

A decorative graphic on the left side of the slide, featuring a blue background with white line art of a building's interior structure, including a staircase and a ceiling. The graphic is partially obscured by a horizontal blue line.

Natural Gas: Outlook and changing trends

Presented by:

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Main highlights

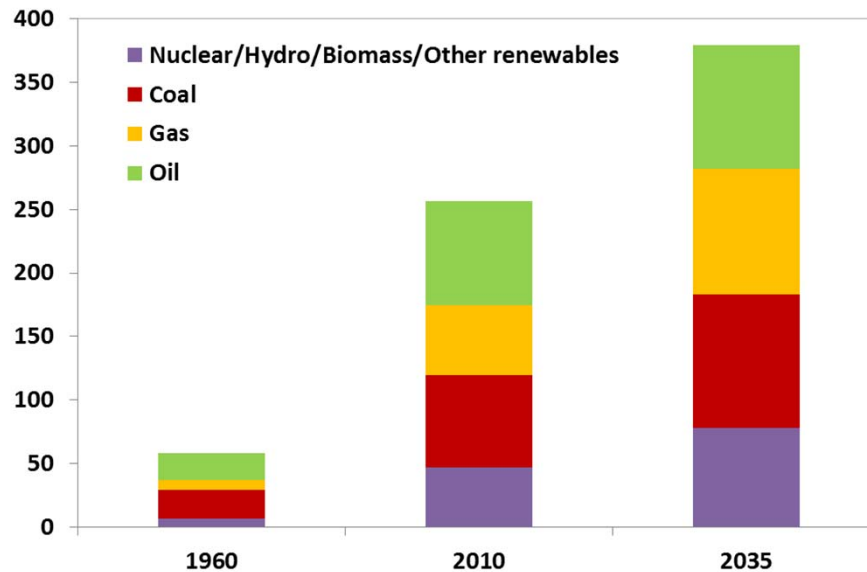


- There has been steady expansion of natural gas supply in the primary energy mix
- Gas demand is dominated by OECD, but growth in developing countries is fastest
- Significant uncertainty associated with natural gas as a fuel in the transportation sector
- In the US, shale gas expansion has resulted in augmented gas use for electric power and increased competitiveness for the petrochemical sector
- The global resource base is large, yet there are many potential barriers to its continued supply rise
- Although it is possible that increased inter-regional gas flows will establish more linkages among regional markets, this does not necessarily mean uniformity in pricing mechanisms nor a sharp convergence in prices

World supply of primary energy and natural gas share



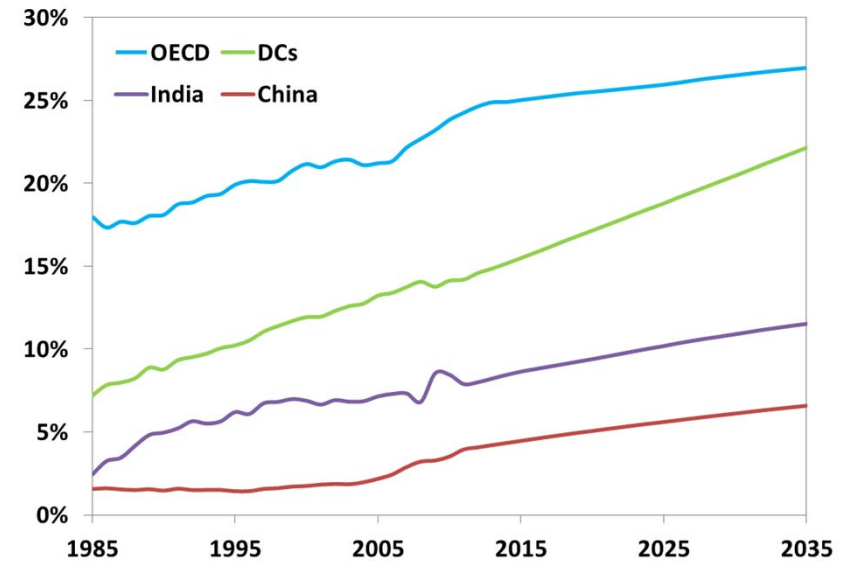
Primary Energy Supply Mix (mboe/d)



