

# European and Global Challenges to the Future of Gas: unburnable or unaffordable?

**Jonathan Stern**

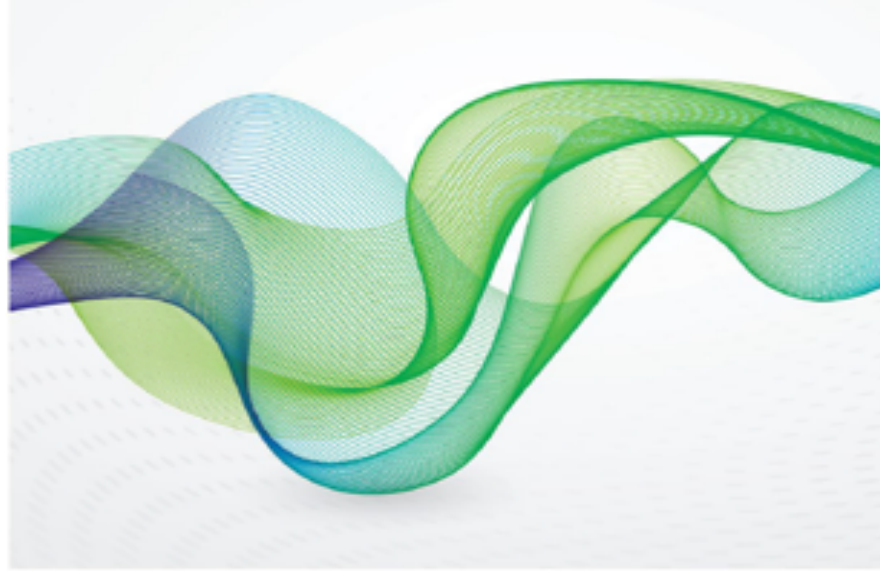
Oxford Energy Network, May 29, 2018

# Two Papers Published in 2017



January 2017

## The Future of Gas in Decarbonising European Energy Markets: the need for a new approach

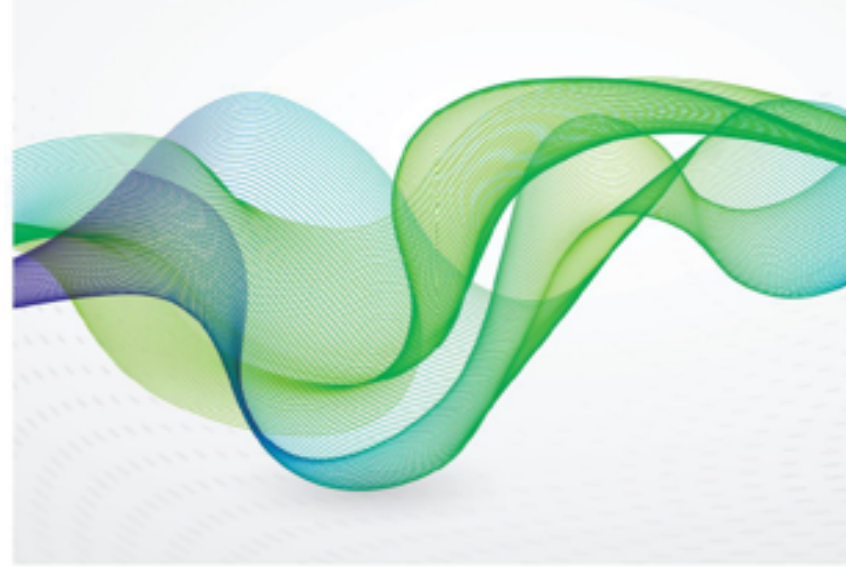


OIES PAPER: NG 116

Jonathan Stern

December 2017

## Challenges to the Future of Gas: unburnable or unaffordable?



OIES PAPER: NG 125

Jonathan Stern

# AGENDA

- **Problems for gas in the European transition**
- **Different regions, different energy agendas**
- **Modelling regional futures for gas in different time frames**
- **Pricing and affordability**
- **National typologies for carbon reduction and affordability**
- **Conclusions – future narratives**



# European Gas: five different problem areas in the 2010s

- **COMMERCIAL:** upstream, utilities and networks
- **BUSINESS MODEL:** liberalisation/competition
- **SECURITY OF SUPPLY:** import dependence
- **ENVIRONMENTAL:** energy transition
- **FRAGMENTATION:** of the value chain

**These problems compounded by short term (next 1-2 shareholders meetings) horizon of many companies; inability to think about 2030 (let alone 2050)  
BUT THIS IS CHANGING!**



‘Gas Advocacy’: failure to convince policy makers (and public opinion) that gas should be considered a ‘transition/bridge’ or ‘destination’ fuel

The industry was confident that gas was lower carbon than coal and cheaper than renewables, and therefore ‘the obvious low carbon solution’ BUT failed to recognise that:

- Renewables: politically popular because of environmental benefits and meeting targets; costs falling rapidly
- Coal was politically popular because of local employment
- Gas was not popular because of: carbon and methane emissions; 2011-14 price levels; ‘insecurity’ of imports; lack of employment connection in most countries (and still)
- ‘Transition’ and ‘Destination’ are slogans lacking definition

