

Reshaping the global olefins industry

US Ethane and LPG

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Sarah Rae – Argus Media

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Headquartered in the UK, Argus has over 1,300 staff working in 29 offices in the world's principal commodity trading and production centres.

Argus publishes more than 42,000 daily and weekly spot and forward price assessments, along with commentary, news and analysis for global commodities and energy markets.

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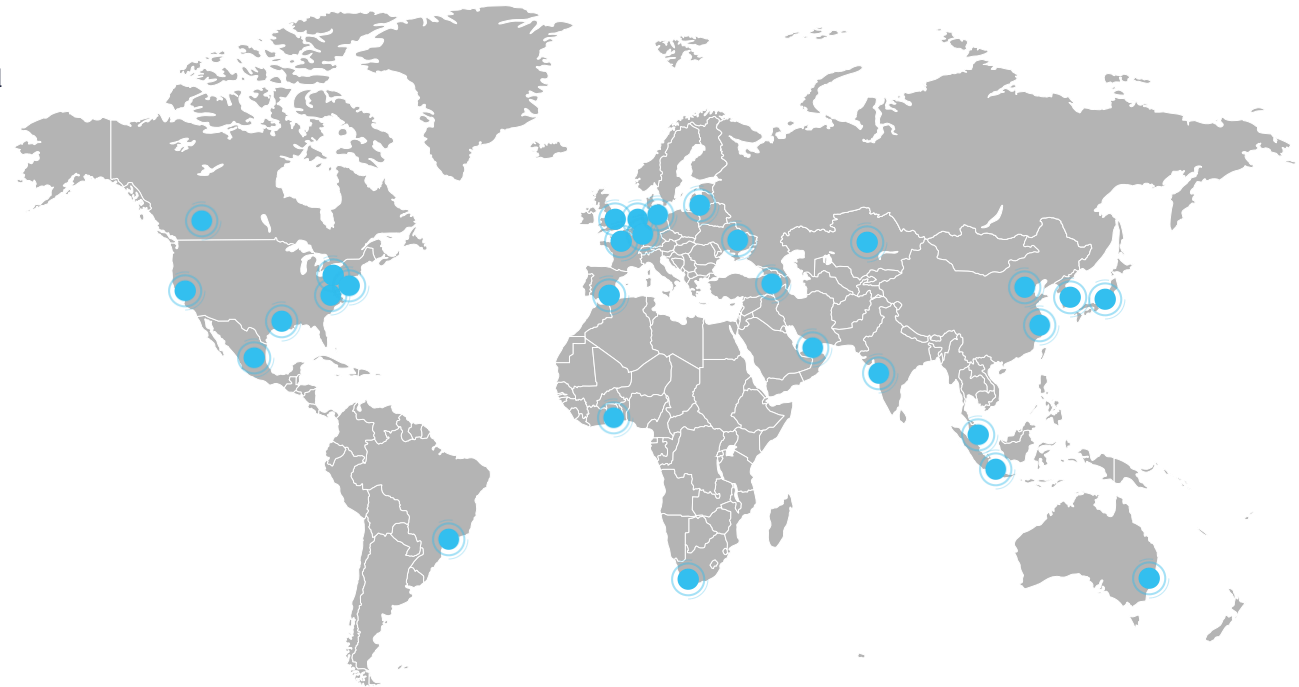
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- Fertilizers
- Agriculture
- Chemicals, including petrochemicals and oleochemicals
- Metals, ferrous, non-ferrous, battery materials, and scrap

Services:

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- Conferences

Argus prices are used as benchmarks worldwide, including for:

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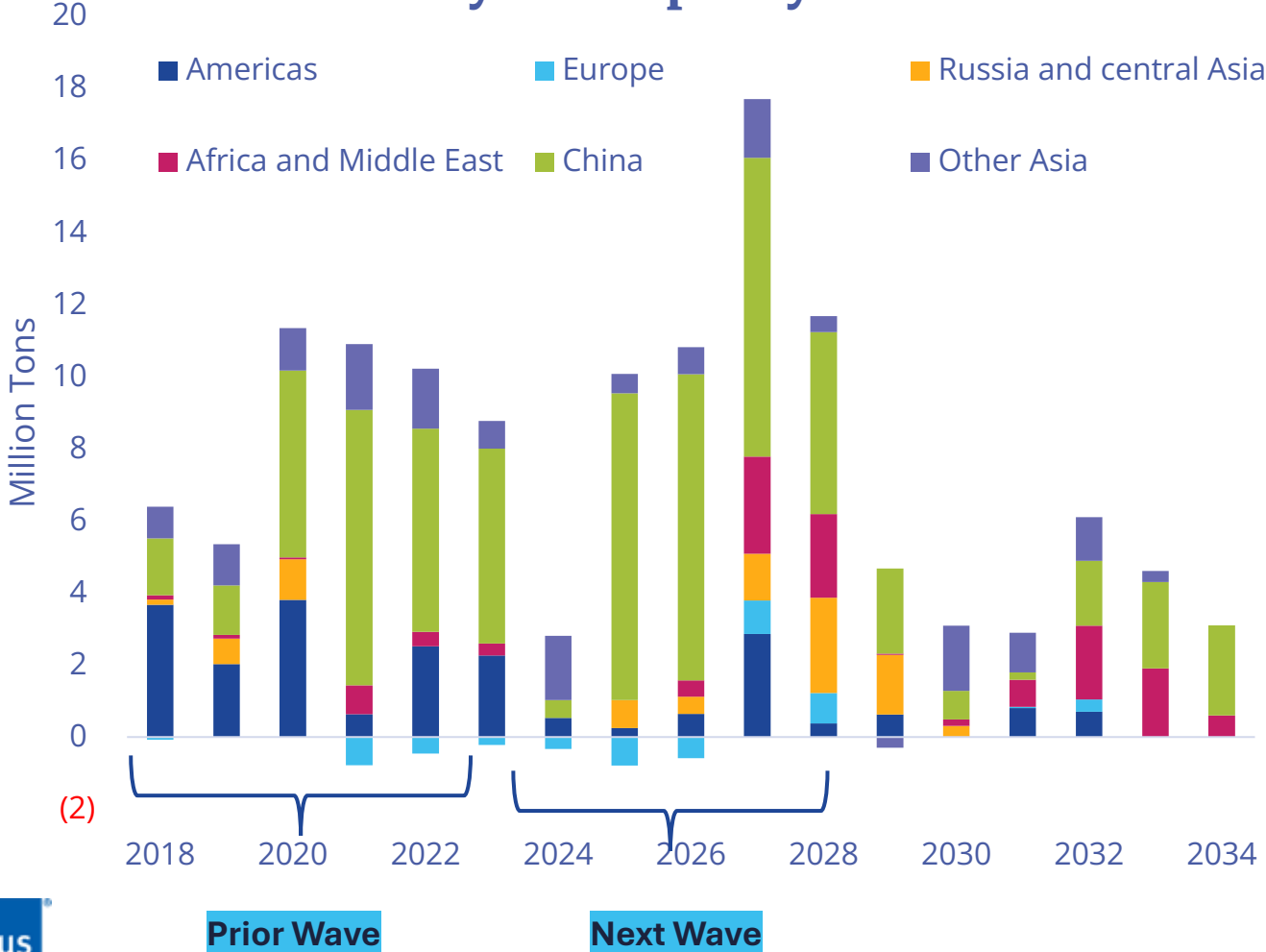


Agenda

- **Global Ethylene market outlook**
 - **How is US ethane production reshaping the global ethylene industry**
- **Global Propylene Market**
 - **the impact of changing production source**

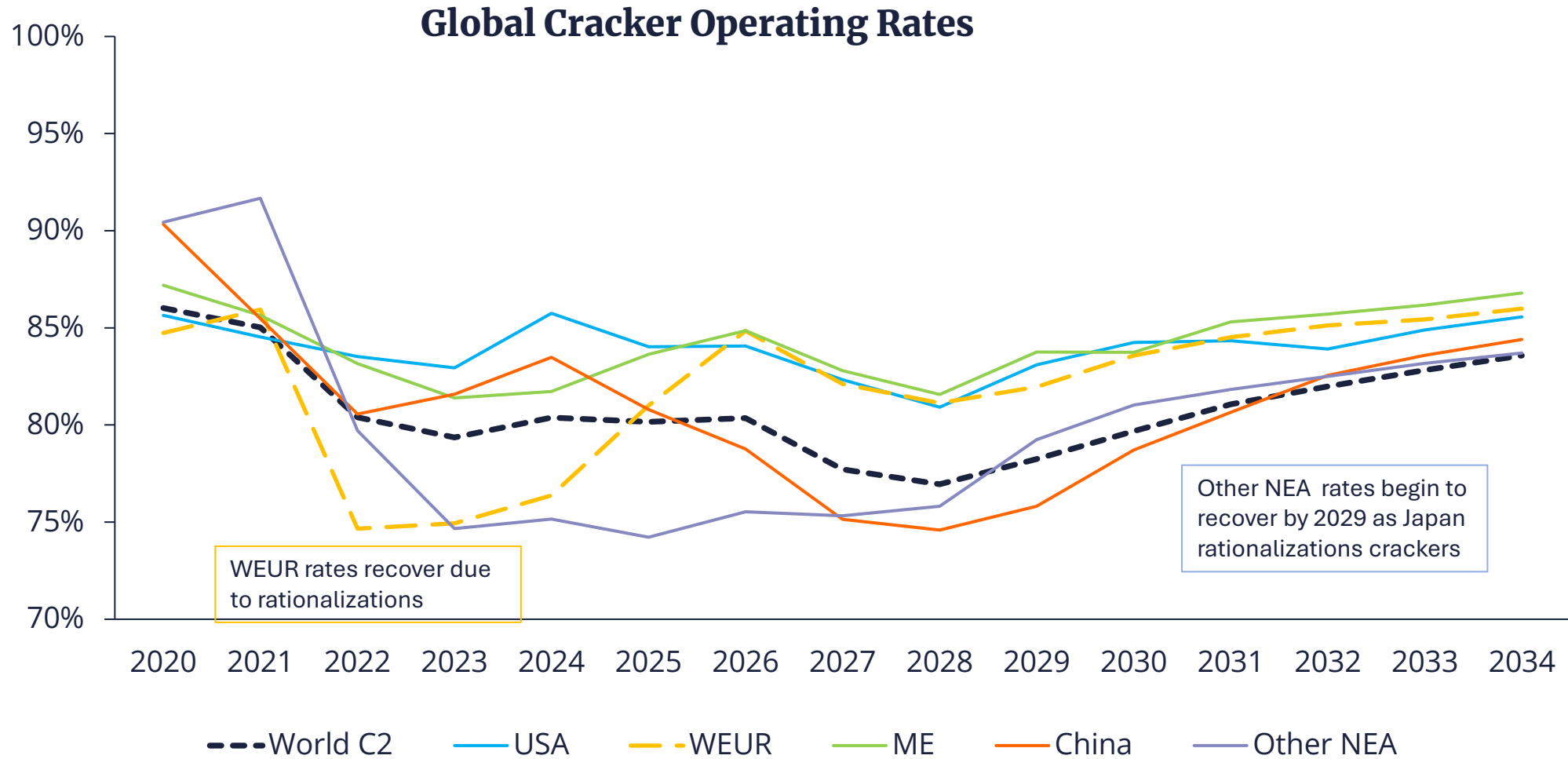
The market environment for ethylene and its derivatives to remain challenging through 2030

