

China, LNG, and the Alaska Gas Pipeline

**Presentation to Alaska Legislature
February 22, 2018**

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Global Fellow, Woodrow Wilson Int'l Center for Scholars
Director, Canada-China Energy & Environment Forum**

China, LNG, and the Alaska Gas Pipeline

Self Introduction:

- **Tenured political economy professor at Univ. of Alberta**
- **Tracking Chinese global energy & resource investments**
- **Organizer of Canada-China annual energy conference since 2004**
- **The Energy Council Special Advisor on China since 2005**
- **Seconded to Alberta Dept. of Energy 2012-2014**
- **Named as one of the 50 most influential people in Alberta in 2014**
- **Advisor to government, private sector on China/Asia projects**
- **Regular media interviews (BNN, CBC, CNN) & op-eds**
- **Facilitated/advised on large energy M&A negotiations**
- **Mission advisor to Natural Resources Canada Minister's China visit**
- **Currently focusing on China related policy/consulting projects**



Meeting with Canadian PM Justin Trudeau, Shanghai 2016



With Canadian former PM Stephen Harper & Deputy Minister of China National Energy Administration Nov. 2017



China, LNG, and the Alaska Gas Pipeline

Overview:

- I. China & its Demand for LNG**
- II. Alaska and LNG Supply**
- III. The AGDC-Sinopec MOU**
- IV. Conclusion**

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China, LNG, and the Alaska Gas Pipeline

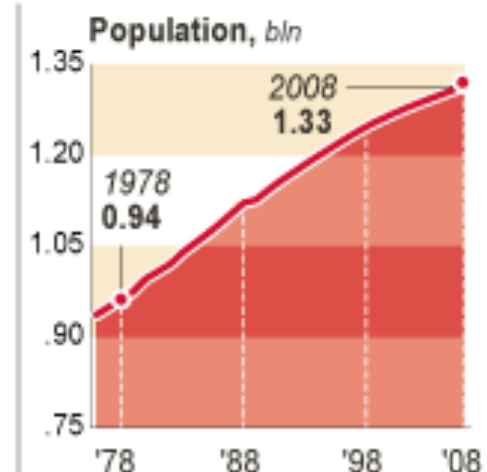
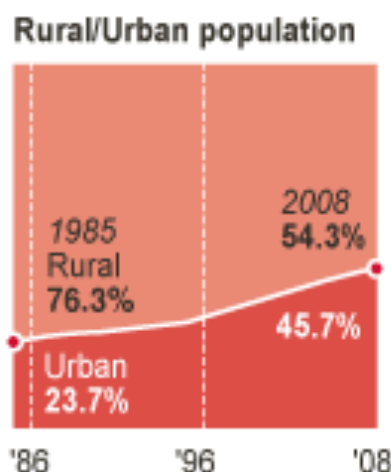
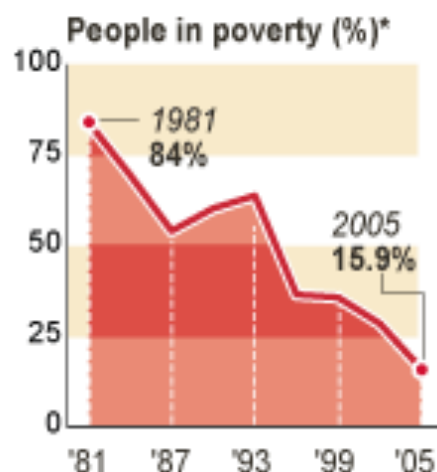
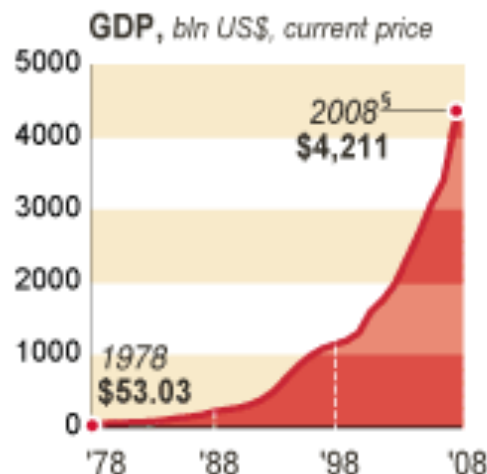
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China's growth



Area:
9.6 mln sq km
Population:
1.33 billion



* World Bank now defines as living on less than US\$1.25 per day

03/04/09

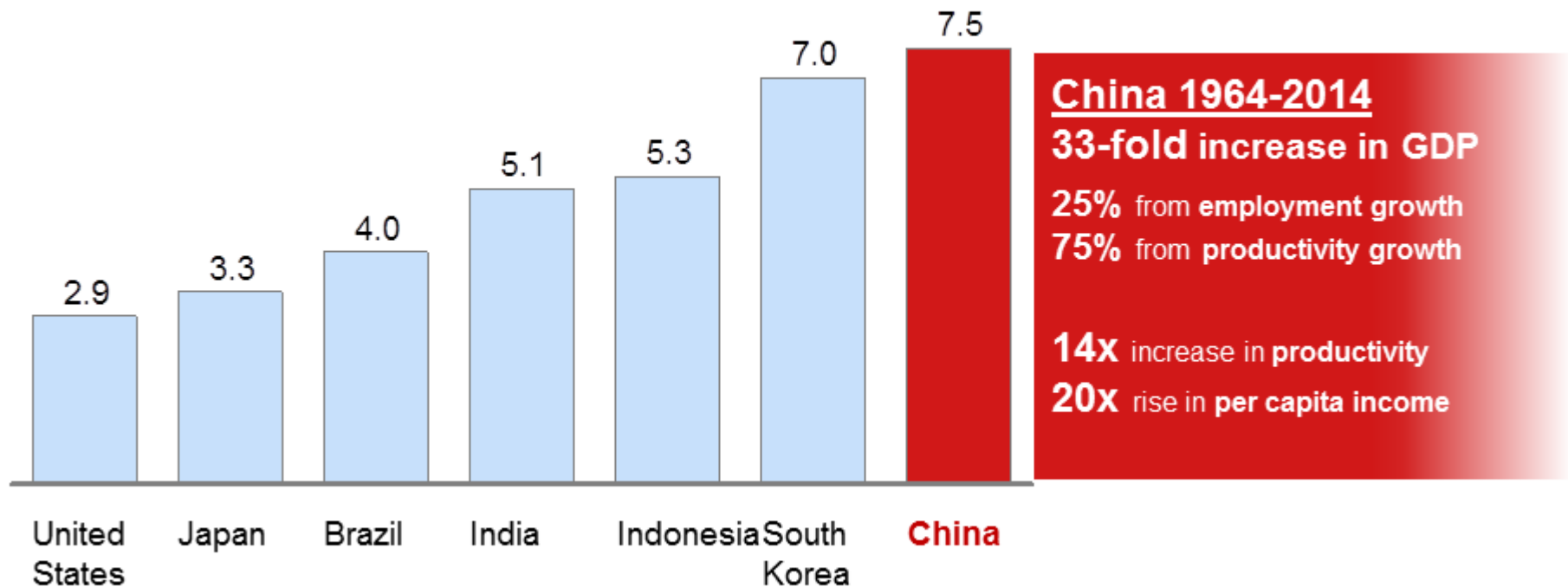
Source: National Bureau of Statistics, State Administration of Foreign Exchange, People's Republic of China, World Bank

† GDP figures from World Development Indicators database and CIA World Factbook, § 2007/08 estimates based on Deutsche Bank

What's next after 50 years of remarkable growth in China?

GDP Growth

Compounded annual growth rate 1964-2014, percent



SOURCE: The Total Economy database of the Conference Board; UN Population Division statistics; World Bank; International Labour Organisation; McKinsey Global Institute analysis

McKinsey & Company

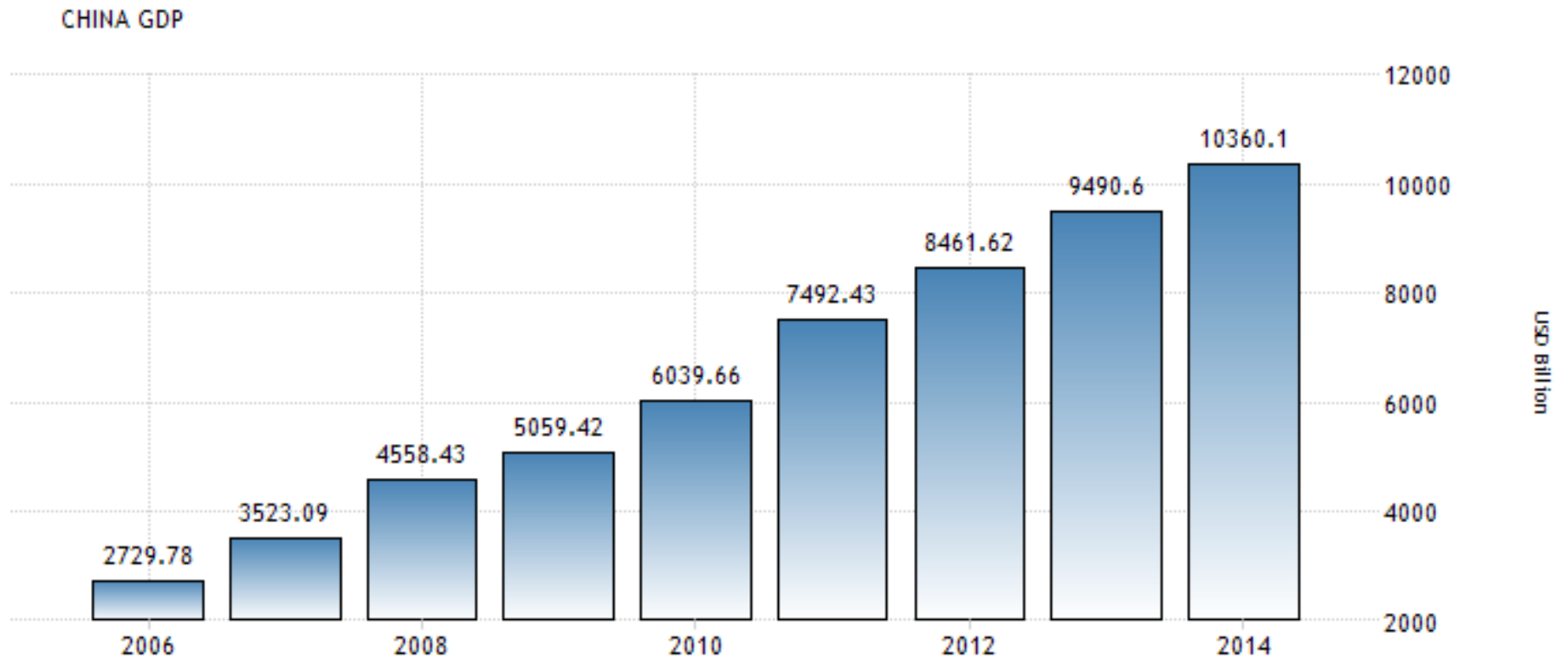
China's GDP Grow was 6.9% in 2015: Slowest in 25 Years

CHINA GDP ANNUAL GROWTH RATE



SOURCE: WWW.TRADINGECONOMICS.COM | NATIONAL BUREAU OF STATISTICS OF CHINA

But China's Total GDP Value Keeps Getting Bigger



SOURCE: WWW.TRADINGECONOMICS.COM | WORLD BANK GROUP

Top three countries by economic dominance

% share* of global economic power

1870



1973



2010



2030
Forecast



Source: Arvind Subramanian

*Weighted by share of world GDP, trade and net capital exports

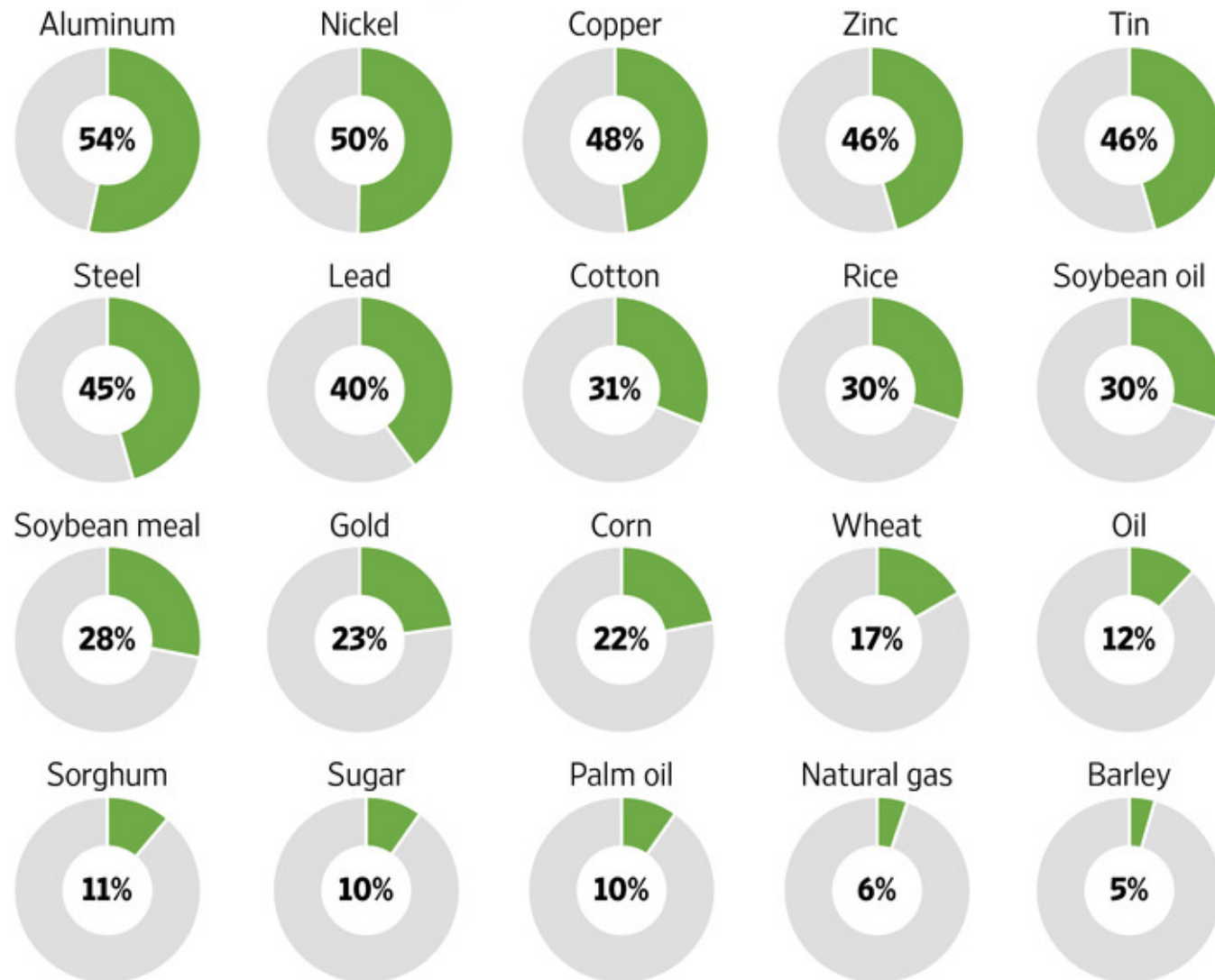
Modernization paradigm on steroids

- 1. Heavy dependence on high capital & labor inputs with low wages, focused on heavy & manufacturing industries**
- 2. Deepening integration with the world economy**
- 3. Huge demand for energy and resources**
- 4. Severe damage to the environment & major contribution to global warming**
- 5. Decisively state interventionist – Marx or Keynes**

Giant Appetite

The main customer for a range of commodities is China, which will continue to wield enormous influence even as slowing economic growth cuts into its demand.

China's share of world consumption

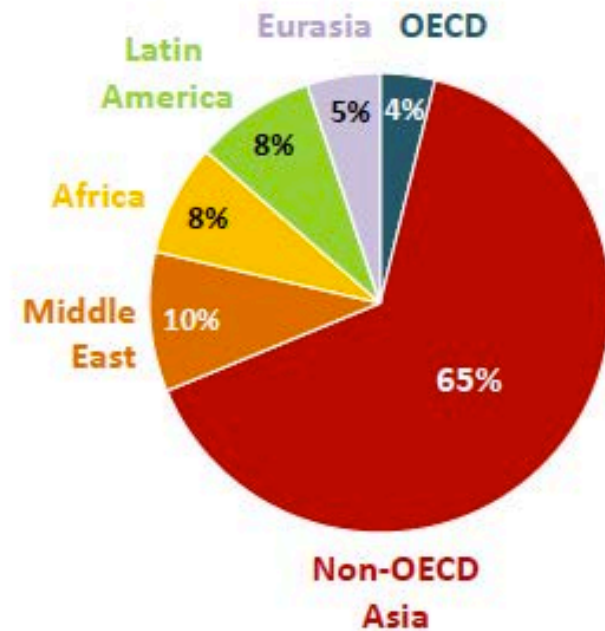


Sources: World Bureau of Metal Statistics (first six months of 2015 for refined metals, slab zinc); World Gold Council (2014 for gold); BP Statistical Review of World Energy 2015 (2014 for oil, natural gas); Metalalytics via Morgan Stanley (2015 estimate for finished steel); U.S. Department of Agriculture (2013-14 season for others)

Primary energy demand, 2035 (Mtoe)

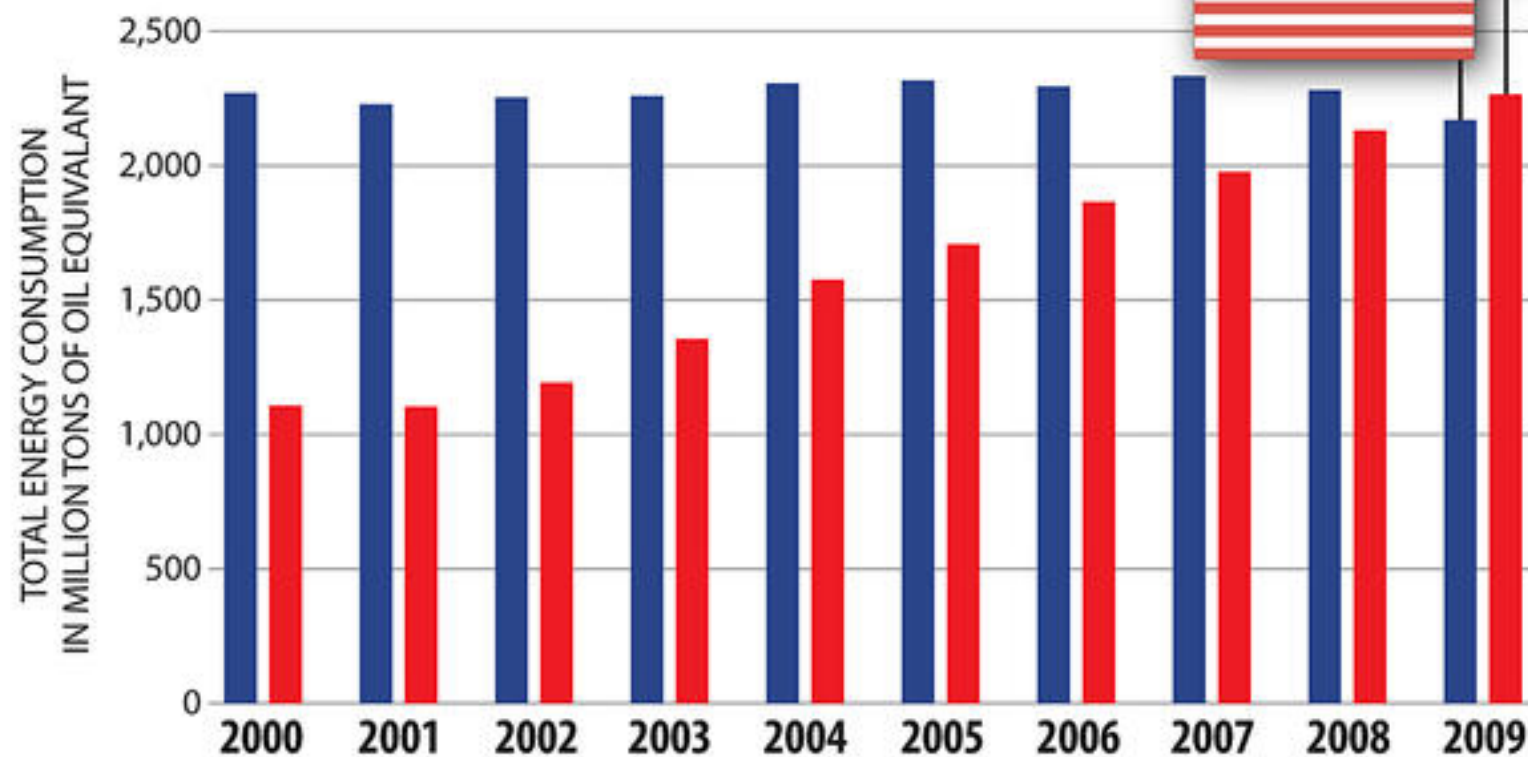


Share of global growth 2012-2035



China is the main driver of increasing energy demand in the current decade, but India takes over in the 2020s as the principal source of growth

China surpasses the United States as the world's top energy consumer

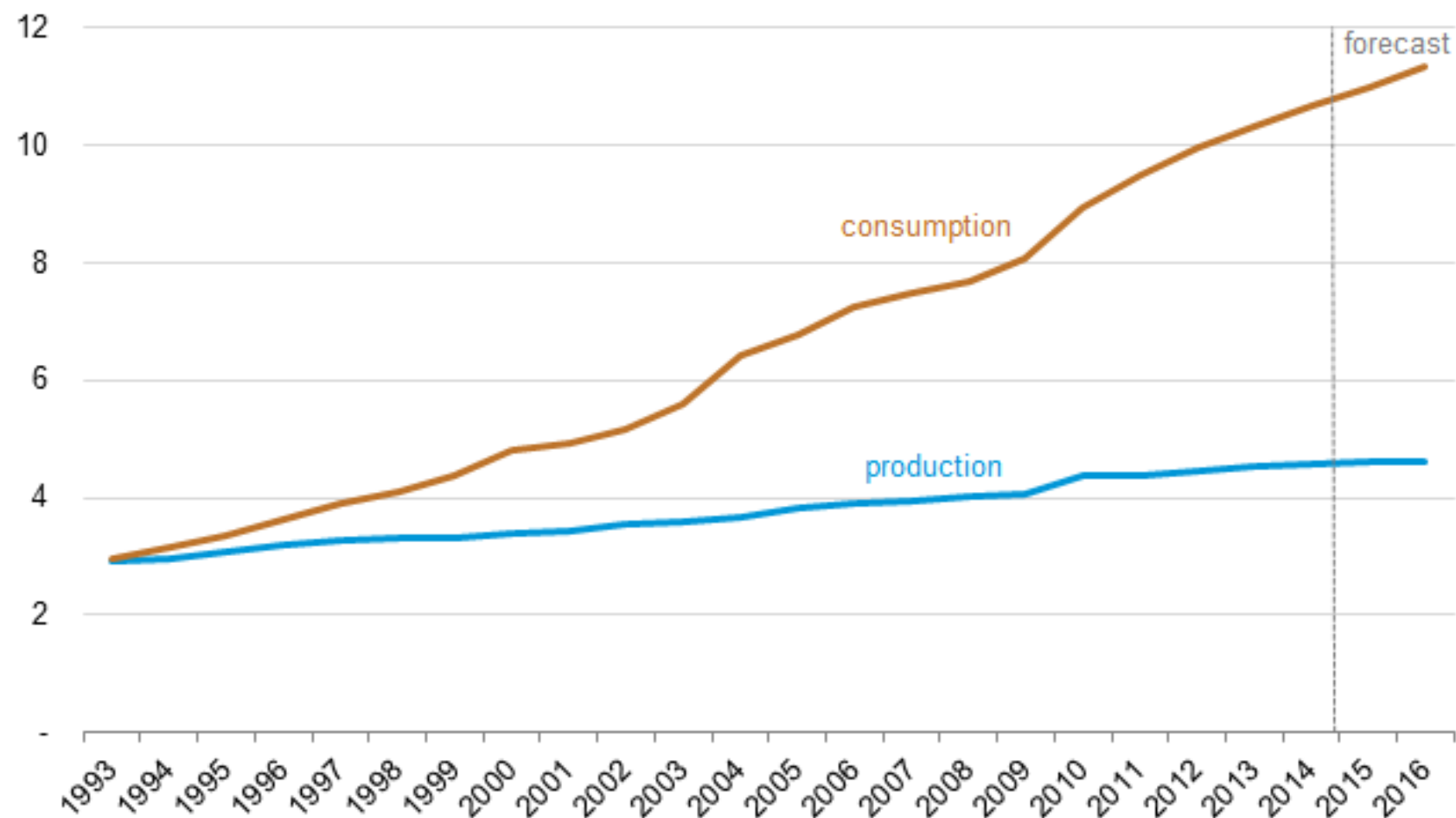


SOURCE: International Energy Agency

RICH CLABAUGH/STAFF

China's oil production and consumption, 1993-2016

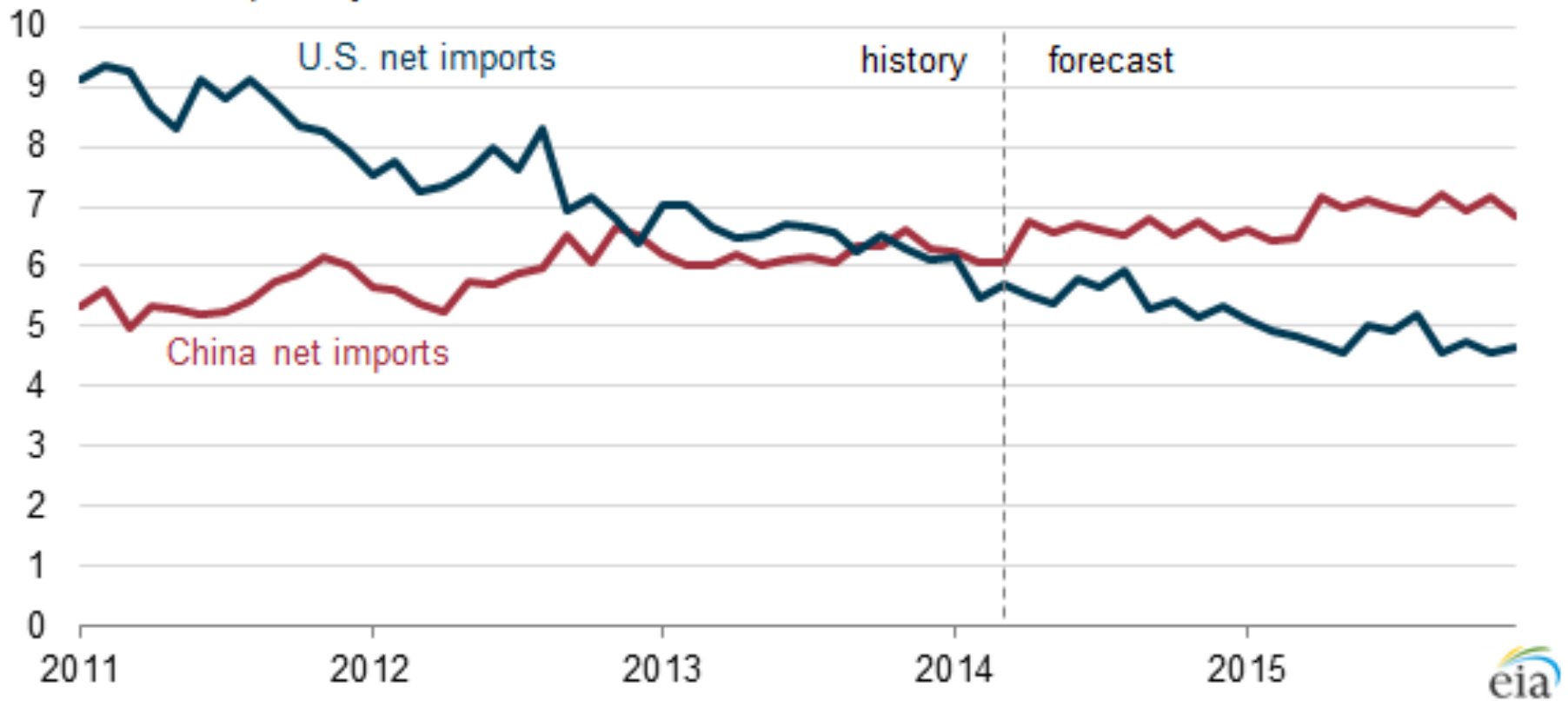
million barrels per day



Source: Energy Information Administration and *Short-Term Energy Outlook*, May 2015

