

China's use of fuel methanol and implications on future energy trends



For

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Overview

- China's changing energy mix: economic growth, energy security and cleaner fuels
- China's methanol use for fuel, both in direct blending and as derivatives
- Feedstocks for China's methanol production
- Future outlook for China's methanol and other alternative fuel uses
- Implementation of Argus data into EIA's historical and projected petroleum data

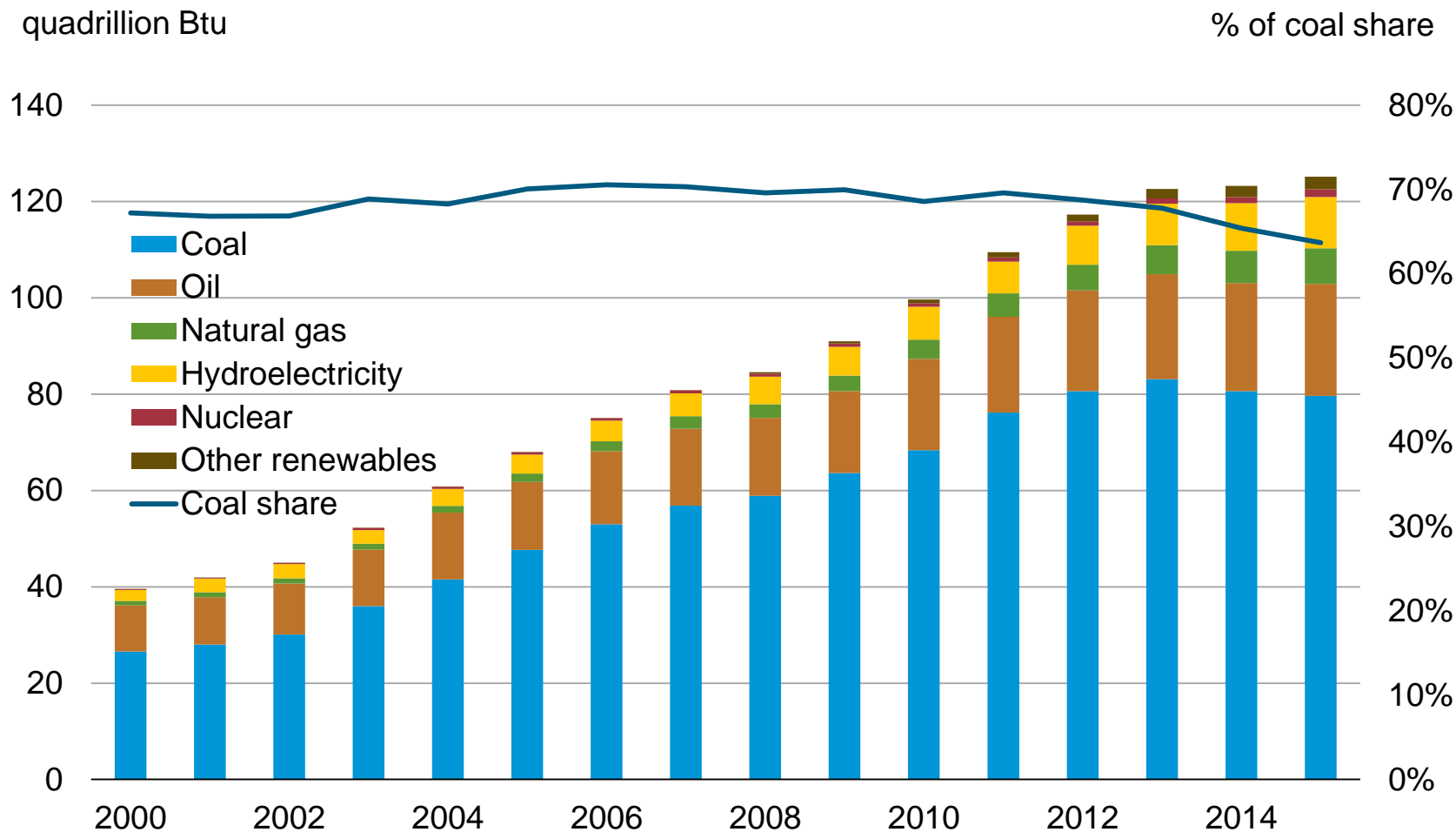
Summary of Argus China Methanol to Energy Study

- China's methanol supply and demand have risen, through direct blending and as derivatives (MTBE, MTG, DME). Recent drivers of methanol consumption growth have been fuel applications and methanol conversions to olefins.
- Coal (directly or through coking gas) accounts for 85% of the feedstock for China's methanol production capacity, and natural gas makes up the remainder. China will continue to use coal as the major feedstock in the future, but demand in the long term could be met by higher methanol imports (natural gas-based).
- Chinese provincial governments are supporting methanol use by adopting standards ranging from M5 to M100. Shanxi is the province with the most widespread use of methanol. National standards exist for M85 and M100, and an M15 standard is under review.
- Independent refiners have increased blending of higher octane components into the gasoline stream in the past few years. Most of these components (methanol, mixed aromatics, and others) are not taxed, and are cost competitive with gasoline. Methanol is the least cost blending component and should remain competitive in the longer term.

