



THE OXFORD  
INSTITUTE  
FOR ENERGY  
STUDIES

A RECOGNIZED INDEPENDENT CENTRE OF THE UNIVERSITY OF OXFORD



# The Future of Gas: unburnable or unaffordable?

**Jonathan Stern**

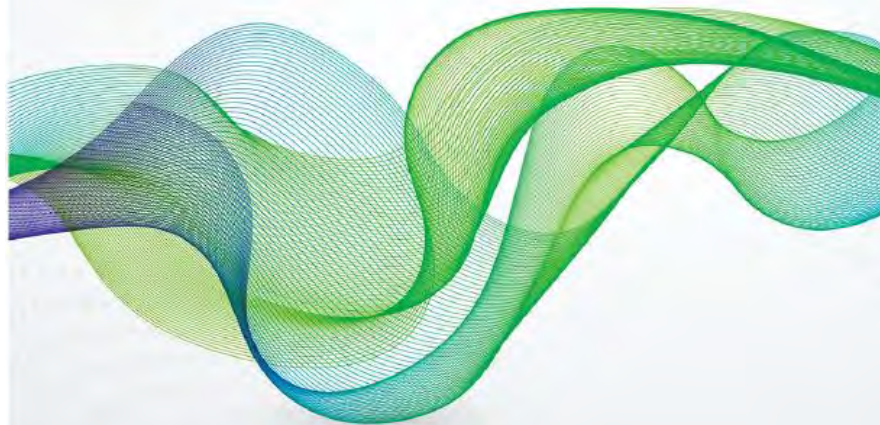
EPRG Spring Seminar, Cambridge, May 11, 2018

# Two Papers Published in 2017



January 2017

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

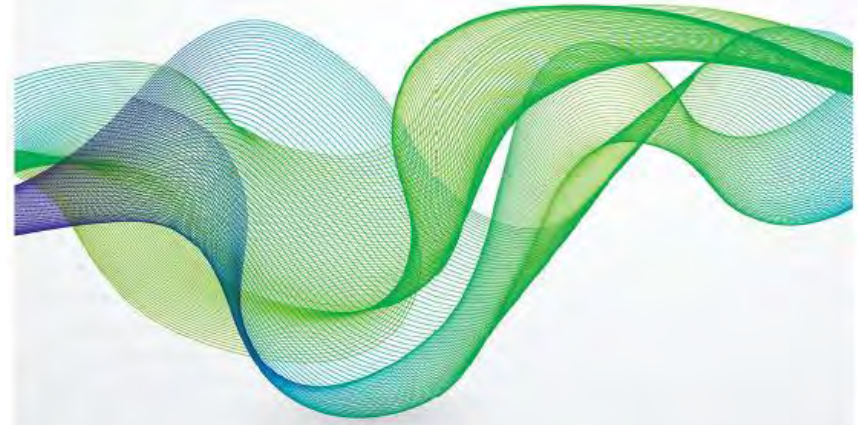


OIES PAPER: NG 116

Jonathan Stern

December 2017

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



OIES PAPER: NG 125

Jonathan Stern



**`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 committed to COP21 targets**

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

- **COMMERCIAL: upstream, utilities and networks**
- **BUSINESS MODEL**
- **SECURITY**
- **ENVIRONMENTAL**
- **FRAGMENTATION**

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



# Environmental Problems

- Gas is still a 'fossil fuel'
- CCS is making very little progress, so large scale decarbonisation of methane is currently 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: 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

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## 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