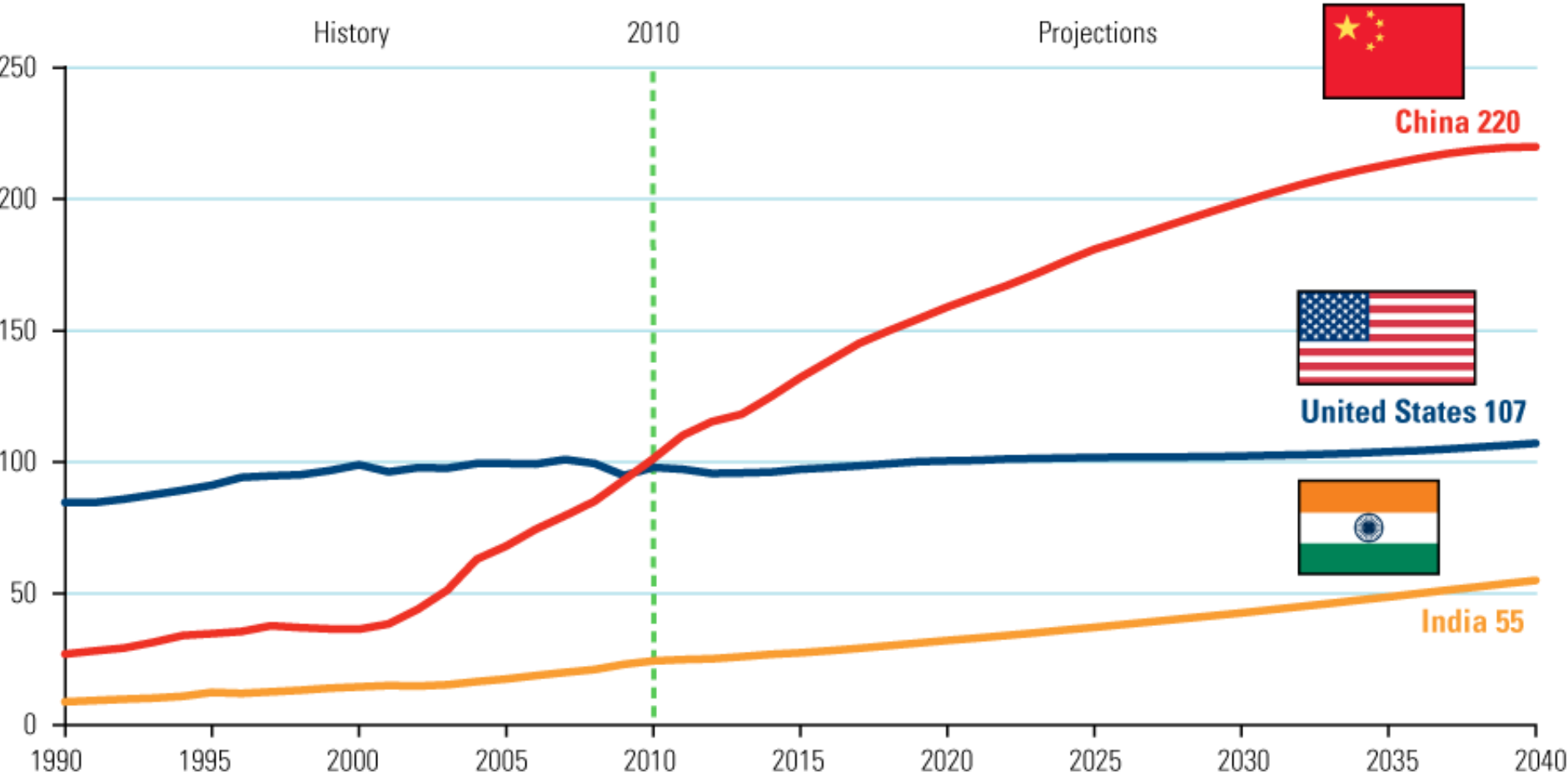
China is now the world's largest net importer of petroleum & other liquid fuels

Comparison of net petroleum and other liquids imports for China and the United States
million barrels per day



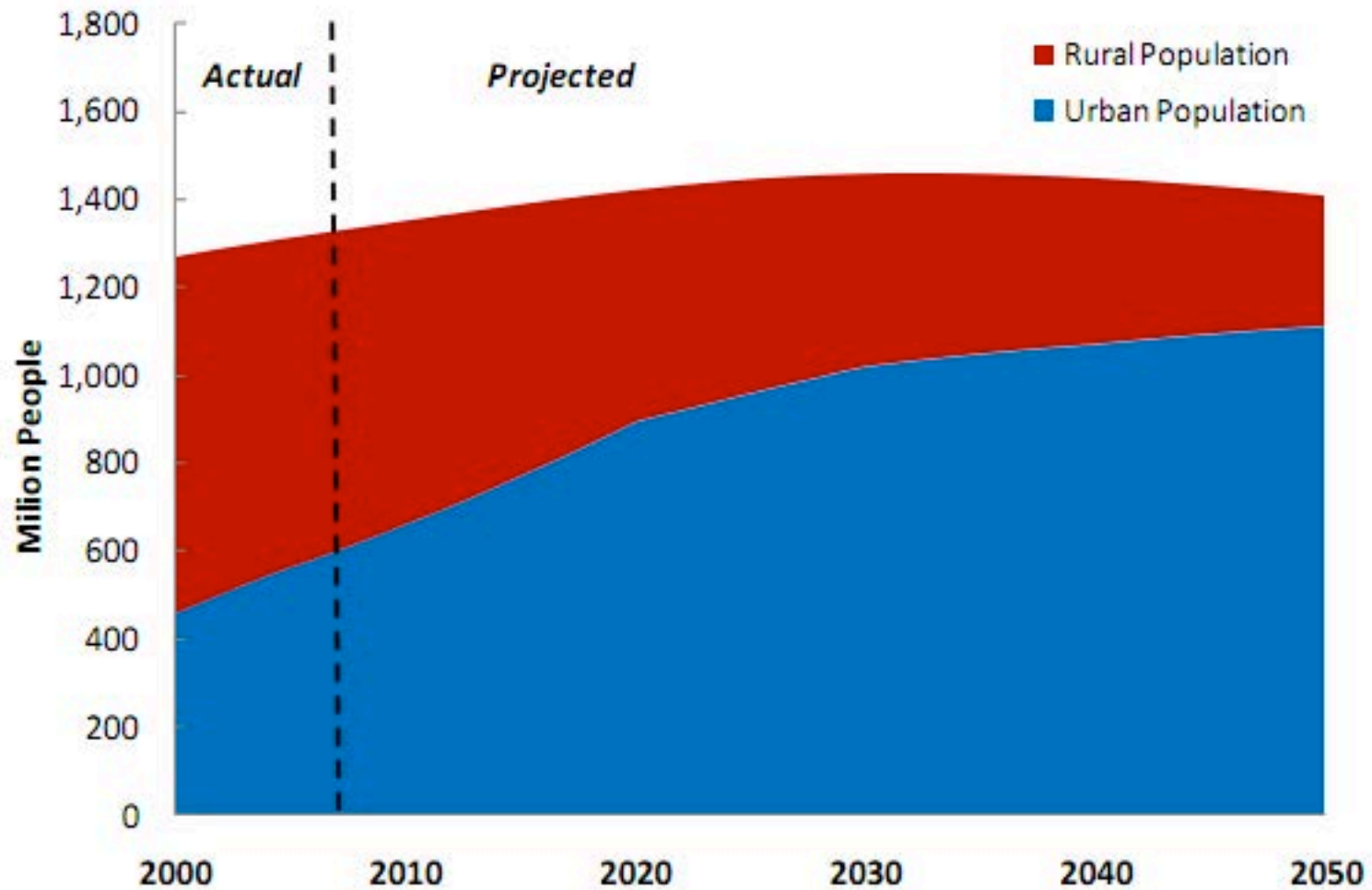
China's Energy Use Could Double U.S. Level by 2040

Energy Consumption in Quadrillion British Thermal Units



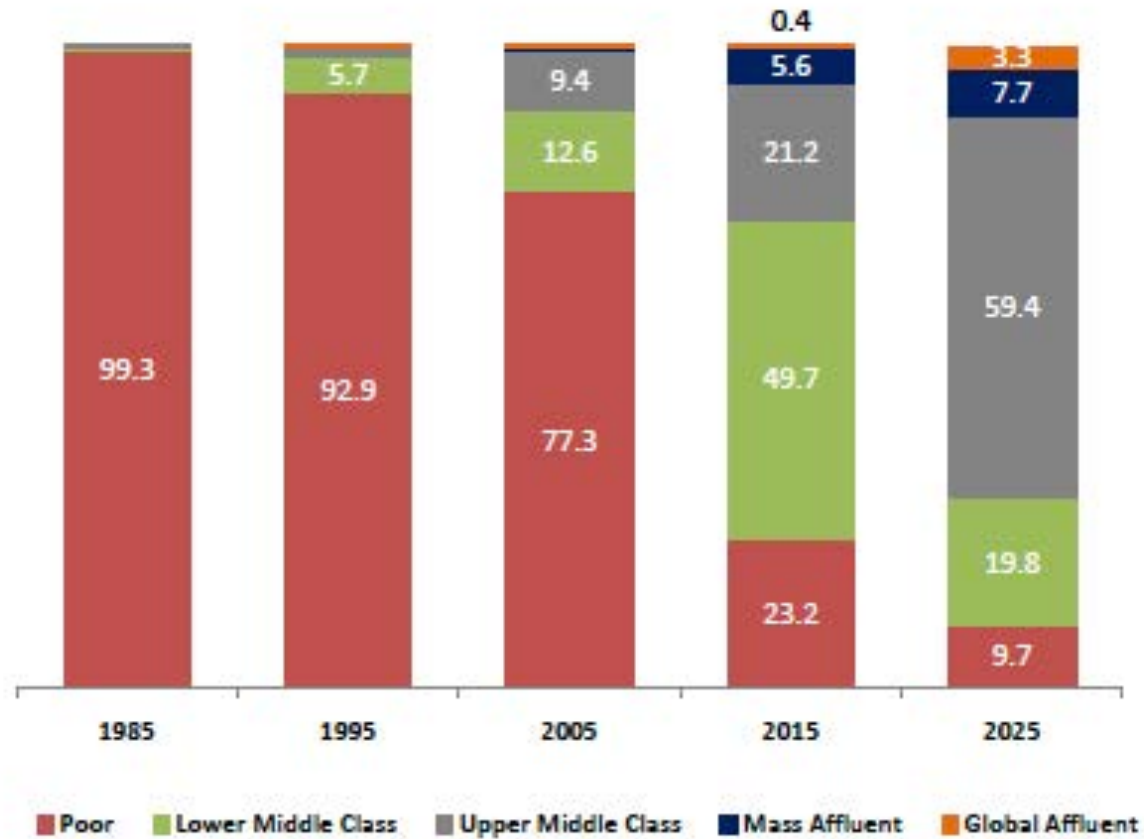
Source: Energy Information Administration, International Energy Outlook 2013

Historical & Projected Population & Urbanization Trends in China



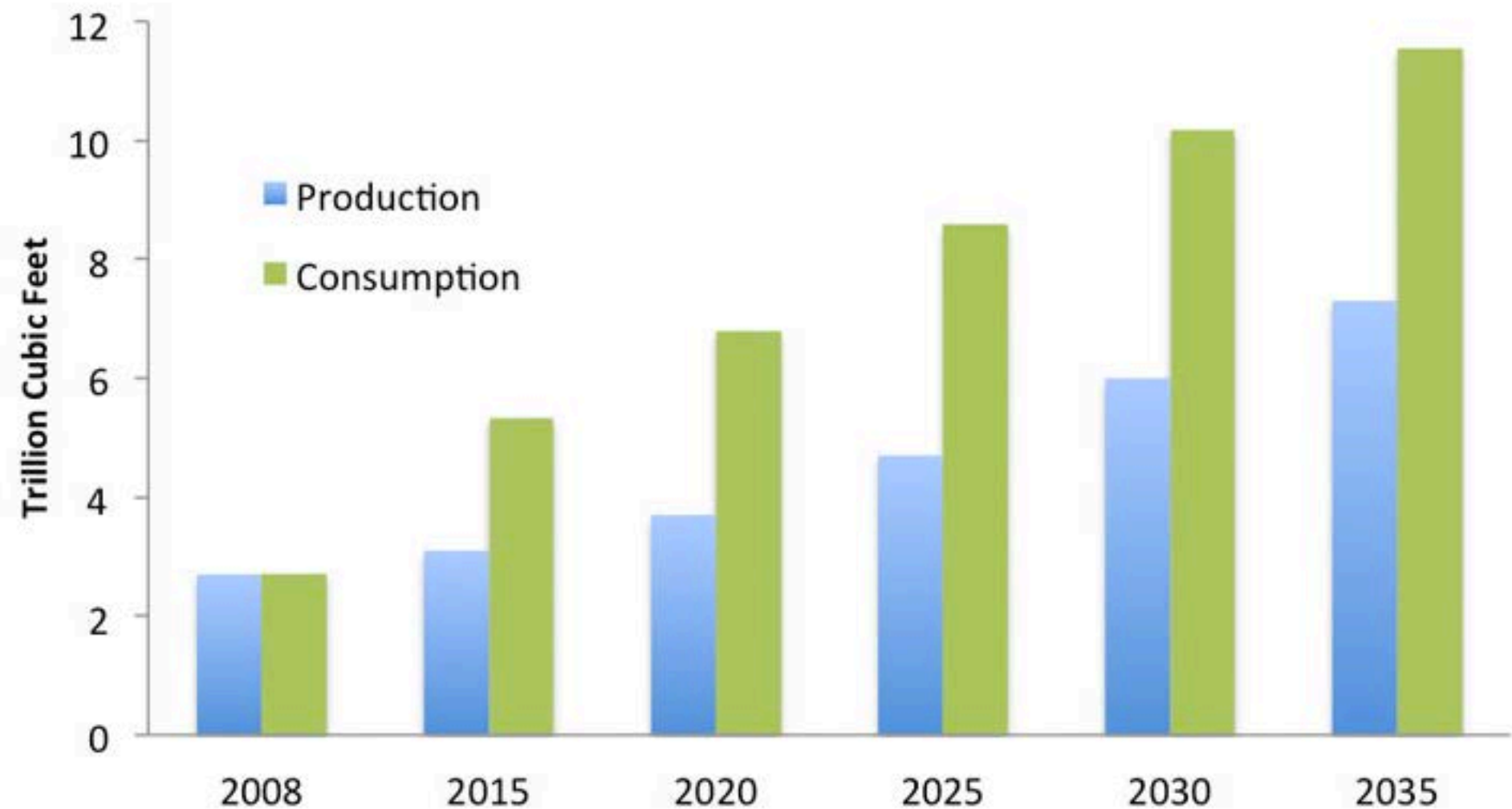
Source: Lawrence Berkeley National Laboratory

Urbanization and China's emerging middle class



Source: McKinsey & Co.

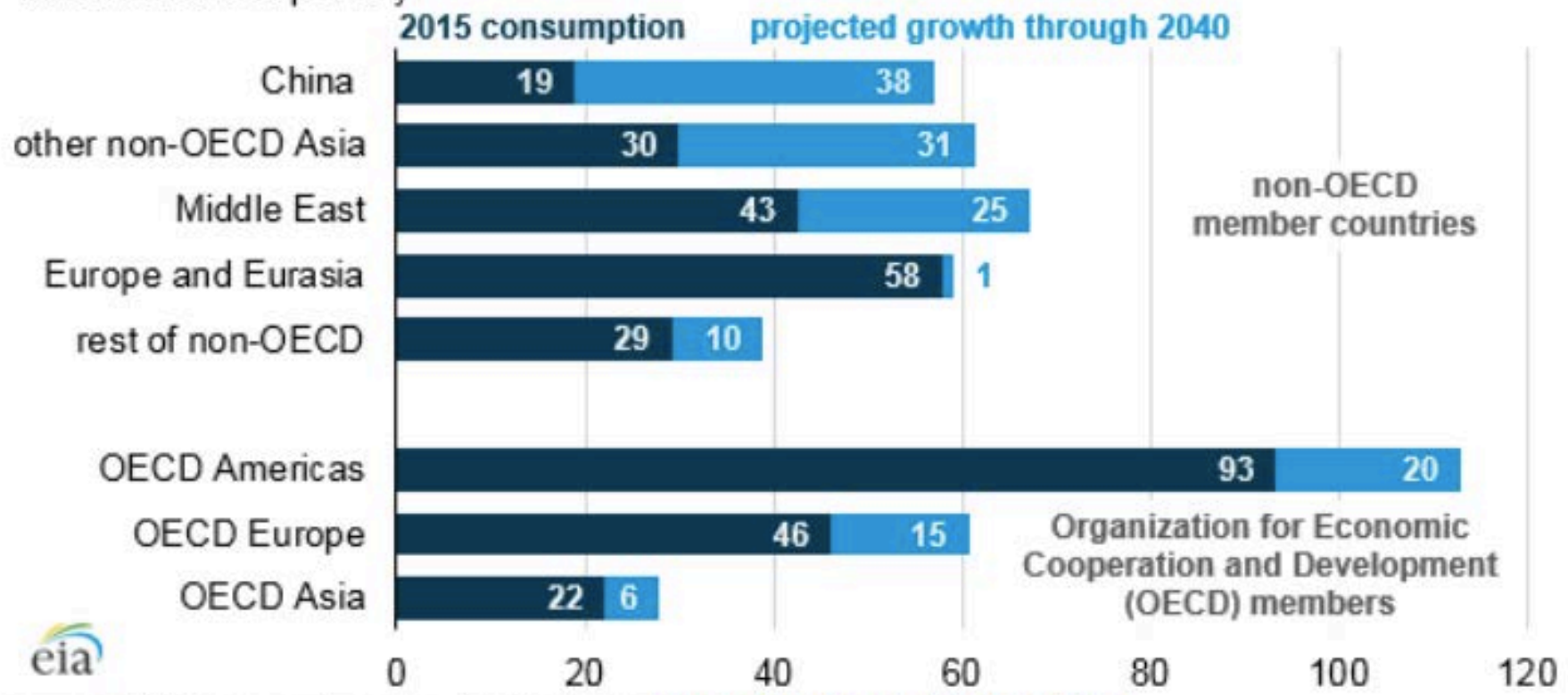
China Natural Gas Production and Consumption



Source: U.S. EIA- International Energy Outlook 2011

China leads the growth in projected global natural gas consumption

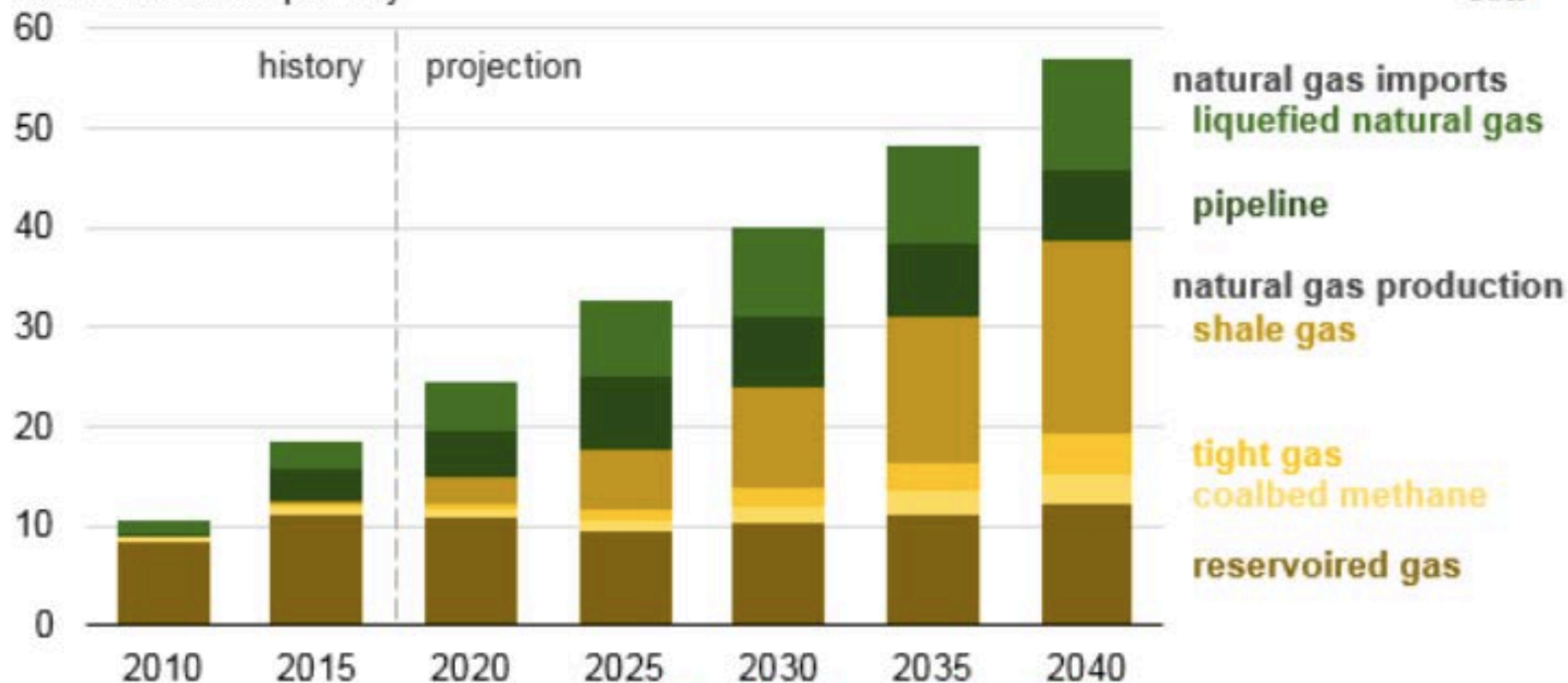
Natural gas consumption in selected regions, IEO2017 Reference case (2015-40)
billion cubic feet per day



Source: U.S. Energy Information Administration, [International Energy Outlook 2017](#)