Argus study will improve EIA's International Energy Outlook

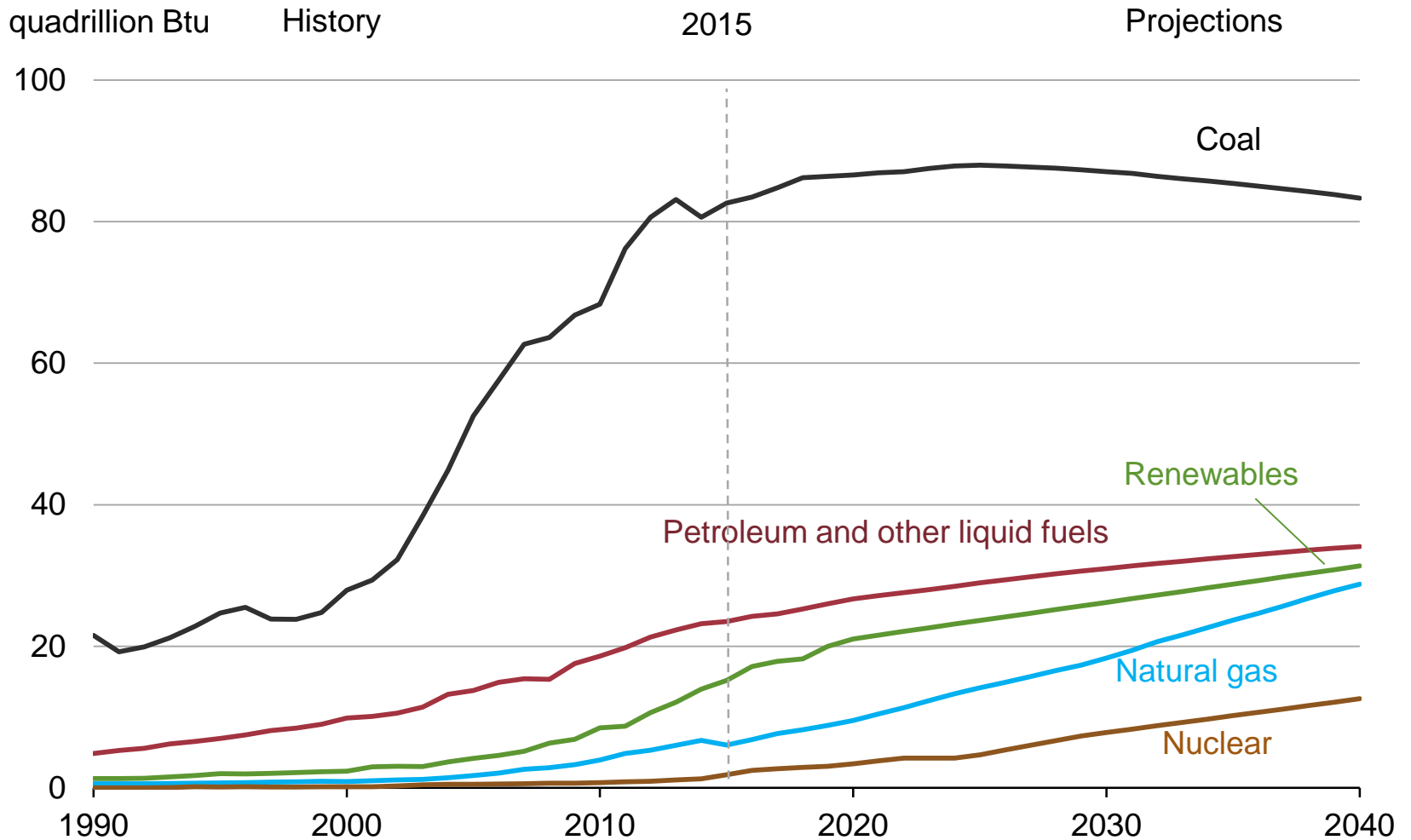
- China's gasoline demand was assumed to come from only petroleum sources in prior IEOs. Although, now we understand that a sizeable volume is likely sourced from coal as a high-methanol blend.
- China's gasoline demand in future IEOs will include methanol blends (under the category of gasoline).
- Methanol will be considered as an alternate bunker fuel in future IEOs.

