Electricity Market Reform and the UK's liberalised energy market

The Institute of Energy Economics Japan
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Structure of talk

Drivers of Electricity Market Reform (EMR)

What problem is EMR intended to resolve?

Historical context

Elements of EMR

Future policy options
1) Climate change policy (Climate Change Act 2008)

2) EU Renewable Energy Directive 2009
   • implies ~30% renewable electricity by 2020
   • (15% energy including heat and transport)
Changing energy policy priorities

climate

affordability security
UK carbon budgets

Source: UK Committee on Climate Change
Progress in meeting carbon budgets
Decarbonisation will require 30-40 GW new low-carbon capacity through the 2020s.

Note: Intermittent technologies are adjusted to be baseload equivalent.
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Low carbon electricity is capital intensive....

Source: Mott McDonald
But intermittent generation = volatile prices in an “energy only” market

Source: Committee on Climate Change
EMR: What’s the problem?

- Low carbon electricity generation tends to be high capital cost/low running cost (fossil plant with CCS excepted)
- Investment in such plant is exposed to additional market risk in a volatile “energy only” market
- Gas plant has a natural hedge because gas prices drive electricity prices and hence has lower risk
- The cost of capital is therefore higher for low carbon generation

- The purpose of Electricity Market Reform is to reduce market risk for low carbon generation by offering stable prices
- This also helps to contain the cost to consumers of low carbon electricity supply
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### Historical context

#### Wholesale electricity

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>Privatisation - Unbundling, generation duopoly, power pool arrangements, but bilateral contracts for differences (CfDs) emerge</td>
</tr>
<tr>
<td>2001</td>
<td>New Electricity Trading Arrangements (NETA) – bilateral contracts plus spot market for imbalances</td>
</tr>
<tr>
<td>2005</td>
<td>British Electricity Trading Transmission Arrangements (BETTA) – includes Scotland</td>
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<tr>
<td>2013</td>
<td>Electricity Market Reform</td>
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#### Retail electricity

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
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</thead>
<tbody>
<tr>
<td>1990</td>
<td>Privatisation - 12 regional supply monopolies. Loads over 1 MW can choose their supplier</td>
</tr>
<tr>
<td>1994</td>
<td>Loads over 100 kW can choose their supplier</td>
</tr>
<tr>
<td>1999</td>
<td>Full retail competition</td>
</tr>
<tr>
<td>2014</td>
<td>Competition and Markets Authority (CMA) inquiry</td>
</tr>
</tbody>
</table>
Initial privatised structure 1990 (England and Wales)

- Generation
- Transmission
- Distribution
- Customer

Supply
12 regional companies

Regulated

Initially the same…
Great Britain today: concentration in supply and generation

Source: Data from Bloomberg New Energy Finance 2012
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Elements of the Electricity Market Reform

1. Carbon price floor

2. Feed-in-tariffs though contracts for difference (CfDs) for all low carbon generation

3. A capacity mechanism

4. Emissions performance standard

*Sits on top of, does not replace, the underlying wholesale market!*

*Sits on top of the EU Emissions Trading Scheme!*
Carbon price floor – the EU ETS context

EU ETS carbon prices
Forward month price, € per allowance

Source: www.theice.com
### Evolving carbon price support

#### 2011

![Graph showing carbon price support evolution](image)

#### 2013

<table>
<thead>
<tr>
<th></th>
<th>Confirmed rates</th>
<th>Indicative rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon price equivalent (£ per tCO₂)</td>
<td>4.94</td>
<td>9.55</td>
</tr>
</tbody>
</table>

#### 2014 - carbon price support frozen at £18/tCO₂ till 2019-20
Feed-in tariffs through contracts for difference (CfDs)

Source: UK Department of Energy and Climate Change
The four stages of EMR – how strike prices are determined

<table>
<thead>
<tr>
<th>Stage 1</th>
<th>Stage 2</th>
<th>Stage 3</th>
<th>Stage 4</th>
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</thead>
<tbody>
<tr>
<td>To 2017</td>
<td>2017 – 2020s</td>
<td>2020s</td>
<td>late 2020s/beyond</td>
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- **Current arrangements alongside new Contracts for Difference with prices set administratively**
- **Technologies mature (but at different rates) and some are able to enter competitive, technology-specific auctions.**
- **Growing maturity of technologies and movement towards technology neutral auctions.**
- **Technologies are mature enough and the carbon price is high and sustainable enough to allow all generators to compete without intervention.**

