Energy Markets in Transition: Key Challenges Ahead

Prepared for 42nd Japan Cooperation Center for Petroleum International Symposium (JCCP)

25 January 2024

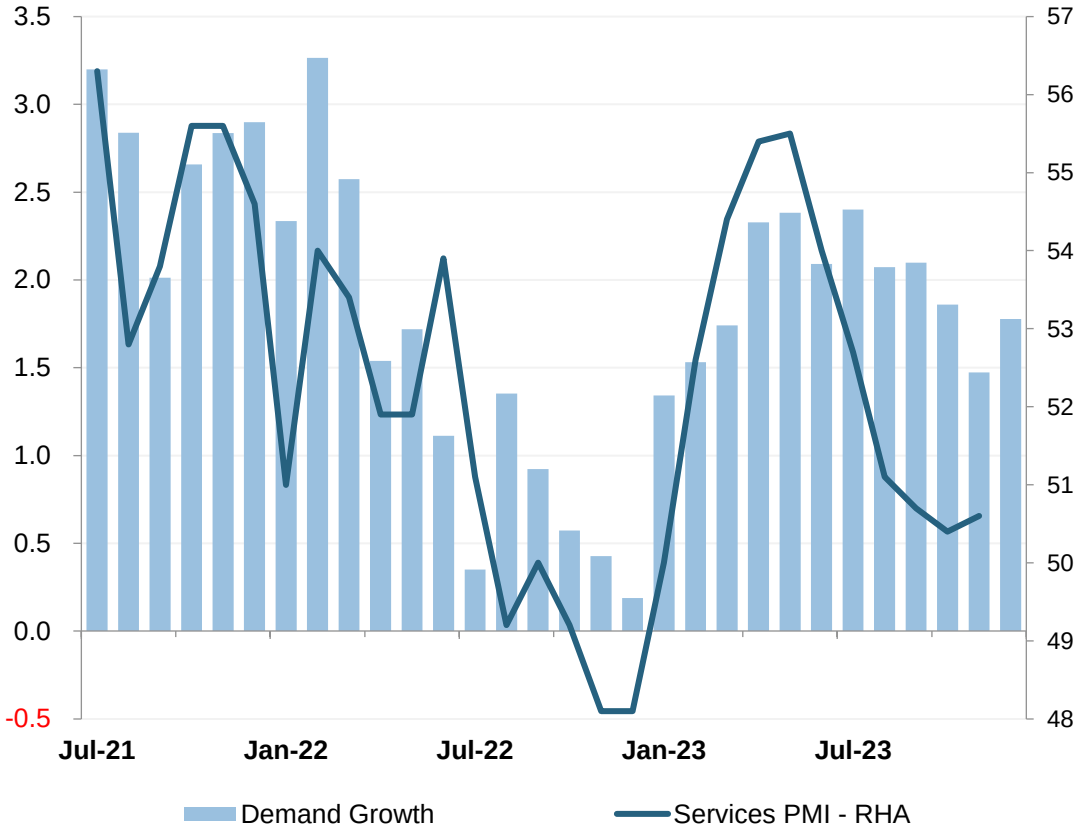
Oil Markets

The Bottom Line on Near-Term Oil Demand: Despite economic worries, it's strong!

- Demand grew by 2.6 mmb/d y-o-y in 2023, before slowing to 1.6 mmb/d in 2024.
- Note that a "normal" global recession could knock 1-3 mmb/d off our demand outlook.
- Context is key: The Great Recession of 2008/09 reduced demand by 3.5 mmb/d at its peak, while COVID-19 caused the loss of 22 mmb/d at its peak.
- Bottom line: The COVID recovery is helping drive demand growth into 2024, but the impact varies across products. Most COVID recovery is done in 2023.

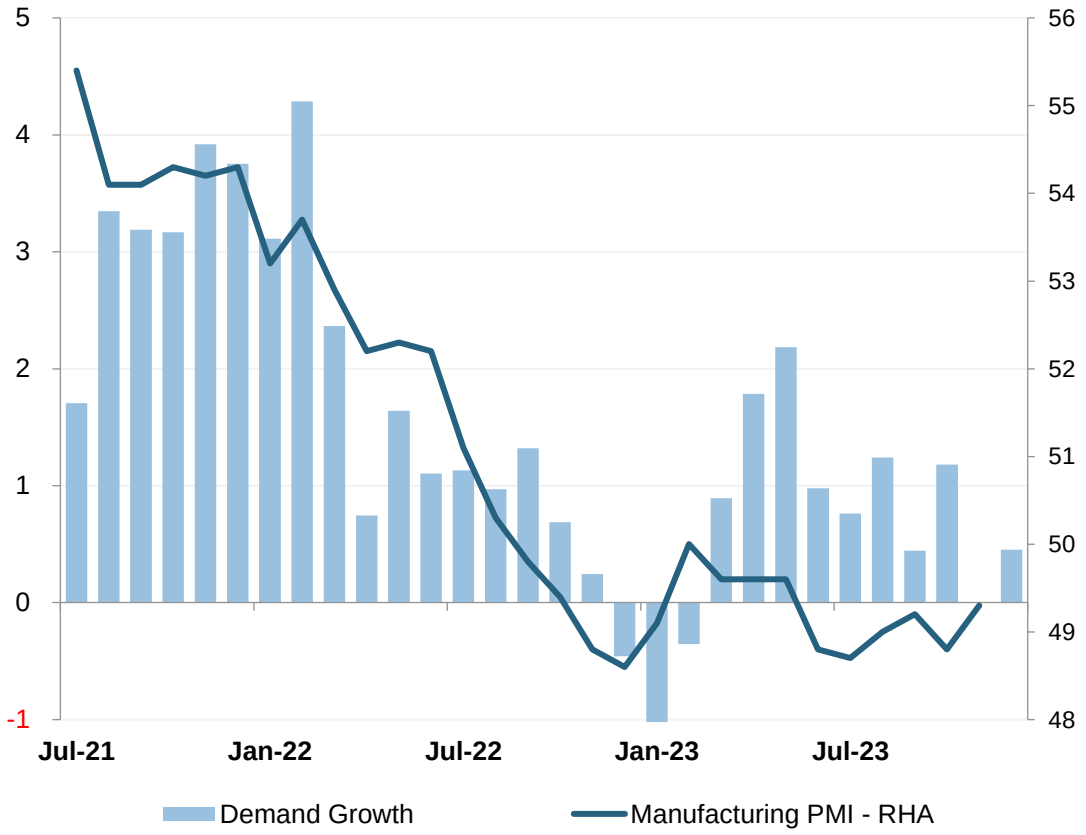
Global oil demand recently driven by services, not by manufacturing and trade

Y-o-Y Change in Global Mobility[1]-Driven Oil Demand, mmb/d and Global Services PMI



Source: FGE, S&P Global
[1]Gasoline and jet/kerosene

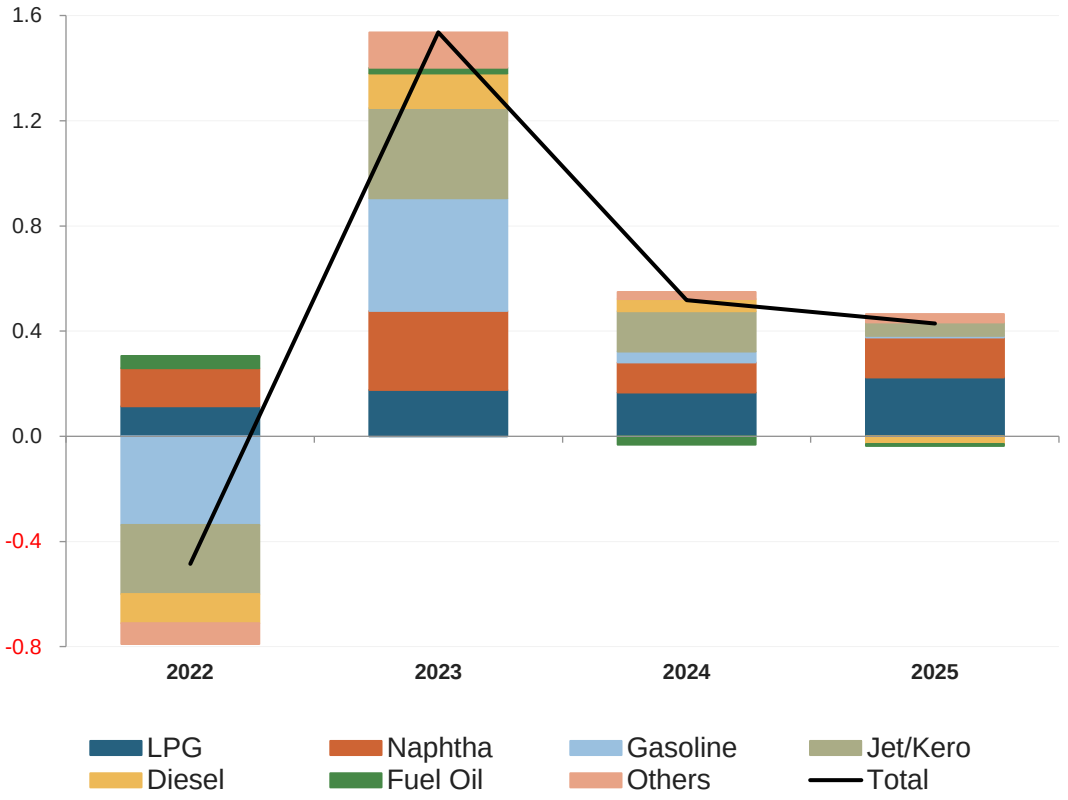
Y-o-Y Change in Global Industry[2]-Driven Oil Demand, mmb/d and Global Manufacturing PMI