China's primary energy consumption has been dominated by coal, though government policies are currently reducing coal's share



Sources: EIA, BP Statistical Review

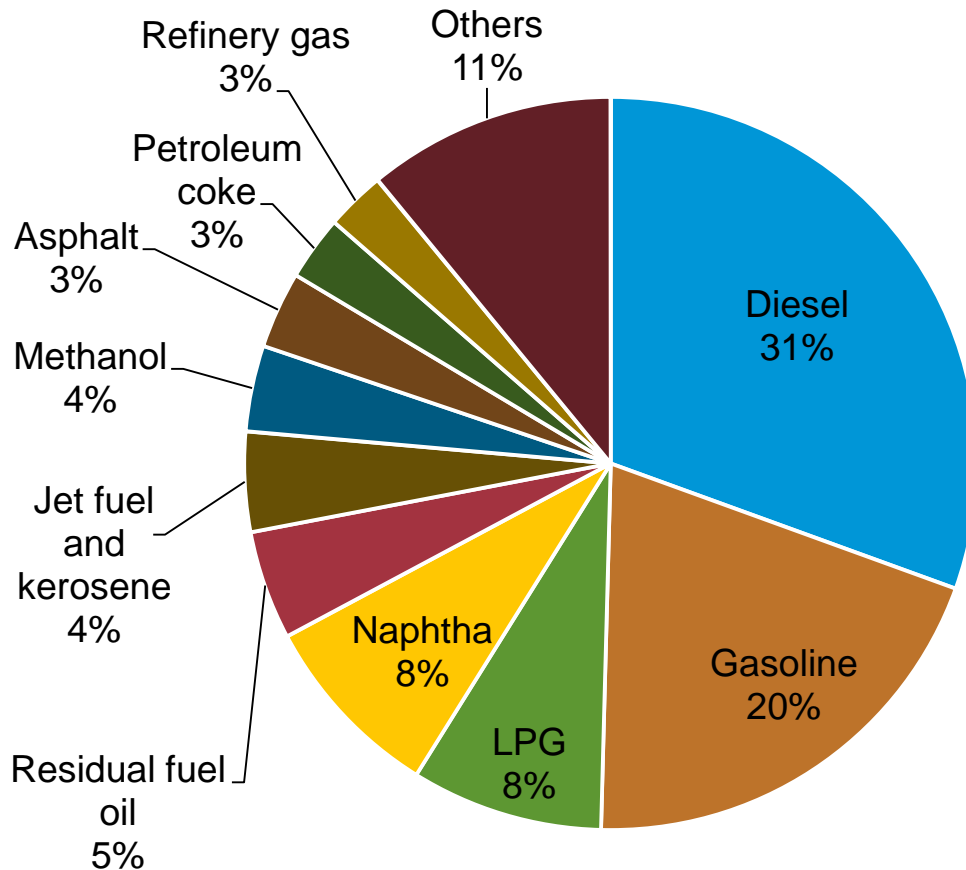
EIA's International Energy Outlook (IEO) 2016: China energy consumption by energy source, 1990–2040