Global Ethylene Capacity Additions



- Capacity oversupply
- Slower economic growth
- Global trade uncertainty
- Asset rationalization
- Increased M&A
- Transportation fuel demand and refinery capacity declining

Operating rates to decline and reach a bottom in 2028

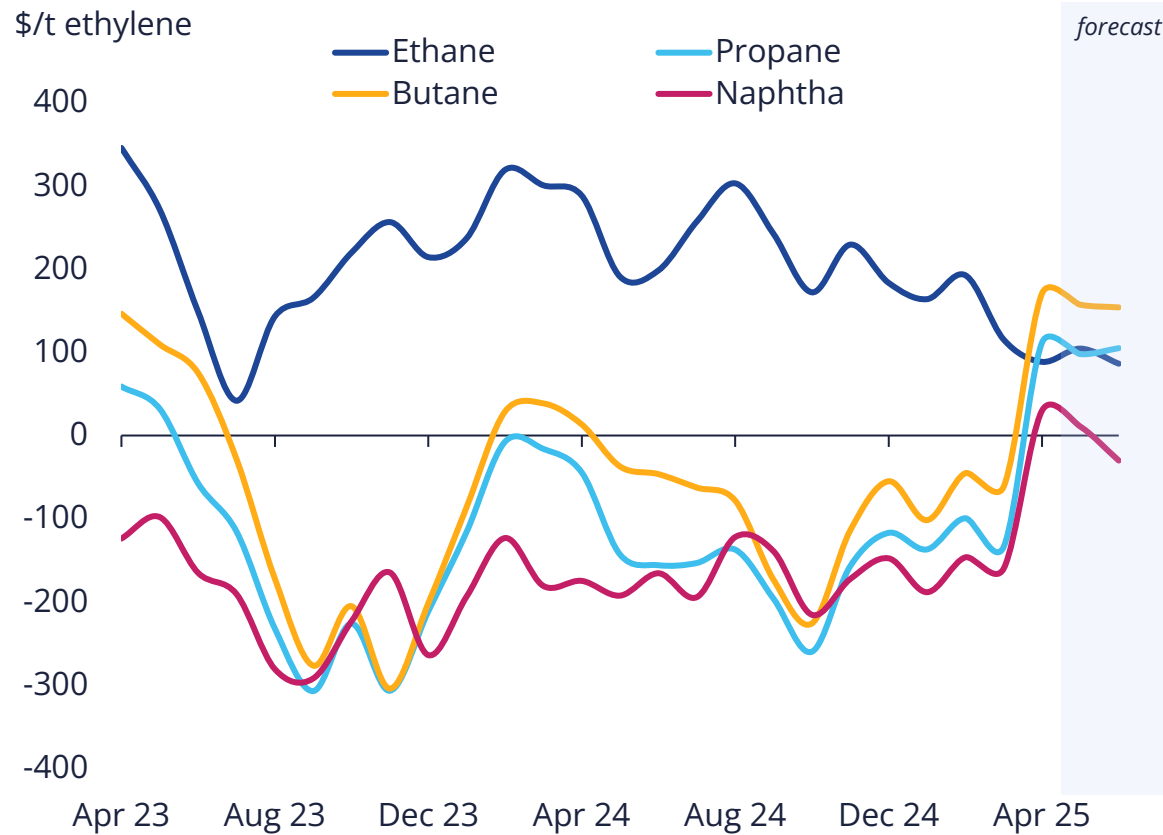


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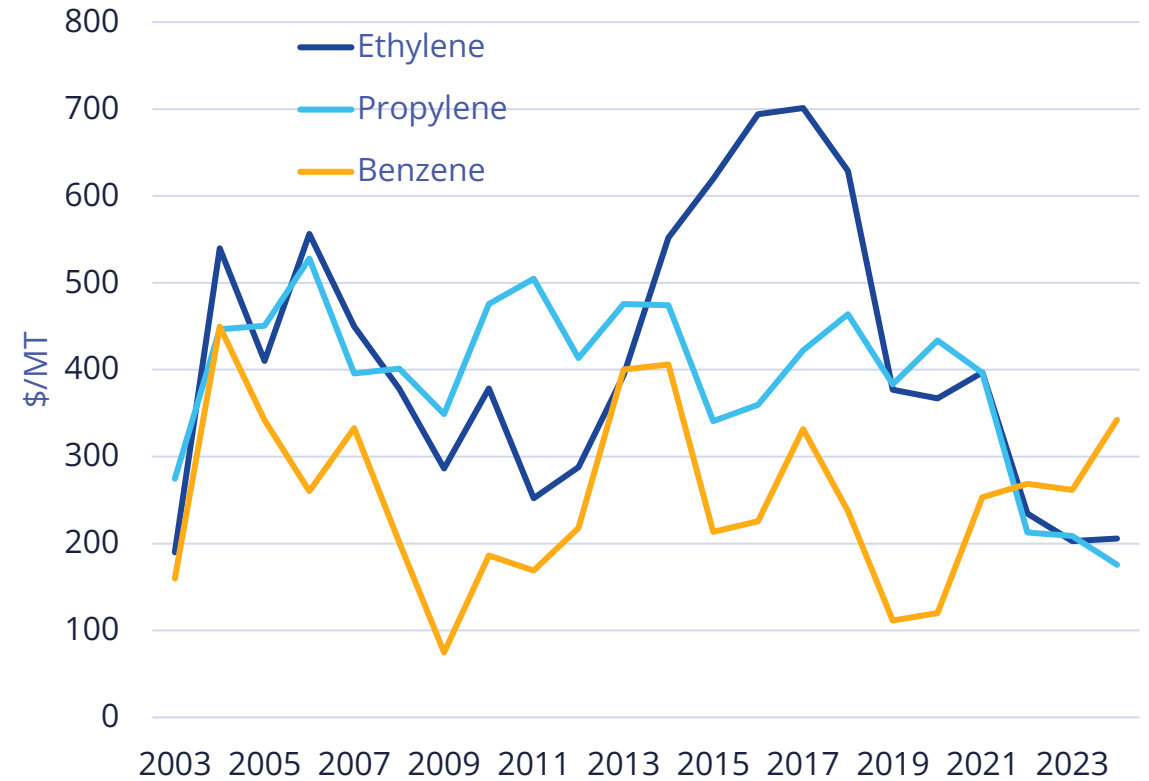
Asia naphtha cracker margins to remain low

Propylene supply length will challenge propylene prices and naphtha cracker margins

Northeast Asia steam cracker cash margins

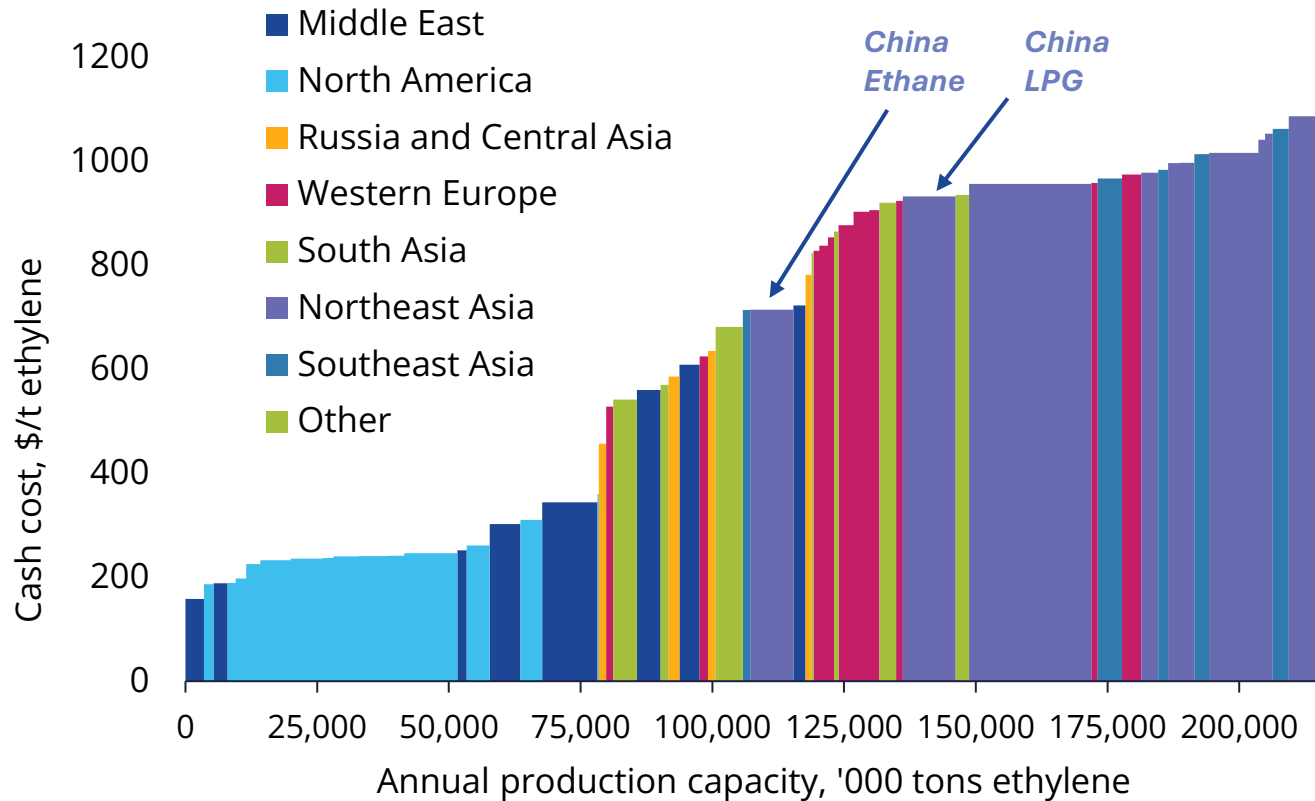


NEA cracker product prices vs Naphtha



Global Steam Cracker Cost Curve FY2024

Despite slower growth and global overcapacity, North American and Middle East producers were able to grow exports of PE and MEG