Source: FGE, S&P Global
[2]Petrochemical feedstocks, diesel and fuel oil

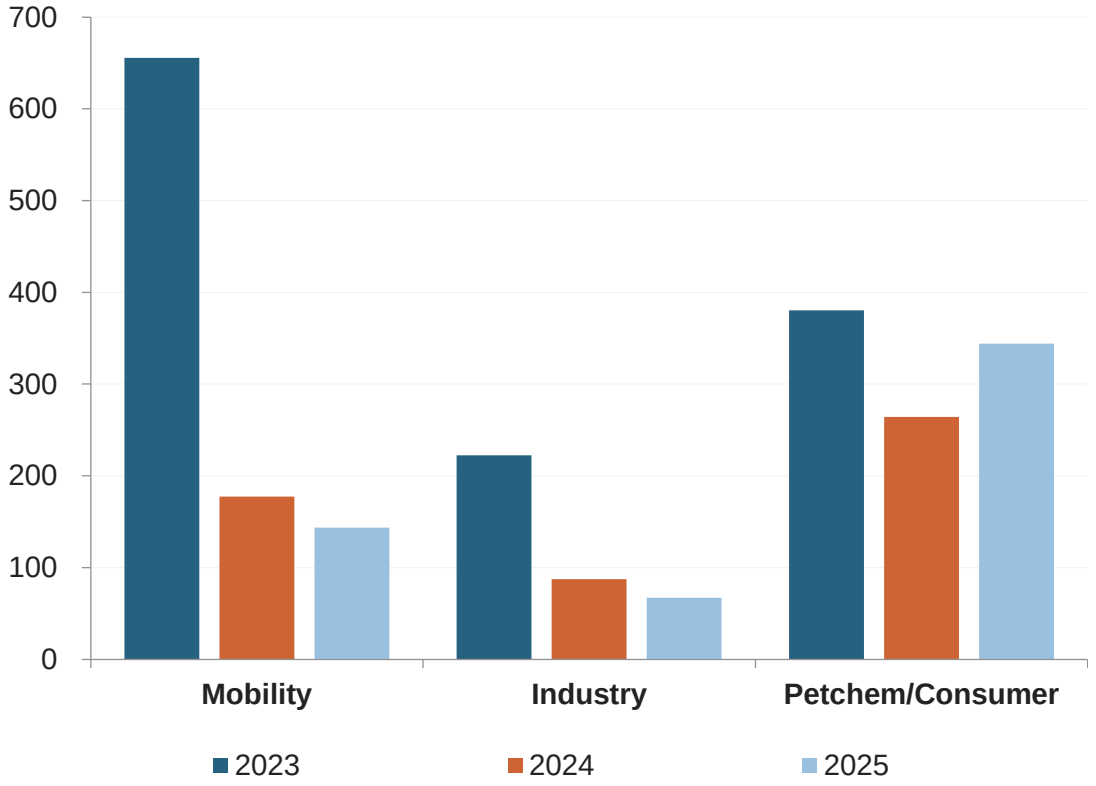
FGE's China Take: What's in store for 2024 and beyond?

China Y-o-Y Demand Growth by Product, mmb/d



Source: FGE

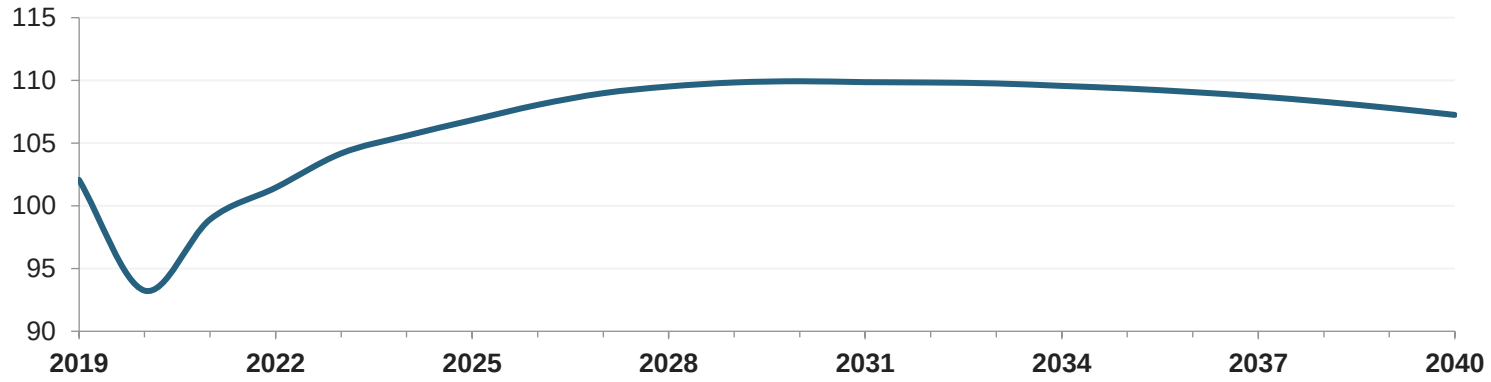
China Y-o-Y Demand Growth by Sector (2023-2024), kb/d



