



## 6<sup>TH</sup> IEF IGU MINISTERIAL GAS FORUM

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# Session 2: Gas demand growth beyond power generation

IEF-IGU Gas Ministerial

22<sup>nd</sup> November 2018

# Key messages: Gas demand growth beyond power generation

## Key messages

Recent global gas demand growth has been concentrated in the power sector

- Growth in other sectors a potential missed opportunity - as a result gas is not gaining share in the energy mix

Looking forward, there is significant opportunity for greater gas demand growth outside of power

- The greatest opportunity for growth is in Asia...  
... but gas is challenged on cost competitiveness
- The industry and buildings sector hold most potential
- Gas adoption in the transport sector is highly variable by country given local fuel substitution economics

Policy incentives for gas adoption are key for accelerating gas demand growth outside of the power sector

- In China, mandated fuel boiler switching is driving rapid growth in industry and buildings
- In India, gas demand is most rapidly growing in the City Gas sector given regulated prices

## Session objectives

Assess the opportunities for greater gas demand growth in industry, buildings, and the transport sector

Identify key barriers to the adoption of gas outside of the power sector

Discuss lessons learned from examples of successful fuel switching to gas and what governments can do to implement them



# Agenda

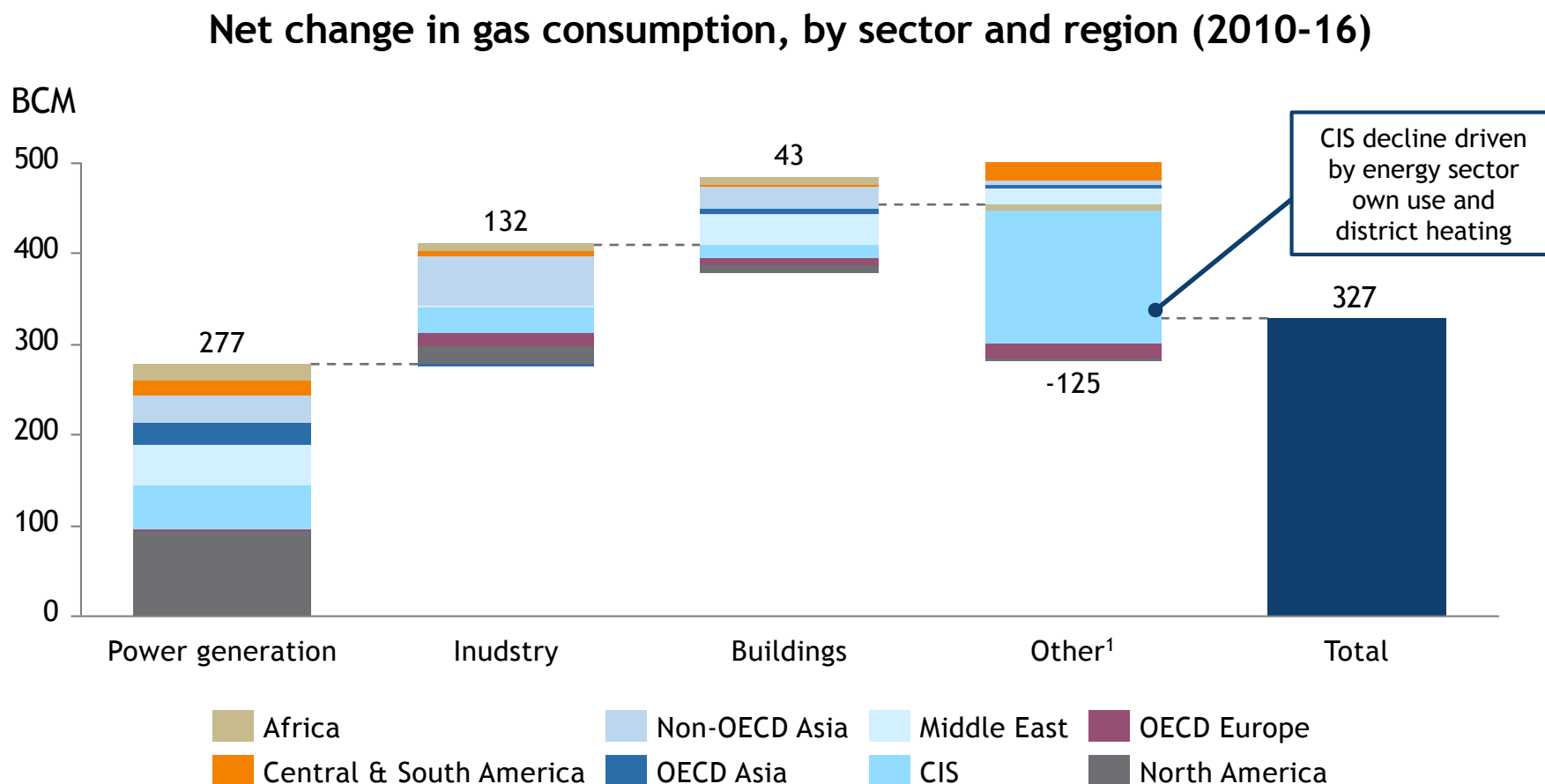
## **Recent trends in gas demand**

Opportunities outside of power generation

Country examples - India and China

Questions for discussion

# Power sector driving the majority of recent global gas demand growth



1. Other Energy Sector: covers the use of energy by transformation industries and the energy losses in converting primary energy into a form that can be used in the final consuming sectors. It includes losses by gas works, petroleum refineries, coal and gas transformation and liquefaction. It also includes energy used in coal mines, in oil and gas extraction and in electricity and heat