**Value chain cooperation very difficult (impossible?)**



# Future of Gas in 'Carbon-Centric NW Europe' – the bad news

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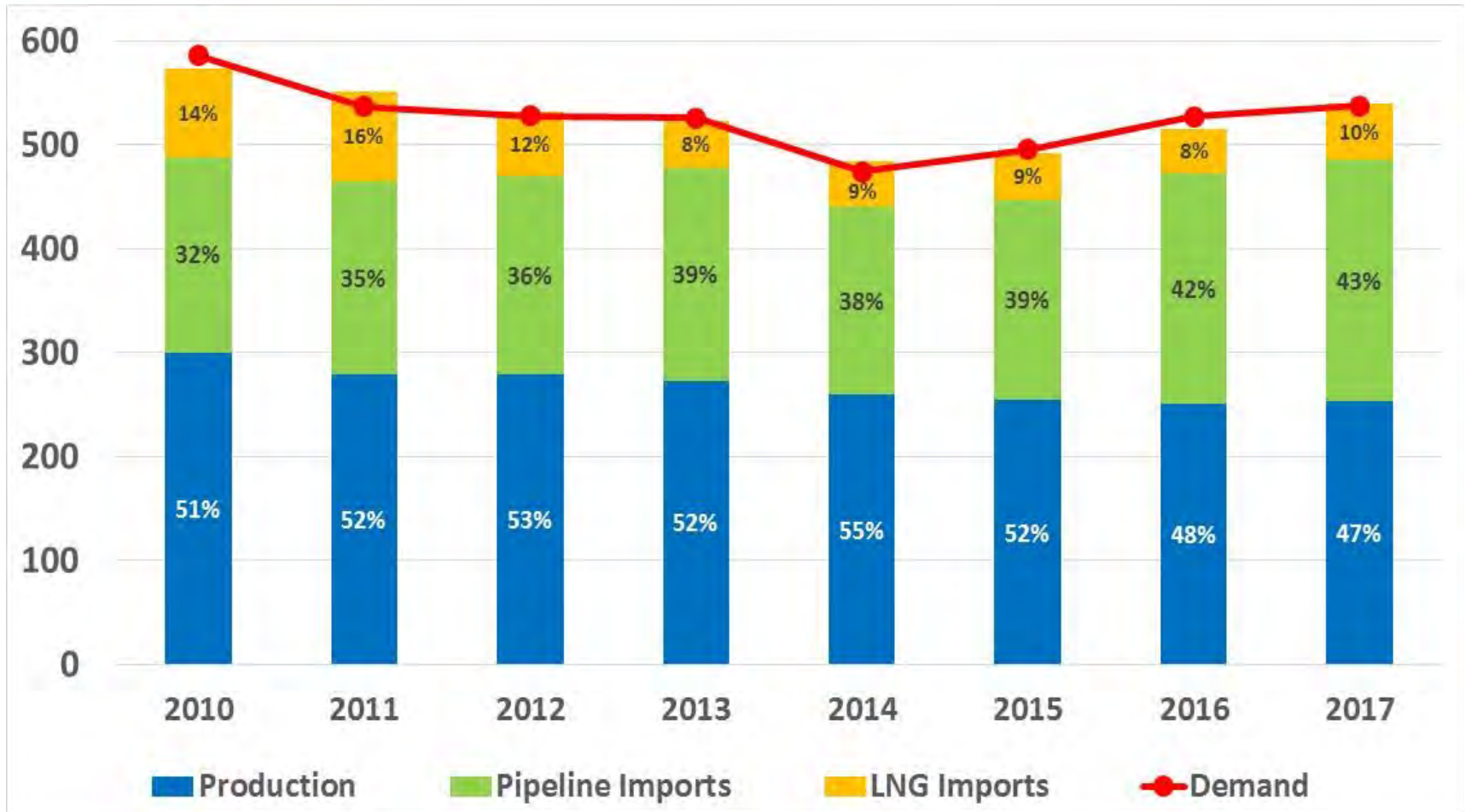
## THE GAS COMMUNITY BELIEVES:

- decarbonisation is ongoing and unstoppable
- only 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 is not happening
- Therefore post-2030 the future is decline, which will accelerate if governments adopt more aggressive decarbonisation policies



# 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

**Carbon-centric 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 “lessons” from other countries is highly dubious**