**Advocacy slogans had little traction or credibility; gas needs to find a convincing narrative for a world – and especially Europe - committed to COP21 targets**

# Environmental Problems



- CCS is making very little progress, so large scale decarbonisation of methane uncertain in any timeframe
- Methane emissions from the gas chain are poorly (or un-) documented and challenged by very high figures from some (extreme?) environmental/ NGO estimates; and in a political/media context this is connected with...
- the unconventional gas and `fracking' is a politically toxic issue in Europe (and problematic even in North America and elsewhere)

These issues are being addressed by industry: OGMP, OGCI, CCAC Guiding Principles on reducing methane, Green Gas Initiative, etc. but results are needed as quickly as possible



# Fragmentation of Commercial Interests Along the gas Value Chain

---

## **PRODUCERS AND EXPORTERS:**

- want to sell large quantities of methane over long time periods (if possible) underpinned by long term contracts

## **NETWORK COMPANIES:**

- Want to prolong the life of their assets not necessarily transporting methane (also biogas, biomethane, hydrogen)

## **SUPPLIERS AND TRADERS:**

- Supply power as well as gas and (unless they are producer affiliates) can switch from gas to power

## **OWNERS OF POWER, REGAS AND STORAGE ASSETS:**

- Maximise life of assets: shorter for power than regas/storage; may be stranded if others decarbonise

**Different value chain agendas prevent cooperation**



# **Future of Gas in Carbon-Centric NW Europe – the bad news for the gas community**

---

## **THE GAS COMMUNITY BELIEVES:**

- **decarbonisation is ongoing and unstoppable**
- **only green methane of CCS will provide credibility for gas advocacy**
- **but with an investment/planning horizon of 5-7 years and corporate fragmentation (but also because of cost) CCS investment has been very slow**
- **Therefore post-2030 the future is decline, which will accelerate if governments adopt more aggressive decarbonisation policies UNLESS..**
- **`Green methane': biogas/biomethane, syngas, methanised H2 from P2G, OR hydrogen from SMR+CCS can be adopted on a large scale**

