China, LNG, and the Alaska Gas Pipeline

Presentation to Alaska Legislature
February 22, 2018

Wenran Jiang, Ph.D.
Special Advisor on China, The Energy Council
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

Office of the Prime Minister / Cabinet du Premier Ministre

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

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

Overview:

I. China & its Demand for LNG

II. Alaska and LNG Supply

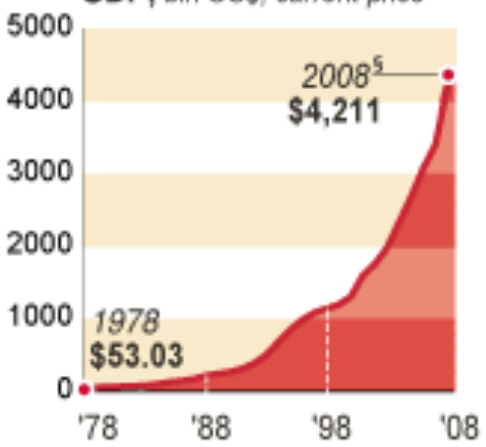
III. The AGDC-Sinopec MOU

IV. Conclusion

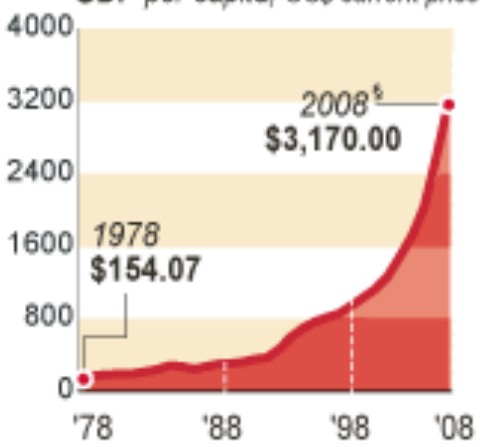
China's growth

Area:
9.6 mln sq km
Population:
1.33 billion

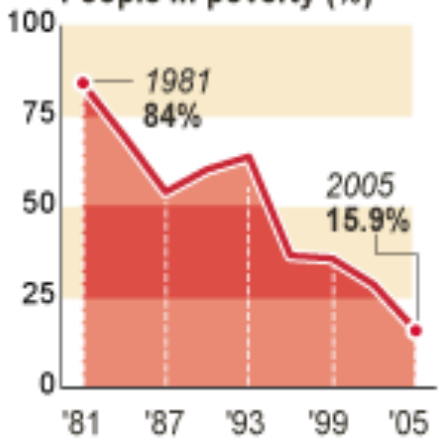
GDP, *bln US$, current price*



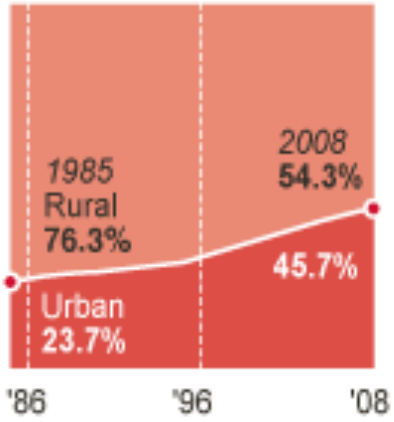
GDP *per capita, US$ current price*



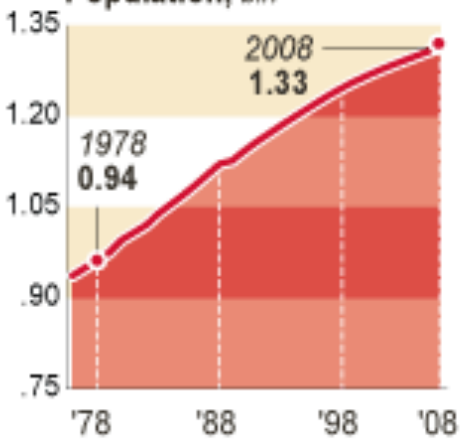
People in poverty (%)*



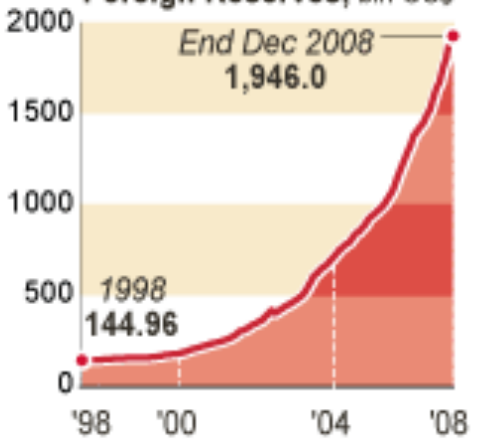
Rural/Urban population



Population, *bln*



Foreign Reserves, *bln US$*



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

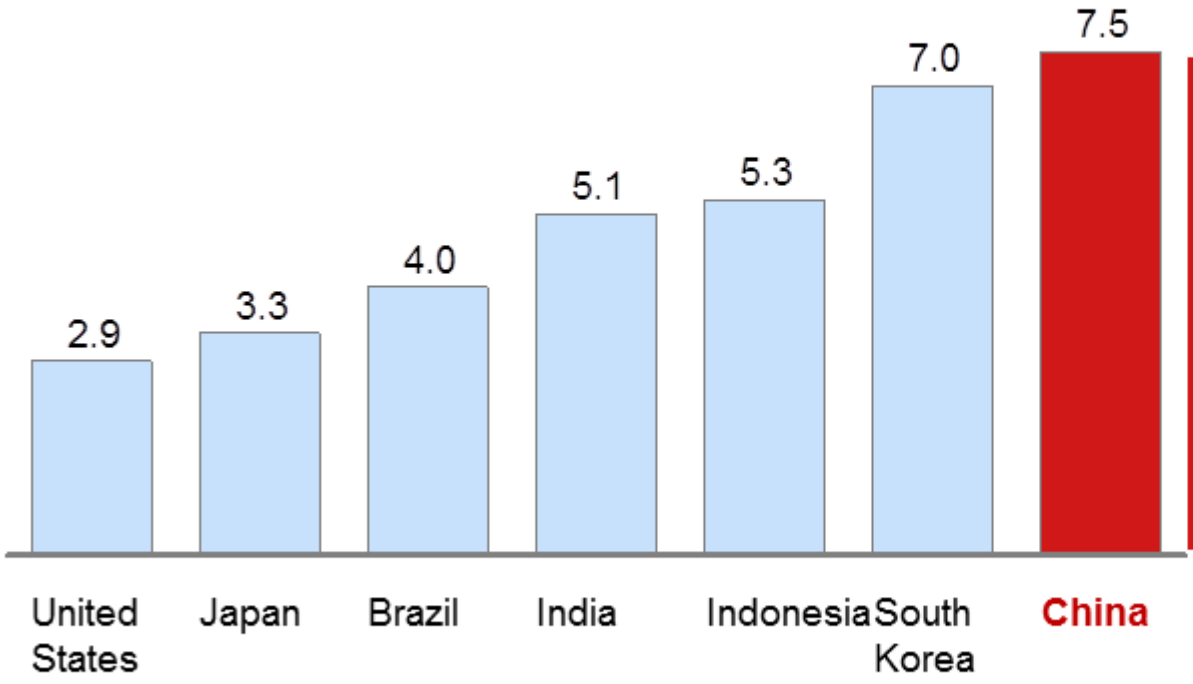
03/04/09

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

REUTERS

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

GDP Growth
Compounded annual growth rate 1964-2014, percent



China 1964-2014

33-fold increase in GDP

25% from **employment growth**
75% from **productivity growth**

14x increase in **productivity**
20x rise in **per capita income**

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

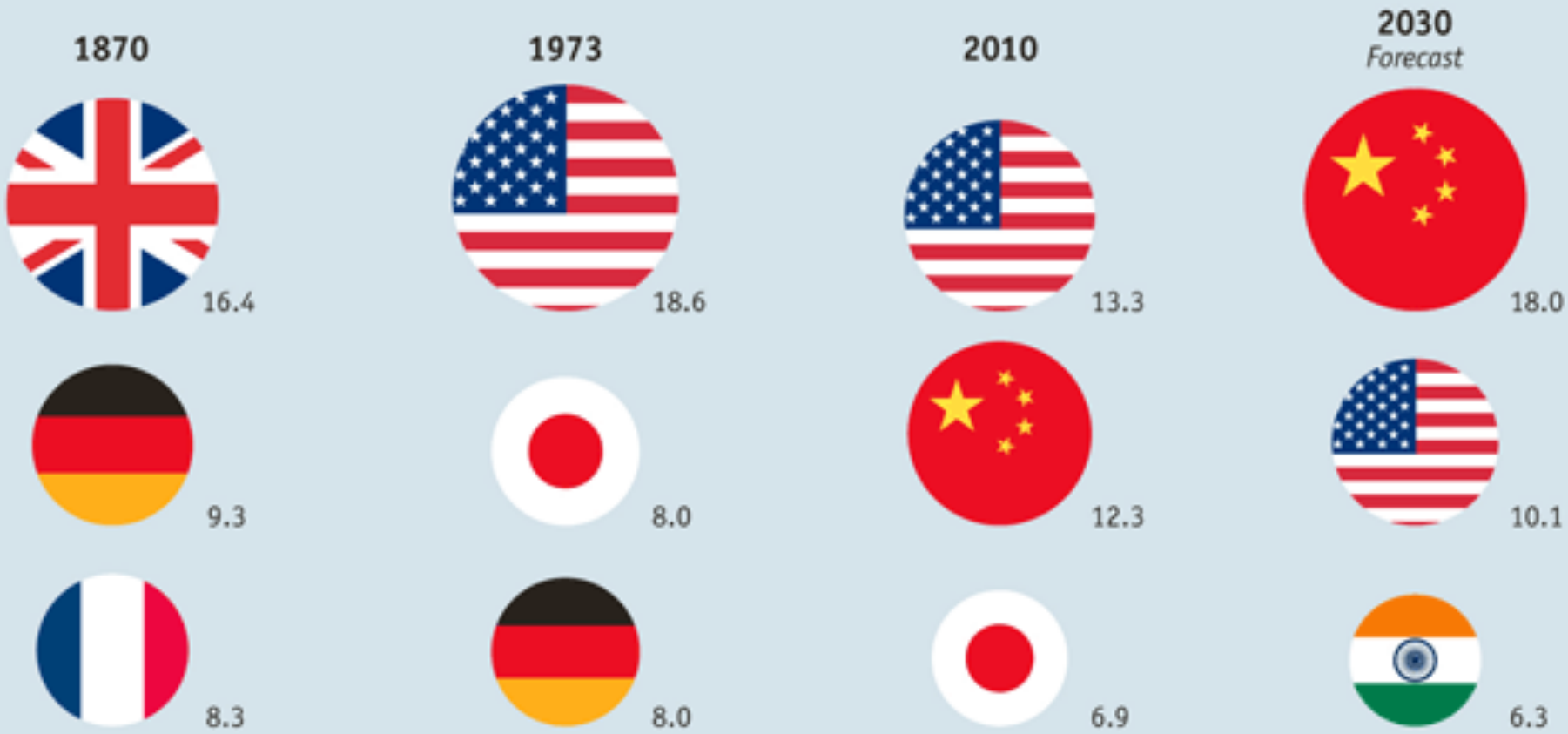
McKinsey & Company

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

But China's Total GDP Value Keeps Getting Bigger

Top three countries by economic dominance

% share* of global economic power



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

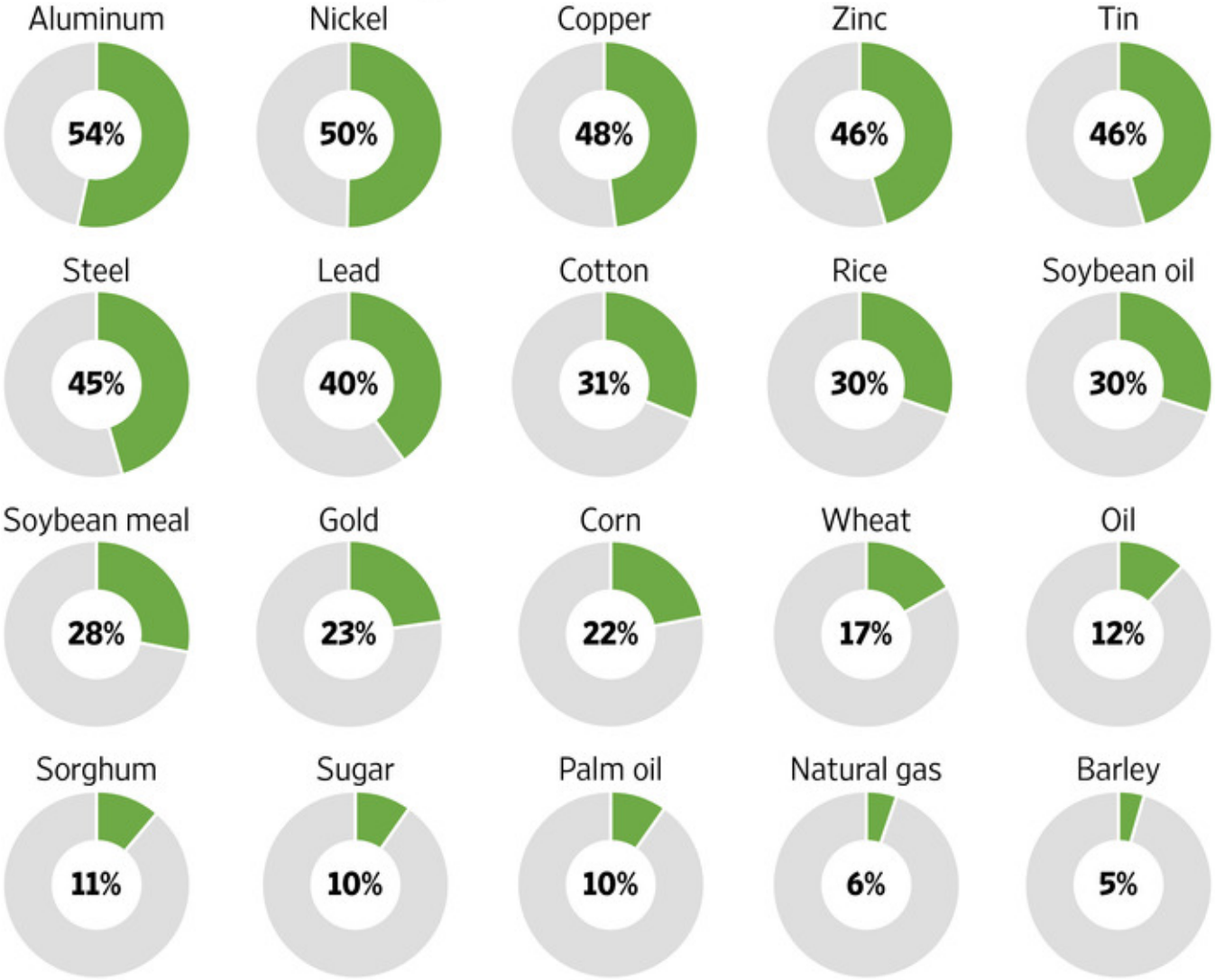
4. Severe damage to the environment & major contribution to global warming

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

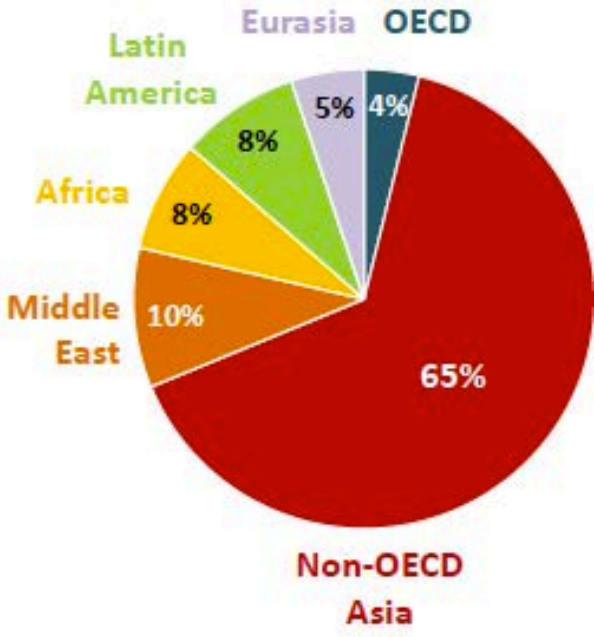


Sources: World Bureau of Metal Statistics (first six months of 2015 for refined metals, slab zinc); World Gold Council (2014 for gold); BP Statistical Review of World Energy 2015 (2014 for oil, natural gas); Metalytics via Morgan Stanley (2015 estimate for finished steel); U.S. Department of Agriculture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

THE WALL STREET JOURNAL.

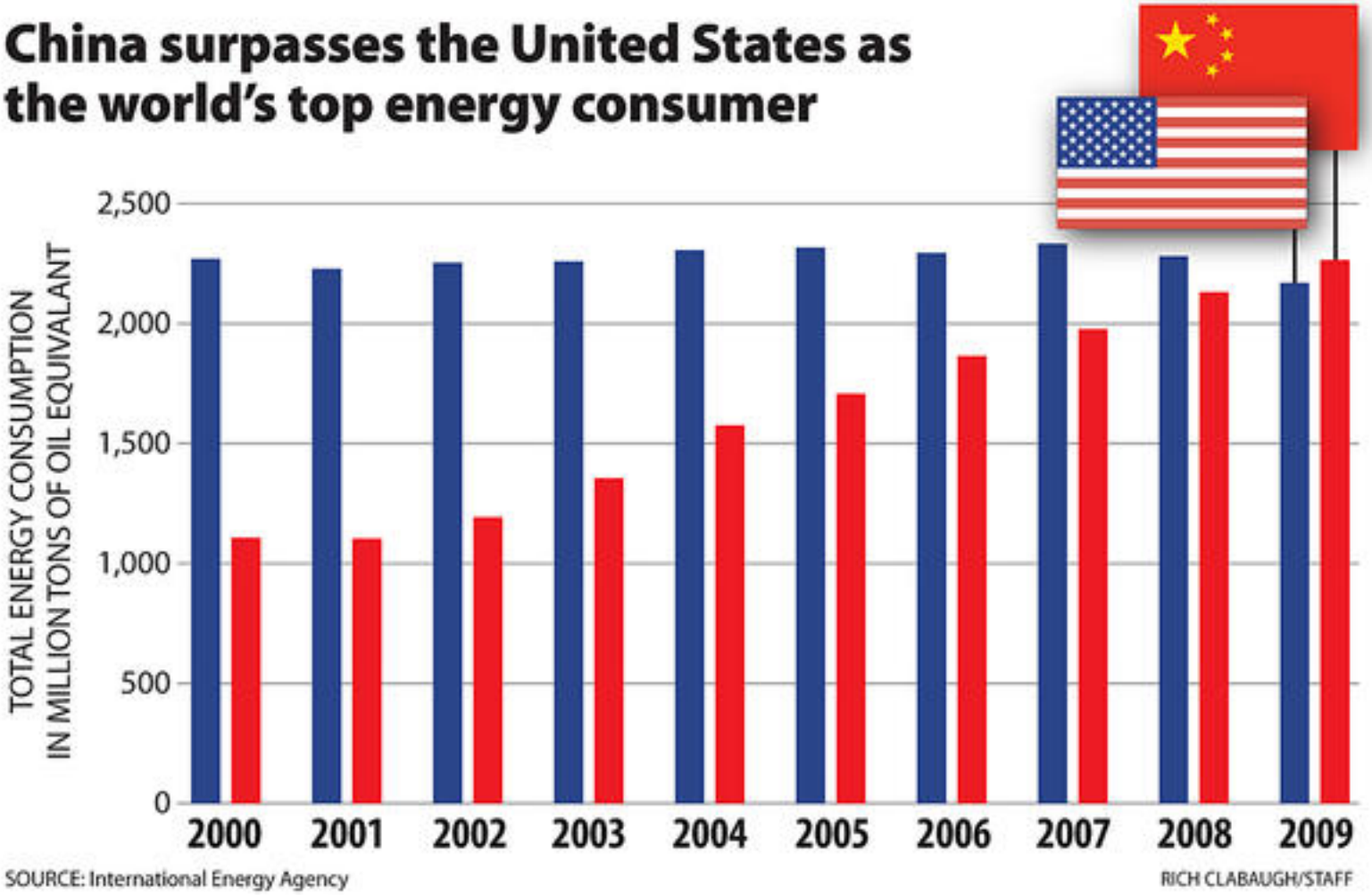
Primary energy demand, 2035 (Mtoe)

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

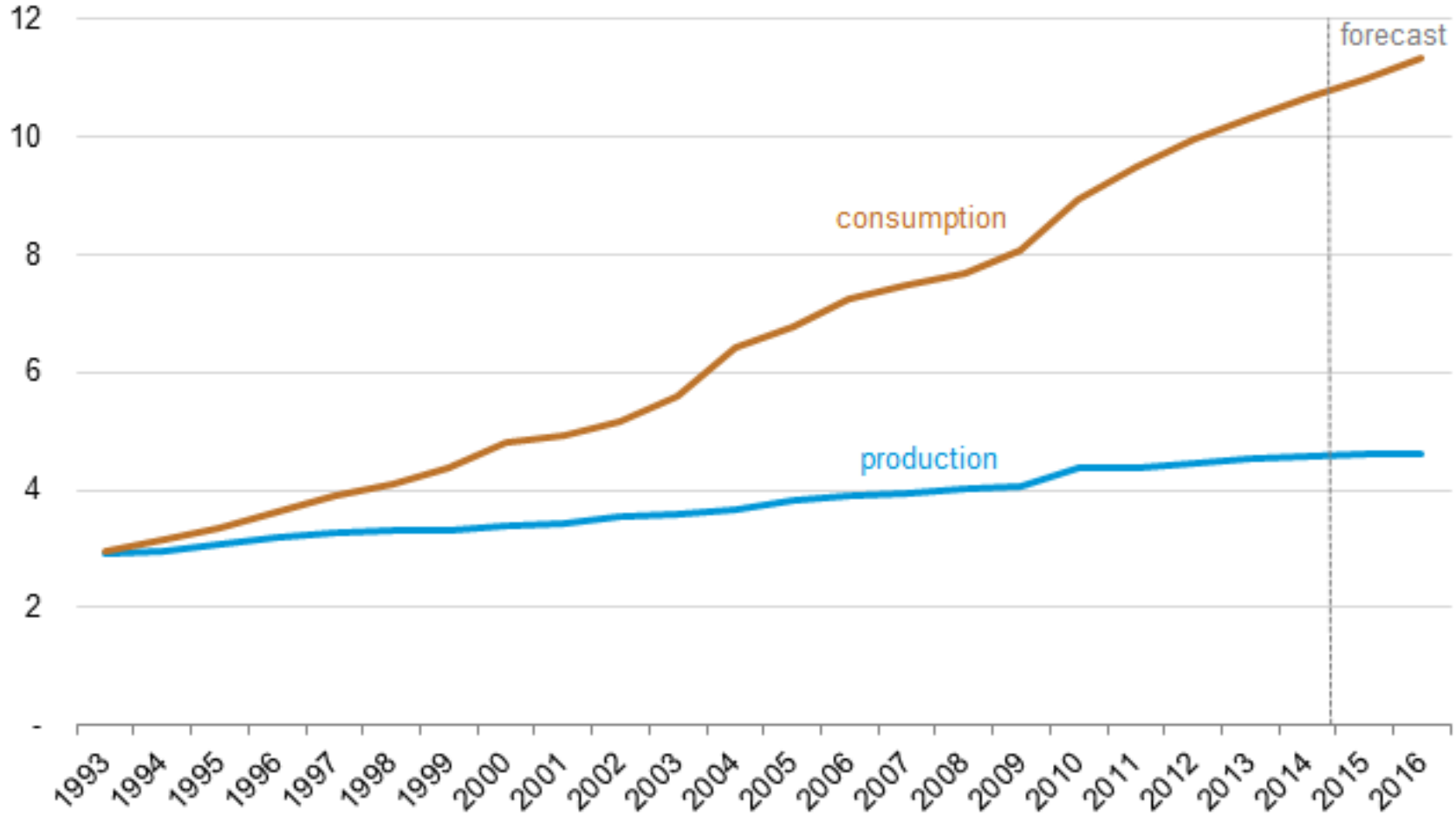


SOURCE: International Energy Agency

RICH CLABAUGH/STAFF

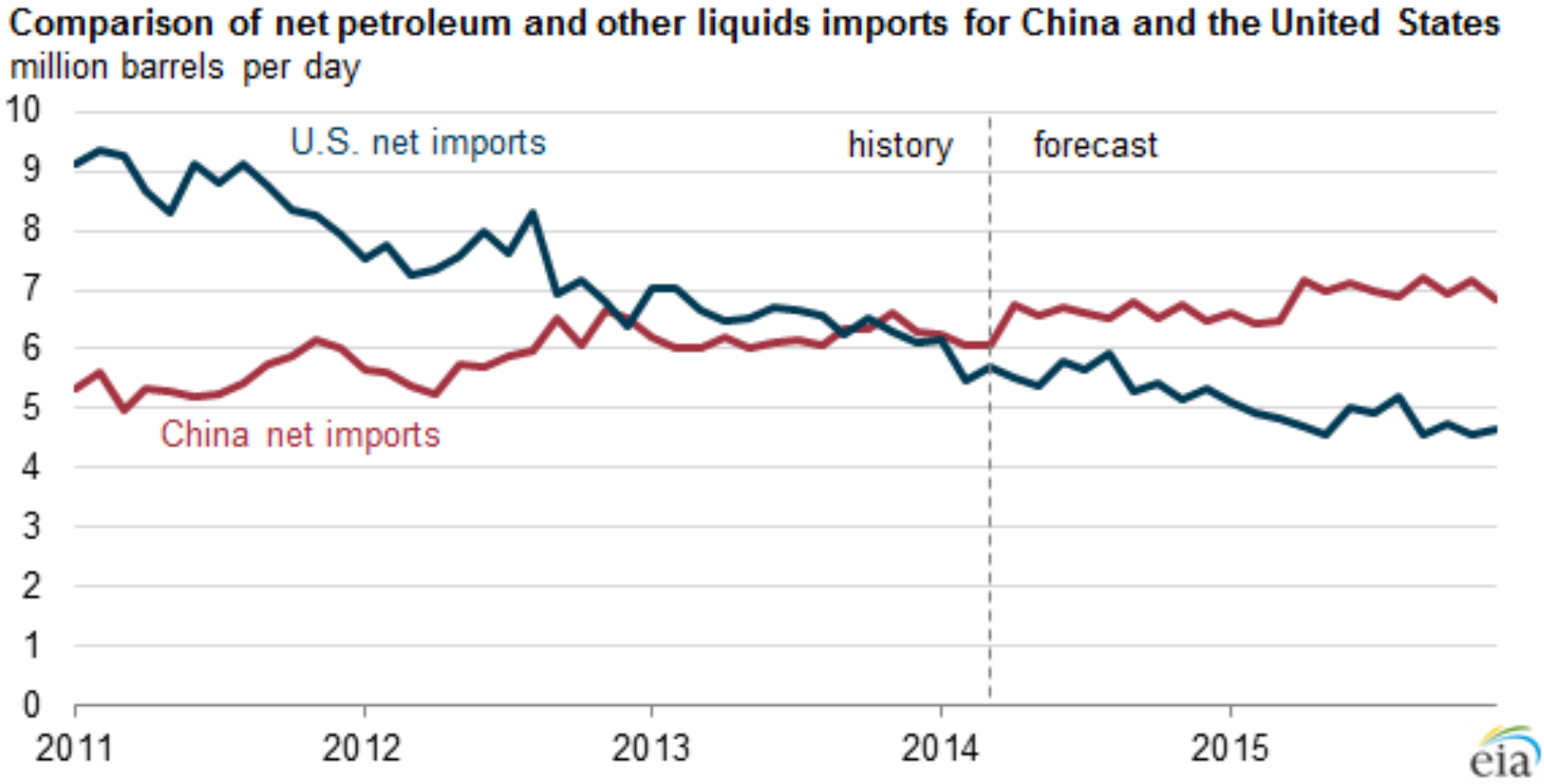
China's oil production and consumption, 1993-2016

