Carbon markets in a downturn

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DISCLOSURES AND ANALYST CERTIFICATIONS ARE LOCATED IN APPENDIX 1
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  -- EMISSIONS IN REMISSION
  -- THE LONG AND THE SHORT OF IT

- HOW LONG IS A PIECE OF STRING?

- THE GLOBAL UPSIDE FOR CARBON MARKETS
The Current Value of the Global Carbon Market

- Current policy framework has two main pillars: Kyoto and the EU-ETS.
- Of this, the ETS accounted for $92bn, and Kyoto mechanisms $34bn.

Source: World Bank, UNEP Risoe, Deutsche Bank

* Projects that issued credits

Kyoto related

Projects that issued credits

Source: World Bank, UNEP Risoe, Deutsche Bank

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Historic CERs/ERUs prices correlations with EUAs

- Up to 75% of the CERs/ERUs transactions on the market relates to purchases by or on behalf of installations in the EU-ETS with compliance obligations to cover
  - most of the turnover in CERs at the moment is being driven by ETS compliance requirements
  - this explains why there has until now been such a close correlation between EUA and CER prices

![Graph showing historic CERs/ERUs prices correlations with EUAs]

Source: Deutsche Bank from Datastream
The policy objectives of the EU-ETS

- The overriding objective of EU climate policy is to limit the increase in average global temperatures to <2°C above pre-industrial levels.

- The ETS is there to generate a ‘clear, undistorted and long-term carbon price signal’ and so help achieve this policy target.

- To this end, there are three main dimensions to the ETS’ role:
  1. To help achieve the EU’s 2020 GHG-emissions-reduction target
  2. To promote CCS technology in the power sector such that it becomes the new entrant of choice by 2020
  3. To help foster a genuinely global carbon market
20% of Final Energy Consumed from Renewables by 2020

The EU is now committed to ensuring that

(i) 20% of its final-energy consumption comes from renewable sources by 2020

- The EU estimates that the annual emissions savings would be 400Mt

(ii) to incentivising the construction of 12 large-scale CCS plants by 2015.

- We estimate that this could lead to emissions reductions of approximately 35Mt per year by that time assuming 5.4GW of total CCS capacity.

BOTH will have to increase their share of overall global power output

The problem at the moment remains one of cost

Source: European Commission
Our estimates for the conventional fossil-fuel technologies assuming a carbon price of €25/tonne

Breakdown of costs for fossil-fuel plant with CO2 at €25/tonne (%)
Our estimates for the conventional fossil-fuel technologies assuming a carbon price of €40/tonne

Breakdown of costs for fossil-fuel plant with CO2 at €40/tonne (%)

- **GAS**
  - Fuel Cost: 68%
  - Fixed opex: 17%
  - Variable opex: 3%

- **COAL**
  - Fuel Cost: 35%
  - Fixed opex: 36%
  - Variable opex: 12%

- **CCS**
  - Fuel Cost: 54%
  - Fixed opex: 1%
  - Variable opex: 18%

- **NUCLEAR**
  - Fuel Cost: 64%
  - Fixed opex: 9%
  - Variable opex: 16%

Source: Deutsche Bank
It Takes CO2 to Contango: Our previous forecasts (May-Oct 2008)

Rise in temperatures < 2°C

<table>
<thead>
<tr>
<th>Year</th>
<th>EU Cap (MtCO2)</th>
<th>CO2 price (€/t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>1,720</td>
<td>40</td>
</tr>
<tr>
<td>2012</td>
<td></td>
<td>67</td>
</tr>
<tr>
<td>2020</td>
<td></td>
<td>67</td>
</tr>
</tbody>
</table>

Long Run abatement supply curve – ordinarily in Contango

Risk of backwardation

Average residual abatement over 2008-20: 125Mt p.a.

Fuel switching (65 Mt p.a.)

Up to 60 GW of new CCGT required

CO2

Large use of carbon credits:
- 2,163M EUAs, CERs, ERUs p.a...
- Fewer carbon credits available:
- 1,971M EUAs, CERs, ERUs p.a...