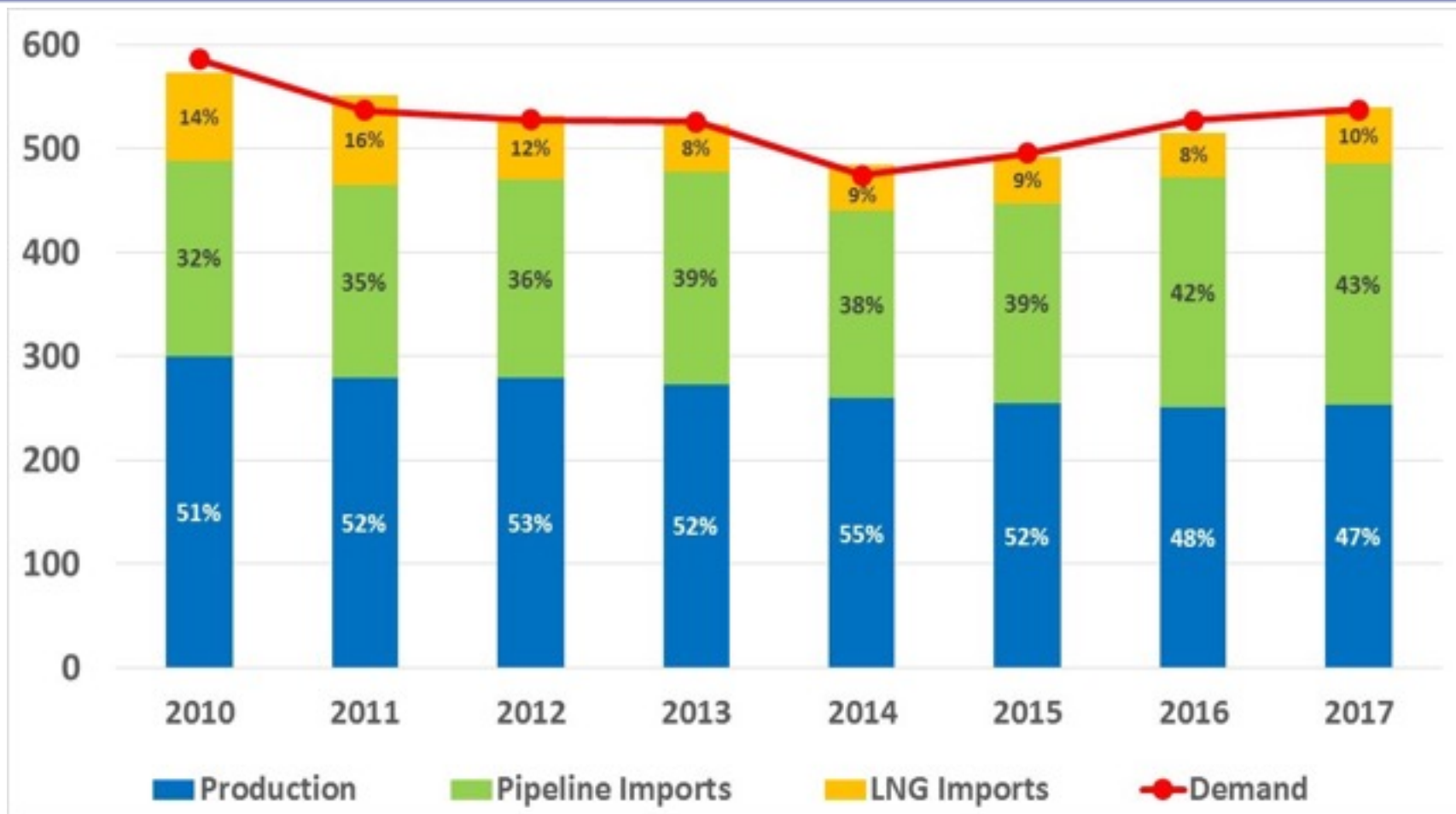




# European Gas Balances, 2010-17 (bcm)

Europe = EU 28 + Norway, Switzerland, SE Europe and Turkey

Source: H. Rogers (OIES)



**The Good News: 2017 demand back to 2012 level**

**And even with falling demand, Europe will require increased imports (and infrastructure?) for much of the 2020s**

- **Production falling fast in the Netherlands, slow decline in UK, small increase in Norway**
- **Russian gas and LNG – are the only large scale import options**
- **But much will depend on price: both absolute and competitive with coal and renewables (carbon pricing)**

**The next decade is by no means 'gloom and doom' for European gas markets – but the 2030s and beyond are a different story – limitation to 'transition fuel' story**

# Regional Energy and Gas Agendas: Europe and the Wider World

In North West Europe: energy research and policy discourse are dominated by carbon reduction

In Central/South East Europe: security (defined as import dependence) is top of the agenda

Outside Europe: air pollution, and access to energy/affordability are the most important issues

**Major analytical problem: no country is like any other; the relevance of “regions” or “lessons” from other countries is highly dubious**

# Leaving North West Europe travelling east: important messages

- Energy and gas policy is not just about carbon!!
- Gas demand is not just about:
  - power generation – industry, heating and transport are very important
  - markets/prices - policy is important