million barrels per day



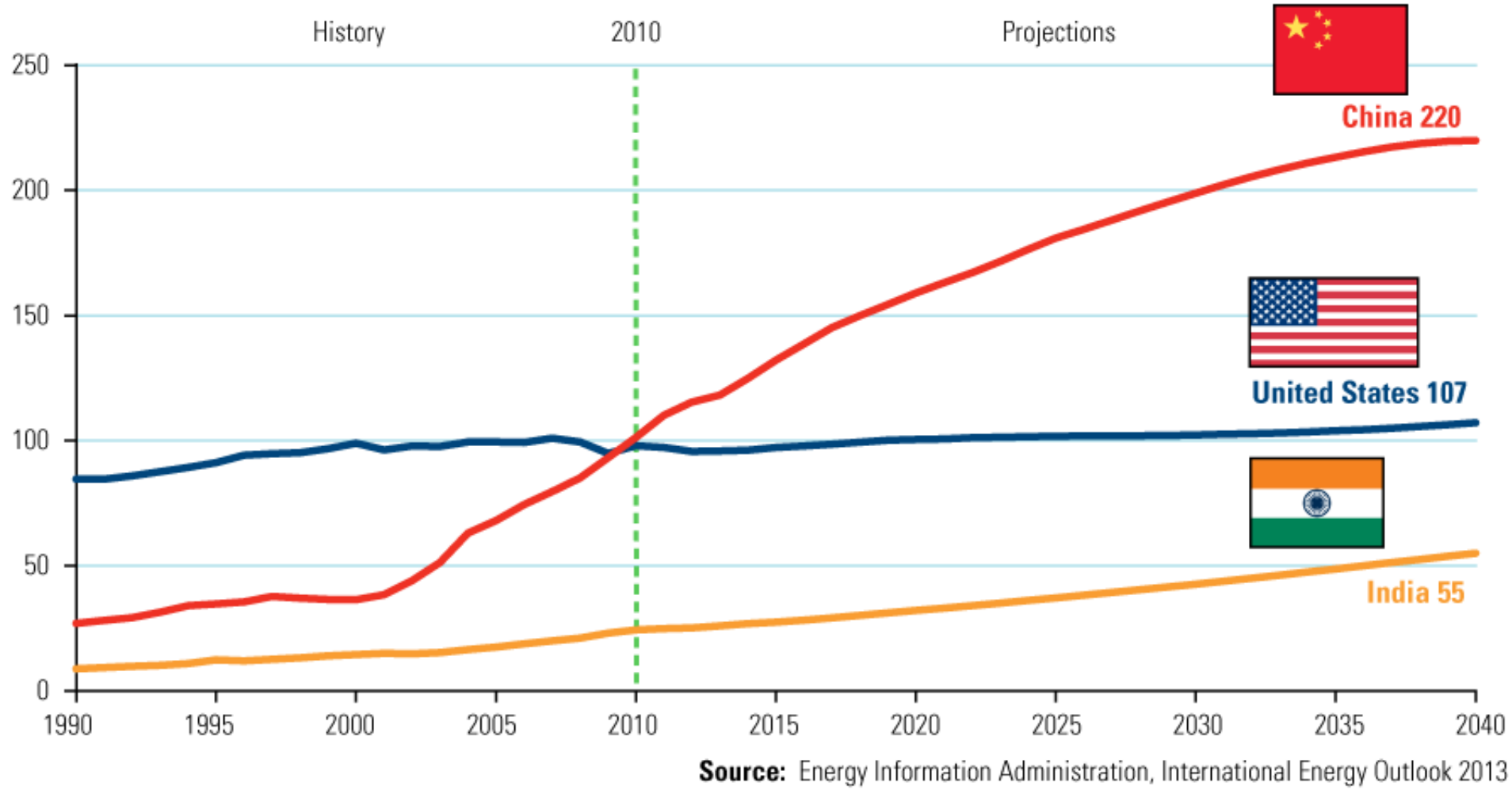
eia Source: Energy Information Administration and *Short-Term Energy Outlook, May 2015*

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



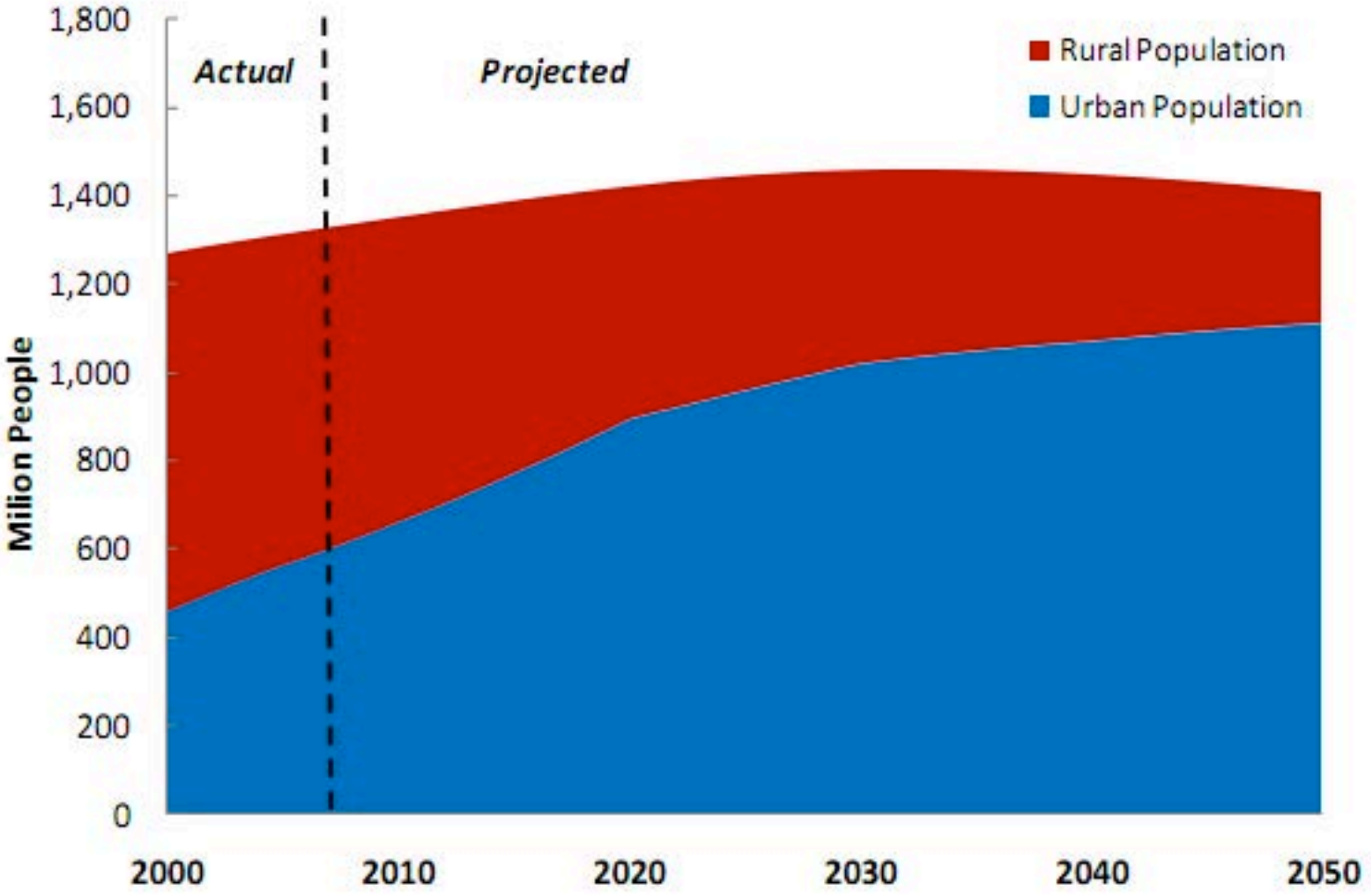
China's Energy Use Could Double U.S. Level by 2040

Energy Consumption in Quadrillion British Thermal Units



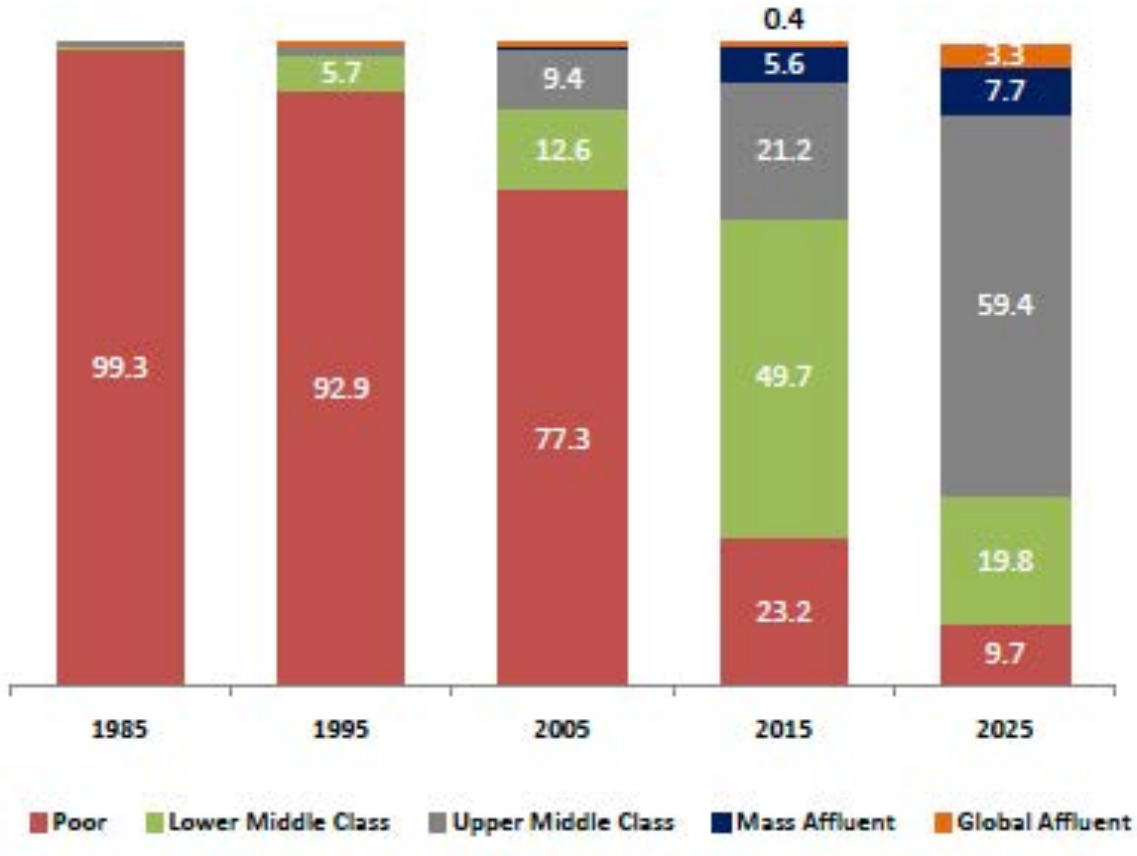
Source: Energy Information Administration, International Energy Outlook 2013

Historical &Projected Population & Urbanization Trends in China



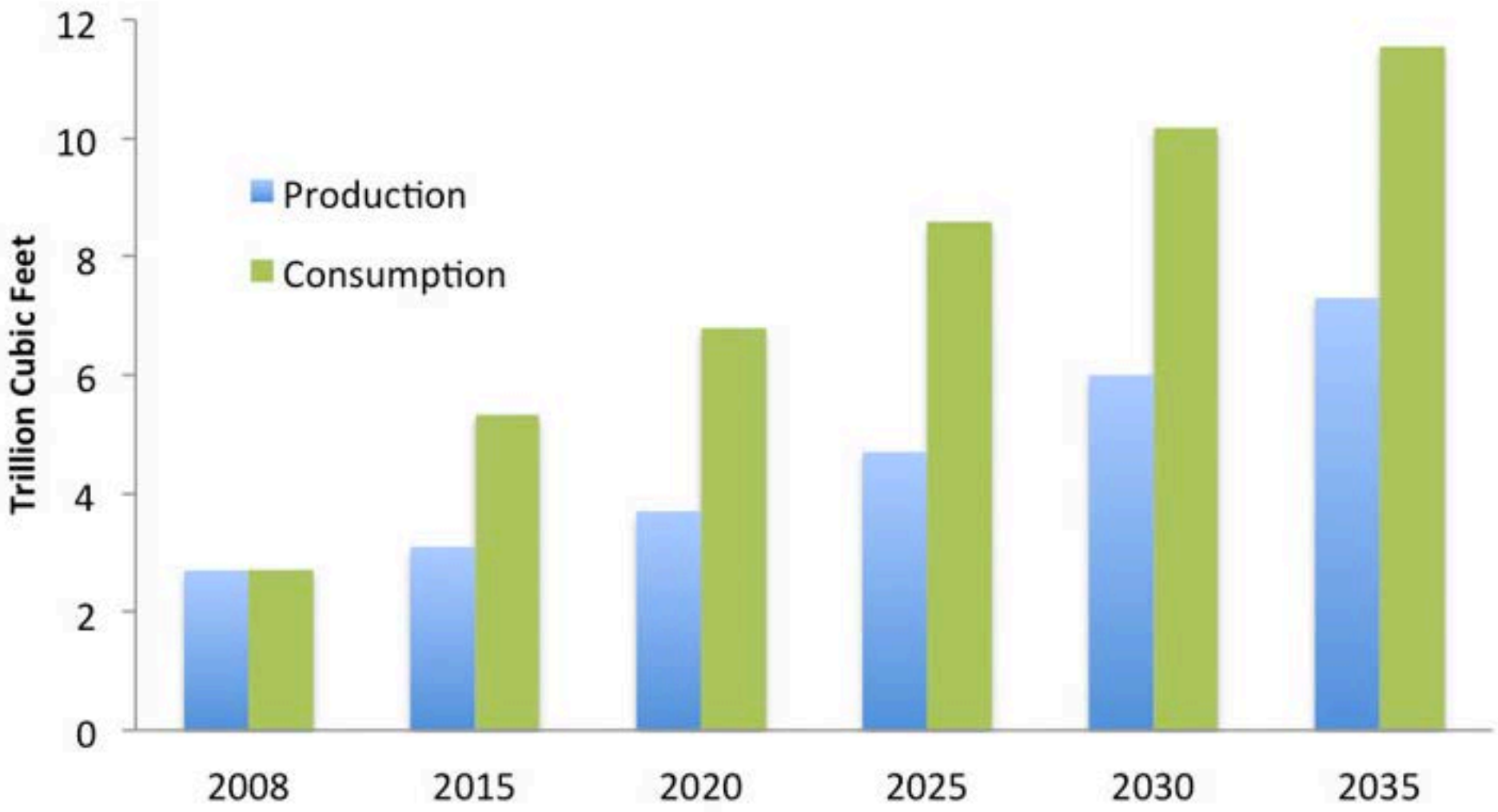
Source: Lawrence Berkeley National Laboratory

Urbanization and China's emerging middle class



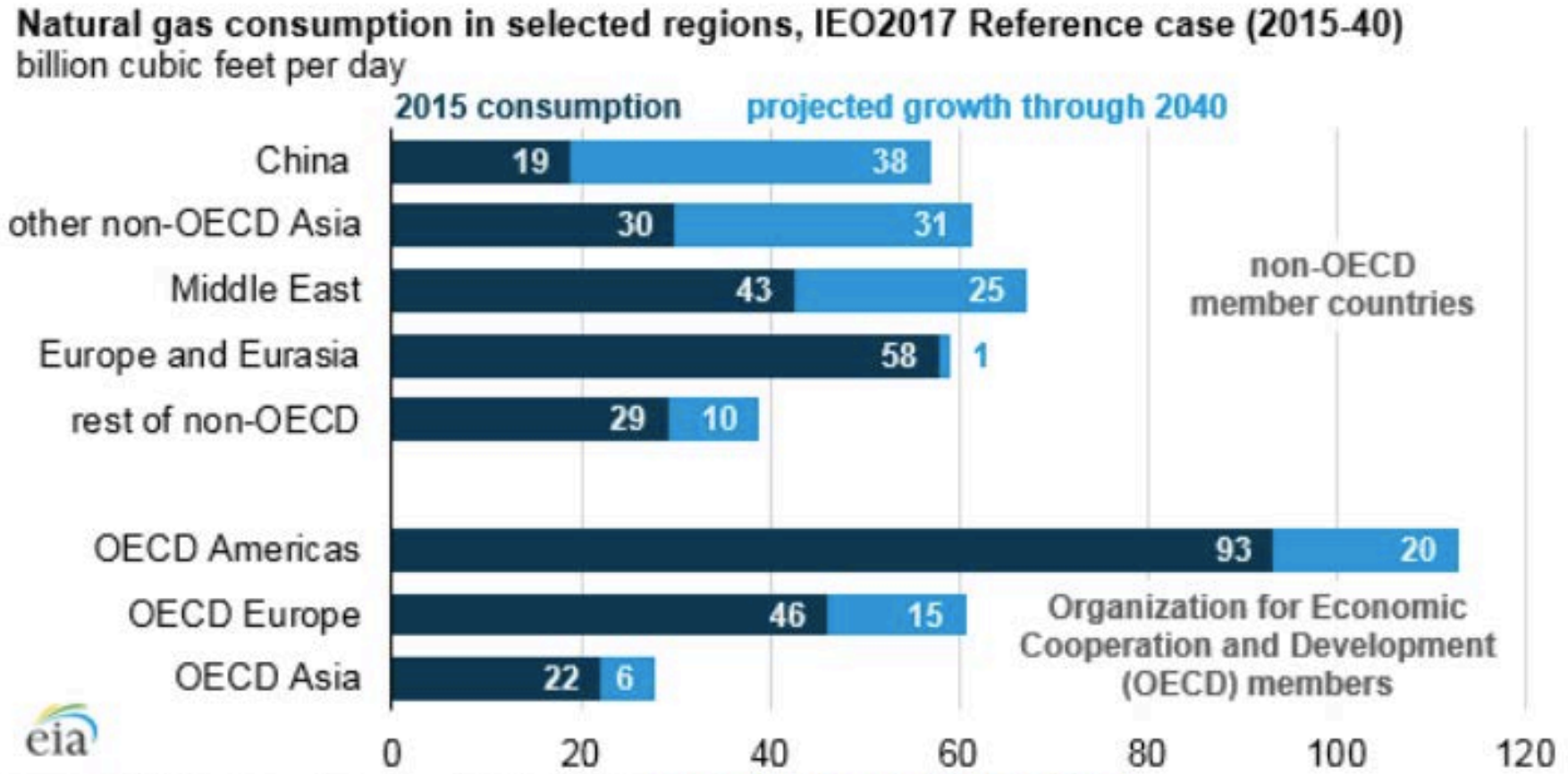
Source: McKinsey & Co.

China Natural Gas Production and Consumption

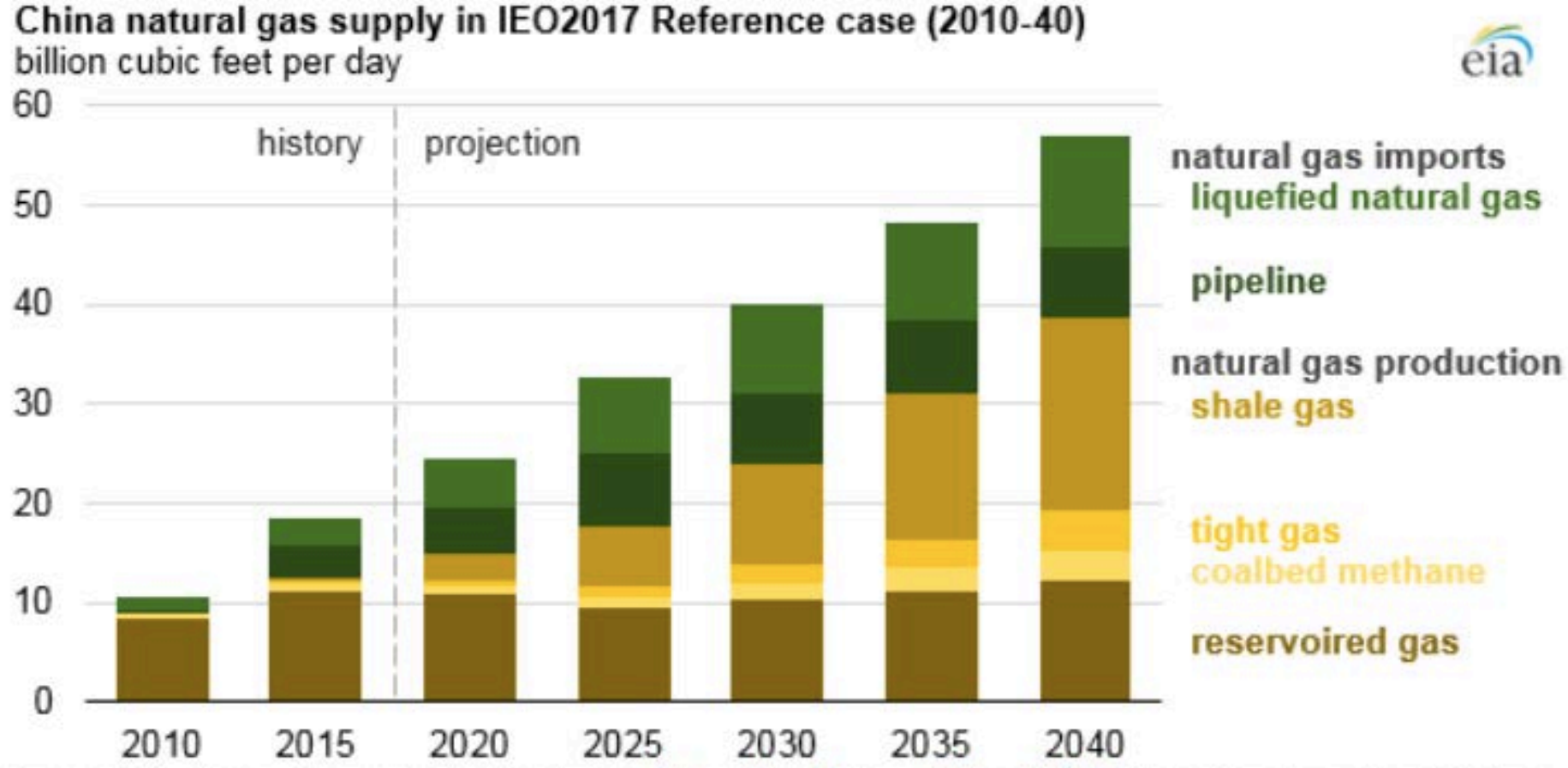


Source: U.S. EIA- International Energy Outlook 2011

China leads the growth in projected global natural gas consumption

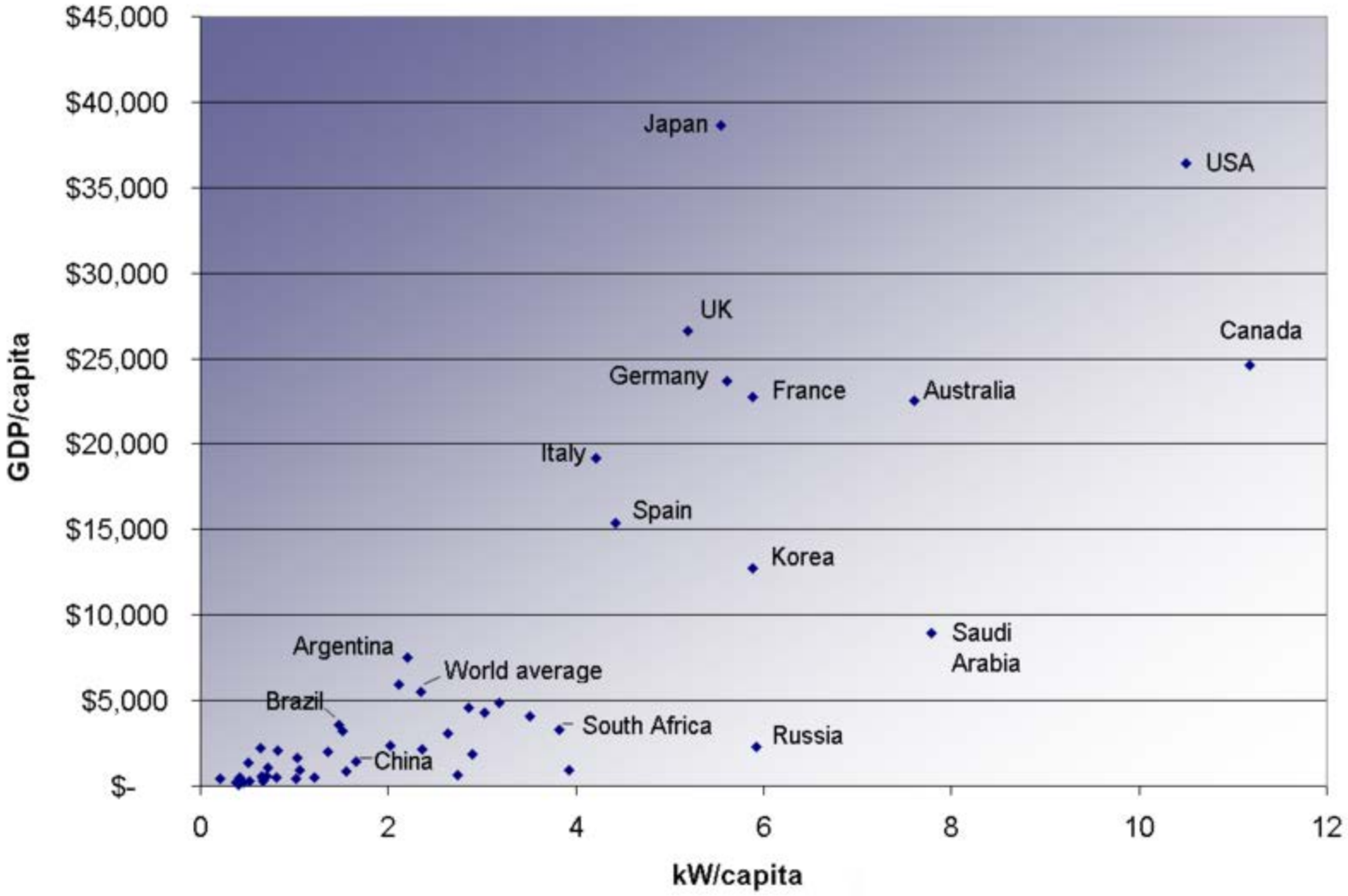


Source: U.S. Energy Information Administration, *International Energy Outlook 2017*



