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Market trends: gas and renewables

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OIES* Natural Gas Research Programme

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Outline

• Introduction on European gas markets
• Focus on the power sector
• Impacts of additional renewables on
  ◆ Gas demand outlook
  ◆ Gas demand patterns
  ◆ Supply flexibility
• Conclusions
Europe = markets linked by pipeline networks

35 countries in “Europe”
Gas demand in Europe 35 in 2008
Total: 587 bcm


3 Countries ~ 50% of demand
7 Countries ~ 75% / 13 countries ~ 90%
Natural gas demand in Europe in mcm

Sources: IEA, *Natural gas information* (various issues) and own analysis
Natural Gas Gross Consumption in OECD Europe, in the Power Sector, 1960–2007, in mcm

Sources: IEA, *Natural gas information* (various issues)
Major uncertainty on the future of gas demand in Europe, biggest question mark on the power sector


Impact of environmental policies
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Electricity Production in OECD Europe in TWh

Sources: IEA, *Electricity information* (various issues)
Electricity Generation in Europe in 2007, in TWh

Source: IEA, *Natural gas information 2009*
Gas – Main contributor to the 2000-08 growth in OECD Europe electricity generation (TWh)

Source: IEA, *WEO 2009*
Key political drivers for investments

- **20/20/20 targets**
  - Cut carbon emissions by 20% by 2020
  - Raise renewable sources to 20% of total energy use by 2020
  - Achieve a 20% cut in energy use by 2020

- **EU ETS**

- **LCPD**
  - FGD or ‘opt-out’

- **IED**
  - Tightens existing limits on emissions of oxides of sulphur and nitrogen (2016-2020)

- **EERP**
  - 565 ml euros on 9 offshore wind

- **National policies**
  - Ex. Germany: 5bln euros in credit programme, higher feed-in tariffs for offshore wind, 10bln in renewable subsidy in 2010, going to 15bln over the next 2-3 years

- **Future electrification of transport and heat ??**
OECD Europe 2008-2020 (TWh)

Source: IEA, WEO 2009 reference case
Levelised costs of electricity

Source: Eurelectric/VGB in IEA, *Projected costs of generating electricity, 2010*
Power Plant Projects in Europe, in MW

Additional Generating Capacity in Europe between 2008 and 2013 based on Existing Plants and under Construction in 2010, in GW

Wind plant Projects by fuel in Europe in 2010, in MW

Source: A. Honore, European Gas Demand, Supply and Pricing, OIES/OUP 2010, p.96
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Focus on the UK

- **Renewable Energy Strategy (July 2009). Targets by 2020:**
  - 15% of energy consumption (2.25% in 2008)
  - 30% of electricity production, including 2% in small-scale generation
  - 10% in transport
  - 12% in heat

- **Measures include to extend Renewable Obligation (RO) life**
  - Support to qualifying offshore wind to 2 ROCs/MWh
  - RO’s life extended to 2037

- **Spending review (Oct 2010)**
  - £860 million for renewable heat incentive from 2011-12
  - Green Investment Bank would be set up with £1 billion (below the £2-6 billions hoped for)
  - £200 million retained to upgrade for offshore wind and ports facilities
  - Review feed-in tariffs for small renewables
Policies to save energy and boost nuclear and renewable could cut gas demand by 17% from 2010 levels by 2020 (i.e. ~ 70 bcm)

But if new nuclear and renewables development does not proceed according to plan, gas-fired power plants will need to fill the gap, and not fall in line with the forecast

Gas demand could start to increase again after 2020 due to more switching from coal to gas-fired generation

“gas will continue to play an important part in the UK’s fuel mix for some years to come”
Major expectations and uncertainties

Generation mix in 2020

Source: Ofgem’s “Project Discovery” scenarios, and in National Grid’s “Gone Green” and “Business as Usual” scenarios
Gas intermittency...