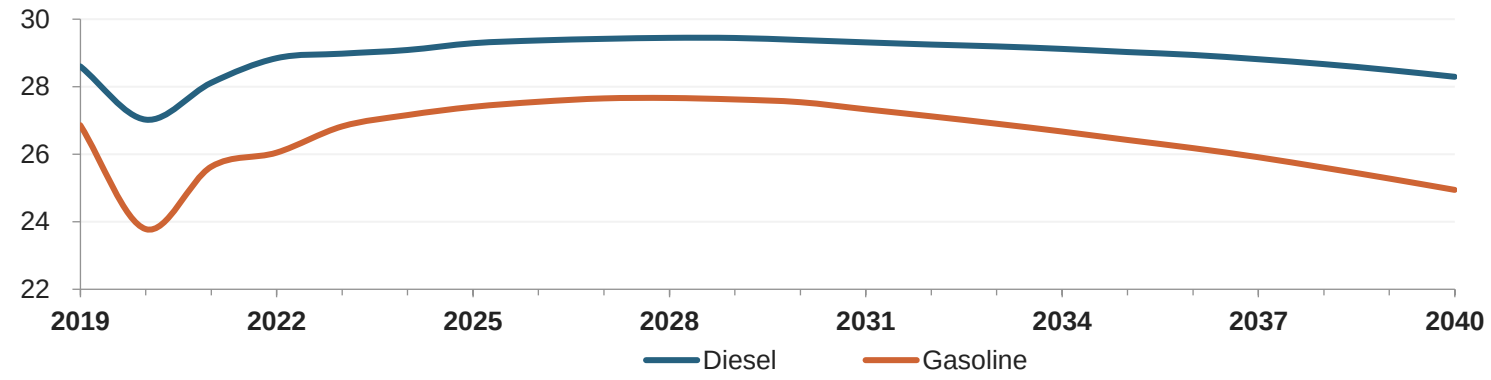
Source: FGE

Oil's Future: It's far from over

Global Total Oil Demand, mmb/d

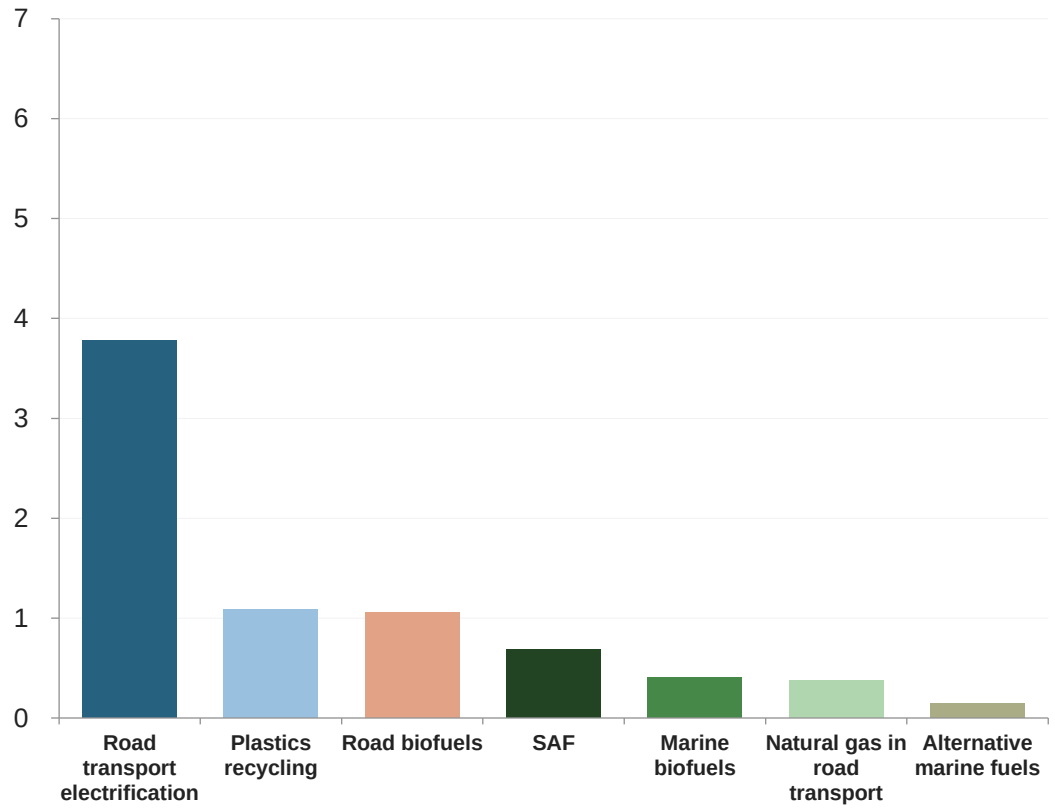


Global Gasoline and Diesel Demand, mmb/d



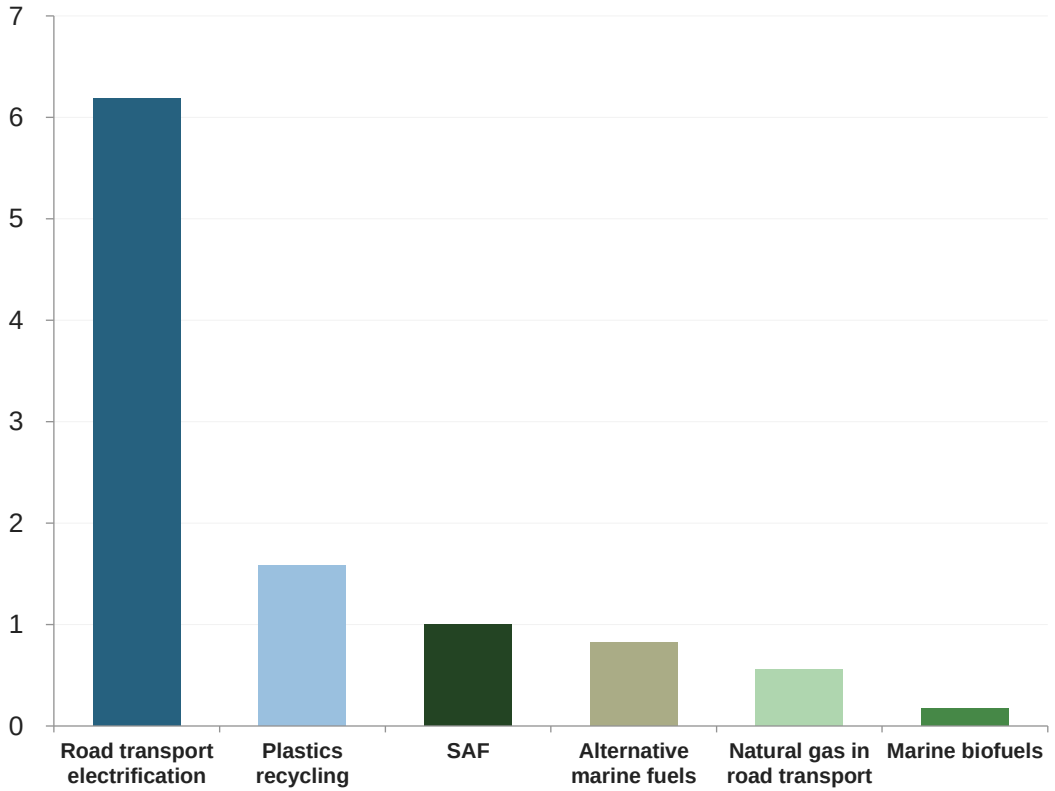
Two Eras: New energy impact on oil demand–mostly EVs

New Energy Impact on Oil Demand 2021-2035, mmb/d



Source: FGE

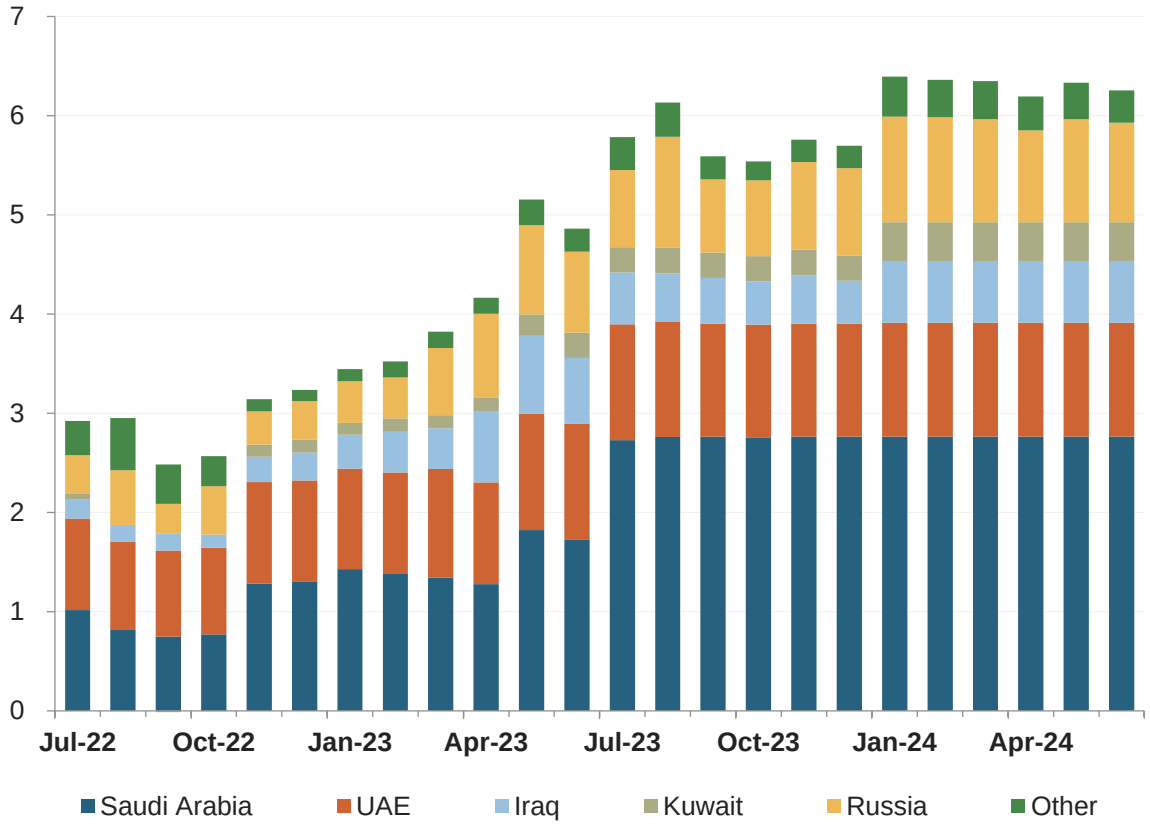
New Energy Impact on Oil Demand 2035-2050, mmb/d