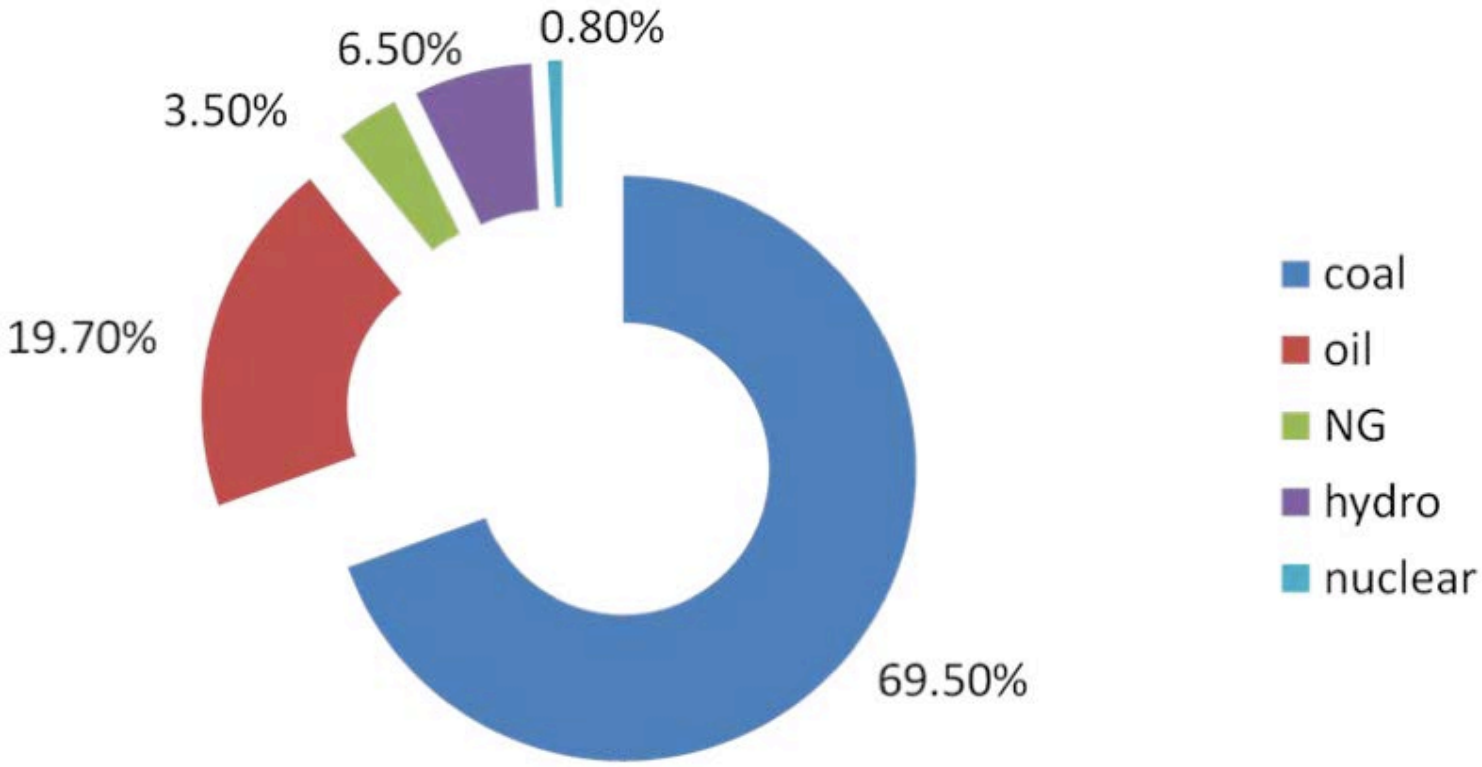
Source: U.S. Energy Information Administration, *International Energy Outlook 2017*, China Development and Reform Commission, China Customs

Energy consumption per capita versus the GNP per capita

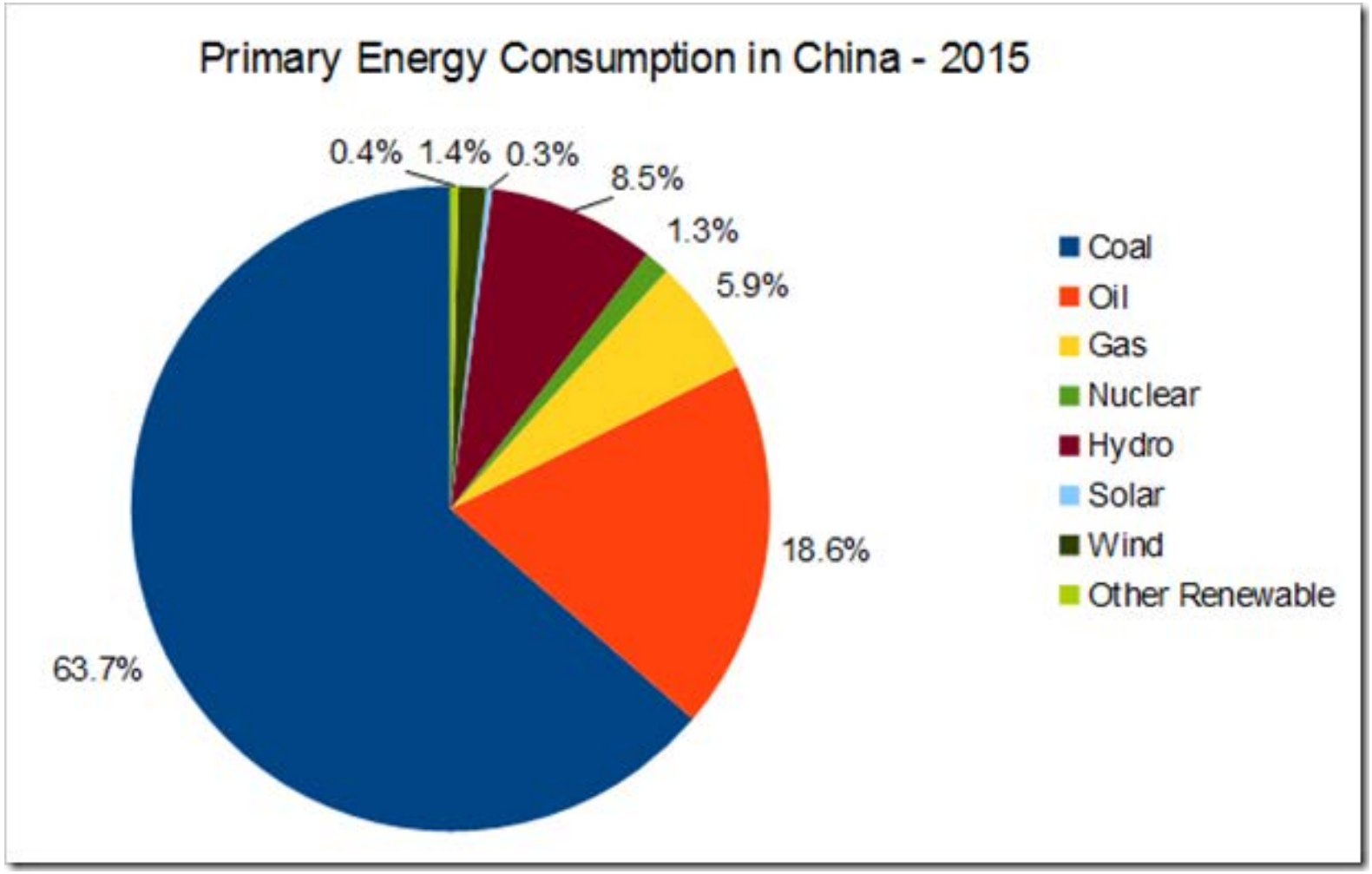


The graph plots the per capita energy versus the per capita income for all countries with more than 20 million inhabitants, the data more than 90% of the world's population. The image shows the broad relation between wealth and energy consumption.

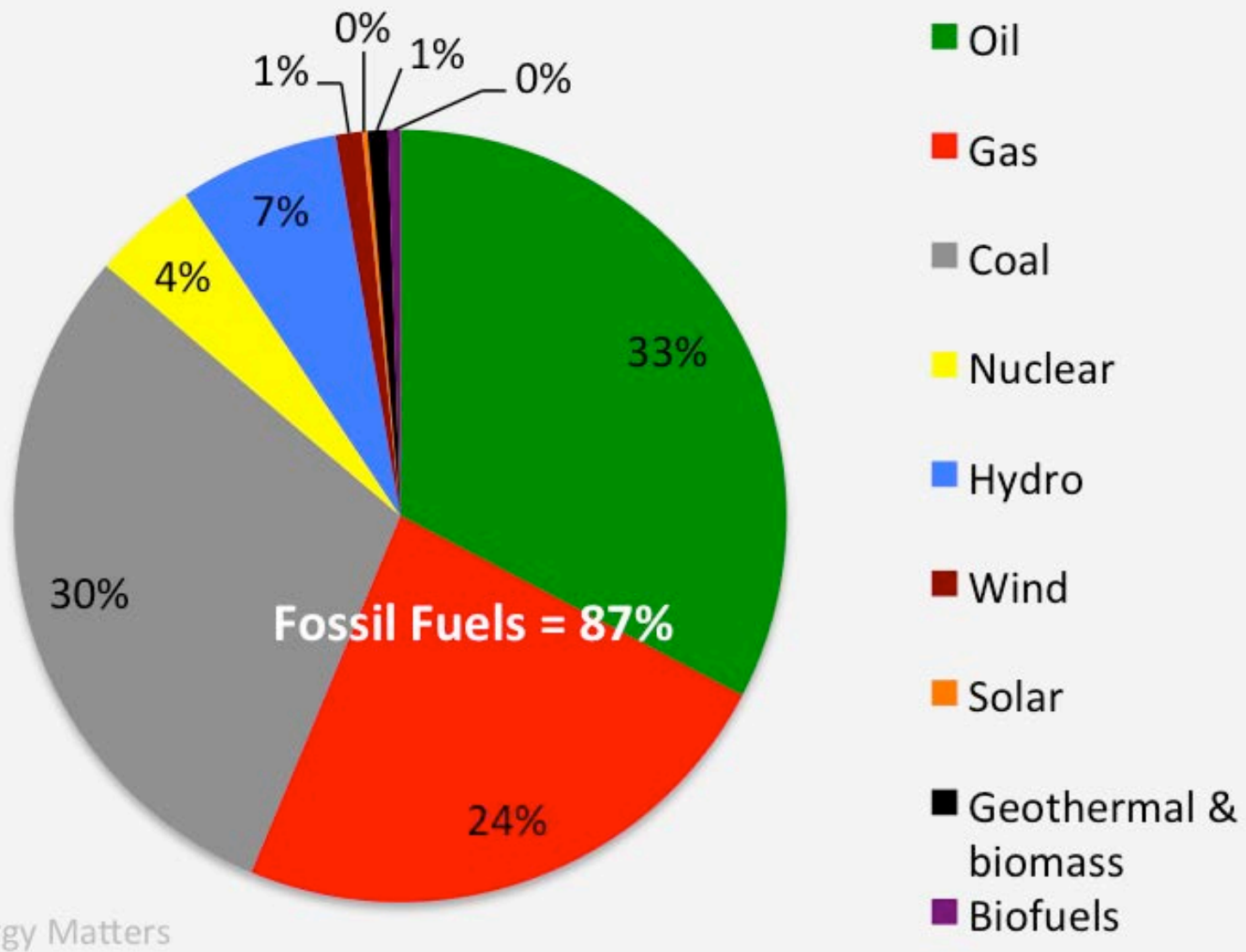
China's Energy Consumption Composition 2007



Source: Energy Research Institute, NDRC 2009

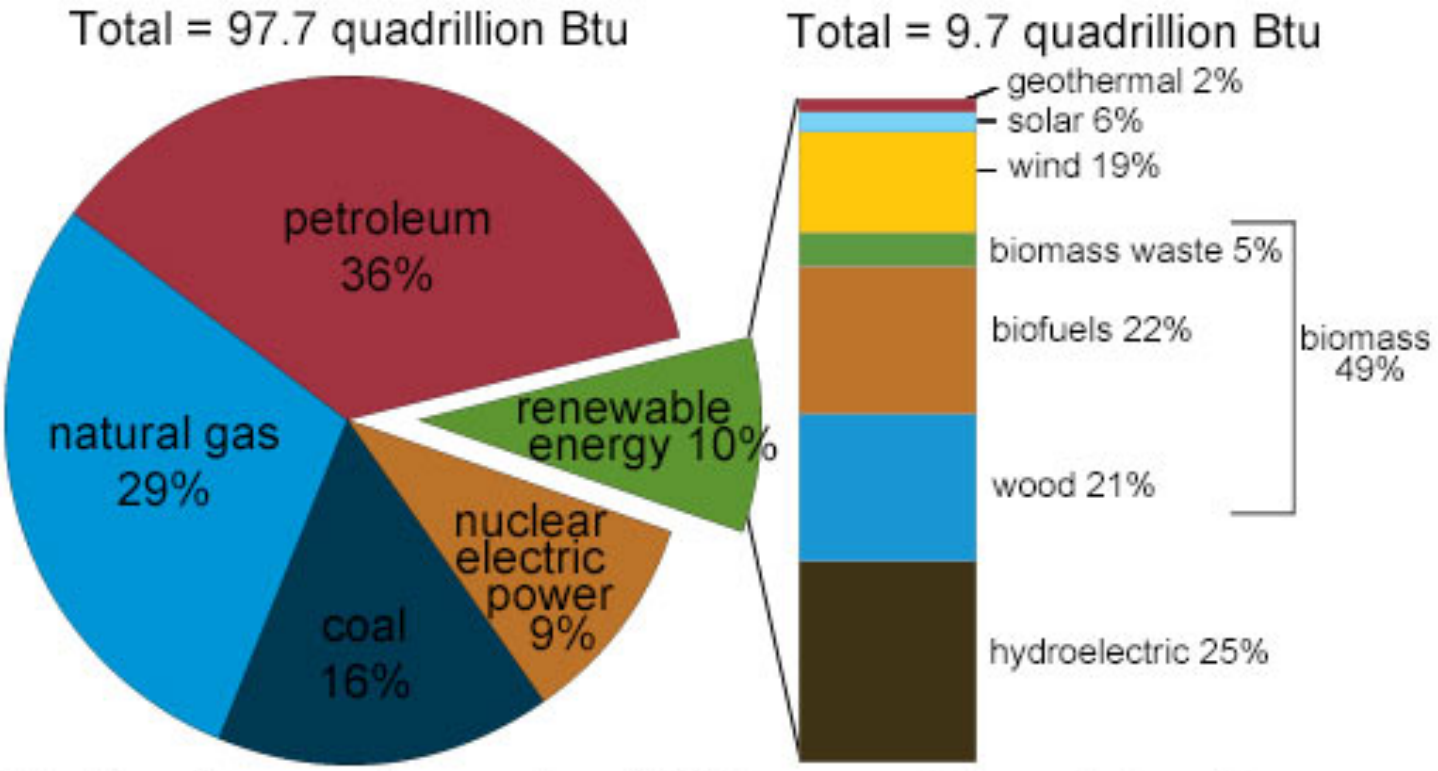

Primary Energy Consumption in China - 2015
0.4%
1.4%
0.3%
8.5%
1.3%
5.9%
18.6%
63.7%
Coal
Oil
Gas
Nuclear
Hydro
Solar
Wind
Other Renewable

Global energy consumption 2013



Energy Matters
euanmearns.com
BP 2014 data

U.S. energy consumption by energy source, 2015

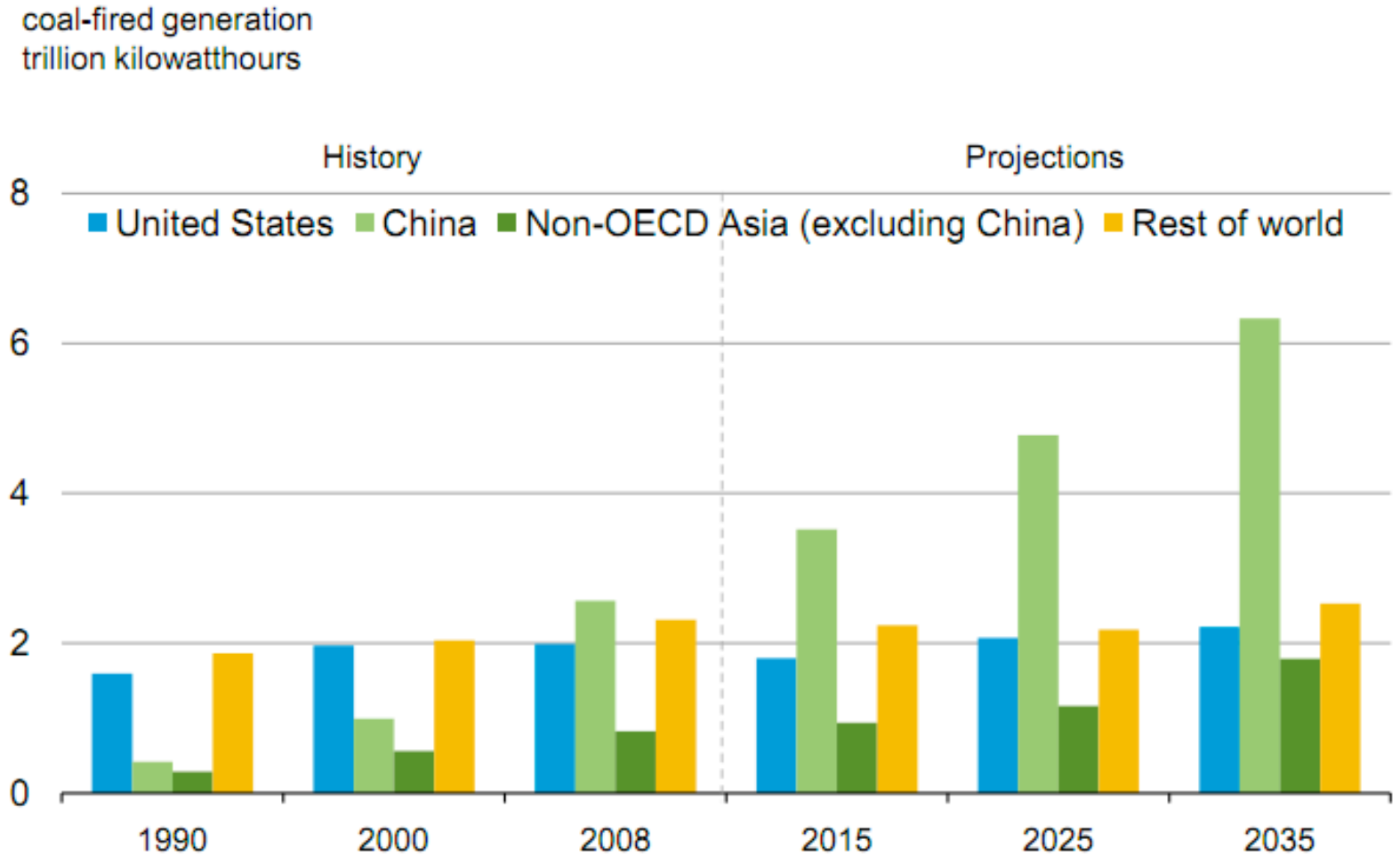


Note: Sum of components may not equal 100% because of independent rounding.