**North West Europe: everything to do with  
energy is primarily about carbon**

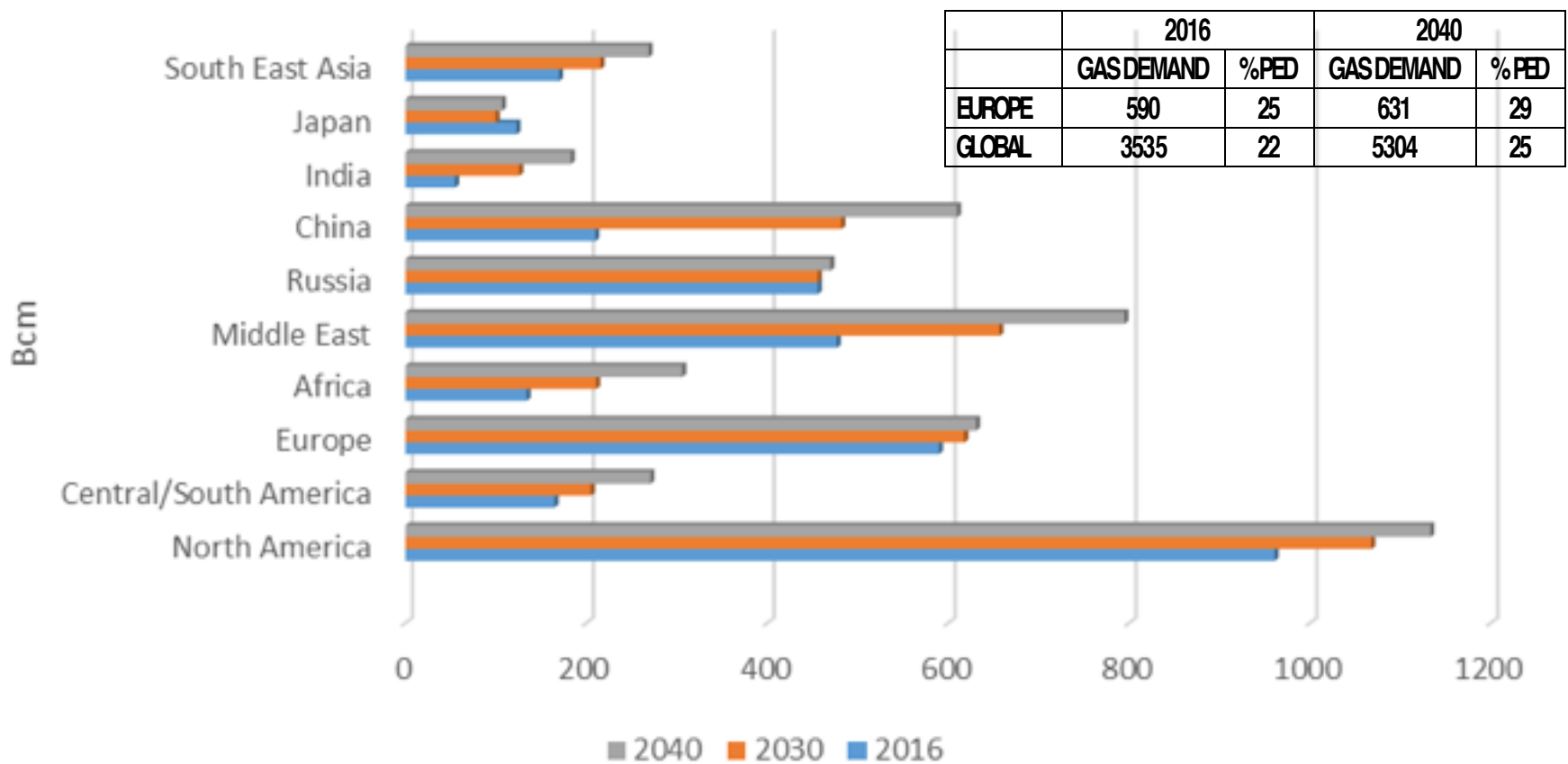


## Overview of a Range of `Carbon-Centric' Global Energy Models

- Most of the models see European gas demand flat or slightly declining in the 2020s with decline accelerating in the 2030s (need to meet targets)
- Outside Europe, most models have no significant gas demand decline both globally and regionally until the late 2030s (exception is Greenpeace's Advanced Energy Revolution)
- assuming progressive fossil fuel reduction/phase-out, this is close to a definition of a `transition fuel'

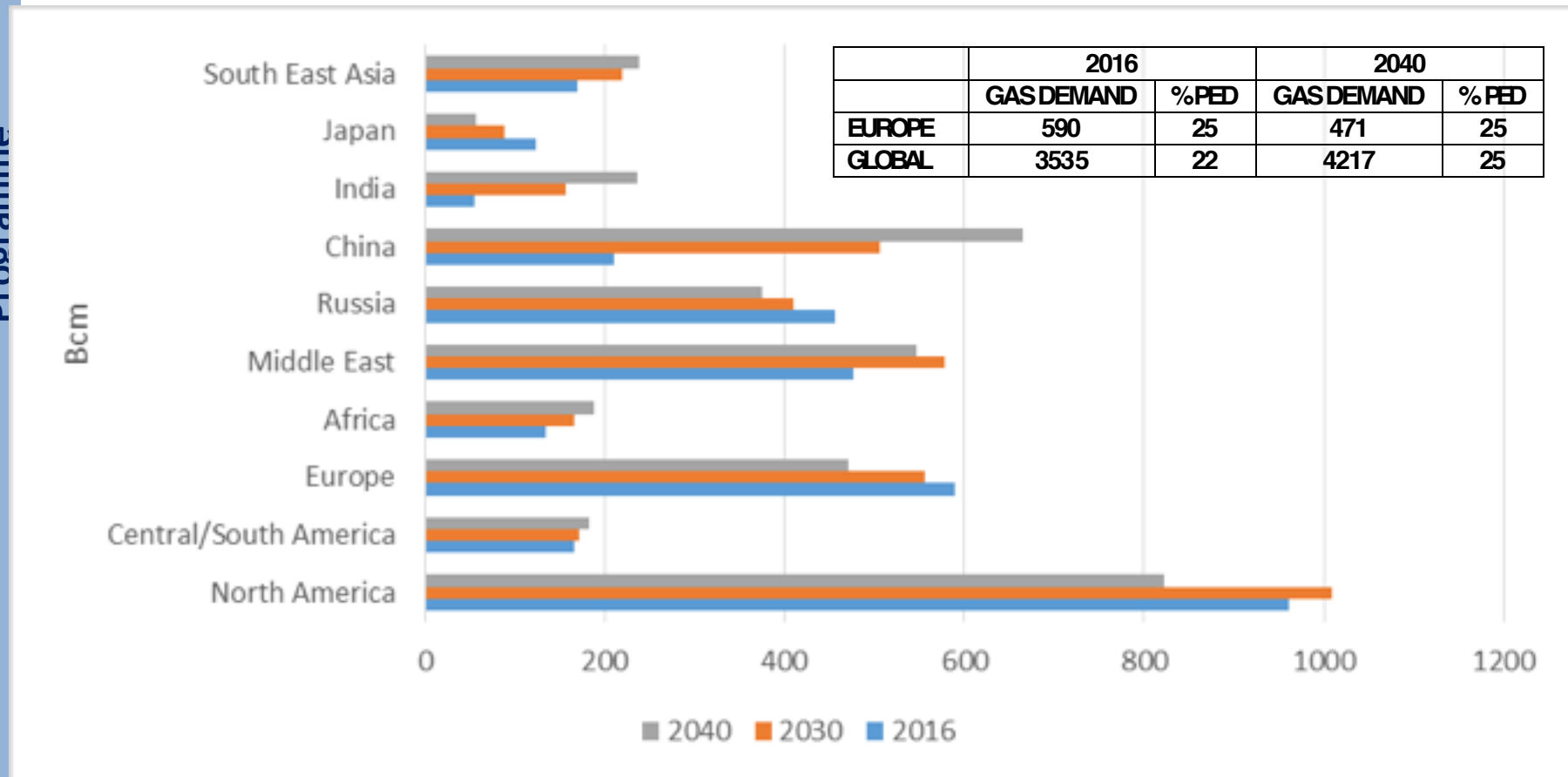
**Academic energy models are dominated by carbon-reduction assumptions ie carbon reduction targets must be/will be met**