FY2024 Energy and Product Prices

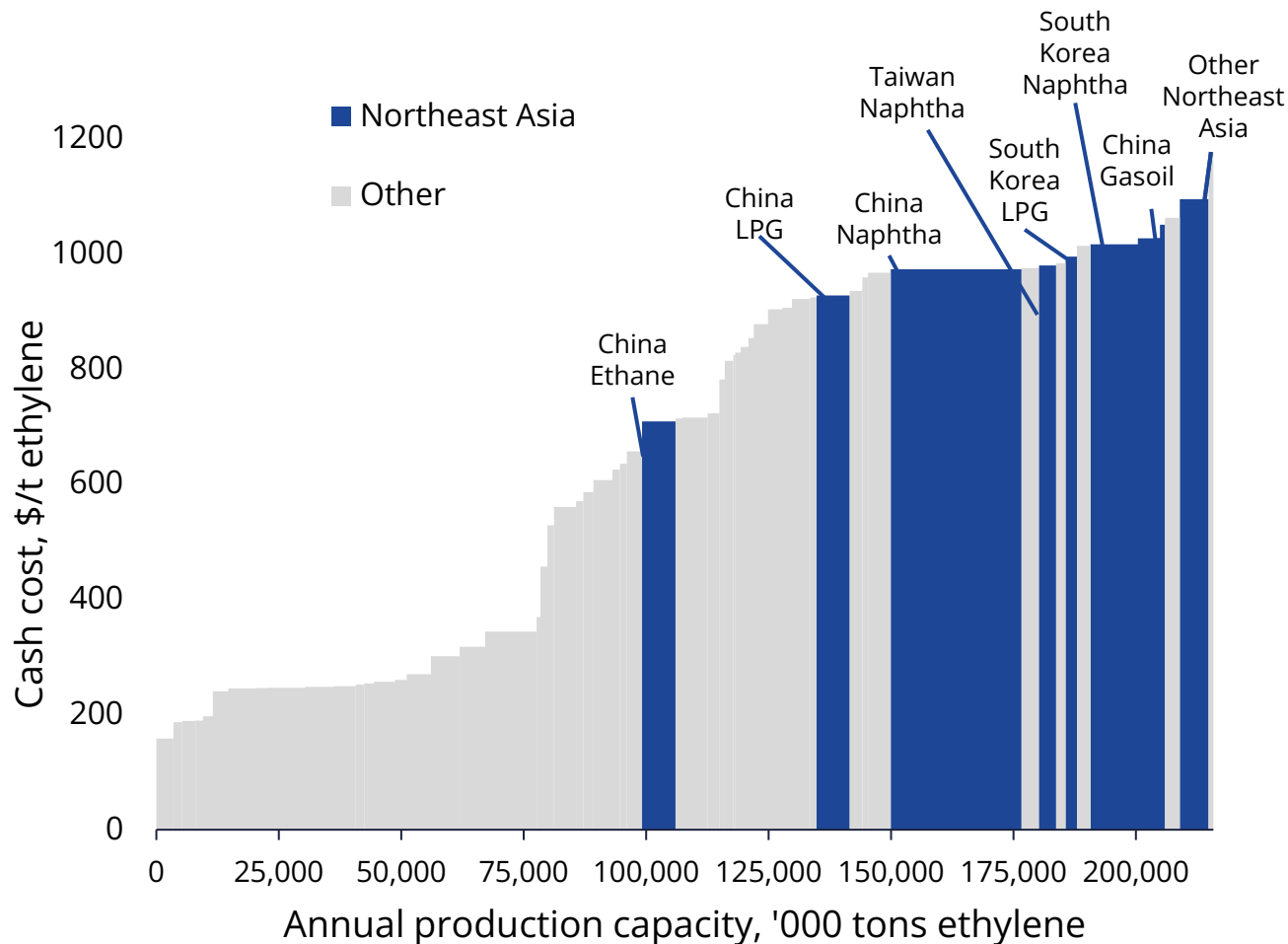
Products	Units	Price
Henry Hub NG	\$/MMBTU	2.19
US Ethane	\$/MT	140
China Ethane	\$/MT	432
Dated Brent Crude	\$/BBL	80.6
Japan Naphtha	\$/MT	674

- WEUR rationalization driven by slow downstream growth, capital to meet and regulatory requirements, not production cost versus NEA production
- Asia producers implementing plans to import US ethane to improve cost competitiveness

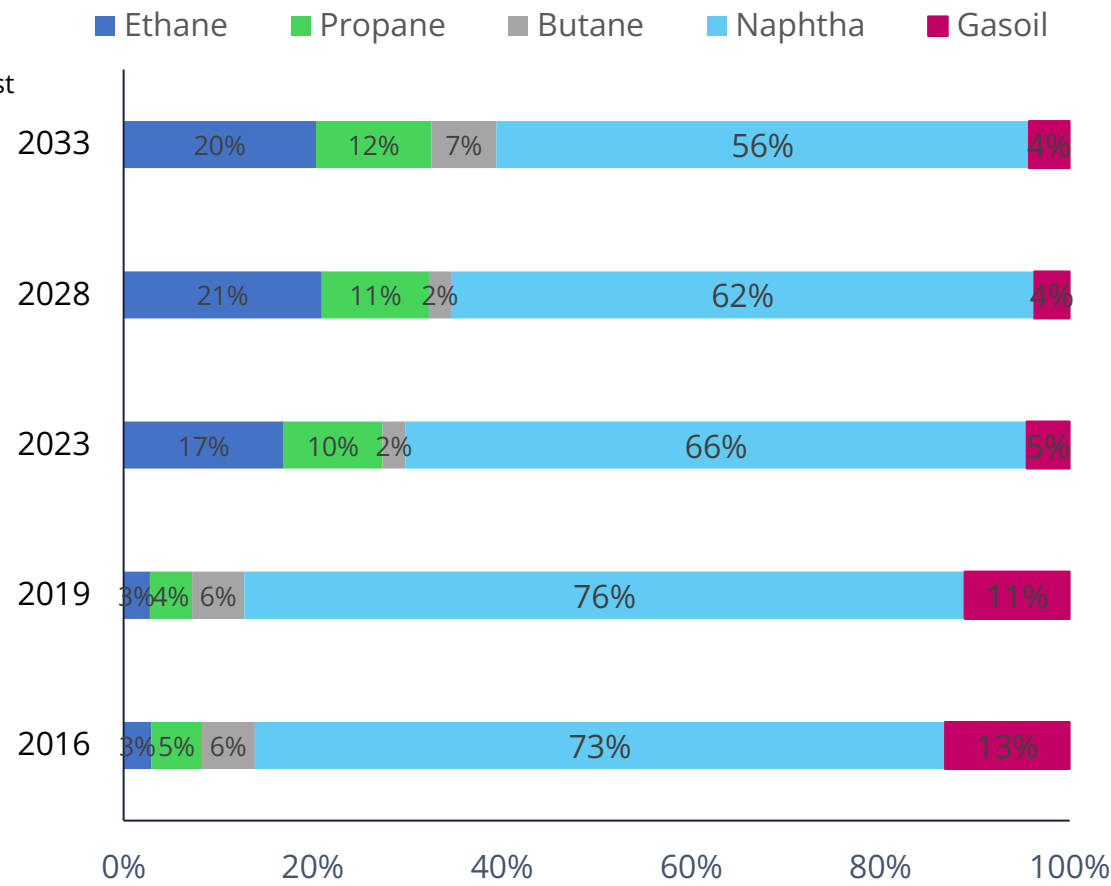
Northeast Asia

China retained its position as the lowest-cost producer in the region as of 2024, supported by flexible gas crackers and newer assets.

Global Steam Cracker Cost Curve



China Steam Cracker Feed slate



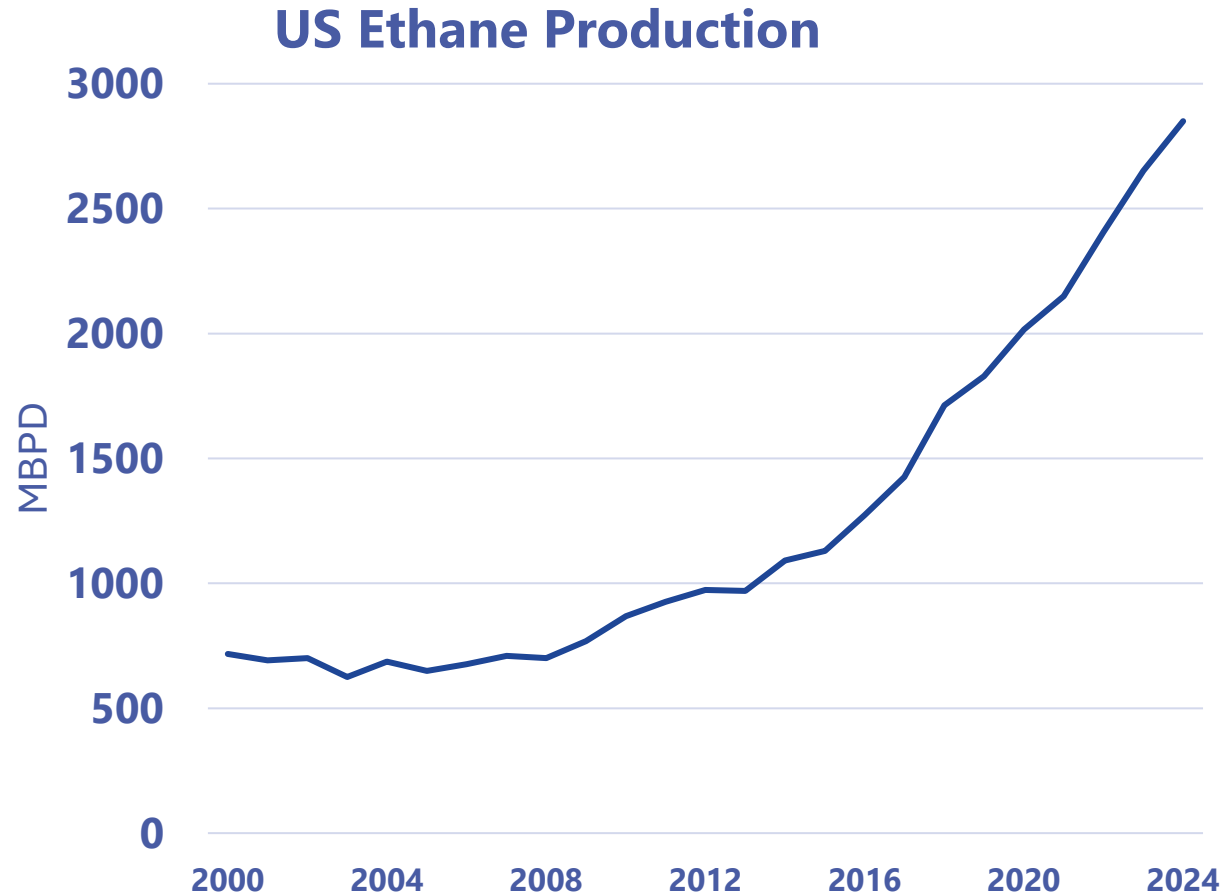
- Argus Consulting Service

Asian ethylene producers are increasingly turning to ethane as a cracker feedstock to improve profitability