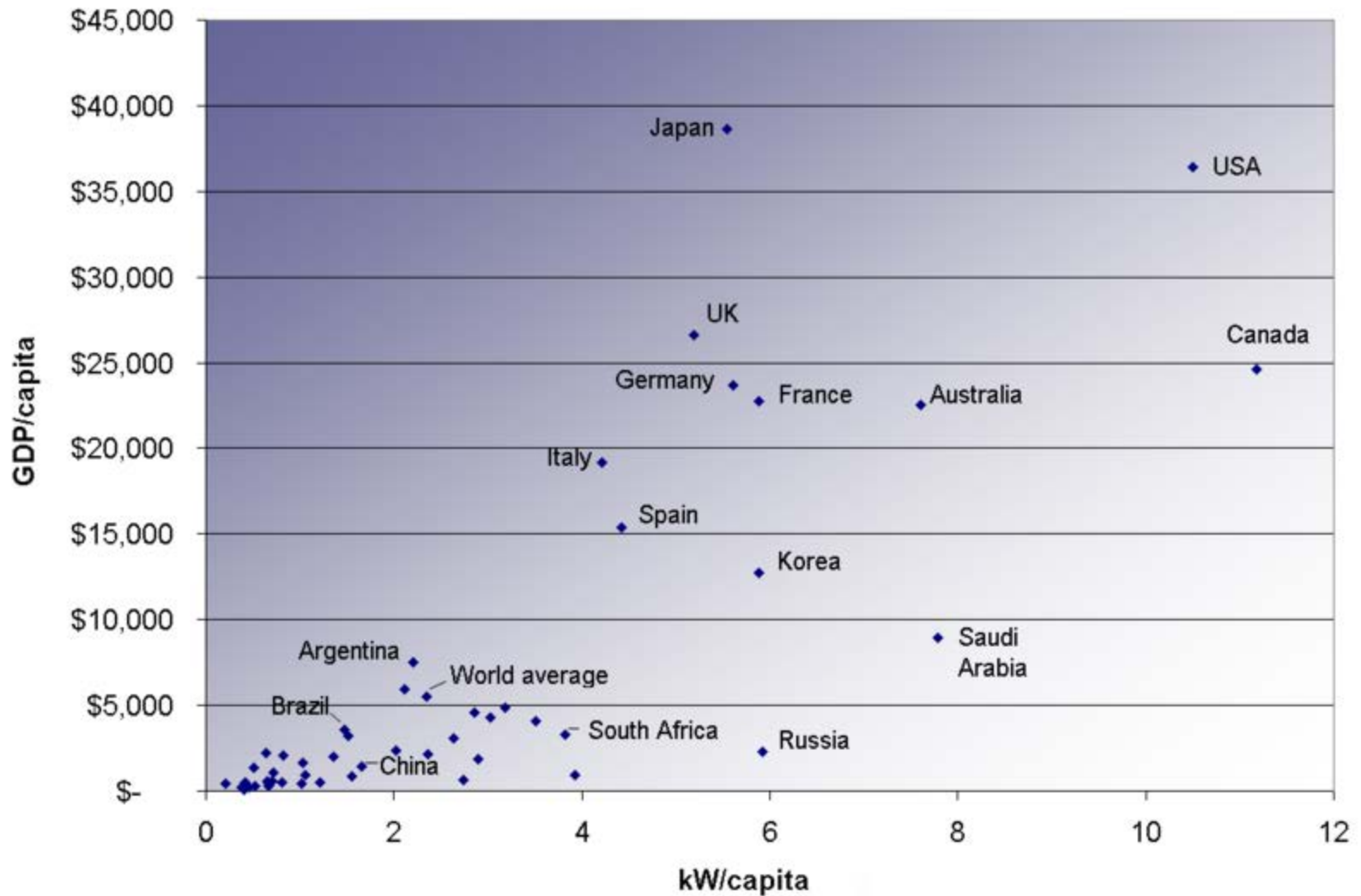
China natural gas supply in IEO2017 Reference case (2010-40)

billion cubic feet per day



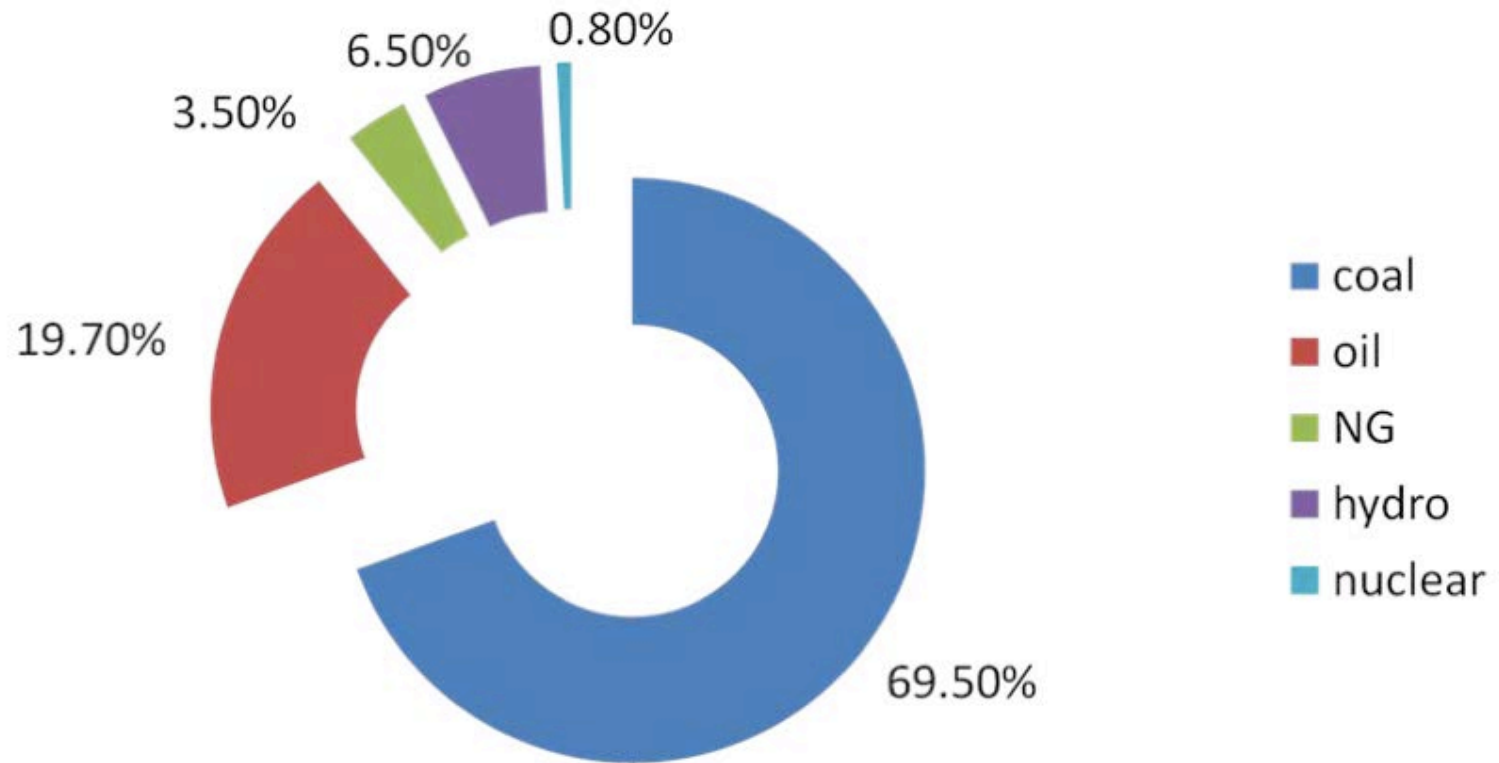
Source: U.S. Energy Information Administration, [International Energy Outlook 2017](#), China Development and Reform Commission, China Customs

Energy consumption per capita versus the GNP per capita



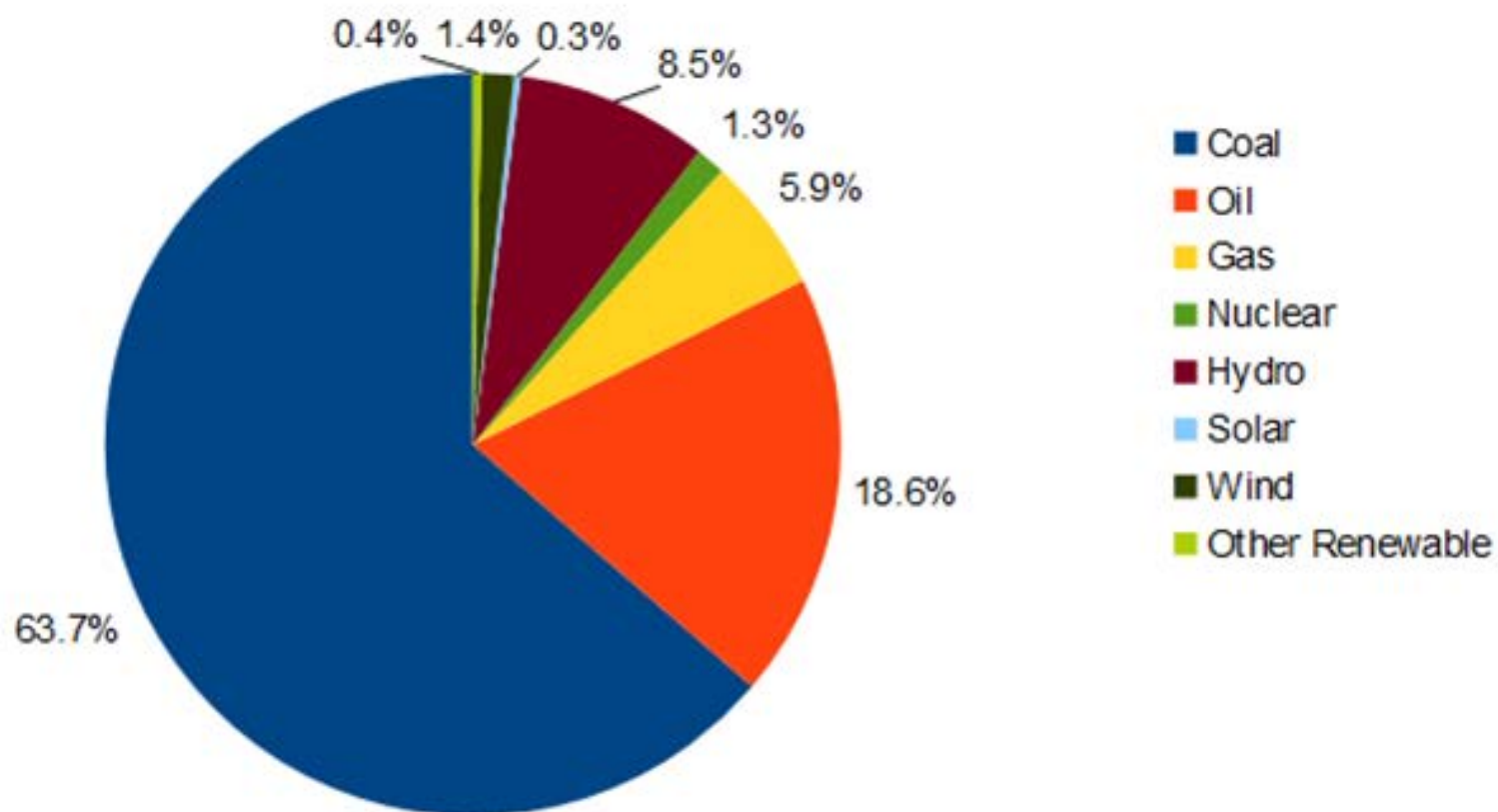
The graph plots the per capita energy versus the per capita income for all countries with more than 20 million inhabitants, the data more than 90% of the world's population. The image shows the broad relation between wealth and energy consumption.

China's Energy Consumption Composition 2007

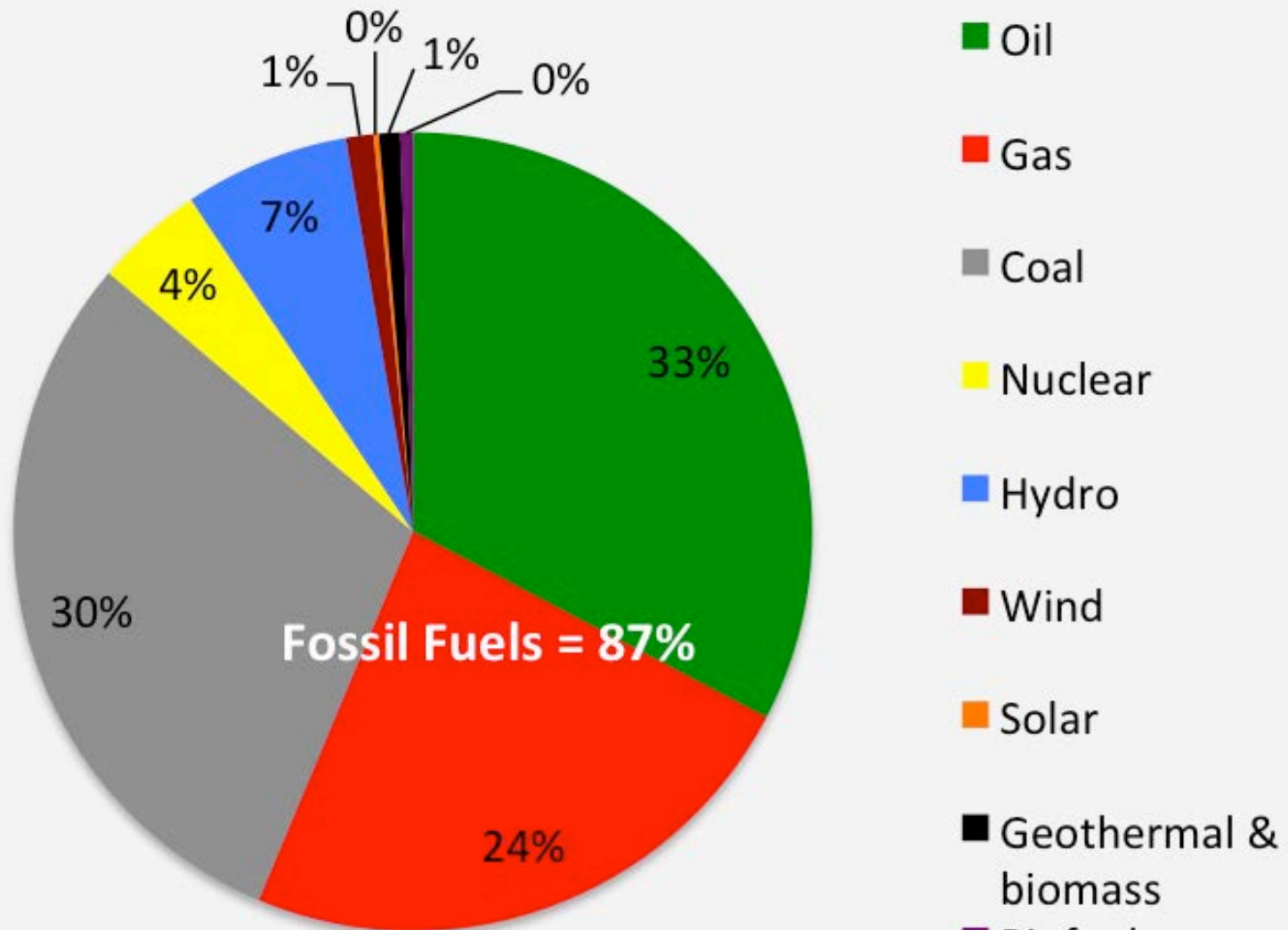


Source: Energy Research Institute, NDRC 2009

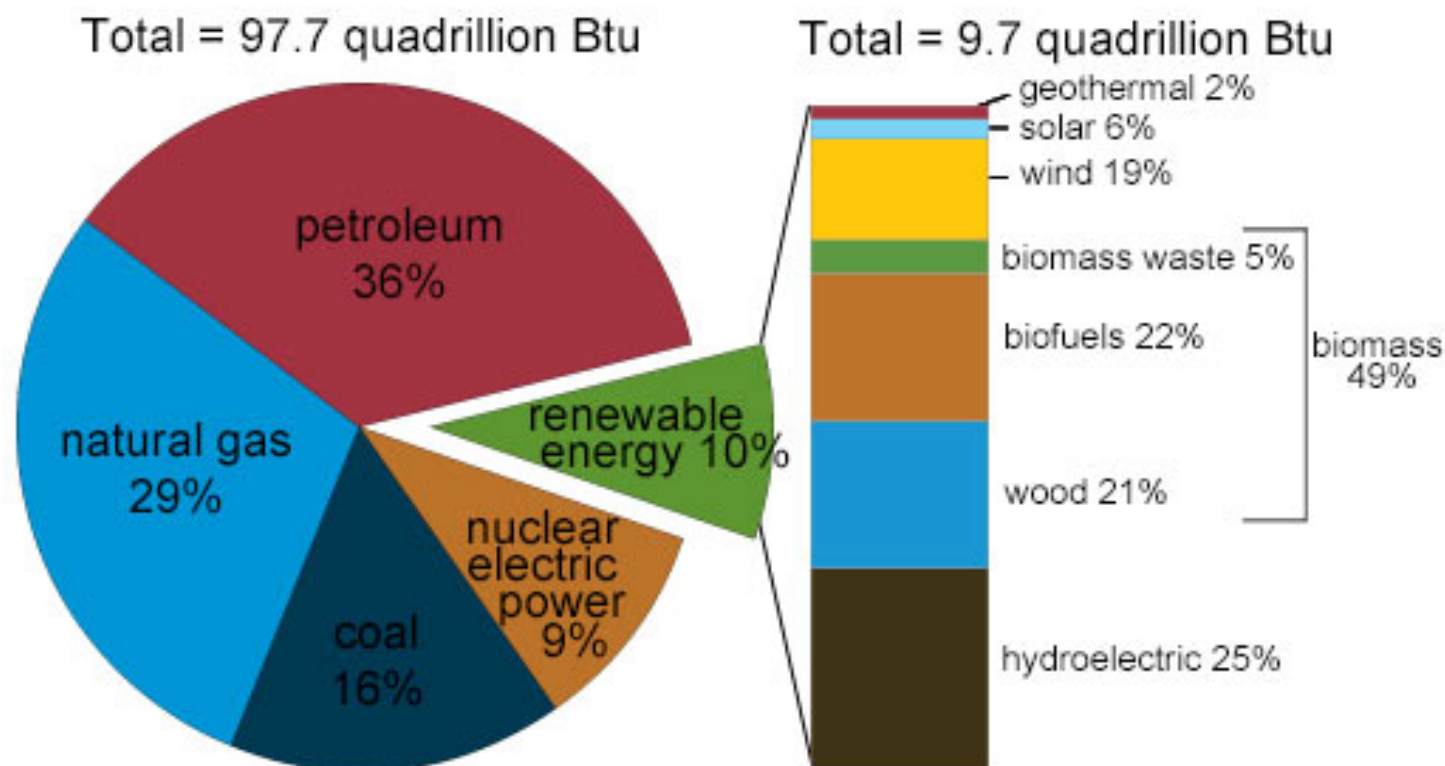
Primary Energy Consumption in China - 2015



Global energy consumption 2013



U.S. energy consumption by energy source, 2015

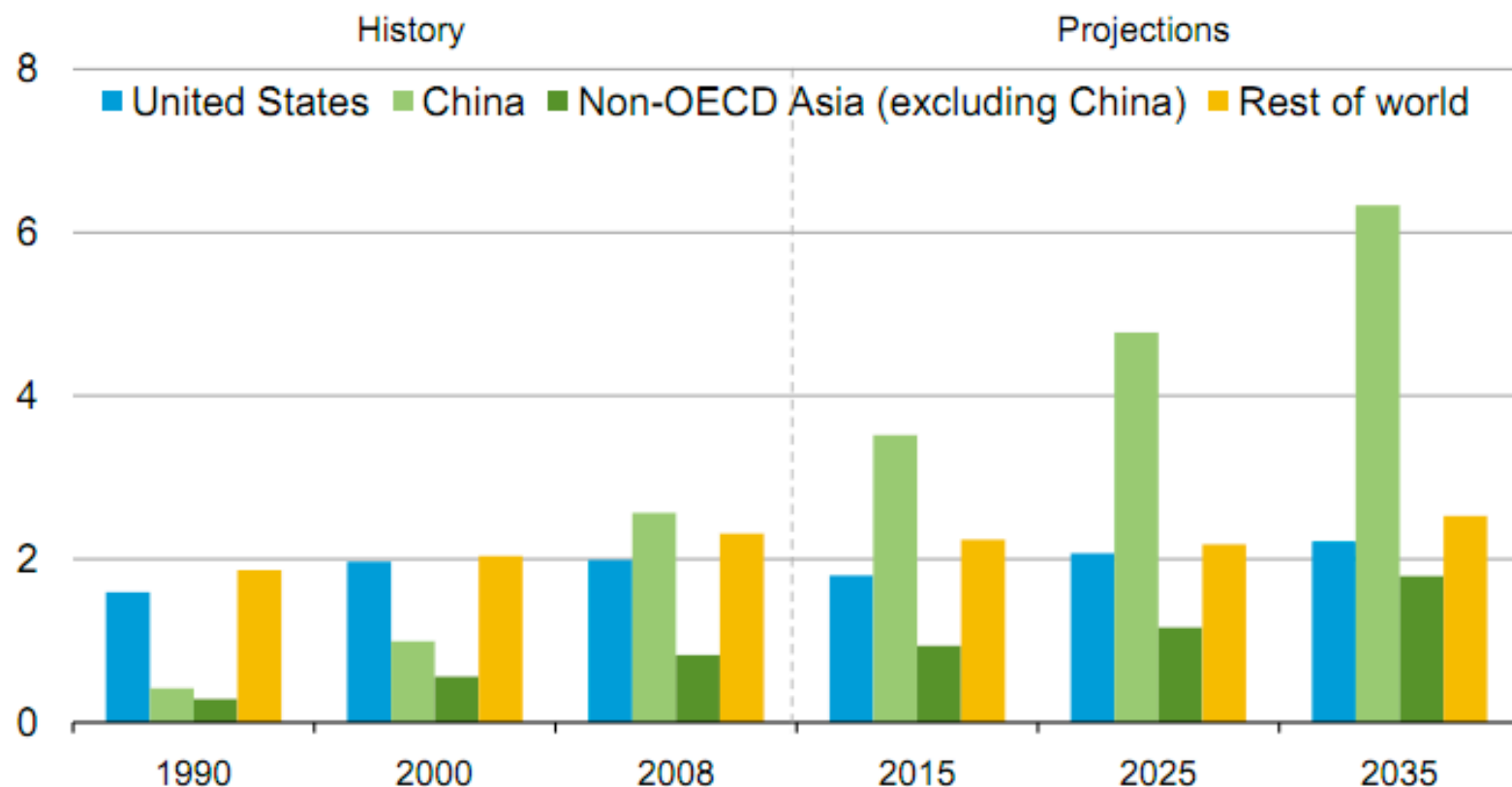


Note: Sum of components may not equal 100% because of independent rounding.