Source: FGE

OPEC’s Challenge Ahead: Managing its spare capacity

OPEC+ Spare Capacity, mmb/d

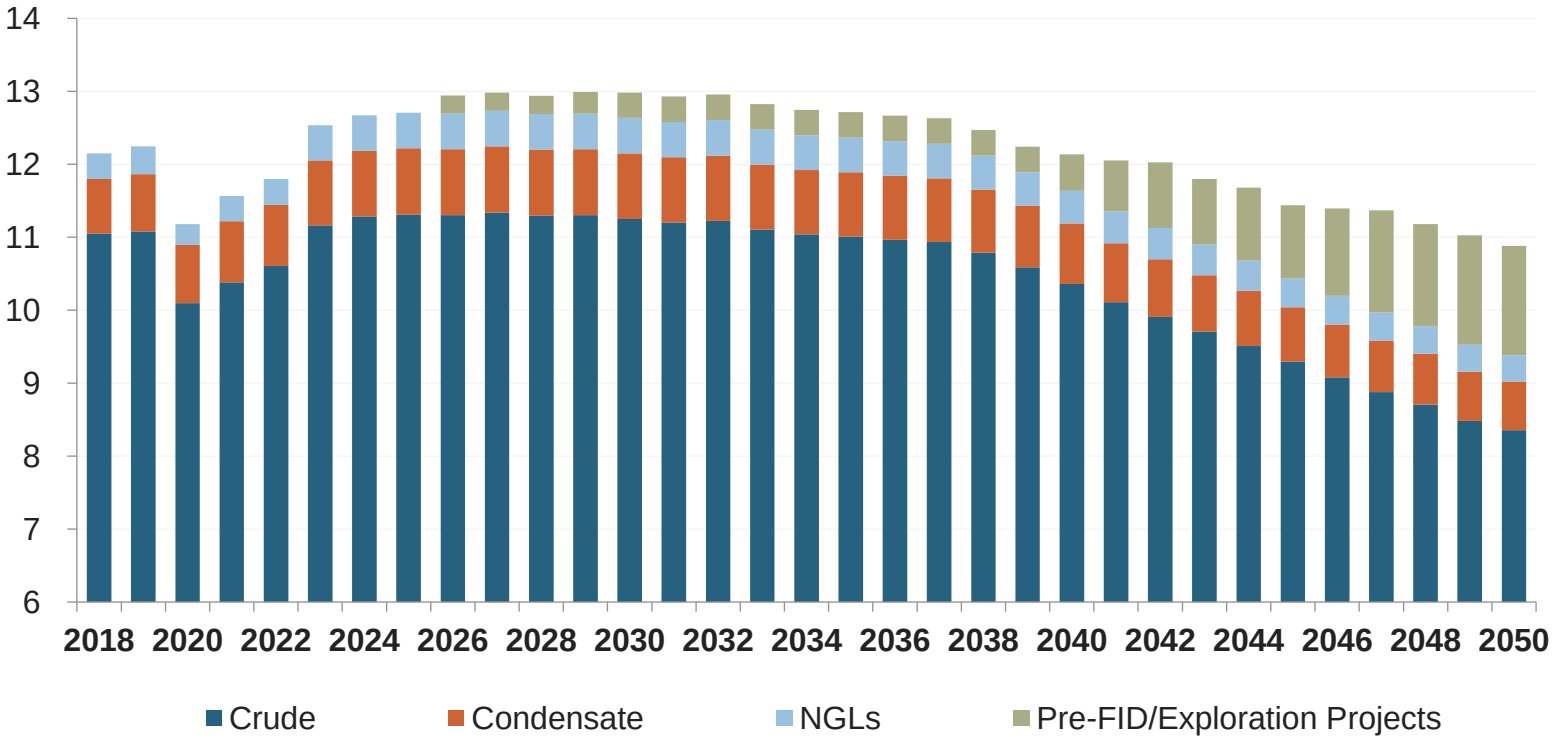


Source: FGE

- Before, some in OPEC worried that high prices would cause US shale to boom and kill off demand.
- Now some in OPEC are less worried about US shale and are more focused on monetizing oil resources before demand peaks.
- Maintaining US$75-US$80/bbl+ is achievable in 2024, but will be challenging.
- With ample spare capacity, OPEC cohesion will be closely monitored.

Russian capacity ahead: Despite western sanctions, capacity will rise

Russia: Upstream Historical Output and Future Capacity, mmb/d

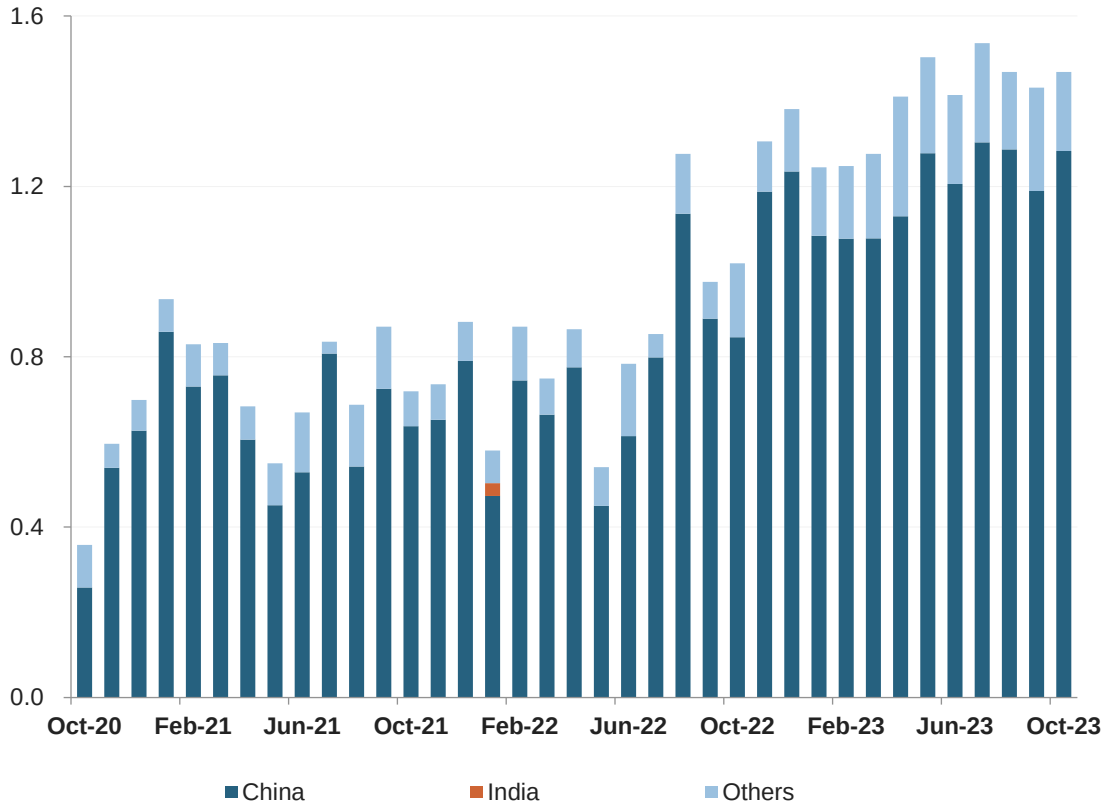


Source: FGE

- We see Russian crude and condensate capacity increasing until 2027-2029. We do not see the exit of Western oil companies having a major impact on Moscow's ability to finance new E&P projects. Moreover, Russia has been focusing on import substitution of foreign technology for several years now.

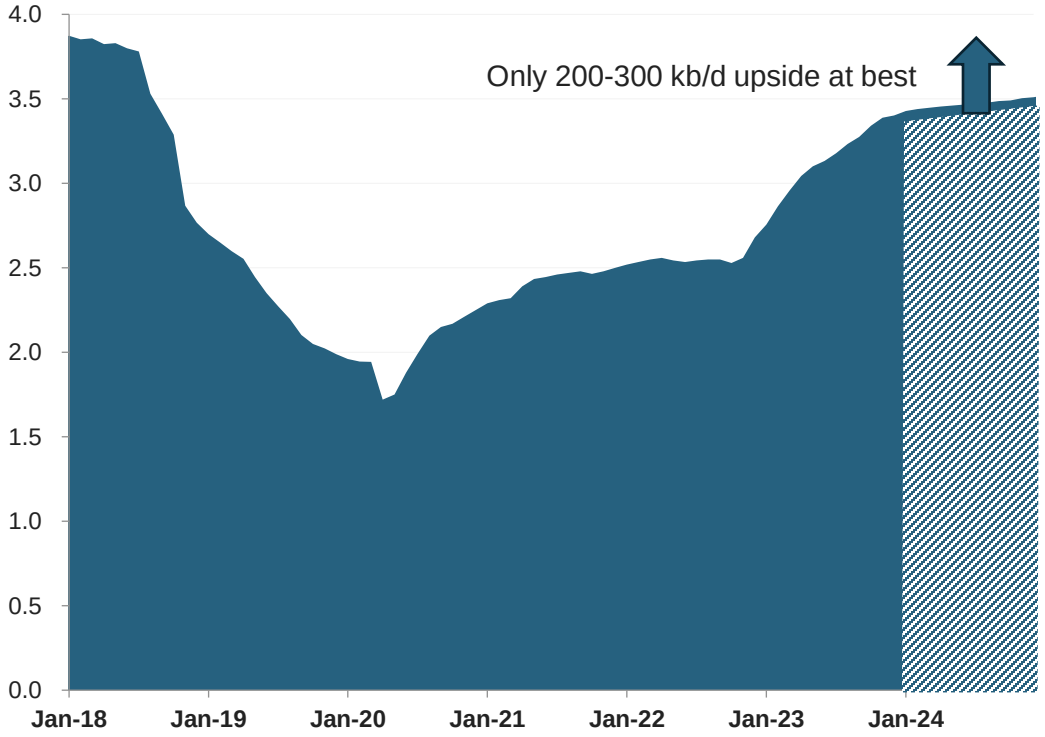
Iranian crude exports push higher…getting close to max output

Iran Crude Oil Exports (Excluding Condensate), mmb/d



Source: FGE

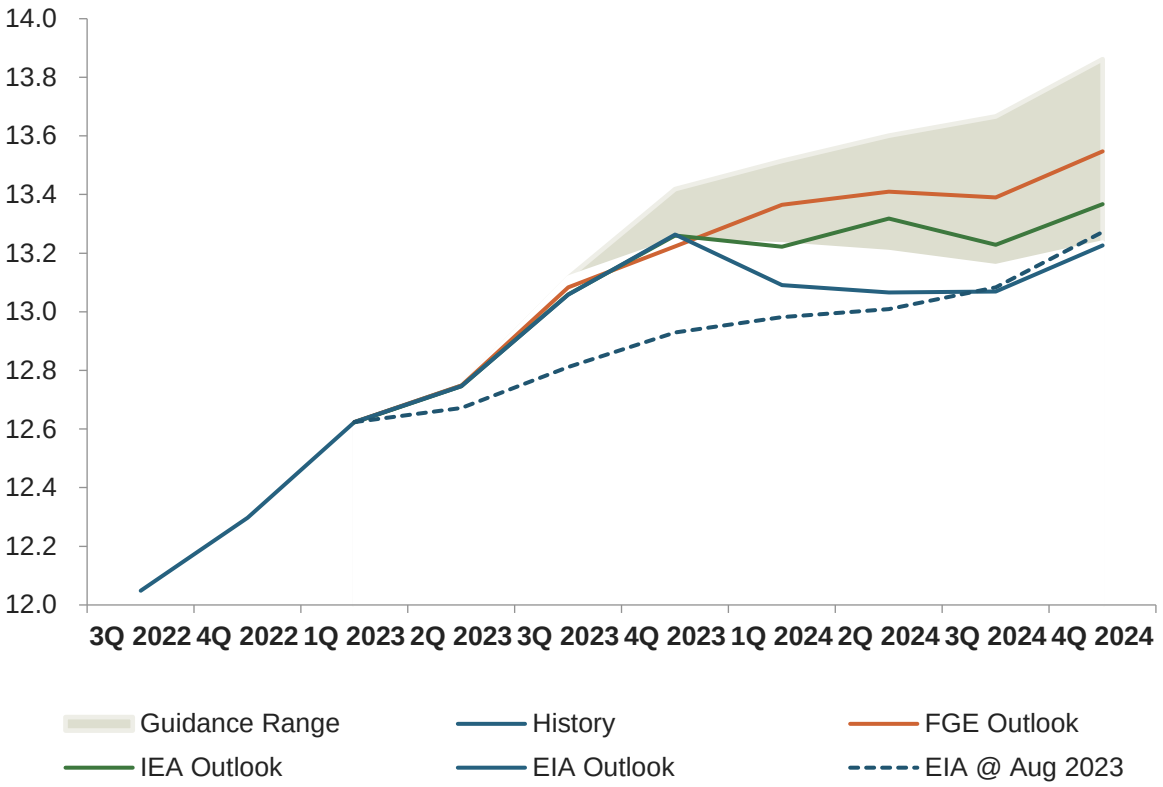
Iran Crude Production (excl. Condensate and NGLs), mmb/d