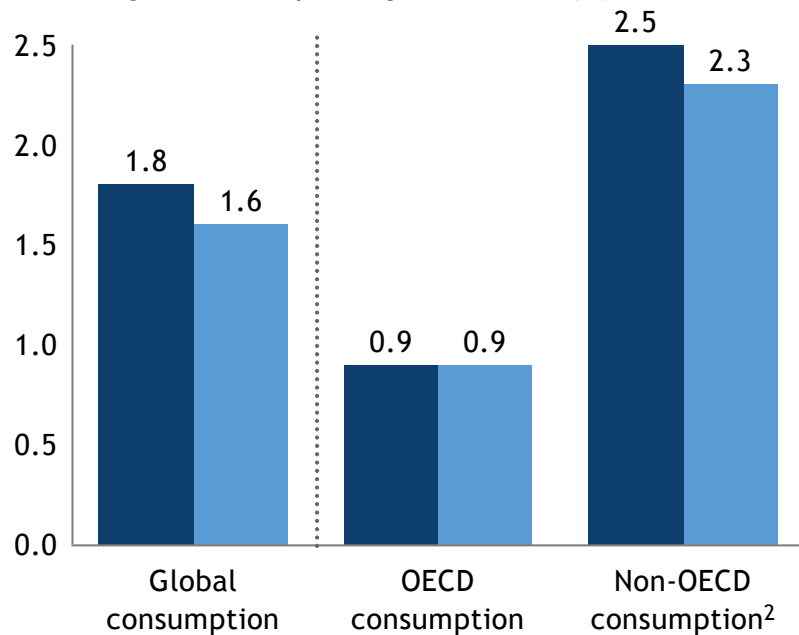
Source: IEA, BCG analysis

# Natural gas consumption growth has not yet achieved all growth expectations

Gas consumption growing slower than anticipated in the "Golden Age of Gas" ...

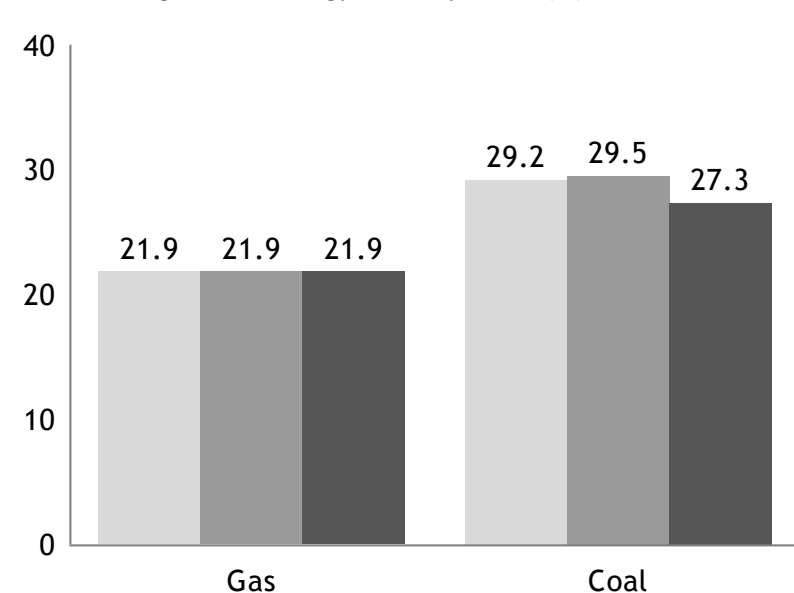
... And has not gained market share in the global energy mix

Annual gas consumption growth rate (%)



■ IEA "Golden age of gas" scenario (2012)<sup>1</sup>  
■ Actual growth rate (2010-16)

Share of global energy mix by fuel (%)



■ 2010 ■ 2014 ■ 2016

1. 2010-2035 Period. 2. IEA WEO 2017, IEA Golden Age of Gas Report, BCG analysis

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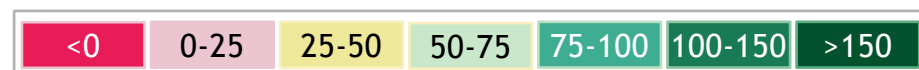
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# Substantial gas demand growth projected outside the power sector

Heat map - net additional gas consumption (2016-2040, bcm/yr)<sup>1</sup>

Regions	Power	Industry <sup>2</sup>	Buildings	Other <sup>3</sup>	Total
Non-OECD Asia-Oceania	227	240	84	68	619 (38%)
Middle East	116	77	88	38	318 (20%)
North America	20	27	13	120	180 (11%)
Africa	82	29	39	20	169 (10%)
Latin America	34	42	9	22	107 (7%)
OECD Asia-Oceania	-3	36	24	18	75 (5%)
CIS	0	19	16	26	61 (4%)
Europe	34	-4	3	6	39 (2%)
Global Bunkers	-	-	-	50	50 (3%)
<b>Total</b>	<b>510 (32%)</b>	<b>465 (29%)</b>	<b>275 (17%)</b>	<b>368 (23%)</b>	<b>1,619</b>