Source: U.S. Energy Information Administration, *Monthly Energy Review*, Table 1.3 and 10.1 (April 2016), preliminary data

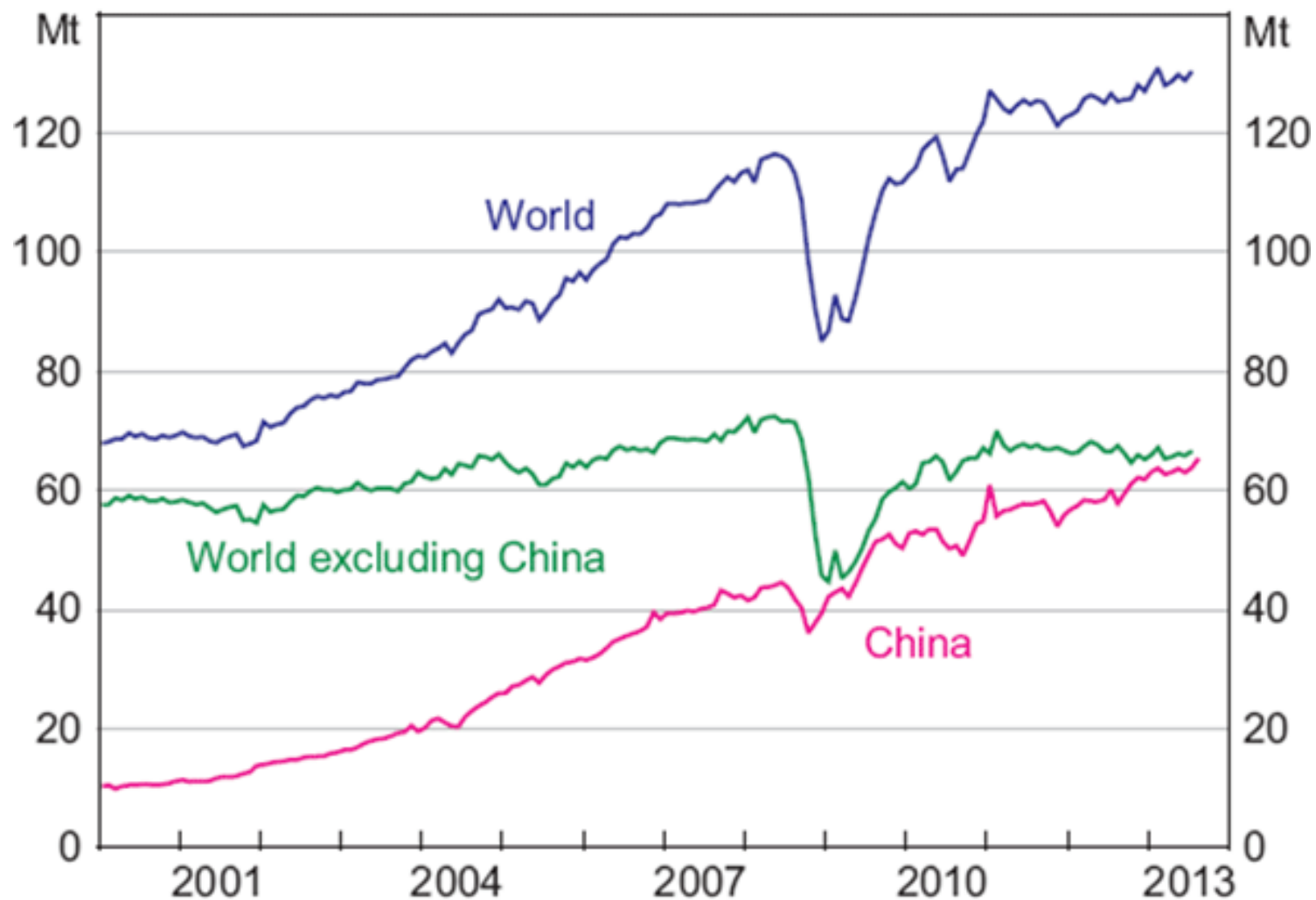
China accounts for nearly three-quarters of the world increase in coal-fired generation

coal-fired generation
trillion kilowatthours



Source: EIA, International Energy Outlook 2011

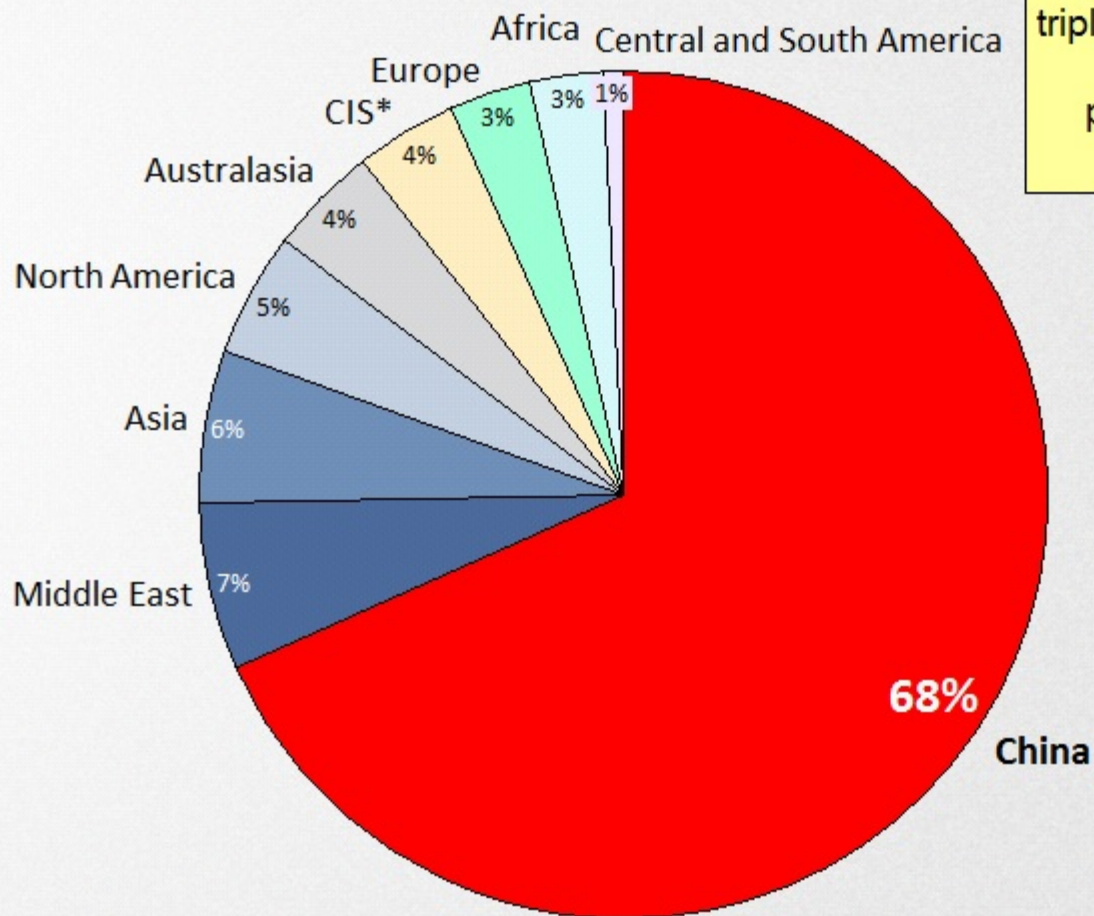
Crude Steel Production*



* Seasonally adjusted

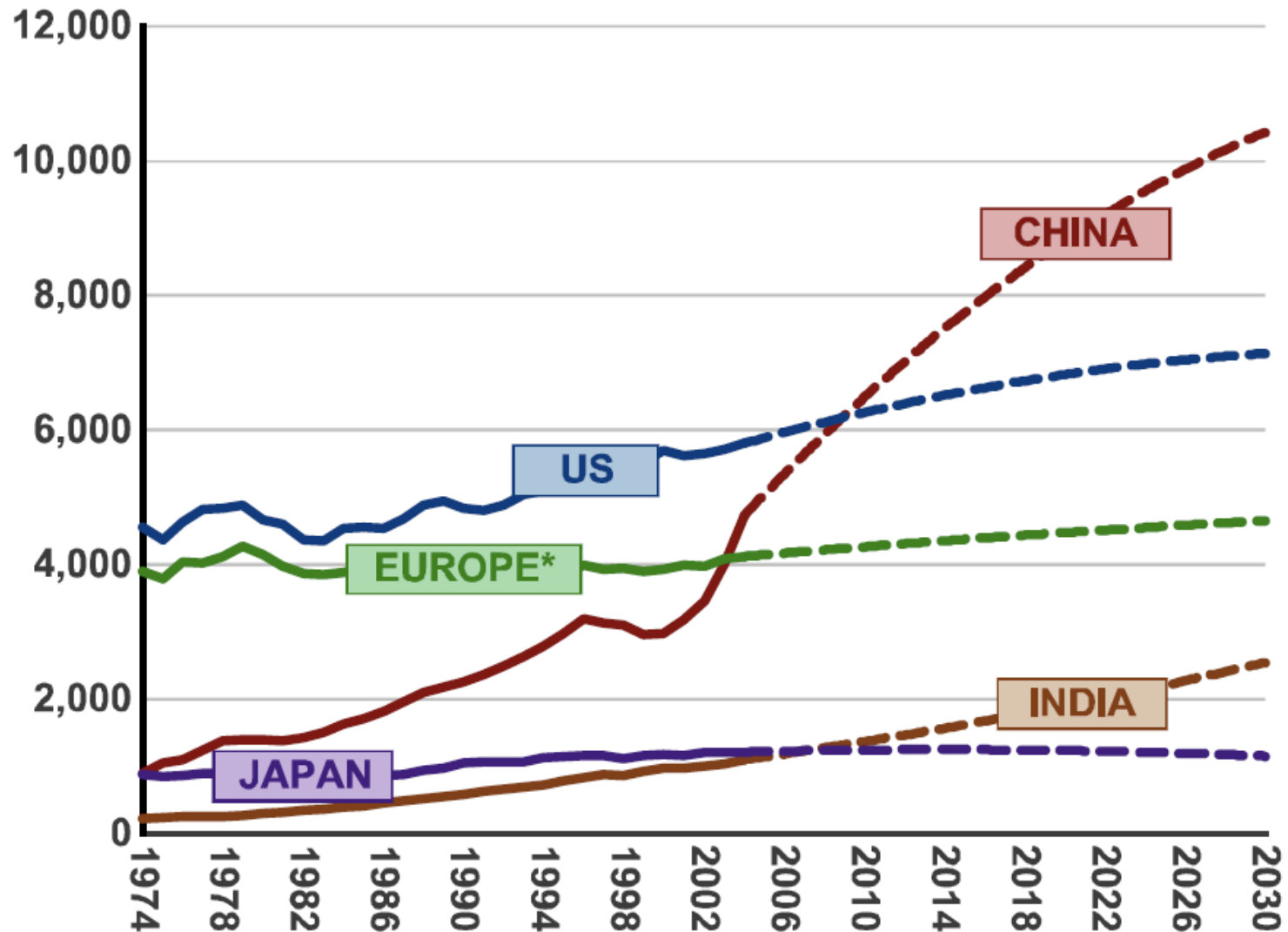
Sources: CEIC; RBA; World Steel Association (worldsteel)

Share of total CO₂ emissions from aluminum smelting, 2014



Industry's emissions tripled since 2000, largely due to China's predominately coal-powered growth.

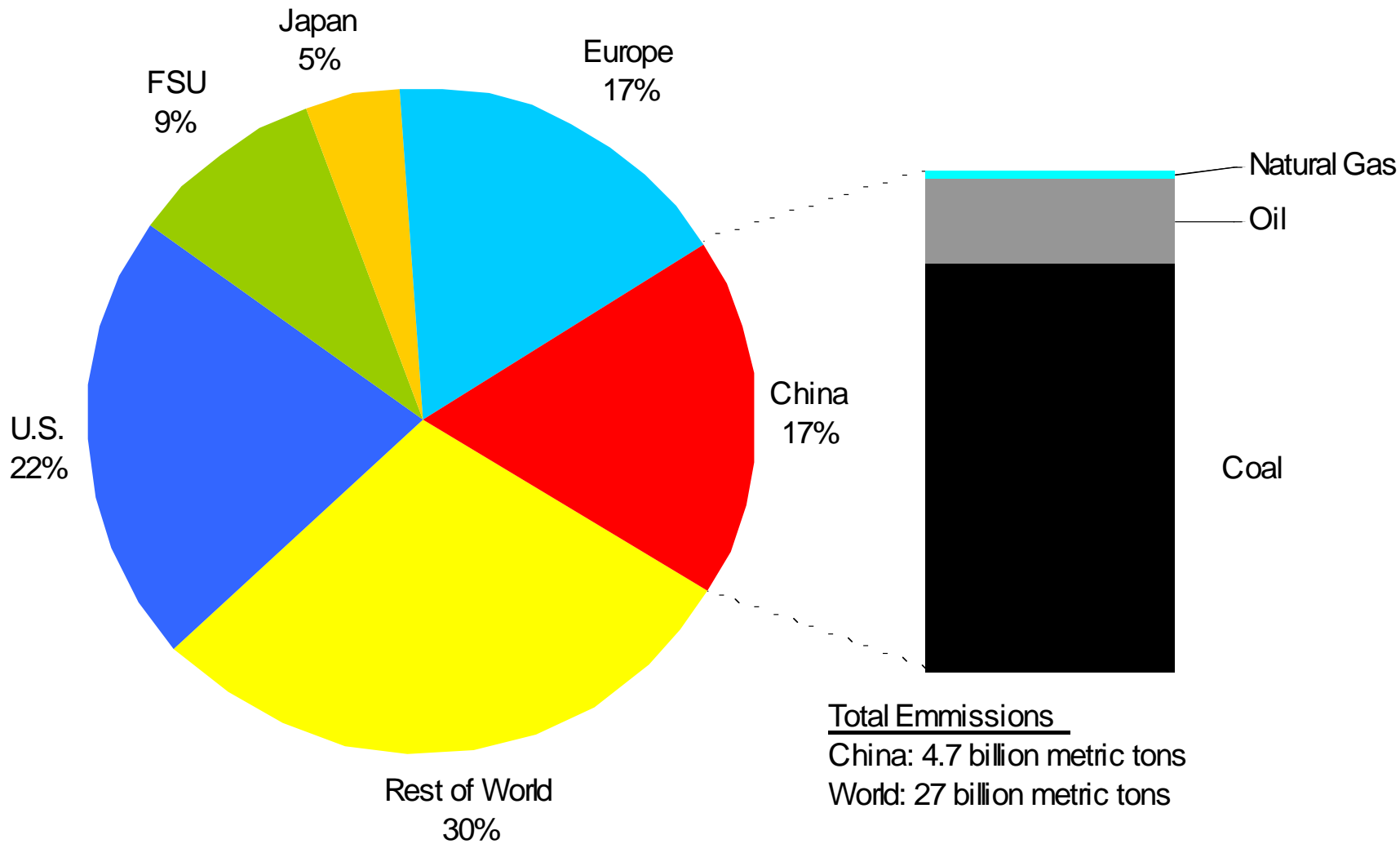
Projected Annual CO2 Emissions (million metric tons)



Source: IEA data and forecasts from the IEA World Energy Outlook 2006.

* Europe refers to OECD Europe.

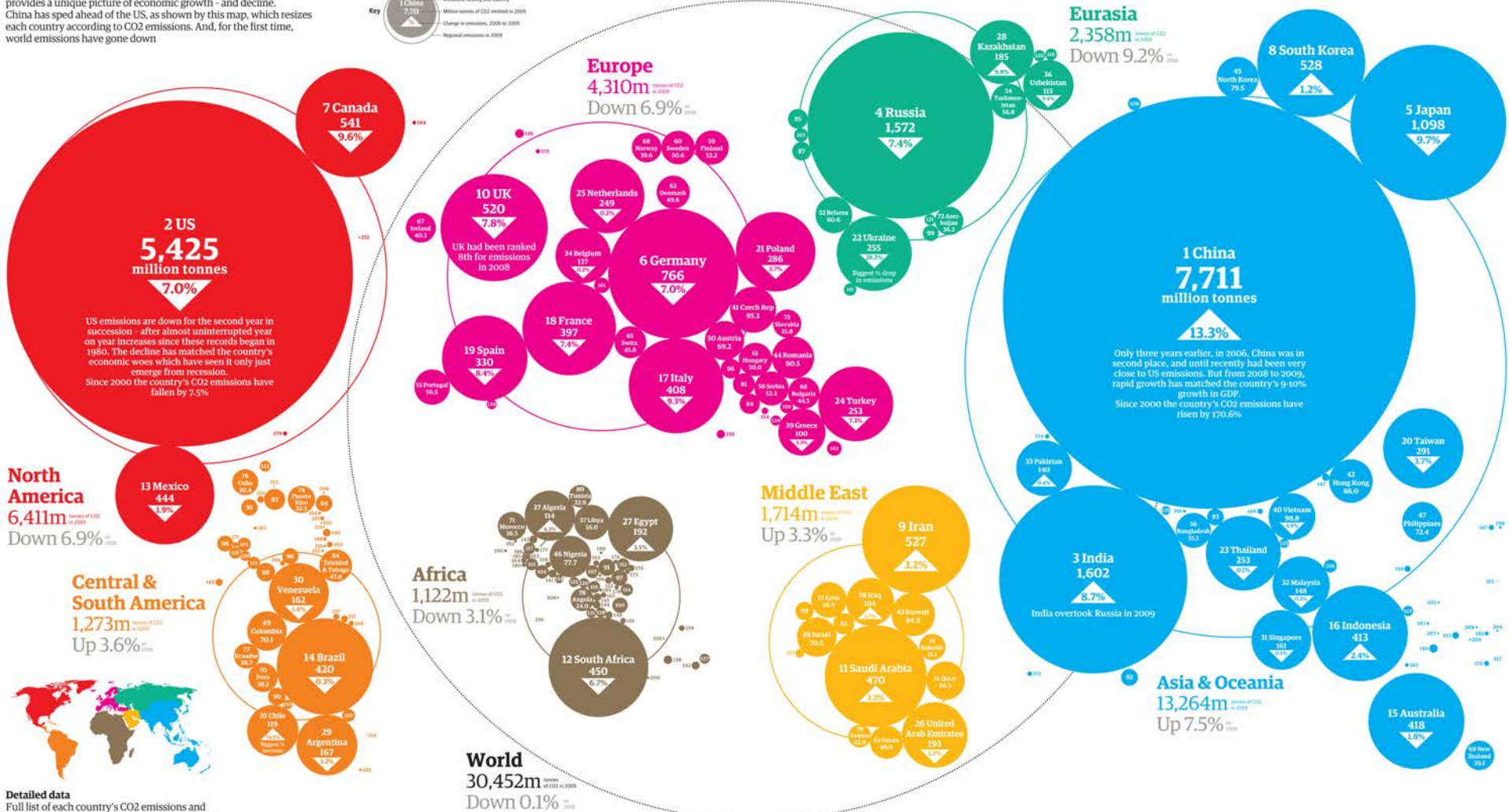
Carbon Dioxide Emissions from Energy Activites, 2004



Source: EIA International Energy Annual

An atlas of pollution: the world in carbon dioxide emissions

Latest data published by the US Energy Information Administration provides a unique picture of economic growth - and decline. China has sped ahead of the US, as shown by this map, which resizes each country according to CO2 emissions. And, for the first time, world emissions have gone down



TEQC

Tones of Equivalent Carbon per Capita

6

5

4

3

2

1

0

India

China

Mexico

Portugal

Sweden

France

Italia

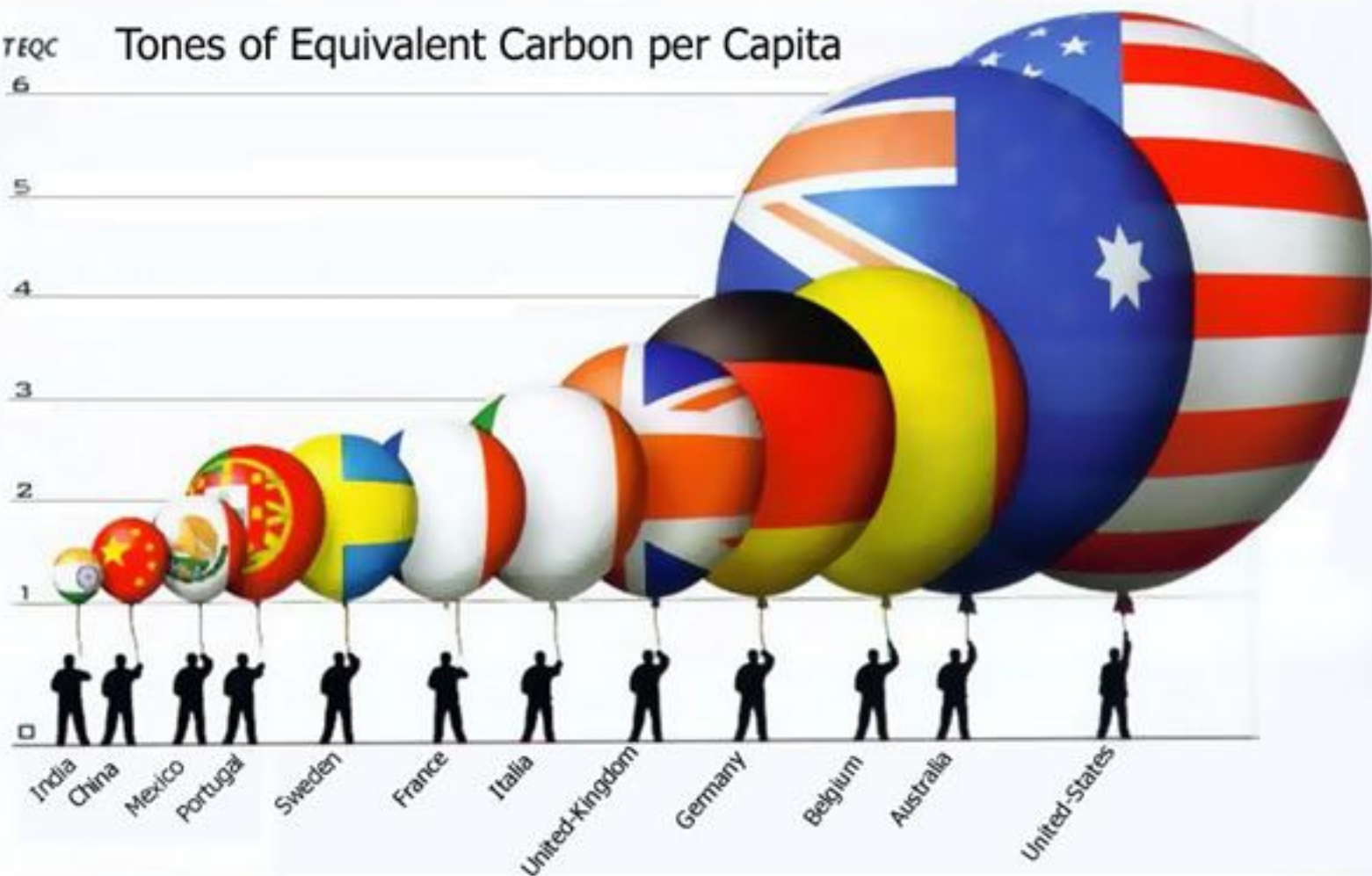
United-Kingdom

Germany

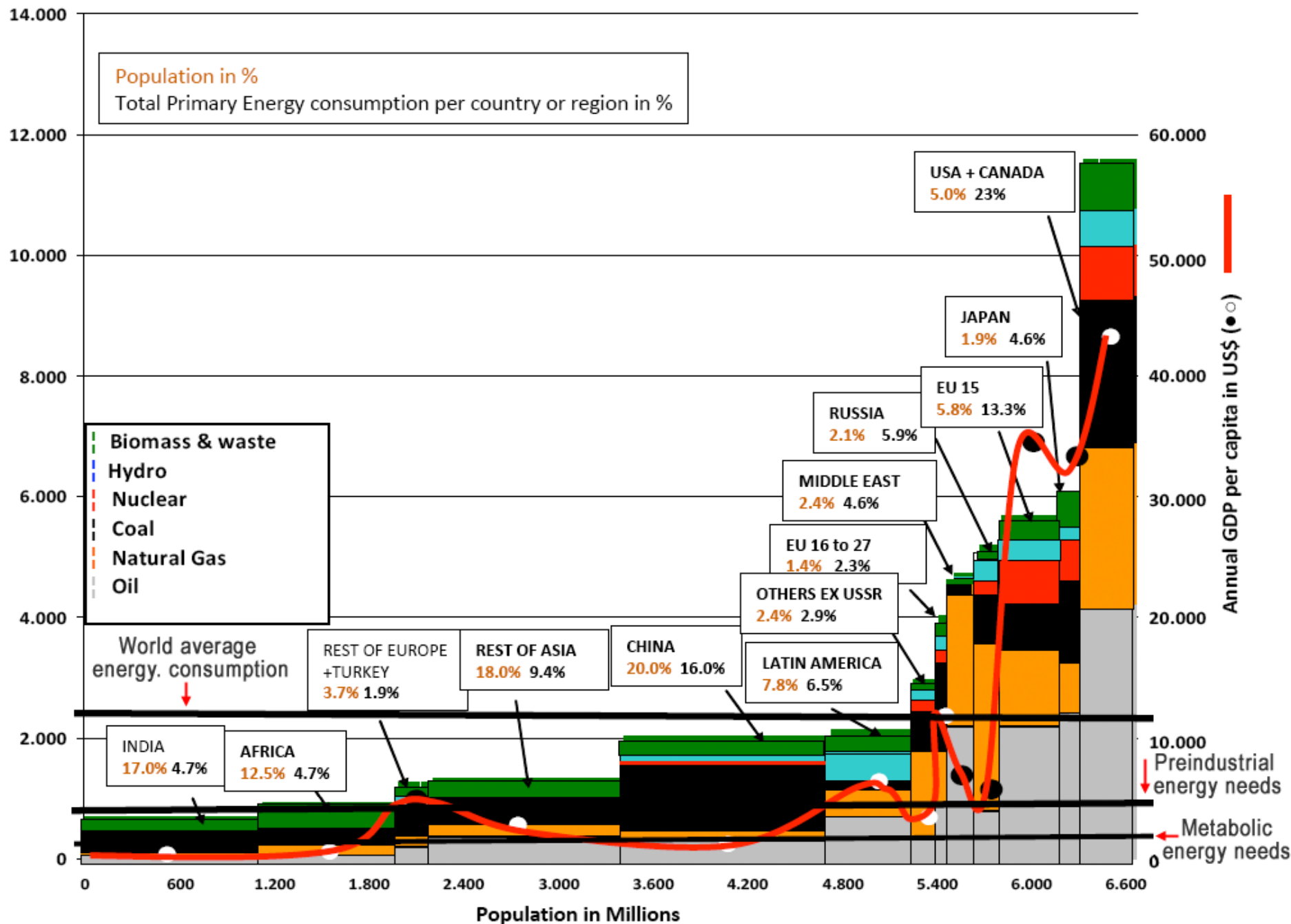
Belgium

Australia

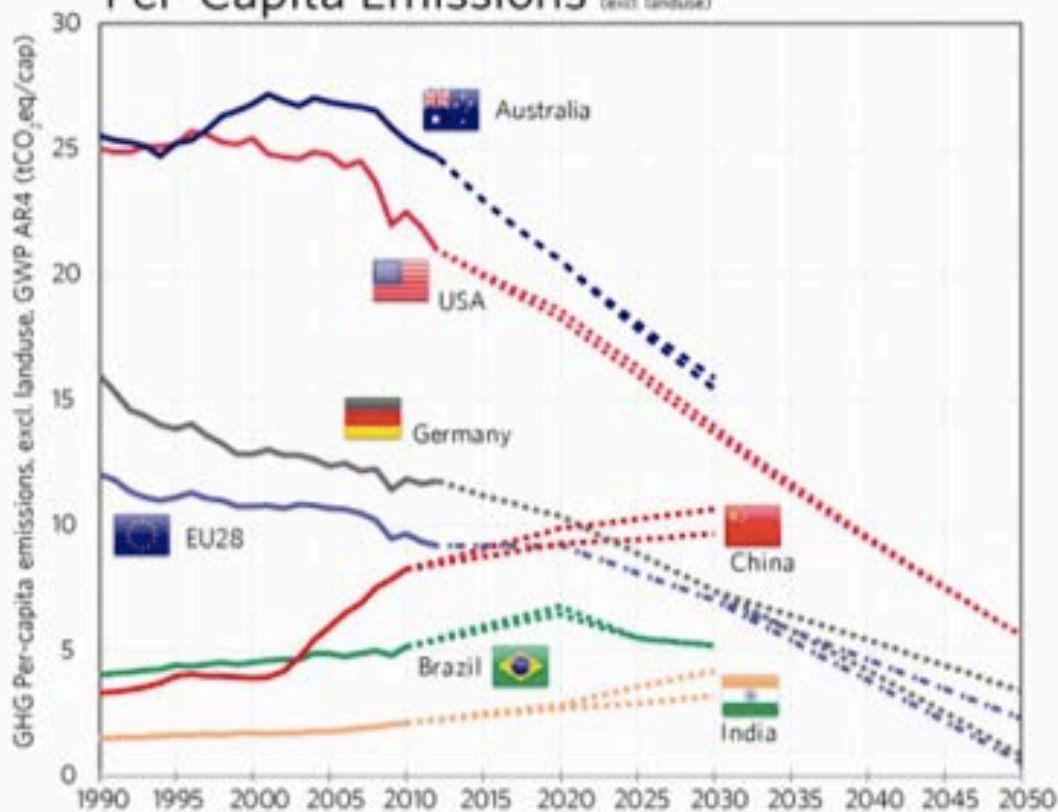
United-States



Energy Consumption in equiv. Watts of power per capita



Per-Capita Emissions (excl. landuse)

