Gas: Global and sustainable soon?

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Intro – gas today and in the future

How do oil and gas companies view gas today?

- Precious: Clean and flexible
- Sustainable solution for future – replace coal
- Growing demand, especially in the electricity sector
- Gas prices to remain high, especially when sent as LNG
- Large regional differences continuing

Do we believe this comfortable story?

View from others

- Power sector – expensive
- NGOs – fossil
- Other issues:
  - Water, fracking, geopolitics

Rethinking the assumptions in a full-picture perspective

Fossil vs renewables – from the age of peak oil

- Sustainability = not depending on finite energy
- Result: Much renewable energy gets preferential accounting
  - Life cycle often not considered – especially the case of hydrogen
  - Emissions not penalised – both climate and other – especially bio fuels

Imports vs domestic – own economy best

- Many countries did not like to be import dependent
  - More development of renewables – also voter expectation
- Will unconventional gas change focus on renewables?
  - Is shale gas clean/ sustainable enough as long as it is domestic?
  - US and China indicate that it might

High/ rising prices are a deterrent – especially oil, but also oil link

- De link from oil and more supplies in competition will improve demand

How optimistic should we dare to be?

Natural to be in love with your fuel, company and project

- Most new LNG projects see themselves as «winning» Japan
  - No room for all – certainly not at the prices some projects want
- Competition not only from other LNG, but also from other fuels
  - Nuclear, (clean) coal, renewables etc.

Supply cost curve does not work without discipline!

- Assumes projects should cover full costs and margins – or TURN OFF
  - This is not happening today – several justifications used
  - *"Just for now", "investments are sunk costs", "we need to grow our market share"*
  - This could be justified as a strategy, but then assume others do it, too

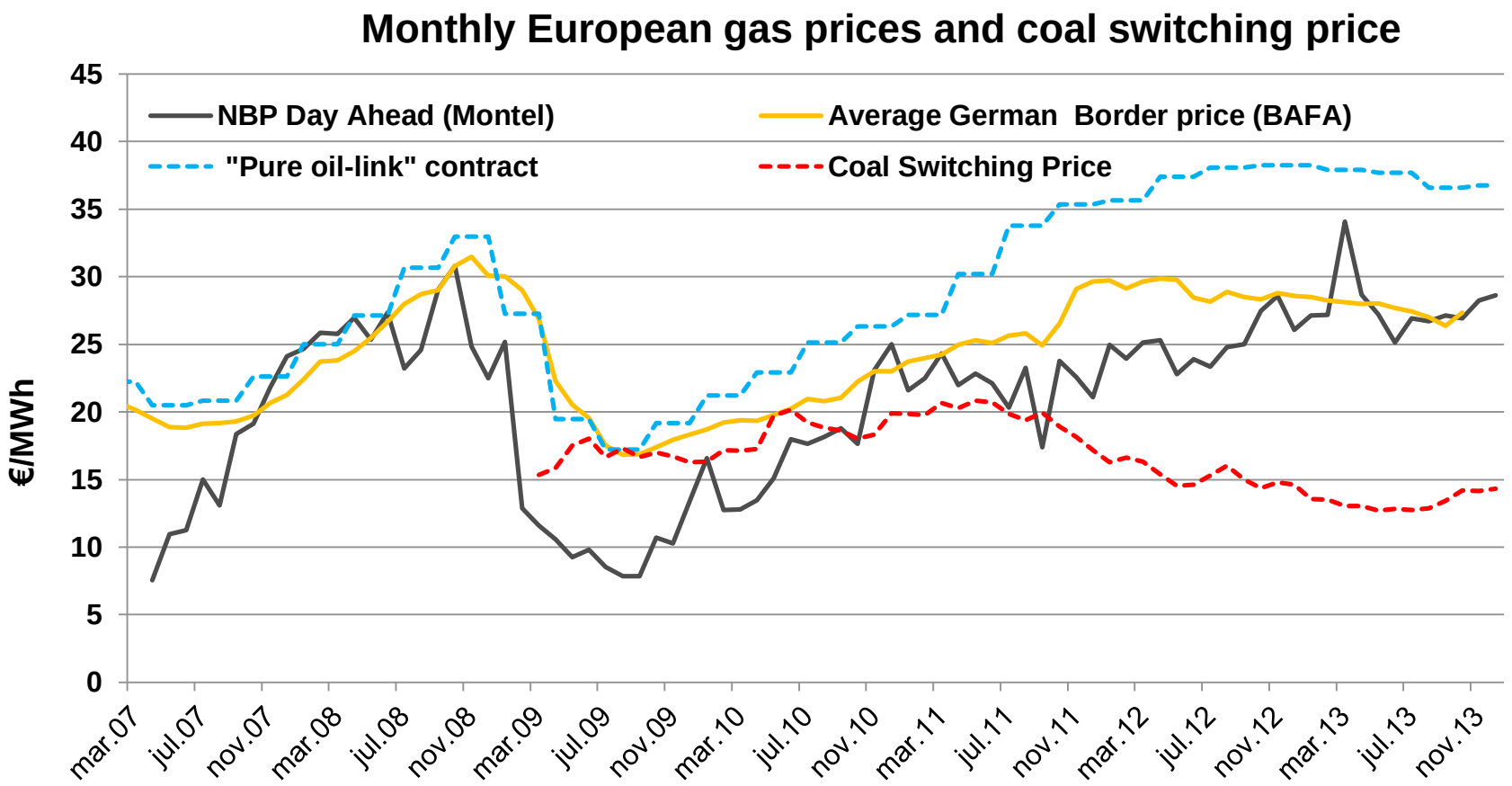
What is the best risk management?