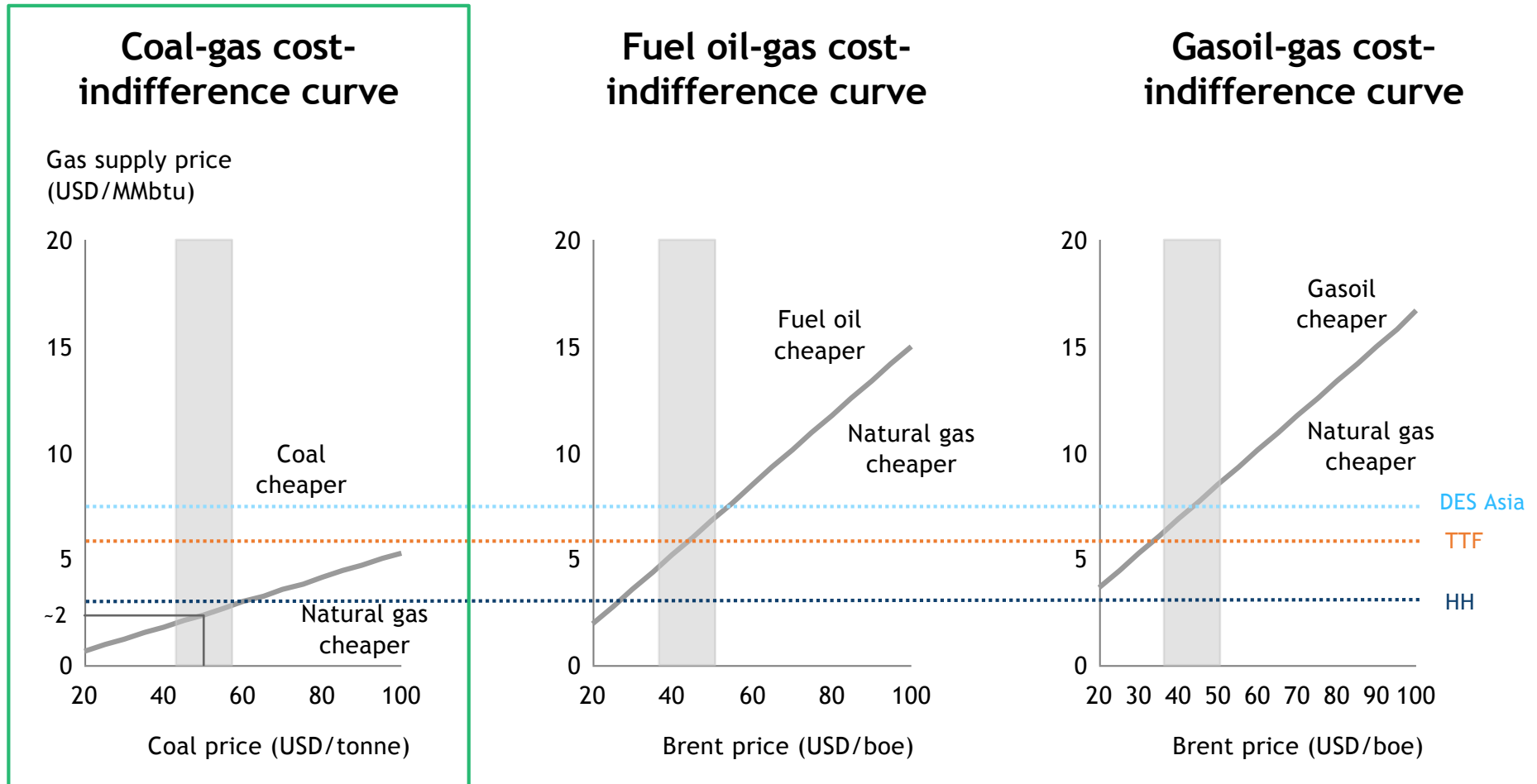


Transportation included

1. Chart represents net change in annual gas consumption between 2016 and 2040 2. Industry sector: includes fuel used within the manufacturing and construction industries. 3. Other Energy Sector: covers the use of energy by transformation industries and the energy losses in converting primary energy into a form that can be used in the final consuming sectors. It includes losses by gas works, petroleum refineries, coal and gas transformation and liquefaction. It also includes energy used in coal mines, in oil and gas extraction and in electricity and heat

Source: IEA, WEO 2017, BCG analysis

# Domestic industries: Cost of gas is a key challenge for greater adoption

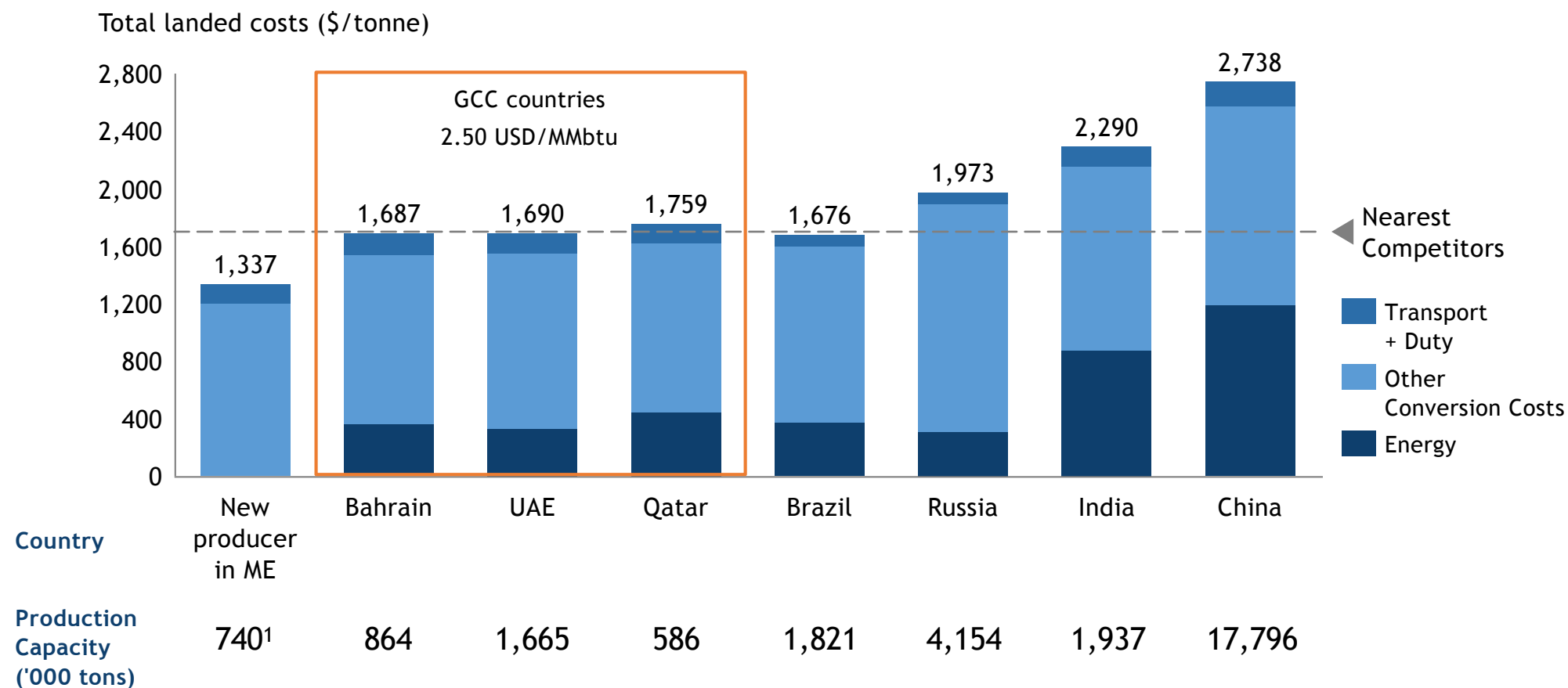


Note: Gas supply cost does not include logistics costs and taxes (supply cost only), assuming calorific value of US coal and average transportation and distribution costs (for gas) of a 'Medium Corporation' in Europe, assuming constant crack-spread vs Brent for gasoil and fuel oil; Source: IEA, EIA, BCG analysis  
 DES: Delivered Ex Ship, TTF: Title Transfer Facility Netherlands, HH: Henry Hub U.S.