# Leaving NW 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

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

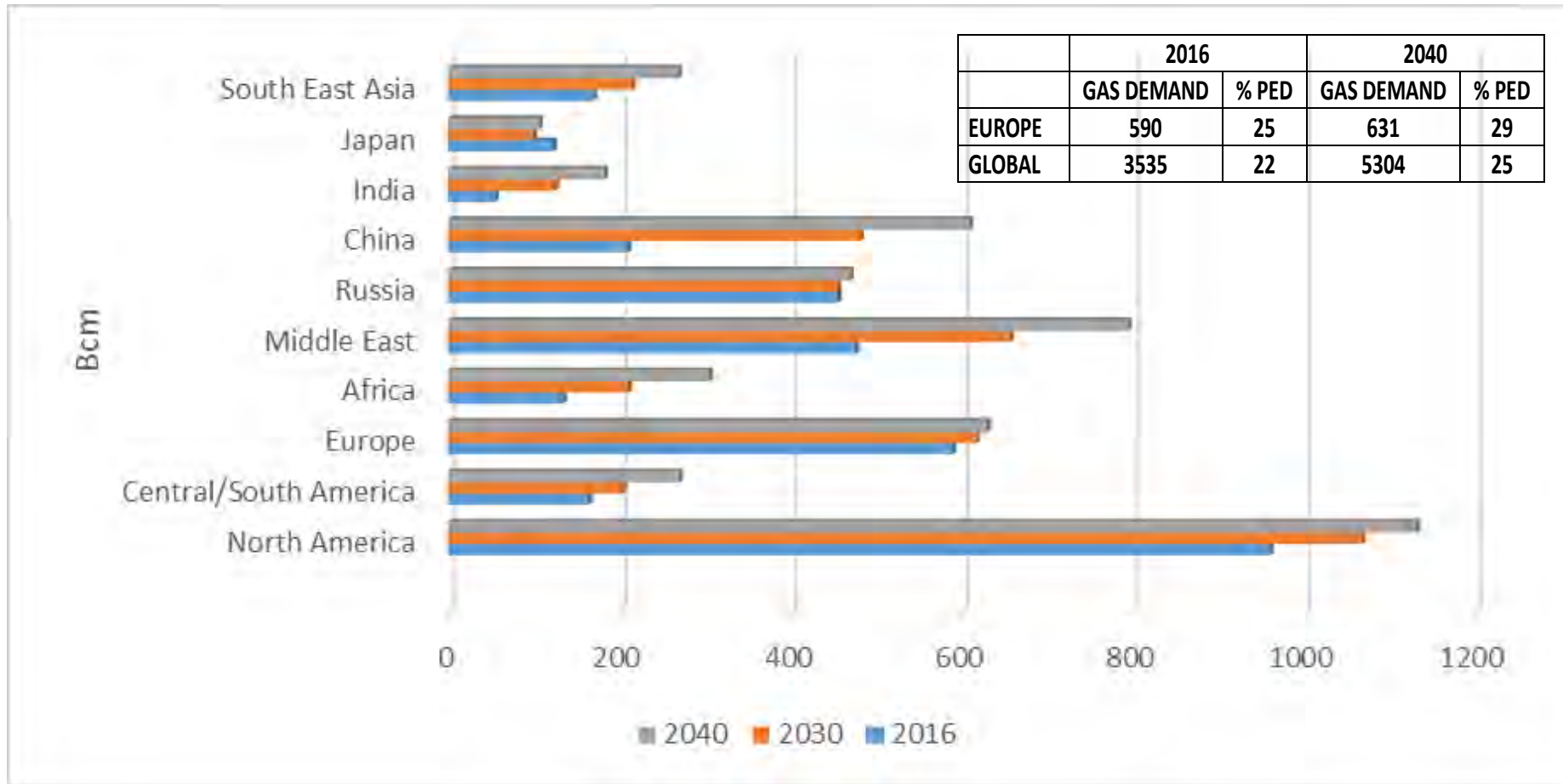


# Overview of a Range of 'Carbon-Centric' Global Energy Models

- 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**

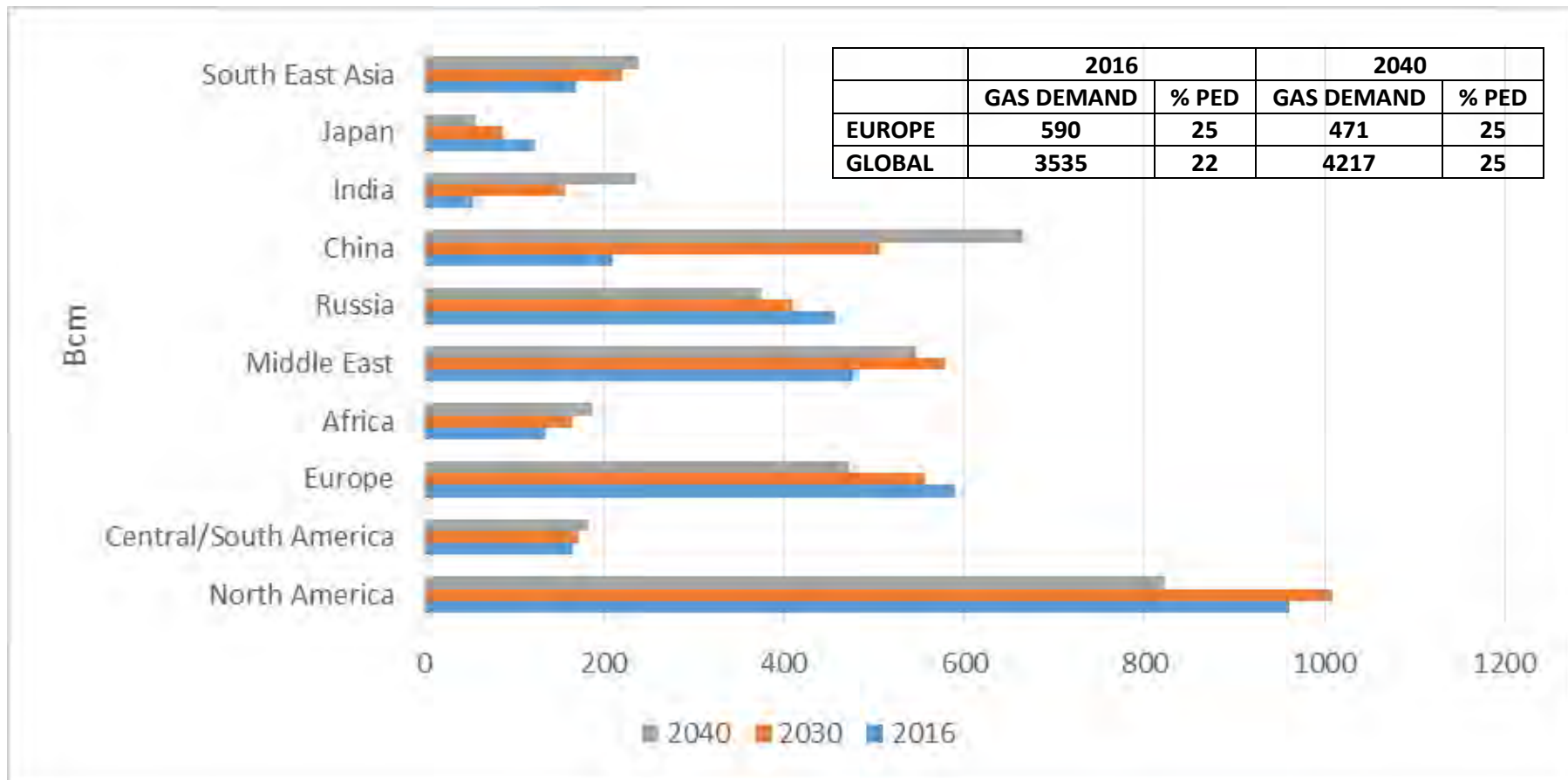
# IEA New Policies Scenario: significant gas demand growth everywhere except Europe, Japan and Russia