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

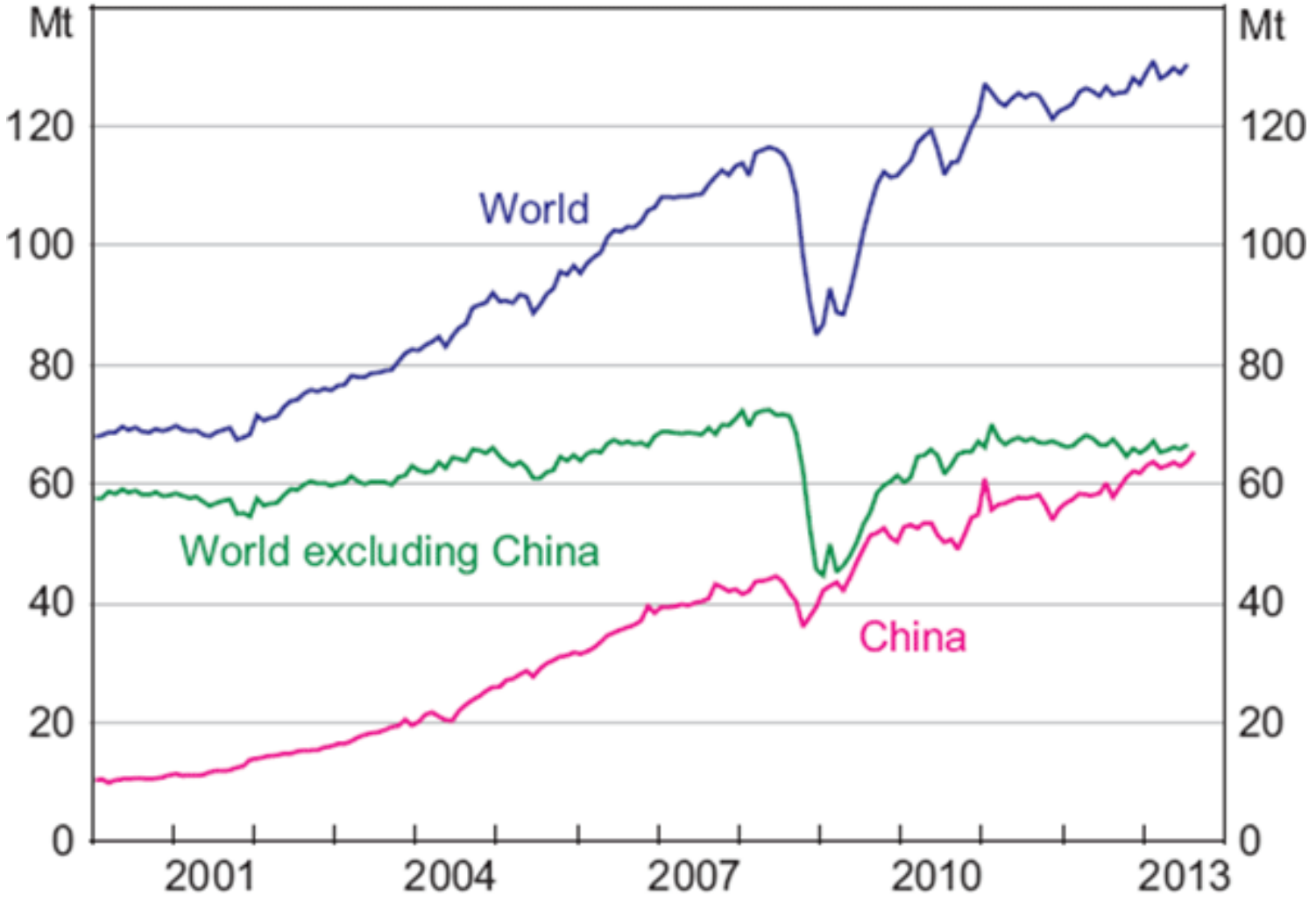
eia

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



Source: EIA, International Energy Outlook 2011

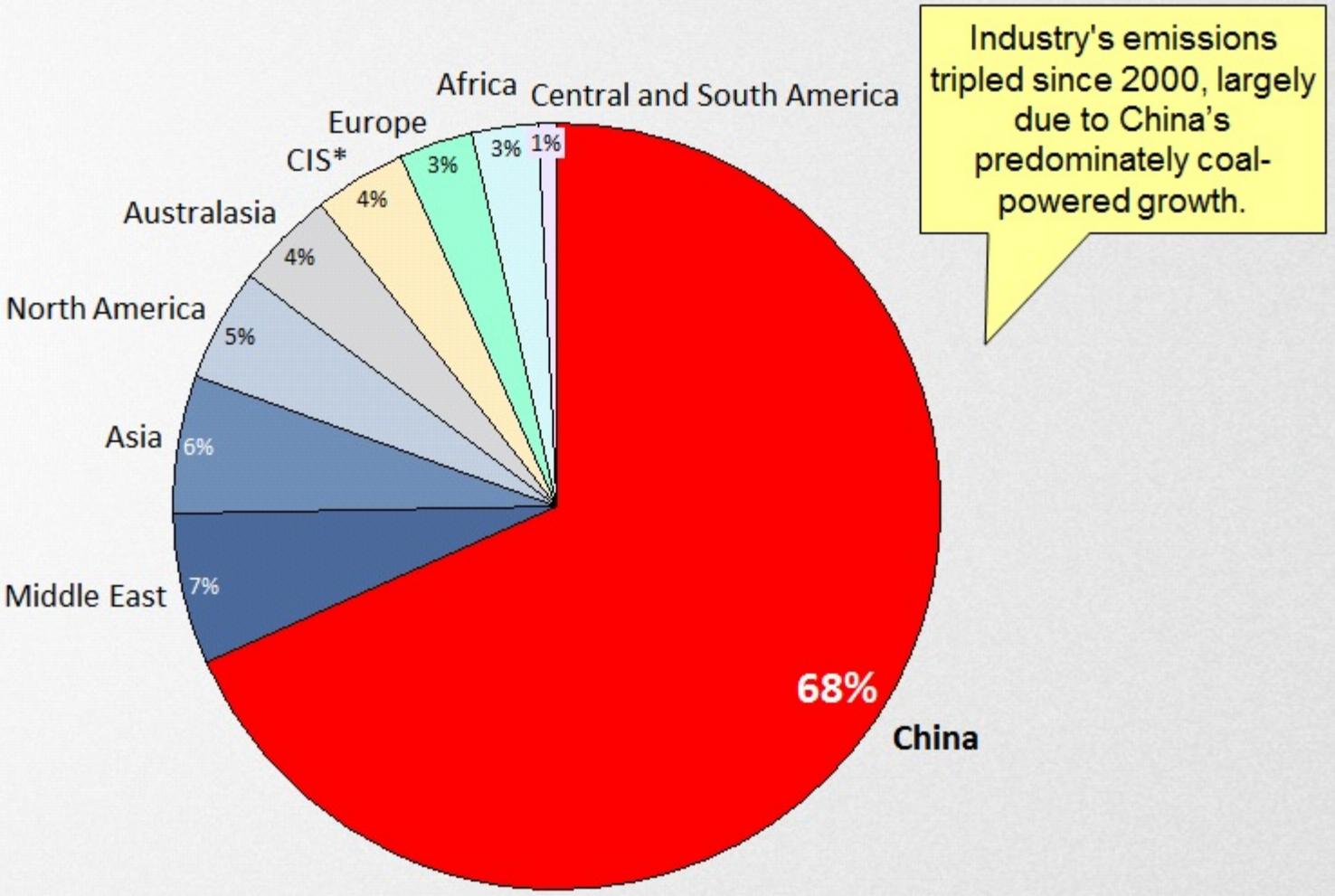
Crude Steel Production*



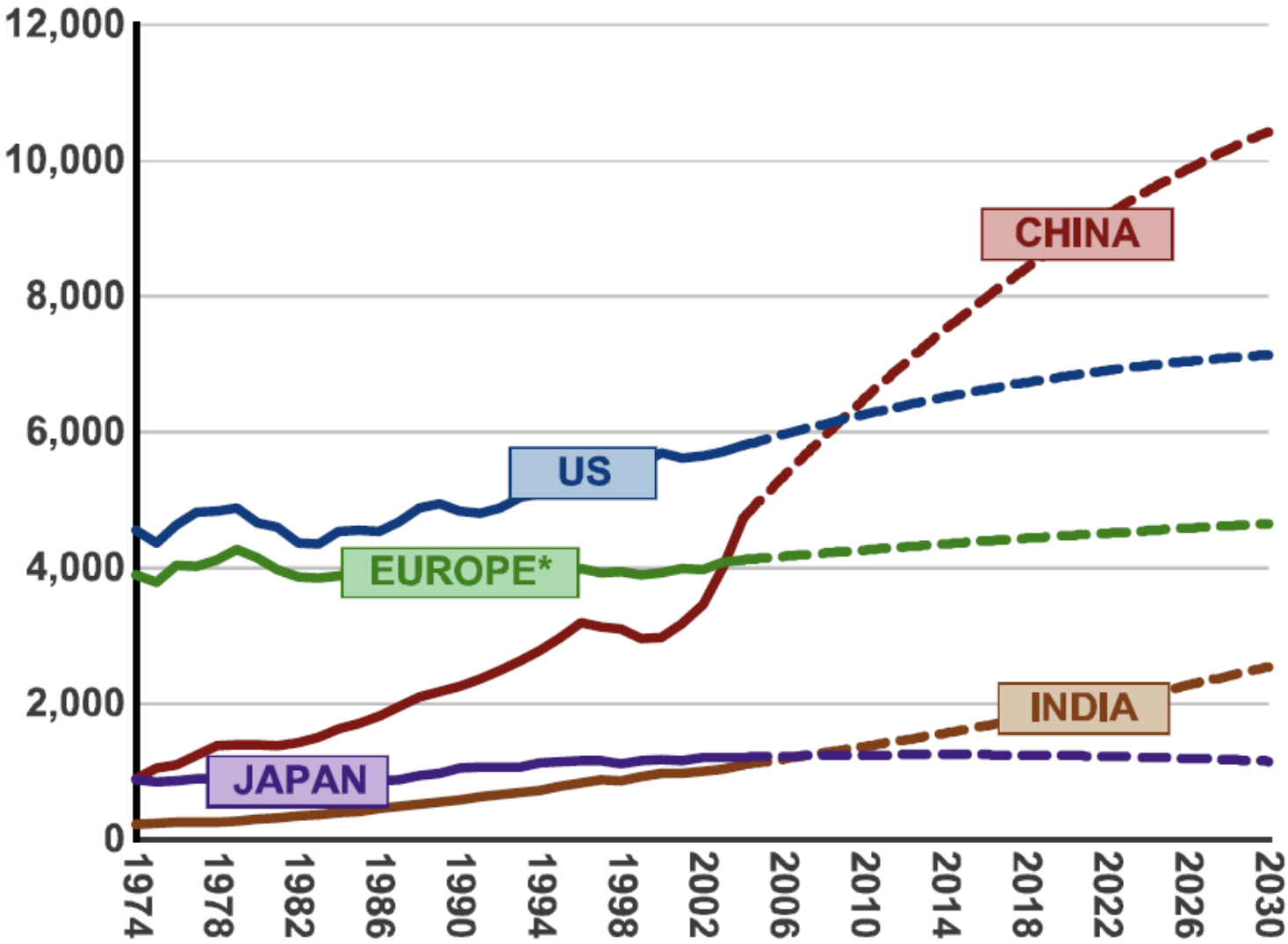
* Seasonally adjusted

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

Share of total CO_2 emissions from aluminum smelting, 2014

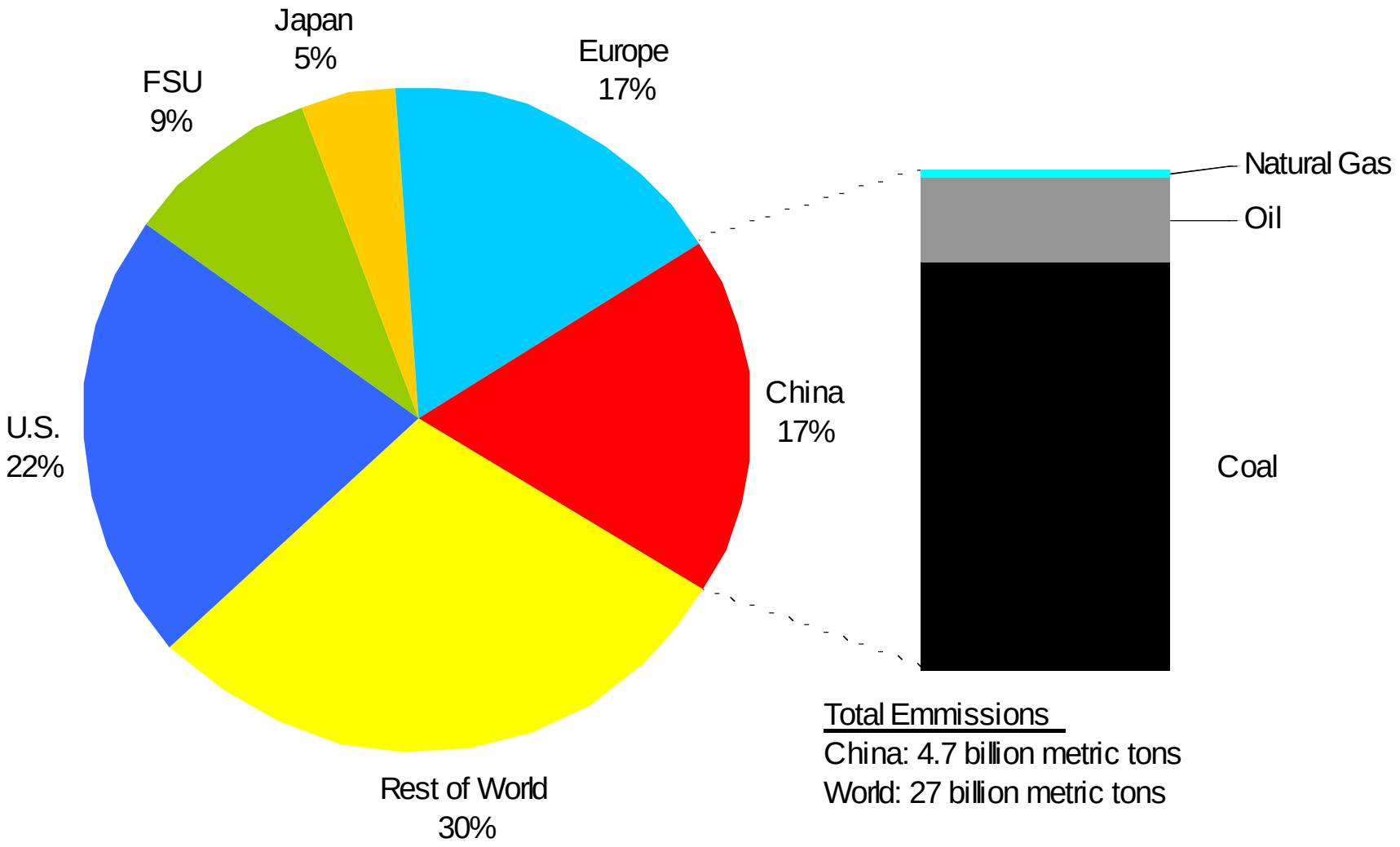


Projected Annual CO2 Emissions (million metric tons)



Source: IEA data and forecasts from the IEA World Energy Outlook 2006.
* Europe refers to OECD Europe.

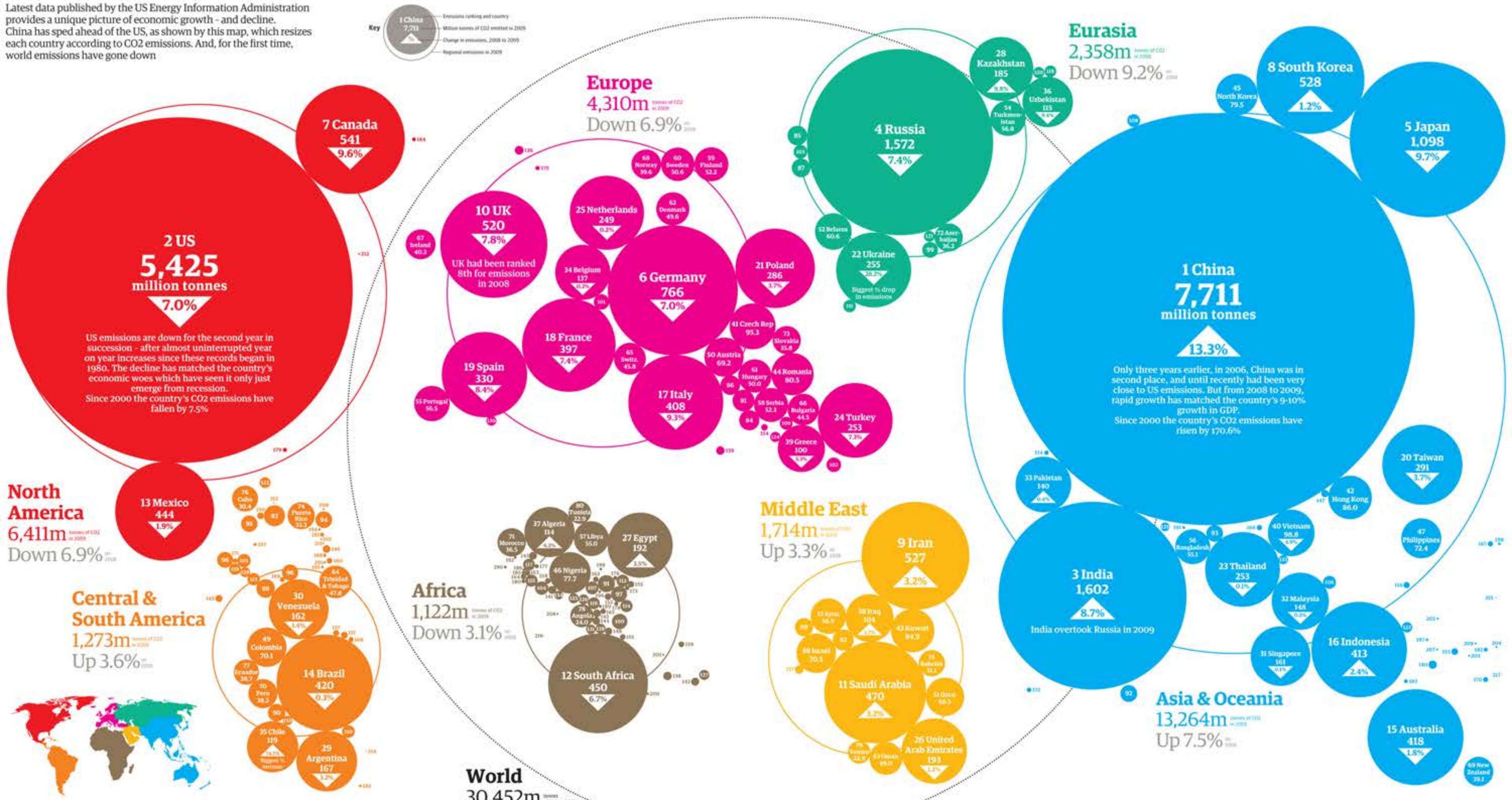
Carbon Dioxide Emissions from Energy Activites, 2004



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



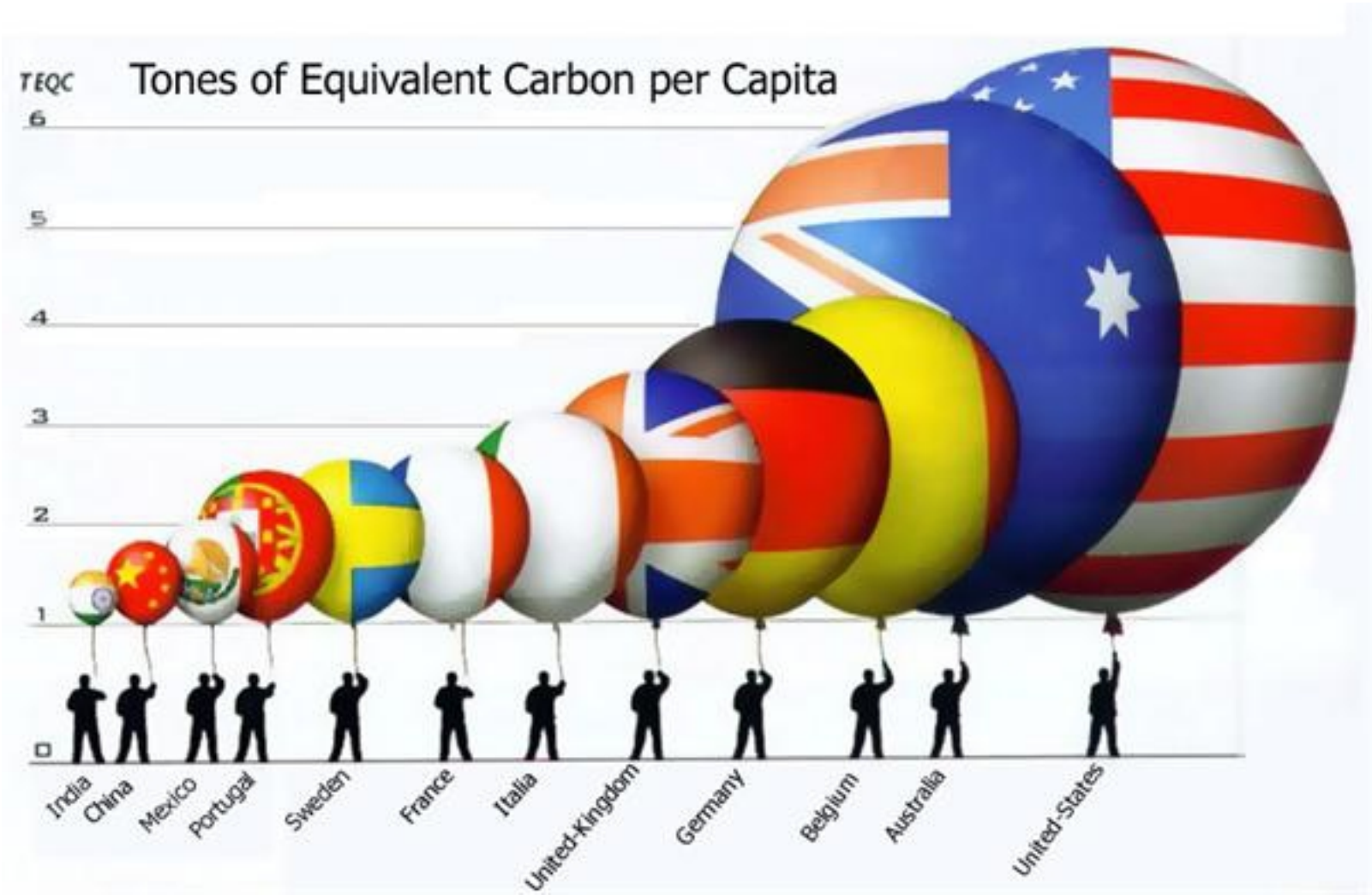
Detailed data

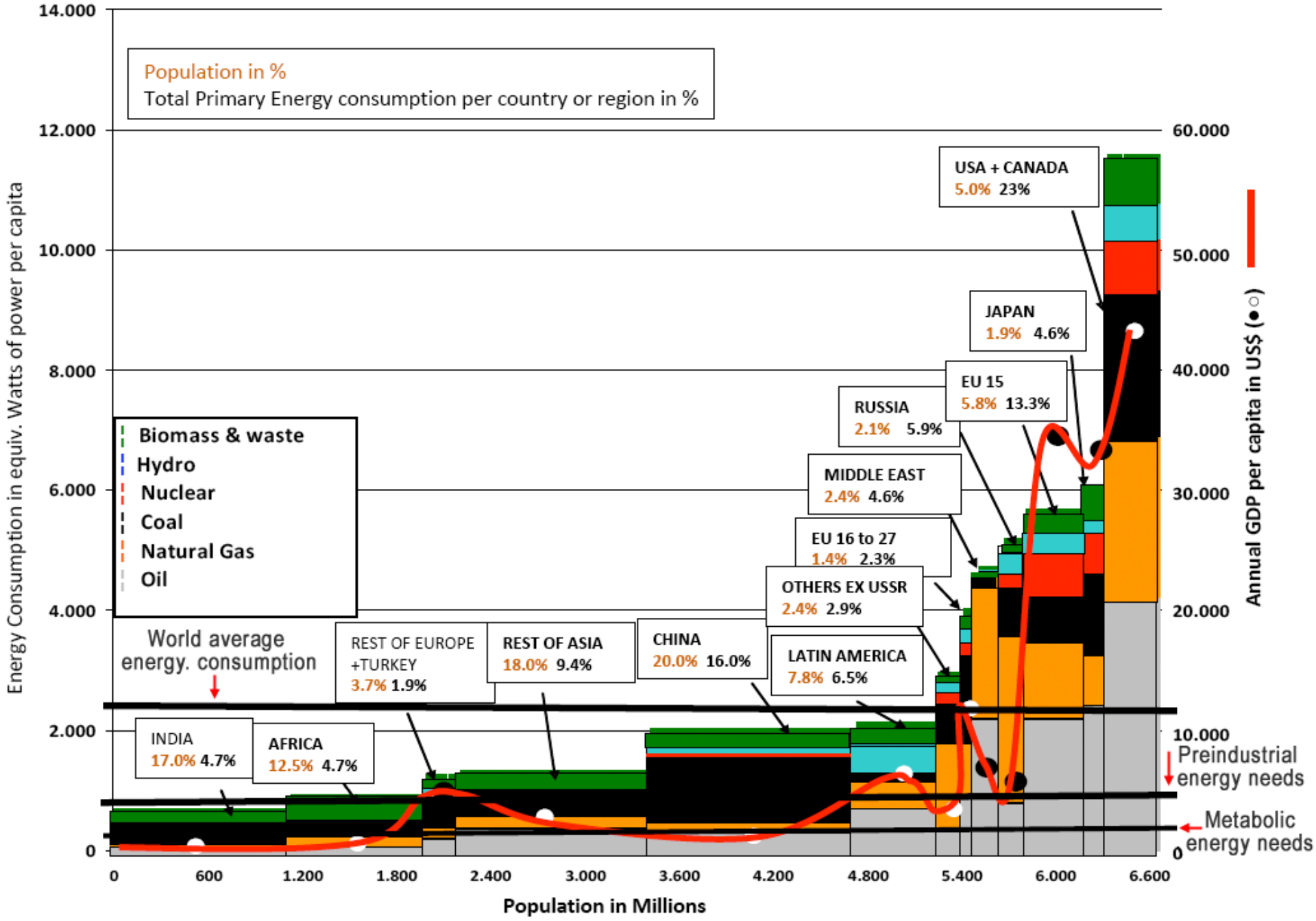
Full list of each country's CO2 emissions and movement in the world emissions league table

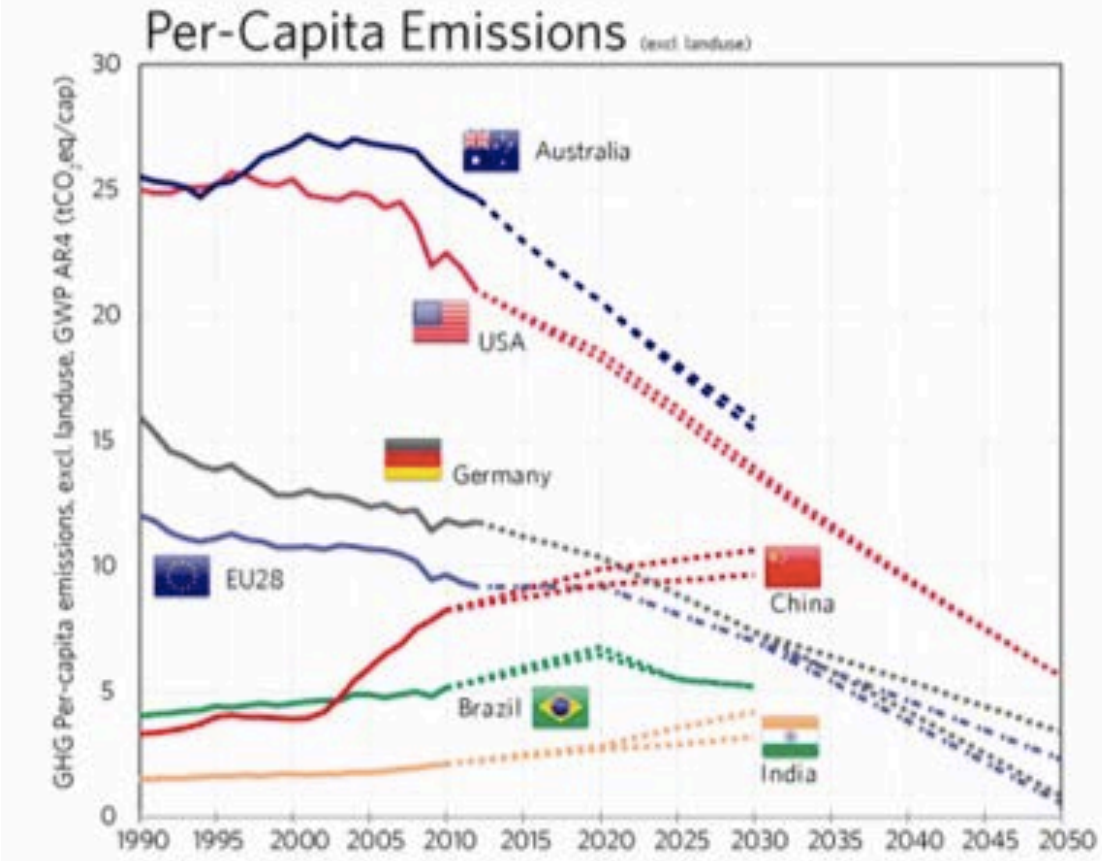
Rank/ change on 2008	Country	Million tonnes 2009	Percent change 08–09
= 1	China	7,711	13.3
= 2	US	5,425	-7.0
▲ 3	India	1,602	8.7
▼ 4	Russia	1,572	-7.4
= 5	Japan	1,098	-9.7
= 6	Germany	766	-7.0
= 7	Canada	541	-9.6
▲ 8	South Korea	528	1.2
▲ 9	Iran	527	3.2
▼ 10	UK	520	-7.8
▲ 11	Saudi Arabia	470	3.2
▼ 12	South Africa	450	-6.7
= 13	Mexico	444	-1.9
▲ 14	Brazil	420	-0.3
▲ 15	Australia	418	1.8
▲ 16	Indonesia	413	2.4
▼ 17	Italy	408	-9.3
▼ 18	France	397	-7.4
= 19	Spain	330	-8.4
▲ 20	Taiwan	291	3.7
▲ 21	Poland	286	-3.0
▼ 22	Ukraine	255	-28.2
▲ 23	Thailand	253	-0.1
▼ 24	Turkey	253	-7.3
= 25	Netherlands	249	-0.2
= 26	United Arab Emirates	193	1.2
= 27	Egypt	192	3.5
▲ 28	Kazakhstan	185	9.8
▼ 29	Argentina	167	-1.2
= 30	Venezuela	162	1.4
= 31	Singapore	161	-0.1
▲ 32	Malaysia	148	-0.2
▲ 33	Pakistan	140	0.4
▼ 34	Belgium	137	-11.2
▲ 35	Chile	119	74.1
▼ 36	Uzbekistan	115	-9.4
▼ 37	Algeria	114	6.2
▲ 38	Iraq	104	3.7
▼ 39	Greece	100	-5.3
▼ 40	Vietnam	98.8	-4.9
= 41	Czech Republic	95.3	-3.8
▲ 42	Hong Kong	86.0	10.3
= 43	Kuwait	84.8	6.2
▼ 44	Romania	80.5	-16.6
▲ 45	North Korea	79.5	14.3
▼ 46	Nigeria	77.7	-22.4
▼ 47	Philippines	72.4	-2.9
▲ 48	Israel	70.5	4.8
▲ 49	Colombia	70.1	7.9
▼ 50	Austria	69.2	-2.5
▲ 51	Qatar	66.5	4.8
▼ 52	Belarus	60.6	-9.5
▲ 53	Syria	56.9	6.1
▼ 54	Turkmenistan	56.8	-4.2
▲ 55	Portugal	56.5	1.5
▲ 56	Bangladesh	55.1	9.4
▼ 57	Libya	55.0	-3.9
▲ 58	Serbia	52.1	-3.2
▼ 59	Finland	52.2	-4.9
▼ 60	Sweden	50.6	-7.7
▼ 61	Hungary	50.0	-10.7
▼ 62	Denmark	49.6	-8.6
▲ 63	Oman	49.0	9.9
= 64	Trinidad and Tobago	47.8	-4.1
▲ 65	Switzerland	45.8	1.0
▼ 66	Bulgaria	44.5	-11.9
▼ 67	Ireland	40.3	-11.2
= 68	Norway	39.6	-0.3
▲ 69	New Zealand	39.1	-1.1
▲ 70	Peru	38.2	4.0
▲ 71	Morocco	36.5	-2.2
▼ 72	Azerbaijan	36.2	-8.9
▼ 73	Slovakia	35.8	-4.5
= 74	Puerto Rico	33.3	-3.2
= 75	Bahrain	31.1	1.6
= 76	Cuba	30.4	4.7
= 77	Ecuador	28.7	1.7
= 78	Angola	24.0	1.8
▲ 79	Yemen	22.9	13.5
▲ 80	Tunisia	22.9	5.7
▼ 81	Croatia	21.5	-4.7
▲ 82	Jordan	20.0	3.4
▲ 83	Dominican Republic	19.9	2.1
▼ 84	Bosnia and Herzegovina	18.3	-15.9
▼ 85	Estonia	17.5	-11.8
▲ 86	Slovenia	17.4	0.5
▼ 87	Lithuania	15.8	-12.8
= 88	Panama	15.5	1.7
= 89	Lebanon	14.8	5.6
= 90	Bolivia	13.9	-2.7
▲ 91	Sudan	13.0	7.0
▲ 92	Sri Lanka	12.8	1.7
▼ 93	Burma	12.5	-9.5
▼ 94	US Virgin Islands	12.5	-3.5
▼ 95	Jamaica	12.1	-4.6
= 96	Netherlands Antilles	11.6	-4.1
▲ 97	Kenya	11.5	2.4
= 98	Guatemala	11.3	-1.4
▲ 99	Armenia	11.2	1.5
▲ 100	Zimbabwe	10.6	18.6
▼ 101	Luxembourg	10.6	-11.2
= 102	Cyprus	9.4	-3.5
▲ 103	Latvia	8.5	8.1
▲ 104	Ghana	8.1	9.6
= 105	Honduras	7.9	-2.4
▼ 106	Brunei	7.6	-27.1
▲ 107	Cameroon	7.5	-1.9
= 108	Mongolia	7.4	-3.8
▼ 109	Macedonia	7.3	-20.1
▼ 110	Uruguay	7.2	80.2
= 111	Moldova	7.1	-4.1
▲ 112	Ethiopia	6.9	7.1
▼ 113	Costa Rica	6.8	-4.4
▲ 114	Tanzania	6.7	7.1
▼ 115	IvoryCoast	6.6	2.2
▲ 116	Congo	6.3	1.8
= 117	Senegal	6.2	1.8
▼ 118	Tajikistan	6.1	-10.4
= 119	El Salvador	5.9	0.0
= 120	Kyrgyzstan	5.7	-0.4
= 121	Georgia	5.3	-4.9
= 122	Bahamas	5.2	3.1
▲ 123	Papua New Guinea	4.8	6.7
▲ 124	Albania	4.6	3.8
▼ 125	Equatorial Guinea	4.6	-2.1
▼ 126	Gabon	4.6	-3.2
▼ 127	Mauritius	4.6	-1.0
▲ 128	Botswana	4.5	7.7
▼ 129	Nicaragua	4.5	-2.9
▼ 130	Gibraltar	4.4	-3.8
▲ 131	Namibia	4.1	3.7
▲ 132	Paraguay	4.0	3.7
▼ 133	Cambodia	3.9	-6.1
▲ 134	Benin	3.5	4.1
▲ 135	Nepal	3.4	3.8
▼ 136	Iceland	3.4	-7.4
▲ 137	Palestine	3.2	4.3
▲ 138	Madagascar	3.1	13.4
▼ 139	Malta	3.1	-2.5
▼ 140	New Caledonia	3.0	0.0
▲ 141	Togo	2.8	5.6
▼ 142	Reunion	2.8	0.0
▲ 143	Mauritania	2.7	5.3
▲ 144	Zambia	2.7	38.8
▼ 145	Congo, Dem Rep	2.7	-2.6
▼ 146	Martinique	2.6	6.3
▼ 147	Macau	2.4	1.3
▲ 148	Mozambique	2.3	4.6
▼ 149	Guadeloupe	2.2	-3.1
▲ 150	Haiti	2.1	2.9
▲ 151	Suriname	2.0	4.0
= 152	Uganda	1.9	-3.0
▼ 153	Fiji	1.9	-6.2
= 154	Montenegro	1.9	4.3
▲ 155	Djibouti	1.8	3.4
▼ 156	Guam	1.7	-3.5
= 157	Guyana	1.5	0.0
▲ 158	Burkina Faso	1.4	2.1
▲ 159	Seychelles	1.4	6.1
▼ 160	Barbados	1.4	-4.0
▲ 161	Swaziland	1.4	17.0
= 162	Niger	1.3	3.5
▼ 163	Guinea	1.3	4.2
▲ 164	Sierra Leone	1.3	5.9
▼ 165	Malawi	1.3	8.6
= 166	Laos	1.2	1.1
▼ 167	Wake Island	1.2	-4.3
= 168	French Guiana	1.2	6.1
= 169	Aruba	1.1	-4.2
▲ 170	French Polynesia	1.1	7.7
▼ 171	Belize	0.94	-5.6
= 172	Maldives	0.92	3.4
= 173	Somalia	0.90	3.4
= 174	Afghanistan	0.83	-2.9
= 175	Faroe Islands	0.80	6.4
▲ 176	Eritrea	0.77	6.4
▲ 177	Mali	0.74	6.4
▼ 178	Rwanda	0.74	0.0
= 179	Bermuda	0.71	4.2
= 180	Liberia	0.69	2.2
= 181	Antigua and Barbuda	0.69	4.4
= 182	American Samoa	0.67	2.2
▲ 183	East Timor	0.63	8.7
▼ 184	Greenland	0.61	-4.8
▲ 185	Guinea-Bissau	0.46	0.0
▲ 186	Gambia	0.44	15.4
▼ 187	Cayman Islands	0.43	-11.8
▼ 188	Saint Lucia	0.40	0.0
▲ 189	Burundi	0.37	4.0
▲ 190	Cape Verde	0.34	4.5
▼ 191	Bhutan	0.33	-11.1
▲ 192	Western Sahara	0.32	0.0
▲ 193	Antarctica	0.31	17.6
▲ 194	Saint Kitts and Nevis	0.30	11.1
= 195	Grenada	0.30	4.8
▼ 196	Central African Republic	0.29	-41.0
▲ 197	Solomon Islands	0.29	25.0
▼ 198	US Pacific Islands	0.29	0.0
▼ 199	Chad	0.29	11.1
▼ 200	Lesotho	0.27	5.9
= 201	Saint Vincent/Grenadines	0.27	17.6
▲ 202	Nauru	0.20	9.1
▼ 203	Tonga	0.15	23.1
▲ 204	Cook Islands	0.15	66.7
▲ 205	Comoros	0.15	25.0
▼ 206	Sao Tome and Principe	0.15	11.1
▲ 207	Vanuatu	0.15	25.0
▲ 208	British Virgin Islands	0.15	25.0
▼ 209	Samoa	0.15	46.7
= 210	Montserrat	0.15	58.7
▼ 211	Dominica	0.14	11.1
▼ 212	Saint Pierre and Miquelon	0.11	16.7
= 213	Turks and Caicos Islands	0.08	0.0
= 214	Falkland Islands	0.05	0.0
= 215	Kiribati	0.04	0.0
= 216	Saint Helena	0.01	11.2
= 217	Niue	0.01	2.9