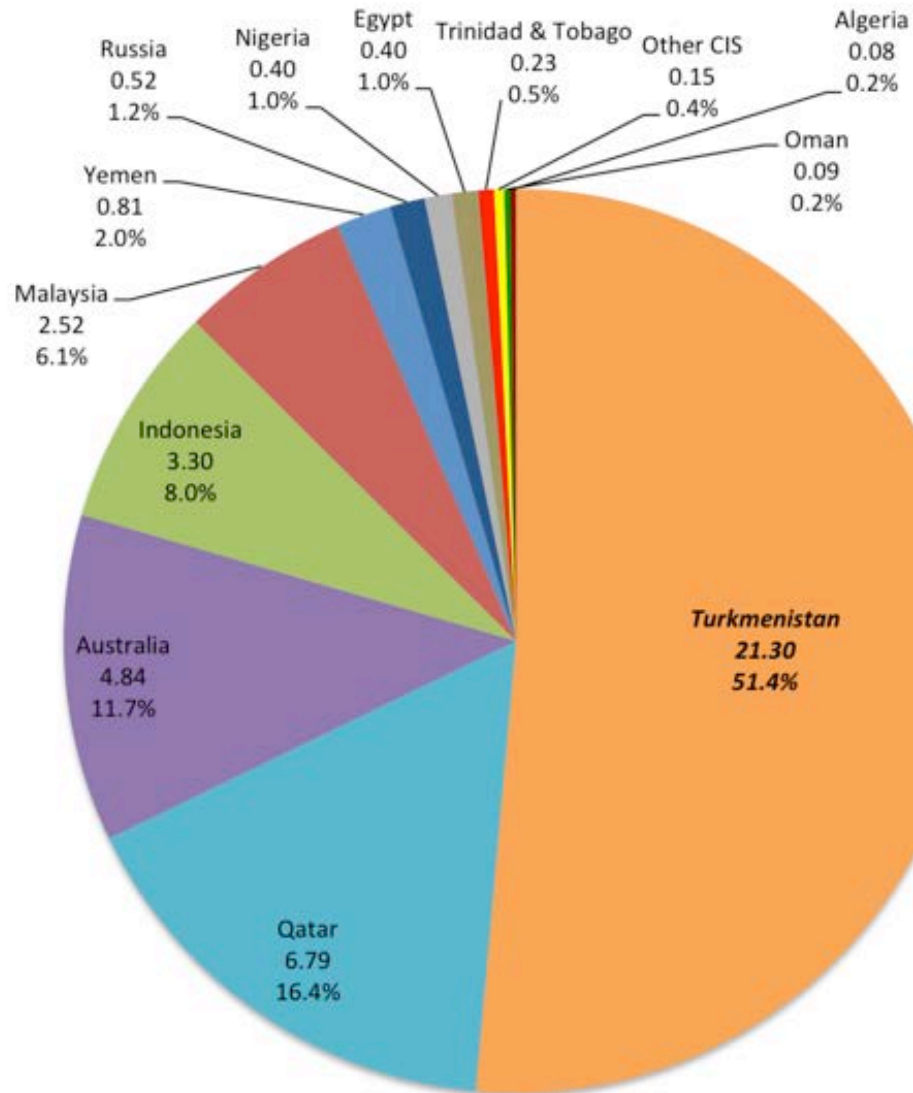


-  Australia highest per-capita emissions among 'developed' countries
-  USA almost linear decrease of per-capita emissions from 2007 to 2050
-  Germany above EU28 average, but catching up by 2030 thanks to -55% target
-  EU28 already achieved its absolute 2020 emission pledge today
-  Chinese per-capita emissions same as EU28 today, increasing 23% from 2010 to 2030.
-  Brazil's pledge to halt net deforestation by 2030 is most important (not shown).
-  India's per-capita emissions projected to increase 75% by 2030 from very low level. 100 GW solar PV by 2022 Mission most important.

China's 13th Five Year Plan (2016-2020)

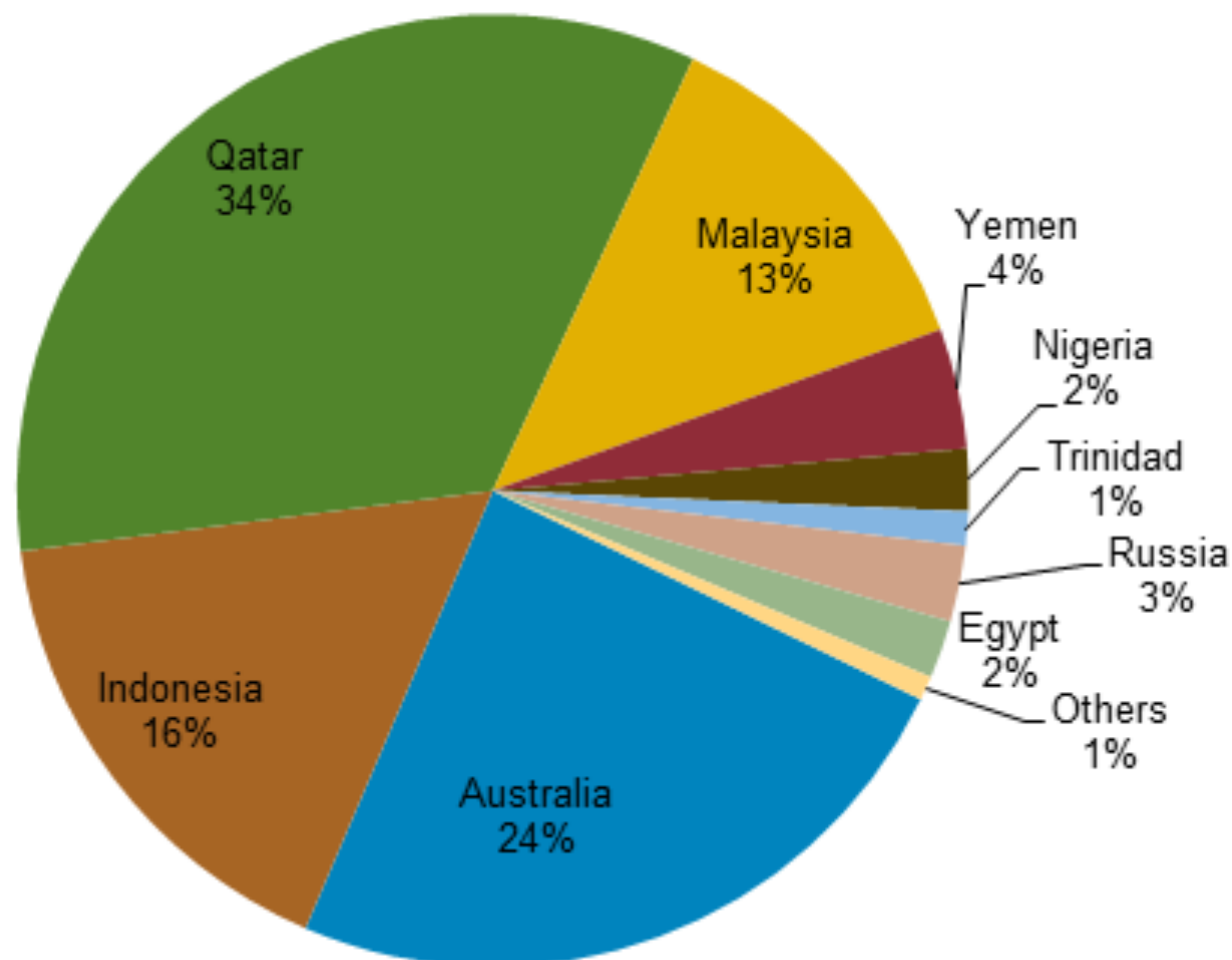
- Major shifts in development paradigm**
- Emphasis on balance between growth & environment**
- Huge investment in clean energy sectors**
- Nationwide efforts in reducing coal use**
- Natural gas & LNG demand will rise due to such policy drivers**

Where does China get its gas? 2012 (bcm) (% total)



Source: BP Statistical Review of World Energy

China LNG import sources, 2012



Source: FACTS Global Energy.
Others: Oman, Algeria.

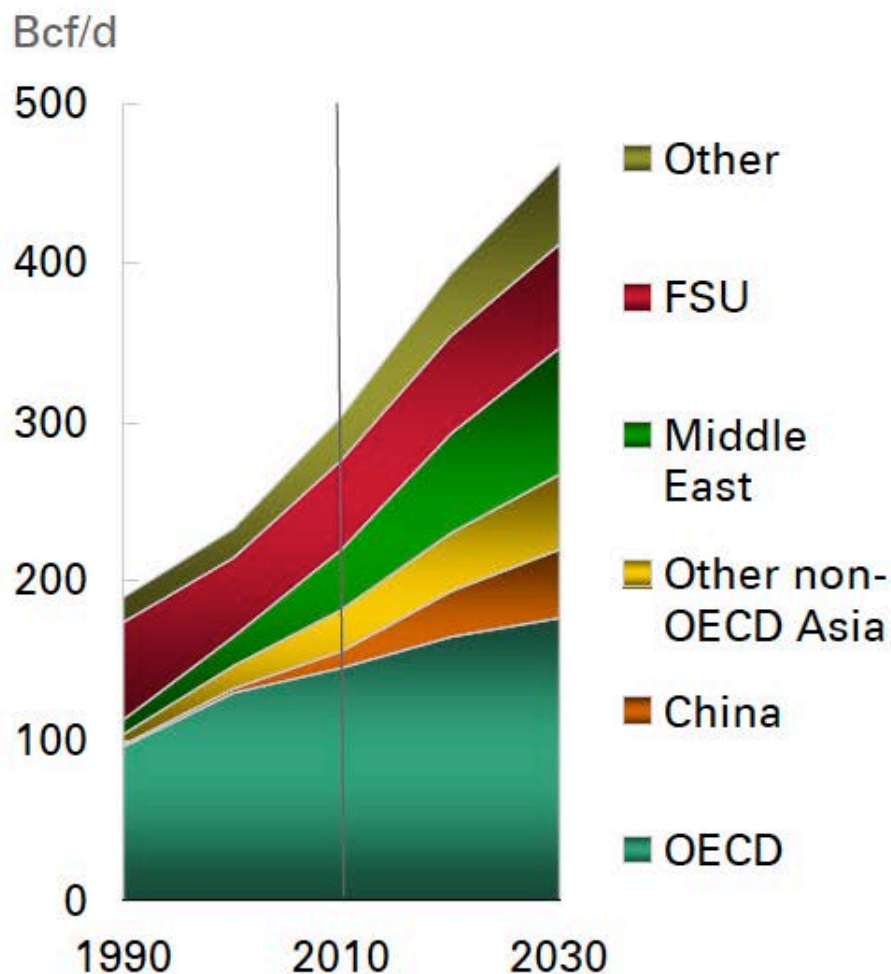
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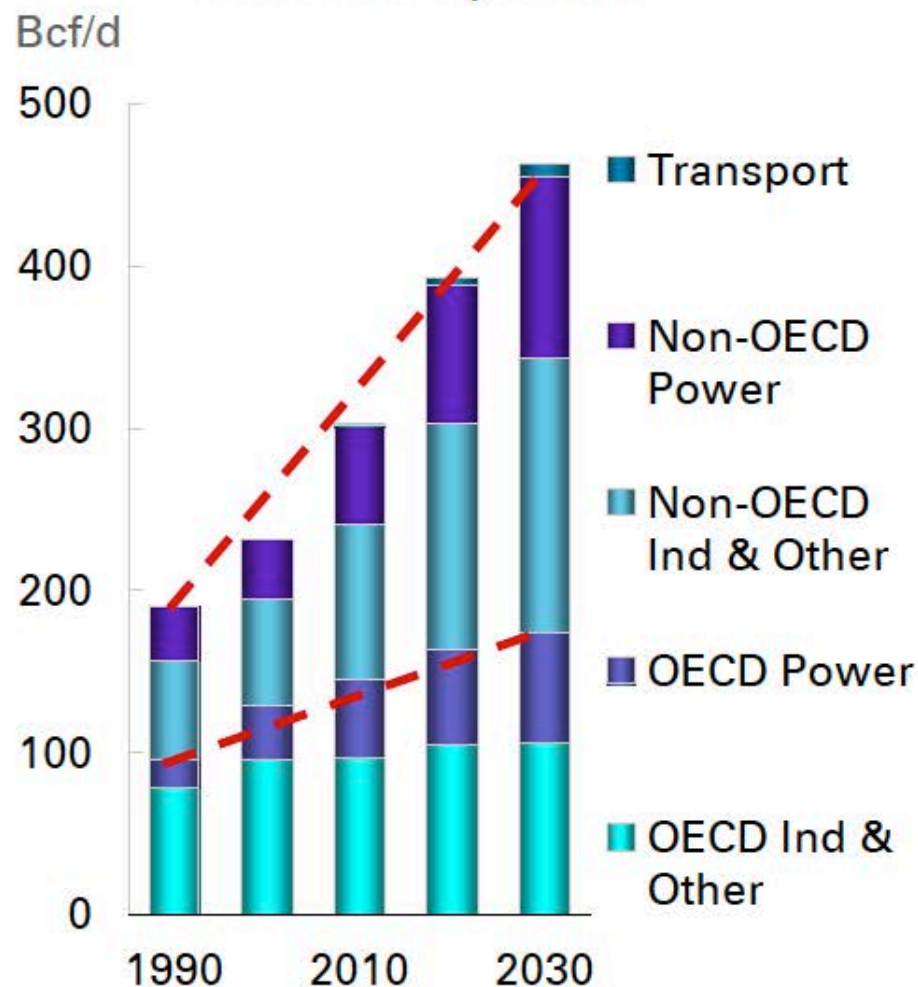
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Gas demand growth is driven by the non-OECD...

Demand by region

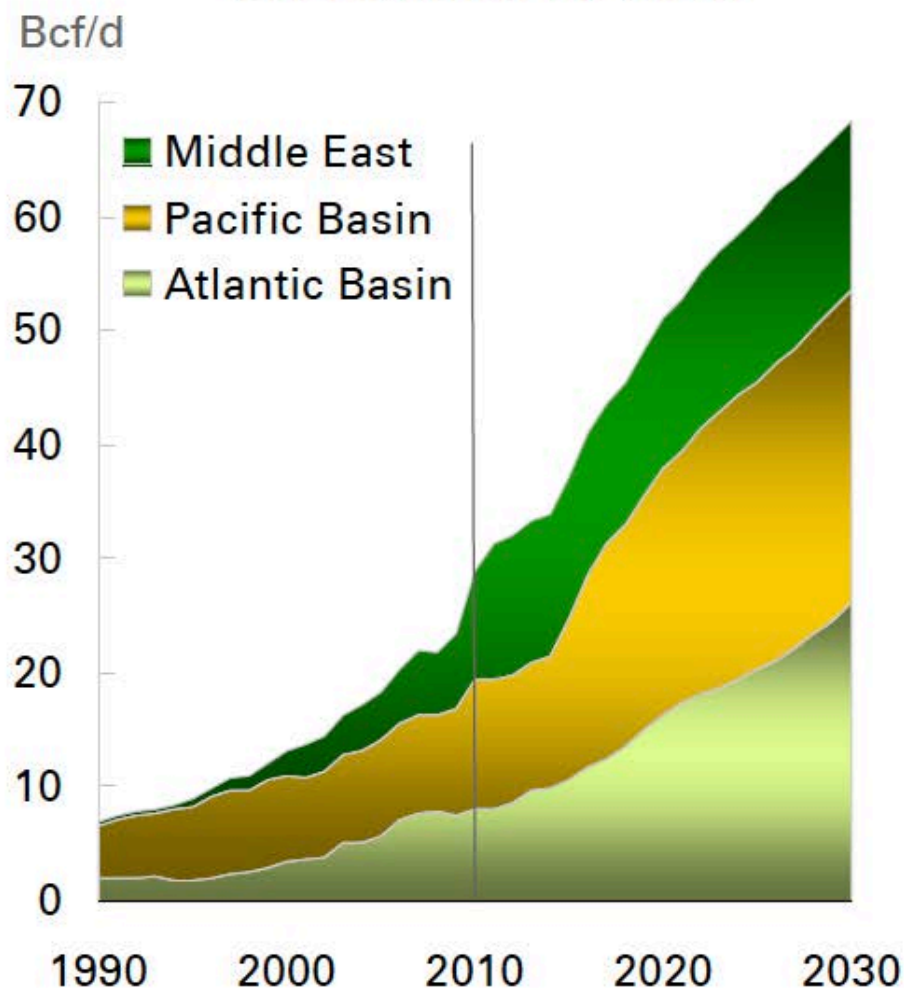


Demand by sector

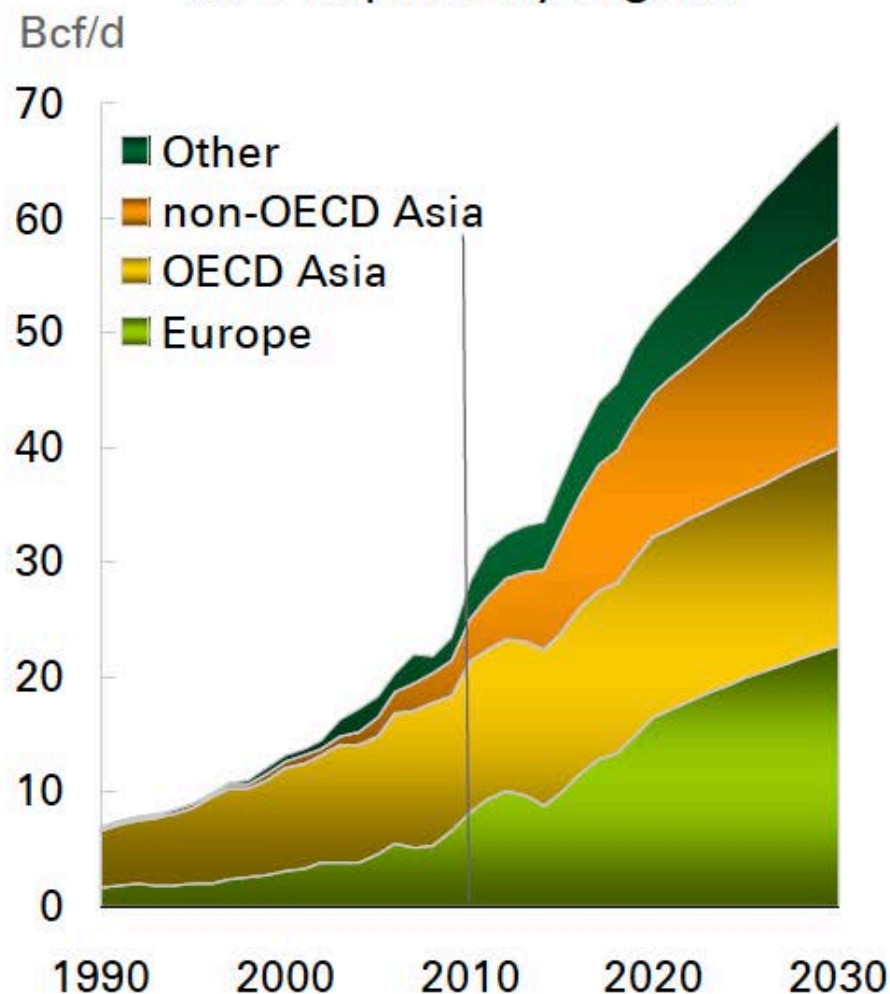


LNG trade grows twice as fast as global gas production...

LNG exports by basin



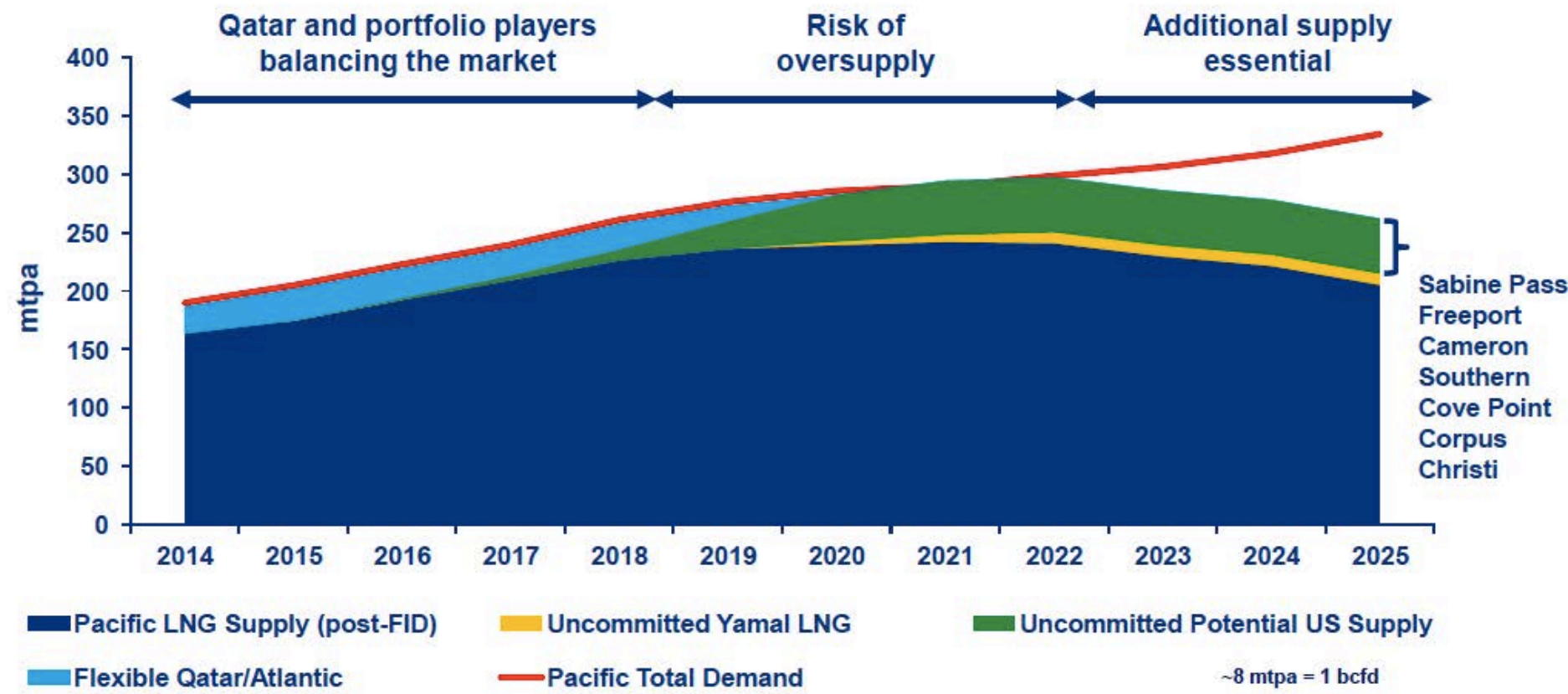
LNG imports by region



Pace of global LNG supply growth has started to outpace Pacific LNG demand growth

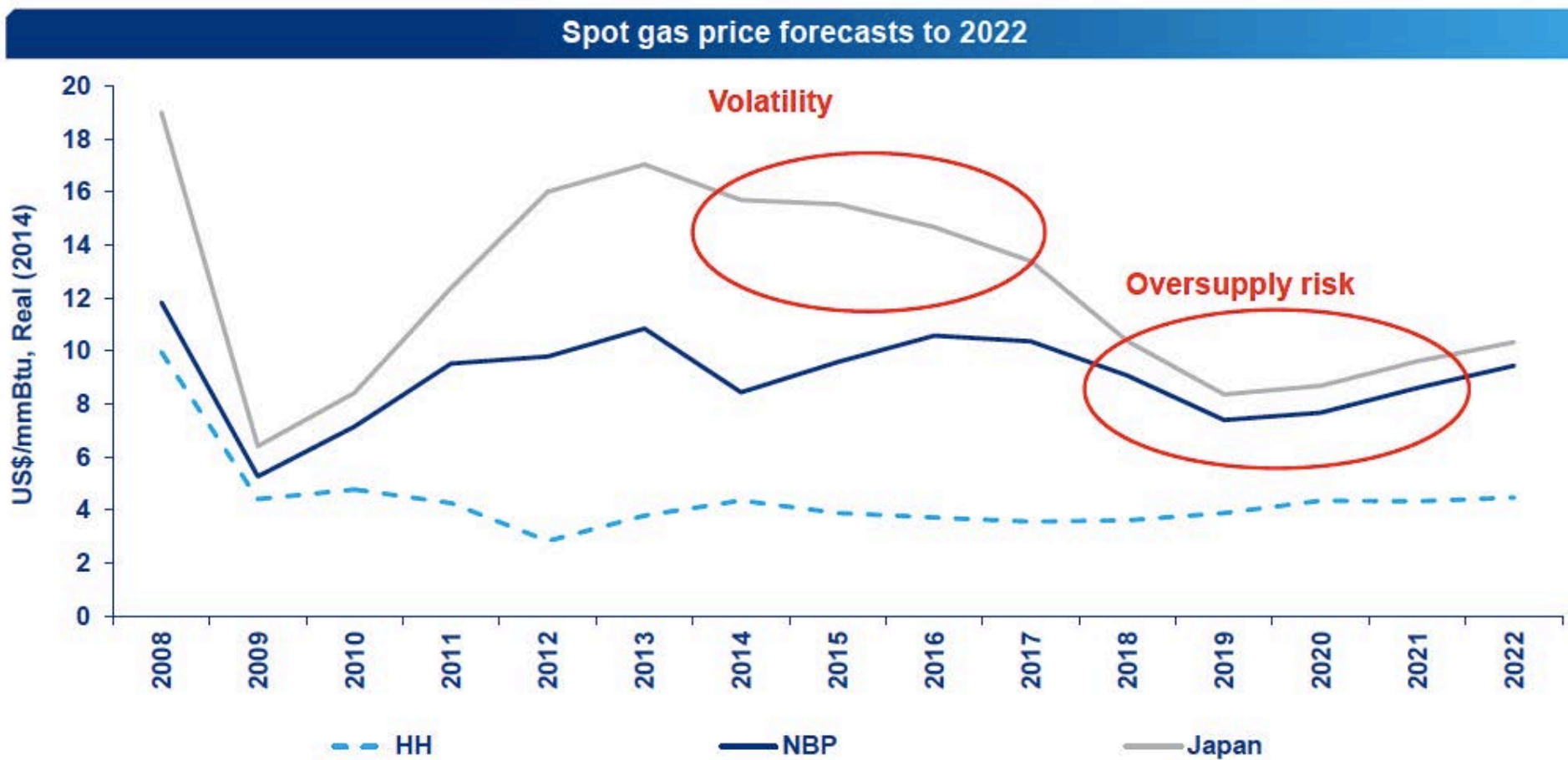
Greater LNG competition between Atlantic (incl. US) and Middle East suppliers will develop

