EMR Delivery Plan consultation workshop

28 August 2013
Welcome and introduction

Vicky Dawe
### Event Programme

<table>
<thead>
<tr>
<th>Timing</th>
<th>Content</th>
<th>Speaker</th>
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<tbody>
<tr>
<td>9:00</td>
<td>Welcome and introduction</td>
<td>Vicky Dawe</td>
</tr>
<tr>
<td>9:10</td>
<td>Delivery Plan content Q&amp;A</td>
<td>Alon Carmel</td>
</tr>
<tr>
<td>10:00</td>
<td>Strike price setting - Explaining RO-X Q&amp;A</td>
<td>James Steel</td>
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<tr>
<td>10:50</td>
<td>- BREAK -</td>
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<tr>
<td>11:05</td>
<td>Reliability Standard Q&amp;A</td>
<td>Alon Carmel</td>
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<tr>
<td>11:35</td>
<td>Outstanding issues and questions: Table discussions Feedback to plenary</td>
<td>Vicky Dawe/ Alon Carmel</td>
</tr>
<tr>
<td>12:30</td>
<td>Next steps</td>
<td>Alon Carmel</td>
</tr>
<tr>
<td>12:35</td>
<td>Close and opportunity to ask informal questions</td>
<td>Alon Carmel</td>
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<tr>
<td>13:00</td>
<td>ENDS</td>
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</table>
The Government’s objectives for Electricity Market Reform are to:

- ensure a secure electricity supply
- ensure sufficient investment in sustainable low-carbon technologies and
- maximise benefits and minimise costs to taxpayers and consumers.

The benefits of EMR will be delivered through a mechanism to support investment in low-carbon generation in the form of:

- Feed-in Tariffs using Contracts for Difference – CfDs,
- a mechanism to support security of supply (the Capacity Market) and
- the institutional arrangements to support these reforms.

The Government committed to publishing an EMR Delivery Plan every five years.
Consultation Process on first EMR Delivery Plan

- Consultation launched on 17th July
- Consultation closes on the 25th September

- How to submit a response
  - We would prefer comments to be submitted via the electronic consultation platform at https://econsultation.decc.gov.uk/
  - Alternatively comments can be provided by email or hard copy

- Your response will most useful if it is framed in direct response to the questions posed
The Government is seeking views on two key policy proposals that will be finalised in the first Electricity Market Reform Delivery Plan.

The two proposals relate to:

1. the strike prices for the Contracts for Difference for renewable technologies; and
2. the reliability standard for the Capacity Market.
Next steps following consultation

• In light of the responses to the consultation the Government may commission further analysis from the System Operator (National Grid).

• We will continue to consult with the Devolved Administrations and the Panel of Technical Experts in the further development of the final Delivery Plan.

• By the end of 2013, the Government intends to publish the EMR Delivery Plan with the confirmed strike prices for CfDs for renewable technologies and the reliability standard.

• The publication of the Delivery Plan is subject to Royal Assent of the Energy Bill as the Delivery Plan’s contents are dependent on the EMR framework in the Bill being enacted.
## Engagement Programme – Delivery Plan Consultation events

<table>
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<tr>
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<tr>
<td>Friday 6 September</td>
<td>Edinburgh</td>
</tr>
<tr>
<td>Monday 9 September</td>
<td>Belfast</td>
</tr>
<tr>
<td>Tuesday 10 September</td>
<td>Bristol</td>
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<tr>
<td>Tuesday 17 September</td>
<td>North Wales</td>
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<tr>
<td>Date</td>
<td>Milestone</td>
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<tr>
<td>25 September</td>
<td>Delivery Plan consultation closes</td>
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<tr>
<td>October 2013 onwards</td>
<td>Government consultations on Secondary Legislation for EMR</td>
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<td>By the end of 2013</td>
<td>Energy Bill receives Royal Assent, subject to Parliamentary time and the will of Parliament</td>
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<tr>
<td>By the end of 2013</td>
<td>First delivery plan, including final renewable CfD strike prices published (subject to Royal Assent)</td>
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<tr>
<td>2014</td>
<td>EMR Delivery mechanisms up and running</td>
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</tbody>
</table>
Delivery Plan content