- Look at margins, not only volumes
- Have a plan B (and perhaps even C), if/ when fundamentals change

Gas has to compete in the market

Markets and supply-demand balances set prices

- Yes, it's complex and tough - and less comfortable than earlier!



Data: Eurostat, Montel, BAFA, Sund Energy

Gas vs other technologies

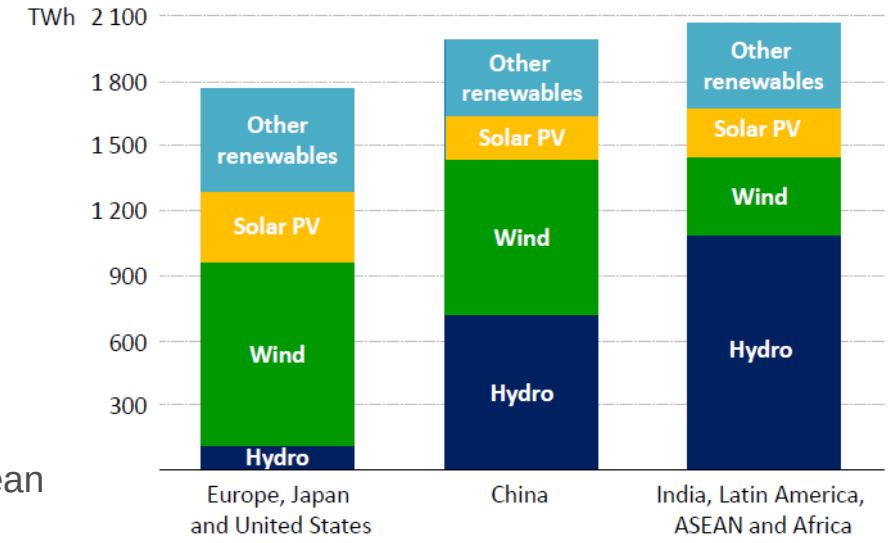
Gas fills an uncertain gap between other technologies already in place:

- Nuclear, coal, hydro, wind, solar and other renewable sources
- This is why the market group of IGU is focusing on the electricity demand during this triennium

Some high margin options

- Replace oil in transportation
  - Large potential!
- Use LNG for remote generators, instead of diesel
  - Already happening in the US and Canada for drilling engines (e.g. Bakken)
  - Also taking off in Indonesia, the Caribbean

Growth in electricity generation from renewable sources, 2011-2035



The expansion of non-hydro renewables depends on subsidies that more than double to 2035; additions of wind & solar have implications for power market design & costs

Higher margin in gas to transport!