Source: EIA, International Energy Outlook 2016

Gasoline and diesel serve more than half of China's petroleum consumption

China's Petroleum Consumption by Product, 2014

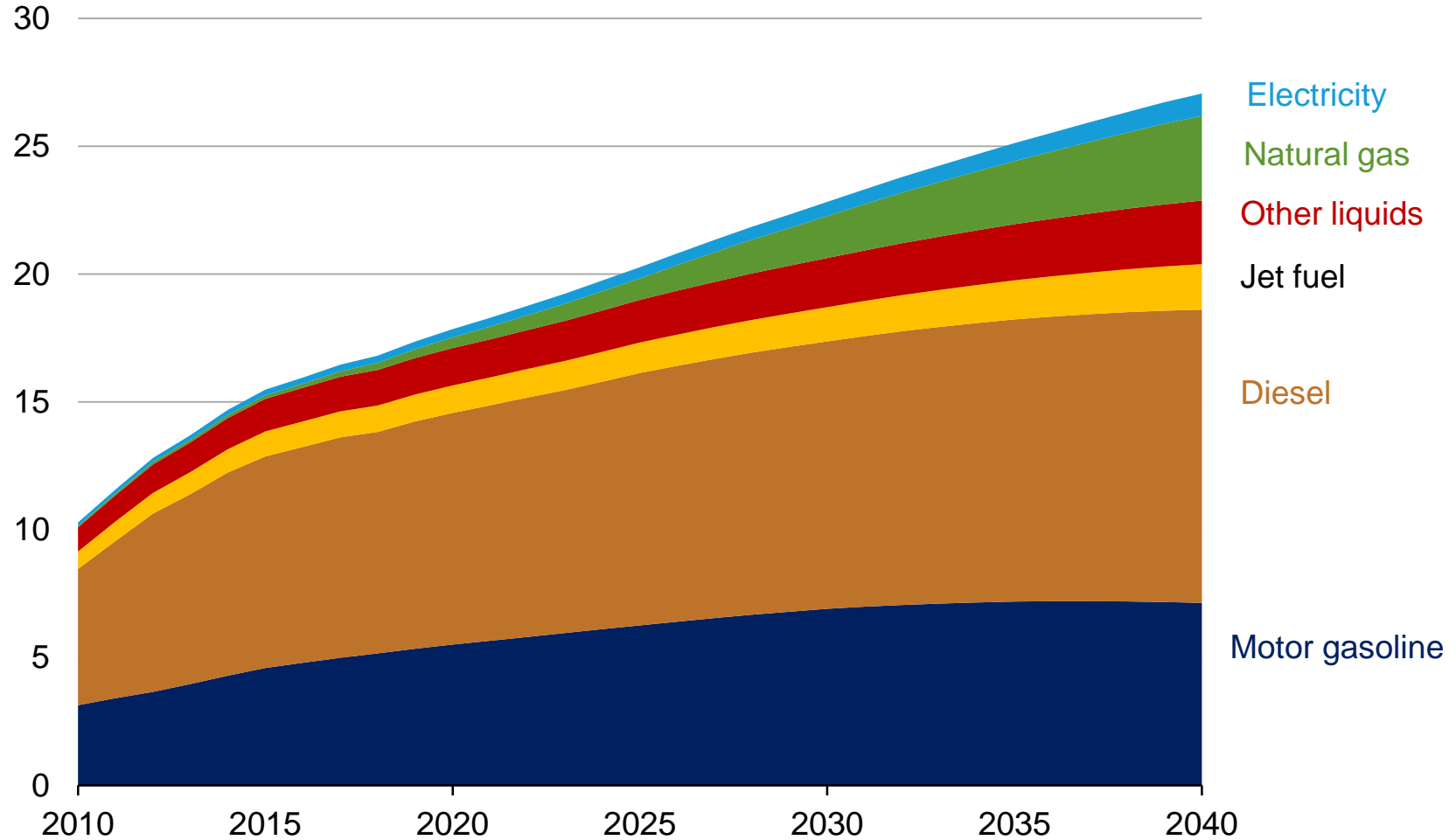


- Since 2014, gasoline, jet fuel, liquefied petroleum gas (LPG), and naphtha have increased substantially.
- Gasoline and jet fuel use has increased in the past 2 years as the economy transitions to a more consumer-driven growth.
- LPG has grown in China's petrochemical sector as new Propane Dehydrogenation (PDH) plants are coming online.
- Shares of diesel and fuel oil have declined as mining and other industrial sectors slowed.

Source: EIA

IEO2016: China transportation sector delivered energy consumption by energy source, 2010–40

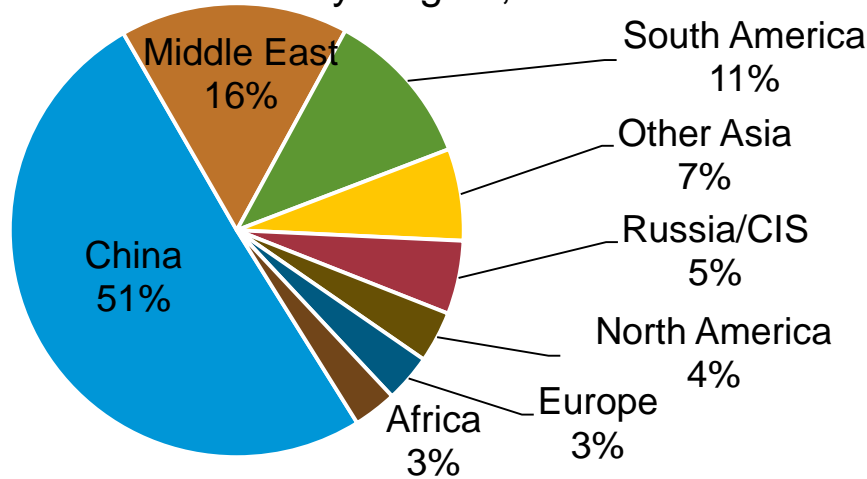
quadrillion Btu



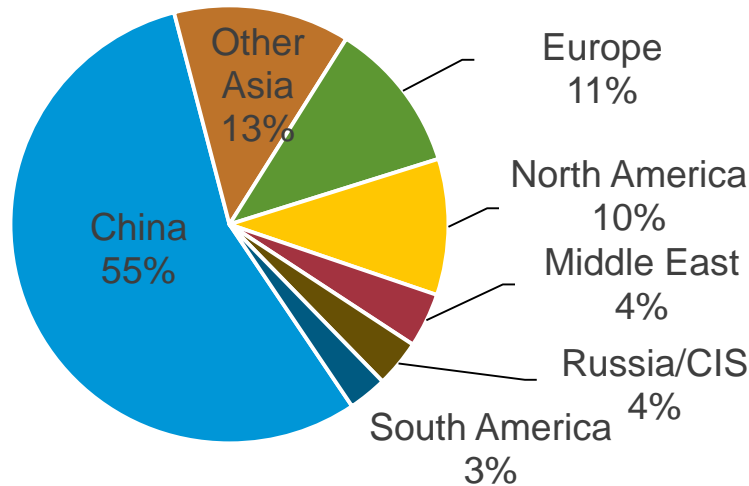
Source: EIA, *International Energy Outlook 2016*

Global methanol production and consumption by region, 2014

Methanol Production by Region, 2014



Methanol Consumption by Region, 2014



- China accounted for more than half of the world's methanol production and consumption in 2014.
- China's consumption exceeds production, and they rely on imports from almost all other regions. Less-expensive production and new methanol producing capacity in the United States could serve China in the future.