# Export industries: Gas only competitive at very low costs

## Primary Aluminium—landed cost into Europe (e.g., Germany)



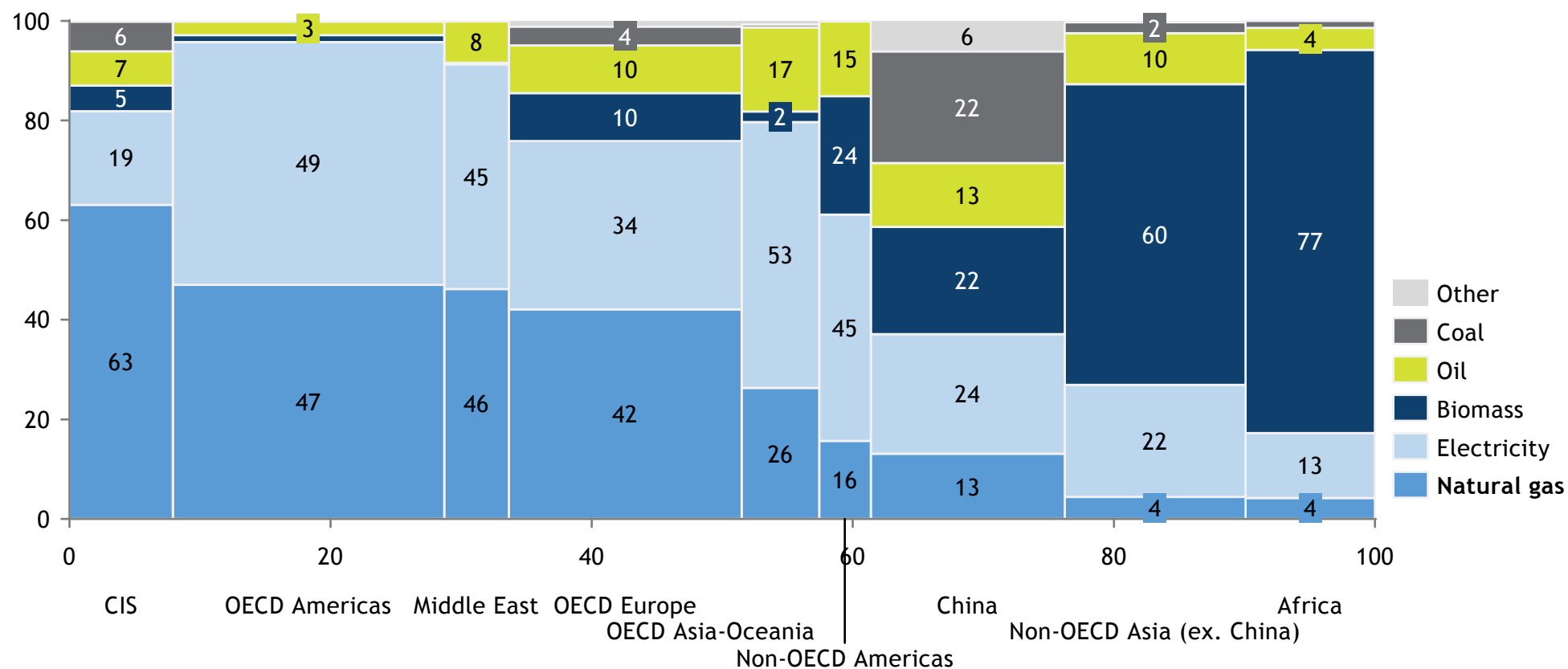
1. Production start in 2013

Note: cash cost excludes depreciation and interest. Average LME price for Primary Aluminum \$2,100/t

Source: Harbor Aluminum Industry Analysis and Outlook; BCG analysis

# Buildings sector: Gas penetration greatest in regions with longstanding access to gas infrastructure

2015 est. share of urban buildings energy consumption by source (%)

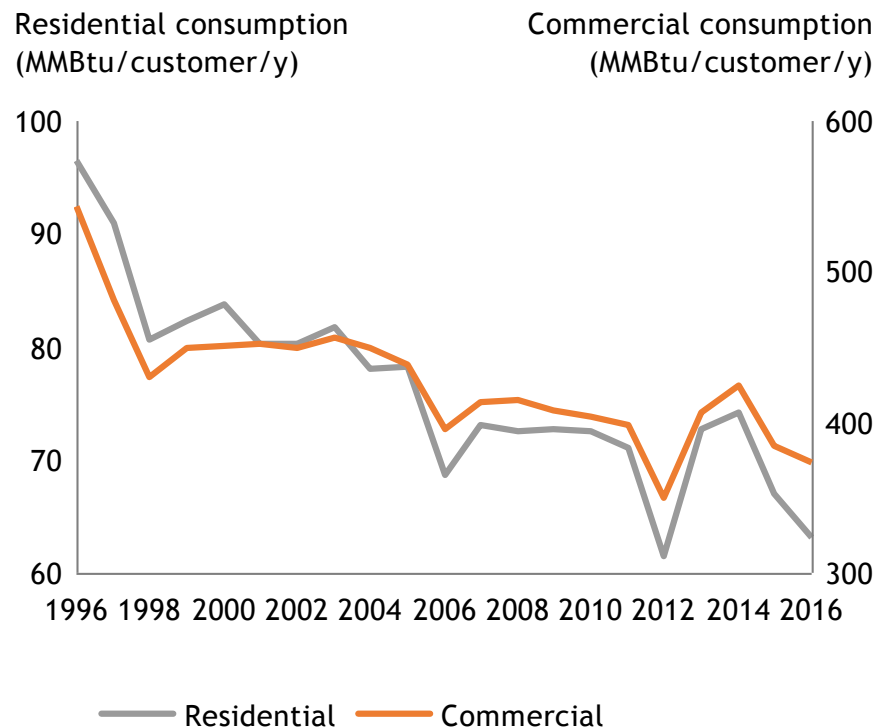


2015 est. share of total urban buildings energy consumption by region (%)

