Investing in efficient coal-fired power plants and deploying CCS

High-Efficiency, Low-Emissions Coal Technology Roadmap Workshop
International Energy Agency, Paris

8/9 June 2011

Brian RICKETTS
Secretary-General, EURACOAL
EURACOAL: 33 members from 19 countries

- COALPRO - Confederation of UK Coal Producers (GBR)
- DEBRIV - Deutscher Braunkohlen-Industrie-Verein (DEU)
- GVSt - Gesamtverband Steinkohle (DEU)
- Mini Maritza Istok (BGR)
- PPC - Public Power Corporation (GRC)
- PPWB - Confederation of the Polish Lignite Producers (POL)
- ZPWGK - Polish Hard Coal Employer´s Association (POL)
- ZSDNP - Czech Confederation of Coal and Oil Producers (CZE)
- APFCR - Coal Producers and Suppliers Association of Romania (ROU)
- BRGM - French Geological Service (FRA)
- CARBUNIÓN - Federation of Spanish Coal Producers (ESP)
- Coallmp - Association of UK Coal Importers (GBR)
- D.TEK (UKR)
- EPS - Electric Power Industry of Serbia (SRB)
- GIG - Central Mining Research Institute (POL)
- HBP - Hornonitrianske bane Prievidza (SVK)
- ISFTA – Institute for Solid Fuels Technology & Applications (GRC)
- Mátrai Kraftwerke (HUN)
- PATROMIN - Federation of the Romanian Mining Industry (ROU)
- Premogovnik Velenje (SVN)
- RMU Banovici D.D. (BIH)
- Swedish Coal Institute (SWE)
- TKI - Turkish Coal Enterprises (TUR)
- Ukrvuglerobotodavtsy - All-Ukrainian Coal Employer’s Association (UKR)
- Vagledobiv Bobov dol EOOD (BGR)
- VDKI - Verein der Kohlenimporteure (DEU)
- Coaltrans Conferences Limited (GBR)
- EMAG (POL)
- Finnish Coal Info (FIN)
- Golder Associates (GBR)
- ISSeP - Institut Scientifique de Service Public (BEL)
- KOMAG (POL)
- University of Nottingham (GBR)
Europe today – on the way to a single market

- Unbundling:
  - power generation
  - transmission
  - distribution

- Cross border competition

- Increasing integration

An EU power market is developing, but with many issues still to address.

IEA CCT workshop, 8/9 June 2011, slide 3
Four questions to discuss

- Security of supply and an affordable cost of electricity.
- The role of coal for power generation in the EU-27 and neighbouring countries.
- Clean coal technologies as a key part of a sustainable low-carbon energy supply.
- The impact of EU policies, targets, ambitions and regulations on investment.
Japan suffers badly damaged infrastructure

source: www.mz-web.de

source: www.focus.de

source: www.welt.de
Power generation in the EU

Coal is No.1 today & will be an important pillar of electricity supply tomorrow.

**EU-27: 3 341 TWh (2008)**

sources: IEA Key World Energy Statistics 2010 and IEA databases
EU solid fuel mix, 2009 – 60% indigenous

EU indigenous brown coal, 126 Mtce (32%)

EU indigenous hard coal, 108 Mtce (28%)

Net imported hard coal, 158 Mtce (40%)

Source: Coal Information 2010, OECD/IEA
Energy prices in Germany, 1973-2010*

The remarkably modest rise in electricity prices over almost four decades is thanks to coal and nuclear.

* consumer price index: 1973 = 100; 2010 = 225

source: StaBuA / BAFA
Impact of fuel switching from coal to gas on balance of payments*

Fuel switching would be an enormous economic burden and impact strongly on the already negative balance of payments in many member states.

* calculation using 2007 energy consumption and prices: gas 280 US$/tce; coal 112 US$/tce
Full costs of new power plants

- **Hard coal**
  - Labour costs
  - CO₂ costs
  - Fuel costs
  - Capital costs

- **Gas**
  - Labour costs
  - CO₂ costs
  - Fuel costs
  - Capital costs

**IEA CCT workshop, 8/9 June 2011, slide 10**
Mitigation of climate change in the EU:

two stages – two speeds

For the EU, this means reducing GHGs from 5.8 Gt/y in 1990, to some 4.6 Gt/y in 2020, and to some 1 Gt/y in 2050.
DG Climate Action 2050 Roadmap for a competitive low-carbon economy

- No new emission reduction target for 2020: 20-20-20-20 target stands.

- CO₂ emission reduction targets are adopted for 2030 (-40%), 2040 (-60%) and 2050 (-80%) to be achieved by internal measures (i.e. without international offset credits).