# IEA New Policies Scenario: significant gas demand growth everywhere except Europe, Japan and Russia



Source: IEA WEO 2017

# IEA Sustainable Development Scenario: significant gas demand growth in China and India, growth in SE Asia and Africa; stable or declining post-2030 elsewhere

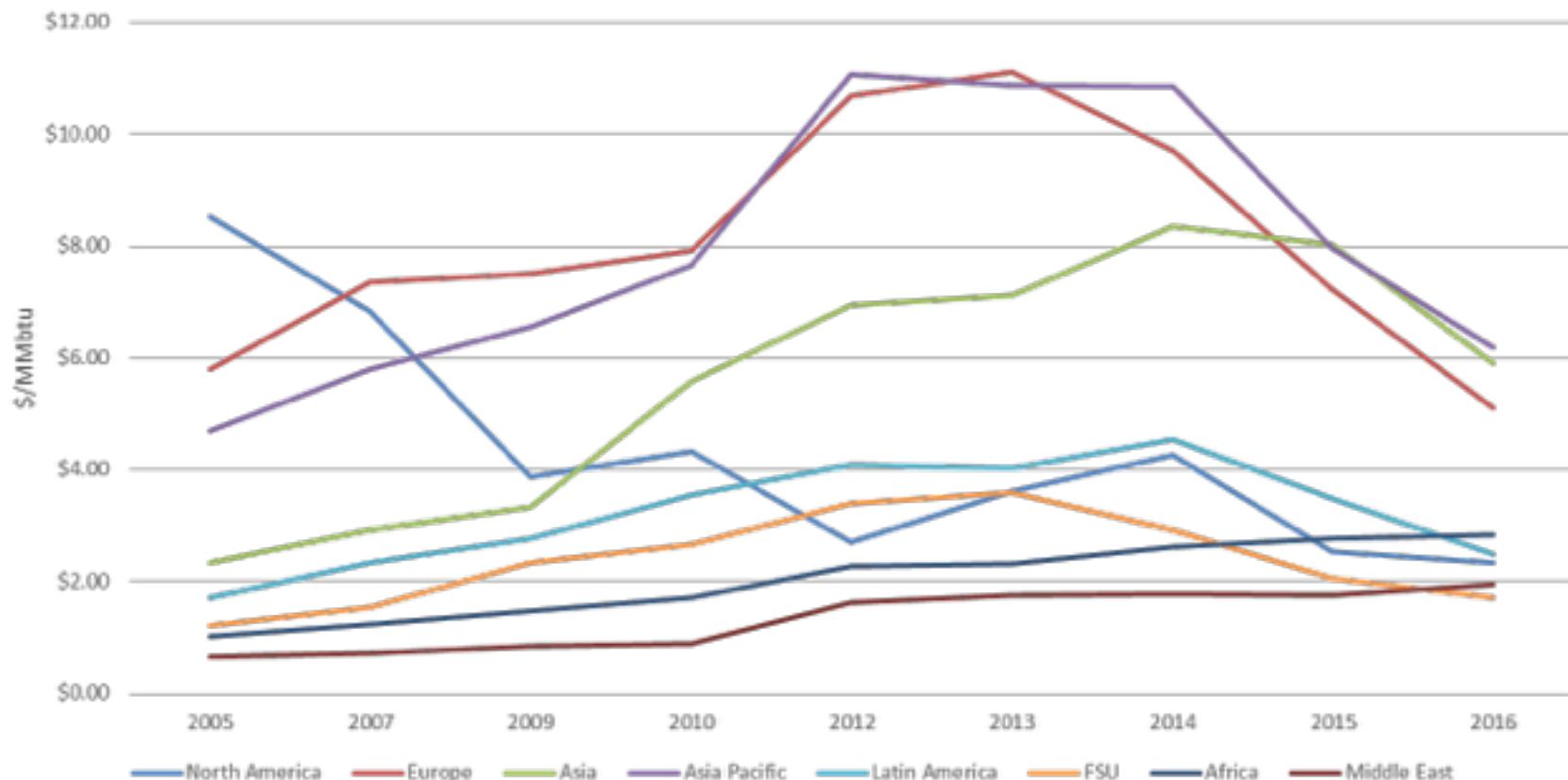


Source: IEA WEO 2017

# Wholesale Gas Prices in Different Regions 2005-16



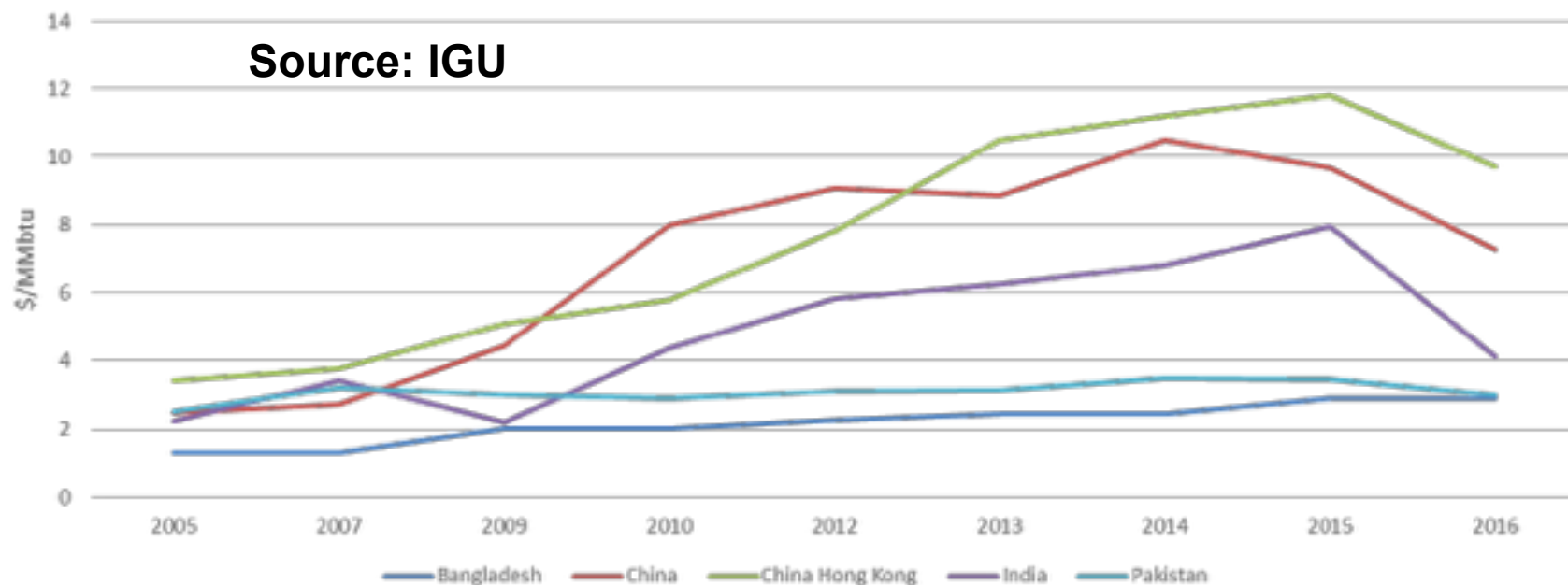
Source: International Gas Union, *Wholesale Gas Price Survey 2017 Edition*, Figure 1.3, p.11



**Two groups: OECD+Asia (post-2009) paid \$6-11/MMbtu;  
FSU, Latam, Africa, Middle East paid less than \$4/MMbtu**  