Source: FGE

US Production Surprises: Company guidance now more useful than rig count

US Crude Output Comparison, mmb/d

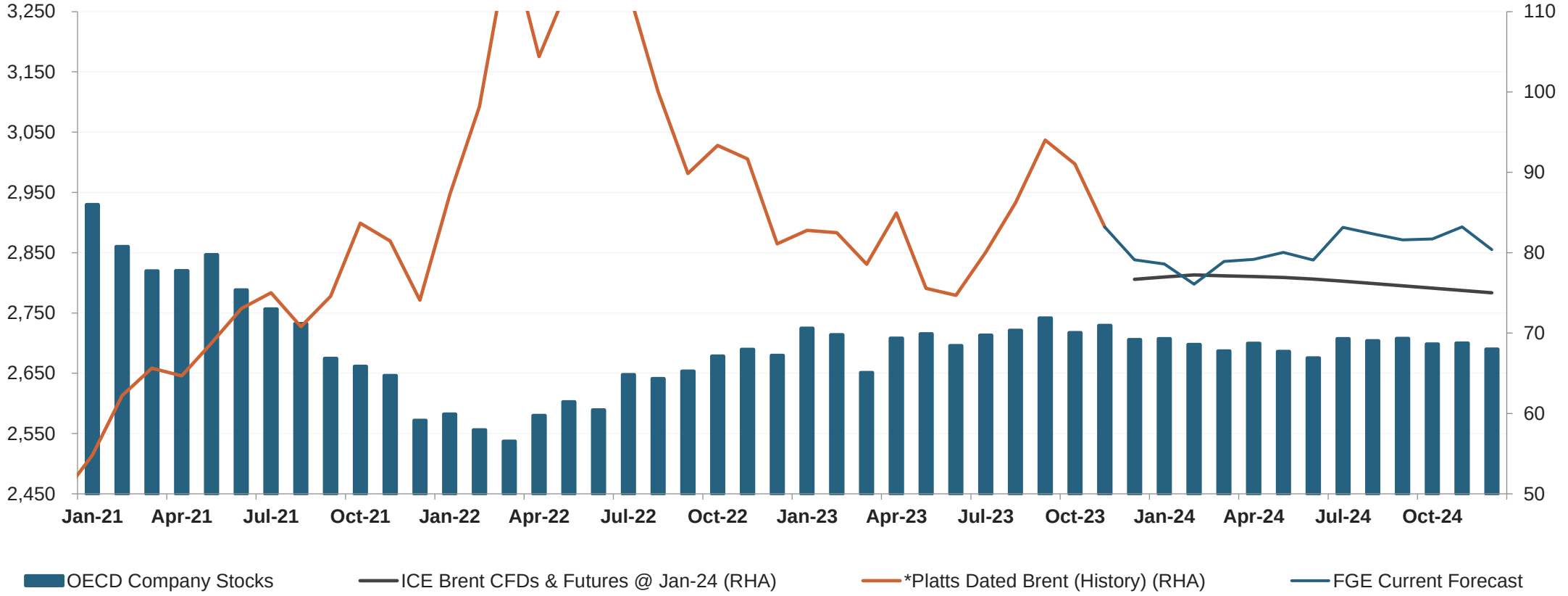


Source: FGE

- Earlier in the shale boom, producers focused almost entirely on growth, not returns.
  - It seems a bit crazy in retrospect, but top management was responding to incentives at the time…high growth = higher share price.
- Incentives have shifted, and management now focuses on returning cash to shareholders as well as growth.
- Shale growth is slower, but it is certainly not dead. Despite cost/labor pressures, rates of return are attractive, and production is rising.
- We find that company guidance provides the best near-term indicator of future US production.

The Bottom Line: OPEC+ must work at it to keep oil around US$80/bbl+

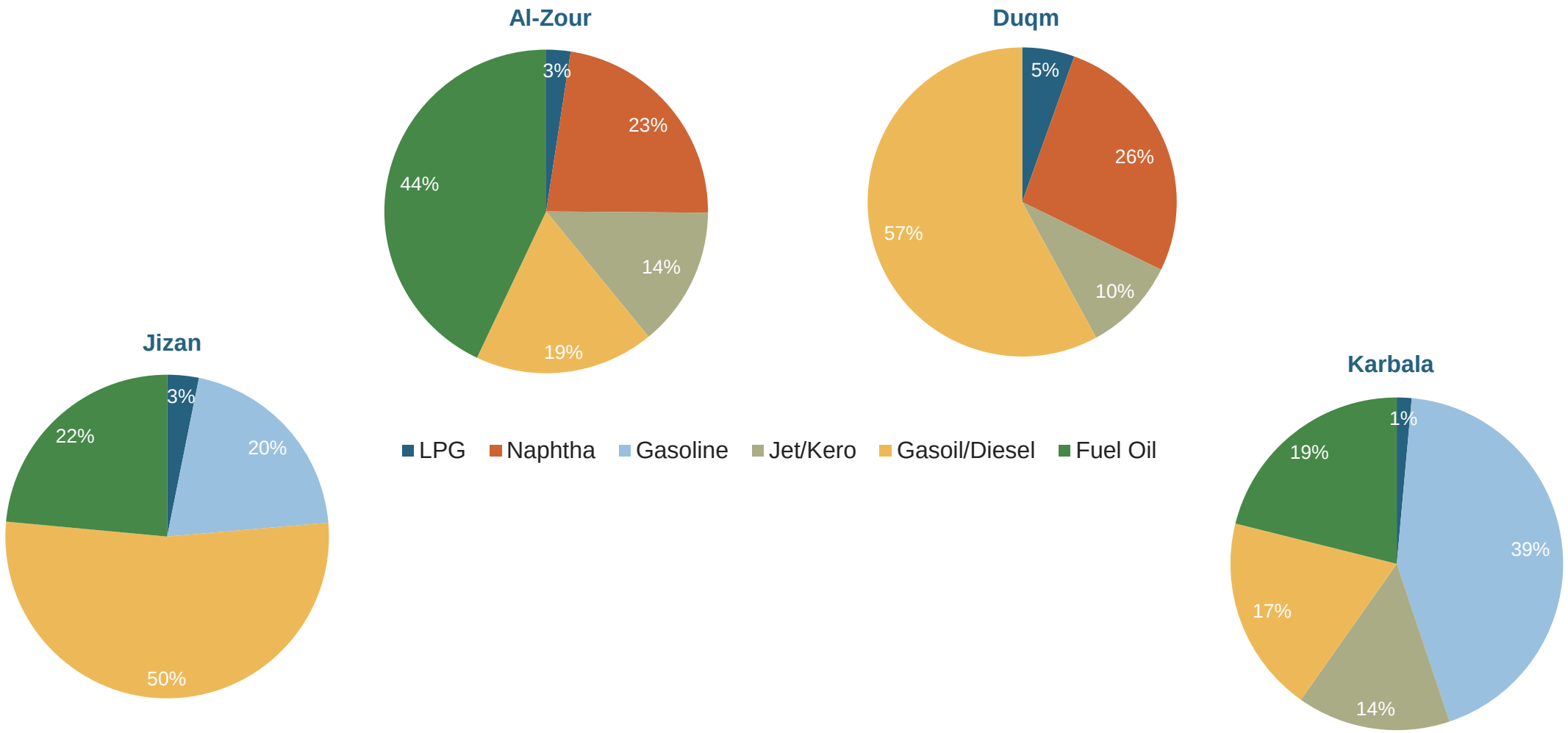
OECD Company Stocks (mmb) vs Brent Outlook (RHA - US$/bbl)