Company	Country Subdivision	Source	Capacity	Startup Year
Wanhua Chemical No.2	Shandong	ethane/butane, naphtha 50:50	1200	2025
Shenghong No.1	Lianyungang	Naphtha, LPG, ethane, change existing feedstock to ethane	1400	2025
Wanhua Chemical No.1	Shandong	Replace existing propane feed to ethane	200	2026
Shenghong No.2	Lianyungang	Naphtha, LPG, ethane	1100	2026
PetroChina Dushanzi Tarim Oilfield	Xinjiang	Ethane	1200	2026
Satellite Lianyungang No.3	Jiangsu	Ethane	1500	2026
PetroChina Lanhai New Materials	Jiangsu	Ethane/LPG	1000	2027
Long Son Petrochemical	Ba Riau, Vung Tau	Naphtha/LPG, to change to up to 2/3 of ethane	950	2027
Hyundai Chem/LG/Hanwha	Daesan	In view of signing MoU for ethane project	NA	NA

US ethane production growth has been significant

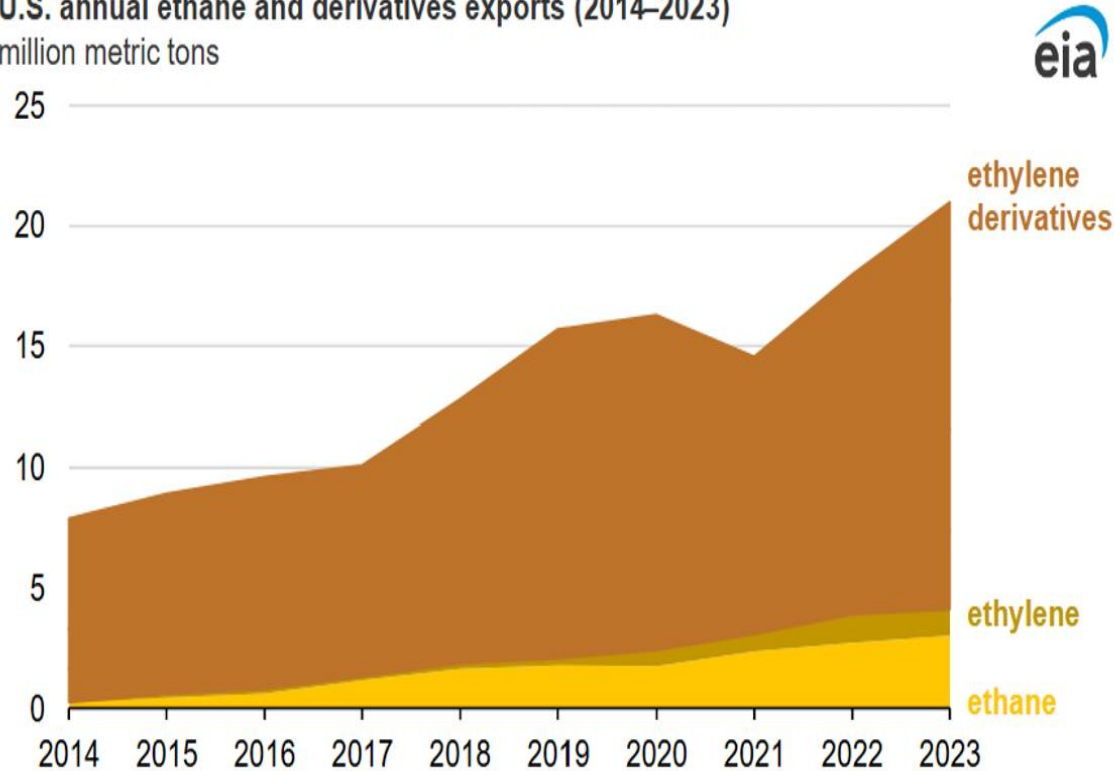
Today it supports the equivalent of 33 world-scale crackers or 50 million tons of ethylene



- North America is now a significant exporter of ethylene derivatives.
- Current North America ethylene production is 50% larger than the Middle East (53/35 MMT).
- Asian producers are increasing their use of ethane as a cracker feedstock.
- A new ethane cracker is currently under construction in Europe.

US ethylene producers are focused on derivative exports. More downstream integration will reduce merchant ethylene supply.

U.S. annual ethane and derivatives exports (2014–2023)
million metric tons



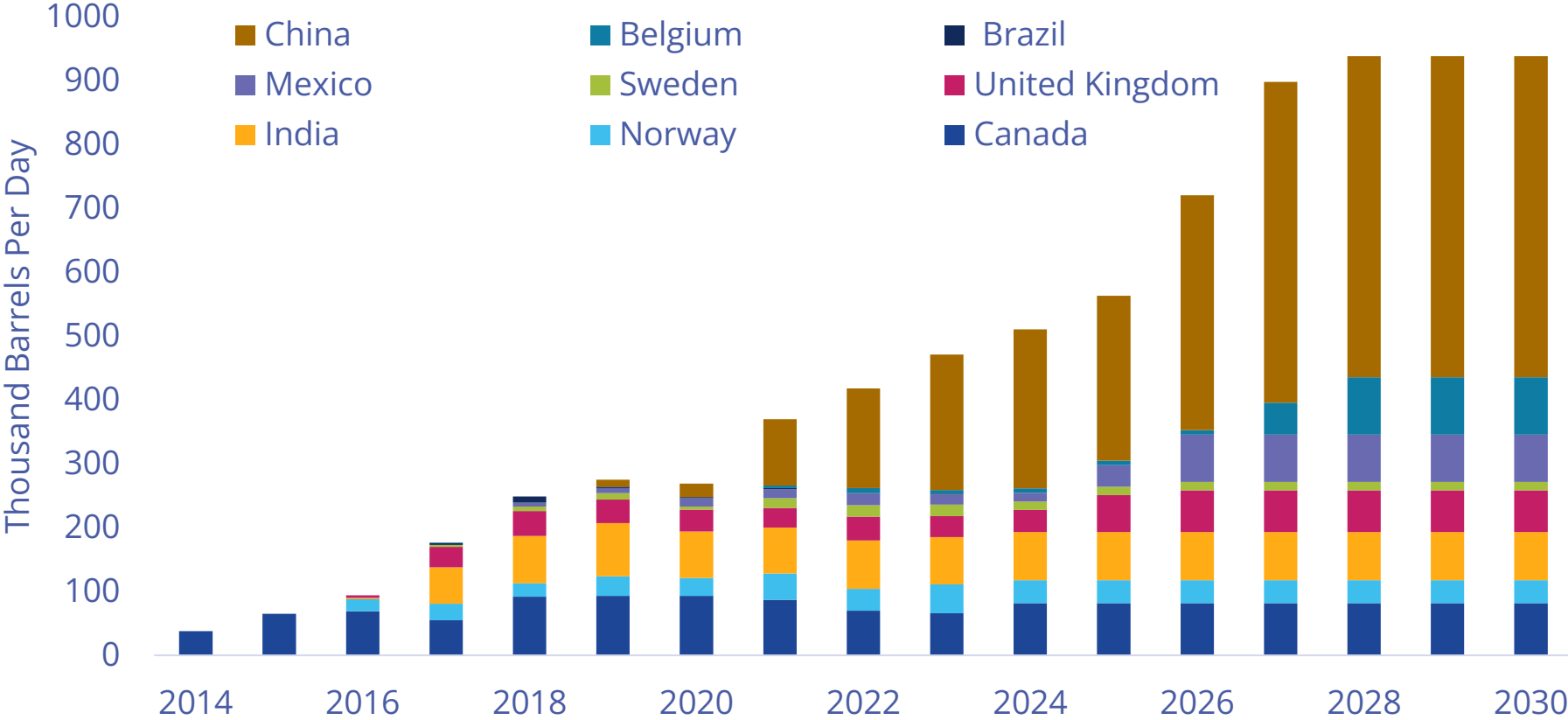
Data source: U.S. Energy Information Administration, *Petroleum Supply Monthly*; and the U.S. Census Bureau

Note: Ethylene derivatives include high-density polyethylene (HDPE), low-density polyethylene (LDPE), ethylene vinyl acetate, polyvinyl chloride (PVC), and other polymers of ethylene not elsewhere specified or included.

- Polyethylene exports set a record in December 2024
- US PVC and MEG exports also grew last year
- Ethylene-to- Alkylate, a new application
- More than 1 million tons of new derivative capacity is currently under construction

China will drive increased US ethane exports. Other countries like Vietnam, Mexico, South Korea and Thailand will also import US ethane.

US Ethane Export



**Can the era of low-cost US
export derivative growth
last?**

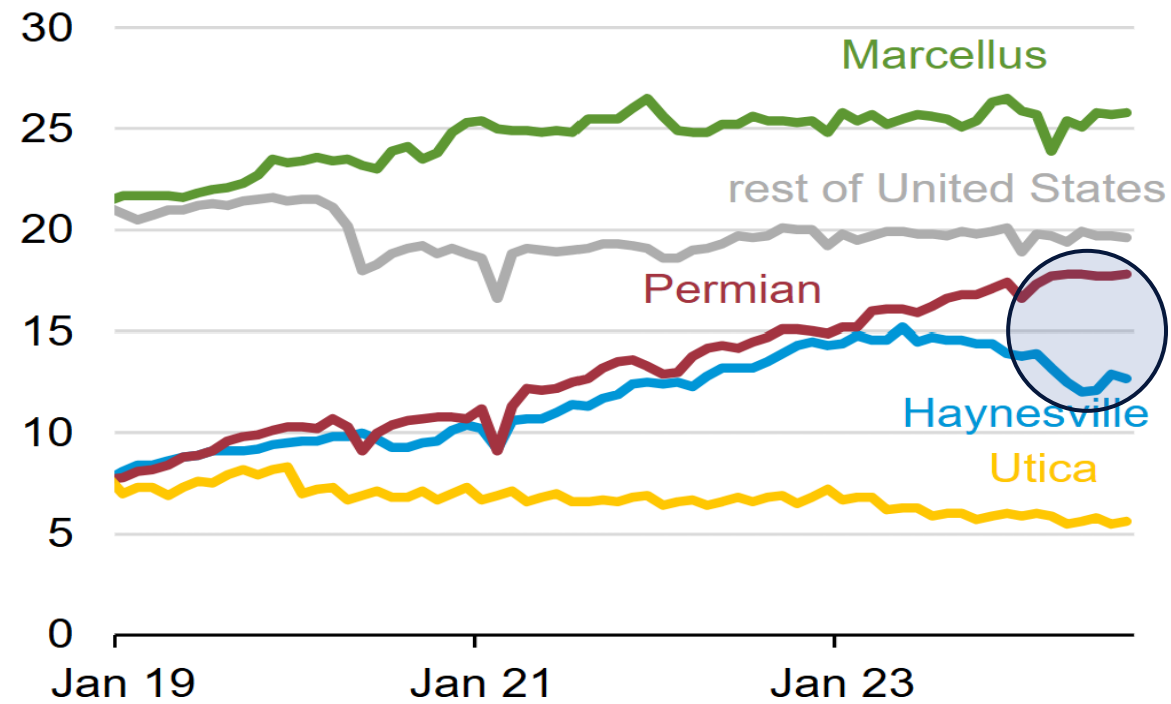
**Is the abundant US ethane
supply sustainable and at
what price?**