Table shows total carbon dioxide emissions from the consumption of energy

GRAPHIC: MARK McCORMICK, PAUL SCRUTON SOURCE: EIA


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


Population in %
Total Primary Energy consumption per country or region in %
Energy Consumption in equiv. Watts of power per capita
Annual GDP per capita in US$ (● ○)
Population in Millions
14.000
12.000
10.000
8.000
6.000
4.000
2.000
0
60.000
50.000
40.000
30.000
20.000
10.000
0
600
1.200
1.800
2.400
3.000
3.600
4.200
4.800
5.400
6.000
6.600
Biomass & waste
Hydro
Nuclear
Coal
Natural Gas
Oil
World average energy. consumption
INDIA 17.0% 4.7%
AFRICA 12.5% 4.7%
REST OF EUROPE +TURKEY 3.7% 1.9%
REST OF ASIA 18.0% 9.4%
CHINA 20.0% 16.0%
LATIN AMERICA 7.8% 6.5%
OTHERS EX USSR 2.4% 2.9%
EU 16 to 27 1.4% 2.3%
MIDDLE EAST 2.4% 4.6%
RUSSIA 2.1% 5.9%
EU 15 5.8% 13.3%
JAPAN 1.9% 4.6%
USA + CANADA 5.0% 23%
Preindustrial energy needs
Metabolic energy needs



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.

climatecollege.unimelb.edu.au

#Facts4Paris

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

- Major shifts in development paradigm

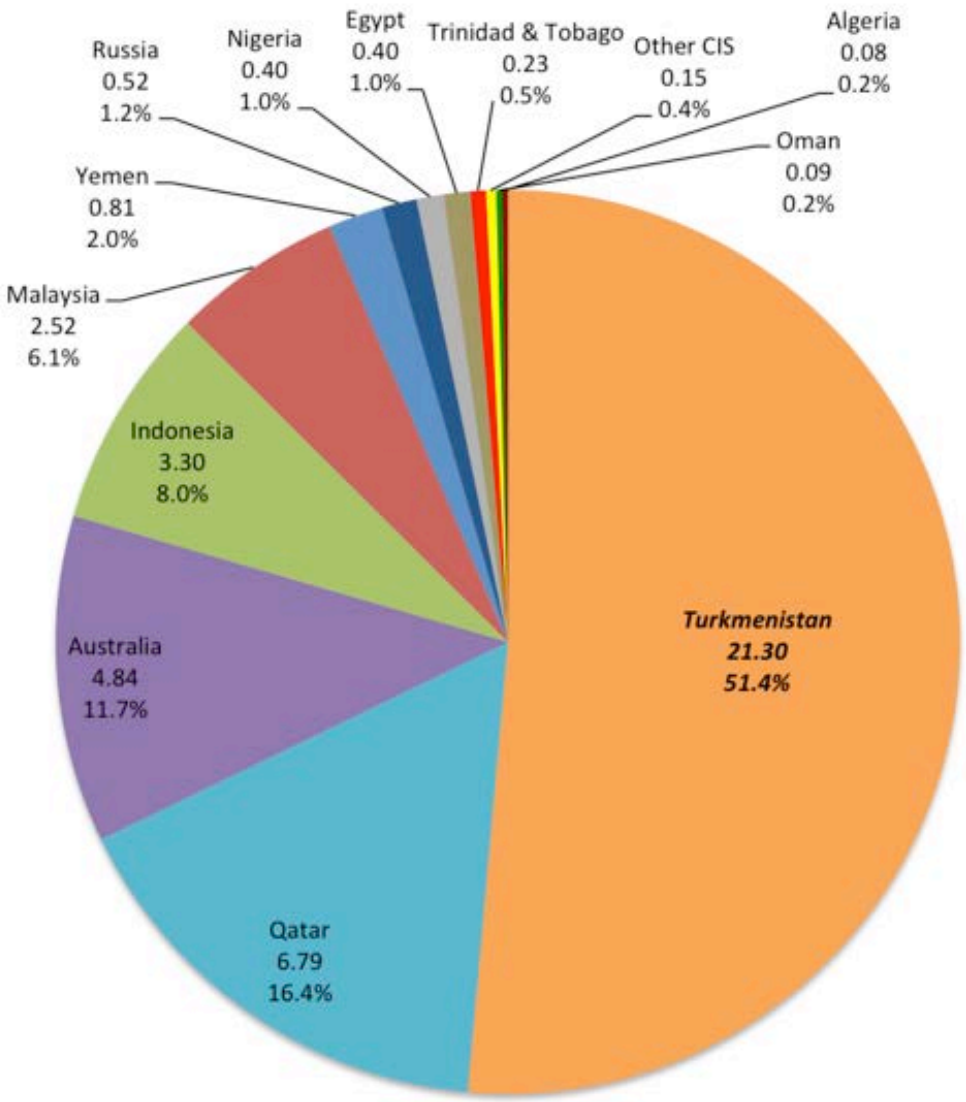
- Emphasis on balance between growth & environment

- Huge investment in clean energy sectors

- Nationwide efforts in reducing coal use

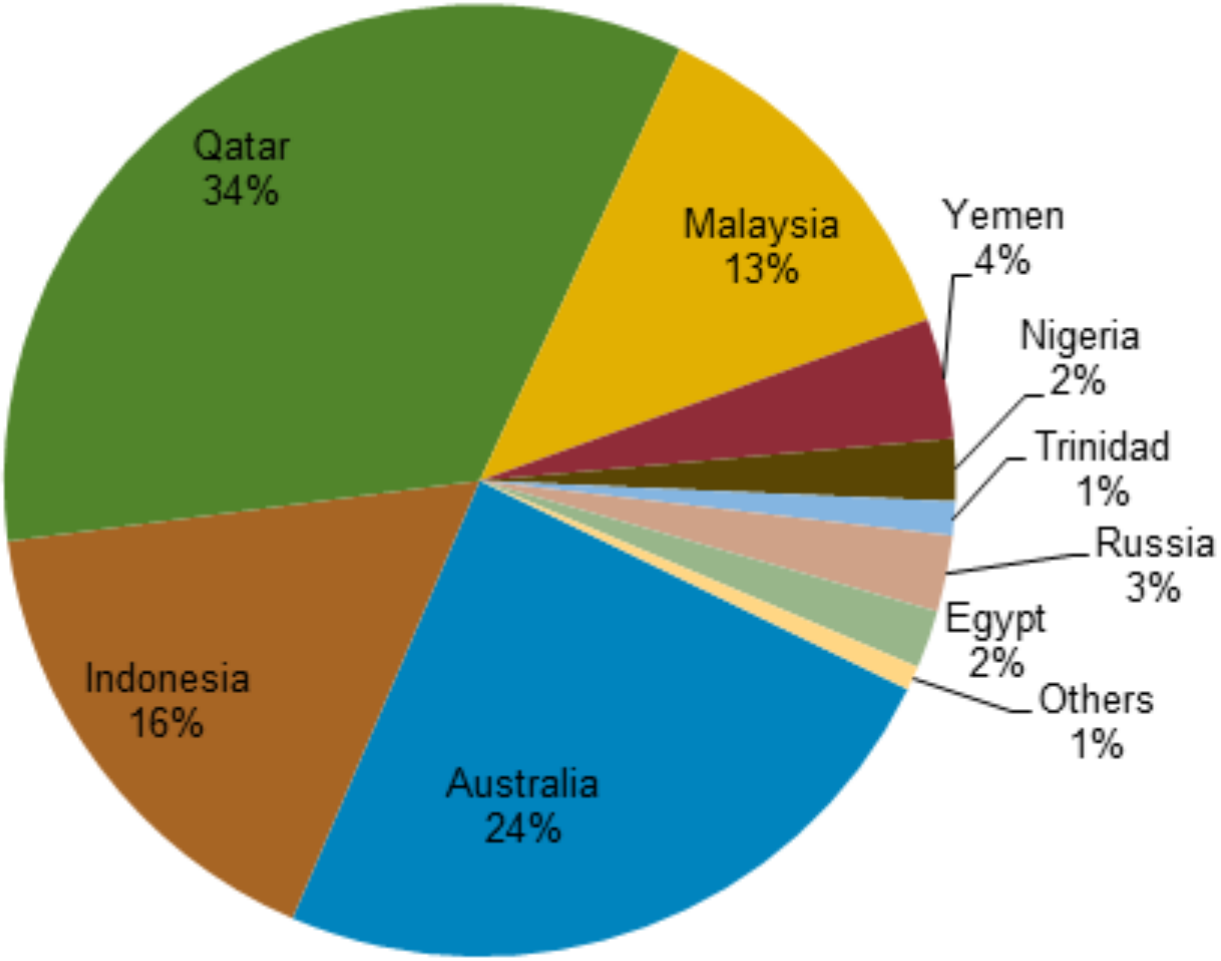
- Natural gas & LNG demand will rise due to such policy drivers

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.

China, LNG, and the Alaska Gas Pipeline

Overview:

I. China & its Demand for LNG

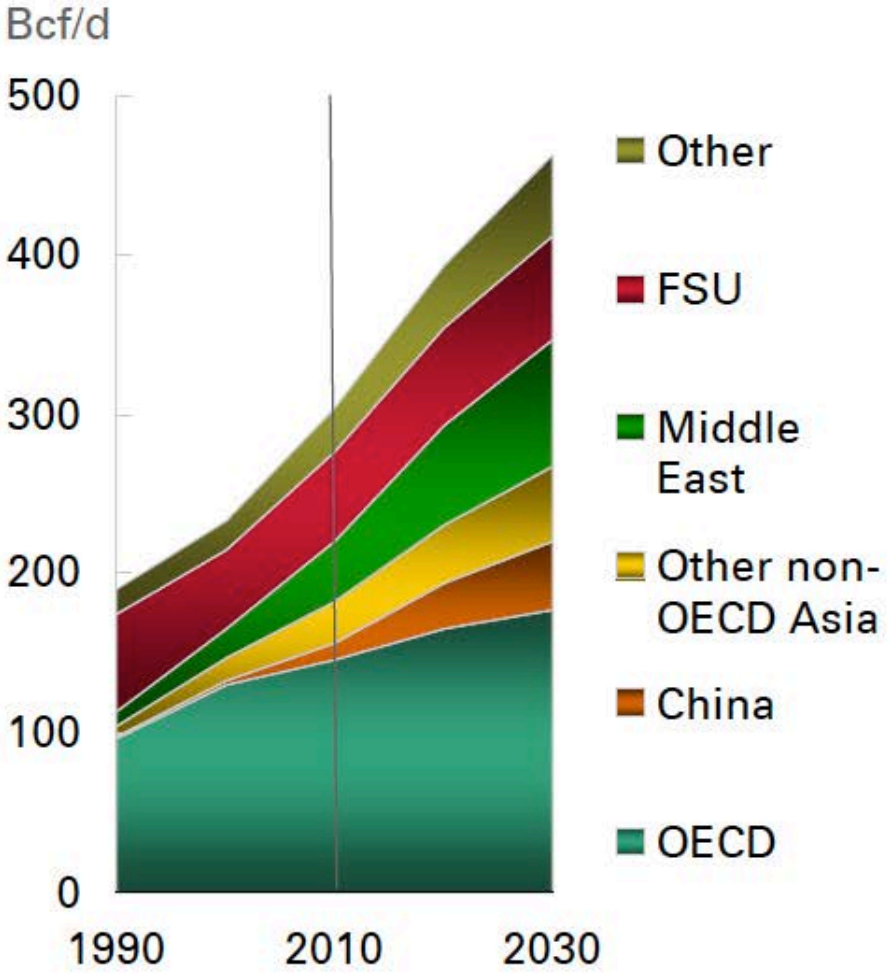
II. **Alaska and LNG Supply**

III. The AGDC-Sinopec MOU

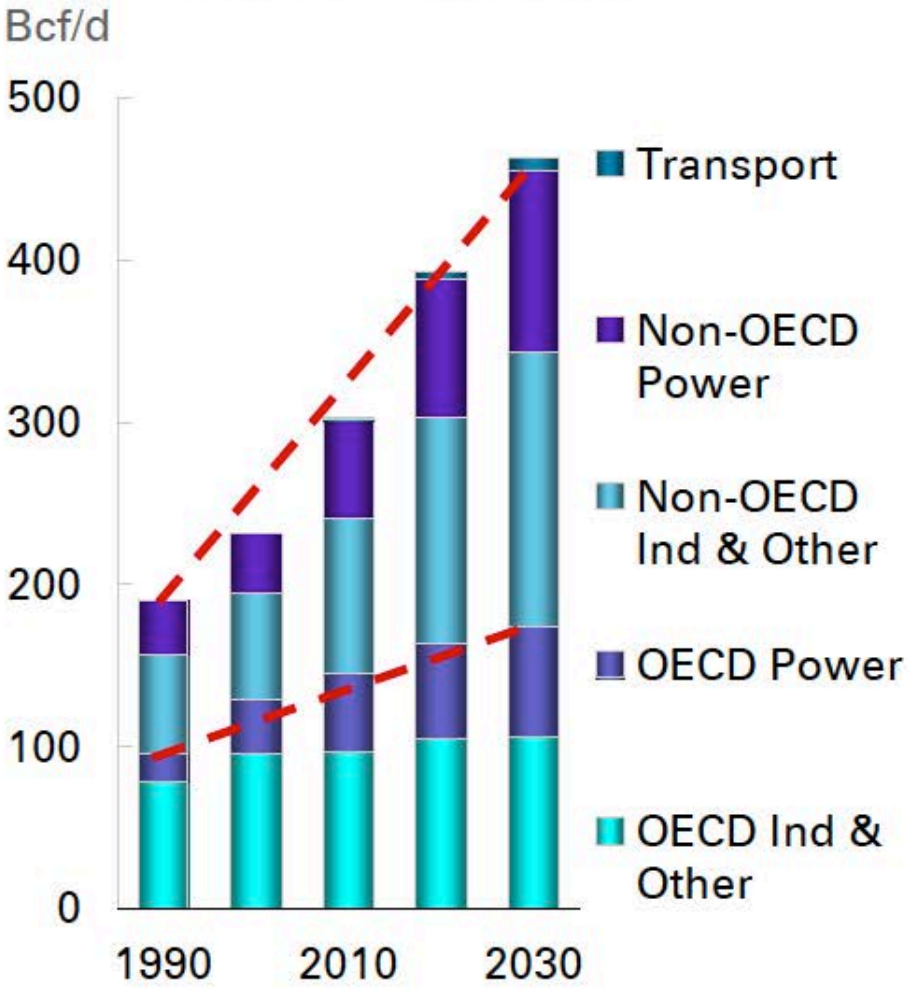
IV. Conclusion

Gas demand growth is driven by the non-OECD…

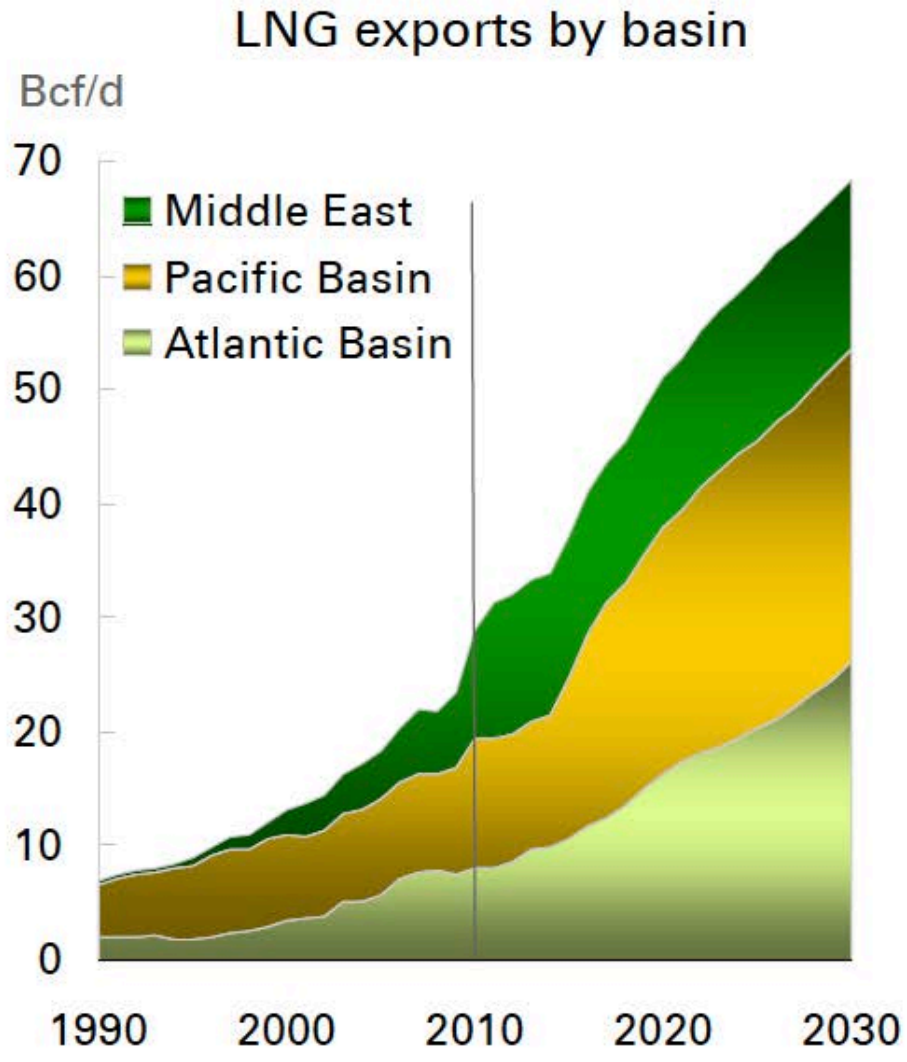
Demand by region

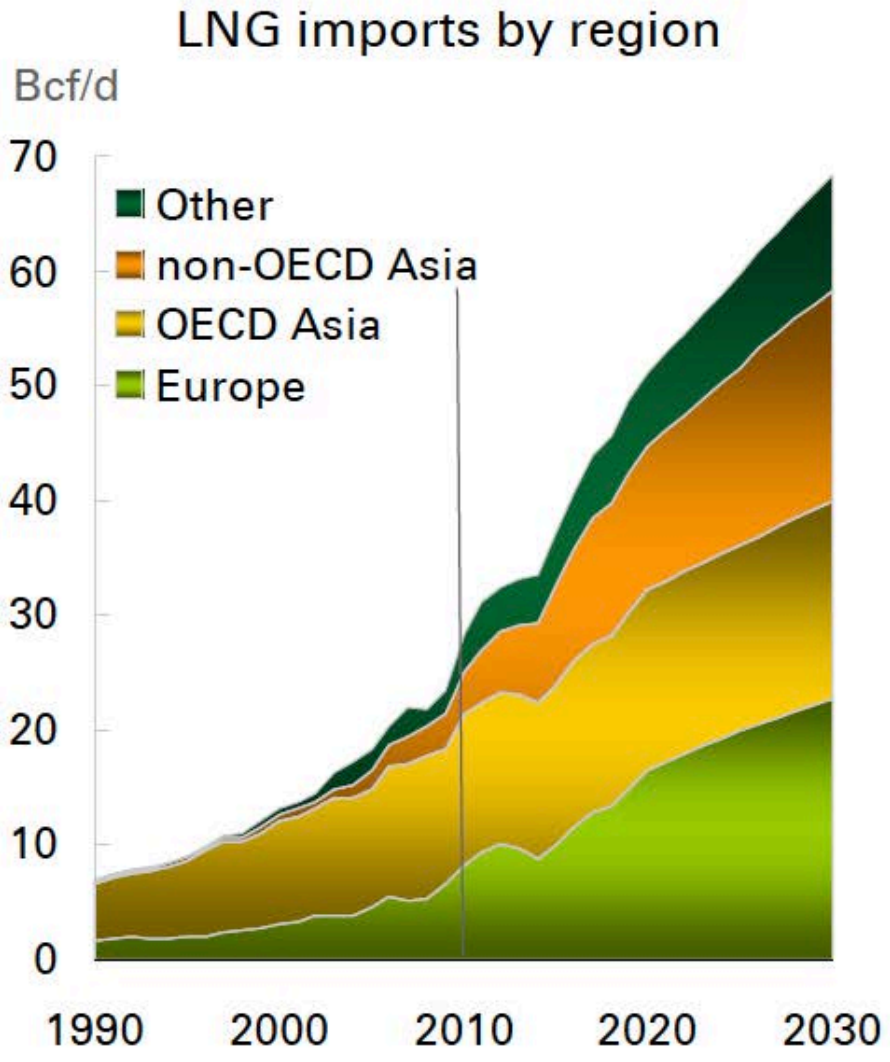


Demand by sector



LNG trade grows twice as fast as global gas production…

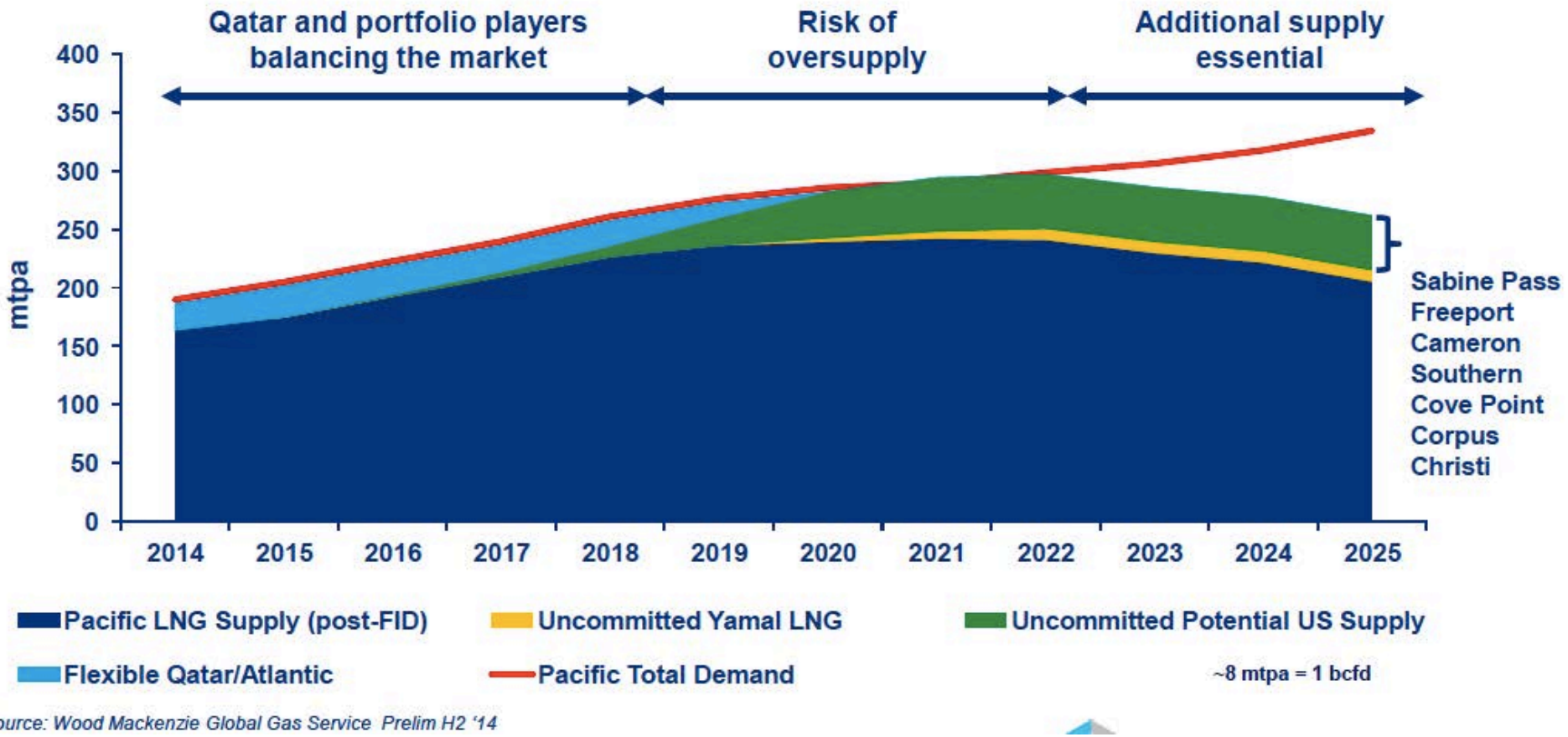




Pace of global LNG supply growth has started to outpace Pacific LNG demand growth