Pacific supply/demand outlook



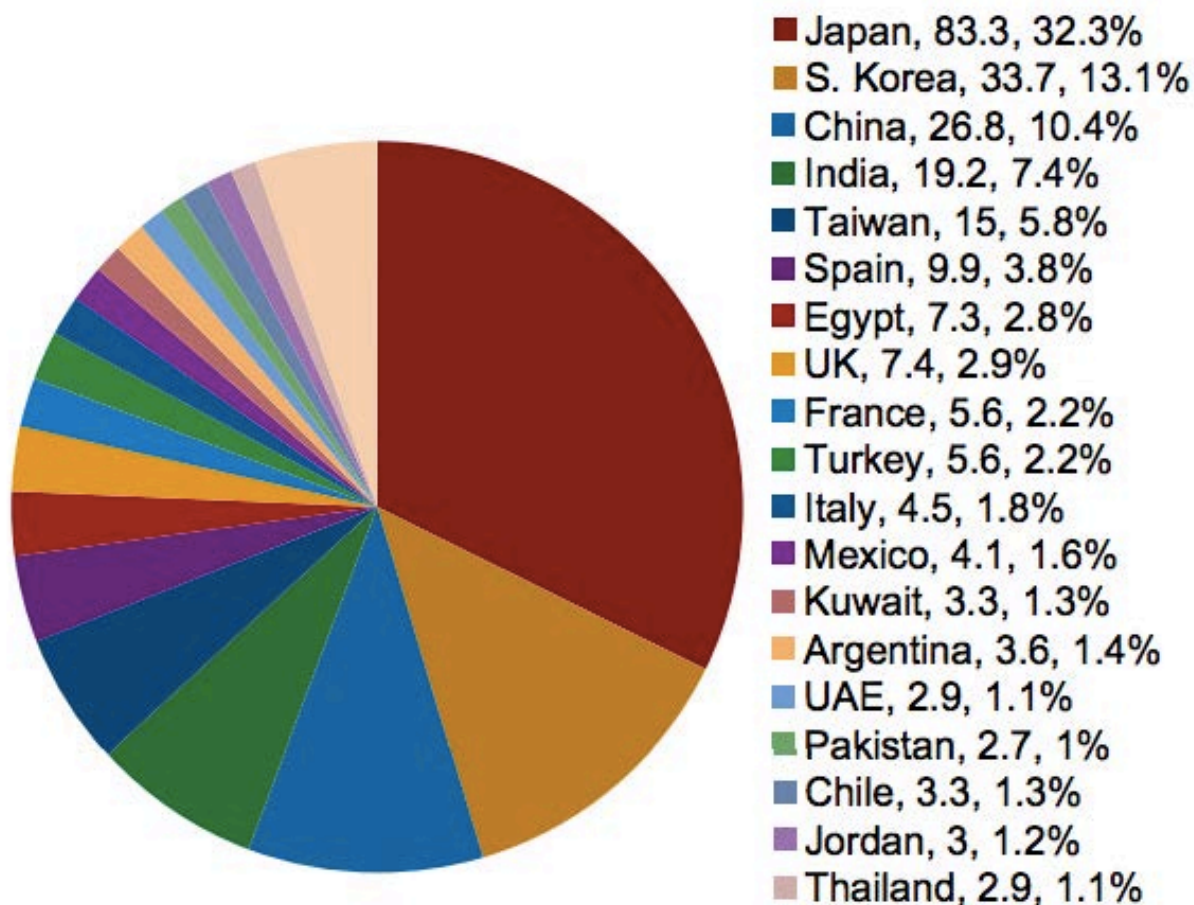
Source: Wood Mackenzie Global Gas Service Prelim H2 '14

This presents a challenging picture for spot prices in Asia and Europe from 2018-21



Source: Argus, Datastream, NYMEX, Wood Mackenzie H1-2014 forecast, North America & Europe gas markets short-term outlook

2016 LNG Imports and Market Share by Country (in MTPA)

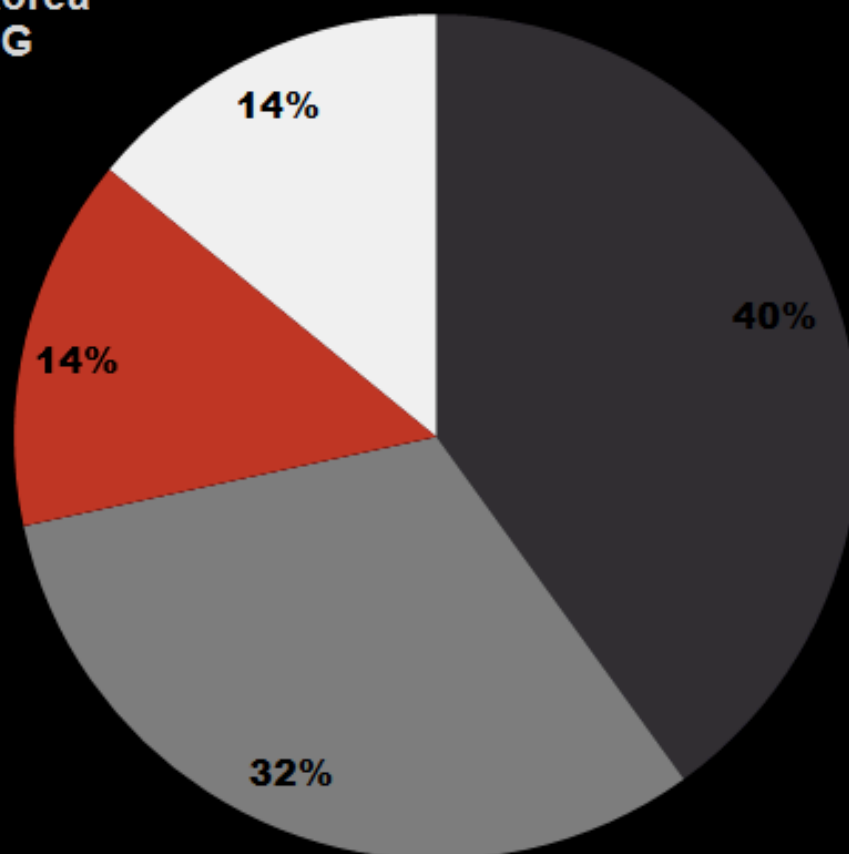


Note: Number legend represents total imports in MT, followed by market share %. "Other" includes countries with imports less than 2.5 MT (by order of size): Singapore, US, Portugal, Puerto Rico, Belgium, Malaysia, Brazil, Lithuania, Poland, Dominican Republic, Greece, Netherlands, Israel, Canada, Jamaica, and Colombia. Sources: IHS Markit, IGU

Global LNG demand share

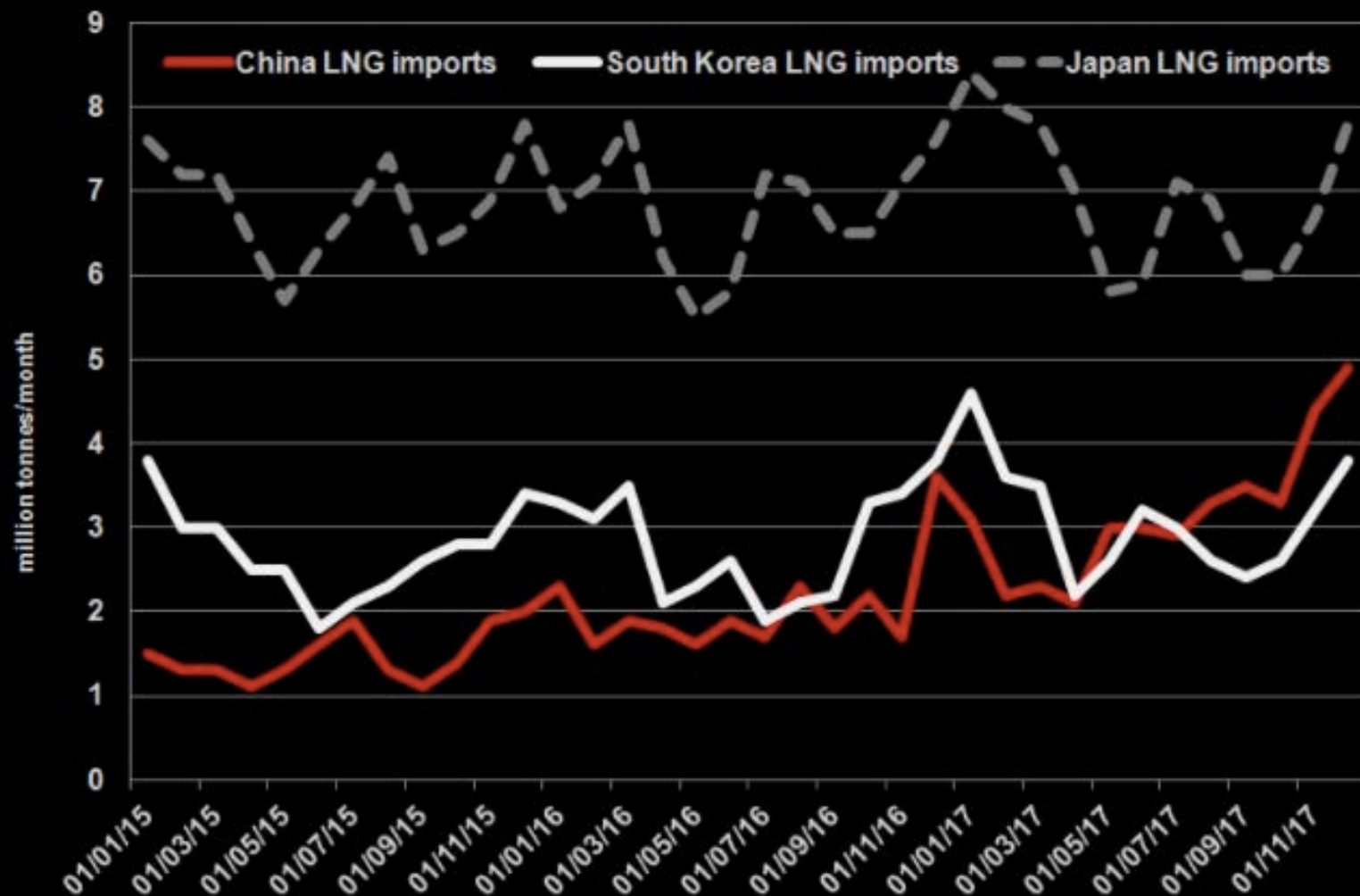
Top importers Japan, China and South Korea together make up 60 percent of world LNG purchases in 2017.

- Others
- Japan
- China
- South Korea

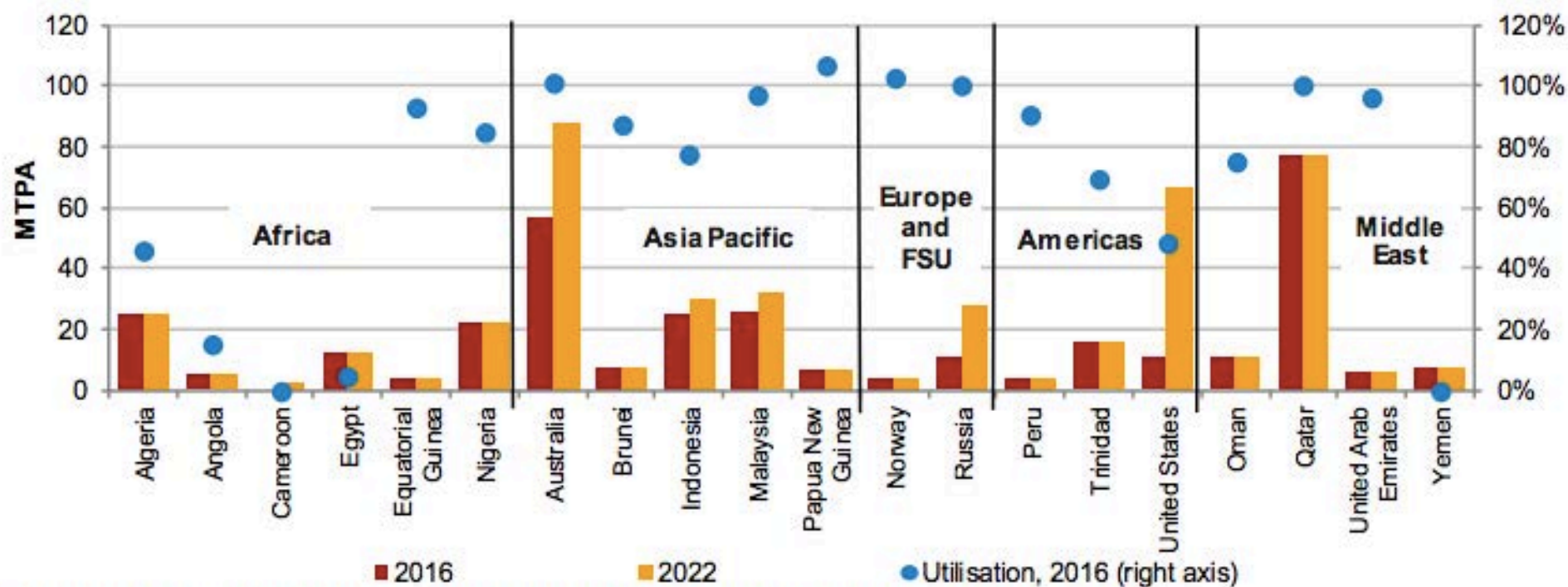


China vs South Korea & Japan LNG imports

China's monthly LNG imports started overtaking South Korea's in mid-2017.



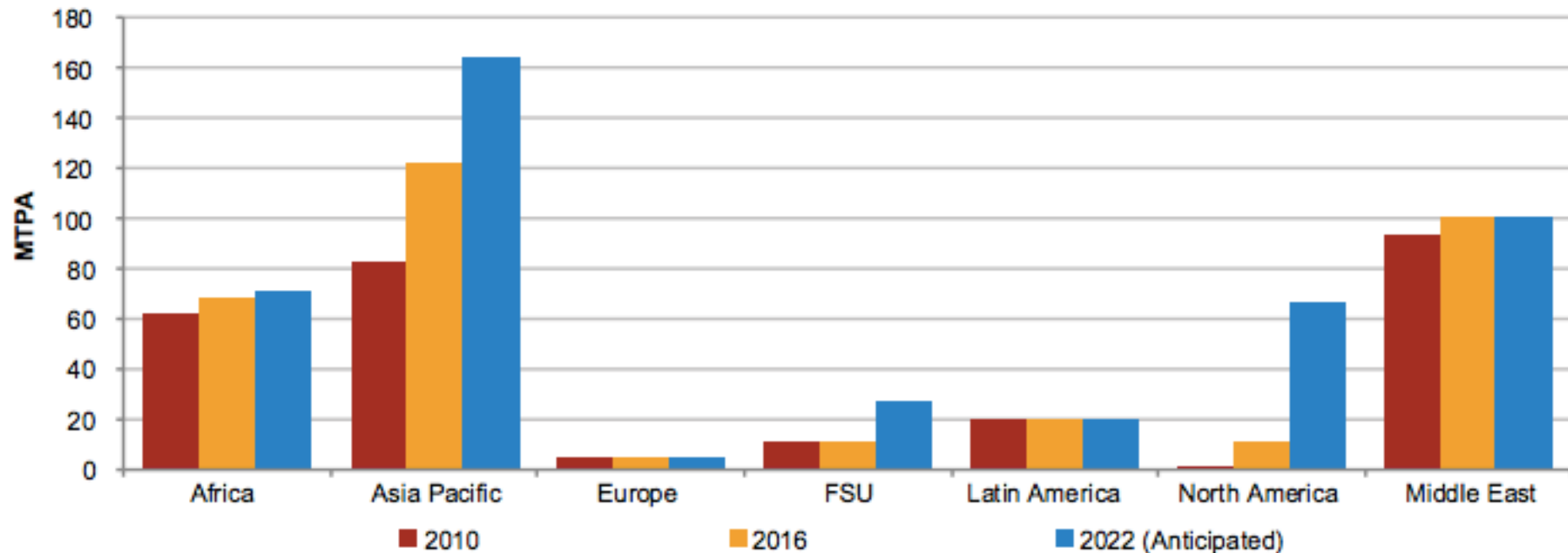
Nominal Liquefaction Capacity by Country in 2016 and 2022



Note: Liquefaction capacity only takes into account existing and under construction projects expected online by 2022.

Sources: IHS, IGU, Company Announcements

Liquefaction Capacity by Region in 2010, 2016, and 2022



Note: Liquefaction capacity only refers to existing and under-construction projects. Sources: IHS, Company Announcements



China's high LNG terminal capacity use tempers winter import growth
Singapore (Platts)--30 Nov 2017 903 am EST/1403 GMT

Capacity utilization rates of over 130% at China's northern and eastern LNG terminals are limiting the scope for significant import growth, despite surging domestic prices due to robust winter demand.

Russia-China Gas Deal May 2014

CHINA-RUSSIA ENERGY DEALS DURING PUTIN'S TWO-DAY VISIT

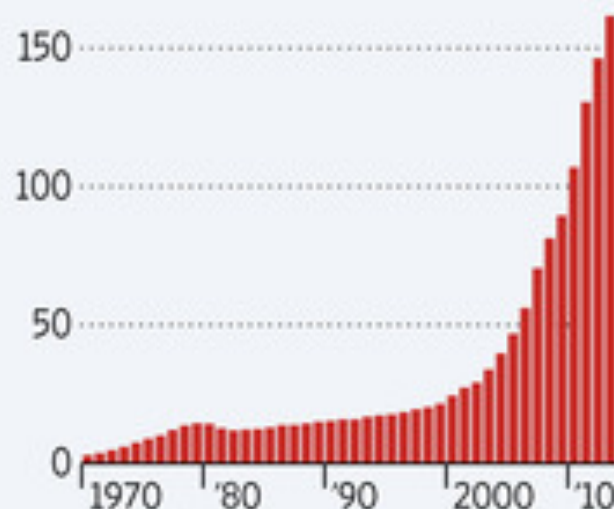


	Chinese company	Russian company	Project	Size of the deal
1	China National Petroleum Corp	Gazprom OAO	Natural gas supply with 38 billion cubic meters annually	About \$400 billion
2	China National Petroleum Corp	Novatek OAO	LNG purchases and sales contract on the Yamal Project	Not available
3	China National Petroleum Corp	Rosneft OAO	Tianjin JV Refinery	Not available
4	China Petrochemical Corp	OAO Sibur Holding	Shanghai JV for rubber plant	Not available
5	Shenhua Group	En+ Group	Coal mine	Not available
6	State Nuclear Power Technology Corp	Rosatom State Atomic Energy Corp	Floating nuclear power plant	Not available

Energy Alliance

Pipeline deals in the works could help China meet its growing natural-gas needs by tapping into Russia's massive supply at a time when Russia is hoping to diversify beyond its traditional market in Europe.

China's natural-gas consumption
in billions of cubic meters



Proven reserves, 2013
in billions of cubic meters



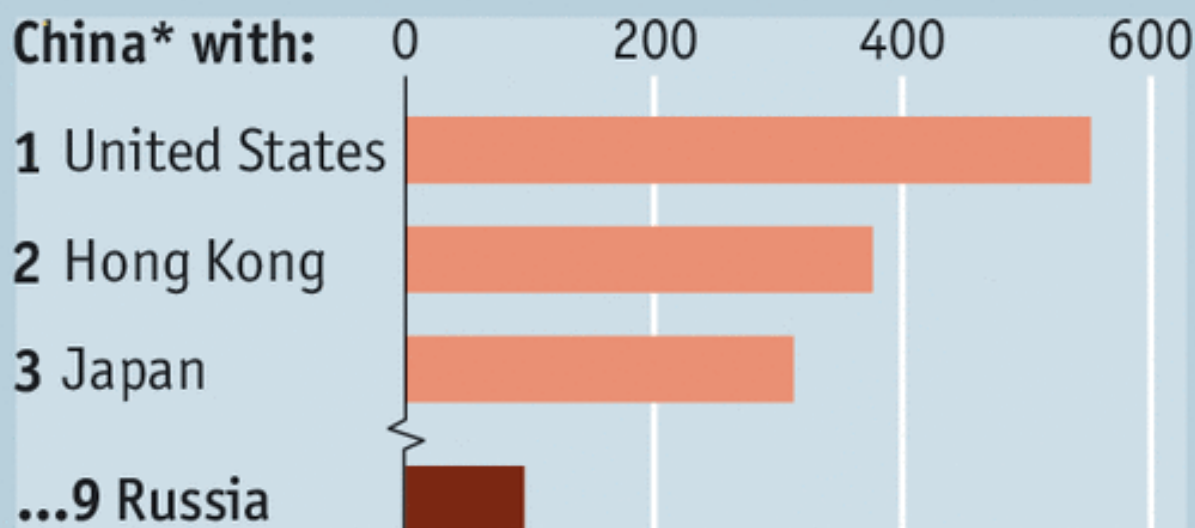
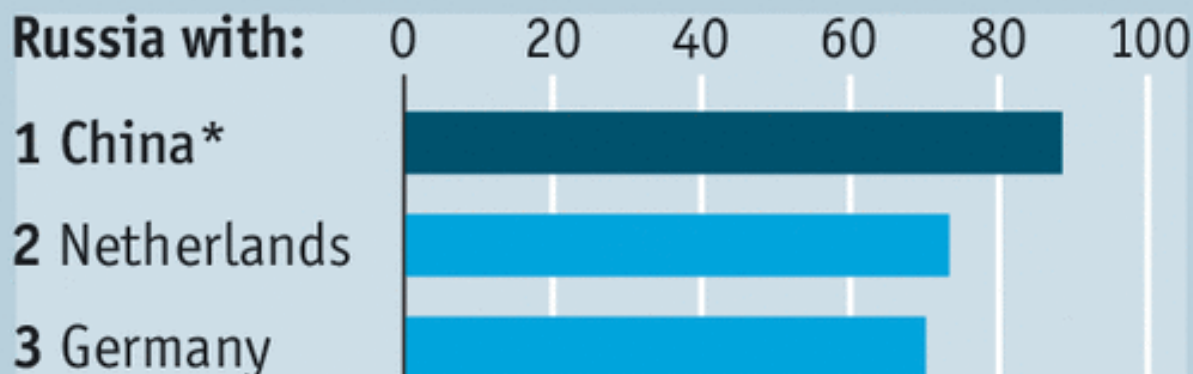
Russia's natural-gas exports, by destination 2013, in billions of cubic meters