Almost 60% of US ethane is produce in Permian. This production depends more on oil price than natural gas

Monthly U.S. shale natural gas production (Jan 2019–Sep 2024)

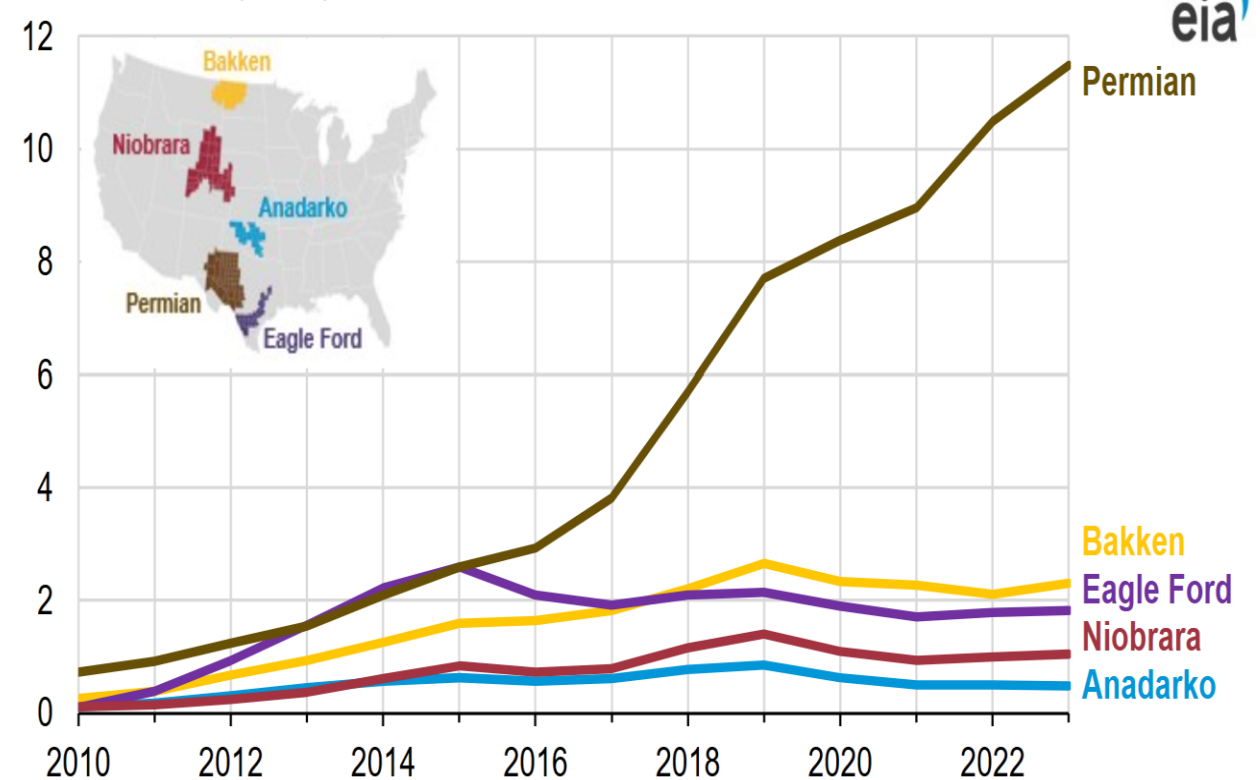
billion cubic feet per day



Data source: U.S. Energy Information Administration, *Short-Term Energy Outlook*

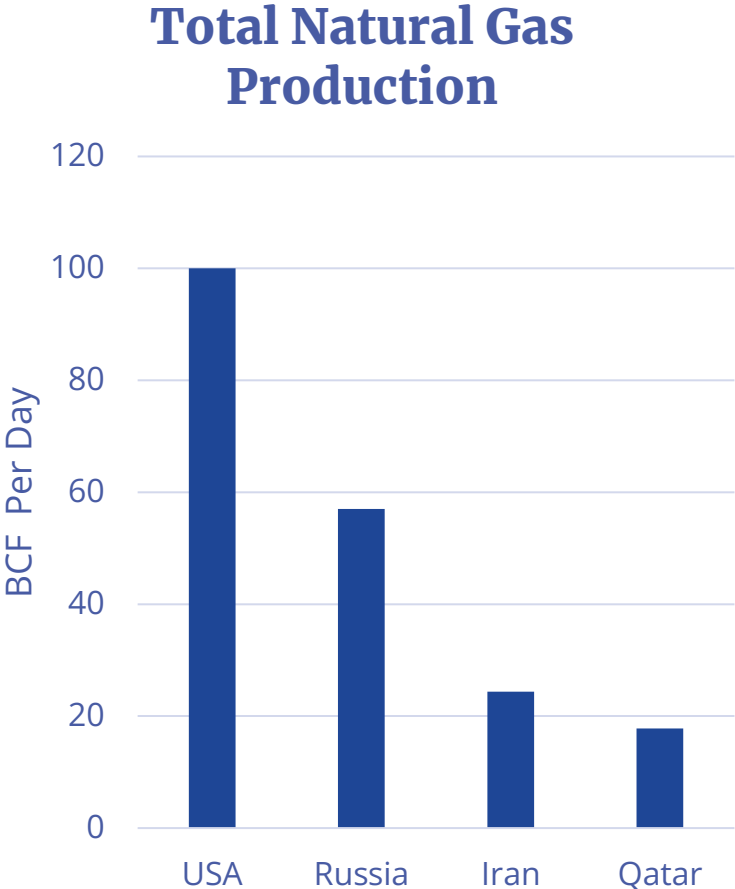
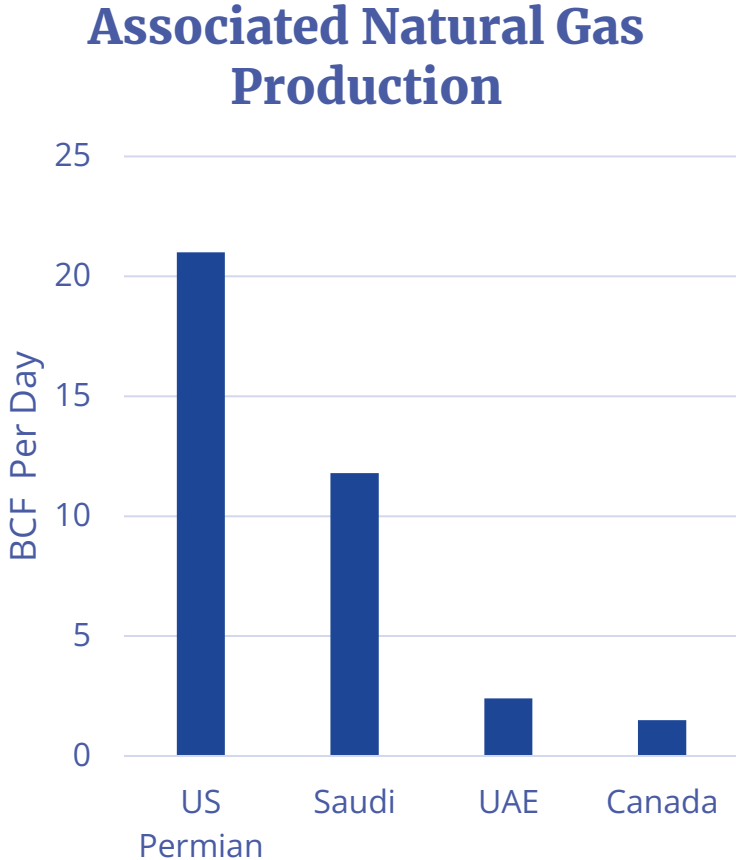
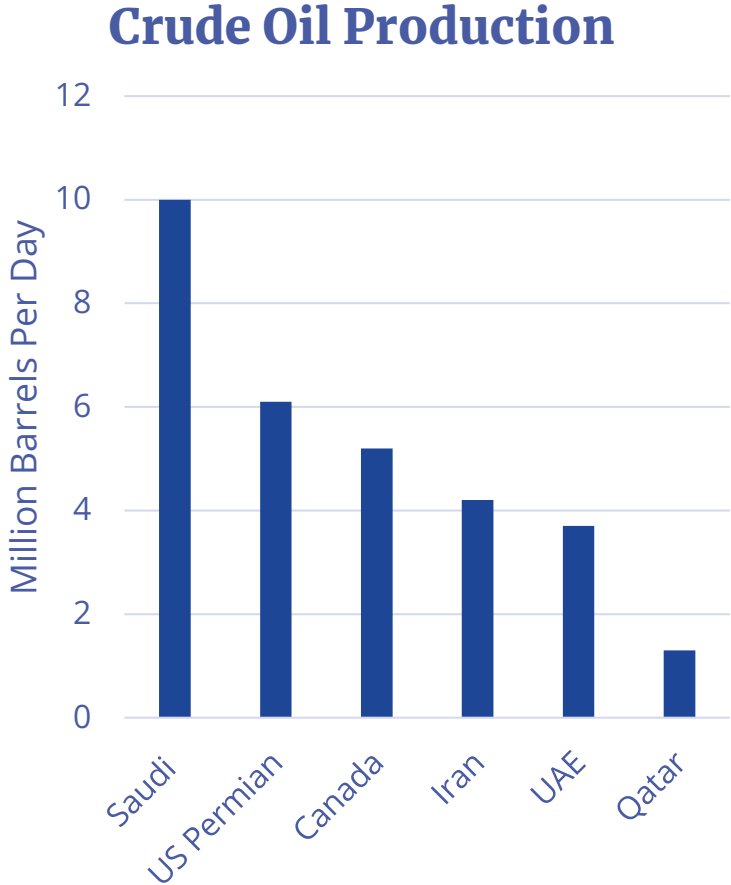