Source: OPEC World Oil Outlook

- Expansion of natural gas supply in the primary energy mix both in absolute and percentage terms

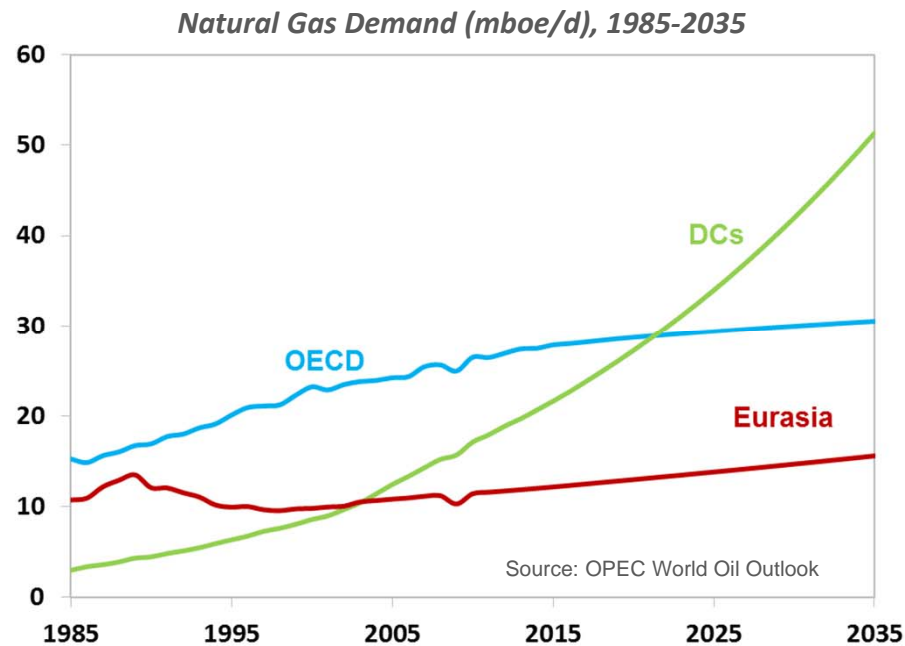
Share of Natural Gas in Primary Energy Supply, 1985-2035



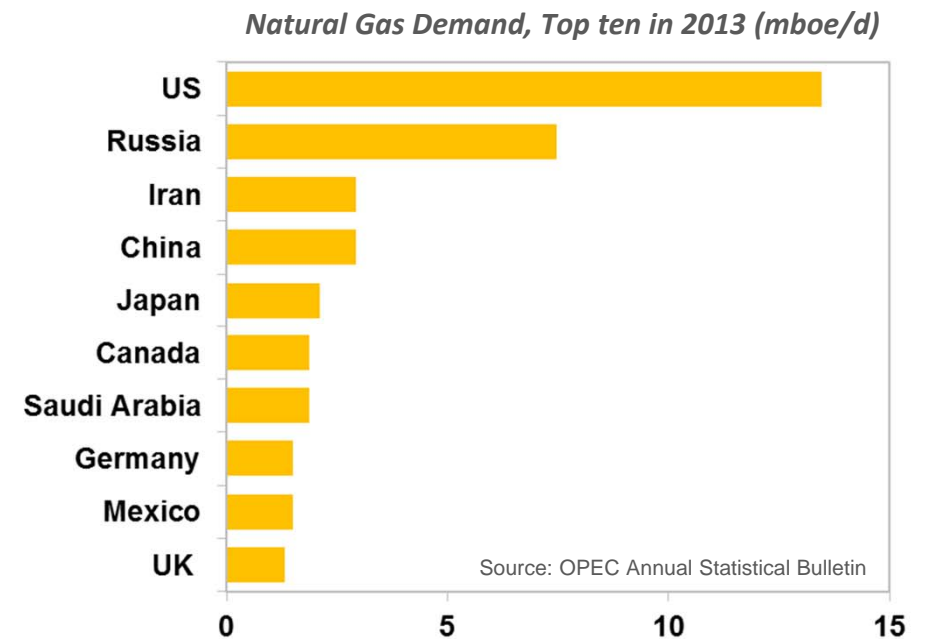
Source: OPEC World Oil Outlook

- Natural gas increasingly important as a source of energy, particularly in DCs

Natural gas demand outlook



- Gas demand is dominated by OECD, but developing countries expected to see fastest demand growth

