunities in the Danish Wind Industry

• Using Denmark as a platform for market entrance to Northern Europe
• Using Denmark as a hub for technology development by tapping into the expertise
• Leveraging existing expertise by working closely together with Danish companies
• Gaining supremacy in the development of automation within component manufacturing and smart grid solutions
We look forward to hearing from you

COPENHAGEN

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<thead>
<tr>
<th>Asia-Pacific</th>
<th>Europe</th>
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<tbody>
<tr>
<td>Tokyo</td>
<td>Paris</td>
<td>New York</td>
</tr>
<tr>
<td>+81 3 3496 3001</td>
<td>+33 1 4431 2193</td>
<td>+1 212 223 4545</td>
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<tr>
<td>Bangalore</td>
<td>Munich</td>
<td>Silicon Valley</td>
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<tr>
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<td>+49 89 5458 54 0</td>
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<td>Seoul</td>
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<td>Toronto</td>
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<td>Shanghai</td>
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