Associated natural gas production in major U.S. crude oil-producing regions (2010–2023)
billion cubic feet per day



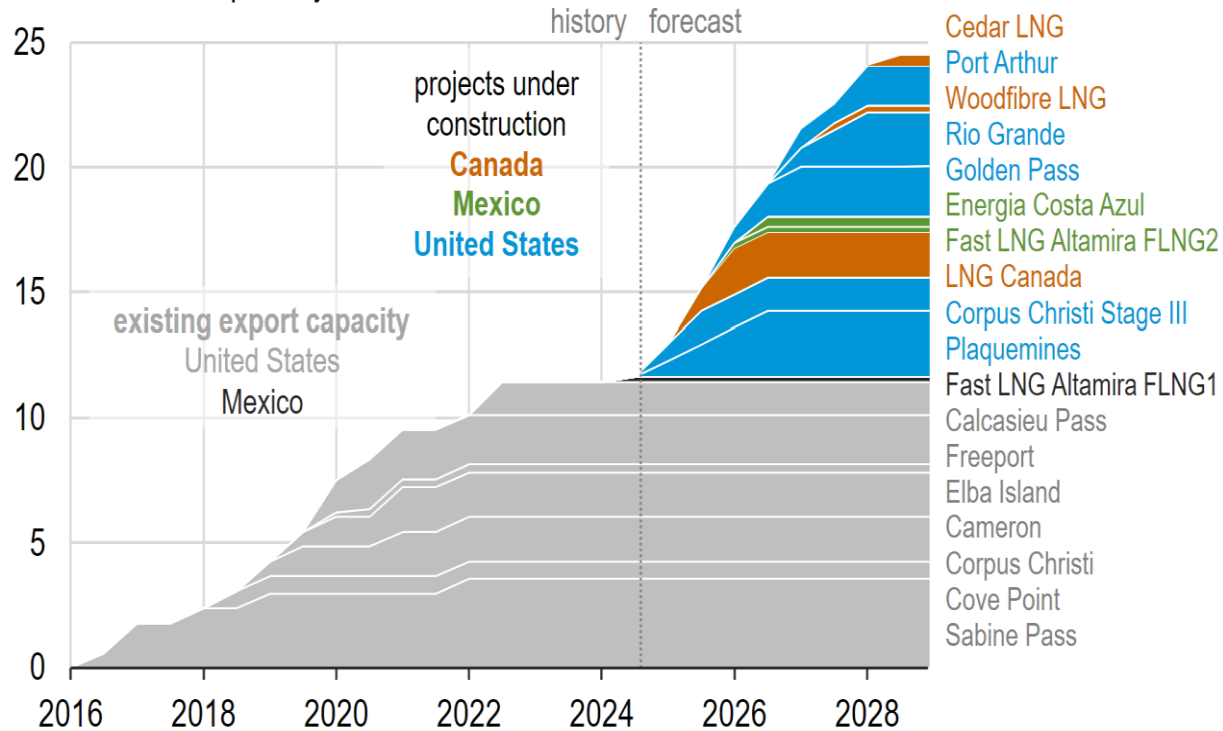
Data source: Enverus Drillinginfo

US oil and gas production compared to Middle East

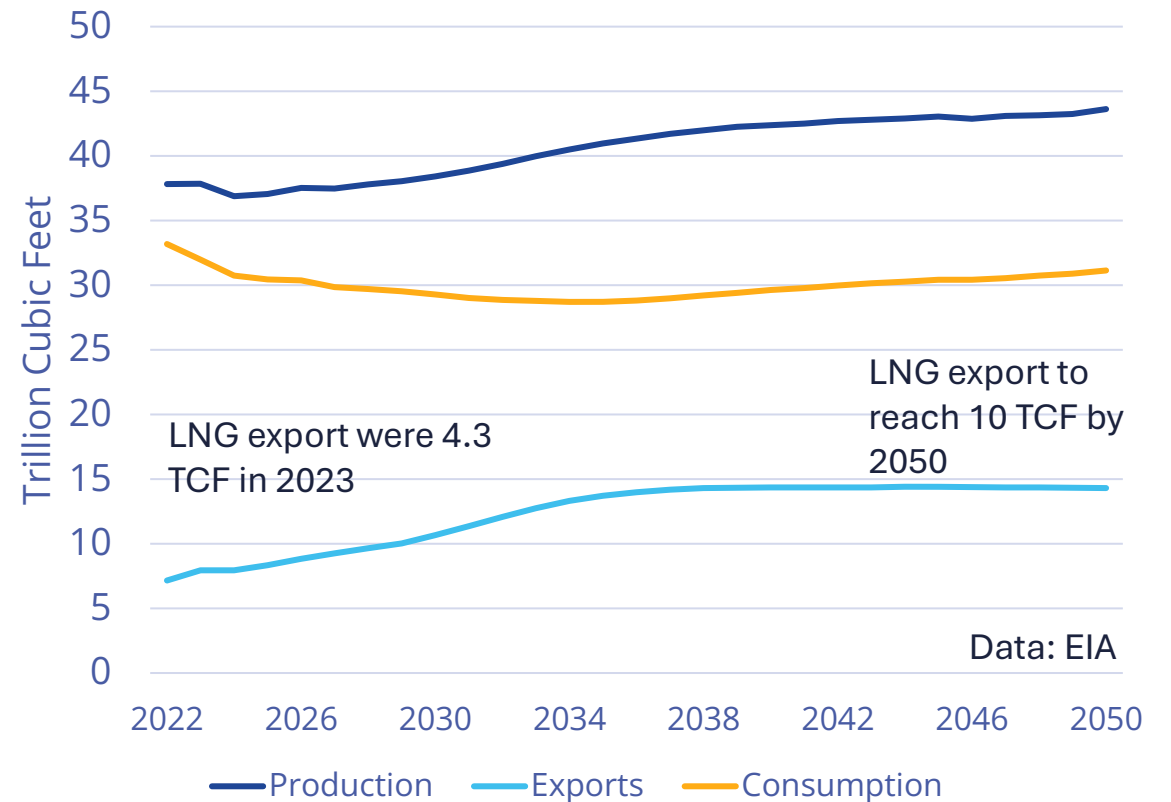


North America LNG exports capacity to double by 2028. Total US gas exports double by 2035

North America liquefied natural gas export capacity by project (2016–2028)
billion cubic feet per day



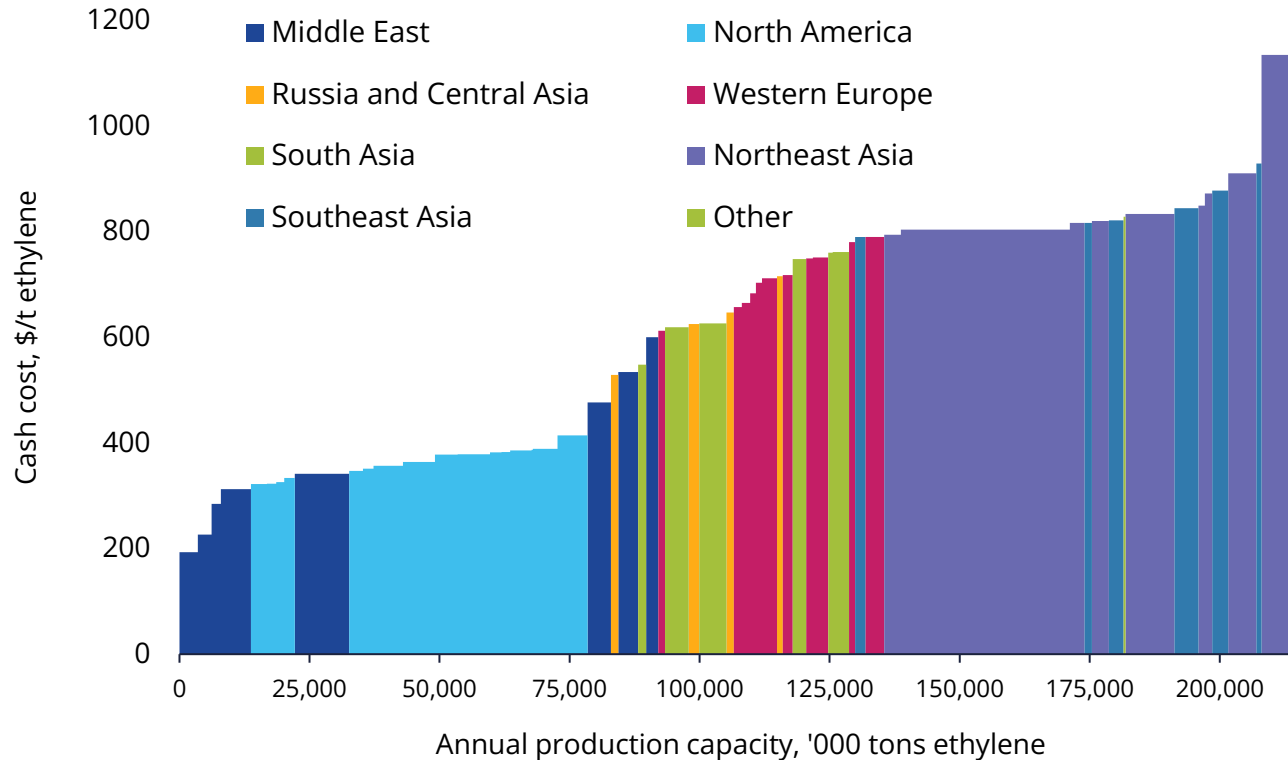
US Natural Gas Market Forecast



Data: EIA

Higher US natural gas and lower crude forecast flattens the FY2025 Cracker Cost Curve

Higher US natural price, lower global crude oil price and China tariffs on US LPG and ethane included in FY2025 cost curve