Source: IEA WEO 2017



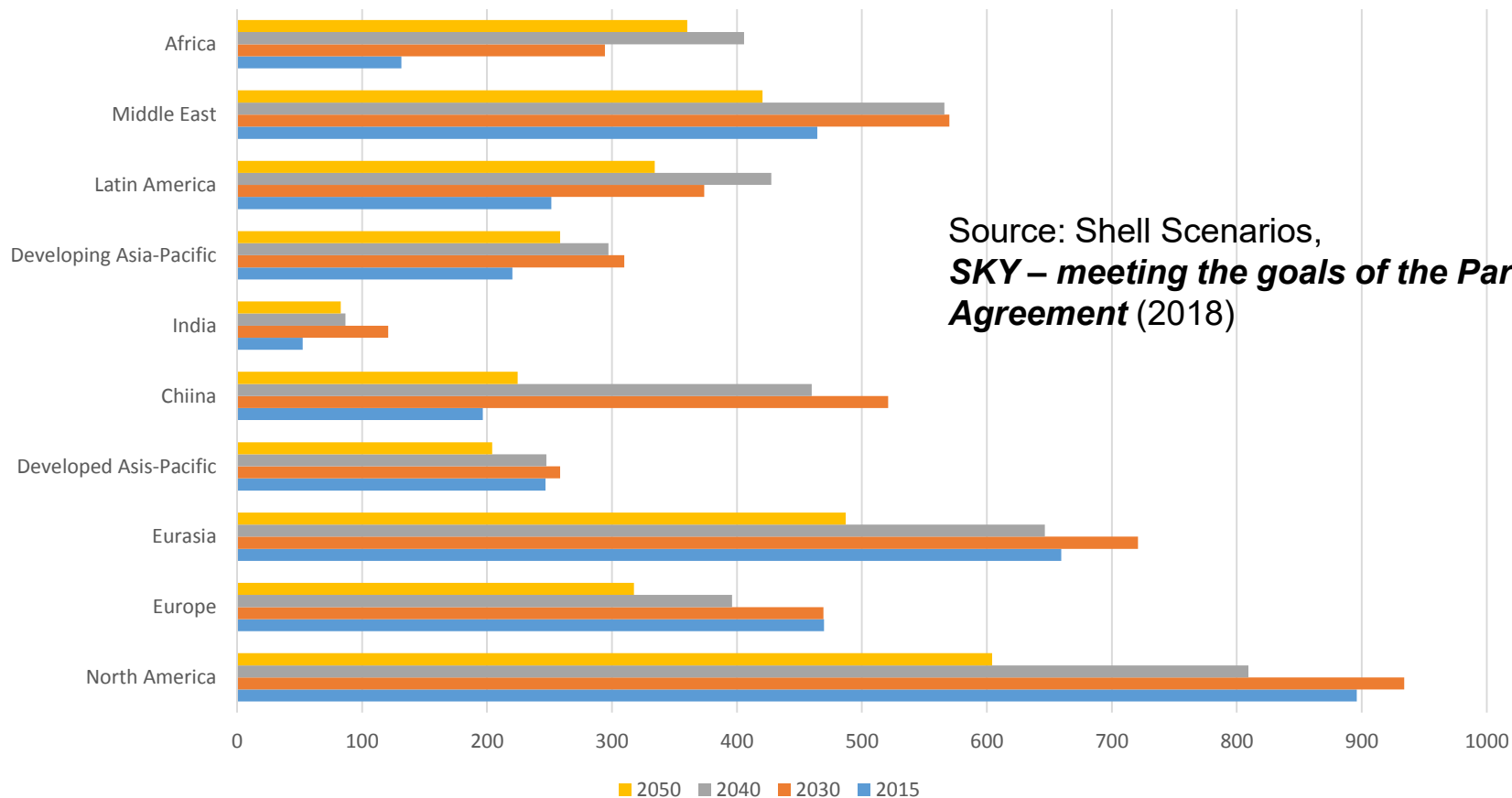
# IEA Sustainable Development Scenario: significant gas demand growth in China and India, growth in SE Asia and Africa; stable or declining post-2030 elsewhere



Source: IEA WEO 2017



# Shell SKY Scenario: significant gas demand growth outside OECD to 2030; decline in OECD to 2040; substantial decline post-2040



