Environmental Control Issues in Industry

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Drax Power Limited


Drax Power Limited
Plant Capacity 4,000 MW
Consume 10Mt solid fuel per annum
Company Listed on FTSE in Dec 2005
Generate 7-10% of UK's electricity needs
Carbon dioxide emissions 22Mt
Electricity Wholesaler with small retail business
FGD operatonal 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

- Industrial Emissions Directive from 2016

Low Carbon Track

Major technology driver, fossil fuels being driven out of the market

Carbon price floor in UK

Change in technology required

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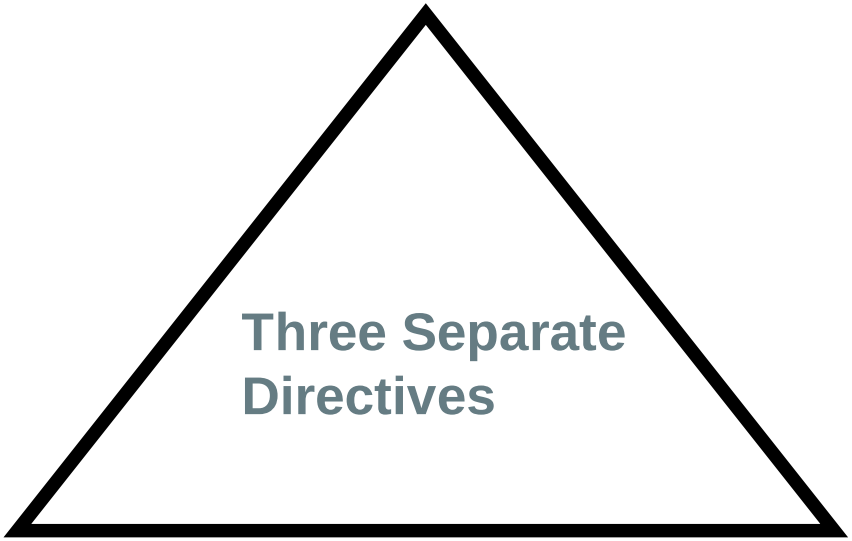
Legislative base 2000-2009

Integrated Pollution Prevention and Control Directive (IPPCD) . Development of (sectoral and other) Best Available Techniques Reference documents (BREF)

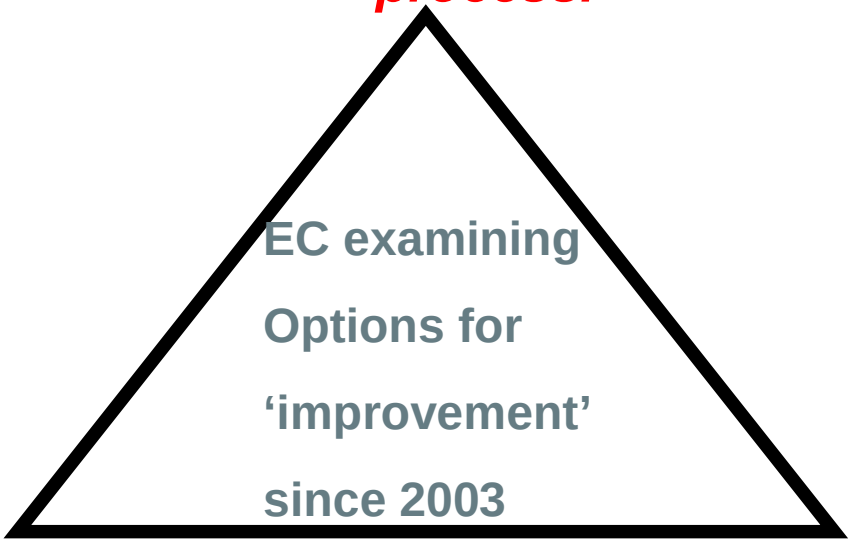


National Emissions Ceilings Directive (NECD) – national ceilings on SO_2 , NO_x

Large Combustion Plant Directive (LCPD) – site specific limits for dust,SO_2 NO_x

Legislative base 2000-2009

IPPCD - PPC permits slow to be implemented, BREFs issued as 'guidance' and often ignored. Poor BREF production process.