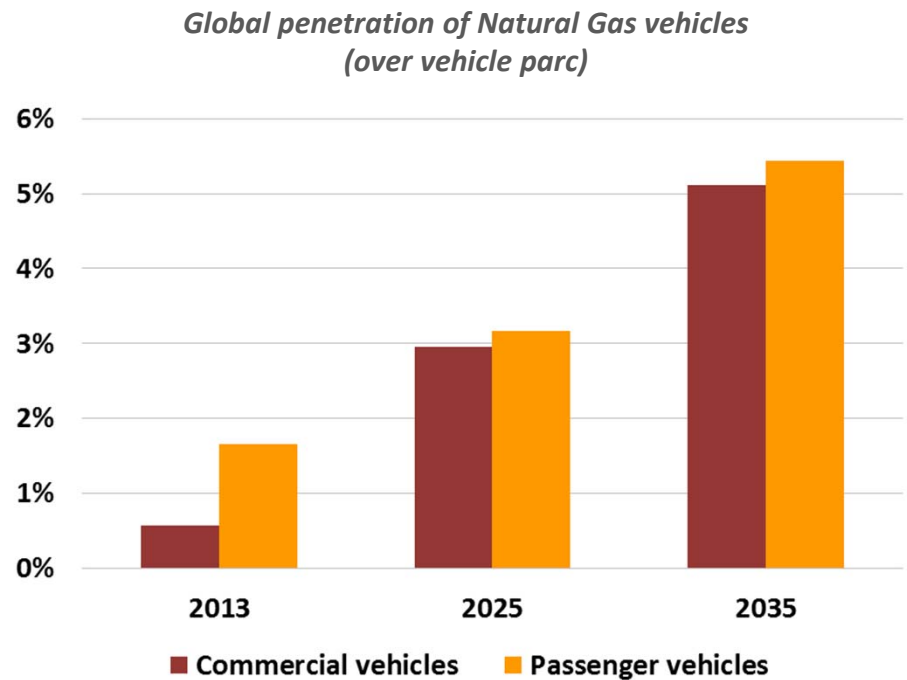


- US is world's largest user of natural gas, averaging above 13 mboe/d in 2013

Natural gas use in transportation



- With abundance of natural gas across globe, use of natural gas in transportation could have significant implications
- Number of NGVs has been rising significantly in some markets such as China and the US
- Looking to the future, the penetration of NG vehicles is likely to accelerate
- Penetration of NV commercial vehicles in 2035 could reach 13% in China and 7% in OECD America
- In other modes of transportation, marine sector is currently adopting LNG as new bunker fuel
- Railways in some regions could be using LNG as replacement for diesel