- Power sector to deliver substantial CO₂ savings, driven by ETS. Commission may revisit the agreed linear reduction of the ETS cap (1.74% points per year) and deploy other tools, e.g. energy taxation and technology support.

### EU energy import dependency


<table>
<thead>
<tr>
<th></th>
<th>oil</th>
<th>gas</th>
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<tbody>
<tr>
<td>2010</td>
<td>80%</td>
<td>&gt;60%</td>
</tr>
<tr>
<td>2030</td>
<td>&gt;90%</td>
<td>&gt;80%</td>
</tr>
<tr>
<td>2050</td>
<td>100%</td>
<td>&gt;90%</td>
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</table>
By 2030, how will the EU generate 4,000 TWh of electricity, plus industry and district heating needs, whilst emitting just 600 MtCO$_2$?

- Impossible by fuel switching alone – the sums don’t add up!
- Feasible with CCS at the majority of plants (gas and coal), but must accelerate deployment.
- Possible with a massive shift to nuclear and renewables, but at what cost?

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**CO$_2$ emission reductions in decarbonisation scenarios** (1990 baseline)

<table>
<thead>
<tr>
<th></th>
<th>total</th>
<th>power sector</th>
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<tbody>
<tr>
<td>2005</td>
<td>7%</td>
<td>7%</td>
</tr>
<tr>
<td>2030</td>
<td>40% - 44%</td>
<td>54% - 68%</td>
</tr>
<tr>
<td>2050</td>
<td>79% - 82%</td>
<td>93% - 99%</td>
</tr>
</tbody>
</table>
EURACOAL response to DG Energy consultation

- **Power plant renewal and modernisation** in short term, highest efficiencies in medium term, strong drive towards CCS in long term.

- An objective assessment of ETS on global emissions and EU industry must inform policy decisions about its future. Introducing “command & control” emission limits would undermine the scheme.

- **Energy storage** is vital to energy security. The cheapest “virtual” store of electricity is coal stocks at power plants.

- **Power system flexibility** to balance intermittent renewables requires flexible backup and incentives, e.g. capacity payments.

- **Energy efficiency** should extend beyond end-use to upstream efficiency where gains can be large and easily realised.

- **Biomass co-firing** at coal power plants is the most efficient way to convert biomass into electricity.

DG Energy must balance security, sustainability and affordability.
Continuous power plant modernisation and new CCS-ready plants

source: VGB PowerTech e.V.
photo courtesy of Vattenfall.
EU Energy Efficiency Directive (22 June 2011)

- Energy “saving” (20-20-20).
- End use (buildings).
- Role of CHP.
- Nothing on upstream, but in IA:

“If Europe were to retrofit its coal plants aged between 20-30 years to improve their efficiency by only 3.5 percentage points, re-power its gas-fired boilers of the same age and ensure that all new coal plants are constructed according to BAT by 2020, the annual power sector emissions would fall by 29 MtCO₂, equivalent to 12% of the EU ETS emissions reduction required by 2020.”

- White Certificates
- Mandatory BAT?
Reducing CCS complexity

- CCS technology demonstration in the power sector, as an integrated process, is proving to be difficult.

- There is a lack of concepts for the industrial application of CCS.

- A separation of the key CCS steps now seems reasonable:
  - \( \text{CO}_2 \) capture carried out by operators of facilities: the technologies exist (three processes for power generation), but industrial applications need incentives;
  - \( \text{CO}_2 \) transport & storage infrastructure constructed and operated by specialist companies: \( \text{CO}_2 \) transport is proven, but public acceptance and regulation are needed, whereas \( \text{CO}_2 \) storage needs cooperation between regions and competition between providers.

Governments should guarantee non-discriminatory access to a \( \text{CO}_2 \) transport infrastructure and ensure sufficient \( \text{CO}_2 \) storage capacity in the future.
Conclusions

- An EU power market is developing, but with many issues still to address.
- Coal is No.1 today and will be an important pillar of electricity supply tomorrow.
- The remarkably modest rise in electricity prices over almost four decades is thanks to coal and nuclear.
- Fuel switching from coal to gas would be an enormous economic burden and carries price and supply risks.
- Continuous investment is needed to modernise power plants across the EU – a “clean coal investment strategy”.
- We should tackle CO₂ capture and CO₂ transport & storage as separate activities with different business models.
- Governments should guarantee non-discriminatory access to a CO₂ transport infrastructure and ensure sufficient CO₂ storage capacity in the future.
Thank you!

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