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

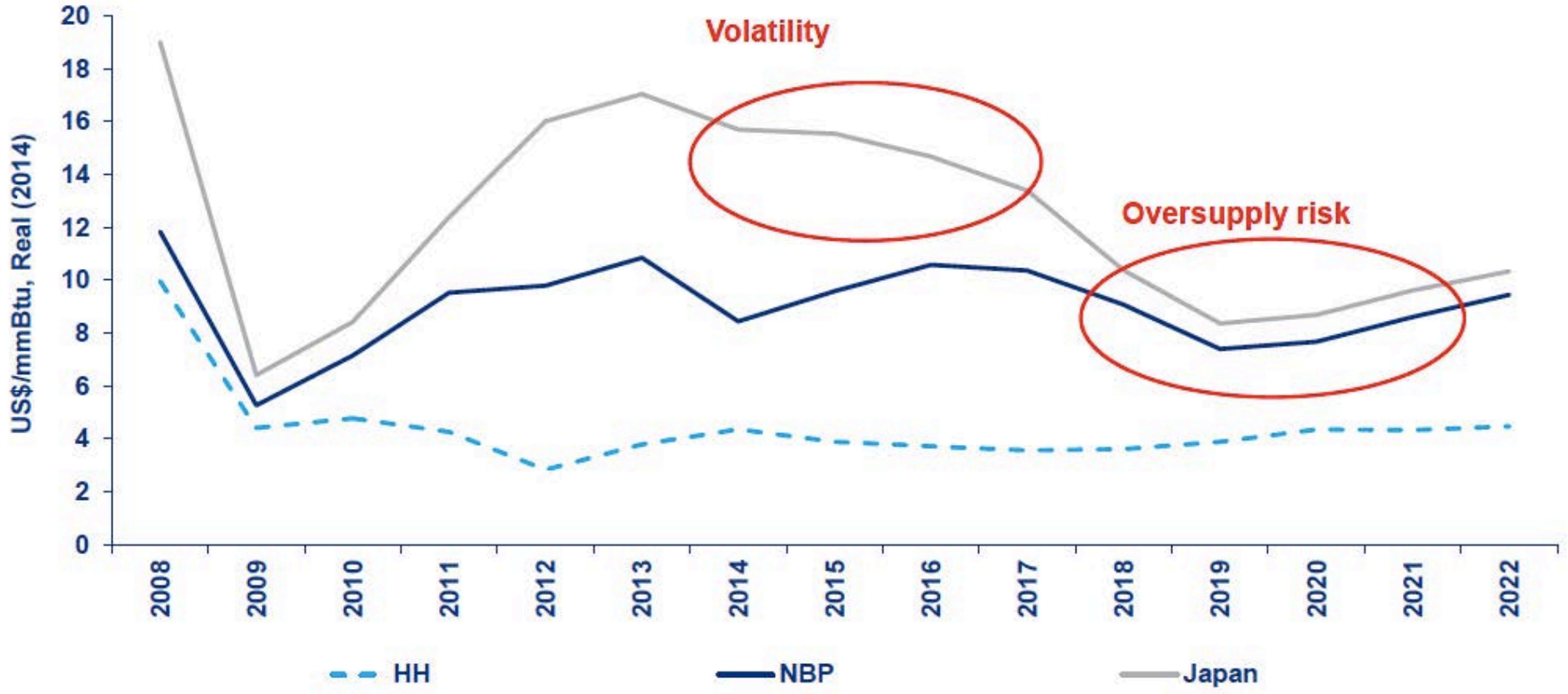
Pacific supply/demand outlook



Source: Wood Mackenzie Global Gas Service Prelim H2 '14

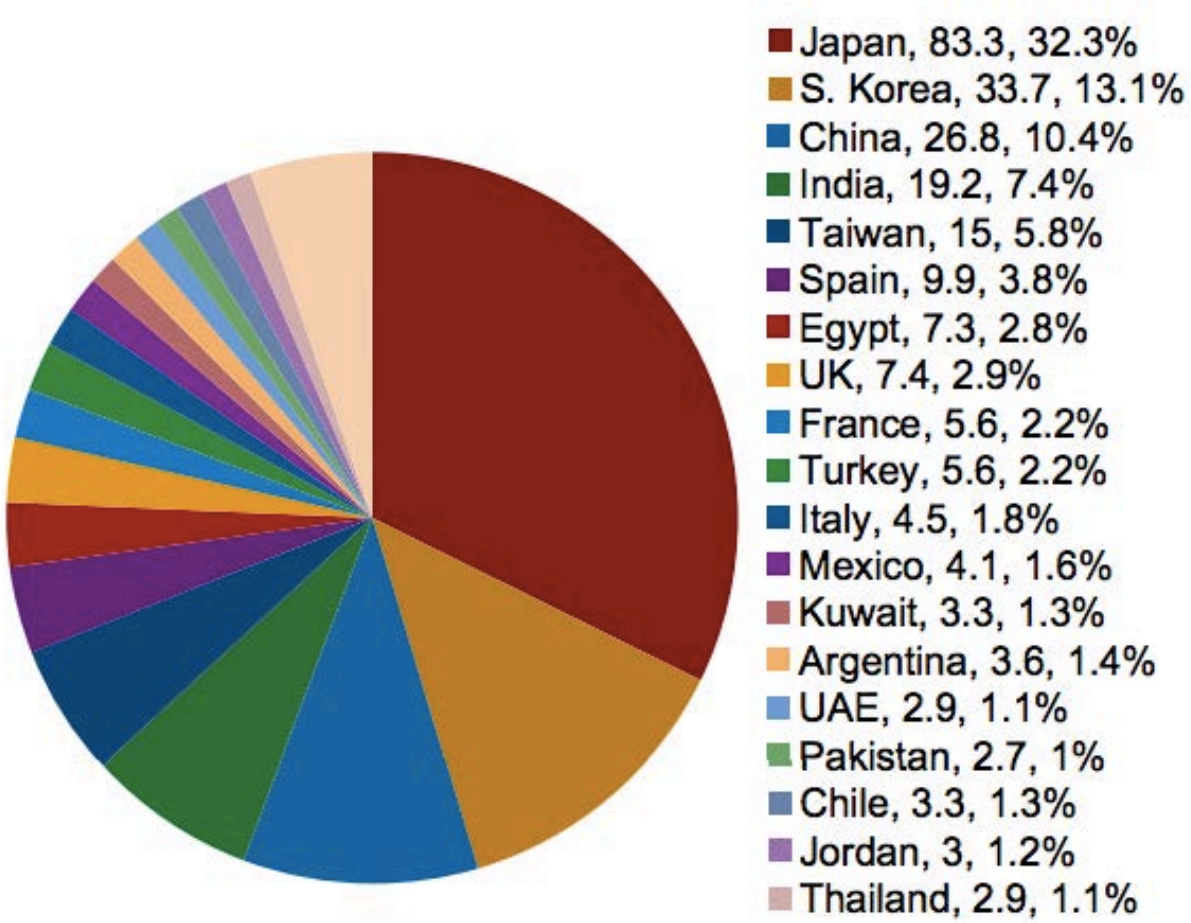
This presents a challenging picture for spot prices in Asia and Europe from 2018-21

Spot gas price forecasts to 2022



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

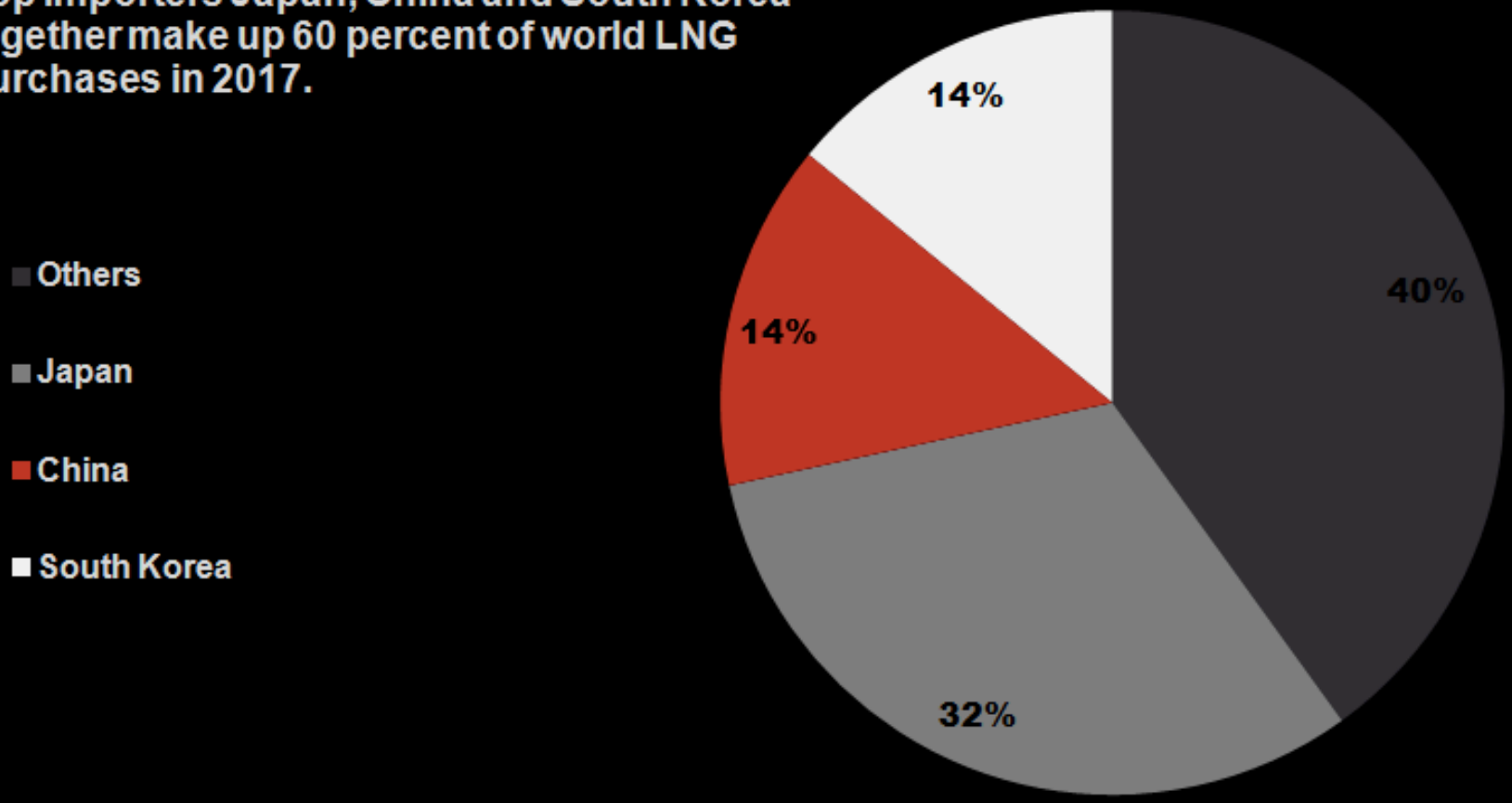
2016 LNG Imports and Market Share by Country (in MTPA)



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.

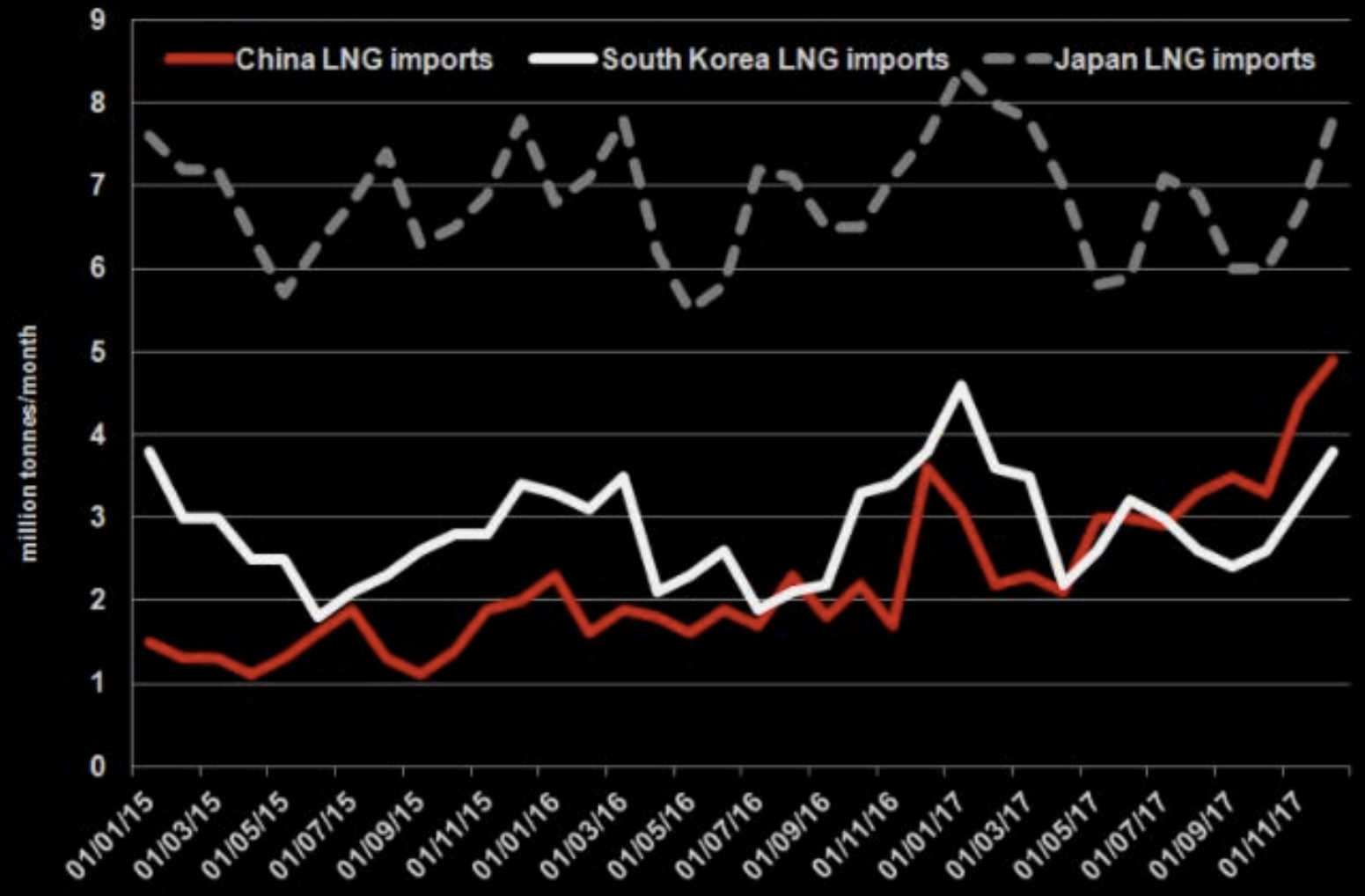


Henning Gloystein| Reuters

Source: Thomson Reuters Eikon

China vs South Korea & Japan LNG imports

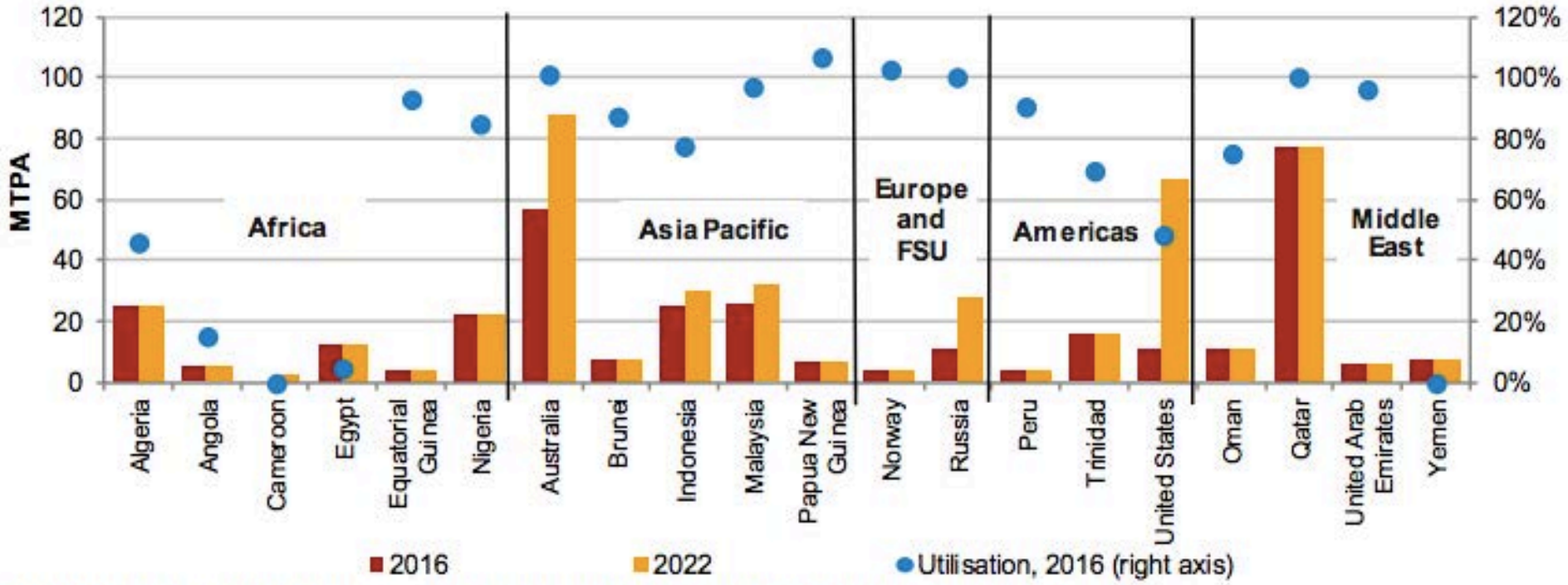
China's monthly LNG imports started overtaking South Korea's in mid-2017.



Henning Gloyystein | Reuters

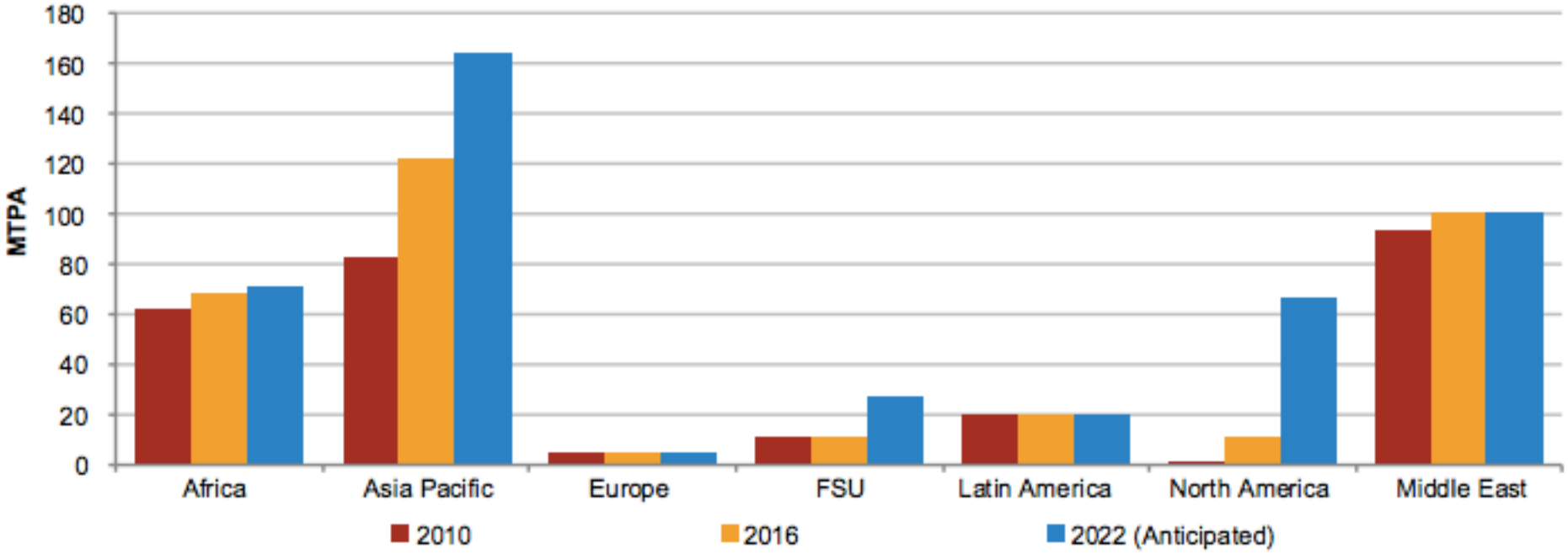
Source: Thomson Reuters Eikon

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

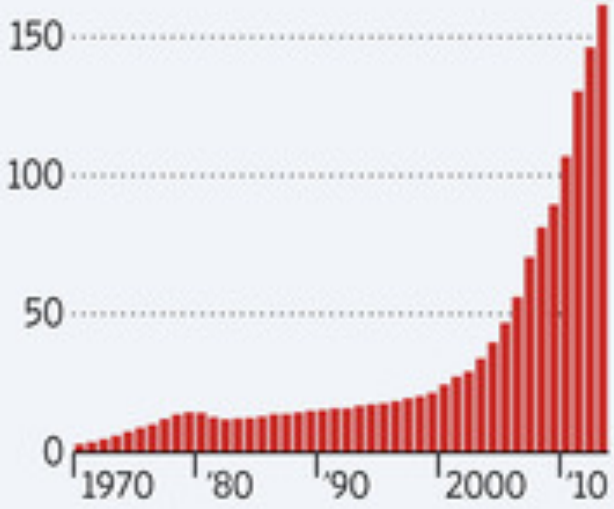
	Chinese company	Russian company	Project	Size of the deal
1	China National Petroleum Corp	Gazprom OAO	Natural gas supply with 38 billion cubic meters annually	About $400 billion
2	China National Petroleum Corp	Novatek OAO	LNG purchases and sales contract on the Yamal Project	Not available
3	China National 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