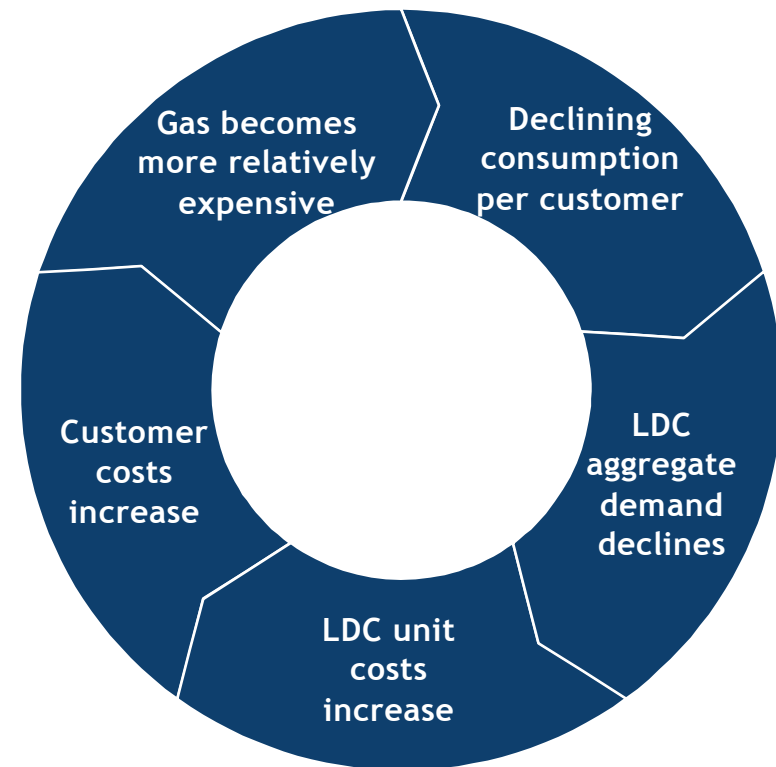
Note: Only includes urban share of buildings sector; estimated for cities based on share of urbanization and urban share of energy use by region  
Source: IEA, BCG analysis

# In developed markets, improving end user efficiency creating challenges for gas utilities

Gas consumption per customer is declining (US example)...







... Creating a negative feedback loop for gas cost competitiveness



LDC: Local Distribution Company (Utility)

# Transport sector: Adoption of CNG varies significantly by country depending on fuel substitution economics

Country	CNG vehicle price premium vs. gasoline	Natural gas-gasoline fuel spread	CNG vehicle share of total vehicle parc	Payback period for compact car
<b>Argentina</b> 	\$1,500	~3.8 USD/gge	~24%	~1 year
<b>Brazil</b> 	\$1,500	~2.1 USD/gge	~5%	~1.5 years
<b>Italy</b> 	\$3,000	~5.9 USD/gge	~2%	~1 year
<b>USA</b> 	\$8,000+	~1.4 USD/gge	0.05%	~13 years

Note: Payback period analysis based on CNG purchase price premium and annual fuel expense only. Data are to be intended as indicative due to the fragmented nature of data sources.

gge: gasoline gallon equivalent

Source: International Energy Agency, NGVA Europe, NGV Communications Group, external research, BCG analysis

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Recent trends in gas demand

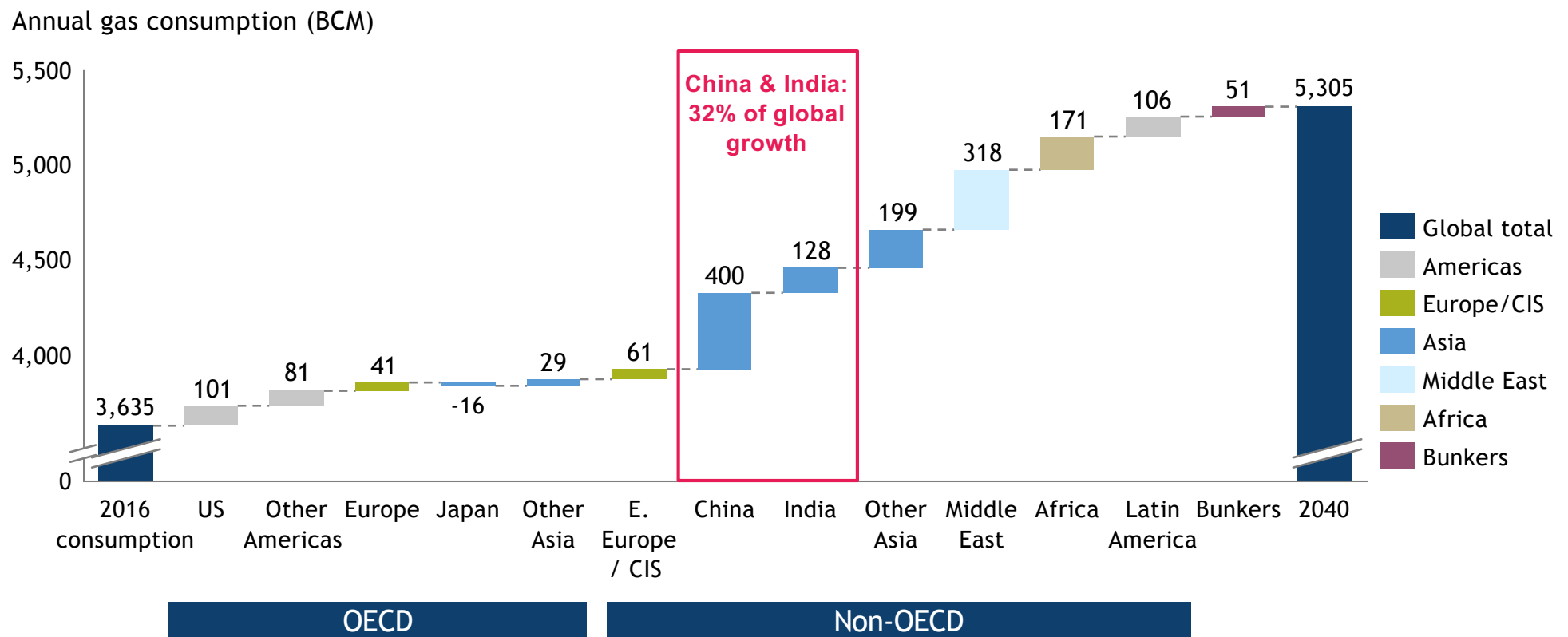
Opportunities outside of power generation

**Country examples - India and China**

Questions for discussion

# China and India will be the critical drivers of global gas consumption growth

## Projected gas consumption growth to 2040



Source: IEA 2017 New Policy Scenario, BCG analysis



# China: Multiple policy measures driving rapid growth of gas across sectors

## Multiple government policies supporting gas

### Coal boiler conversions to gas

- Target conversation of 200k coal boiler units to natural gas to meet local pollution targets