**Nuclear**

**Mature renewables**
The Levy Control Framework (LCF) – capping costs to consumers

- An annual cap on EMR costs incurred by consumers
- Included: Renewables Obligation, Feed-in Tariffs and Contracts for Difference
- Excluded: capacity payments and energy demand measures
- £5.3bn cap in 2015-16 rising to £7.6bn by 2020-21
- 20% headroom for contingencies
- Believed to be compatible with 30% renewables by 2020
- LCF costs will rise with: a) lower wholesale market price; b) lower carbon price support; c) higher capacity mechanism price
Nuclear progress – Hinkley Point

EDF Energy

- Sites at Hinkley Point and Sizewell up to 6,400 MW
- AREVA EPR Passed Generic Design Assessment and site work started – but no Final Investment Decision (FID) as yet
- Strike price agreed for Hinkley Point - £92.50/MWh, £89.50/MWh if Sizewell developed
- 35 year inflation-linked contract
- Gained EU State Aid approval but Austria may appeal
Nuclear progress – other consortia

NuGen (Toshiba, GDF SUEZ)

- Moorside up to 3400 MW
- Westinghouse AP1000
- Passed Generic Design Assessment

Horizon Nuclear Power (Hitachi)

- Sites at Wylfa and Oldbury, 5400 MW
- Advanced Boiling Water Reactors
- Going through Generic Design Assessment
## CfD administrative strike prices for renewables

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<tbody>
<tr>
<td>Biomass (with CHP)</td>
<td>125</td>
<td>125</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>Biomass Conversion</td>
<td>105</td>
<td>105</td>
<td>105</td>
<td>105</td>
<td>105</td>
</tr>
<tr>
<td>Hydro</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Landfill Gas</td>
<td>55</td>
<td>55</td>
<td>55</td>
<td>55</td>
<td>55</td>
</tr>
<tr>
<td>Onshore Wind</td>
<td>95</td>
<td>95</td>
<td>95</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>Offshore Wind</td>
<td>155</td>
<td>155</td>
<td>150</td>
<td>140</td>
<td>140</td>
</tr>
<tr>
<td>Wave and tidal stream</td>
<td>305</td>
<td>305</td>
<td>305</td>
<td>305</td>
<td>305</td>
</tr>
<tr>
<td>Large Solar PV</td>
<td>120</td>
<td>120</td>
<td>115</td>
<td>110</td>
<td>100</td>
</tr>
</tbody>
</table>

15 year contracts….
CfD auctions allocating the funds available

Three ‘pots’ – no fungibility between them

1. Established’ technologies (onshore wind, PV, energy from waste with CHP, hydro (all >5 MW) + landfill gas and sewage gas
2. Less established’ technologies (offshore wind, wave, tidal stream etc)
3. Biomass conversion

- *If pots are undersubscribed* – all get the administrative strike price

- *If pots are oversubscribed*, auction is triggered and all are paid the price of the last successful bid

- Current auction process under way
Anecdotal observations on CfD process

- Cost of capital for completed projects has fallen as planned – projects can be attractive to long-term institutional investors (e.g. pension funds)

- Cost of capital for developers has gone *up* compared to the Renewables Obligation. The ‘less established’ technologies ‘pot’ could be used up by a single offshore wind project … therefore risk of over-subscription and wasted preparatory work for developers
Capacity mechanism

- A market-wide mechanism for all generation not supported by Renewables Obligation or CfDs
- Four years ahead - first auctions held December 2014 for 2018-19
- Offers for 1 year, 3 years or 15 years of provision
- 65,000 MW of bids submitted, of which 49,300 MW accepted, of which 9,800 MW new/refurbished plant (174 MW demand side)
- Clearing price - £19.40/kW/year – lower than expected
Emissions Performance Standard

- 450 g/kWh for new or refurbished plant
- Compare to 370 g/kWh for new combined cycle gas turbine (CCGT), 900 g/kWh for existing coal
- Effectively kills new coal without carbon capture and storage (CCS)
- Negotiations on two CCS projects still under way (one coal, one gas)
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Certainty beyond 2020

• Carbon intensity target (g/kWh) for electricity in 2030. May be set in 2016 under the Energy Act 2013. Advocated by the Committee on Climate Change to provide certainty beyond 2020.

Continuation of unabated coal

• Falling cost of compliance with the EU Industrial Emission Directive which would otherwise have taken coal off the system in the early 2020s. Could be operating at (low load factor) in 2030

• Beefed up emissions performance standard to take existing coal off the system (application to existing plant, degression over time from 450 g/kWh) – suggested by ‘think tanks’

Reform of the EU ETS

• Market stabilisation reserve