Global gas demand increases amid growing uncertainties

Incremental gas demand by region, 2014 - 2020

- Global gas demand will re-accelerate following a marked slowdown in both 2013 and 2014.
- Global gas demand is projected to grow 2% on average by 2020.
GDP used to have a large impact on electricity up until recently.

Income elasticity of power demand in the growth period leading to current consumption level.

- USA: internet bubble to financial crisis, 2001-2007
- Germany, reunification to financial crisis 1993-2007
It is not only the financial crisis and not explained by electricity prices.

<table>
<thead>
<tr>
<th>Year</th>
<th>Germany Power</th>
<th>USA Power</th>
<th>Germany GDP</th>
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<td>1.02</td>
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<td>2008</td>
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</tr>
</tbody>
</table>

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Coal mainly competes with long distance gas imports

Global coal-fired power generation (TWh)

- **Other**
- **US**
- **China**
A young and efficient coal fleet in Asia takes advantage of low coal prices

- 350 GW coal capacity came online in 2010-2014
- 80% of the global ultrasupercritical fleet is in Asia
- To cut the load factor of an USC plant one needs 4$/mbtu LNG or 8$ LNG and a 50$/ton carbon price

Manjung, Malaysia
Who is cleaning the air in China?

Expansion of energy sources with low particulate and SO2 emissions 2014-2020

- Retrofitted coal plants
- Low carbon sources: Solar, Wind, Hydro, Nuclear
- Gas

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Is LNG still competitive with wind and solar?

Recent long-term remuneration contract prices (e.g. auctions or FITs)

- **Germany**: 67-100 $/MWh
- **US**: ~75 $/MWh
- **China**: 80-100 $/MWh
- **Turkey**: 73 $/MWh
- **Ireland**: 69 $/MWh
- **UK**: 120 $/MWh
- **US**: 48 $/MWh
- **India**: 88 $/MWh
- **Dubai**: <60 $/MWh
- **Australia**: 65 $/MWh
- **SA**: 65 $/MWh
- **Brazil**: 54 $/MWh
- **Chile**: 81 $/MWh
- **SA**: 52 $/MWh
- **UK**: 120 $/MWh
- **Dubai**: <60 $/MWh

- Combination of technology cost reduction, better resources, appropriate regulatory framework attracting financing
- Long-term PPAs and price competition effective drivers
Integration of renewables: gas in competition with Silicon Valley

- Better forecasting algorithms
- Close to real time operation
- Improved grid monitoring and TSO collaboration
- System friendly renewables
Will solar + batteries make gas capacity redundant?

At 40 – 50 latitude (EU, Japan, New York) up to 85% of PV production is between 15\textsuperscript{th} March and 15\textsuperscript{th} October
Alternative vehicles and lower oil prices

Fuel switching impact of 2014 US vehicle sales

- Heavy trucks
- Buses and garbage trucks
- Cars
- Gas
- Electricity
- EVs
- Plug in hybrids
LNG as a marine bunker fuel

- SO2 regulations on bunker
- Less constraining space and weight limits on ships
- Major ports with already existing LNG facilities nearby: Yokohama, Singapore, Shanghai, Dubai, Rotterdam
Global production growth shifts towards OECD countries

Incremental gas supply by region, 2014 - 2020

Major downward revisions 2015 v 2014
Low oil prices fail to stop North American production expansion

- Marcellus
- Cost deflation
- Technological progress
- Access to capital
Second wave of additional LNG supply is coming soon

Additional LNG export capacity by year, 2005 -20

- United States
- Russia
- Southeast Asia
- Qatar
- Other Middle East
Low oil prices detrimental to new LNG investments

Correlation between oil price and LNG activities in the US

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Global LNG trade flows will shift

Change in LNG net trade: 2014-20 (bcm)

United States & Canada: 62.2
Latin America: Mexico & Chile: -7
OECD Europe: -44
FSU/non-OECD Europe: -2
Middle East: -4
China: -38
Japan & Korea: 3
Non-OECD Asia: -48
Africa: -2
Australia: 73

This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area.
China’s supplies become more diversified

- Domestic production: 47 bcm
- LNG: 38 bcm
- Pipeline: 51 bcm
Russian gas: the East is the manifest destiny?

• Production constrained by EU and domestic demand
• Surging independent production backed by NGLs
• Pipeline projects rely on Russian suppliers and rouble costs
The age of capital discipline

Oil at 100$

Oil at 60$
Europe import dependency rises

- 2014 Russian import
- Increase
- Decrease
- 2020 Russian import

- Demand increase (weather related)
- Demand increase (non weather related)
- Domestic supply decrease
- LNG supply increase
- Caspian supply increase

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Reducing EU dependency on gas imports: running faster to stand still

WEO NPS 2035 without increasing gas imports to the EU:

- **120000 windmills to compensate for declining coal generation**

- **PV on 52 million rooftops to compensate for decommissioned reactors**

- **5 times the current EU biogas production to compensate for declining gas upstream**
Thank you for your attention!