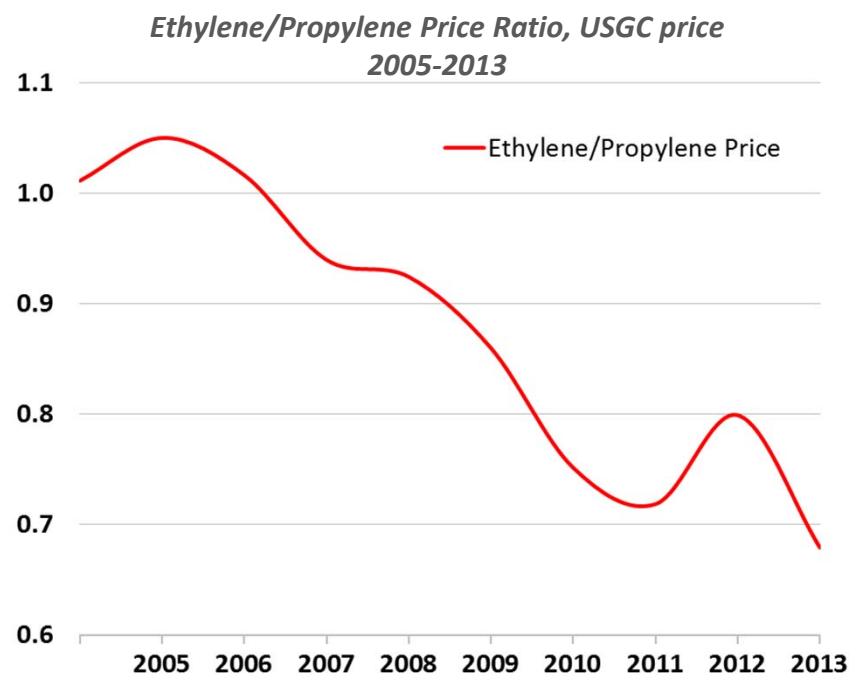


Source: OPEC Road Transportation Model (RTM)

The petrochemical industry



- The US shale gas boom is having important consequences for its petrochemical industry
- The availability of relatively cheap natural gas has provided the country with ethane at relatively low prices
- Ethane is forecast to displace further volumes of naphtha as a cracker feedstock
- However, the shift to lighter steam cracking feedstocks reduced the availability of co-product
- In 2012, co-product propylene production from steam cracking was 2 million tonnes lower than the level of production in 2006.

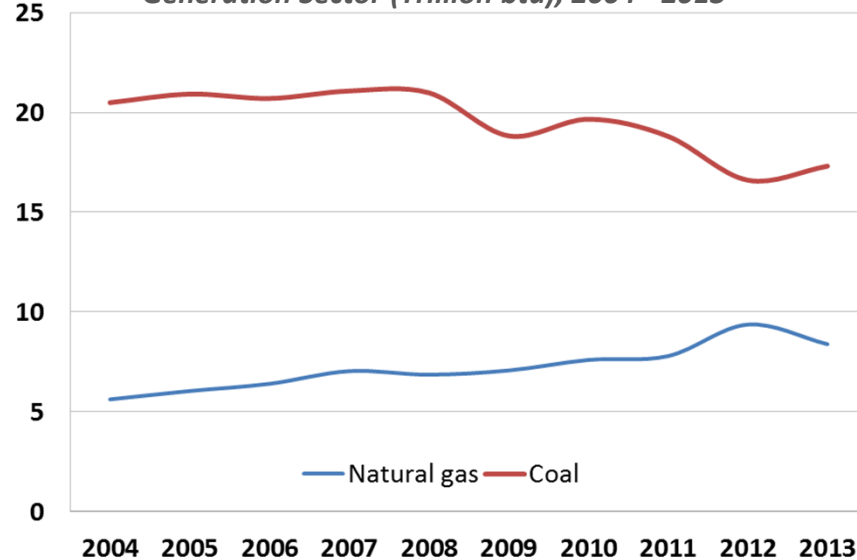


Source: Nexant

US power generation: competition between gas and coal

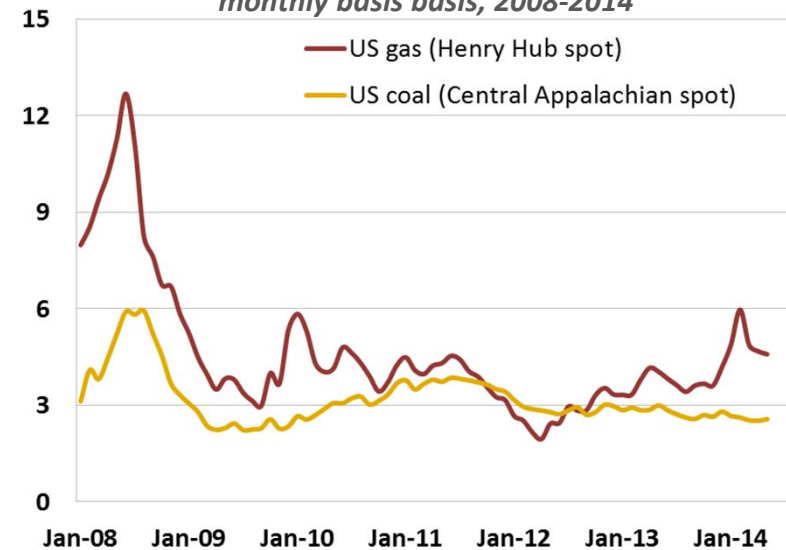


*US Gas & Coal Consumption in electricity
Generation Sector (Trillion btu), 2004 - 2013*