In power-plants

EUA & CER/ERU use

Source: Deutsche Bank
Contango downgraded: Our previous forecasts (until Dec 2008)

- EU Cap (MtCO2)
  - 2008: 2,083
  - 2012: 1,720
  - 2020: 1,720

- CO2 price (€/t)
  - 2008: 30
  - 2012: 48
  - 2020: 48

- Long Run abatement supply curve – ordinarily in Contango
  - Materially lower risk of backwardation than previously

- Rise in temperatures < 2°C
  - 2008
  - 2012
  - 2020

  - Fuel switching (65 Mt p.a.)
  - up to 25-30 GW of new CCGT required

- Borrowing not allowed
  - Phase 2
  - Phase 3

- CCS plant
  - No longer competitive by 2020

Source: Deutsche Bank AG

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EU-23 distribution of EUA deficits and surpluses by sector (Mt)

Source: European Commission, Member State NAPs, Deutsche Bank; Based on data of installations that released their 2008 verified emissions and for which we have allocation data.

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Power sector’s 2008 net EUA position incl. auctioned EUAs (Mt)

Source: Deutsche Bank, European Commission, NAPs; Based on data of installations that released their 2008 verified emissions and for which we have allocation data
### DB projected aggregate net position of ETS sectors, 2008-12 (Mt)

<table>
<thead>
<tr>
<th></th>
<th>Power sector</th>
<th>All other sectors combined</th>
<th>NET ETS position before unused NER allowances</th>
<th>Unused NER allowances</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assumed net position in 2008</td>
<td>-180</td>
<td>+90</td>
<td>-90</td>
<td>+65</td>
</tr>
<tr>
<td>Implied net position in 2009</td>
<td>-143</td>
<td>+190</td>
<td>+47</td>
<td>+65</td>
</tr>
<tr>
<td>Implied net position in 2010</td>
<td>-158</td>
<td>+140</td>
<td>-18</td>
<td>+65</td>
</tr>
<tr>
<td>Implied net position in 2011</td>
<td>-194</td>
<td>+130</td>
<td>-64</td>
<td>+65</td>
</tr>
<tr>
<td>Implied net position in 2012</td>
<td>-208</td>
<td>+100</td>
<td>-108</td>
<td>+65</td>
</tr>
<tr>
<td>TOTAL 2008-12</td>
<td>-883</td>
<td>+650</td>
<td>-233</td>
<td>+325</td>
</tr>
</tbody>
</table>

Source: Deutsche Bank
### RWE: % of German electricity output over 2008-12 already sold

<table>
<thead>
<tr>
<th>Phase-2 of ETS</th>
<th>Amount of total expected power output already sold</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>100%</td>
</tr>
<tr>
<td>2009</td>
<td>&gt;95%</td>
</tr>
<tr>
<td>2010</td>
<td>&gt;80%</td>
</tr>
<tr>
<td>2011</td>
<td>&gt;45%</td>
</tr>
<tr>
<td>2012</td>
<td>&gt;20%</td>
</tr>
<tr>
<td>Weighted average over entire 2008-12 period</td>
<td>&gt;68%</td>
</tr>
</tbody>
</table>

Source: RWE
RWE’s net EUA position over Phases 1 & 2 of the ETS

- 2007 CO2 Emissions: 158
- 2007 CO2 Certificates Granted: 35
- Expected range of CO2 emissions 2008-12: 140 +/- 5%
- Expected CO2 certificates granted 2008-12: 145

Free allocation (post auctioning) ca. 60% = ca. 80 M t +/- 5%

RWE carbon shortfall over 2008-12 and 2013-20 (Mt/y)

- 2008-12: 60-70
- 2013-20: 160-170
- 2013: +100

Source: RWE

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EUA surplus over Phase 2 if full NER used (Mt)

EUA deficit of incumbents over Phase 2

Source: Deutsche Bank

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German nukes to close by 2013 under existing legislation: 7GW to come offline …

This would equate to 53TWh of lost CO2-free output by 2013

Source: Deutsche Bank
DB estimate of increase in ETS emissions from nuclear phase-out, 2009-13 and 2014-20

DB estimate of increase in ETS emissions from changing German capacity mix under nuclear phase-out, 2009-20

Source: Deutsche Bank
Over the longer term, it still takes CO2 to contango

Ultimately, new power-generation capacity will probably still be needed, which implies a carbon price of €25-30/t already today based on a long-term oil price forecast of $85/bbl, and a long-term coal-price forecast of $125/t
How the Global Carbon Market Might Look in Future

Potential total size of the Global Carbon Market
- by 2010E $175bn
- by 2020E $1,000bn

Regional Markets in North America and Australasia will likely bolster demand for CERs.

Potential future linking opportunity
- Linking via Kyoto project mechanisms

Source: Deutsche Bank
Appendix 1

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