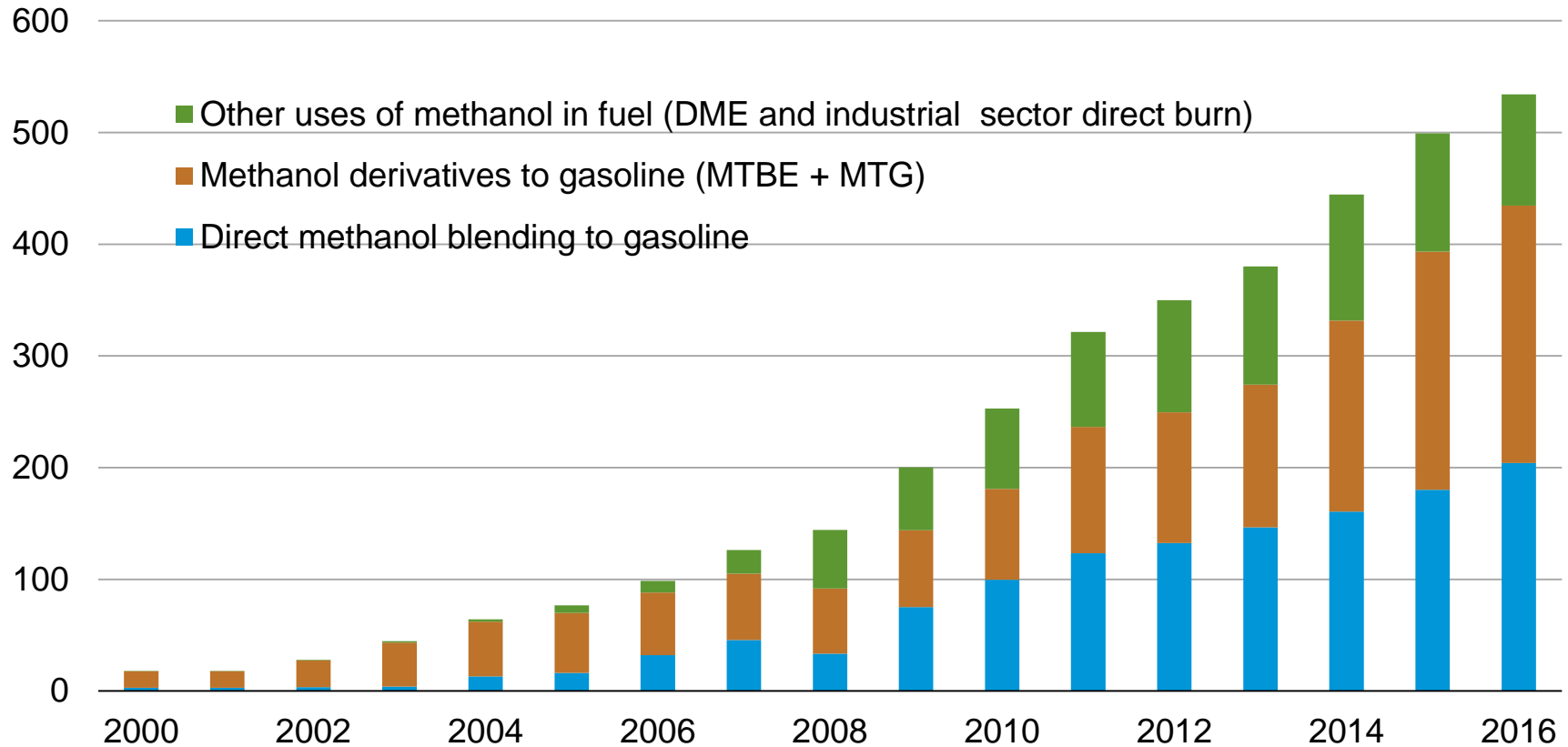
Source: Argus Media group

Uses of methanol in fuel

- Direct blending
 - Blending standards vary by region
 - Issues with high levels of blending
- Methyl Tertiary Butyl Ether (MTBE)
 - Oxygenate booster for gasoline
 - No longer used in the United States (but manufactured and exported)
- Dimethyl Ether (DME) as LPG alternative