**Global gas demand peak/plateau 2030-35 followed by modest decline to 2040 but 25% decline 2040-50**

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



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

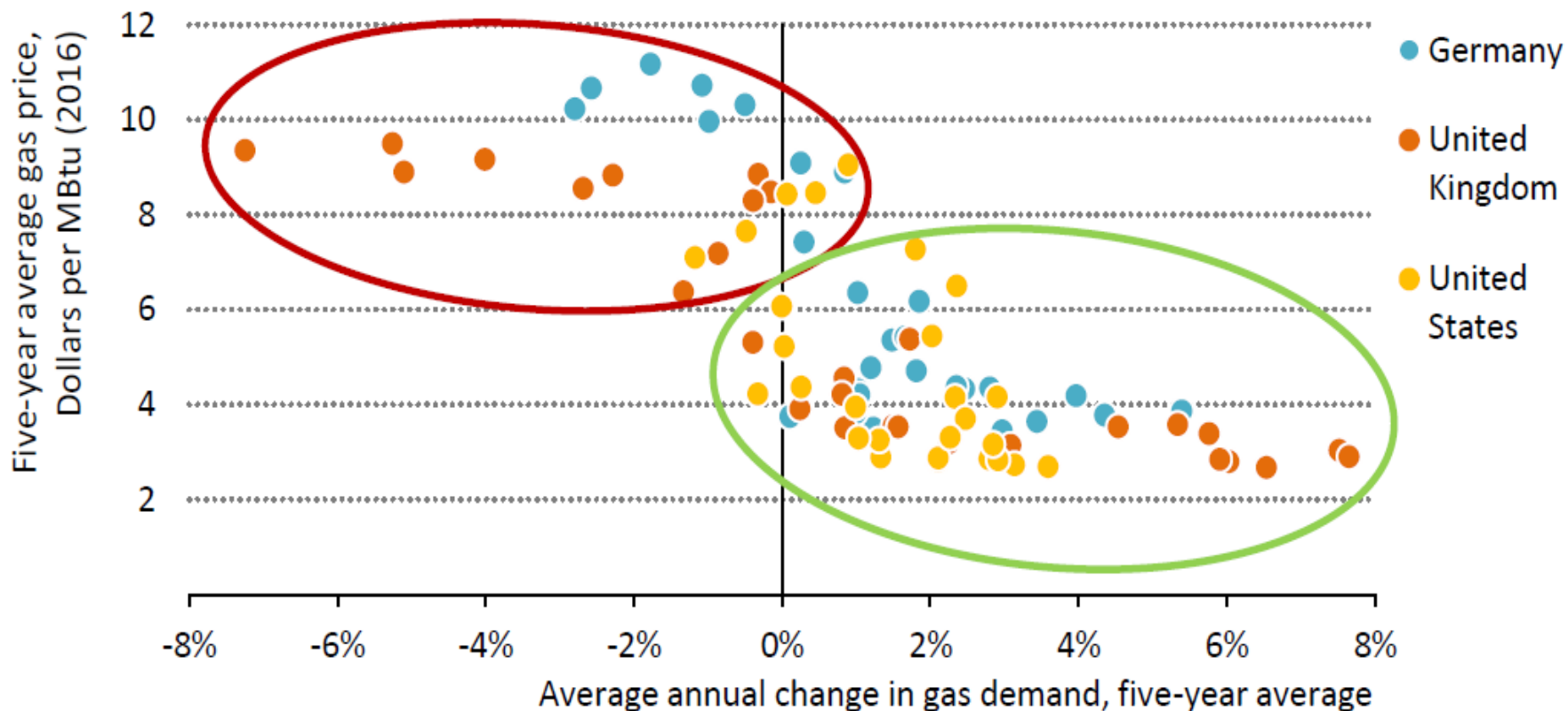
	New Policies				Sustainable Development	
	2025	2030	2035	2040	2025	2040
United States	3.7	4.4	5.0	5.6	3.4	3.9
European Union	7.9	8.6	9.1	9.6	7.0	7.9
China	9.4	9.7	10.0	10.2	8.2	8.5
Japan	10.3	10.5	10.6	10.6	8.6	9.0