Source: Platts, ICE, FGE*

Updated: 9 January 2024

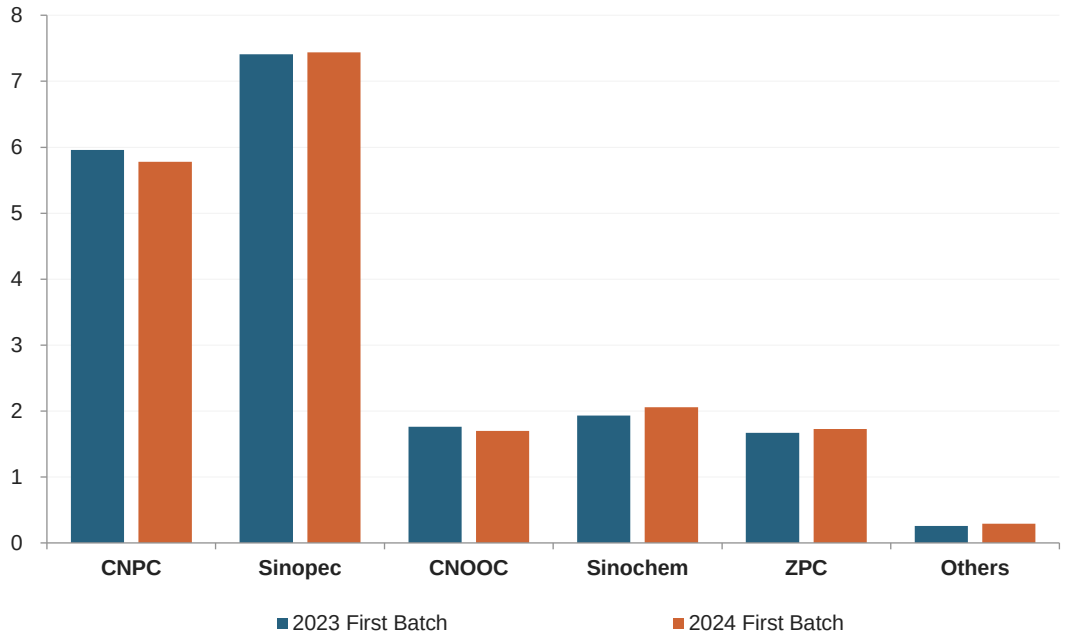
Middle East refinery yields and plans vary substantially



Source: FGE

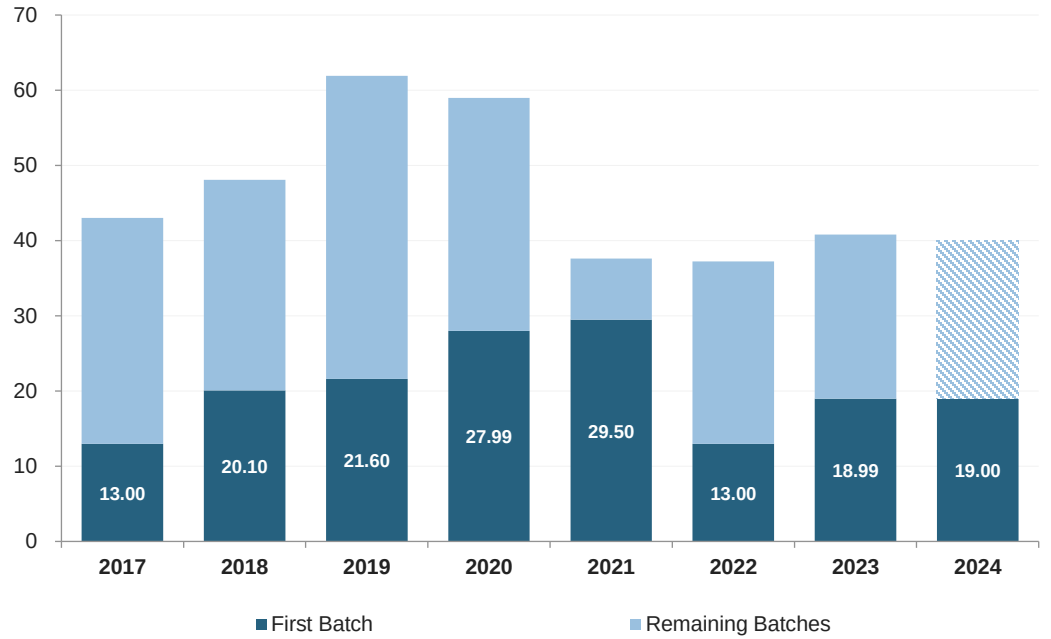
China quota policy remains a trade-off between economic revival and refining consolidation

China's Transport Fuels Export Quotas by Refiner, mmt



Source: FGE

China Transport Fuel Export Quota Comparison, mmt

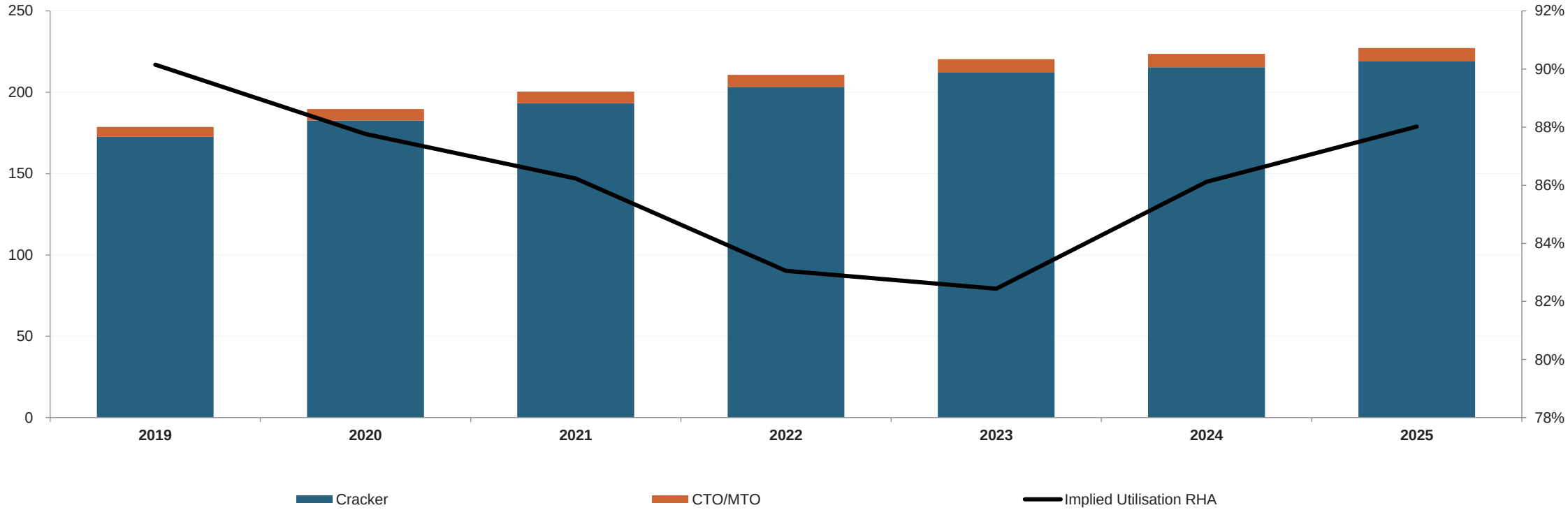


Source: FGE
Note: Remaining quotas for 2024 are based on FGE's forecast

- Chinese quota policy remains a trade-off between economic revival and refining consolidation.
- **Gasoline**: Surplus managed by continuous declines in NOC yields–shifts towards petrochemicals.
- **Gasoil**: Big uncertainty–depends on how high Chinese teapots can run. Crude import quotas are allocated with better flexibility than ever.

A new cycle ahead?...When will petchems finally improve?

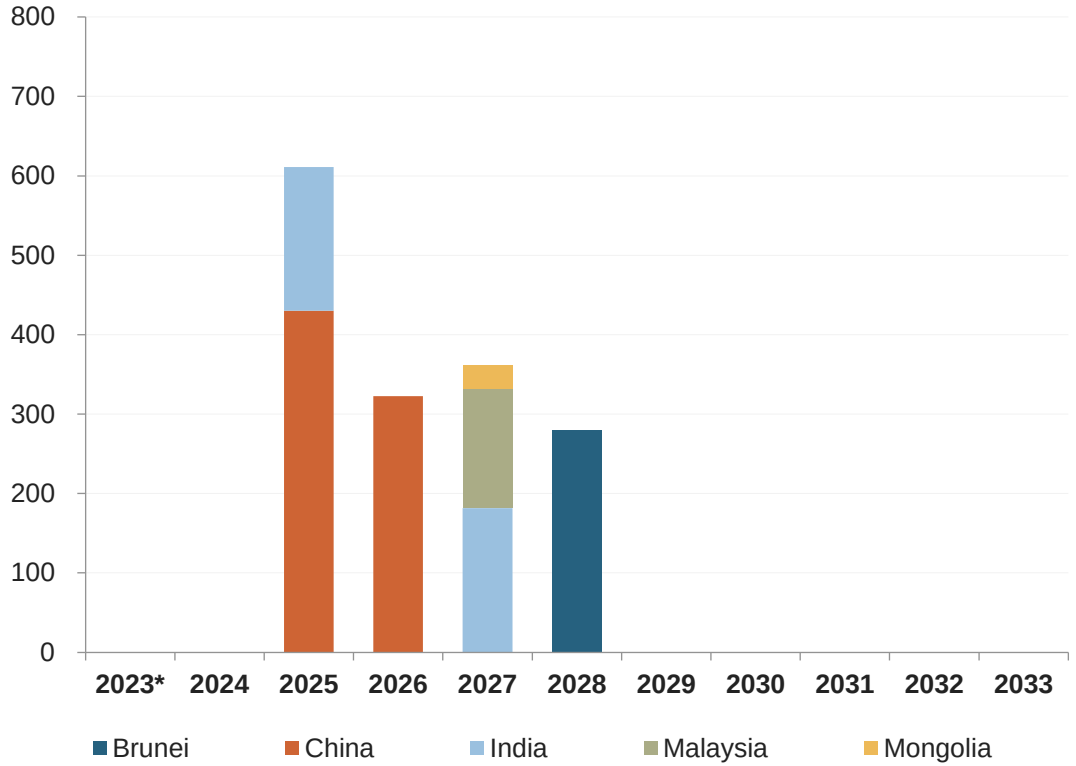
Global Ethylene Capacity versus Implied Utilisation, mmt and %