The study was focused around a Core scenario – not a base case but instead a ‘stress-test’ with a high percentage of generation from renewables.

GB capacity assumptions

- Demand growth approx 0.4% p.a.
- Oil price ~$70/bbl
- Coal price ~$70/tonne
- Carbon price ~€37/tCO₂

Source: Poyry, How wind generation could transform gas markets in GB and Ireland, June 2010
2030: electricity system flexes in response to wind
GB, Feb 2030 based on Feb 2006

Source: Poyry, *How wind generation could transform gas markets in GB and Ireland*, June 2010
Gas demand for power

Source: Poyry, *How wind generation could transform gas markets in GB and Ireland*, June 2010
By 2029, gas demand from power generation becomes more volatile, which feeds into overall system demand volatility (weather 2003)

Source: Poyry, How wind generation could transform gas markets in GB and Ireland, June 2010
Influence of Wind Power on Natural Gas Demand for the Power Sector, Spanish market, 27 August 2009 and 8 November 2009

Source: Presentation at Platts 4th Annual European Gas Storage, 10 February 2010, Luis I. Parada
Wind power and CCGT in Spain

Source: presentation at Flame 2010, Amsterdam, Fransisco de la Flor
Infrastructure in Spain, 1969-2016

Source: presentation at Flame 2010, Amsterdam, Fransisco de la Flor
Natural Gas Gross Consumption in Selected Countries, by month, 1999–2009, in mcm

Source: IEA, Monthly Natural Gas Survey
Natural Gas Production, Net Imports and Stock Changes, in OECD Europe, 1999–2009, in mcm

Source: IEA, Monthly Natural Gas Survey
LNG regasification terminals in Europe

In bcm

Capacity:
- Existing: 164.2
- Construction: 46.5
- Planned: 260.6

Flows:
- 2008: 59.4
- 2009: 71.7
- 2010e: ~85

Sources: GLE (June10) & own analysis
Natural Gas Production in Europe, in mcm

Source: IEA, Monthly Natural Gas Survey
Natural Gas Storage in Europe, in 2008

Source: Presentation at 24th World Gas Conference, 5-9 October 2009, J-M Leroy
### Additional needs for peak cycle

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Conclusions

- Ambitious environmental and renewable energy targets have been set in Europe, but also at the national level.
- Wind power is expected to play a major role in electricity generation towards and beyond 2020.
- As a consequence, electricity markets will change as they become more and more dependent on intermittent output from wind generation.
- But there will also be some major effects on gas markets:
  - 1/ Some gas plants will more and more be used as back up for wind power, which means lower annual load factors and therefore lower annual gas consumption for these plants in the future.
Conclusions

• 2/ CCGTs will be needed when the wind is not blowing leading to high gas demand OR switched off when the wind is blowing leading to low gas demand **within days/hours**
  - => CCGT gas demand will be more variable inter and intra day
  - => The intermittency of wind generation is expected to be passed on to gas demand

• 3/ As wind generation grows, overall gas demand growth rate is likely to slow down but peak gas demand will remain high
  - Gas demand will become more volatile, although because wind power is generally higher in winter, it could also flatten the seasonality pattern (?)

• => Wind could become an important factor in determining future gas demand
  - Analysis of demand fluctuations will need to not only pay attention to temperatures, but also to wind generation, in the future
Conclusions

- Wind generation will impact gas demand but it is also expected to translate into significant transformation of the supply side.
- CCGTs can be up and running from a cold start in three to six hours, much more quickly than coal or nuclear power stations.
- => Sudden surge in gas will be needed to start up CCGTs when wind power drops.
- => Need something that can provide an enormous flow of gas in two to three hours.
- => Increasing need for daily and within day flexibility.
  - How? Solutions? Problems?
  - Opportunities for European gas trading development?
  - Need to operate the gas grids in a more flexible way?
Thank you

http://www.oxfordenergy.org/gasprog.shtml