Alon Carmel
1. Overview of Delivery Plan contents

2. CfD strike prices

3. Forward Look to 2030

4. CM Reliability Standard (separate presentation)

5. Levy Control Framework

6. CfD contract terms and allocation process
### 1. Overview of the Draft Delivery Plan – published 17 July

<table>
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<tr>
<th>Chapter</th>
<th>Description</th>
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<tbody>
<tr>
<td>1</td>
<td>Introduction</td>
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<tr>
<td>2</td>
<td>Contracts for Difference for Renewables</td>
</tr>
<tr>
<td>3</td>
<td>Capacity Market – Reliability Standard</td>
</tr>
<tr>
<td>4</td>
<td>Summary of Price and Bills impact</td>
</tr>
<tr>
<td>5</td>
<td>Forward look to 2030</td>
</tr>
<tr>
<td>6</td>
<td>Next steps</td>
</tr>
<tr>
<td>Annex A</td>
<td>Developing the modelling and analysis</td>
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<td>Annex B</td>
<td>Strike price methodology</td>
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<tr>
<td>Annex C</td>
<td>Reliability standard methodology</td>
</tr>
<tr>
<td>Annex D</td>
<td>Levy Control Framework</td>
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<tr>
<td>Annex E</td>
<td>Report from the System Operator (National Grid)</td>
</tr>
<tr>
<td>Annex F</td>
<td>Panel of Technical Experts Report</td>
</tr>
</tbody>
</table>

Consultation closes 25 September 2013
### 2. CfD Draft Strike Prices for Consultation

<table>
<thead>
<tr>
<th>Renewable Technology</th>
<th>Draft Strike prices (£/MWh, 2012 prices)</th>
<th>Illustrative Deployment in 2020 (GW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced Conversion Technologies (with or without CHP)</td>
<td>155</td>
<td>155</td>
</tr>
<tr>
<td>Anaerobic Digestion (with or without CHP)</td>
<td>145</td>
<td>145</td>
</tr>
<tr>
<td>Biomass Conversion</td>
<td>105</td>
<td>105</td>
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<tr>
<td>Dedicated Biomass with CHP</td>
<td>120</td>
<td>120</td>
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<tr>
<td>Energy from Waste with CHP</td>
<td>90</td>
<td>90</td>
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<tr>
<td>Geothermal (with or without CHP)</td>
<td>125</td>
<td>120</td>
</tr>
<tr>
<td>Hydro</td>
<td>95</td>
<td>95</td>
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<tr>
<td>Landfill Gas</td>
<td>65</td>
<td>65</td>
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<tr>
<td>Offshore Wind</td>
<td>155</td>
<td>155</td>
</tr>
<tr>
<td>Onshore Wind</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Sewage Gas</td>
<td>85</td>
<td>85</td>
</tr>
<tr>
<td>Large Solar Photo-Voltaic</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>Tidal Stream</td>
<td>305</td>
<td>305</td>
</tr>
<tr>
<td>Wave</td>
<td>305</td>
<td>305</td>
</tr>
</tbody>
</table>
Our approach to strike prices in 2014/15 – 2016/17 is based on “RO minus X” (or RO-X).

The ‘minus X’ reflects the assumption that the required rate of return for a renewables project to proceed, the hurdle rate, is lower under the CfD than under the RO.

This ensures that investors face similar incentives between the Renewables Obligation (RO) and CfD regimes.
Our approach to calculating strike prices

2017/18 – 2018/19

Strike prices are defined by factors including the affordability constraint presented by the LCF, as well as expectations of future technology costs.

In general, estimates of the cost of different electricity generating technologies in the future are driven by expectations and assumptions of technology specific learning rates and global and UK deployment.
3. Forward Look to 2030

- The generation mix beyond the Delivery Plan period will be influenced by how the costs of individual technologies develop in the coming decade.
- We have used three technology scenarios and three decarbonisation scenarios to illustrate the potential range of low-carbon generation deployment in 2030.

