Offshore Wind Cost Reduction: Findings of The Crown Estate and the Cost Reduction Taskforce

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CONTENTS

• Summary of UK offshore wind
• Role of The Crown Estate
• Offshore Wind Cost Reduction
UK: Global offshore wind leader?

- Potentially the largest offshore wind resource in the world
- Largest pipeline of offshore wind projects (46GW+)
- Largest operational capacity in the world
State of play

Immediate pipeline (GW) – as at June 2012

- Fully Operational: 2.1
- Under Construction (inc. partly exporting): 2.1
- Consented / awaiting construction: 2.2
- Awaiting consent / In Planning: 4.3

GW

THE CROWN ESTATE
Opportunity from current leasing rounds

1.2GW, 13 sites, Round 1
6.5GW, 17 sites, Round 2
1.5GW, 4 sites, R1/R2 Extensions
4.8GW, 5 projects, STW
32.2GW, 9 zones, Round 3

Offshore wind demonstration sites (4 projects)
Northern Ireland – tender results imminent
Regulatory Environment

**Targets**
- UK Climate Change Act
- 2020 renewables target
- Scottish renewables target

**Economic Support Mechanisms**
- Renewables Obligation
- Electricity Market Reform
- Feed in Tariff Contract for Difference
- Carbon Price Floor

**Planning**
- National Policy Statements
- IPC / PINS regime
- SEA

**Grid / transmission**
- Project Transmit
- OFTO regime
- Grid Coordination
THE CROWN ESTATE

Is a landowner
Is not a regulator
Is a public body – The Crown Estate Act 1961
Is not part of Government – but works closely with Government, statutory bodies etc.

Assets of £8.1b, surplus paid to Treasury (£240m in 2011/12)

Urban Portfolio
Rural & Coastal Portfolio
Energy & Infrastructure Portfolio
Windsor Estate
Our sectors
How do we work in offshore wind?

- Leasing rounds
- Rental charge based on energy output
- Co-investment in development (in Round 3)
- Facilitator and advisor – working closely with industry and government
- Strategic workstreams to accelerate and de-risk the programme
Strategic Challenges To Programme Delivery

- Health & Safety
- Supply Chain & Skills
- Planning & Consent
- Project Economics & Financing
- Grid & Technology

Levelised Cost of Energy
Gov’t ambition: 11-18GW offshore wind by 2020
18GW conditional on reducing cost to £100/MWh
Relative cost of technologies

Source:
Committee on Climate Change, Renewable Energy Review, May 2011 (part chart).
Cost Reduction Pathways study

Crown Estate ‘Pathways’ study

Industry

DECC Cost Reduction Taskforce

Establish baseline costs
- Levelised cost of energy basis
- Costs for FID 2011

Develop pathways framework
- Market development
- Speed of technology development
- Supply chain maturity

Assess cost reduction from baseline
- Technology, supply chain and finance impact
- Overall pathways
- Health and safety impact

Formulate prerequisites
- Identify key decisions
- Determine required prerequisites

Source: The Crown Estate
Unprecedented industry participation

- 100+ companies involved
- 60 one:one meetings
- 20 workshops
- Steering group representing industry and government
Baseline: Costs appear to have stabilised
...despite the move to deeper water
And we are generating at windier sites, resulting in greater energy capture...
Baseline LCOE of £140/MWh

Levelised Cost of Energy (£/MWh)

2011 FID
LCOE model structure

Offshore wind levelised cost of energy

Capital Costs
- Consenting/Development
- Project Mgmt.
- Turbine
- Support structure
- Array electrical
- Installation
- Decommissioning
- Insurance

Operating costs
- Operations and Maintenance
- Insurance
- Transmission charges
- Seabed rent
- Other

Annual energy production
- Gross annual energy production
- Losses
- Availability
- Net annual energy production to offshore substation

Weighted average cost of capital
- Capital structure
- Equity returns
- Debt margin and tenor
- Re-financing

Timing
- Phasing of capital and operating costs and annual energy production over time
- Re-financing/Changes in weighted average cost of capital
Industry ‘Stories’

3. ‘Supply Chain Efficiency’
- 36GW in Europe by 2020 (17GW in UK)
- Incremental technology evolution (e.g. steady progress to 5-7MW turbines)
- Greater competition, investment, project collaboration and better risk management
- Deeper financial markets, lower risk/lower cost of capital