Transportation segment should be considered by all gas sellers

- Opportunity for new and higher margins
  - But played down by many due to calculations under different times
  - In the IGU, it seems, it is treated mainly technically
- Ships, trucks and cars – rapid increase in fleets now, globally!
  - More available models, at lower cost (shorter payback times on investment)
  - Building on well-known technology and quick deployment of fuelling infrastructure
- Not because of promotion by the gas companies
  - Actually, despite the difficulty in dealing with largely reluctant sellers
  - Often, encouraged by the authorities – cleaner fuel with lower tax/ exemptions

Add small-scale LNG to this

- Opens for new transportation solutions at less risk
  - Port bunkering infrastructure offers synergies for ship and truck LNG fuelling
- Greatly improves capitalisation of stranded reserves (reducing flaring)

Combination with biogas gives even greener credentials

Transportation sector is growing gas demand

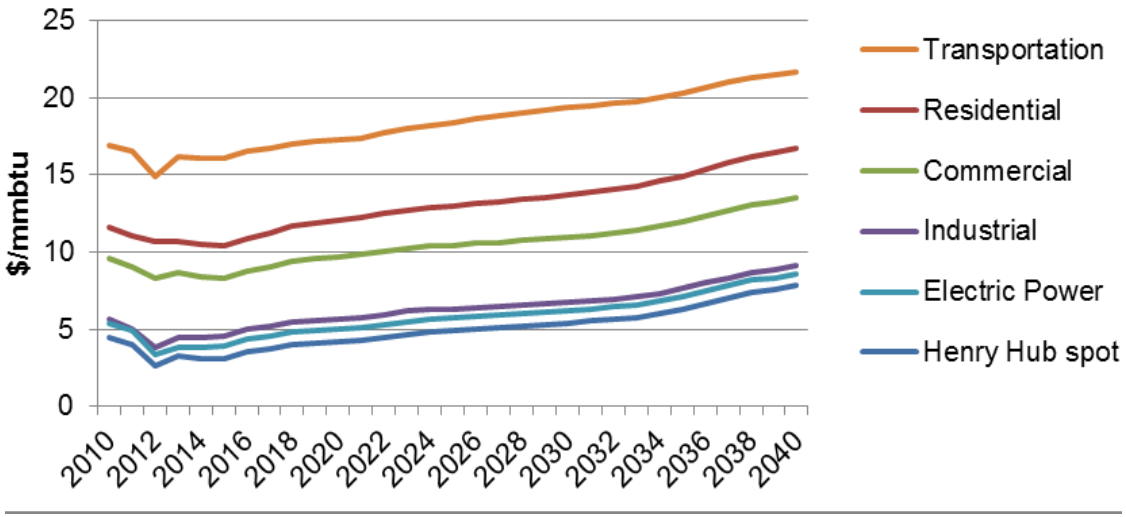
Several markets see more use in transportation sectors

- US, China, EU, Asia, Latin America

Compressed natural gas (CNG) to cars and buses

- CNG filling at stations or homes + biogas

US gas prices: Spot and end-user by sector
(reference case)



Source: EIA, AEO 2013, Reference case

LNG for ships, buses and trucks

- Around ports first, but also filling stations
- Bio-methane and SNG lowering climate footprint – even more attractive

Nationwide average fuel price in US

	$/mmbtu	$/DGE*
LNG**	24,82	3,19
CNG	18,21	2,34
Gasoline	31,13	4,01
Diesel	30,99	3,99

Source: US DoE: Alternative fuel price report, April 2013
* DGE – Diesel Gallon Equivalent
** Data from 10 LNG filling stations

Cleanliness is relative – and several parameters

CO2 very popular and good for gas

- But watch out for the methane and its co2-equivalent
  - Several NGOs are waking up to this
- Perception could be impacted with better discussion
  - More input from the industry

Water becoming higher on the agenda after fracking debates

- University of Texas study
  - Each litre used on gas fracking saves 30 litres by replacing coal
  - Both mining and generation very water intensive
- Some ethical problems are coming to some of the renewables
  - Biofuels impact food production capacity and are very water intensive

Sulphur becoming fashionable to consider again – good for gas!

- Leaders in tackling local emissions problems are mainly China and the US
  - Focus on sulphur, NOx and particles could bring changes in energy use quicker
  - Motivation by impact you can see here and now (not vague assumptions for a generation or two later) and this will also reduce some climate emissions

Investing socially responsible matters!