Source: FGE

Asia: No new grassroots refineries expected beyond 2028 for now

Asia 'Firm and Likely' CDU Capacity Grassroots Additions, kb/d



Source: FGE
**2023 data are for the rest of the year i.e. Aug-Dec 2023*

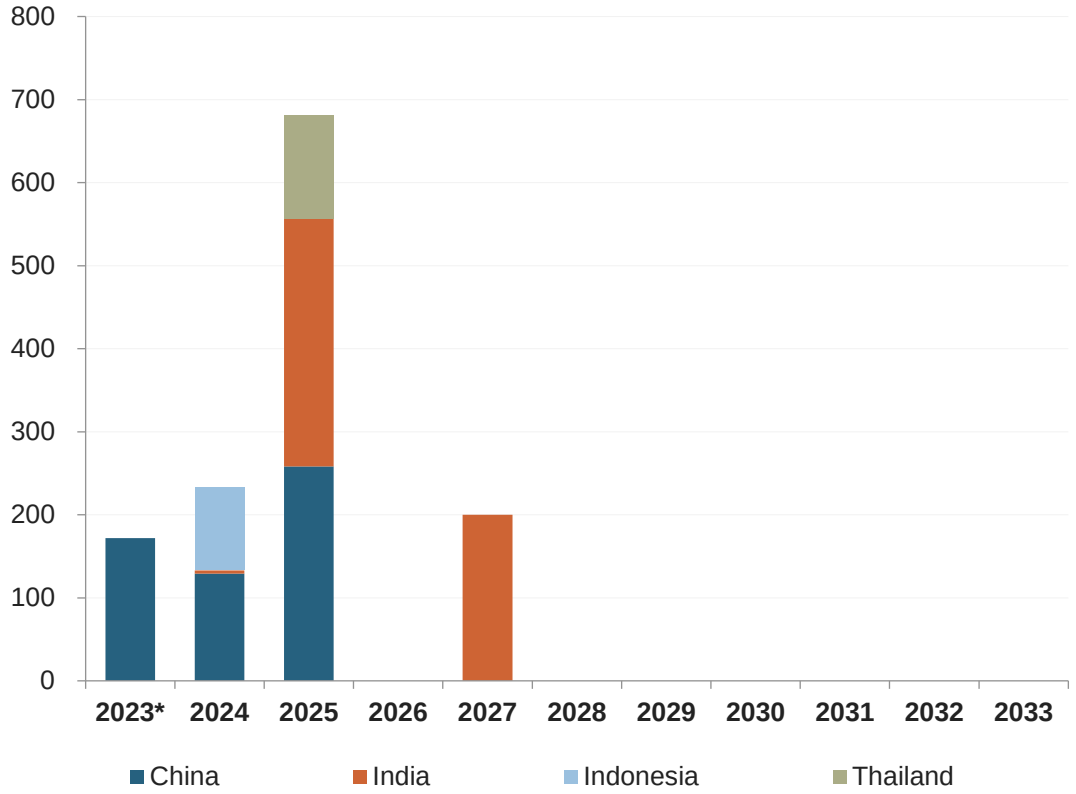
Key Grassroots Refinery Additions (2023-2033)

Country	Operator	Refinery Site	Size (kb/d)	Year
China	Local Yulong	Shandong	430	2025
India	HRRL	Barmer	181	2025
China	Norinco / Saudi Aramco / Panjin Xincheng	Liaoning, Panjin	323	2026
India	CPCL	Nagapattinam	182	2027
Malaysia	Pengerang Energy Complex	Pengerang	150	2027
Brunei	Hengyi Petrochemical	Pulau Muara Besar (PMB)	280	2028

Source: FGE
Note: The capacity for Pengerang Energy Complex is for a condensate splitter

Asia: Several CDU expansion projects will materialize by 2027

Asia 'Firm and Likely' CDU Capacity Expansions, kb/d



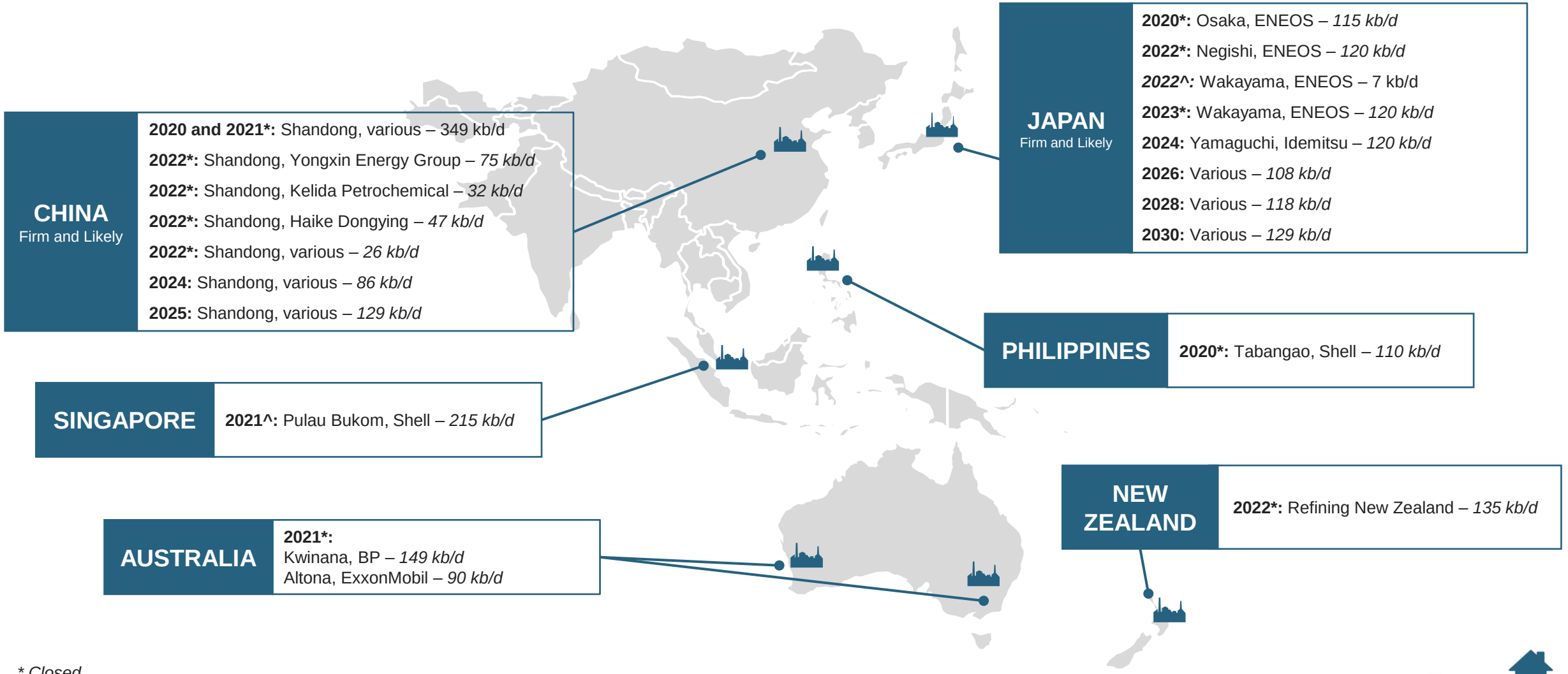
Source: FGE
**2023 data are for the rest of the year, i.e., Aug-Dec 2023*

Key CDU Refinery Expansions (2023-2033)

Country	Operator	Refinery Site	Size (kb/d)	Year
China	Local Hebei Xinhai Chemical	Hebei	172	2023
Indonesia	PT Pertamina	Balikpapan	100	2024
China	CNOOC / Local Ningbo Daxie (formerly known as Liwan)	Zhejiang	129	2024
Thailand	Thaioil	Sriracha	125	2025
China	Sinopec Zhenhai Phase 2 Expansion Project	Zhenhai	258	2025
India	IOCL	Barauni, Gujarat, Mathura	208	2025
India	Numaligarh Refinery Ltd.	Numaligarh	91	2025
India	IOCL	Panipat	200	2027

Source: FGE

Asia: Refinery closures in 2020-2030



CHINA
Firm and Likely

2020 and 2021*: Shandong, various – 349 kb/d
2022*: Shandong, Yongxin Energy Group – *75 kb/d*
2022*: Shandong, Kelida Petrochemical – *32 kb/d*
2022*: Shandong, Haike Dongying – *47 kb/d*
2022*: Shandong, various – *26 kb/d*
2024: Shandong, various – *86 kb/d*
2025: Shandong, various – *129 kb/d*

JAPAN
Firm and Likely

2020*: Osaka, ENEOS – *115 kb/d*
2022*: Negishi, ENEOS – *120 kb/d*
2022^: Wakayama, ENEOS – 7 kb/d
2023*: Wakayama, ENEOS – *120 kb/d*
2024: Yamaguchi, Idemitsu – *120 kb/d*
2026: Various – *108 kb/d*
2028: Various – *118 kb/d*
2030: Various – *129 kb/d*

PHILIPPINES

2020*: Tabangao, Shell – *110 kb/d*

SINGAPORE

2021^: Pulau Bukom, Shell – *215 kb/d*

NEW ZEALAND

2022*: Refining New Zealand – *135 kb/d*

AUSTRALIA

2021*:
Kwinana, BP – *149 kb/d*
Altona, ExxonMobil – *90 kb/d*

** Closed*
^ Shell and ENEOS downsized the Pulau Bukom and Wakayama refineries, respectively

Commercial vehicles electrification potential

High Electrification Potential

- Urban delivery cycles are the ideal duty cycle for battery electric powertrain.
- Range not a concern as duty cycles usually are below 100 miles/day and urban traffic allows for regen breaking.
- Long overnight garage times are suitable for charging.