<table>
<thead>
<tr>
<th>Technology Scenario</th>
<th>Installed capacity in 2030 (GW)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Offshore wind</td>
</tr>
<tr>
<td>100g CO₂/kWh scenario</td>
<td>18</td>
</tr>
<tr>
<td>50g CO₂/kWh scenario</td>
<td>23</td>
</tr>
<tr>
<td>200g CO₂/kWh scenario</td>
<td>9</td>
</tr>
<tr>
<td>High CCS deployment</td>
<td>11</td>
</tr>
<tr>
<td>High nuclear deployment</td>
<td>10</td>
</tr>
<tr>
<td>High offshore wind deployment</td>
<td>39</td>
</tr>
</tbody>
</table>
5. Levy Control Framework

- Levy Control Framework places limit on cost to consumers
- Now extended to 2020/21 giving industry greater certainty about limits on a longer timescale
- Government will want to manage this cap on spending carefully and prudently – i.e. take account of risks, do not plan to spend full amount
- Some flexibility to use headroom (20% above limit)
- Government will publish more detail about the Governance Framework for the LCF in final Delivery Plan

Table 1: Upper Limits to Electricity Policy Levies, 2011/12 prices

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<thead>
<tr>
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</thead>
<tbody>
<tr>
<td></td>
<td>£4.30bn</td>
<td>£4.90bn</td>
<td>£5.60bn</td>
<td>£6.45bn</td>
<td>£7.00bn</td>
<td>£7.60bn</td>
</tr>
</tbody>
</table>
6. CfD contract terms and Allocation – part of a package on CfDs

1. **Removal of wholesale electricity price exposure** by providing a fixed strike price to developers, therefore stabilising project revenue

2. **Robust and reliable private law contractual arrangement** providing developers with a clear set of rights and obligations, and recourse to arbitration and expert determination processes to resolve disputes

3. **Robust single counterparty** owned by government and set up as a limited liability company

4. **Early certainty and security of support levels** in the project development process

5. Provision of an element of **protection against those risks that are outside the developers control** (e.g. change in law risk, force majeure risk, risk of grid connection delay)
## Draft CfD Terms

<table>
<thead>
<tr>
<th>Part</th>
<th>Subject</th>
<th>Part</th>
<th>Subject</th>
<th>Part</th>
<th>Subject</th>
</tr>
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<tbody>
<tr>
<td>Part 1</td>
<td>Introduction</td>
<td>Part 11</td>
<td>Change in Law</td>
<td>Part 12</td>
<td>Termination</td>
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<tr>
<td>Part 2</td>
<td>Term</td>
<td>Part 13</td>
<td>Credit Support</td>
<td>Part 14</td>
<td>Confidentiality, Announcements, Freedom of Information</td>
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<td>Part 3</td>
<td>Conditions Precedent</td>
<td>Part 15</td>
<td>Intellectual Property Rights</td>
<td>Part 16</td>
<td>Dispute Resolution</td>
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<tr>
<td>Part 4</td>
<td>Milestone</td>
<td>Part 17</td>
<td>General Provisions Regarding Liabilities, Remedies and Waivers</td>
<td>Part 18</td>
<td>Miscellaneous</td>
</tr>
<tr>
<td>Part 5</td>
<td>Metered Output, Market Reference Price, Strike Price</td>
<td>Part 19</td>
<td></td>
<td>Part 20</td>
<td>Schedules and Annexes</td>
</tr>
<tr>
<td>Part 6</td>
<td>Billing and Payment</td>
<td>Part 21</td>
<td></td>
<td>Part 22</td>
<td></td>
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<tr>
<td>Part 7</td>
<td>General Payment Mechanics</td>
<td></td>
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<td>Part 8</td>
<td>Metering</td>
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<tr>
<td>Part 9</td>
<td>Information Provision</td>
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<tr>
<td>Part 10</td>
<td>Representations, warranties and undertakings</td>
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</tbody>
</table>
Allocation Methodology describes the journey a developer must go through in order to secure and then retain a Contract for Difference (CfD).