LI YI / CHINA DAILY

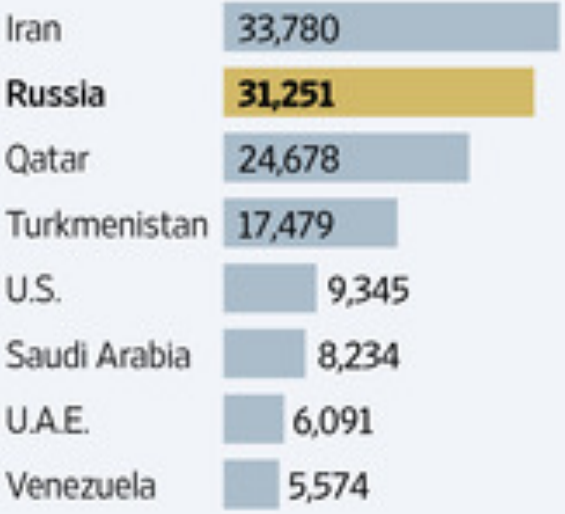
Energy Alliance

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



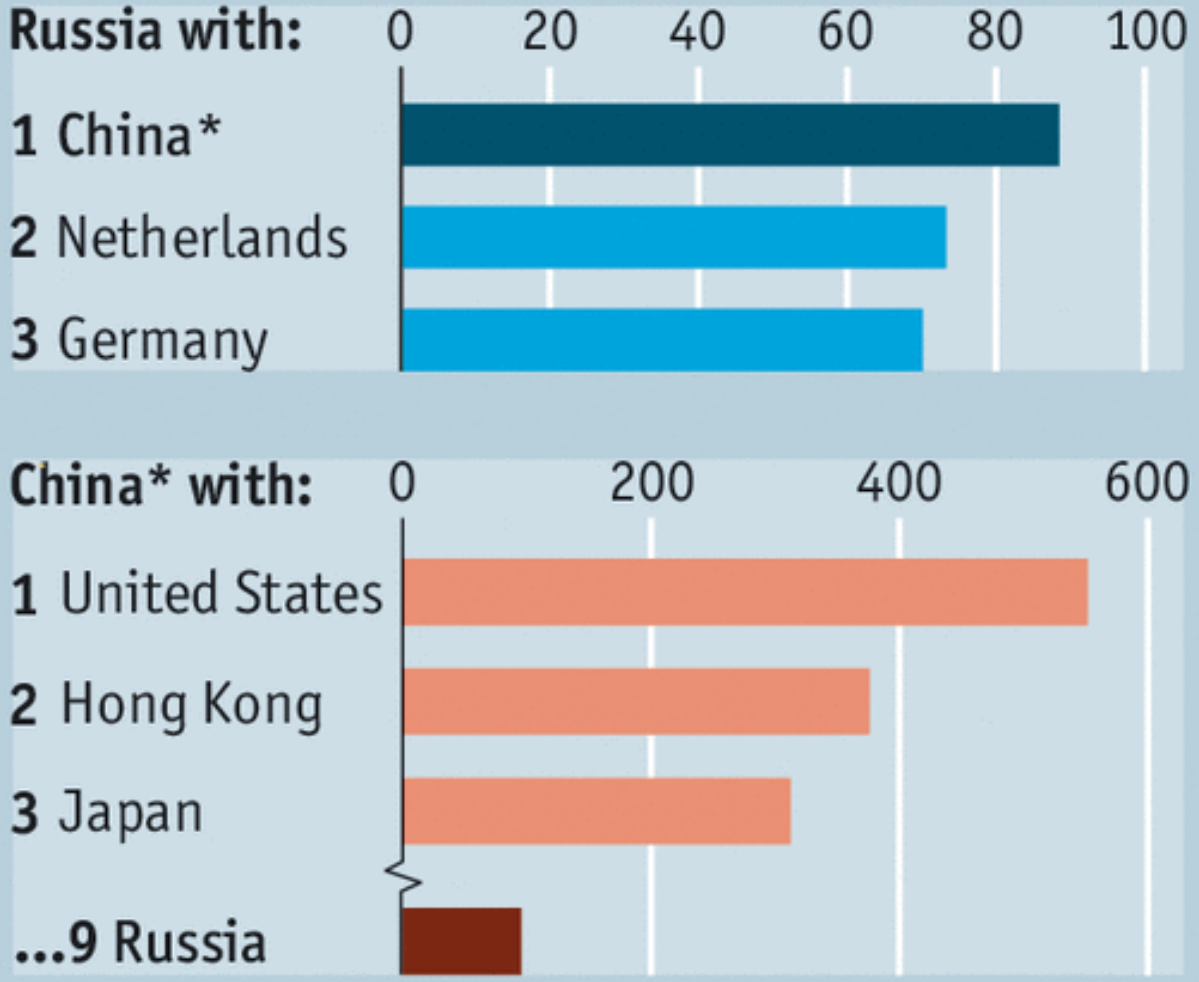
Russia's natural-gas exports, by destination 2013, in billions of cubic meters

Source: BP Statistical Review

The Wall Street Journal

Giant tiger, small bear

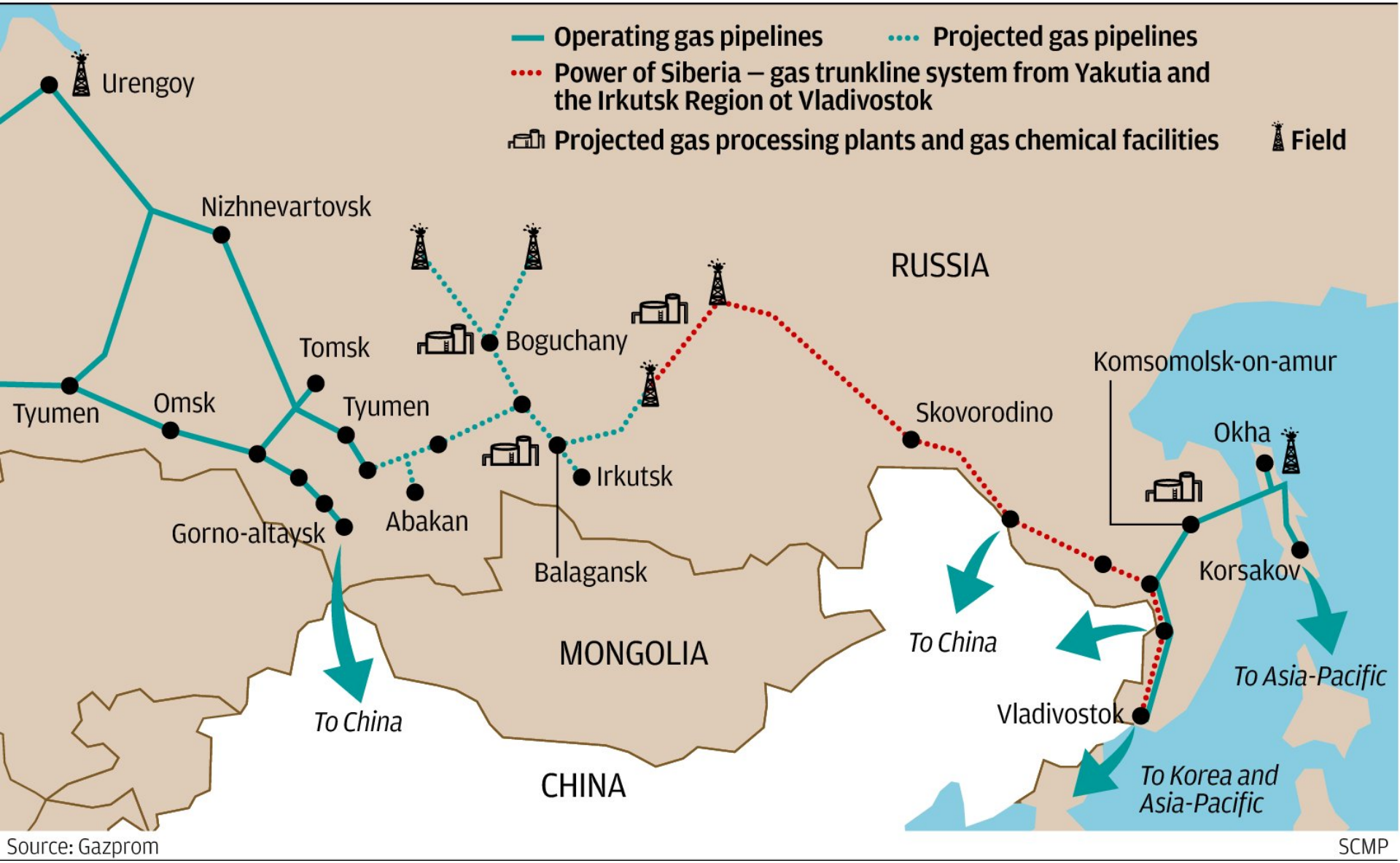
Total trade in goods, 2014, $bn



Source: IMF

*Mainland

Russia-China Gas Pipelines



Source: Gazprom

SCMP

SILK ROAD


RUSSIA
GERMANY
POLAND
UKRAINE
KAZAKHSTAN
MONGOLIA
ROMANIA
Black Sea
ITALY
UZBEKISTAN
Caspian Sea
Tian Shan Mountains
GREECE
TURKEY
TURKMENISTAN
Mediterranean Sea
IRAQ
CHINA
AFGHANISTAN
IRAN
Himalayan Mountains
PAKISTAN
NEPAL
EGYPT
SAUDI ARABIA
INDIA
MYANMAR
LAOS
Red Sea
Arabian Sea
Bay of Bengal
THAILAND
VIETNAM
CAMBODIA
Main Silk Road
Eurasian Steppe Route
Main Connecting Routes
0mi 500
0km 1,000
Copyright Stratfor 2013 www.stratfor.com

CHINA-CENTRAL ASIA INFRASTRUCTURE DEVELOPMENT

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

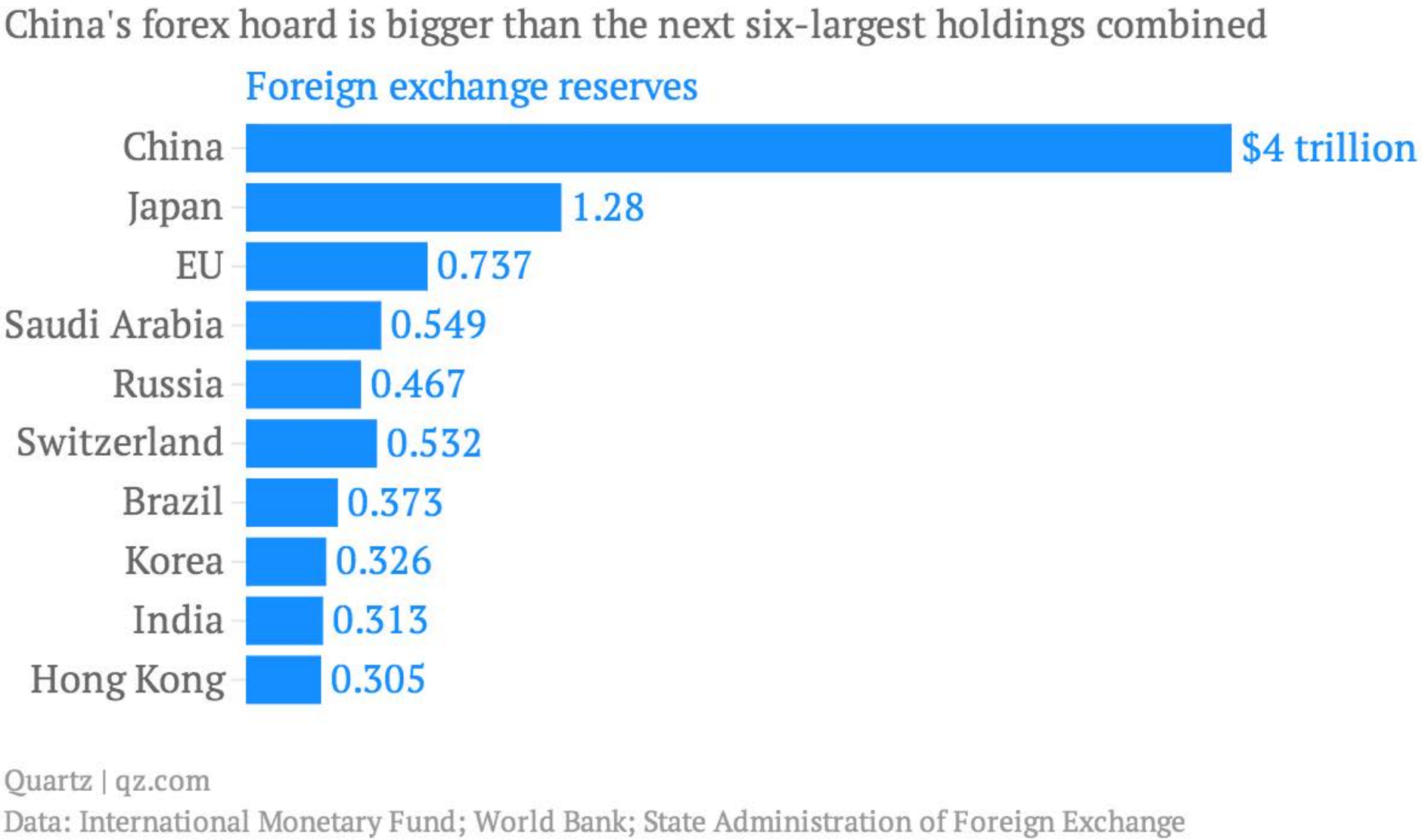
- China is known for massive resource investments worldwide;

- China has been innovative in how to arrange these deal:

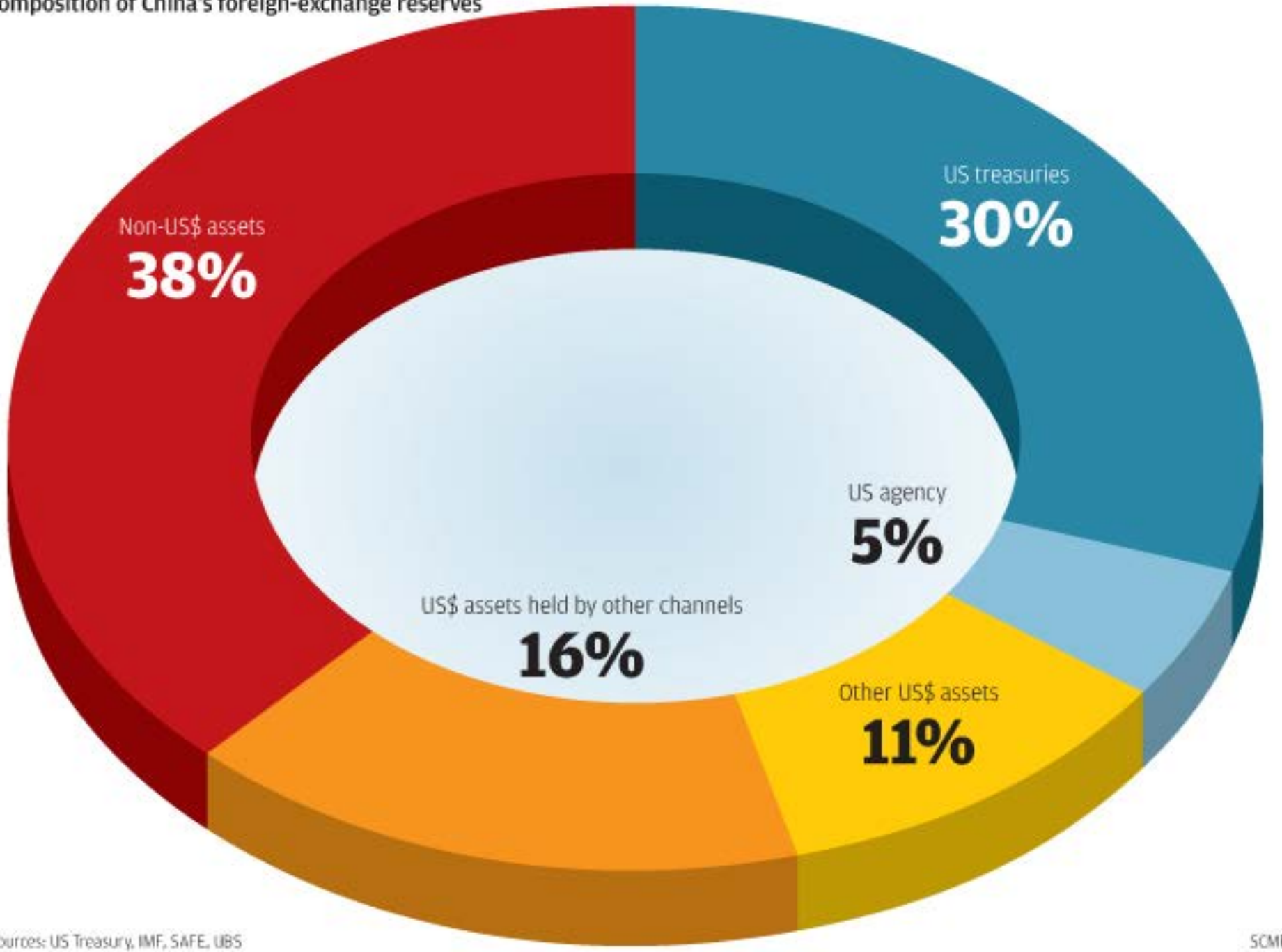
  -- Infrastructure in exchange for copper (DRC)
  -- Infrastructure/loans for oil (Angola)
  -- Loans in exchange for oil
  -- Long-term supply of oil and gas (Russia)

- SOEs, NOCs, Financial institutions join hands

China has deep pocket for overseas assets



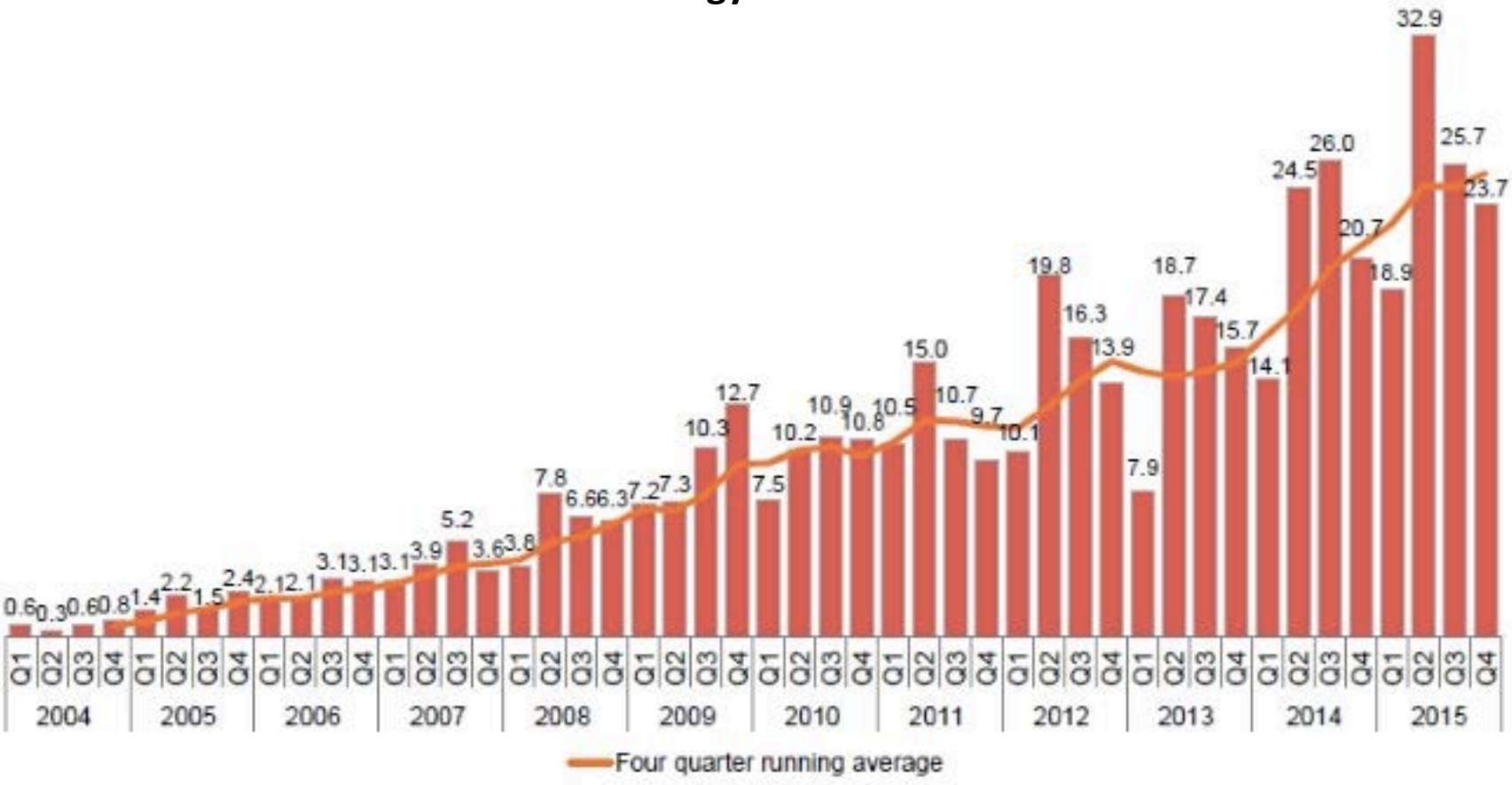
Composition of China's foreign-exchange reserves



Sources: US Treasury, IMF, SAFE, UBS

SCMP

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

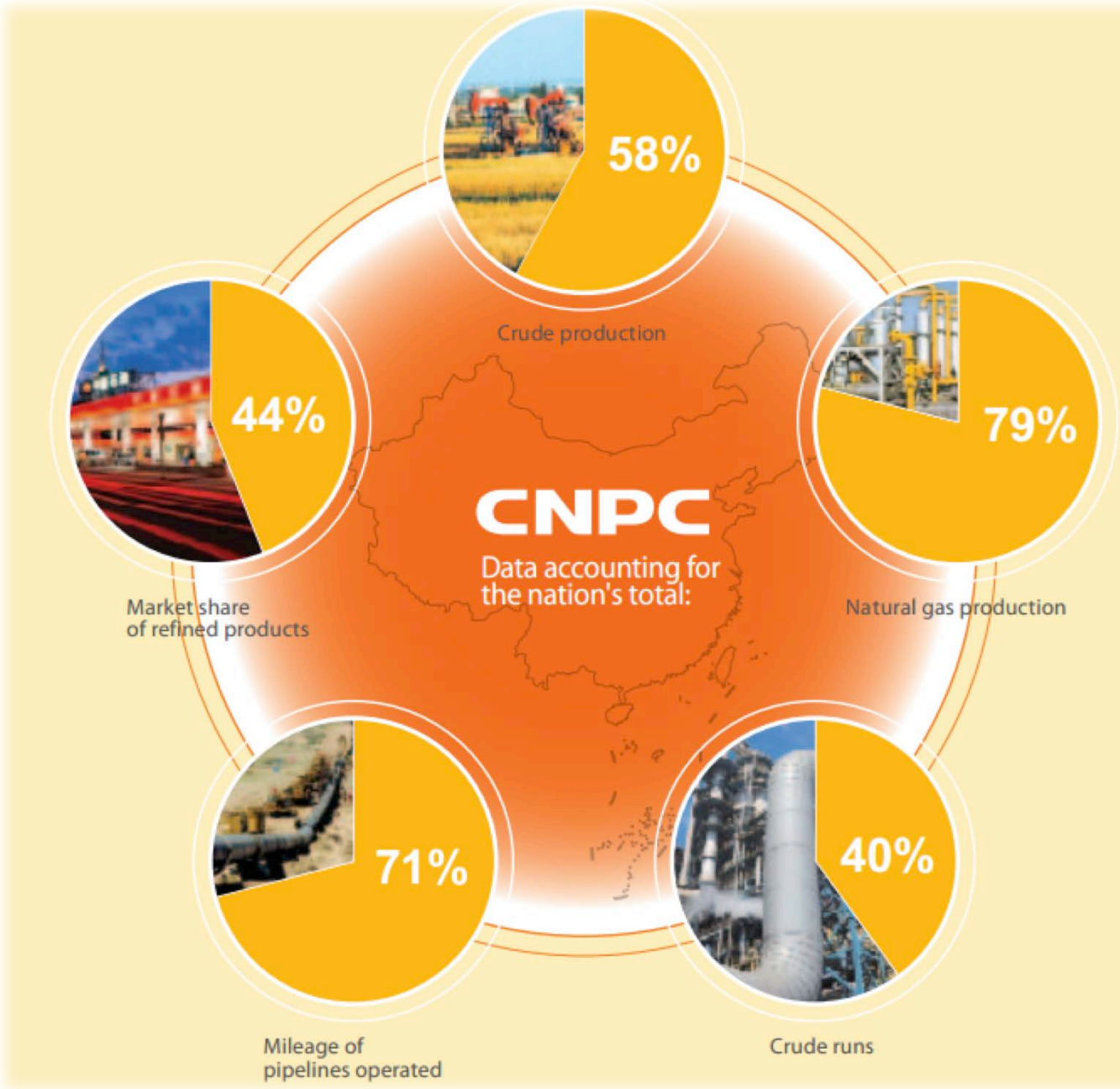
中国中化集团公司
SINOCHEM GROUP

Yangtze River cuts China from West to East…

China National Petroleum Corp.
(CNPC)

PetroChina

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


58%
Crude production
44%
Market share
of refined products
79%
Natural gas production
CNPC
Data accounting for
the nation's total:
71%
Mileage of
pipelines operated
40%
Crude runs