Source: US Energy Information Administration

*Comparison of US Gas & Coal Prices, (US\$/MMbtu)
monthly basis basis, 2008-2014*

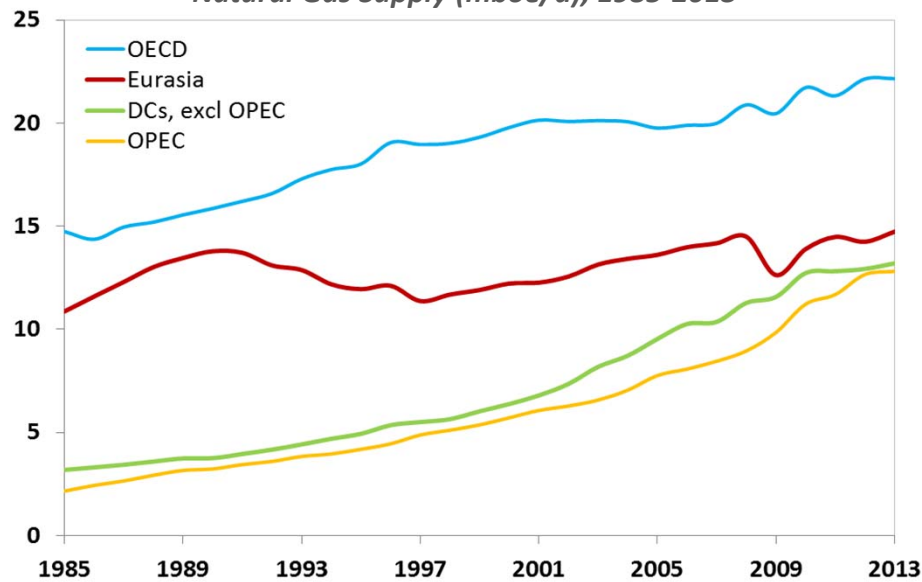


- US electric power sector taking advantage of low natural gas price resulting from shale gas production
- Narrowing gas & coal price differential after 2008 led to reversal during 2011-2012

Natural gas supply



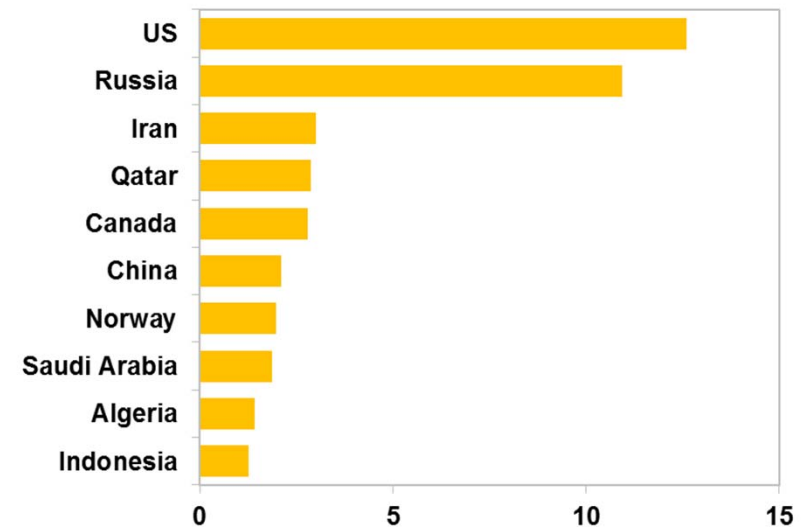
Natural Gas Supply (mboe/d), 1985-2013



Source: OPEC World Oil Outlook

- Historically, natural gas supply dominated by OECD and Eurasia, but OPEC and Other Developing Countries have seen a rapid rise since 2000