Key changes set out in document:

- Time-periods for Target Commissioning Windows and Longstop Dates for each technology;
- Greater flexibility for developers to adjust the capacity of their project after securing a CfD;
- Approach to phased offshore projects, including the use of a single strike price; and
- Inclusion of requirement for developers to submit an approved supply chain plan to Government.
Strike price setting - Explaining RO-X

James Steel
1. RO-X

2. Modelling of project cash-flows

3. Example: offshore wind commissioning in 2016/17
1. RO-X

2. Modelling of project cash-flows

3. Example: offshore wind commissioning in 2016/17
• Strike prices for 2014/15 – 2016/17 are set so that, given our current assumptions, the marginal investor incentivised under the RO is indifferent between choosing the RO or CfDs. We refer to this approach as “Renewables Obligation minus X” or RO-X.

• The ‘minus X’ reflects the assumption that the required rate of return for a renewables project to proceed, the hurdle rate, is lower under the CfD than under the RO. It also reflects changes to PPA discount assumptions to reflect the reduced risks in CfD PPAs.
Calculating strike prices on the basis of RO-X involves the following steps:

I. Calculate, for each technology in each year, an RO range of the net present value (NPV) of lifetime costs of plants commissioning in that year based on plant capital, operating, fuel and financing cost estimates. Variation in costs is derived from low, central and high capital costs, with other costs held constant;

II. Combine these costs with revenue assumptions to determine the discounted NPV of the marginal investment under the RO;

III. Calculate a range of costs under CfDs, based on the same cost assumptions, except for lower financing costs. Combine this with revenue assumptions under the new EMR arrangements and vary the strike price in £1 increments until the NPV of the same marginal investment under CfDs is as close as possible to that under the RO; and finally,

IV. Round strike prices to the nearest £5.
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1. RO-X

2. Modelling of project cash-flows

3. Example: offshore wind commissioning in 2016/17
Timing of costs and revenues under the RO and CfDs

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<th>Pre-development start</th>
<th>Construction start (FID)</th>
<th>Operation start</th>
<th>End of CfD support</th>
<th>End of RO support</th>
<th>End of life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-development costs</td>
<td>Capital costs</td>
<td>Fixed operational expenditure</td>
<td>Variable operational expenditure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RO revenues</td>
<td>Wholesale revenue</td>
<td>ROC revenue</td>
<td>LEC revenue</td>
<td>CM revenue</td>
<td></td>
</tr>
<tr>
<td>CfD revenues</td>
<td>Wholesale revenue</td>
<td>CfD revenue</td>
<td>LEC revenue</td>
<td>CM revenue</td>
<td></td>
</tr>
</tbody>
</table>
Costs (underlying costs are the same under the RO and CfDs, but hurdle rates are different)
Calculation of costs

Predevelopment costs

- Capacity
- Predevelopment costs (£/MW)
- Predevelopment time
- Predevelopment phasing

Predevelopment costs in each year

Predevelopment costs

Capital costs

Fixed operational expenditure

Variable operational expenditure
Calculation of costs

Capital costs

- Capacity
- Capital costs (£/MW, low, medium, high)
- Construction time
- Construction phasing

Construction costs in each year

Capital costs

Predevelopment costs

Fixed operational expenditure

Variable operational expenditure
Calculation of costs

Fixed operational expenditure

- Capacity
- Fixed opex (£/MW/year)
- ‘Connection and UoS’ (£/MW/year)
- Insurance (£/MW/year)
Calculation of costs

Variable operational expenditure

- Fuel cost (£/MWh)
- Investor foresight
- Efficiency
- Capacity
- Load factor
- Variable opex (£/MWh)

Fuel costs in each year

Variable opex in each year

Predevelopment costs

Capital costs

Fixed operational expenditure
Revenue under the RO

- Pre-development start
- Construction start (FID)
- Operation start
- End of CfD support
- End of RO support
- End of life

Wholesale revenue
ROC revenue
LEC revenue
CM revenue
Calculation of revenue under the RO

Wholesale revenues

- Wholesale price projection
- Investor foresight
- Wholesale PPA discount
- Capacity
- Load factor
- Transmission losses

Wholesale price (£/MWh)

Garage (MWh)

Wholesale revenue

ROC revenue

LEC revenue

CM revenue
Calculation of revenue under the RO

RO revenues

- Wholesale revenue
- LEC revenue
- CM revenue

- ROC price projection
- ROC band
- ROC PPA discount

- Capacity
- Load factor

- RO support (£/MWh)
- Generation (MWh)

