A Short Tale from a Small Windy Island

Howard V Rogers
Centre for Energy Economics 2011 Annual Meeting & Forum
8th December 2011

Themes

• Wind Modelling Methodology
• The impact of Wind on Gas
• Implications for UK

Based on the Following Research:

*The Impact of Import Dependency and Wind Generation on UK Gas Demand and Security of Supply to 2025, Howard Rogers, August 2011, [http://www.oxfordenergy.org](http://www.oxfordenergy.org)
UK Generation Capacity in 2011 (GW)

- Nuclear: 29.3 GW
- Coal: 28.9 GW
- Wind: 4.6 GW
- Oil: 3.6 GW
- Hydro: 1.1 GW
- Other: 2.8 GW

Wind Turbine Output Curves

- Upland
- Lowland
- Offshore

Source: Trudewind 2008a, P.10.
Zones and Representative Weather Stations

13 Onshore Zones
7 Offshore Zones

Existing and Future UK Wind Generation Capacity

Sources: British Wind Energy Association, DECC, Poyry, CCC, Own Analysis
UK Sources of Power Generation 2009 – Daily
(3.8 GW Wind Capacity)

Sources: National Grid, Own Analysis

UK Sources of Power Generation 2015 – Daily
(14.8 GW Wind Capacity)

Sources: National Grid, Own Analysis
UK Sources of Power Generation – 2020 Daily
(27.6 GW Wind Capacity)

Sources: National Grid, Own Analysis

2020 Hourly Analysis

Days 337 – 343 (December)

Days 245 – 262 (September)

Sources: National Grid, Own Analysis
UK Sources of Power Generation 2025 Daily
(43.2 GW Wind Capacity)

Sources: National Grid, Own Analysis

2025 Hourly Analysis

Days 121 – 127

Days 241 – 247

Sources: National Grid, Own Analysis
UK Sources of Power Generation

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<tr>
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<th>Gas Demand in Power*</th>
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<tr>
<td></td>
<td>TWh</td>
</tr>
<tr>
<td>2009</td>
<td>147.7</td>
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<tr>
<td>2015</td>
<td>125.5</td>
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<tr>
<td>2020</td>
<td>140.5</td>
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<td>2025</td>
<td>130.7</td>
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* 50% efficiency Assumed

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<th>Working Gas volume bcm</th>
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<tr>
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<td>Depleted Field</td>
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<tr>
<td></td>
<td>Absolute</td>
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<tr>
<td>2009</td>
<td>1.50</td>
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<td>2015</td>
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<td>1.50</td>
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<td>2025</td>
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Sources: Own Analysis
Conclusions

• The growth of wind capacity requires gas fired generation as a buffer, with gas consumption broadly at current levels to 2020.
  - (Incentives to invest in additional CCGT capacity need resolving)
• Wind becomes challenging to manage above 28 GW of installed capacity; short notice turn-down required at a reasonable cost to consumer.
• Given crucial ongoing role of gas it would appear prudent to take UK storage levels to 10% of consumption*. (Cost circa £2 - 3bn versus {UK Regulator} Ofgem estimate of investment in Green Scenarios of £200bn )

* Cf US level of 18%

Thank You for your attention.

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