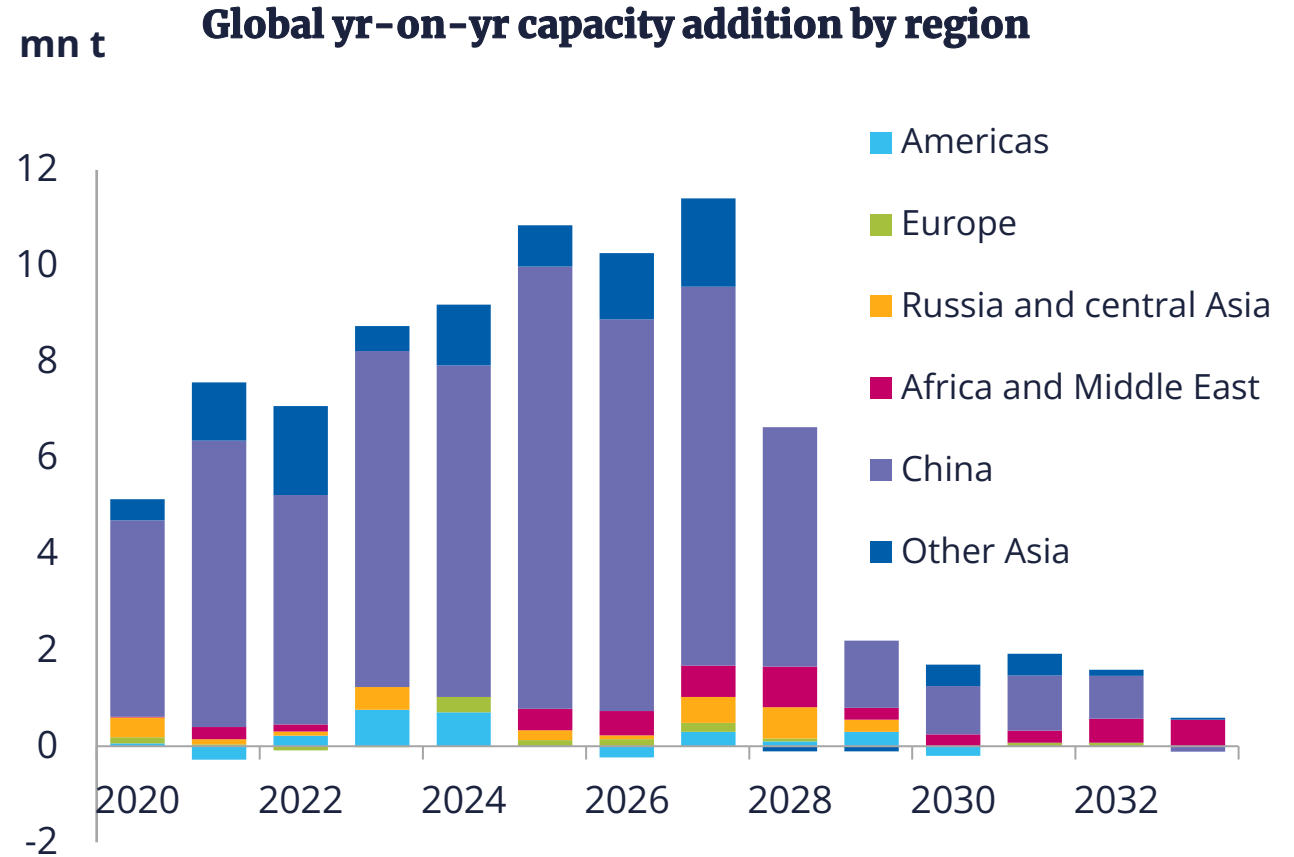
FY2024 Energy and Product Prices

Products	Units	Price
Henry Hub NG	\$/MMBTU	3.94
US Ethane	\$/MT	246
China Ethane	\$/MT	1026
Dated Brent Crude	\$/BBL	70.4
Naphtha	\$/MT	601

Propylene

Propylene has attracted over investment leading to an extended period of lower operating rates and margins

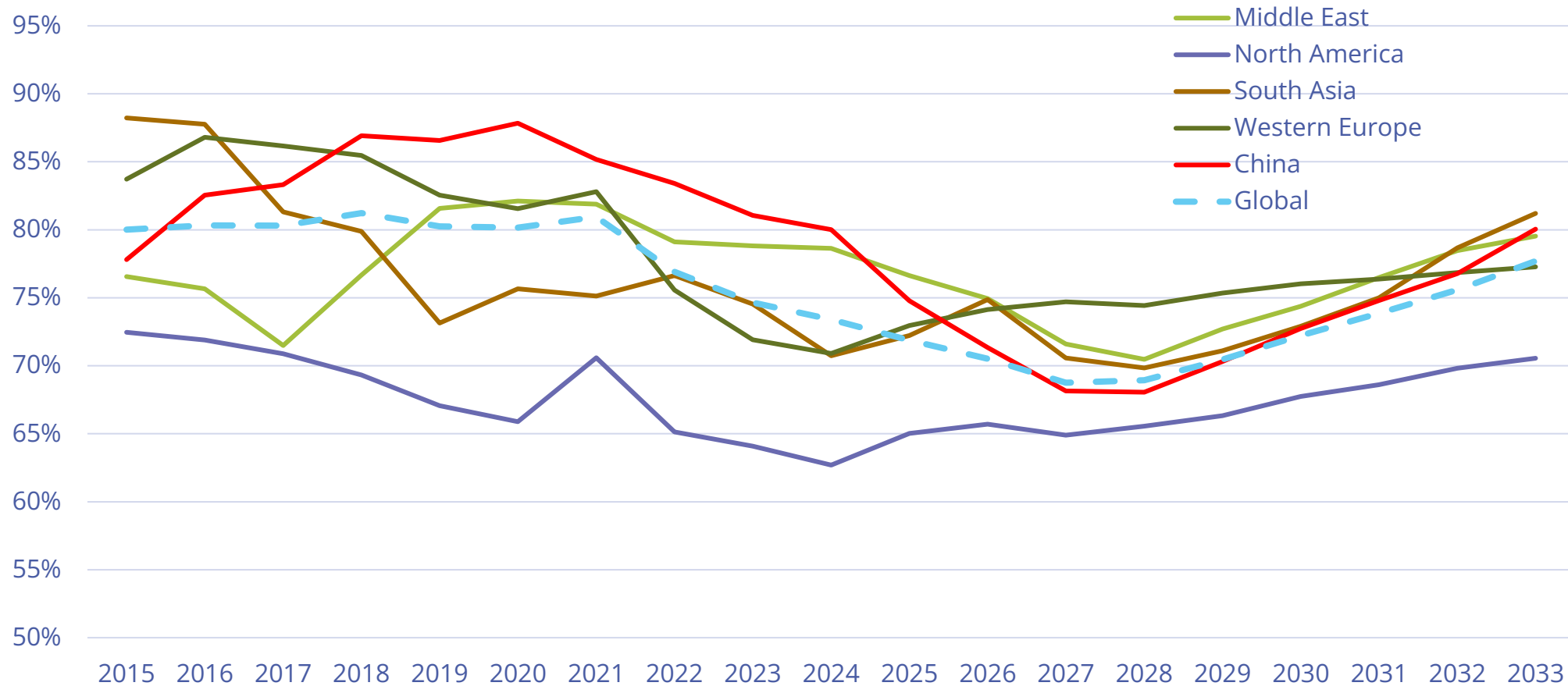
- Average annual demand growth 2014-2024 (excluding 2022 covid impact) is 4.2mnt/yr
- From 2021-2028 average capacity additions are 8.7mnt/yr
- Investment driven by multiple factors
 - Extended period of high margins and operating rates 2011-21
 - Refineries seeking petrochemical alternatives to fuels
 - PDH – expectations of propylene shortages as cracker invest in lighter feeds and refineries close



Argus Propylene Analytics
— Argus Consulting Services

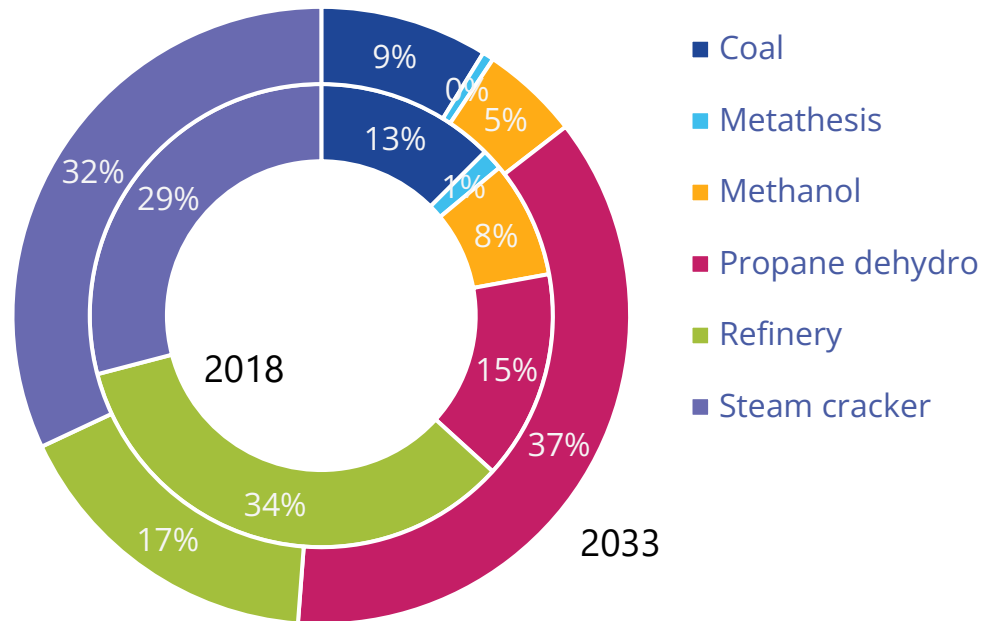
Global operating rates will fall

- US rates exposure to wide tolerance on refinery capacity & SC feedstock flex



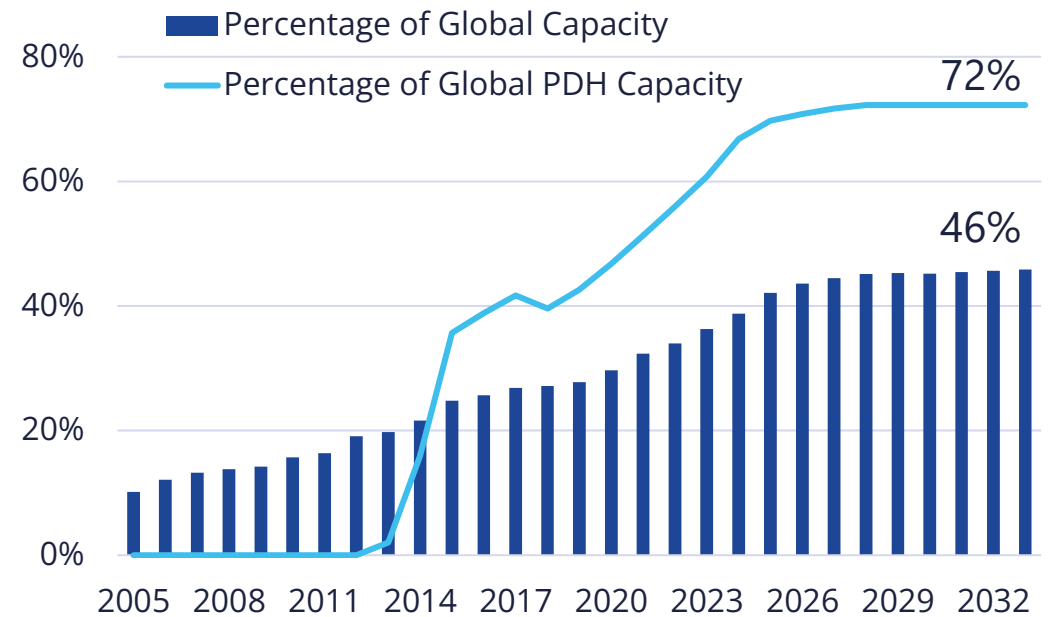
Much of the new capacity is in China with a rising proportion from PDH