**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



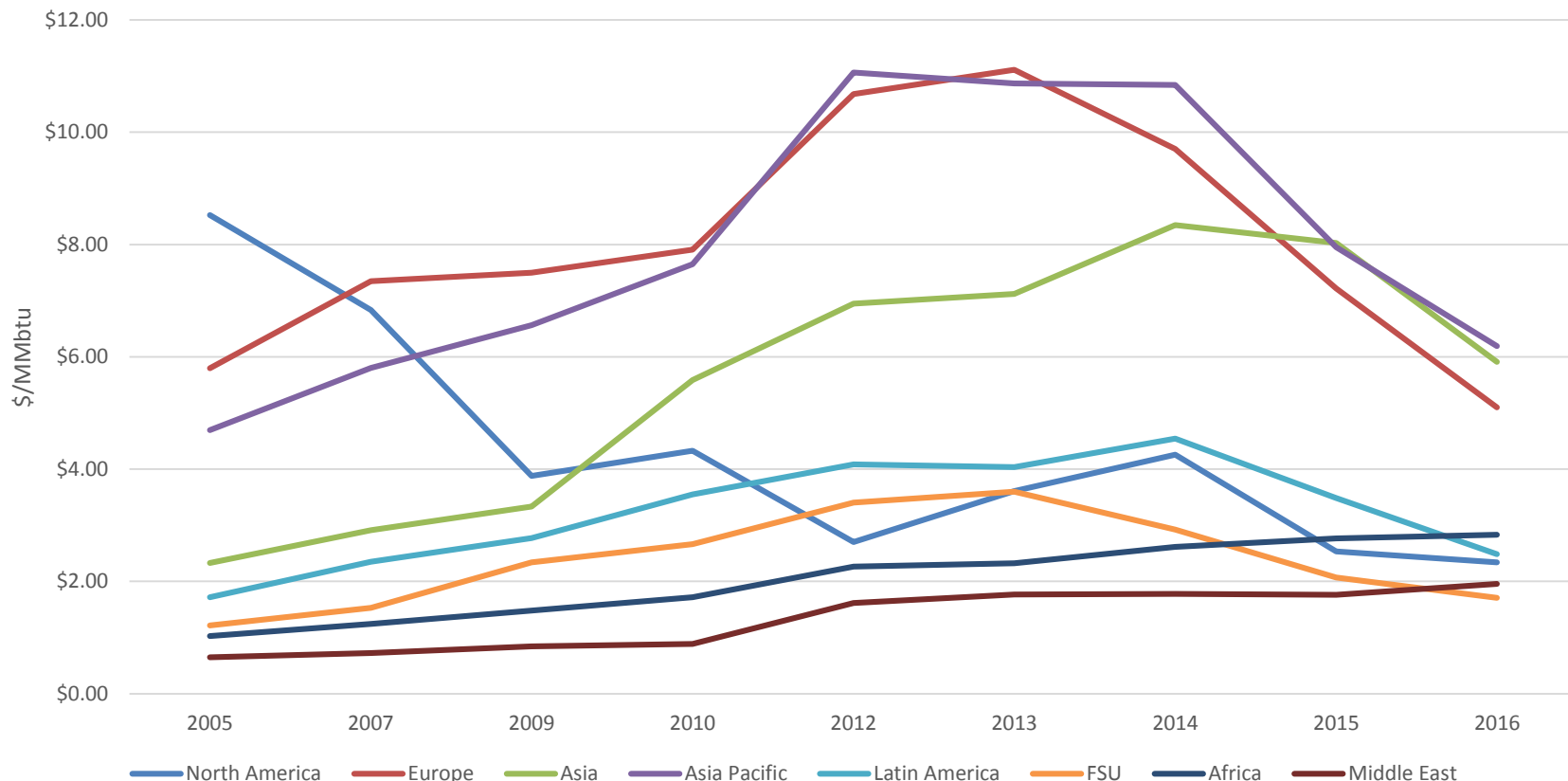
*Analysis of historical demand trends in the US, UK and Germany shows that gas use increased at prices below \$6/MMbtu, but declined at prices above \$8/MMbtu*