**Note: \$1/MMbtu = €2.8/MWh or 7.1 pence/therm**



# But Country Granularity is Crucial - Asia as an example



- China and Hong Kong have shown clear capacity to pay \$6-10/MMBtu (but even generalisations across one country are difficult eg Chinese provincial prices range from \$5-10/MMBtu)
- Pakistan and Bangladesh prices have been below \$4/MMBtu; India is an intermediate case

**So how can Bangladesh and Pakistan afford to pay even \$6 for LNG? Answer: with government subsidies. Same answer for many other countries eg in the Middle East. How sustainable are subsidies at much higher levels of gas imports?**



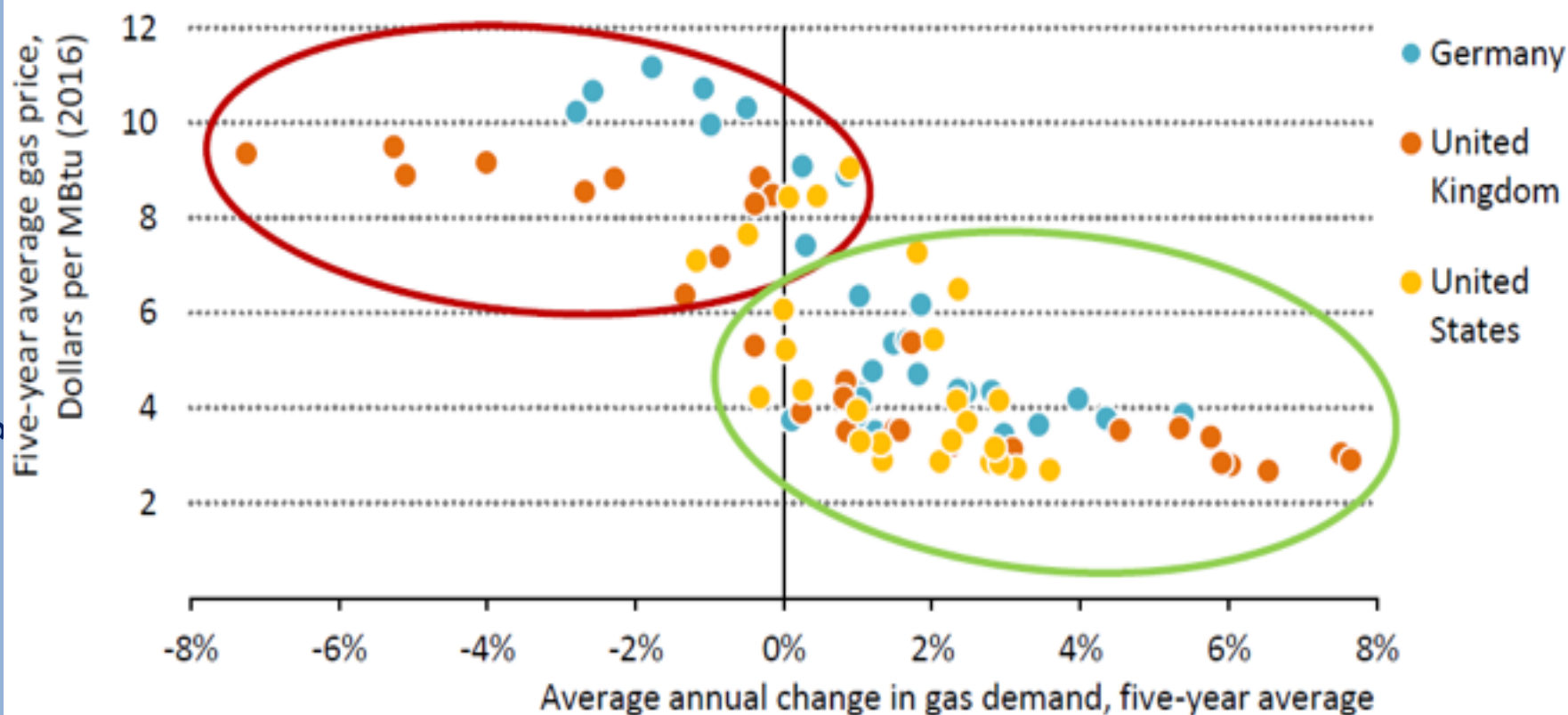
# Natural Gas Import Prices by Scenario (\$/MMbtu real 2016)