Large institutional investors are becoming more aware

- These have been a large part of oil and gas companies' investors
- Considering their financial exposure to sustainability issues such as:
  - Carbon bubble – "most hydrocarbons should stay in the ground"
  - Water use
  - Human rights in difficult countries
  - Disputes with local people
  - Corruption
  - Transparency and good governance, difficult for some gas players

Markets will start pricing more SRI-related financial exposure

- As with the CCGTs that are easy to turn off, it is easy to pull out of a company
  - Target: Companies that look bad in the portfolio from a sustainability perspective
- NOT only to be "political correct", but to manage the risks and exposures
  - Could punish less sustainable companies in many ways
- Impacts on the whole value chain from exploration to final consumer
- Costs could rise, and even threats to the license to operate

Solutions are often simple

Ground-breaking technology are often not bringing expected changes

- Much money and effort is being put into technology

The favourite response of many and supported by strong lobby

- CCS, LNG bunkering, SOx scrubbers, renewable energy and more

Pragmatic and simple solutions need to be taken

- More focus on simplicity, affordability, change and full picture outlook
- Might be uncomfortable or difficult for engineers and politicians

Meanwhile, out-of-box technology should be expected

- New fuels from carbon and sunlight?
- Less materialism, demand growth going forward?

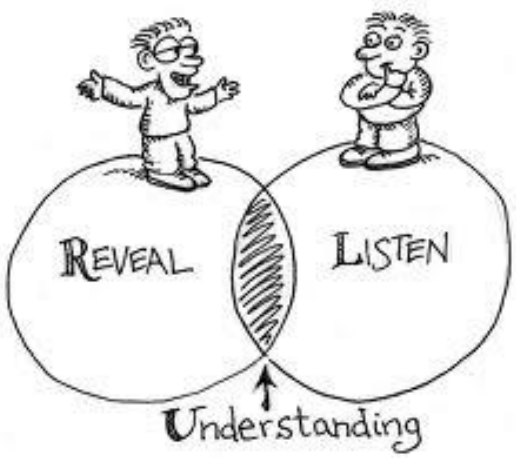
What should companies do?

Listen more!

- Remember they are intelligent on the other side, too…

Engage more, dare to talk!

- Much of the negative perceptions are from fear/ lack of comforting understanding



Think of simple and differentiating solutions!

- Be honest in the choice of volume vs value/ margin
- Both individually and as an industry

Stress test new ideas for different futures - properly!

- The traditional +/- 20% is not enough!

Dare to think different scenarios from your dreams, forget extrapolation!

- Full new scenarios, some with painful outcomes – better early than late
- Need to be considered for robustness of strategy and investments!

2050 – not that far away when planning infrastructure

Many countries now planning for climate neutral/ fossil free

- Some gas could still be used: Biogas or synthetic gas (from wind)

Many consumers will use less than today – which may be needed

- Less materialism, fewer factories, less energy demand

Several large cities want to be green

- Less space to heat per person, less transportation needed

What is the space of natural gas in this – and how to fill it?

- Limited demand – empty fields now at low prices?
- High value for a few specialised areas – limited production – when?
- Chemical industry, other?

So, will gas be global or remain regional/local?

LNG makes gas more similar to oil: Commodity

Two main (extreme) scenarios for illustration:

- Oversupply, need for global trade, volume game: Global
- Shortage, high prices where possible, more shale: Local

If global – which marker to use?

- US Henry Hub possible – as Brent is for oil – deep and liquid market
  - Will the US want that – $, increased prices at home?
- TTF “the middle man2 - €/MWh
- JKM – the marginal short term – best for Asia?

If this is not desired – who will cut production to bring shortage?

We are happy to discuss further!

We offer strategic and commercial advice + partner selection

- Producers, TSOs, large buyers, governments
- Gas, electricity, environment and more

Selected recent work

- Scenarios for European gas 2020 prices and flows in full energy picture

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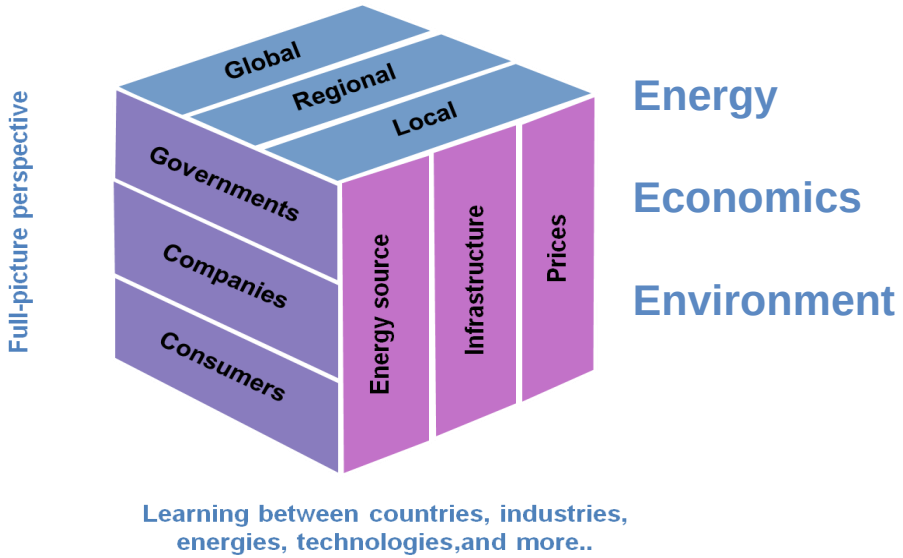