**Source: IEA, WEO 2016, Figure 8.5, p.342**

# Wholesale Gas Prices in Different Regions 2005-16

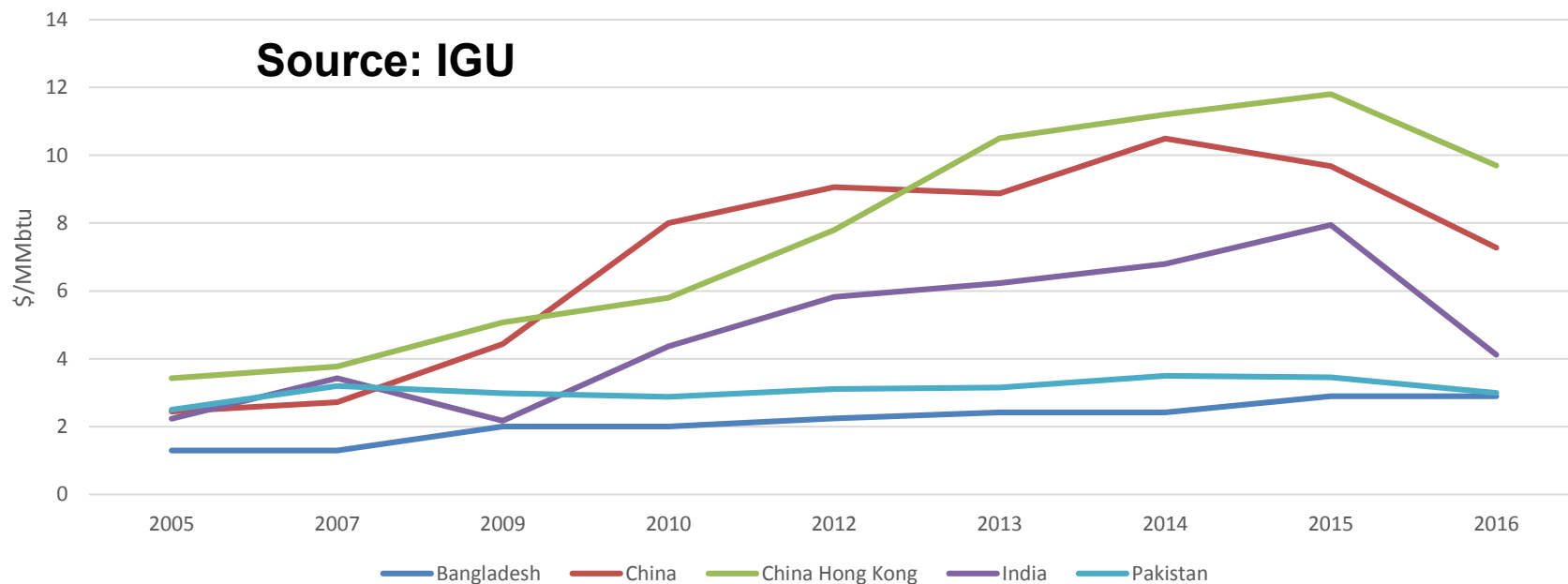


Source: International Gas Union, *Wholesale Gas Price Survey 2017 Edition*, Figure 1.3, p.11



**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



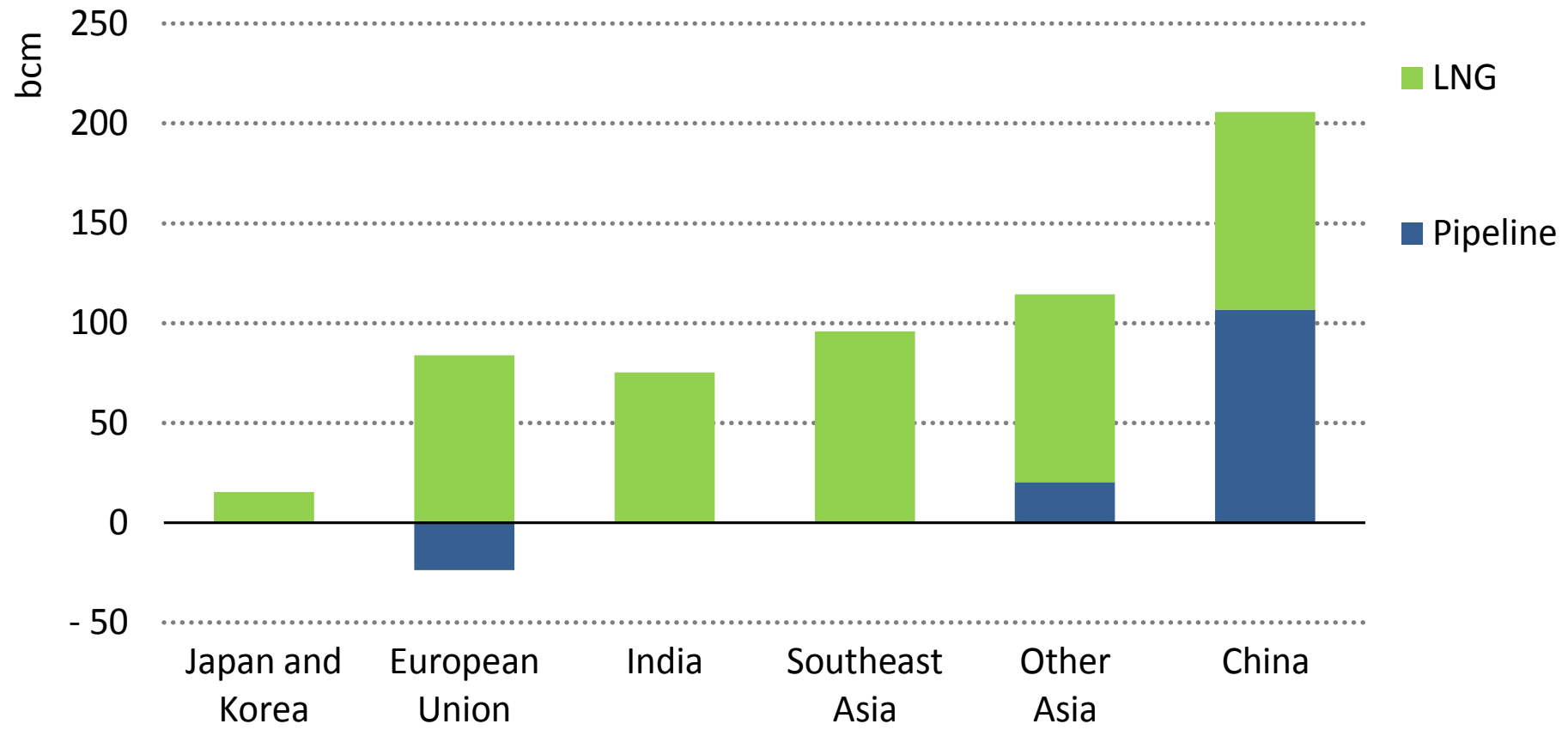
- **China and Hong Kong have shown clear capacity to pay \$6-10/MMbtu (but even generalisations across one country are difficult eg Chinese provincial prices range from \$5-10/Mmbtu)**
- **Pakistan and Bangladesh prices have been below \$4/Mmbtu; India is an intermediate case**