China's methanol consumption in fuel products has been increasing over the past decade

thousand barrels per day

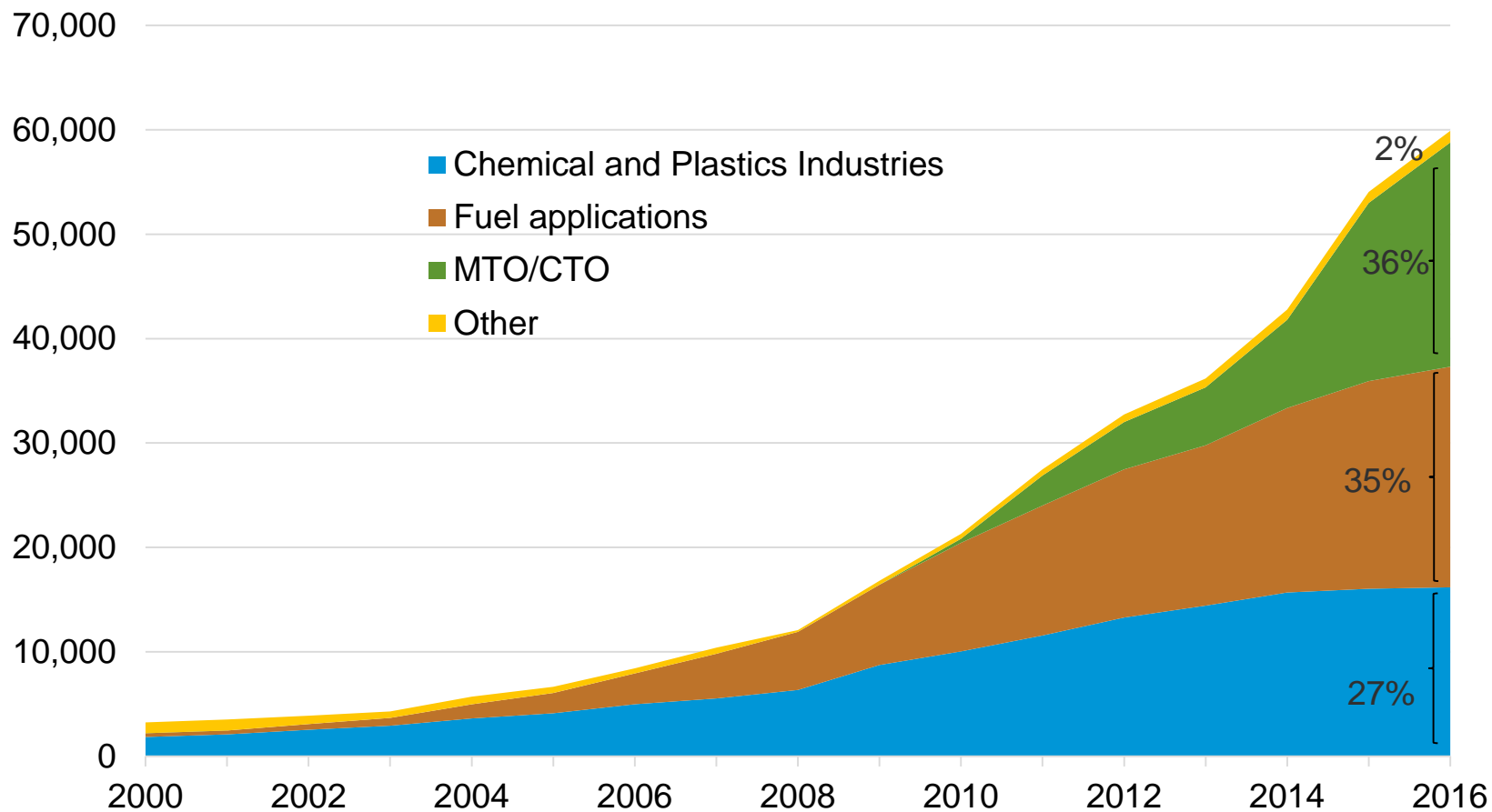


Source: Argus Media group

Notes: DME = Dimethyl Ether; MTBE = Methyl Tertiary Butyl Ether; and MTG = methanol-to-gasoline

China's methanol consumption is increasingly being driven by fuel applications and methanol conversion to olefins