Natural Gas Supply, Top ten in 2013 (mboe/d)



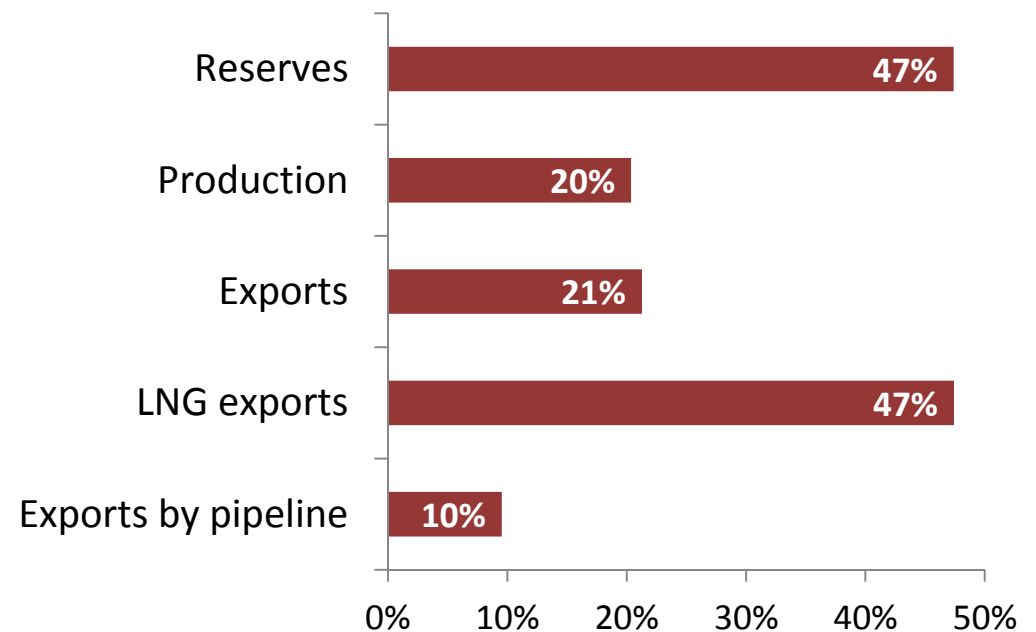
Source: OPEC Annual Statistical Bulletin

- US (12.5 mboe/d) and Russia (nearly 11 mboe/d), top two producers account for almost 40% of global production

OPEC natural gas profile and global share (2013, in %)



- OPEC countries, with large reserves share (47%) in the world, possess significant potential for production and exports of natural gas
- They constitute nearly half of the global LNG trade