- ROC revenue
Calculation of revenue under the RO

LEC revenues

- LEC value projection
- LEC PPA discount
- Capacity
- Load factor

LEC support (£/MWh)

Generation (MWh)

LEC revenue

Wholesale revenue
ROC revenue
CM revenue
Calculation of revenue under the RO

Capacity market revenues

- Wholesale revenue
- ROC revenue
- LEC revenue

- Capacity
- CM derating assumption
- CM clearing price assumption (£/MW)

CM revenue
Cashflows for a project under the RO are compared to the levelised cost to estimate RO deployment

- Using the range of capital costs (low, medium, high) construct a supply curve of [20] points

- At each point on the supply curve, use the calculated revenues and the RO hurdle rate to determine the NPV of an investment with those capital costs

- The most expensive point on the supply curve with an NPV>0 is the marginal investment under the RO
# Revenue under CfDs

<table>
<thead>
<tr>
<th>Pre-development start</th>
<th>Construction start (FID)</th>
<th>Operation start</th>
<th>End of CfD support</th>
<th>End of RO support</th>
<th>End of life</th>
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<tbody>
<tr>
<td>Wholesale revenue</td>
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<tr>
<td>CfD revenue</td>
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<tr>
<td>LEC revenue</td>
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<tr>
<td>CM revenue</td>
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</tbody>
</table>
Calculation of revenue under CfDs

Wholesale revenues

- Wholesale price projection
- Investor foresight
- Wholesale PPA discount
- Capacity
- Load factor
- Transmission losses

Wholesale price (£/MWh)

Generation (MWh)

Wholesale revenue

CfD revenue

LEC revenue

CM revenue
Calculation of revenue under CfDs

CfD revenues

CfD strike price
Wholesale price
Transmission losses
Capacity
Load factor

CfD support (£/MWh)
Generation (MWh)

Wholesale revenue
LEC revenue
CM revenue

CfD revenue
Calculation of revenue under CfDs

**LEC revenues**

- LEC value projection
- LEC PPA discount
- Capacity
- Load factor
- LEC support (£/MWh)
- Generation (MWh)
- LEC revenue

**Revenue components**

- Wholesale revenue
- CfD revenue
- CM revenue
Calculation of revenue under CfDs
Capacity market revenues

- Capacity
- CM derating assumption
- CM clearing price assumption (£/MW)

Wholesale revenue
CfD revenue
LEC revenue
CM revenue
Calculating RO-X strike prices

- Using the range of capital costs (low, medium, high) construct a supply curve of [20] points

- At each point on the supply curve, use the calculated revenues and the CfD hurdle rate to determine the NPV of an investment with those capital costs

- Adjust the strike price (in £1/MWh increments) so that the NPV of the investment that was marginal under the RO has the same NPV under CfDs.

- Round the final strike price to the nearest £5/MWh
Contents

1. RO-X

2. Modelling of project cash-flows

3. Example: offshore wind commissioning in 2016/17
## Data sources

<table>
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<th>Data</th>
<th>Source</th>
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<tbody>
<tr>
<td>Predevelopment costs, predevelopment time, construction costs,</td>
<td>Electricity Generation Costs (unrounded figures used)</td>
</tr>
<tr>
<td>construction time, fixed opex, UoS, insurance, variable opex</td>
<td></td>
</tr>
<tr>
<td>Generic unit size, predevelopment phasing, construction cost phasing</td>
<td>Consistent with Electricity Generation Costs</td>
</tr>
<tr>
<td>PPA discounts, load factors, hurdle rates, wholesale prices</td>
<td>EMR Draft Delivery Plan Annex E (unrounded figures used)</td>
</tr>
<tr>
<td>Transmission losses, ROC values, LEC values, capacity mechanism</td>
<td>Consistent with analysis in EMR Draft Delivery Plan Annex E</td>
</tr>
<tr>
<td>mechanism derating, capacity mechanism clearing price</td>
<td></td>
</tr>
</tbody>
</table>
Costs for offshore wind, 2016/17

Predevelopment costs

- Capacity (200MW)
- Predevelopment costs (£71/kW)
- Predevelopment time (5 years)
- Predevelopment phasing (22% in the first four years, 11% in the last year)