4. ‘Rapid Growth’
- 43GW in Europe by 2020 (23GW in UK)
- High levels of technology evolution across all wind farm elements (e.g. turbines progress rapidly to 5-7MW+)
- Greater competition, investment, project collaboration and better risk management
- Challenging volume of finance required

1. ‘Slow Progression’
- 31GW in Europe by 2020 (12GW in UK)
- Incremental technology evolution, progress limited by market size
- Limited competition/economies of scale
- Modest developments in financing solutions, reduced in risk/cost of capital

2. ‘Technology Acceleration’
- 36GW in Europe by 2020 (17GW in UK)
- High levels of technology evolution across all wind farm elements (e.g. turbines progress rapidly to 5-7MW+)
- Fragmented supply chain with some improvement in collaboration
- Limited improvement in cost of capital due to ongoing changes in technology
Technology & Supply Chain: Key areas of cost reduction

<table>
<thead>
<tr>
<th>Area</th>
<th>Supply Chain</th>
<th>Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Turbines</td>
<td></td>
<td>17%</td>
</tr>
<tr>
<td>Competition</td>
<td>6%</td>
<td></td>
</tr>
<tr>
<td>Front end activity</td>
<td>5%</td>
<td></td>
</tr>
<tr>
<td>Scale / Productivity</td>
<td></td>
<td>4%</td>
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<tr>
<td>Installation</td>
<td>3%</td>
<td></td>
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<tr>
<td>Support structures</td>
<td></td>
<td>3%</td>
</tr>
<tr>
<td>Other</td>
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<td>9%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>39%</td>
</tr>
</tbody>
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Turbine cost reductions

- Increases in rated power: 9%
- Improved blade design and manufacture: 3%
- Changes in drive trains: 2%
- Larger rotor: 1%
- Other: 3%
- Total: 17%
Increased Competition

UK offshore wind - current turbine market share

- Siemens 64%
- Vestas 32%
- REpower 4%
## Supply Chain Capacity

<table>
<thead>
<tr>
<th>Development and Consenting</th>
<th>Turbines</th>
<th>Balance of plant</th>
<th>Installation and Commissioning</th>
<th>Operations and Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental impact assessment</td>
<td>Wind farm design</td>
<td>Survey vessel operation</td>
<td>Offshore wind turbines</td>
<td>Blades</td>
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<tr>
<td>2012</td>
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### Key
- **Red** - An area of significant concern requiring immediate analysis and strategic action
- **Improving from last year**
- **Orange** - Area of concern requiring some proactive intervention
- **Deteriorating from last year**
- **Green** - Not currently an area of concern, investment required, maintain watching brief

**Source:** Towards Round 3: the offshore wind supply chain in 2012, BVG Associates, June 2012
Offshore wind funding requirements and availability

Offshore Wind Capital requirements to 2020

Annual funding requirements compared with available funding (Supply Chain Efficiency Story)
Overall costs of finance could reduce by around 1% by 2020

Note: WACC = Weighted average cost of capital, expressed in post-tax nominal terms.
Reducing the cost of offshore wind to £100/MWh by 2020 is achievable, making offshore wind cost-competitive with other low carbon technologies.
Immediate action and commitment from government and industry is required to achieve cost reduction

**Robust policy framework signalling demand for offshore wind**
- Clarity on ROC bandings
- Clarity on Levy Control Framework post 2015
- Smooth implementation of EMR and visibility of CfDs
- Predictable flow of projects from consenting system, plus planning envelope flexibility
- OFTO regime
- Renewables Roadmap update

**Ramping up the supply chain (inc. technology development)**
- Availability of test and demo sites
- Developers signalling demand to supply chain (including through frameworks)
- Investment in manufacturing sites
- Collaborative working (horizontal and vertical collaboration)
- Skills development
- Government RD&D support

**Attracting new finance and insurance players to the sector**
- Engagement with potential new investors (debt & equity) and insurers
- Engagement with credit agencies to reach agreement on bankable structures
- Support from Multi-lateral agencies (including GIB)
- More clarity on risks and risk allocation
Taskforce recommendations and follow on actions

29 recommendations in total
Established OW Programme Board
TCE Consultation on further demo sites ongoing
Establish Standardisation body (through OWPB)
Investigate Alliancing approach
Resourcing of statutory advisers
R&D - ‘offshore wind wind catapult’