Source: OPEC Annual Statistical Bulletin, BP

Shale gas resources and constraints

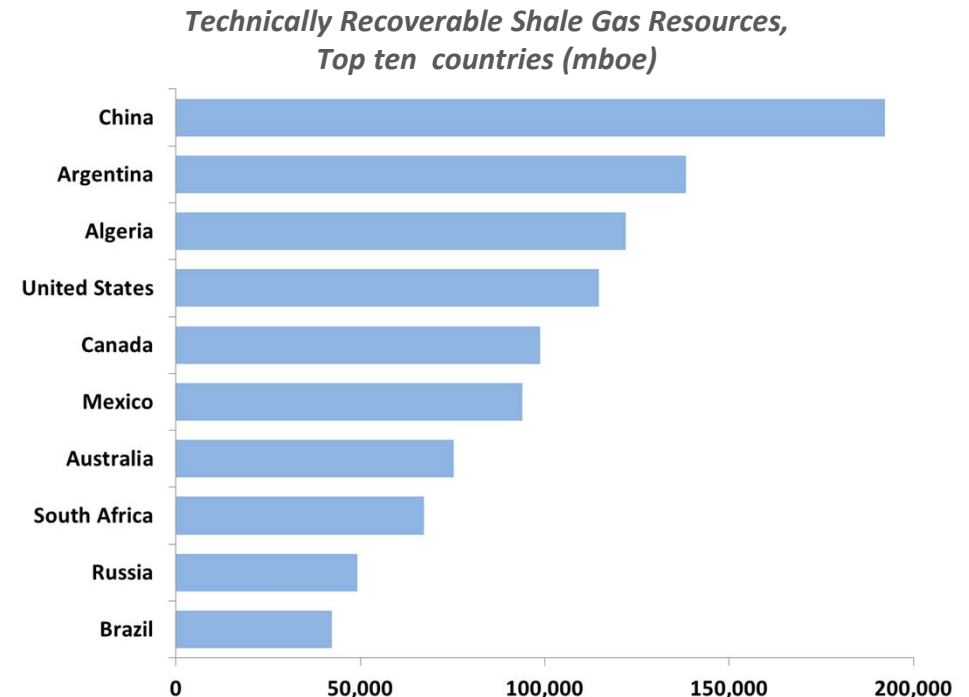


Resources:

- Assessment commissioned by the US EIA, estimates global shale gas resource of around 1.3 trillion boe
- Of the total, China accounts for 15%, Argentina 11%, Algeria 10%, US 9%, Canada 8%, Mexico 7%, Australia 6%, South Africa 5% and Russia 4%

Constraints:

- Environmental impacts of hydraulic fracturing process with inherent risk of releasing toxic chemicals into groundwater
- Other environmental issues include possible surface spills of chemicals; disposal of waste water and excessive water use; rising traffic volumes
- Technical and commercial concerns involve high decline rates and future costs

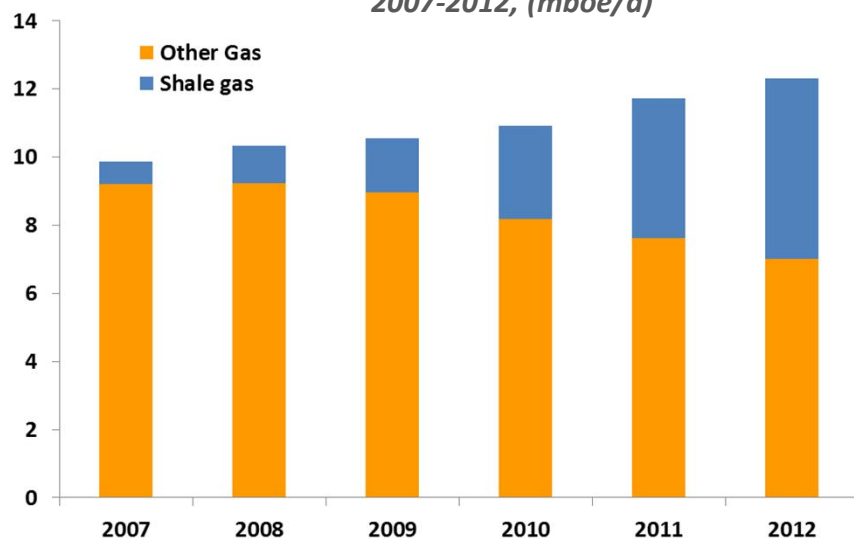


Source: Advanced Resources International, Inc. 2013

Shale gas and prospects for US LNG



*Share of Shale Gas in Total US Gas Production
2007-2012, (mboe/d)*



Source: US Energy Information Administration

- Share of shale gas in total US natural gas on the rise due to improvements in horizontal drilling associated with hydraulic fracturing

*LNG export projects approved by US Department of Energy,
(mboe/d)*

COMPANY	QUANTITY
Sabine Pass Liquefaction, LLC (Louisiana)	0.410
Freeport LNG Expansion, L.P. and FLNG Liquefaction, LLC (Texas)	0.262
Lake Charles Exports, LLC (Louisiana)	0.374
Dominion Cove Point LNG, LP (Maryland)	0.144
Jordan Cove Energy Project, L.P. (Oregon)	0.149
Cameron LNG, LLC (Louisiana)	0.318
Freeport LNG Expansion, L.P. and FLNG Liquefaction, LLC (Texas), additional	0.075
LNG Development Company, LLC (Oregon)	0.233
TOTAL	1.965