Predevelopment costs in each year

- Predevelopment costs
  - Capital costs
  - Fixed operational expenditure
  - Variable operational expenditure
Costs for offshore wind, 2016/17

Capital costs

- Capacity (200MW)
- Capital costs (£2126/kW, £2516/kW, £2943/kW)
- Construction time (3 years)
- Construction phasing (30%, 40%, 30%)

Construction costs in each year

- Predevelopment costs
- Capital costs
- Fixed operational expenditure
- Variable operational expenditure
Costs for offshore wind, 2016/17

Fixed operational expenditure

- Capacity (200MW)
- Fixed Opex (£64,117/MW/year)
- ‘Connection and UoS’ (£46,849/MW/year)
- Insurance (£11,788/MW/year)

Predevelopment costs
Capital costs
Variable operational expenditure
Costs for offshore wind, 2016/17

Variable operational expenditure

Capacity (200MW)

Load factor (37.7%)

Variable opex (£1.60/MWh)

Fuel costs (£/MWh)

Investor foresight

Efficiency

Fuel costs in each year

Variable opex in each year

Predevelopment costs

Capital costs

Fixed operational expenditure

Variable operational expenditure
Revenue under the RO for offshore wind, 2016/17

Wholesale revenues

- Wholesale price projection
- Investor foresight (5 yrs)
- Wholesale PPA discount (5%)
- Capacity (200MW)
- Load factor (37.7%)
- Transmission losses (~1%, time dependent)

Wholesale price (£/MWh)

Generation (654 GWh)

Wholesale revenue

ROC revenue

LEC revenue

CM revenue
Revenue under the RO for offshore wind, 2016/17

**RO revenues**

- **ROC price projection**
- **ROC band (1.8)**
- **ROC PPA discount (5%)**
- **Capacity (200MW)**
- **Load factor (37.7%)**

**Wholesale revenue**

- **RO support (£/MWh)**
- **Generation (661GWh)**

**ROC revenue**

**LEC revenue**

**CM revenue**
Revenue under the RO for offshore wind, 2016/17
LEC revenues

- LEC value projection
- LEC PPA discount (5%)
- Capacity (200MW)
- Load factor (37.7%)
- LEC support (£/MWh)
- Generation (661 GWh)

Wholesale revenue
ROC revenue
CM revenue
Revenue under the RO for offshore wind, 2016/17
Capacity market revenues

- Capacity (200MW)
- CM derating assumption (22%)
- CM clearing price assumption (£25/kW)

Wholesale revenue
ROC revenue
LEC revenue
CM revenue
Project cashflows for offshore wind commissioning in 2016/17 under the RO

RO hurdle rate: 10.2%

### Project cashflows

<table>
<thead>
<tr>
<th>Year</th>
<th>Predevelopment costs</th>
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</table>
Revenue under CfDs for offshore wind, 2016/17
Wholesale revenues

- Wholesale price projection
- Investor foresight (5 yrs)
- Wholesale PPA discount (5%)
- Capacity (200MW)
- Load factor (37.7%)
- Transmission losses (~1%, time dependent)

Wholesale price (£/MWh)
Generation (654GWh)

Wholesale revenue

CfD revenue
LEC revenue
CM revenue
Revenue under CfDs for offshore wind, 2016/17

CfD revenues

- CfD strike price (£150/MWh)
- Wholesale price
- Transmission losses (~1%, time dependent)
- Capacity (200MW)
- Load factor (37.7%)

CfD support (£/MWh)

Generation (654GWh)

Wholesale revenue

LEC revenue

CM revenue
Revenue under CfDs for offshore wind, 2016/17
LEC revenues

LEC value projection
LEC PPA discount (5%)
Capacity (200MW)
Load factor (37.7%)
LEC support (£/MWh)
Generation (661GWh)

LEC revenue
Wholesale revenue
CfD revenue
CM revenue
Revenue under CfDs for offshore wind, 2016/17

Capacity market revenues

- Capacity (200MW)
- CM derating assumption (22%)
- CM clearing price assumption (£25/kW)

Wholesale revenue
CfD revenue
LEC revenue
CM revenue
Project cashflows for offshore wind commissioning in 2016/17 under CfDs

CfD hurdle rate: 9.6%
What is the Reliability Standard?