Source: BP Statistical Review
The Wall Street Journal

Giant tiger, small bear

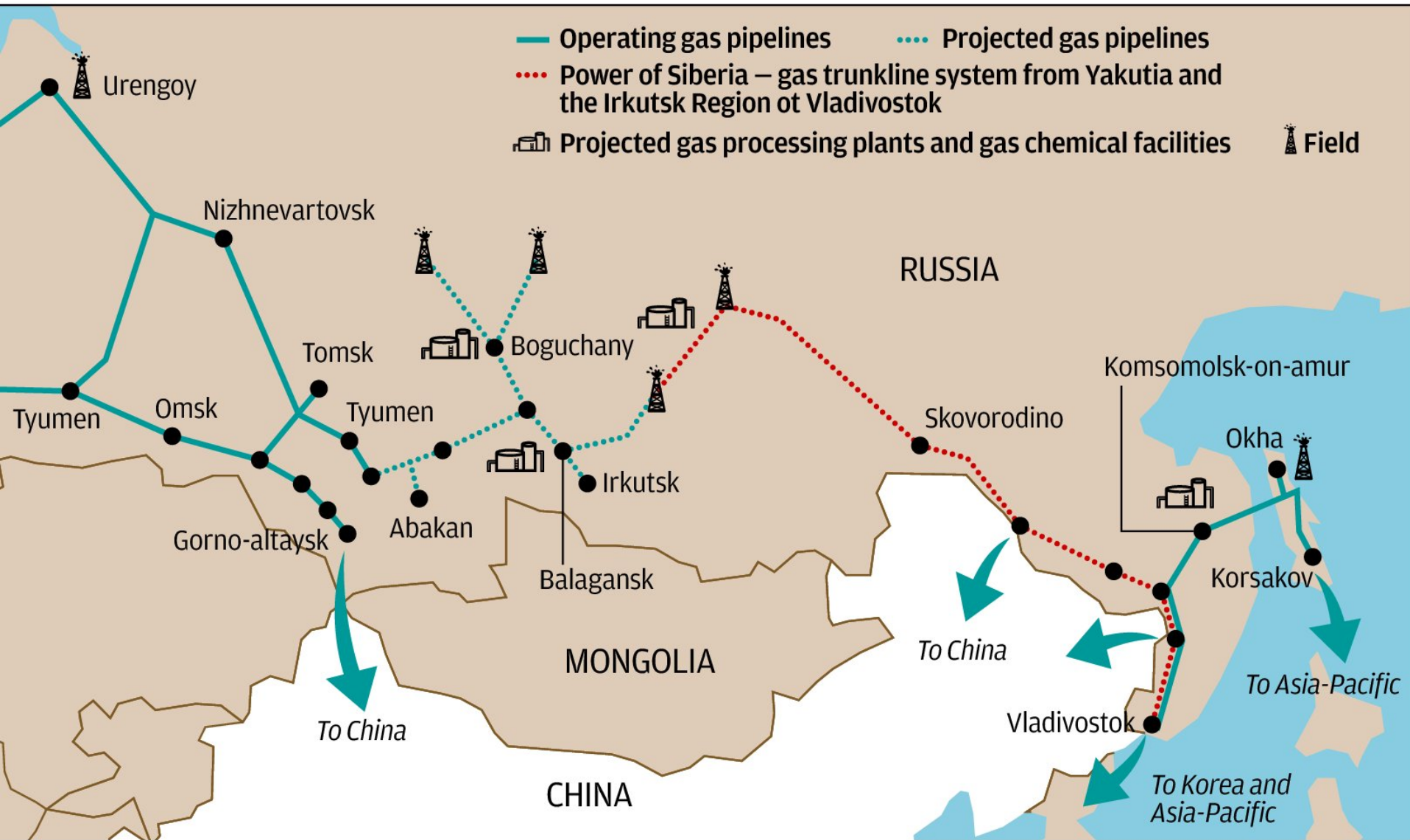
Total trade in goods, 2014, \$bn



Source: IMF

*Mainland

Russia-China Gas Pipelines



SILK ROAD



CHINA-CENTRAL ASIA INFRASTRUCTURE DEVELOPMENT



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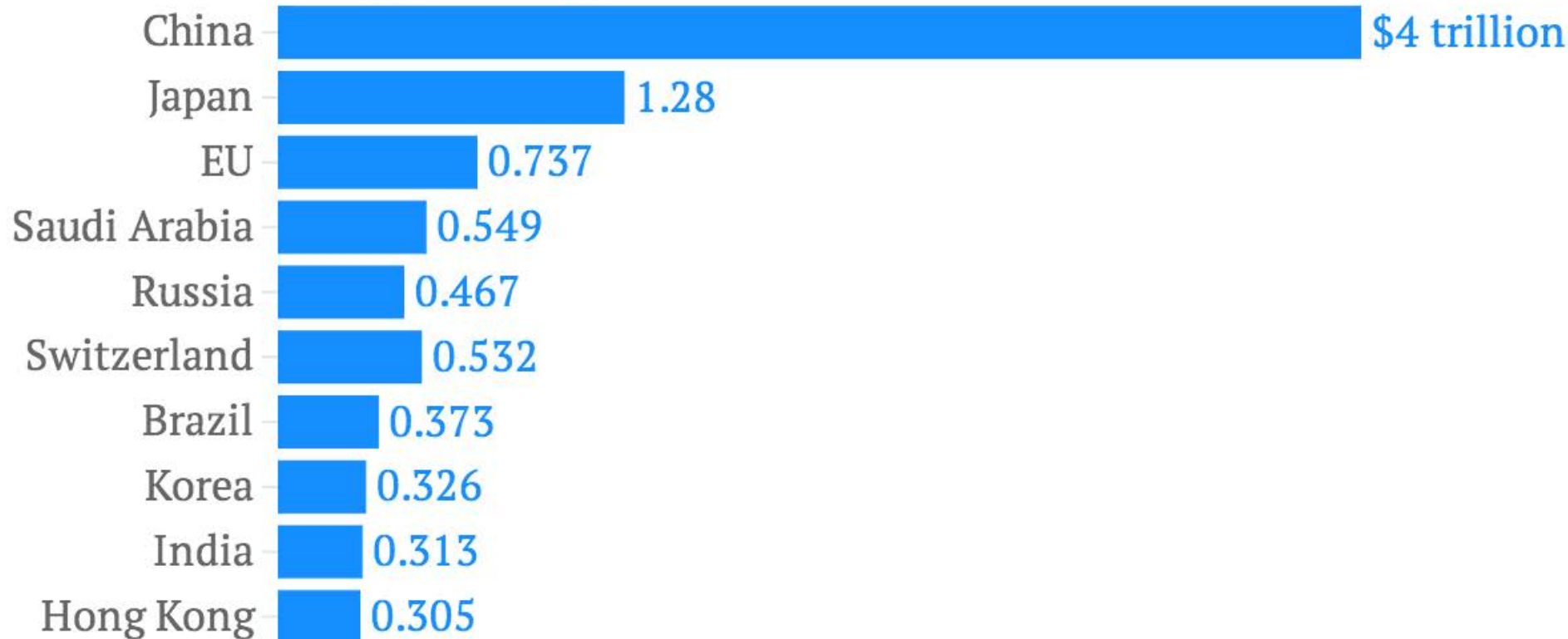
China, LNG, and the Alaska Gas Pipeline

- China is known for massive resource investments worldwide;**
- China has been innovative in how to arrange these deal:**
 - Infrastructure in exchange for copper (DRC)**
 - Infrastructure/loans for oil (Angola)**
 - Loans in exchange for oil**
 - Long-term supply of oil and gas (Russia)**
- SOEs, NOCs, Financial institutions join hands**

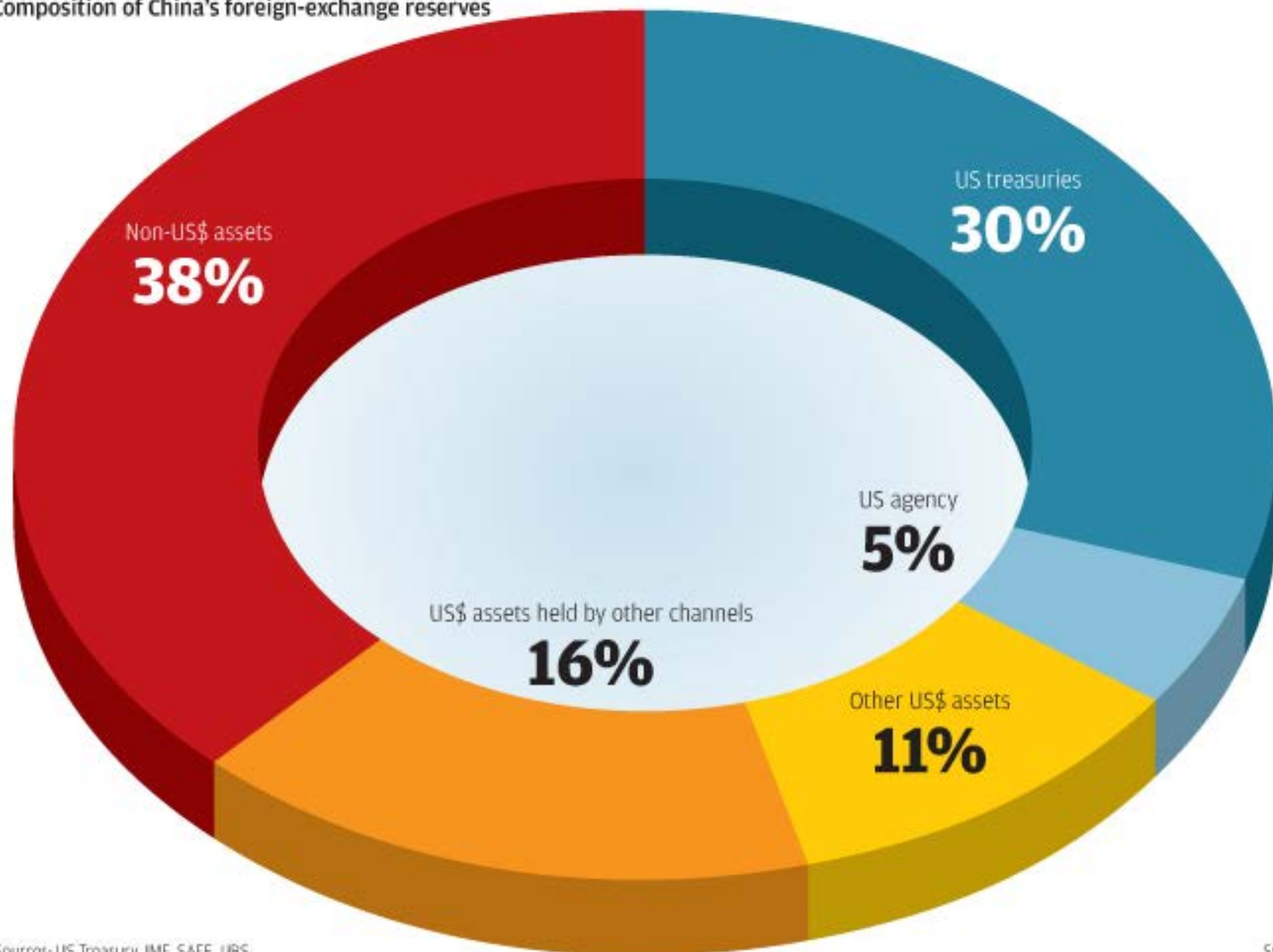
China has deep pocket for overseas assets

China's forex hoard is bigger than the next six-largest holdings combined

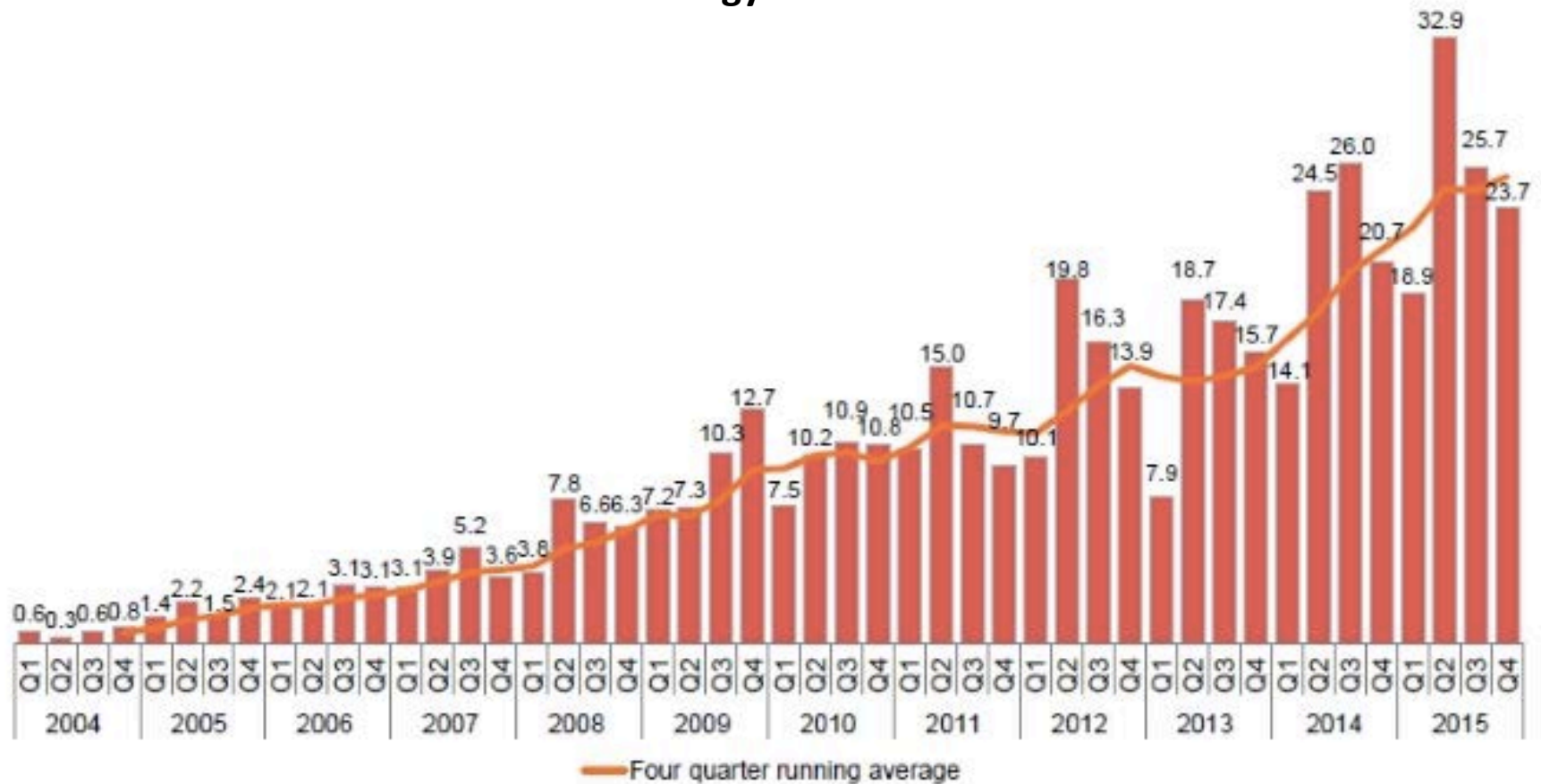
Foreign exchange reserves



Composition of China's foreign-exchange reserves



China Leads the World in Clean Energy Investment



Note: Total values include estimates for undisclosed deals. Excludes corporate and government R&D, and spending for digital energy and energy storage projects (reported in annual statistics only).

Source: Bloomberg New Energy Finance

Image: China's new investment in clean energy 2004-2015, in US\$ billion. From the "Clean Energy Investment: Q4 2015 Factpack", courtesy of [Bloomberg New Energy Finance](#)

China's National Oil Companies



中国石油天然气集团公司
CHINA NATIONAL PETROLEUM CORPORATION



中国石油化工股份有限公司
CHINA PETROLEUM & CHEMICAL CORPORATION



CNOOC LIMITED
中国海洋石油有限公司



中国中化集团公司
SINOCHEM GROUP

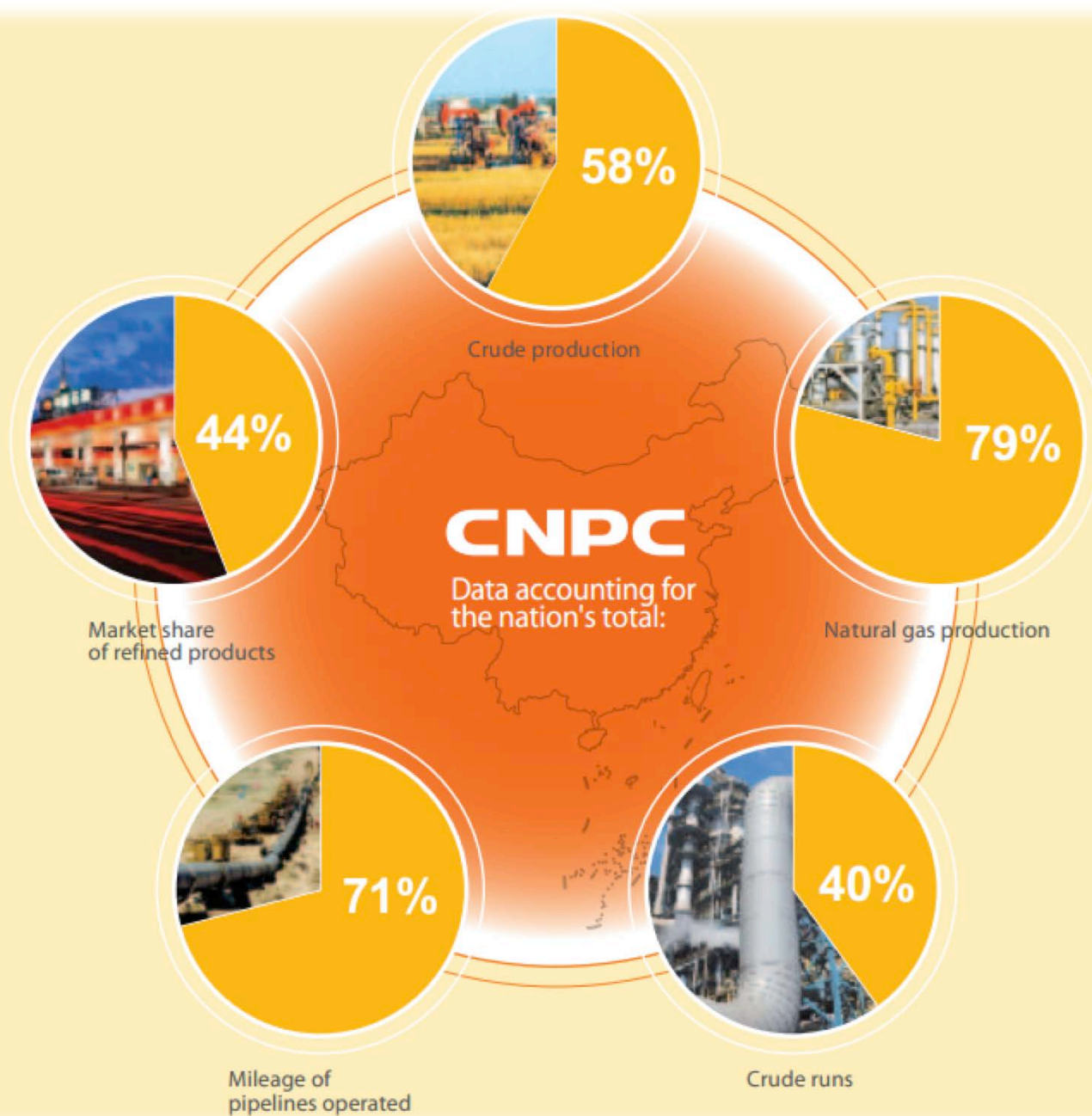
Yangtze River cuts China from West to East...



China National Petroleum Corp. (CNPC)



- China's largest oil and gas producer and distributor and World's 5th!
- PetroChina is listed subsidiary of CNPC.
- CNPC is the majority operator of China's domestic pipelines (71%)
- Dominate in Northern China



Sinopec



- Originally was put in charge of refining and marketing- dominates downstream market
- In 2010 Sinopec became the 2nd largest refiner globally.
- Southern China.

Sinopec



Sources of Crude Oil Processed by the Company

Unit: million tonnes

	2010	2009	2008	Change from 2009 to 2010 (%)
Company produced crude oil in China	35.13	35.22	34.57	(0.3)
PetroChina	5.10	7.05	6.13	(27.7)
CNOOC LIMITED	6.91	6.49	9.04	6.5
Import	165.00	138.82	128.38	18.9
Total	212.14	187.58	178.13	13.1

China National Offshore Oil Corporation CNOOC



- Third largest Chinese NOC
- Mainly offshore oil investments



- Owns more than 200 subsidiaries inside and outside China;
- Controls several listed companies:
 - Sinochem International (SH, 600500)
 - Sinofert (HK, 00297)
 - Franshion Properties (HK, 00817)
 - Far Eastern Horizon (HK, 03360).
- Earliest entrant in Fortune Global 500 and has entered the list for 21 times, ranking 168th in 2011.
- Rated by SASAC as “top A corporate performance” for 7 years in a row.



Oil production

Million barrels of oil
equivalent per day

PetroChina



2006
2.9

2010
3.4

Sinopec



2006
0.9

2010
1.1

Cnooc



2006
0.5

2010
0.9

China's oil production and consumption

Million barrels per day

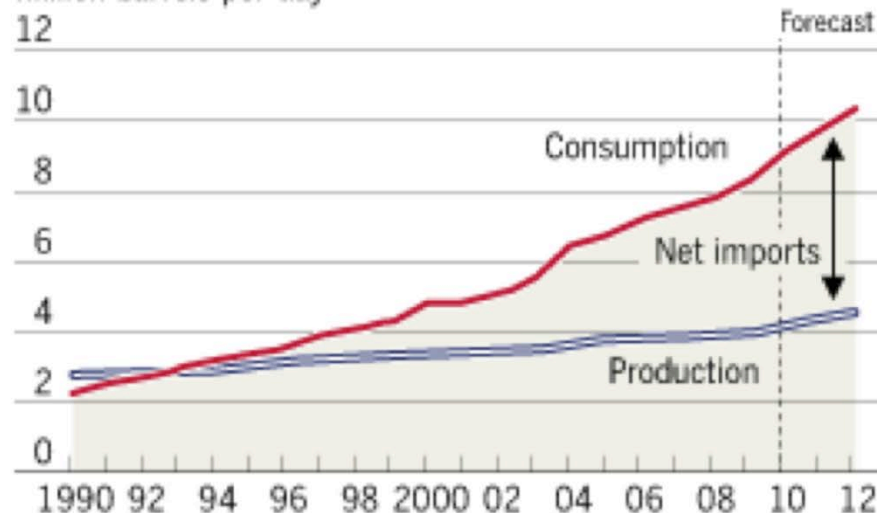
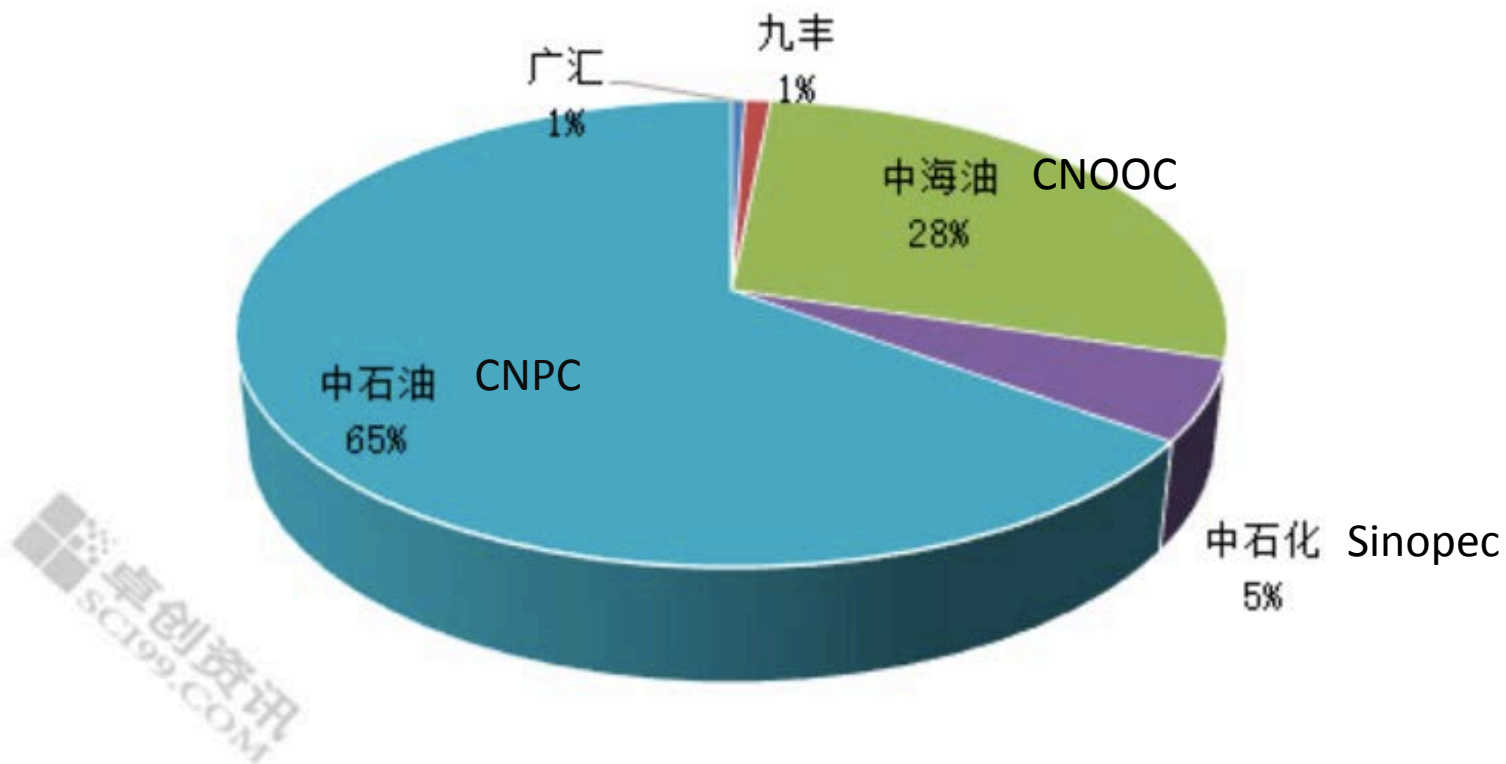