**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?**

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

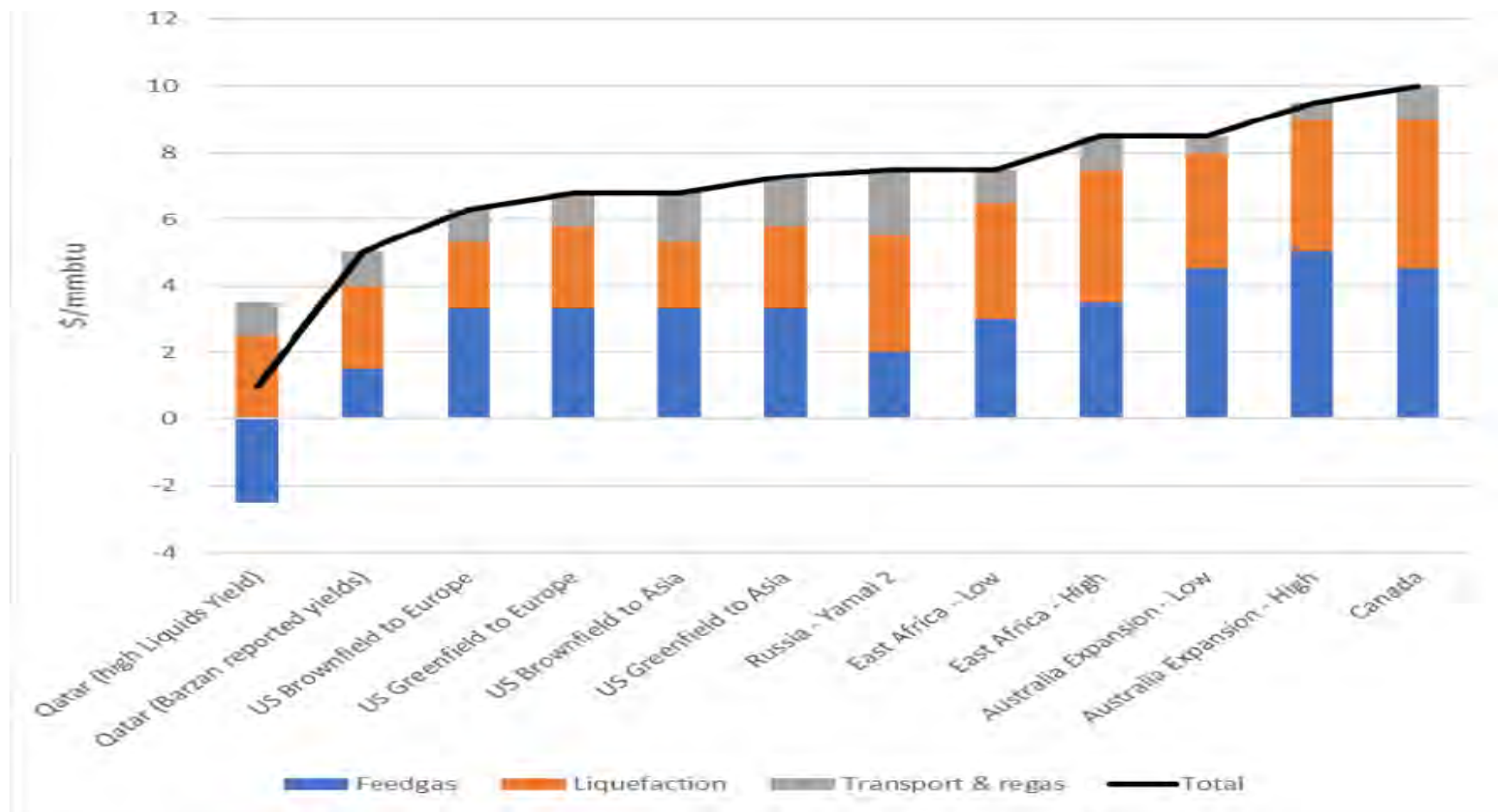
**Affordability of LNG imports is  
the key metric for gas demand  
in many regions NOW**

# Change in gas imports by selected region and mode in the New Policies Scenario, 2016-2040



**Asia leads the growth in global gas trade; outside China, new pipeline trade routes find it hard to advance in a market with LNG readily and flexibly available**

# 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 - natural gas (methane) becomes 'unburnable' without CCS: in Europe post-2030, in other regions by the late 2030s**

**The affordability challenge is NOW: is it worth developing new gas projects with costs above \$6-8/MMbtu and for which markets? How many new projects can be delivered at that cost?**



# The Gas Challenge: convincing narratives are needed 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**



# THANK YOU

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