- The Reliability Standard represents the level of electricity security of supply that we aim for.
- Idea is to reflect the right balance between security of supply and the cost of that security.
- Captures risk of unmet demand caused by having insufficient generating capacity.
- We propose that the Reliability Standard be set on an enduring basis in order to provide assurances to Capacity Market participants on the level of security that HMG wants.
- We expect to express the Reliability Standard in terms of a Loss of Load Expectation. This is the metric used by all of our interconnected neighbours as well as in markets in the United States which have Capacity Markets.
- We prefer this metric of security of supply to Capacity Margins which is are not as good an indicator of risk and will get worse over time as we add more wind onto the system.
The proposed Reliability Standard reflects the tradeoff between the benefits of security of supply and the costs.

The benefits of security of supply are represented by the marginal cost to consumers of having their electricity disconnected. We have carried out a joint study with Ofgem to determine this value. The headline figure suggests a Value of around £17,000/MWh.

The costs of security of supply are represented by the costs of additional “peaking” capacity. Analysis by Parsons Brinckerhoff suggests that the marginal cost of additional capacity is around £47,000/MW.

These values suggest that the optimal value is around 3 hours of expected lost load per year or in other words a reliability level of 99.97%.

This is within the bounds of other countries as suggested below.

<table>
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<th>LOLE (hours/yr)</th>
<th>Equivalent to Standard of..</th>
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<td>3</td>
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</tr>
<tr>
<td>4</td>
<td>Netherlands</td>
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<tr>
<td>8</td>
<td>Ireland</td>
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</table>
We carried out a joint study with Ofgem to look at customers' value of lost load.

London Economics carried out the analysis using survey techniques.

Individuals and businesses will have different VoLLs and they will vary by the time of year and time of day.

Analysis suggests that the average value of domestic and SME electricity users at times of system peak is around £17,000/MWh.

This is the result of a choice experiment approach. Customers are asked to choose between 2 different scenarios each involving compensation. Their responses inform the estimated value of lost load based on econometric analysis.
Cost of New Entrant Capacity

- The cost of new entrant capacity represents the cheapest possible capacity that could be built to cover peak periods.

- Technical definition: it is the yearly amount needed to pay for capacity such that the discounted value (NPV) of its operations is zero over its technical operating lifetime, assuming the plant never runs and receives no energy market revenue.

- At the moment the cheapest plant of this type is an OCGT peaking plant.

- We have had Parsons Brinckerhoff calculate this.
### Timings

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### Capital Cost

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### Fixed Operating Costs

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<tr>
<td>Insurance, Connection and UoS charges</td>
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- Above figures provided by consultancy Parsons Brinckerhoff for DECC (2013).

### Hurdle Rate

- Report on technology costs for the Committee on Climate Change (2012) suggested range of 6-9% so we have used a central figure of 7.5%
Government will set out a demand curve in a Capacity Auction to ensure that there is some elasticity of demand and to take account of uncertainty over the parameters.

- Target based on analysis from SO
- Net CONE based on Gross CONE minus expected energy market revenues
- Cap based on a multiple of Net CONE
- Slope based on Target +/- XGW of capacity

As part of the development of the Capacity Market these parameters are being developed and we intend to consult on them as part of the Secondary Legislation for the Energy Bill.
Consultation questions

1. Do you agree with our proposed reliability standard of 3 hours LOLE?
2. Do you agree with the methodology underpinning the reliability standard – that is to calculate this using the value of lost load and the cost of new entry? If not, please explain why and provide supporting evidence.
3. Do you agree with the analysis of the value of lost load as described on Page 48 and in Annex C? If not, please explain why and provide supporting evidence.
4. Do you agree with our estimate of the cost of new entry as described on page 49 and in Annex C? If not, please explain why and provide supporting evidence.
5. Do you agree the reliability standard should be reviewed every five years to reflect any future evidence in the value of lost load and the cost of new plant entry?
6. Do you agree with the proposed methodology for the auction demand curve? If not, please explain why and provide supporting evidence.
Outstanding issues and questions – table discussions
Next steps

Alon Carmel
Close and informal questions