### New residential connections

- Target to increase penetration from 35% to 85%, adding >120m new connections

### Incentives for CNG/LNG for transport

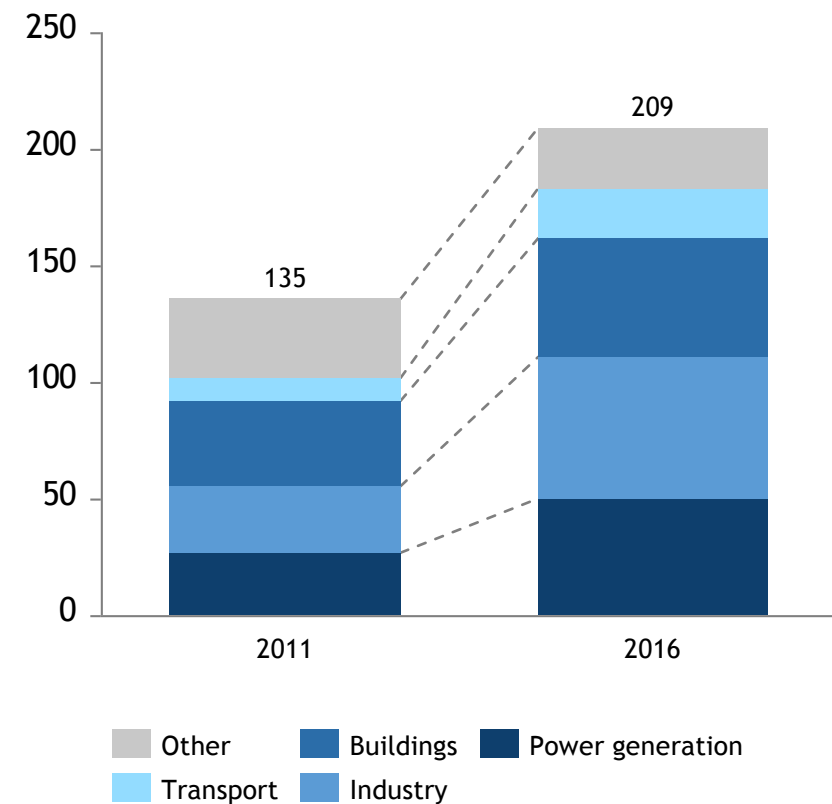
- Discounts provided on prices in gas price formula
- Gas consumption of cars targeted to more than double from 2014 to 2020

### 5 year plan target gas capacity

- Targeting 44GW of new gas-fired capacity ...
- ... Though also targeting 200GW of new coal capacity

## Consumption growth across sectors

China consumption (BCM)





# Coal to gas boiler switching in the north drove strong demand growth in 2017

Clean air policies focused on coal to gas switching in industry & buildings...

2017 was the target compliance year for Chinese PM2.5 emissions targets

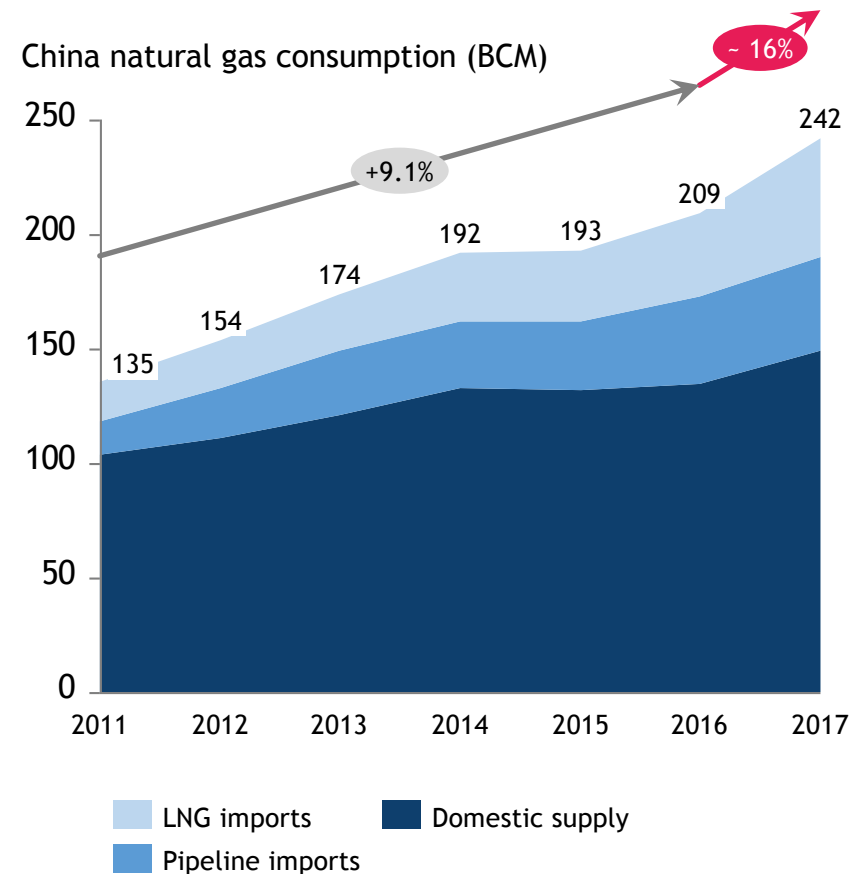
Northern cities critical to meeting targets

- "2+26 policy" launched in 2017 targeting Beijing, Tianjin, and 26 other Northern cities
- Aim to reduce PM2.5 emissions by 15% to meet 2017 targets

Focus on switching coal boiler use and rationalizing inefficient industries

- Direct mandates to switch fuel use enforced on a local level
- Industry capacity cut among less efficient plants (e.g. steel, aluminum)