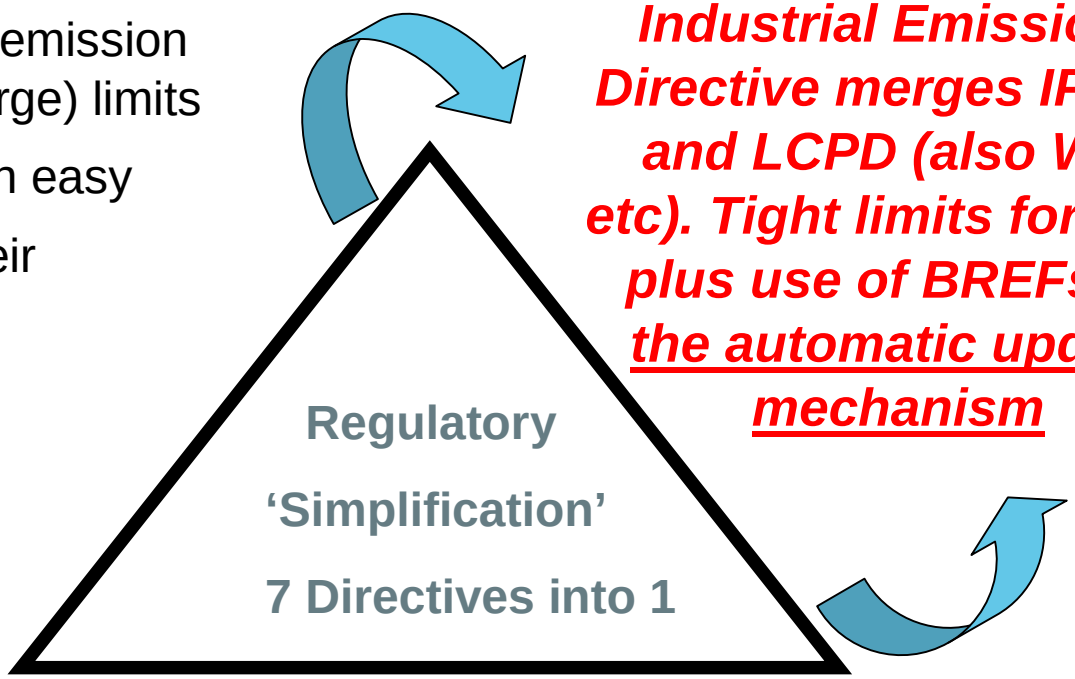
NECD - 2010 only.

Largely irrelevant in UK

LCPD – considered by EC as insufficiently stringent, fixed in 2000, too many derogations, inconsistent with BREF

Legislative base 2010 and beyond

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?

BREF/BAT

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_x and SO_2 emission limits for large existing coal

	Existing Plant >300MWth NO_x	Existing Plant >300MWth SO_2	Comments
LCPD to 2016	500 200 from 2016	400	Monthly ELV with 95% 48hr compliance National Emission Reduction Plan
IED limits in force from 2016	200	200	Monthly ELV with 95% 24hr compliance Transitional National Plan
BREF (Current)	90-200	20-200	Daily Average Emission levels (AEL) for the best plant ('lower BAT') Daily Average Emission levels (AEL) for an acceptable performance ('upper BAT')