Changing landscape of sources - China



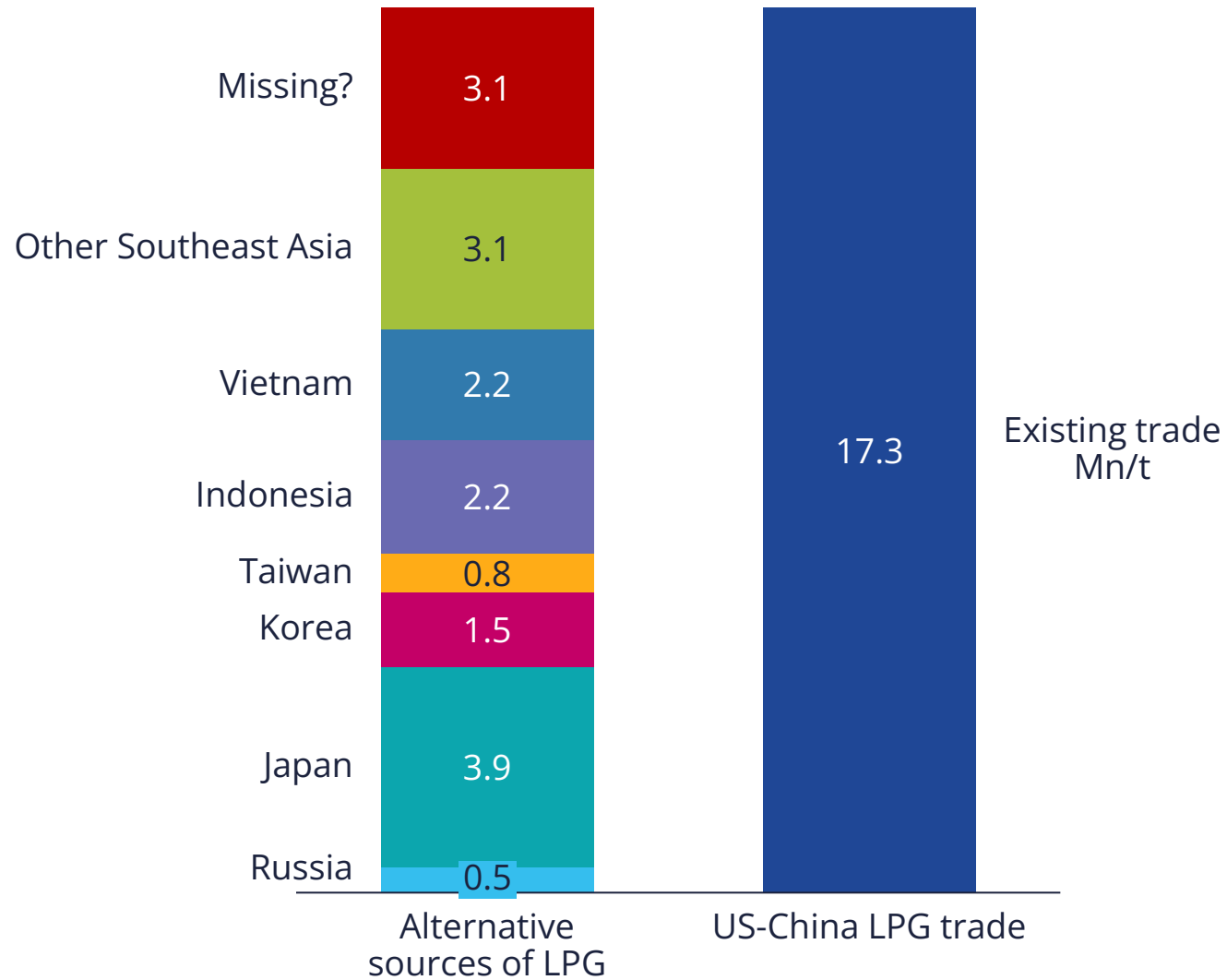
Argus Analytics

China – percentage of total global capacity and PDH capacity

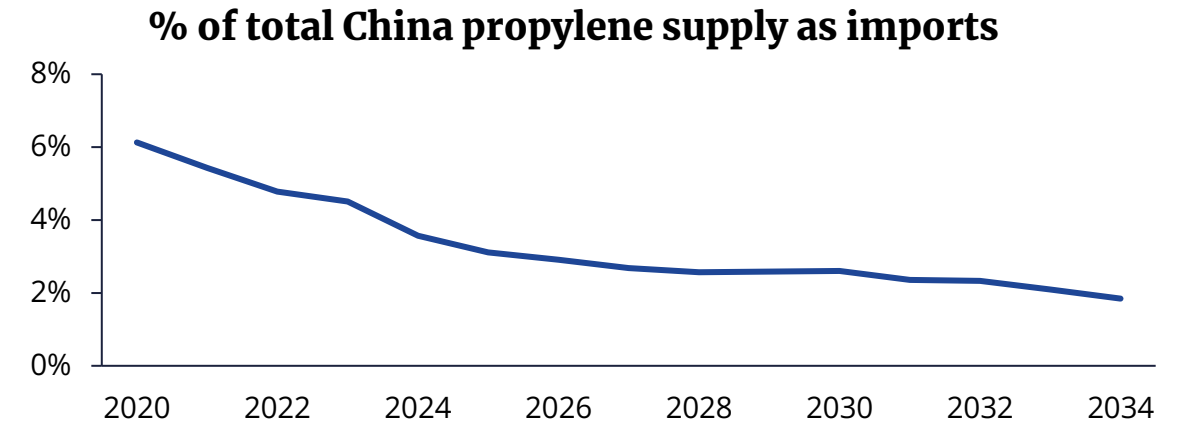
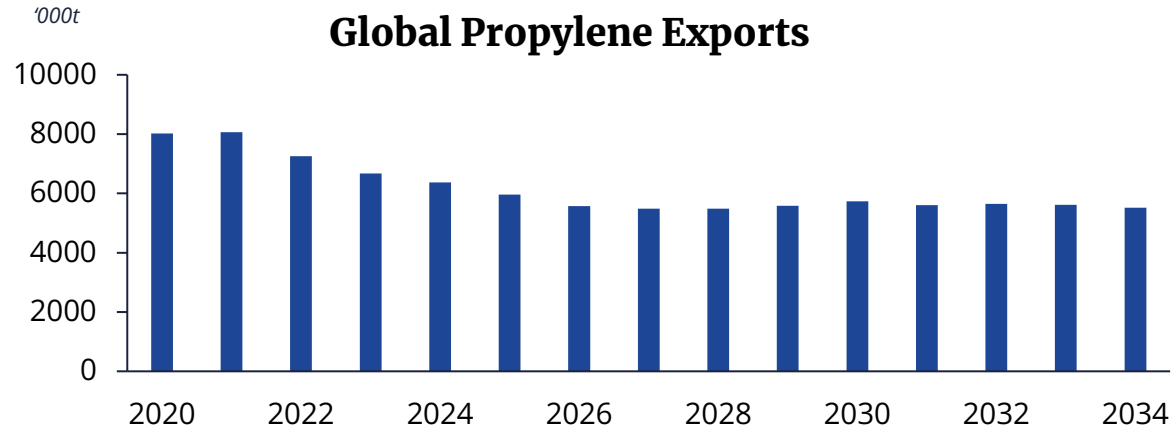


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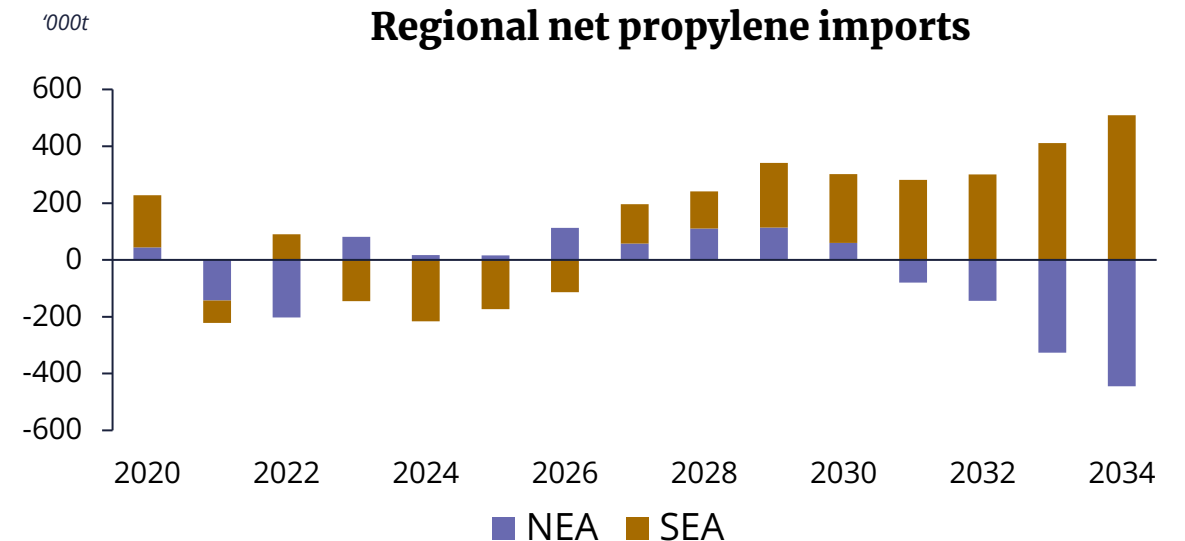
Asia - China particularly - increasingly reliant on PDH as a source of propylene and on propane imports



China increased self-sufficiency is impact trade flows



- Global trade of propylene peaked at 9mn t in 2019, Since then, trade has fallen to 6.4mn t in 2024 and *Argus* expects exports to fall further to 5.5mn t in 2028 before settling at an average 5.6mn t over 2029-34.
- A main driver is China's capacity expansion, decreasing its reliance on imports from other countries, notably other northeast and southeast Asian countries, depressing their operating rates
- Over time southeast Asia forecast to become a net importer and northeast Asia into a net exporter.



Thank you

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