... Resulted in dramatic gas consumption growth



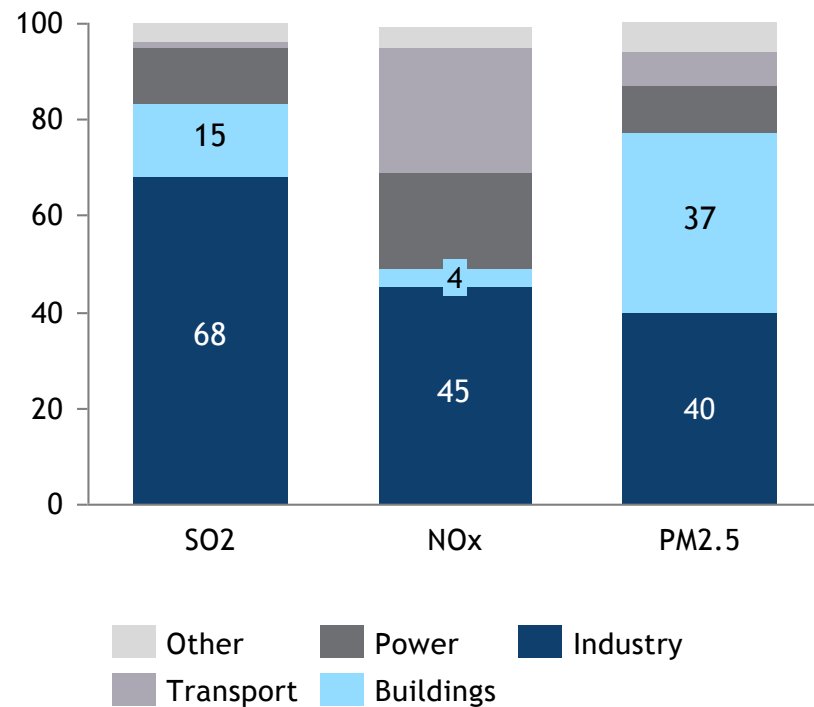




# Continued potential for high gas demand growth in industry & buildings sectors

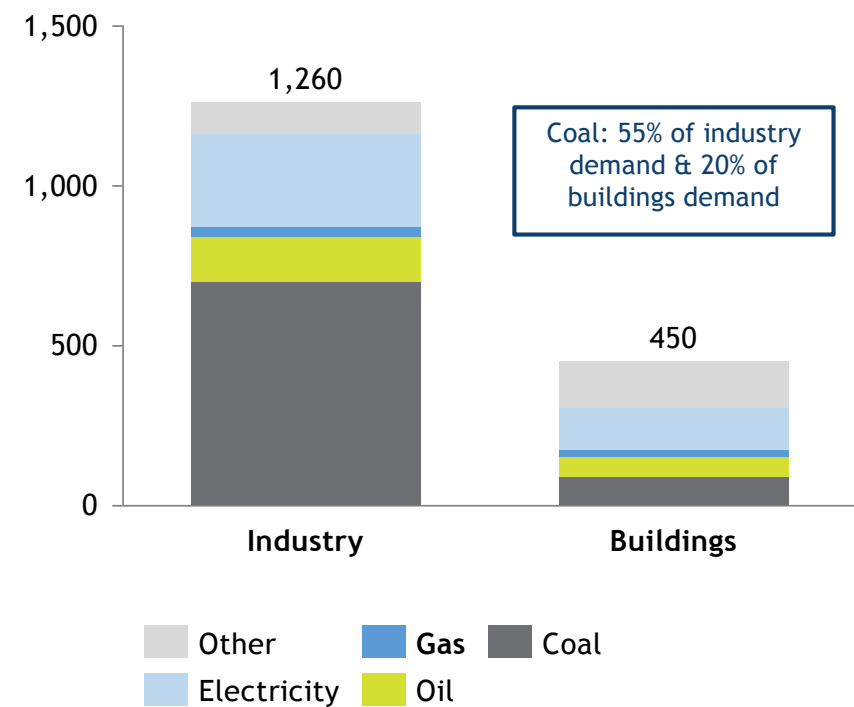
Industry & buildings are key drivers of localized pollution in China...

Emissions by sector in 2015 (%)



... Driven by a high share of coal consumption

Energy demand by sector in 2015 (Mtoe)

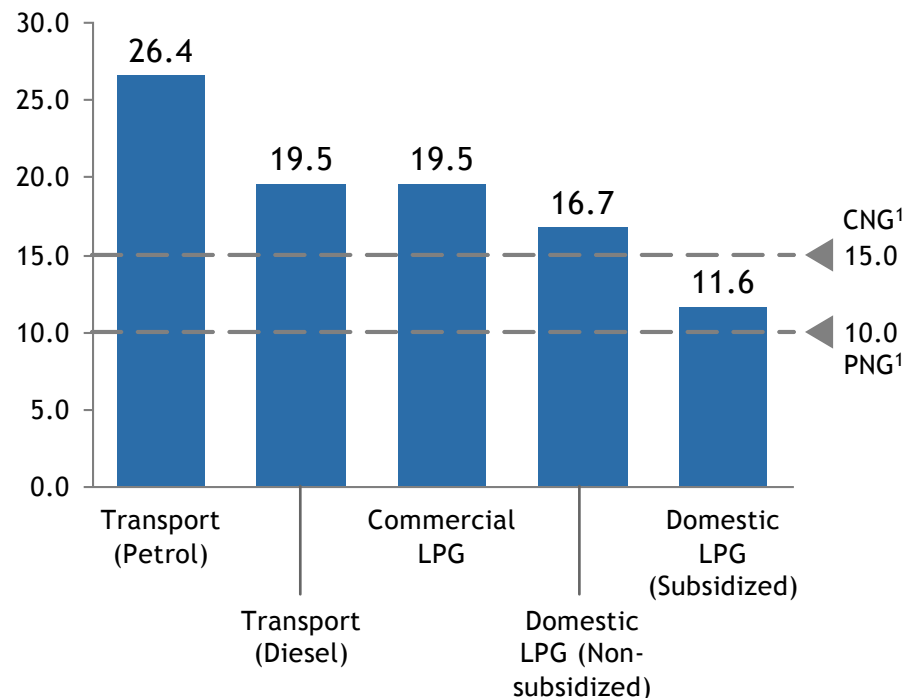


Source: IEA, BCG analysis

# India: Regulated pricing structure provides incentives for city gas adoption...

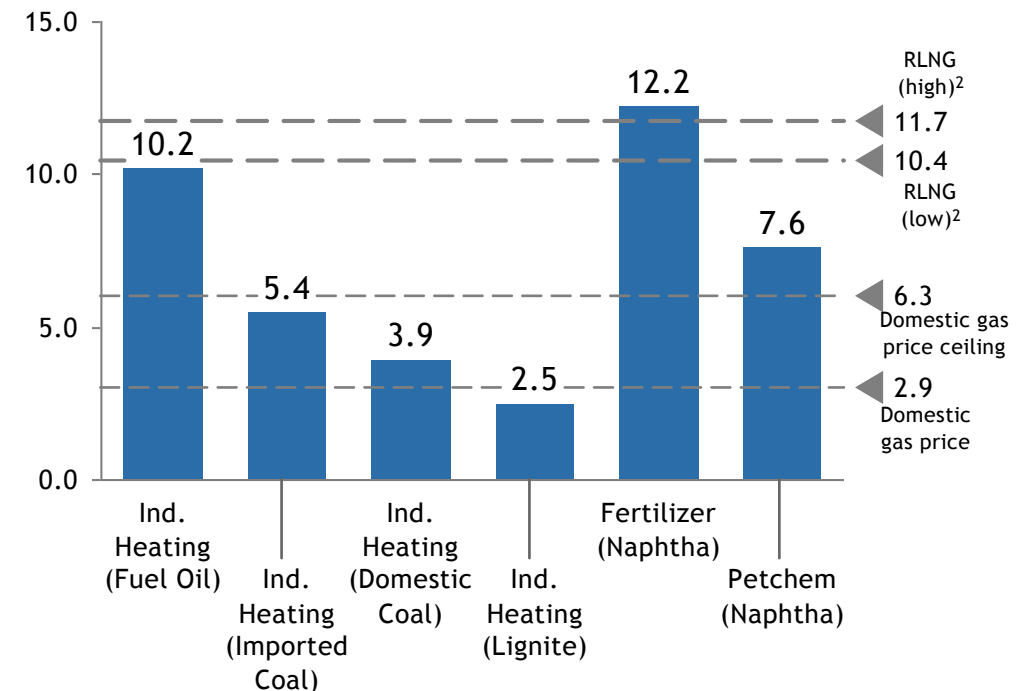
## CNG and PNG attractive than alternate fuels