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**

中国中化集团公司
SINOCHEM GROUP

- 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

	2006	2010
PetroChina	2.9	3.4
Sinopec	0.9	1.1
Cnooc	0.5	0.9

China's oil production and consumption

Million barrels per day

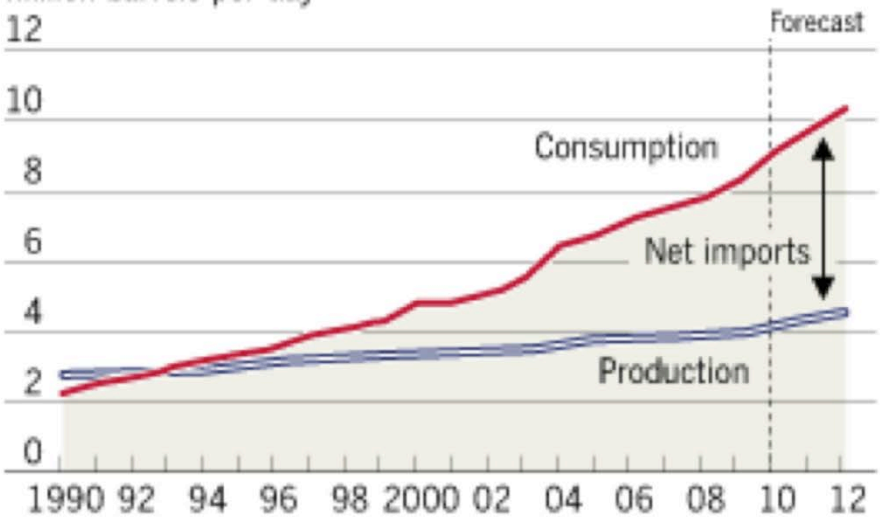
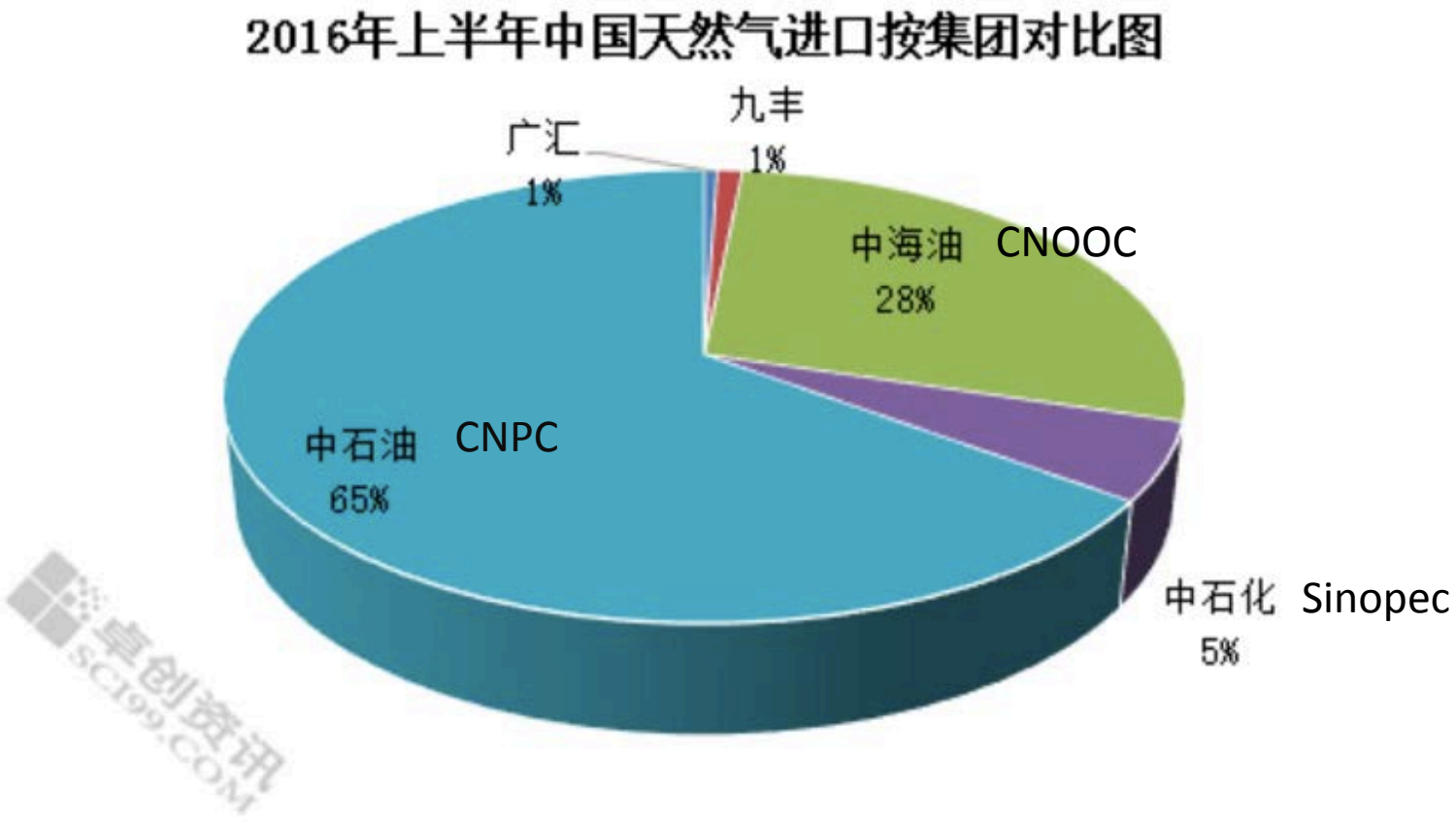
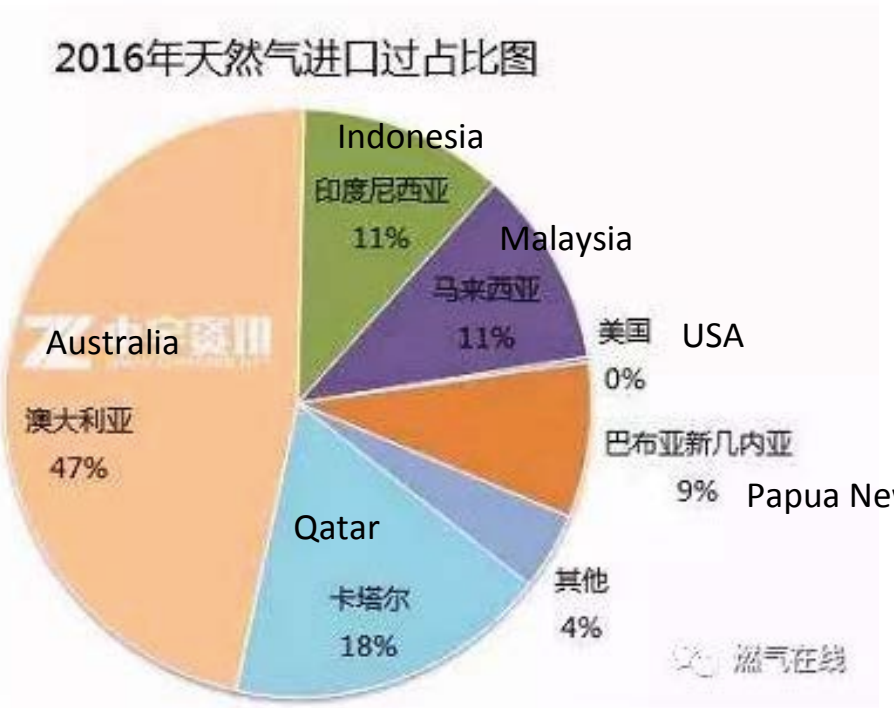


Photo: Xinhua News Agency

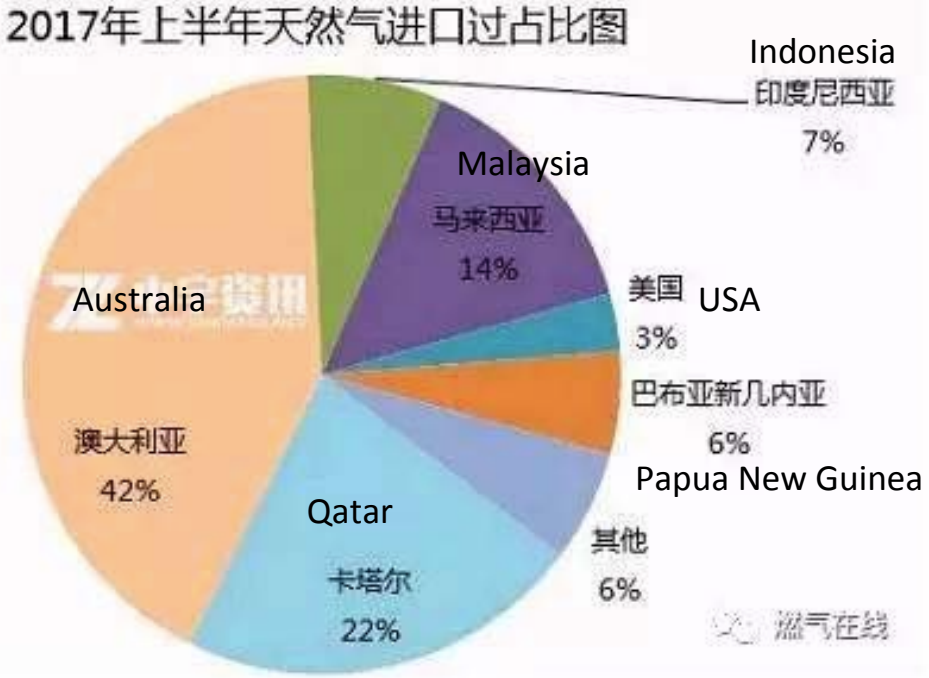
Sources: Bloomberg; EIA

January-June 2016 China gas/LNG imports by companies



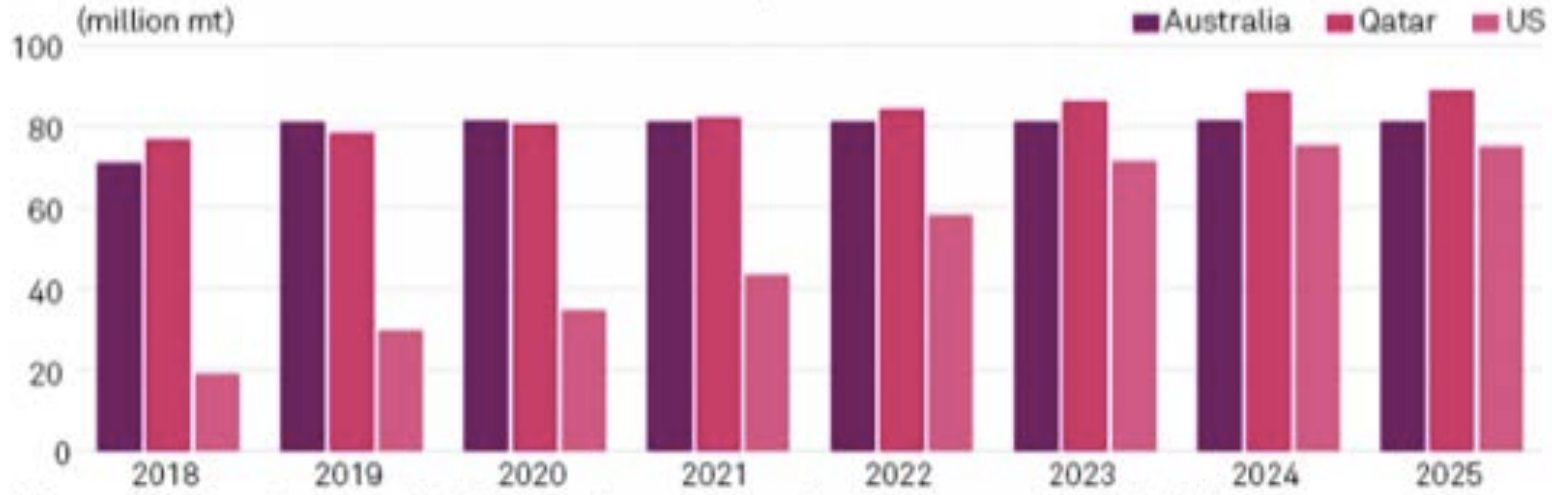


2016 China LNG import sources



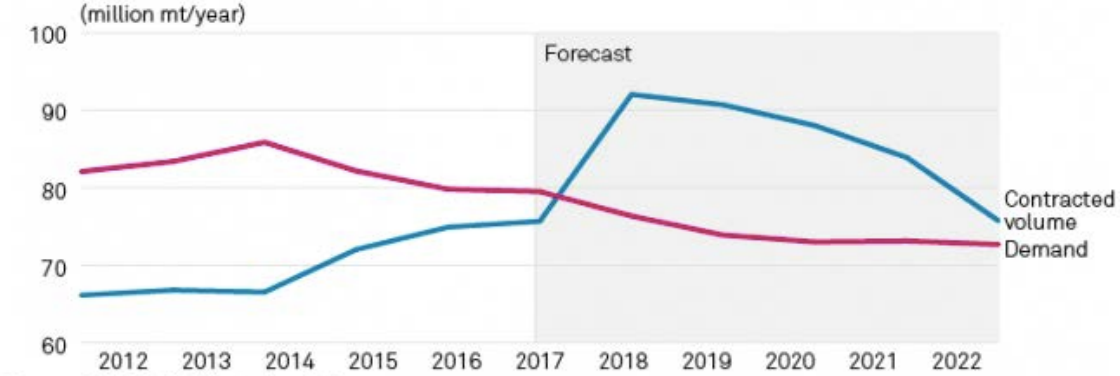
2017 first half
China LNG import sources

LNG EXPORT FORECAST FROM QATAR, AUSTRALIA AND THE US*



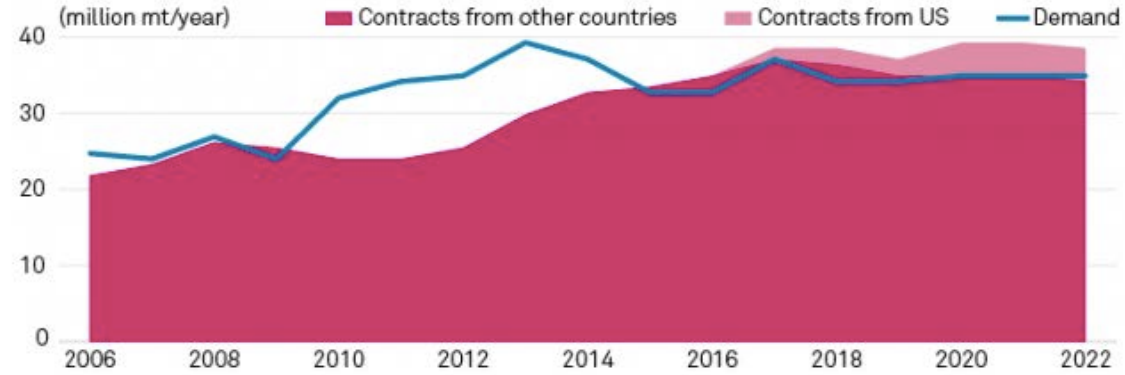
*Forecast made prior to Qatar's LNG capacity expansion plan announcement in July 2017
Source: S&P Global Platts Analytics

JAPAN LNG DEMAND VERSUS CONTRACTED VOLUME



Source: S&P Global Platts Analytics

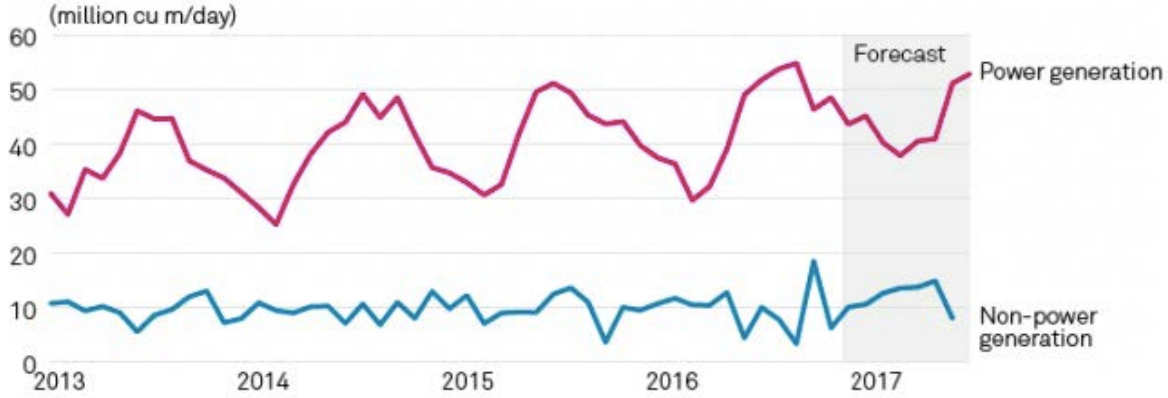
SOUTH KOREA LNG DEMAND VERSUS CONTRACTED VOLUME



Source: S&P Global Platts Analytics

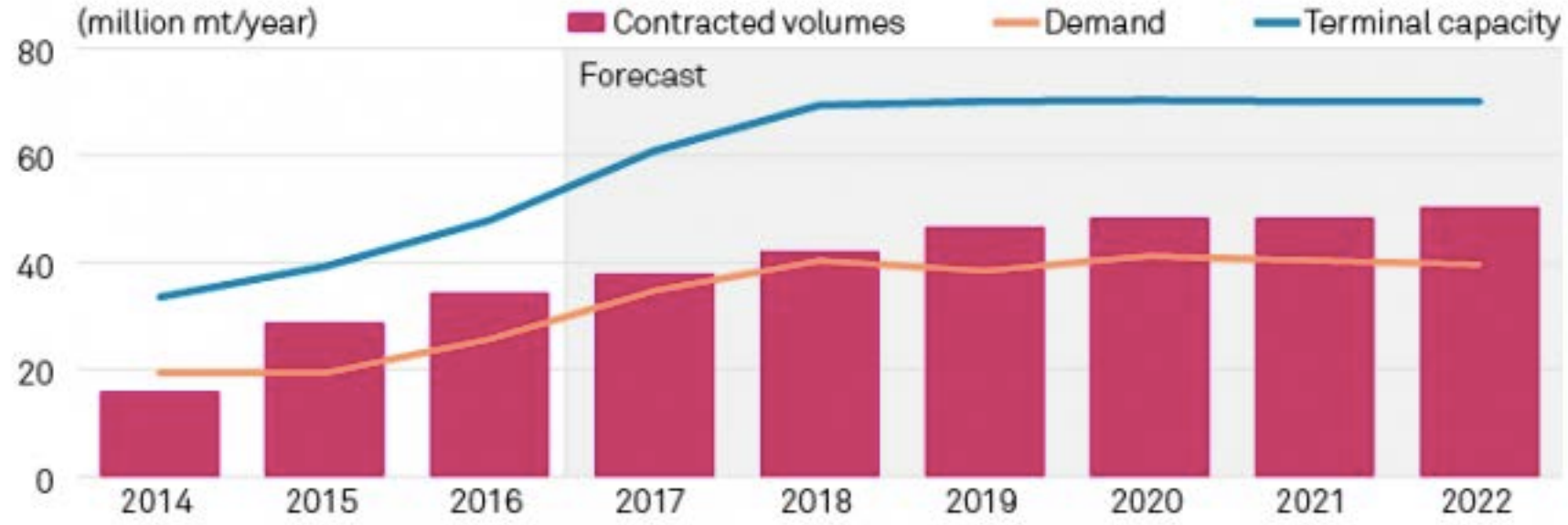
2017-2022 is forecast.

TAIWAN GAS USE



Source: S&P Global Platts Analytics

CHINA IMPORTS PROJECTIONS VERSUS CAPACITY



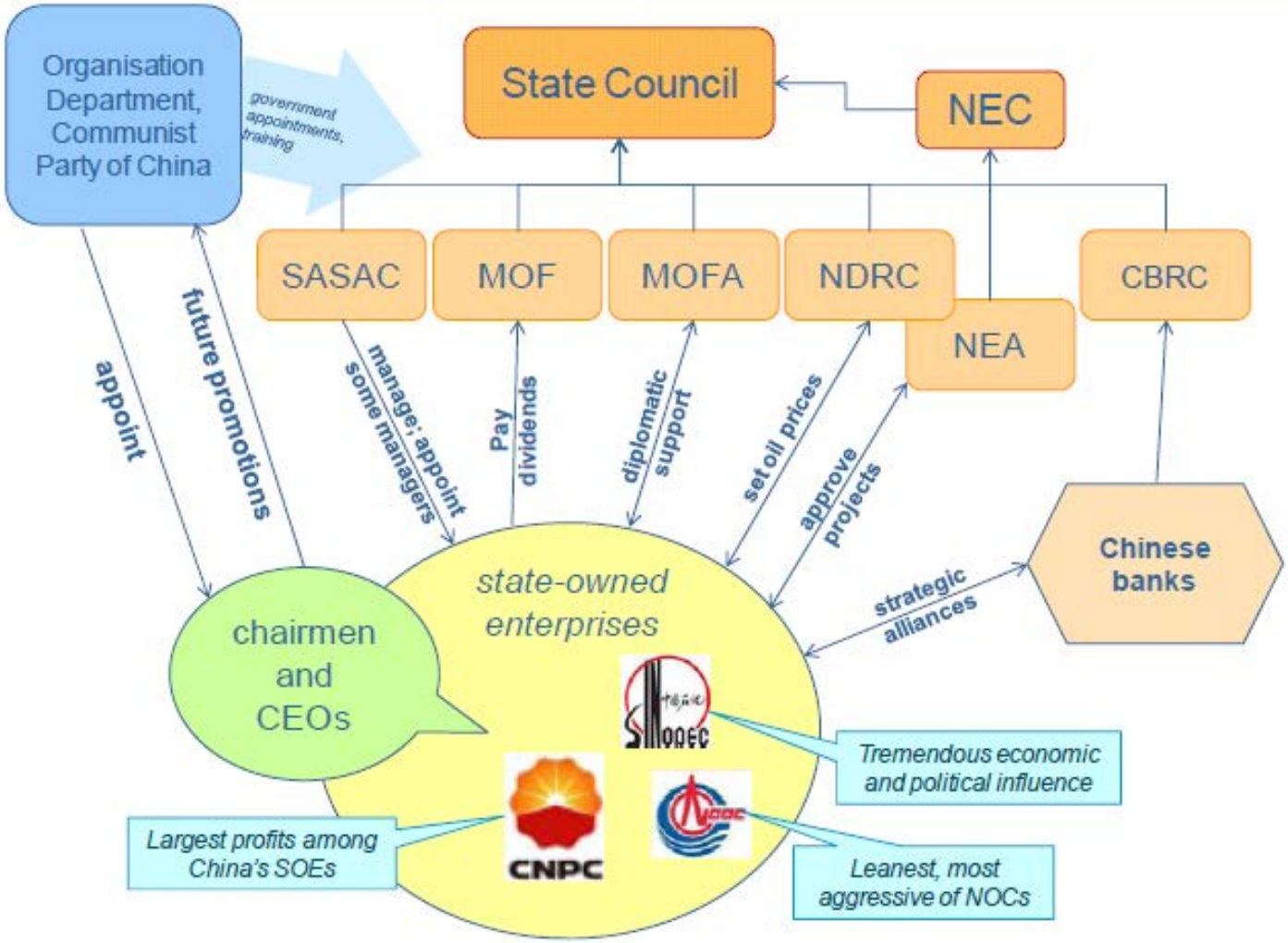
Source: S&P Global Platts Analytics

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**

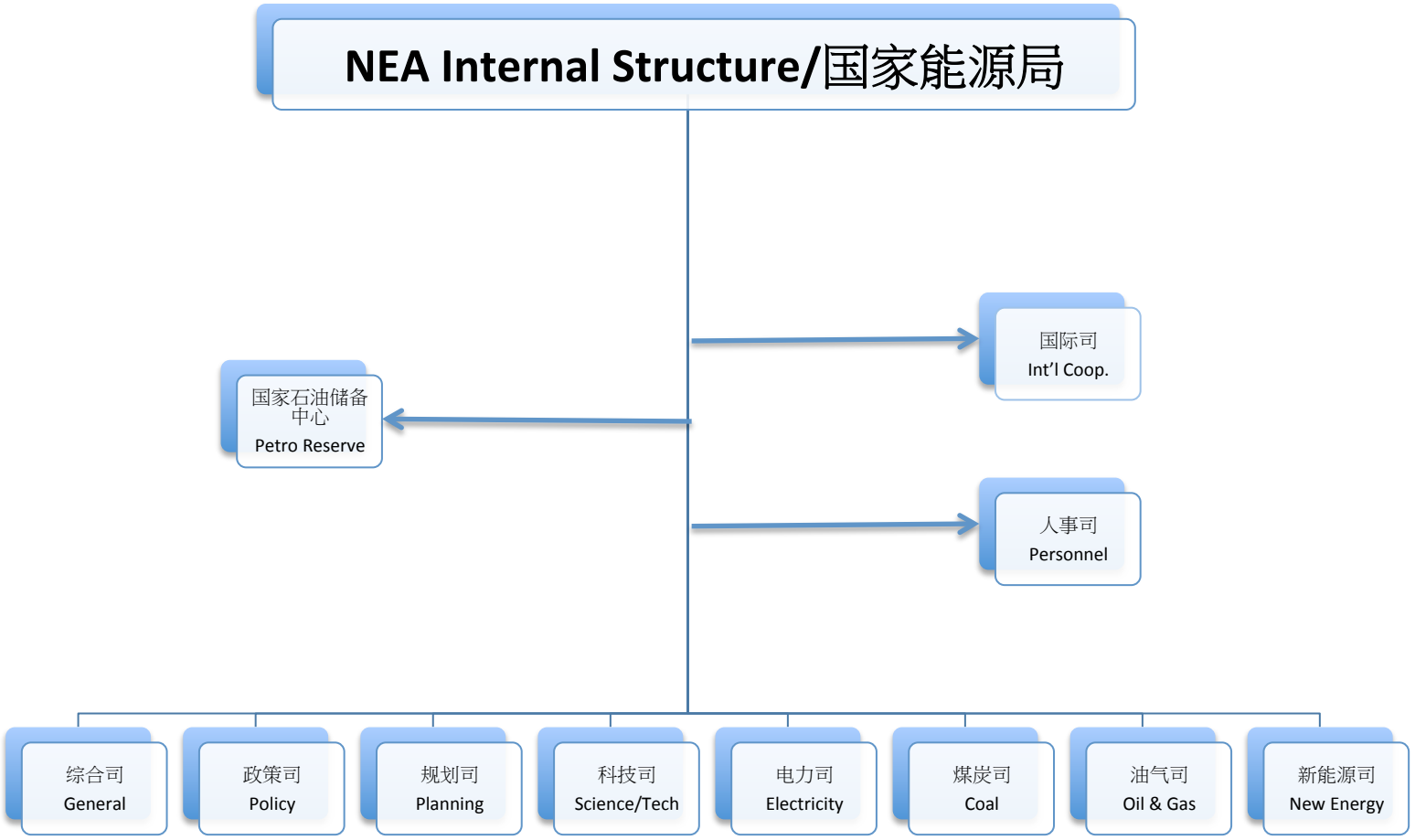
Governing Structure of Chinese NOCs



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 polices; 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.



Source: Wenran Jiang, Canada-China Energy & Environment Forum

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**

中国投资有限责任公司
CHINA INVESTMENT CORPORATION

- **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 …

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

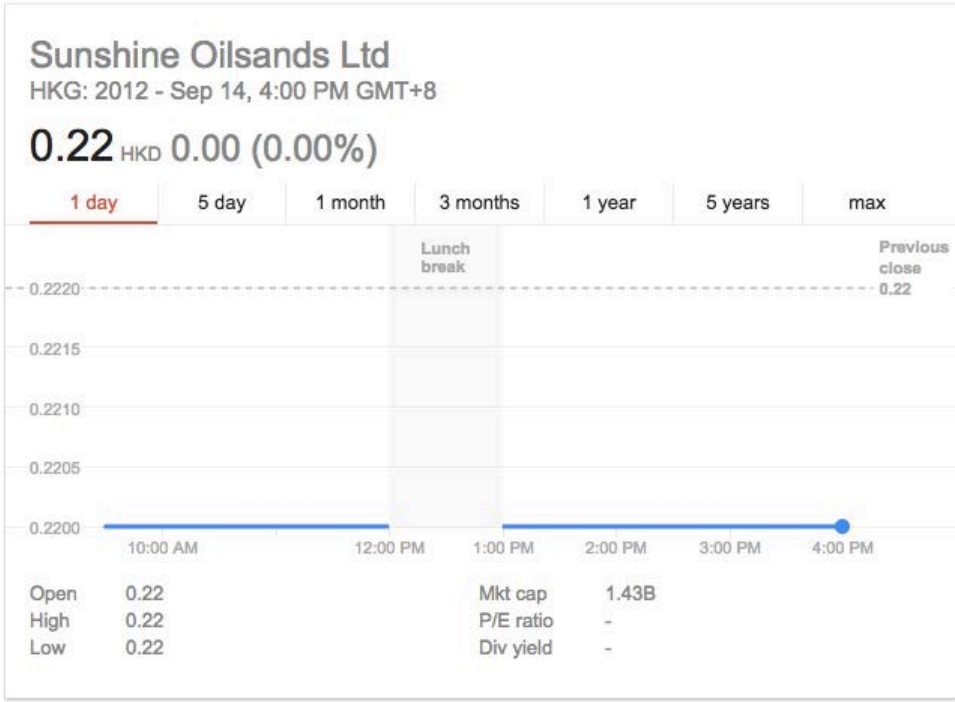
Range	-	Div/yield	-
52 week	0.20 - 1.30	EPS	-0.20
Open	-	Shares	272.60M
Vol / Avg.	0.00/653.00	Beta	0.69
Mkt cap	59.97M	Inst. own	-
P/E	-		

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	-		



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

THANKS YOU!

Wenran Jiang, Ph.D.

Email: wenran.jiang@gmail.com

Cell: 587 989 9929