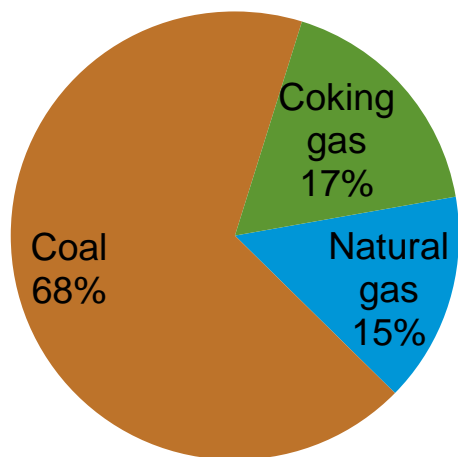
thousand metric tons



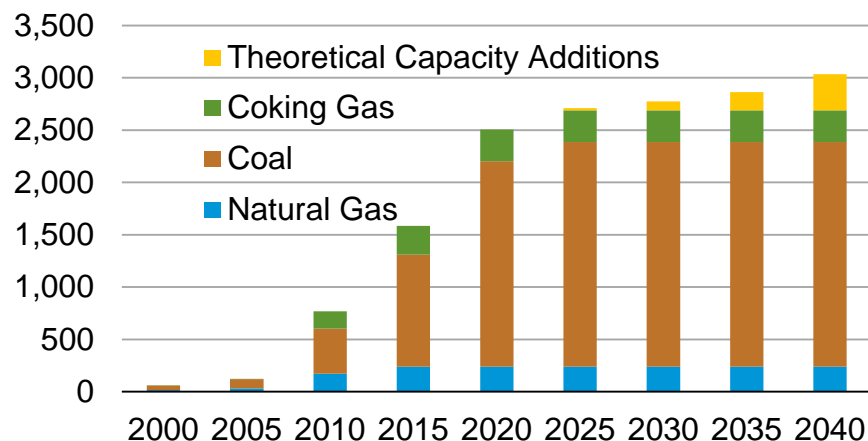
Source: Argus Media group

China's methanol capacity by feedstock

China's Methanol Production Sources, 2015



China Methanol Capacity by Feedstock thousand barrels per day

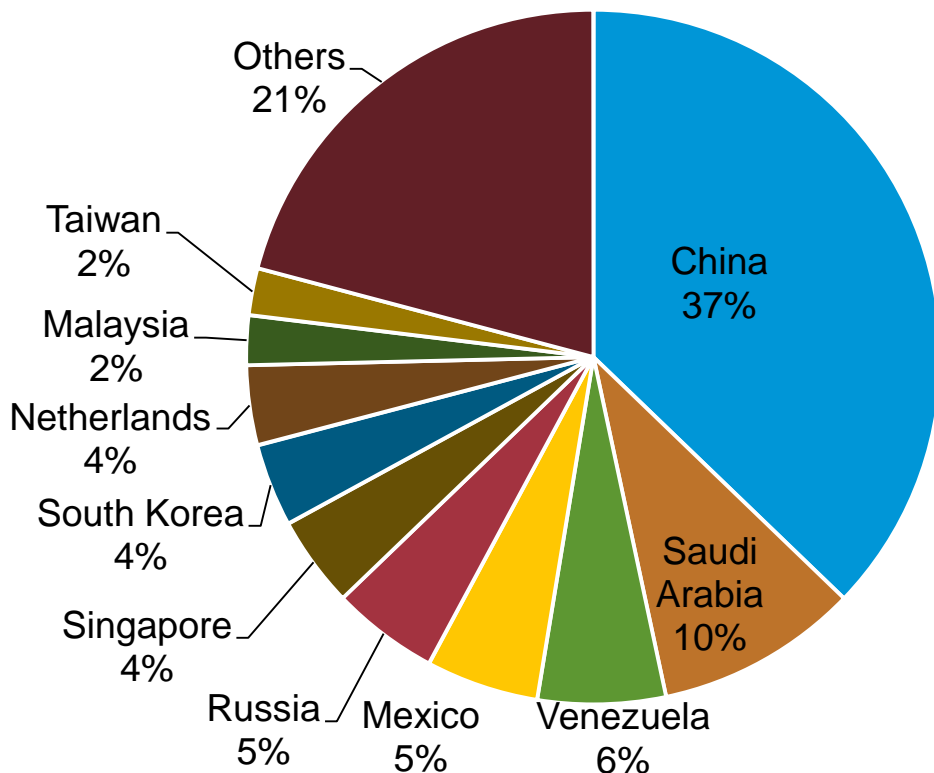


Source: Argus Media group

- Most of China's methanol production stems from coal as a source. About two-thirds of China's methanol production is from direct coal supplies.
- Coking gas is a by-product of steel production, which uses coal as a direct fuel source.
- Natural gas accounts for about 15% of methanol production.
- China is likely to rely on coal as a feedstock for the near future because of its cost competitiveness. However, any tightening of environmental regulations or changes in China's energy policies could alter coal's share in China's methanol production.