Maximum gas price for substitution (\$ / MMBTU)<sup>3</sup>



## Domestic gas competitive to all industrial fuels

Maximum gas price for substitution (\$ / MMBTU)<sup>3</sup>

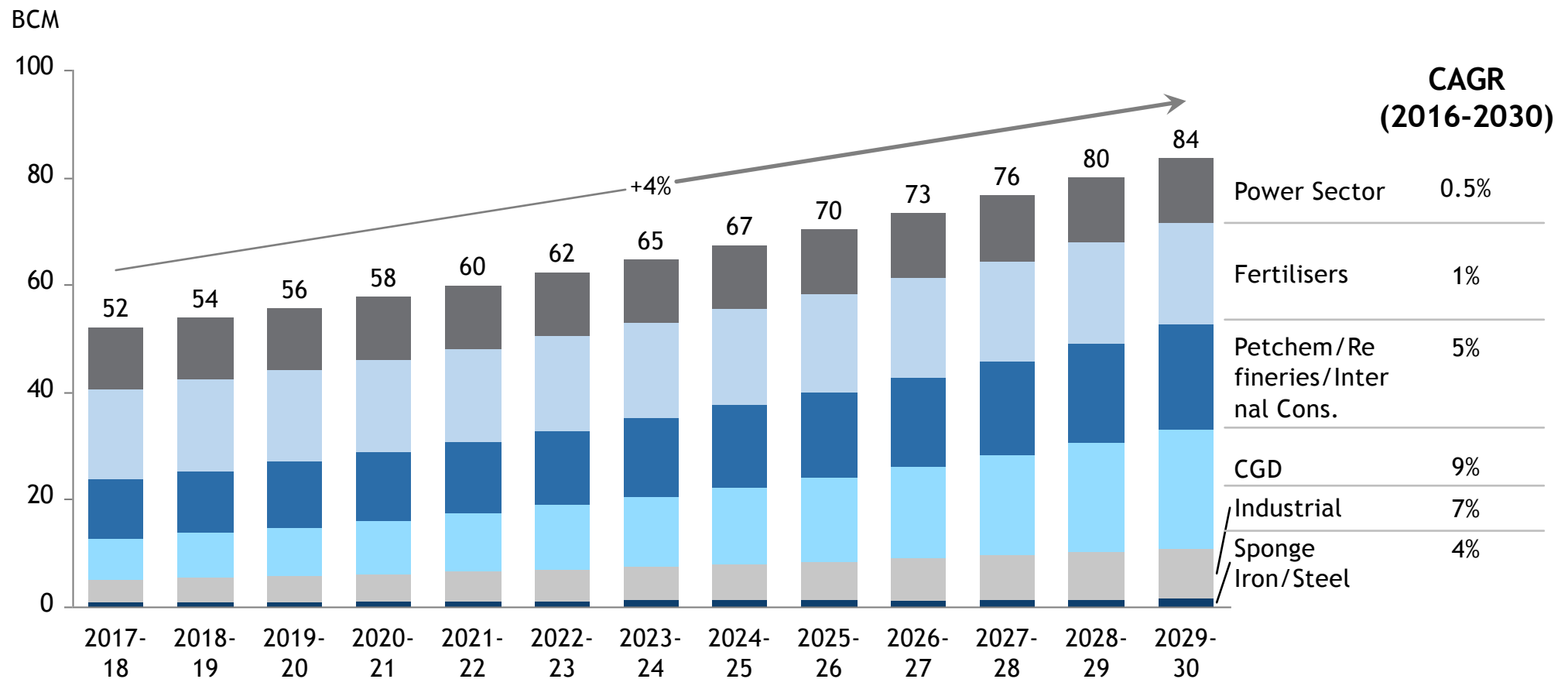


1. CNG and PNG prices based on average end customer prices from analyst reports. Domestic gas price based on \$2.89/MMBTU MoPNG mandate + ~\$1.5 taxes and transmission charges. 2. RLNG (low) price based on \$10.2 / MMBTU total price (including tariffs and margin) + 2% CST. RLNG (high) price based on \$10.2 / MMBTU total price + 15% Gujarat VAT on interstate sales. 3. Maximum gas price for substitution (\$/ MMBTU) calculated as break-even point for gas usage with respect to the alternate fuel currently used, actual propensity may be lower.

Source: MoPNG, Bloomberg

... As a result, city gas sector projected to be a key demand growth driver

India gas consumption forecast by sector



Source: Ministry of Petroleum and Natural Gas, BCG analysis

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# Questions for discussion

- 1 Opportunities for greater gas demand growth in industry, buildings, and transport sectors
  - What sectors provide the greatest opportunity for gas demand growth?
  - What will it take to accelerate gas demand growth in Asia?
  - How can industry make the case for gas in non-power sectors?
- 2 Key barriers to adoption of gas outside the power sector
  - How can gas become more cost competitive?
  - How can governments and industry facilitate gas infrastructure investment outside of power?
  - What is needed to convince businesses and consumers to switch to gas?
- 3 Lessons learned from examples of fuel switching
  - What are effective means of advocating gas to governments and the public, outside the power sector?
  - Can the experience of Chinese coal boiler switching be replicated elsewhere?
  - What should the role of regulated prices and/or government incentives (standards, fiscal measures) be for facilitating fuel switching?