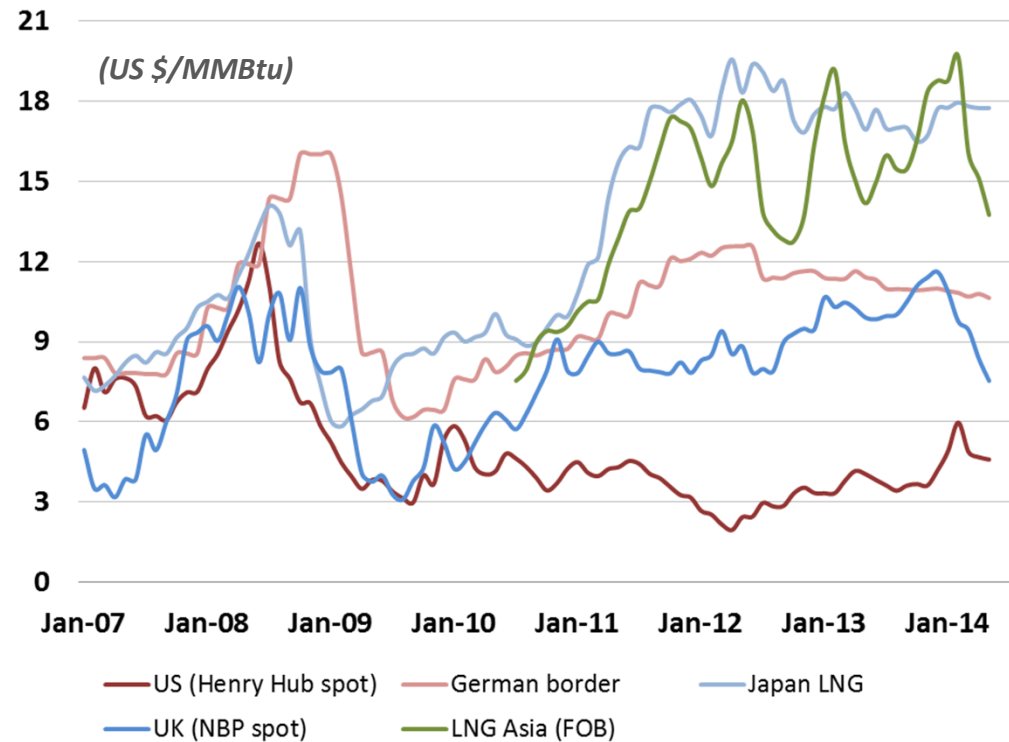
Source: US Office of Fossil Energy

- License to export granted to 8 projects so far
- Nearly all targeting Asian markets; 4 projects have already secured buyers

Comparison of natural gas prices



- Natural gas market exhibited a trend towards price divergence between different regions as shale gas supply increased
- While gas prices in US and Japan were at same level in mid 2008, they have gone apart by a factor of 4 or more in later years



Source: IMF

Effect of US LNG on regional markets



- US shale gas boom and the resulting price differential between North American and European markets raises questions about prospects for LNG exports
- Extent to which US starts exporting LNG uncertain: exports may be hindered by transportation costs and domestic opposition due to potential economic losses
- How exports might impact European and Asian markets is still subject of much debate, in which LNG transportation costs and demand are key determinants

Key questions



- What are the prospects for shale gas supply expansion in the US and other regions?
- Can gas significantly penetrate the transportation sector?
- Will natural gas capture market share from coal in the electrical power sector, especially Asia?
- Over the next 20-30 years, is natural gas the main route to CO₂ emission reduction?
- To what extent will US LNG exports materialize, and when?

The 2nd IEA-IEF-OPEC Symposium on Gas and Coal Market Outlooks

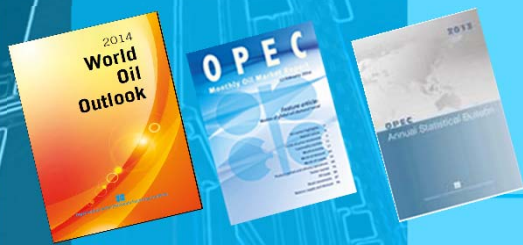
30th October, 2014



Thank you

Official launch of the OPEC World Oil Outlook
6th November, 2014 in Vienna

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