Global MTBE consumption by region in 2015

MTBE Consumption by Region, 2015

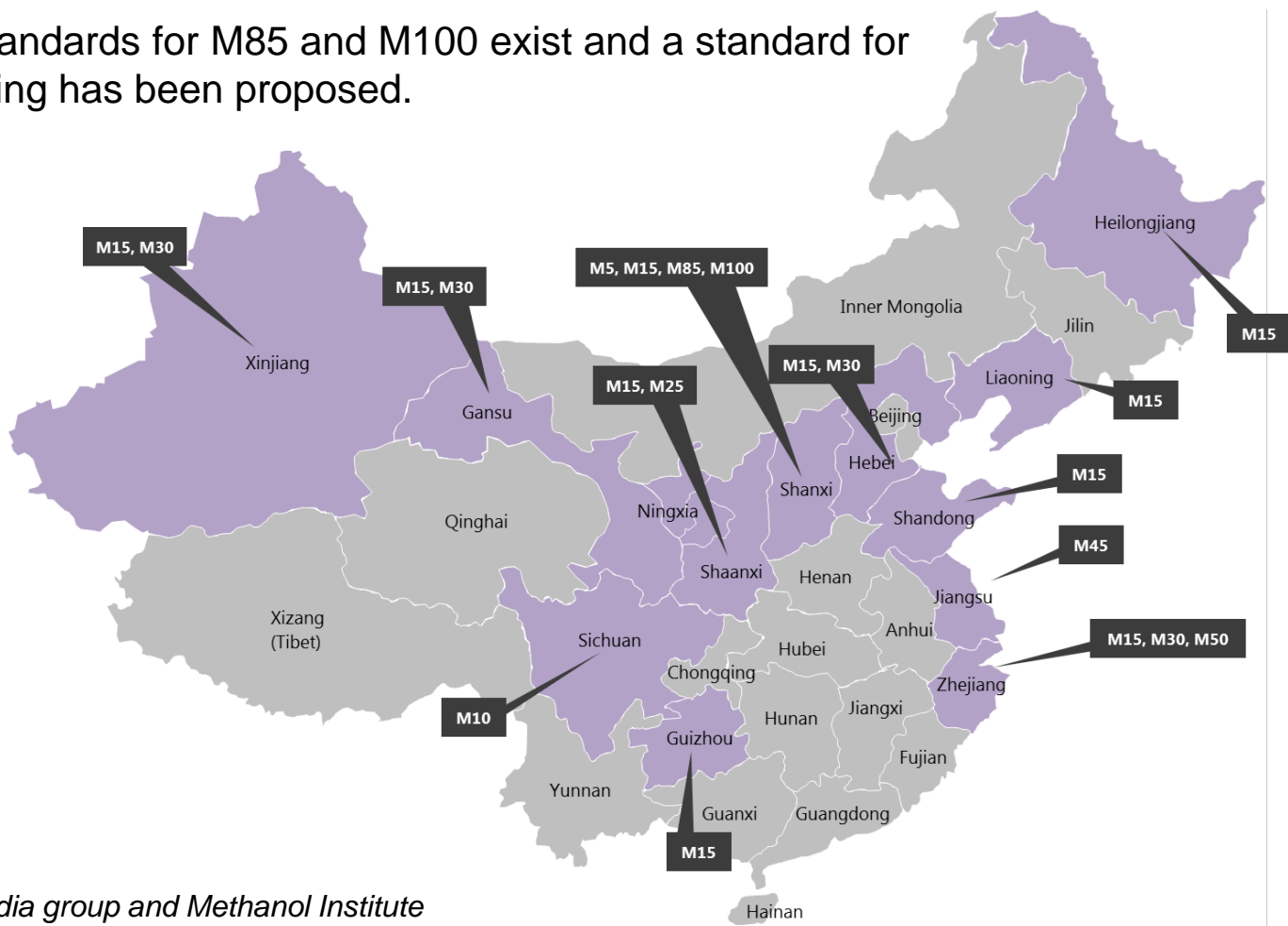


Source: Argus Media group

- China was, by a wide margin, the world's top MTBE consumer in 2015.
- China's higher gasoline specifications (resulting in lower sulfur content) require gasoline to be blended with higher oxygenates such as MTBE.
- China also has the world's highest MTBE production capacity.
- The U.S. has long since abandoned MTBE as a fuel oxygenate for health and environmental reasons.

China's methanol blending by province

- China has methanol blending standards in 14 provinces.
- National standards for M85 and M100 exist and a standard for M15 blending has been proposed.



Sources: Argus Media group and Methanol Institute

U.S. methanol production is growing to serve some of China's import needs; China is investing in new U.S. methanol plants

Methanol Project	Company	Output capacity (million ton/year)	Location	Status	Startup year
St. James project Phase 1	Yuhuang Chemical	1.7	St. James Parish, LA	Under construction	2018
Port of Kalama project	Northwest Innovation Works joint venture (BP and Chinese Academy of Sciences)	3.6	Kalama, WA	Planning and permitting stage	TBD

Source: Oil and Gas Journal, Seattle Times, The News Tribune, Sightline Institute

For more information

U.S. Energy Information Administration home page | www.eia.gov

Short-Term Energy Outlook | www.eia.gov/steo

Annual Energy Outlook | www.eia.gov/aeo

International Energy Outlook | www.eia.gov/ieo

Monthly Energy Review | www.eia.gov/mer

Today in Energy | www.eia.gov/todayinenergy