The investment difficulty – two levels of BAT

BAT based on 400mg/m^3 SO_2 and 500mg/m^3 NO_x

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

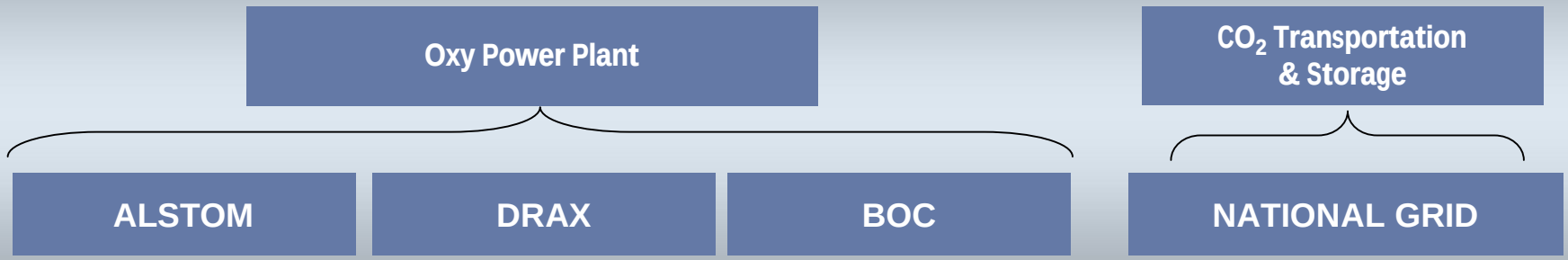
Biomass conversion

- **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**

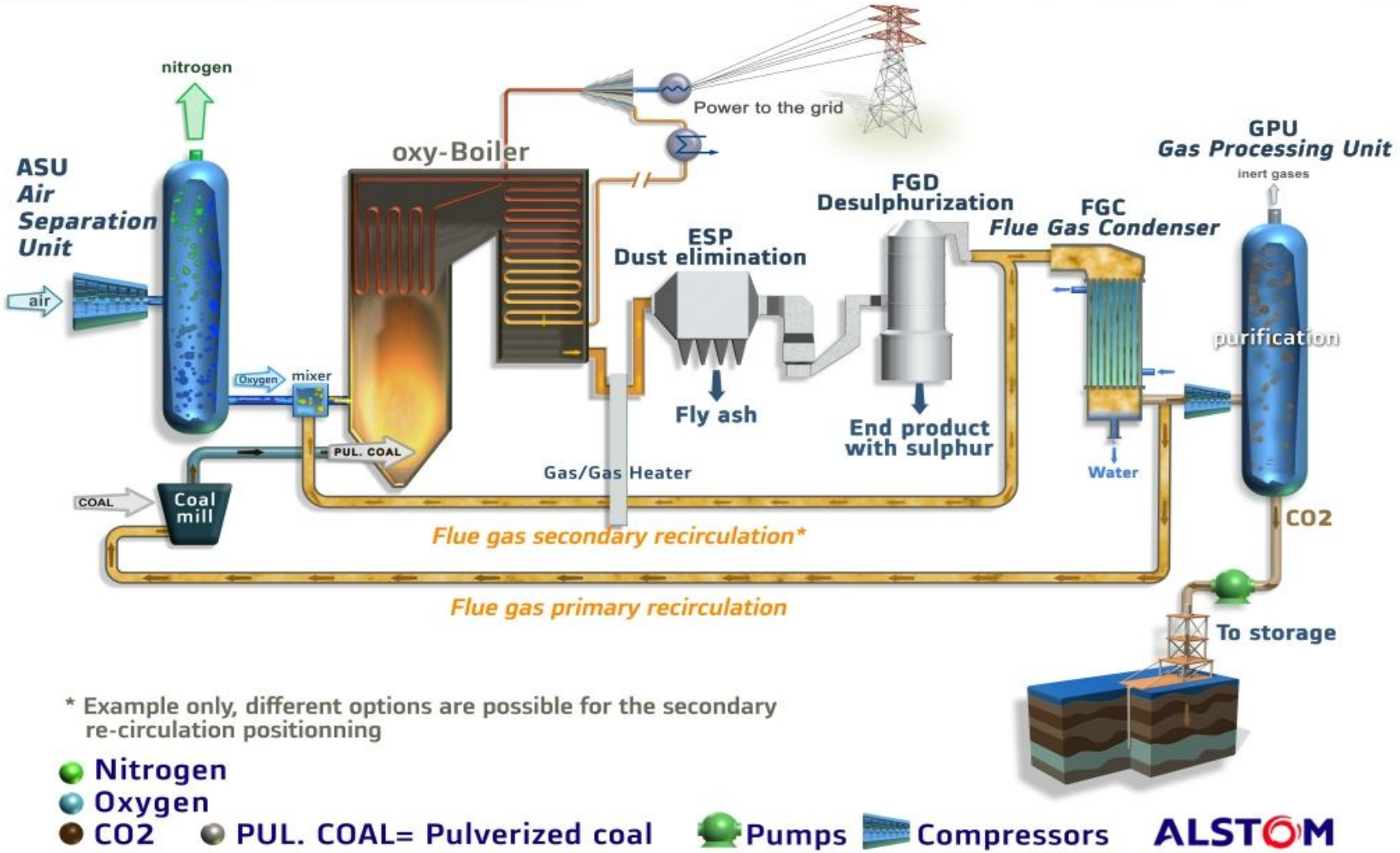
Medium term transitional technology

Oxy-fuel CCS

Project Promoters



Oxy-Fuel


nitrogen
ASU
Air
Separation
Unit
air
Oxygen
mixer
oxy-Boiler
Power to the grid
ESP
Dust elimination
Fly ash
FGD
Desulphurization
End product
with sulphur
FGC
Flue Gas Condenser
Water
GPU
Gas Processing Unit
inert gases
purification
CO2
To storage
PUL. COAL
COAL
Coal
mill
Gas/Gas Heater
Flue gas secondary recirculation*
Flue gas primary recirculation
* Example only, different options are possible for the secondary
re-circulation positionning
Nitrogen
Oxygen
CO2
PUL. COAL= Pulverized coal
Pumps
Compressors
ALSTOM

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**