Source: IEA WEO 2017, Table 1.4, p.52.

	New Policies				Sustainable Development	
	2025	2030	2035	2040	2025	2040
United States	3.7	4.4	5.0	5.6	3.4	3.9
European Union	7.9	8.6	9.1	9.6	7.0	7.9
China	9.4	9.7	10.0	10.2	8.2	8.5
Japan	10.3	10.5	10.6	10.6	8.6	9.0

**Do these prices fit with demand profiles? How 'affordable' is LNG in Africa, Latin America and much of Asia at prices of \$7-9/mmbtu? In Europe prices above \$8 may destroy demand**

## Historical importance of the \$6-8/MMBtu [€16-22/MWh or 42-56p/th] price thresholds

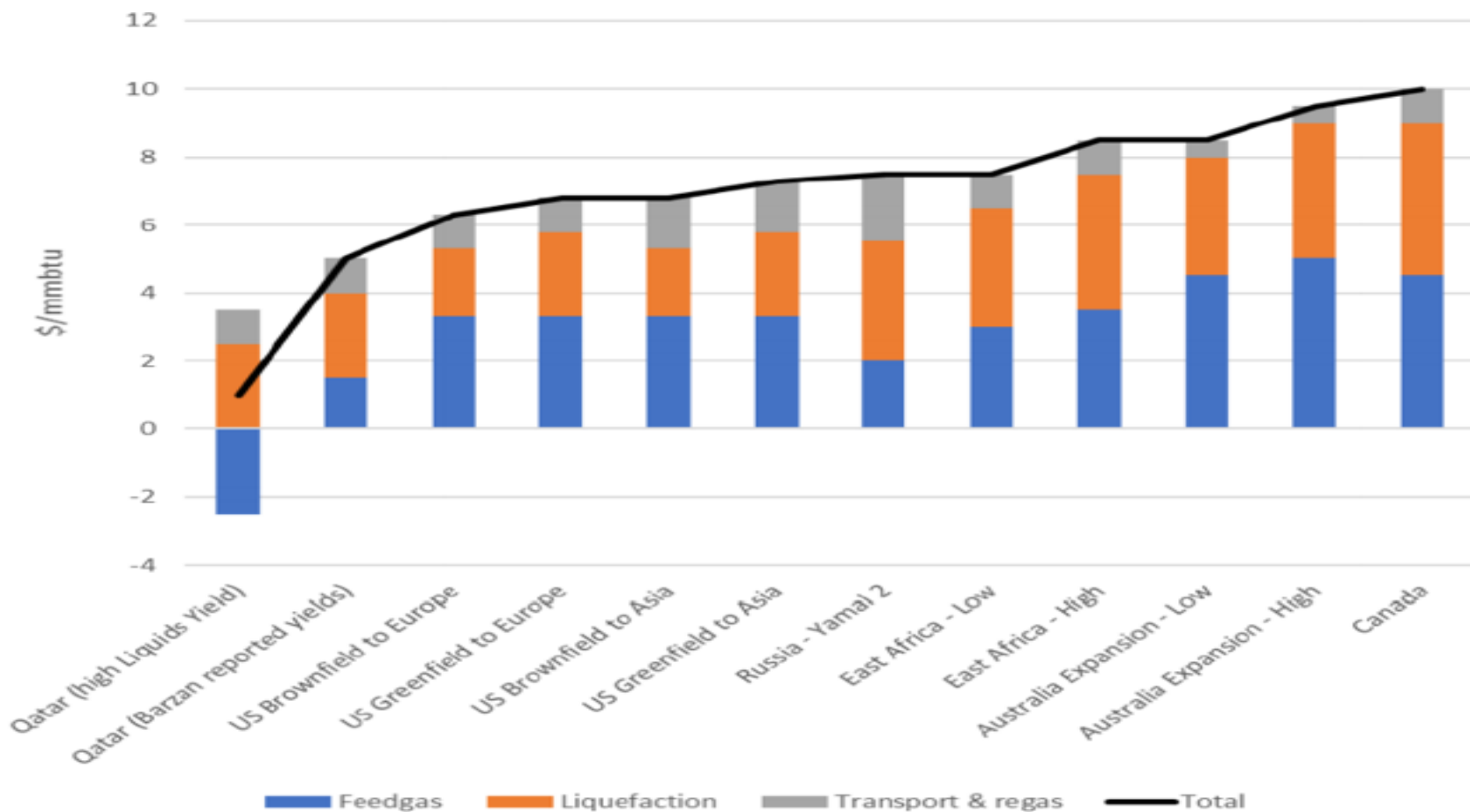


*Analysis of historical demand trends in the US, UK and Germany shows that gas use increased at prices below \$6/MMBtu, but declined at prices above \$8/MMBtu*

**Affordability = `energy access' (absolute level of income) and competitiveness against alternatives**

**Affordability of LNG imports is the key metric for gas demand in many regions NOW**

## Estimated Breakeven Market Prices for New LNG Projects Assuming Significant Cost Reduction



Source: Rogers/OIES

**Aside from Qatar, \$6-8.50/mmbtu is the range for most new projects – too expensive for many countries**



Unaffordable/Uncompetitive (the next decade/2030) or  
'unburnable' (post-2035-40)

- Affordability - many non-OECD countries unable to pay prices above \$6 to remunerate new gas projects; in OECD prices above \$8/MMbtu will destroy demand
- Competition with domestic coal, and increasingly renewables, means gas will need to focus on non-power sectors; or be confined to a back-up role
- More complicated commercial model for all value chain players as focus switches from power to industrial, residential, transport sectors

**Carbon reduction challenge – the 'tipping point' for methane usage without CCS in Europe is 2030, and in other regions 2035/40**  
**The affordability challenge: is it worth developing new gas projects with delivered costs above \$6-8/MMbtu and for which markets?**  
**How many new projects can be delivered at that cost?**



## Future of Gas Typologies: additional demand, power demand, replacement supply

- Very large additional (not only power) demand/import (50-100+ Bcm): China (high affordability), India (low affordability), Gulf countries (continued subsidies)

### Demand from power markets:

- ❖ **Demand growth and switching:** Philippines, Thailand, Tunisia, Morocco, Ivory Coast, South Africa, Ghana
- ❖ **Daily/seasonal back-up for intermittent renewables:** Latin America (hydro) NW Europe and some US states (wind/solar)

- Replacement supply (due to falling domestic production and expiring long term contracts): Europe, Japan, Korea