Photo: Xinhua News Agency

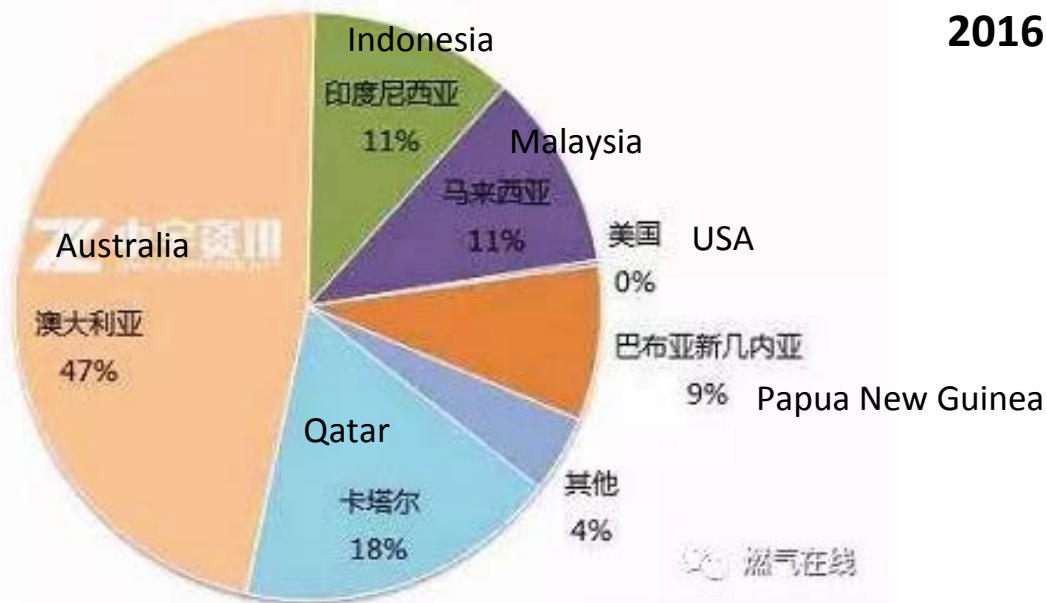
Sources: Bloomberg; EIA

January-June 2016 China gas/LNG imports by companies

2016年上半年中国天然气进口按集团对比图

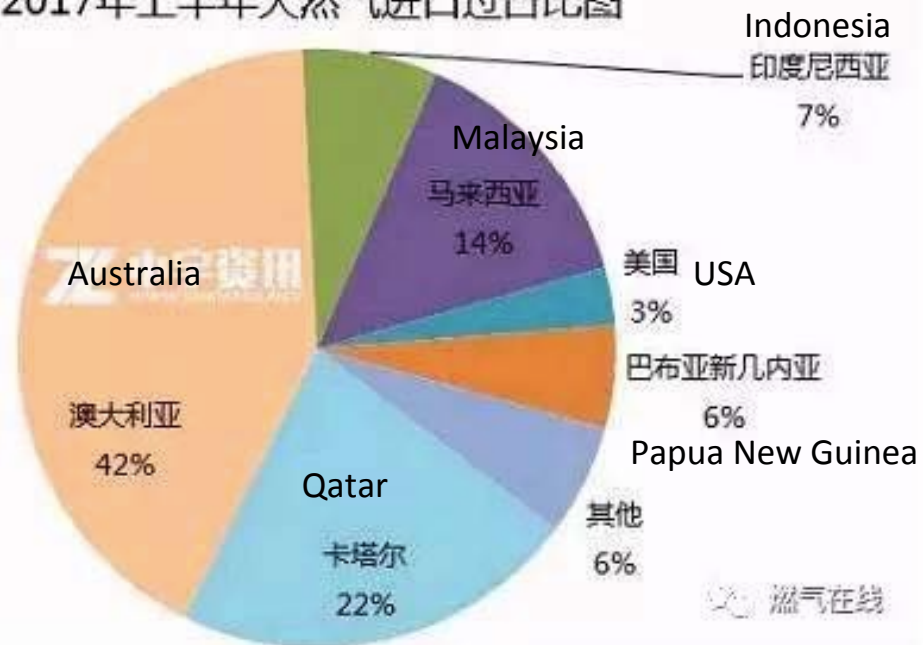


2016年天然气进口过占比图



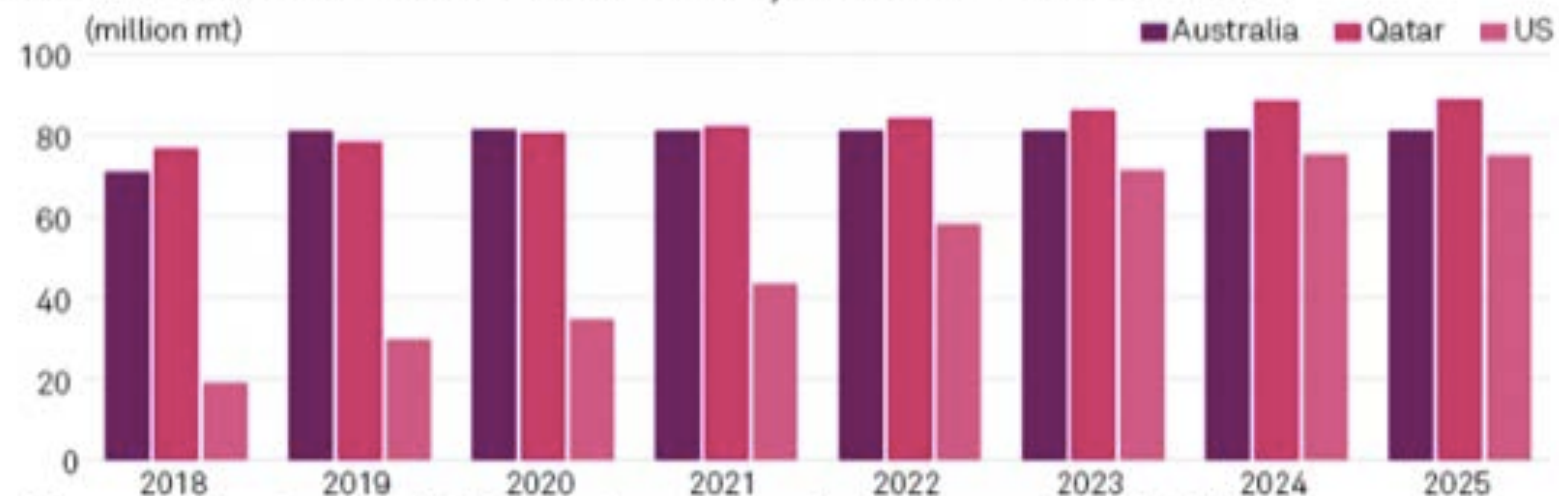
2016 China LNG import sources

2017年上半年天然气进口过占比图



2017 first half
China LNG import sources

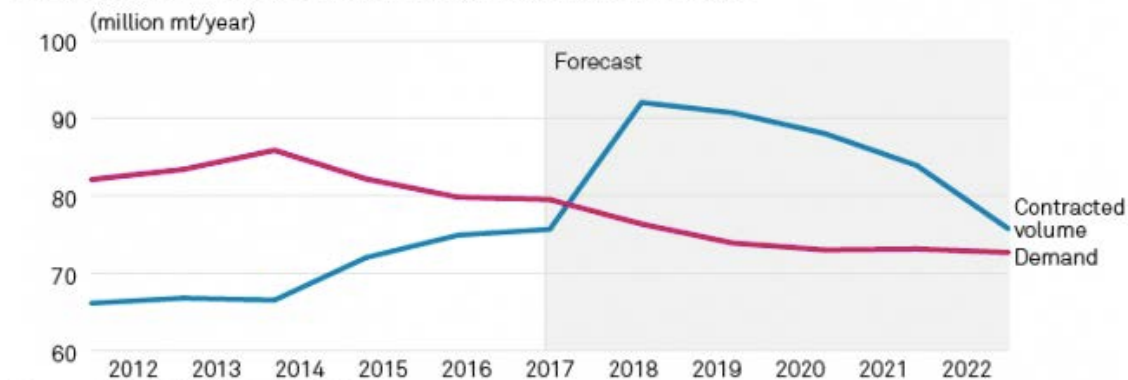
LNG EXPORT FORECAST FROM QATAR, AUSTRALIA AND THE US*



*Forecast made prior to Qatar's LNG capacity expansion plan announcement in July 2017

Source: S&P Global Platts Analytics

JAPAN LNG DEMAND VERSUS CONTRACTED VOLUME



Source: S&P Global Platts Analytics

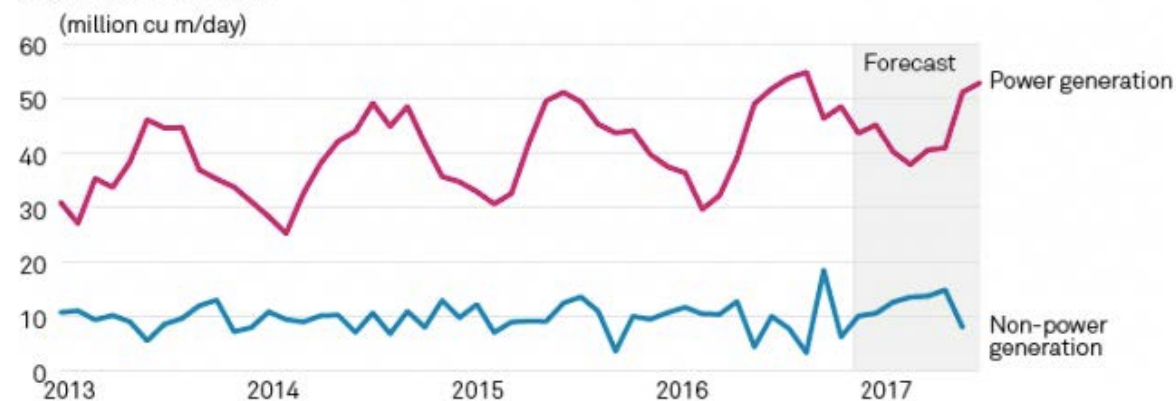
SOUTH KOREA LNG DEMAND VERSUS CONTRACTED VOLUME



Source: S&P Global Platts Analytics

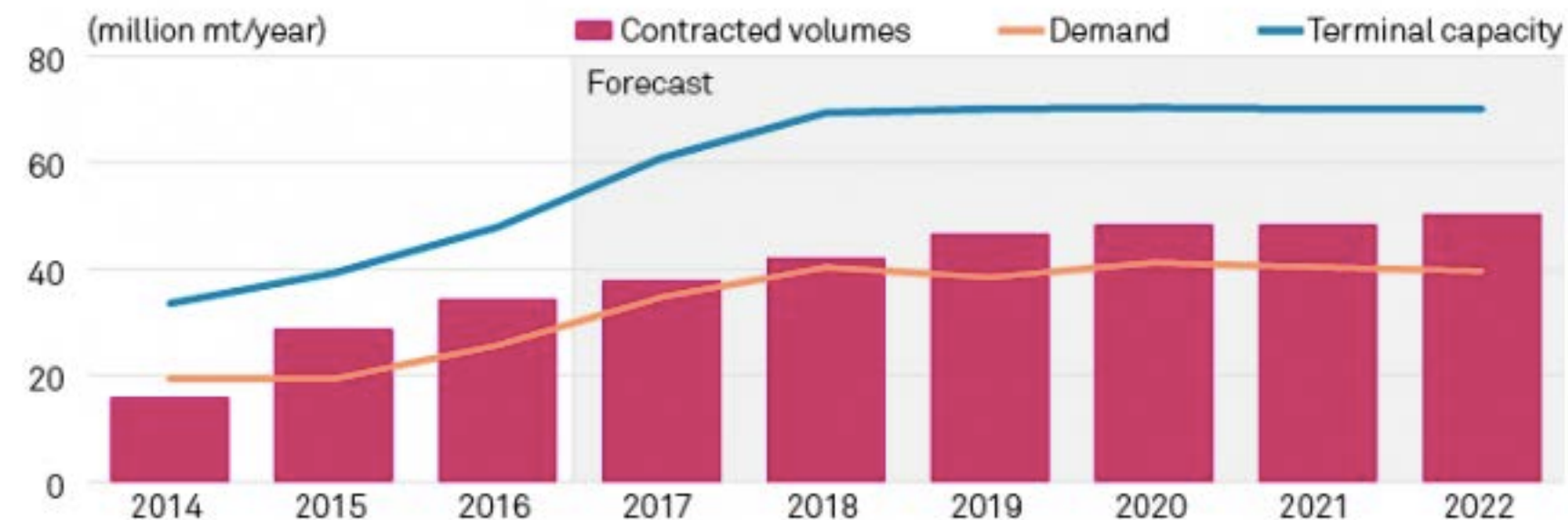
2017-2022 is forecast.

TAIWAN GAS USE



Source: S&P Global Platts Analytics

CHINA IMPORTS PROJECTIONS VERSUS CAPACITY



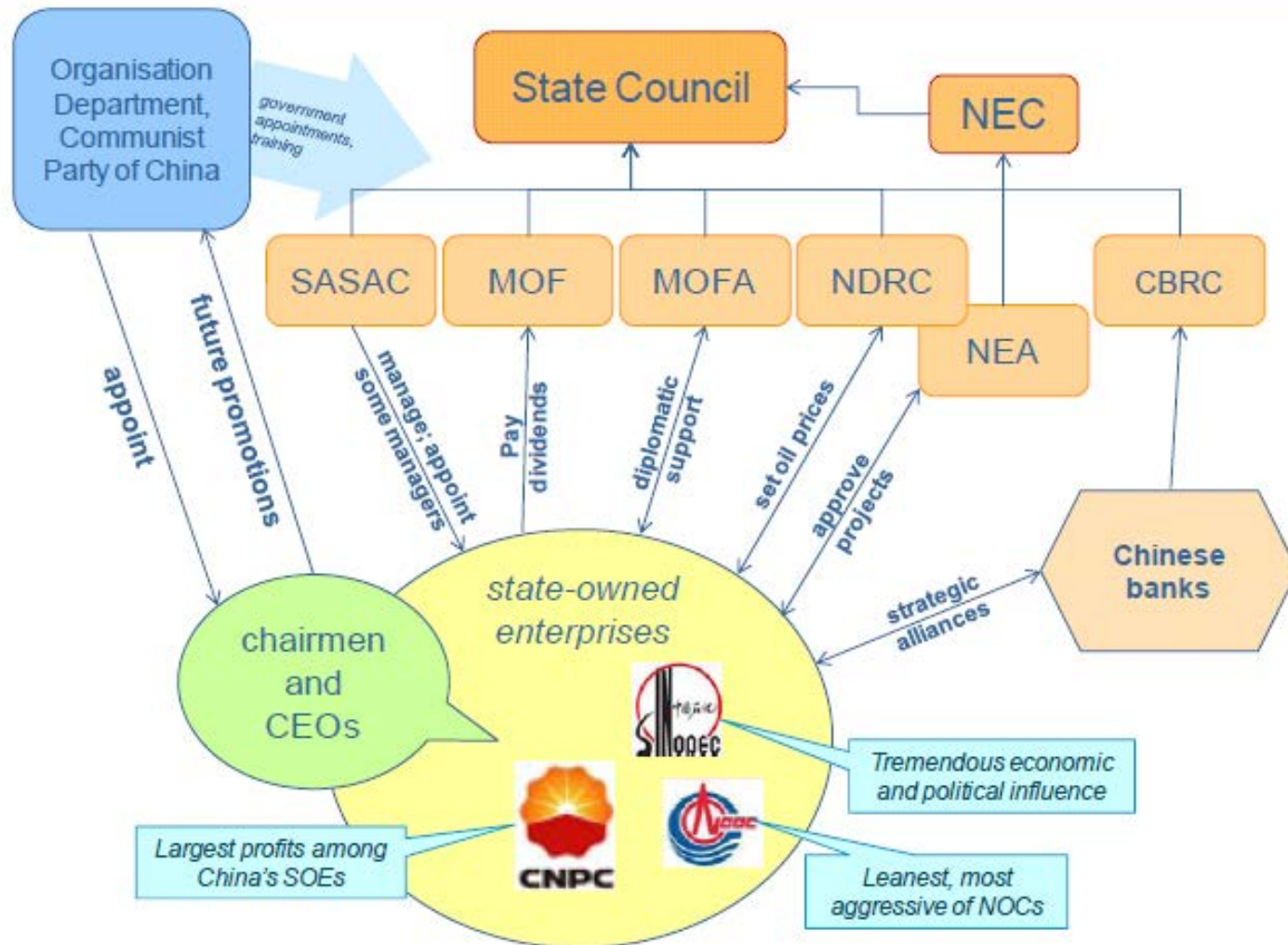
Source: S&P Global Platts Analytics

China, LNG, and the Alaska Gas Pipeline

But recent interruptions show conventional wisdoms may be misleading

- Centralized policies caused local confusion**
- Unexpected Central Asia supply cut**
- Short supply of gas, LNG and coal**
- Gas/LNG/coal price jump**

Governing Structure of Chinese NOCs

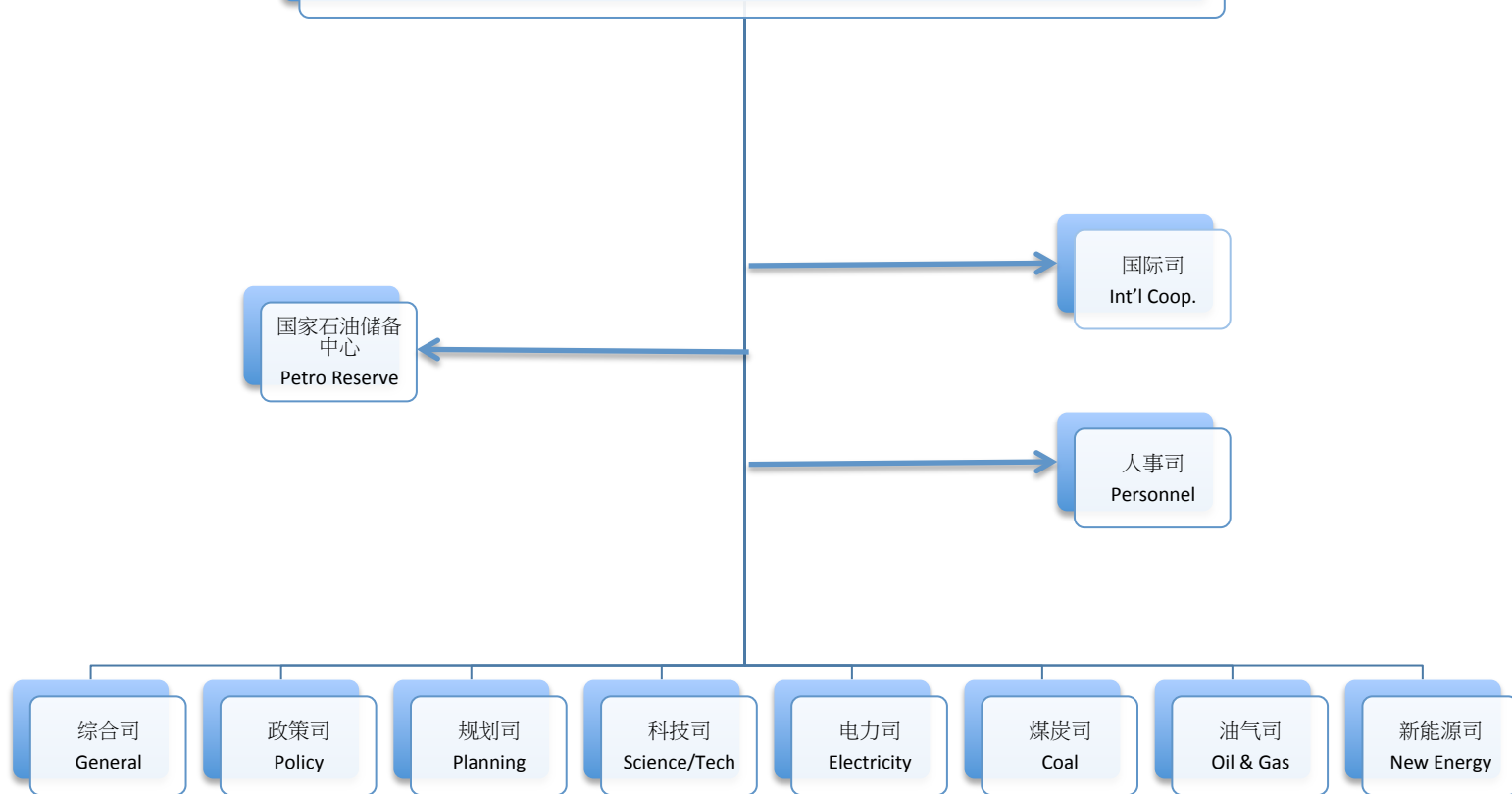


Notes: NEC = National Energy Commission; SASAC = State Assets Supervision and Administration Commission; MOF = Ministry of Finance; MOFA = Ministry of Foreign Affairs; NDRC = National Development and Reform Commission; NEA = National Energy Administration; CBRC = China Banking Regulatory Commission; SOE = state-owned enterprise.

National Energy Administration (NEA)

NEA is responsible for formulating and implementing energy development plans and industrial policies; promoting institutional reform in the energy sector; administering energy sectors including coal, oil, natural gas, power (including nuclear power), new and renewable energy and etc.; taking charge of energy conservation, comprehensive utilization of resources in the energy sector; guiding scientific and technological advancement; organizing and carrying out the R&D of important equipment and guiding the assimilation and innovation of imported complete sets of major equipment; organizing and coordinating key energy-related demonstration projects and promoting the deployment of new products, new technologies and new equipment; approving, reviewing, or examining fixed asset investment projects of the energy sector within national plans and the scale of annual plans in accordance with the authority stipulated by the State Council; conducting energy forecasting and precaution and participating in energy operation coordination and emergency preparedness; formulating and implementing national oil reserve plans and policies; taking the lead in launching international energy cooperation; participating in the formulation of policies related to energy such as resources, finance and taxation, environment protection, and addressing climate change; making recommendations on energy price adjustment and imports and exports aggregate; and undertaking the daily work of the National Energy Commission.

NEA Internal Structure/国家能源局





中國銀行

BANK OF CHINA

- **One of the four largest state-owned commercial banks**
 - Industrial and Commercial Bank of China.
 - Bank of China.
 - China Construction Bank.
 - Agricultural Bank of China
- **Plays a key function in China's global financial network**
- **Jointly lending on major overseas investment**
- **Critical player in this AGDC-Sinopec project**



- **China's Sovereign wealth fund**
- **Established in 2007 with \$200 billion**
- **Total assets now over \$800 billion**
- **Opened first N American office in Toronto in 2011**
- **But moved to NYC in 2015**
- **Plays a key function in China's global financial network**
- **Jointly lending on major overseas investment**
- **Critical player in this AGDC-Sinopec project**

China, LNG, and the Alaska Gas Pipeline

Major Chinese Investment in Canada Since late 2009

IN	\$	FROM
Teck Resources	\$1.5 bil.	China Investment Corp.
AOSC	\$1.9 bil.	PetroChina
Syncrude	\$4.65 bil	Sinopec
Penn West Energy	\$1.25 bil	China Investment Corp.
Opti/Nexen	\$2.1 bil.	CNOOC
Daylight (100%)	\$2.2 bil.	Sinopec
Shell Canada	\$1.1 bil.	PetroChina
Talisman (North Sea)	\$1.5 bil.	Sinopec
Nexen (100%)	\$15.1 bil.	CNOOC
EnCana	\$2.2 bil.	PetroChina
TOTAL:	About \$35 billion	

**CIC invested \$1.25 billion in Penn West Corp. in 2010, at over \$18 per share...
Now ...**

1.31 **+0.08 (6.50%)**

Sep 13 - Close

TSE data delayed by 15 mins - Disclaimer
Currency in CAD

Range	1.23 - 1.31	Div/yield	-
52 week	1.03 - 1.72	EPS	-0.89
Open	1.23	Shares	504.33M
Vol / Avg.	848,466.00/557,986.00	Beta	4.25
Mkt cap	660.67M	Inst. own	-
P/E	-		

G+

Compare: ☐ S&P TSX ☐ CR ☐ ARX ☐ TVE ☐ TOU ☐ PXT ☐ POE ☐ CVE ☐ more »

Zoom: [1d](#) [5d](#) [1m](#) [3m](#) [6m](#) [YTD](#) [1y](#) [5y](#) [10y](#) [All](#)

Sep 14, 2007 - Sep 13, 2017 -29.1 (-95.69%)



[Settings](#) | [Technicals](#) | [Link to this view](#)

Sources include SIX.

CIC invested \$500 million in 2009. Now...

SouthGobi Resources Ltd (TSE:SGQ)

0.220 0.000 (0.00%)

Sep 13 - Close

TSE data delayed by 15 mins - Disclaimer

Currency in CAD

Range	-	Div/yield	-
52 week	0.20 - 1.30	EPS	-0.20
Open	-	Shares	272.60M
Vol / Avg.	0.00/653.00	Beta	0.69
Mkt cap	59.97M	Inst. own	-
P/E	-		

1d 5d 1m 3m 6m 1y 5y Max



CIC invested \$150 million in 2012. Now...

SUNSHINE OILSANDS LTD (TSE:SUO)

0.00000

- Close

TSE data delayed by 15 mins - Disclaimer

Currency in

Range	-	Div/yield	-
52 week	0.05 - 0.17	EPS	-0.02
Open	-	Shares	3.90T
Vol / Avg	0.00/415,889.00	Beta	-
Mkt cap	-	Inst. own	-
P/E	-		

1m 3m 6m 1y 5y Max



Sunshine Oilsands Ltd

HKG: 2012 - Sep 14, 4:00 PM GMT+8

0.22 HKD 0.00 (0.00%)

1 day

5 day

1 month

3 months

1 year

5 years

max



China, LNG, and the Alaska Gas Pipeline

Chinese investment in Canada's oil sands:

Beginning in 2010, CIC made four strategic investments in the oilsands worth about \$1.9 billion in total.

2015 conclusion:

The investments have led to massive losses and much soul-searching at CIC. Today, the corporation's big bets on Canadian resources, not counting Teck, are worth less than 20 cents on the dollar.

China, LNG, and the Alaska Gas Pipeline

Overview:

- I. China & its Demand for LNG
- II. Alaska and LNG Supply
- III. The AGDC-Sinopec MOU
- IV. Conclusion**

China, LNG, and the Alaska Gas Pipeline

- **China's is the largest growing market for LNG**
- **China's demand for LNG is driven by both market & policy**
- **China's energy market growth will be volatile**
- **There are increasing competition for China's LNG market**
- **Global capacities are increasing, partly due to US exports**
- **Chinese overseas energy investment has shifted to the US**
- **Chinese large NOC and investment players are key drivers**
- **AGDC-Sinopec MOU is well positioned**
- **But Chinese are cautious, and are hard negotiators**
- **More work and expertise are required to finalize the MOU**
- **Alaska/AGDC should engage Chinese extensively**