Environmental Control Issues in Industry

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Drax Power Limited

- **Company Listed on FTSE in Dec 2005**
- **Plant Capacity 4,000 MW**
- **Consume 10Mt solid fuel per annum**
- **Carbon dioxide emissions 22Mt**
- **Generate 7-10% of UK’s electricity needs**
- **Electricity Wholesaler with small retail business**
- **FGD operational since 1990**
- **Aiming at 2000 MW biomass by 2016**
Existing Plants in Low Carbon Transition

Fossil Fuel Track
SO2, NOx and particulate controls from 1990s, mainly by incremental and well telegraphed changes to plant standards
- Large Combustion Plant Directive to 2016

Low Carbon Track
Major technology driver, fossil fuels being driven out of the market
Carbon price floor in UK
Change in technology required

Three Separate Directives

National Emissions Ceilings Directive (NECD) – national ceilings on SO₂, NOₓ

Large Combustion Plant Directive (LCPD) – site specific limits for dust, SO₂, NOₓ
IPPCD - PPC permits slow to be implemented, BREFs issued as ‘guidance’ and often ignored. Poor BREF production process.

NECD - 2010 only.
Largely irrelevant in UK

LCPD – considered by EC as insufficiently stringent, fixed in 2000, too many derogations, inconsistent with BREF
Key EC objective is to gain control of LCP air emission (and water discharge) limits and to establish an easy mechanism for their upgrade and enforcement.

**Industrial Emissions Directive** merges IPPCD and LCPD (also WID etc). Tight limits for 2016 plus use of BREFs as the automatic update mechanism.

**NECD – 2020-2030.**

*likely to be a constraint in UK power sector?*
IED effectively forces all EU plant to use limits in any new BREF

- Allows EC to further change limits and introduce other issues during BREF production.
- Compliance with any new BREF to be implemented in permits 4 within years (max).
- EC potentially restructuring BREF to shorter, more focussed, document and to better address the key issues of integrating IED and BREF
- This is EC’s opportunity to rewrite Annex V in IED and to introduce other features (dioxins, heavy metals (mercury), start up/shut down)
- BREF to become a IED implementation document?
- Potential new areas may therefore be unit/plant, start up/shut down, operational hours, daily AEL/monthly ELV, upper/lower BAT
- First draft of new version in May 2013
**NO\textsubscript{x} and SO\textsubscript{2} emission limits for large existing coal**

<table>
<thead>
<tr>
<th></th>
<th>Existing Plant &gt;300MWth NO\textsubscript{x}</th>
<th>Existing Plant &gt;300MWth SO\textsubscript{2}</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCPD to 2016</td>
<td>500</td>
<td>400</td>
<td>Monthly ELV with 95% 48hr compliance National Emission Reduction Plan</td>
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<tr>
<td></td>
<td>200 from 2016</td>
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</tr>
<tr>
<td>IED limits in force from 2016</td>
<td>200</td>
<td>200</td>
<td>Monthly ELV with 95% 24hr compliance Transitional National Plan</td>
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<tr>
<td>BREF (Current)</td>
<td>90-200</td>
<td>20-200</td>
<td>Daily Average Emission levels (AEL) for the best plant (‘lower BAT’)</td>
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<tr>
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<td>Daily Average Emission levels (AEL) for an acceptable performance (‘upper BAT’)</td>
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</table>
The investment difficulty – two levels of BAT

- BAT based on 400mg/m$^3$ SO$_2$ and 500mg/m$^3$ NO$_x$

- BAT based on 200mg/m$^3$ SO$_2$ and 200mg/m$^3$ NO$_x$

2016

2019(?)

New BAT level ?

- EC BAT Reference (BREF) rewrite 2013-2014

- EA permit review 2014-5

- New IED BAT benchmarks in permits 2019(?)

- New BREF rewrite 2022(?)

NECD / Gothenburg
Influence of low carbon legislation

- Certainty in emission standards to 2019
- Uncertainty and potential constraints (SO$_2$ or NO$_x$) beyond 2019 but technically manageable through
  - equipment (SCR/SNCR),
  - fuel choice,
  - burner management,
  - FGD enhancement

However--

- Coal plant aging. Cost of retrofit can be high.
- Definition of BAT for ‘mid-merit’ plant
- Fitting SCR requires £3-4/MWh for 10yrs in payback
- UK carbon price floor effectively limits coal operations
- Existing plants vital to provide sufficient capacity and flexibility but will experience output reductions and then closure as new low C capacity is completed.
Implications for UK generation

Assuming current carbon price floor plans persist

All existing coal plant

- Minimal environmental investment but low load post 2016
- Retrofit with SCR/SNCR but at reducing load factors.
- Convert wholly/partly to biomass to manage both NOx/ SOx and carbon issues
Construction of Biomass store (First of Four) at Drax site
Environmental impacts of biomass

Biomass conversion

- Emission levels in BREF similar to coal
- Generally low sulphur – need for FGD?
- Generally reduced NOx (SCR may be difficult to retrofit)
- Particulate should be amenable to standard technology
- Technical engineering issues to overcome
- Major safety/ dust management issues
- Upstream investments
- Supply chain concerns

Medium term transitional technology
Oxy-fuel CCS

Project Promoters

Oxy Power Plant

CO₂ Transportation & Storage

ALSTOM  DRAX  BOC

NATIONAL GRID
Oxy-Fuel

- Example only, different options are possible for the secondary re-circulation positioning
  - Nitrogen
  - Oxygen
  - CO2
  - PUL. COAL = Pulverized coal
  - Pumps
  - Compressors

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Route planning

• Onshore route planning:
  • Two rounds of public consultation completed
• Offshore route planning:
  • Route options in preparation

Storage Development

• Prime storage target site and backup identified
• Offshore facilities conceptual design studies completed
• Appraisal drilling pre-drill data package defined
• Appraisal drilling expected summer 2013
Conclusions

BREF process driving standards forward
- regular updates of standards
- investment programmes driven by BREF
- biomass conversion new to BREF process
- CCS an ‘emerging technique’ with no formal standards yet.

Low carbon requirements dictating new generation of plant
- different set of environmental concerns
- biomass
- CO$_2$