**Few generalisations – each country (region) is different**

**If the affordability challenge can be addressed, gas has ~20 years before it becomes globally `unburnable' – this is a respectable claim to be considered a `transition fuel'**

**BUT**

**But by 2025/30, new long term contracts for gas, and investments in new gas infrastructure may no longer be possible in Europe (in relation to carbon reduction targets)**



The gas community needs to move from slogans to actions

## COST REDUCTION/MARKET DEVELOPMENT:

- Cost (margin?) reduction, especially in the LNG chain
- Reintegrating the value chain

## GREENING GAS:

Address methane leakage issue: transparent reporting of data throughout the value chain by country

- Biogas/biomethane - popular political choice (but lacking scale and needing significant subsidies?)
- Hydrogen (with or without CCS) is where gas can be a partner of renewables through electrolysis

**Greening gas can be a first step towards complete decarbonisation - but only a first step**



# The Gas Challenge is to create convincing narratives for different countries/regions

## IN CARBON-CENTRIC COUNTRIES:

- That methane can be decarbonised (via CCS) with large scale transformation to green gas and/or hydrogen
- Gas can play a larger role in Europe than simply storage back-up for renewables
- That gas supplies can be diversified at acceptable cost

## ELSEWHERE:

- That LNG can be profitably delivered to OECD countries at a cost of <\$8/MMbtu (in low income countries \$5-6/MMbtu)
- That gas can make a major and short term contribution to improved air quality

- In carbon-centric Europe, investments are needed to demonstrate that these narratives can become reality if post-2030 decline is to be avoided
- elsewhere LNG cost reduction is the imperative



# The Oxford Institute for Energy Studies

**Recognised Independent Research Centre at Oxford University  
Voted one the leading global energy and resource think tanks\***

Independent analysis, established energy expertise, insightful research

A focus on the evolving role of oil, gas, coal and electricity in the global energy economy

Extensive interaction with leading industrial, commercial and policy actors

Regular publications and exclusive events

- **Gas Programme founded in 2003 as a unique academic think-tank**
- **A prominent forum for research and debate on the key catalysts of gas industry development**
- **Funded by sponsors who receive exclusive access to research and events**

<https://www.gotothinktank.com/>