More dialogue can be very productive

- Not only with each other, like here (IGU)
- Internal consensus and dismissal of other views could be very costly

Increase transparency

- Not just on costs, but prices, strategy, emissions and more
- Increasingly expected by all stakeholders and necessary for trust as well as market development

Learn new tricks

- Margins, trading, risk management, dealing with uncertainty and being agile.

No more large base load volumes at high prices on take-or-pay contracts

- Competition between each other as well as other energy forms

Clean up the perception

- Upstream oil and gas has been seen as capitalist and dirty for many years
  - Utilities were seen as good guys.
- Now utilities are loosing trust to, many are told to freeze rates to consumers
  - Even if a populist move from politicians, voters nod and the perception is confirmed
- Pressure to do better sourcing, lower wholesale prices will be needed

Negative spark spreads have almost become a rule

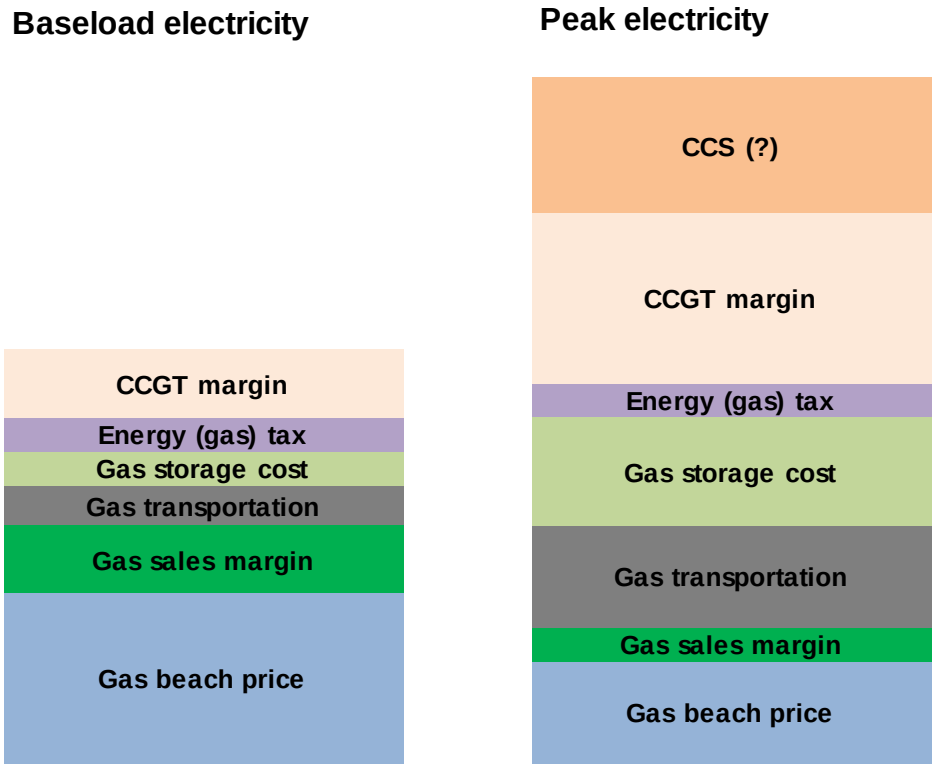
Largest uncertainty in the electricity sector

- Margins and returns most important
- Operate generation mix according to costs and principle of "clean enough“

Much more disciplined than oil companies in turning down generation that is least profitable

- Right now, that is natural gas in large parts of the world
- The sales pitch of gas being flexible is not enough for volume
  - Right now it is used to turn gas/ CCGTs completely off

Illustrative sketch: Gas balancing wind



Or should we focus more on payability of segments?