Medium Electrification Potential

- Likely to have payload concerns, however many of these use the volume limits but not weight limits.
- Range is not a concern with duty cycles below 150 miles/day.
- Charging overnight a possibility.

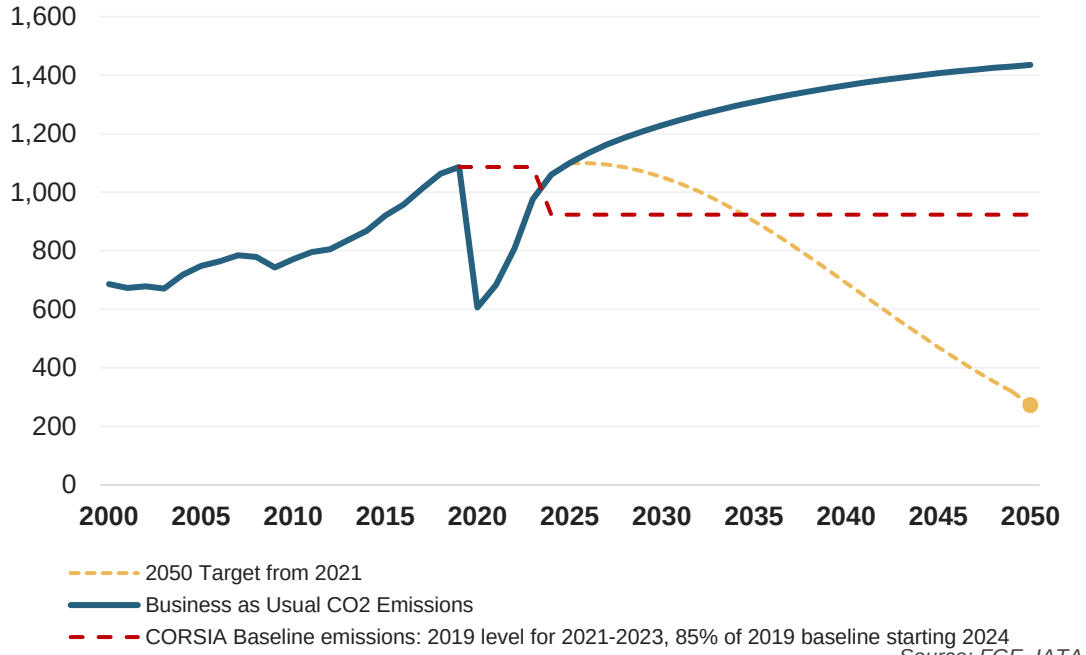
Low Electrification Potential

- Duty cycles may not allow for electrification.
- The vehicle may need to do two or three driver shifts per day with little garage time at the depot available for charging.
- Payload/range trade-off.

Image sources: Ford, Volvo, Scania

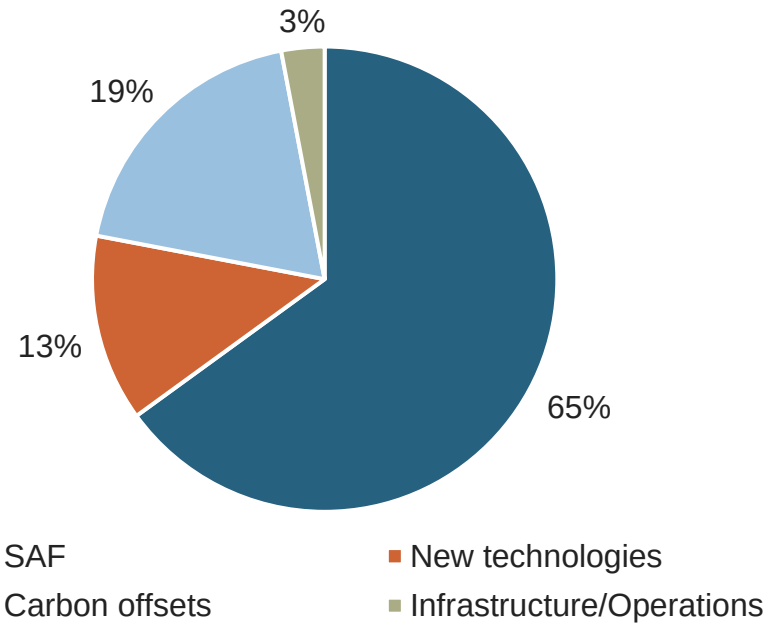
Airline industry's long-term net-zero plans

CO2 Emissions from Global Jet Fuel, mmtpa



Source: FGE, IATA

IATA Net-Zero 2050 Plan



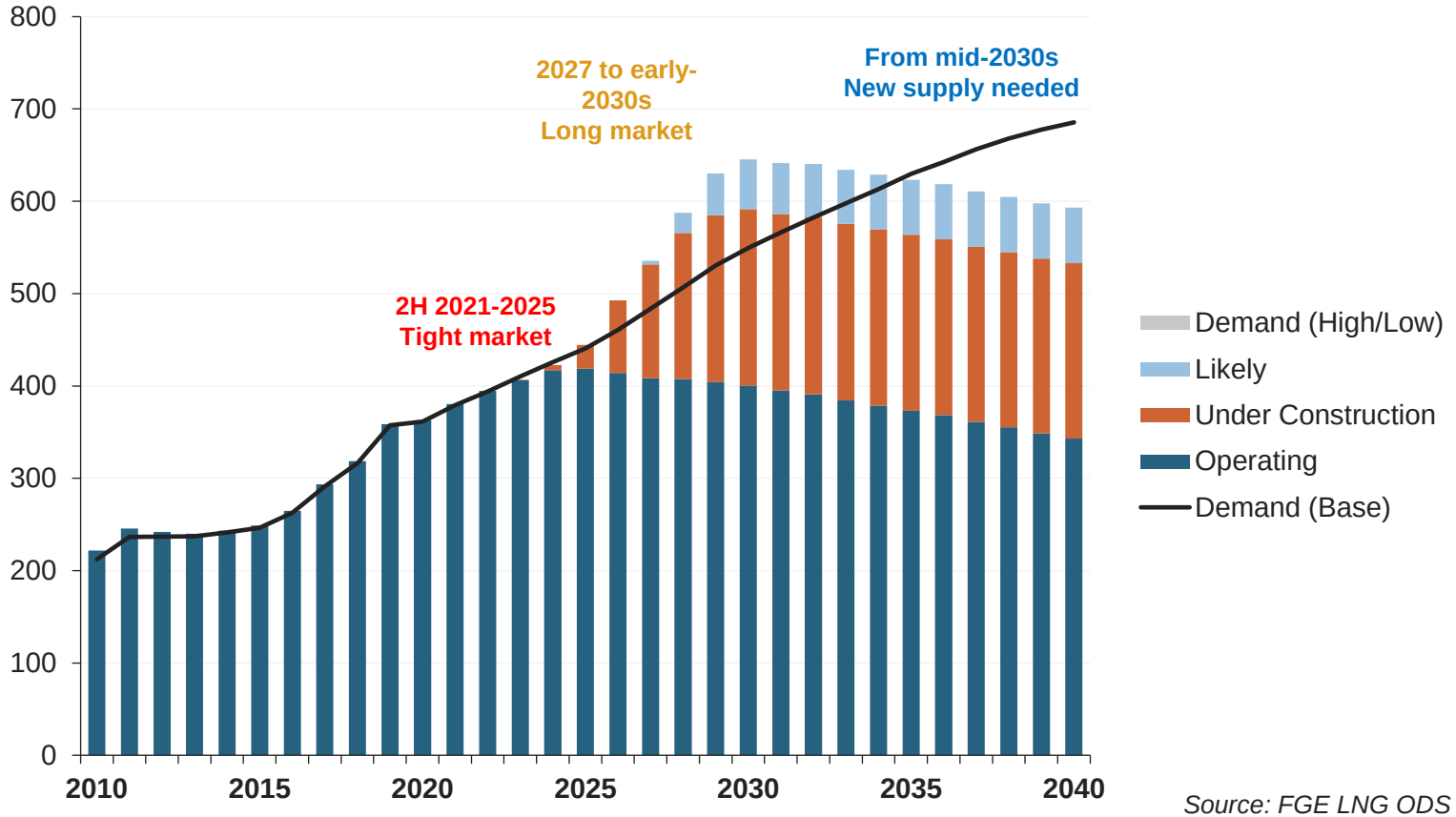
Source: FGE, IATA

- In 2009, the global aviation industry set a goal of halving its CO2 emissions by 2050 compared with 2005 levels.
- In 2021, the airline members of the International Air Transport Association (IATA) approved a resolution to achieve net zero carbon emissions by 2050.
- About two-thirds of the emissions reduction is expected to come from sustainable aviation fuels (SAF), while around one-fifth of the emissions will still be offset.

Gas/LNG Markets

LNG market undergoes boom and bust cycles with the current tight market only beginning to rebalance in 2026

Global LNG Supply vs Demand, mt

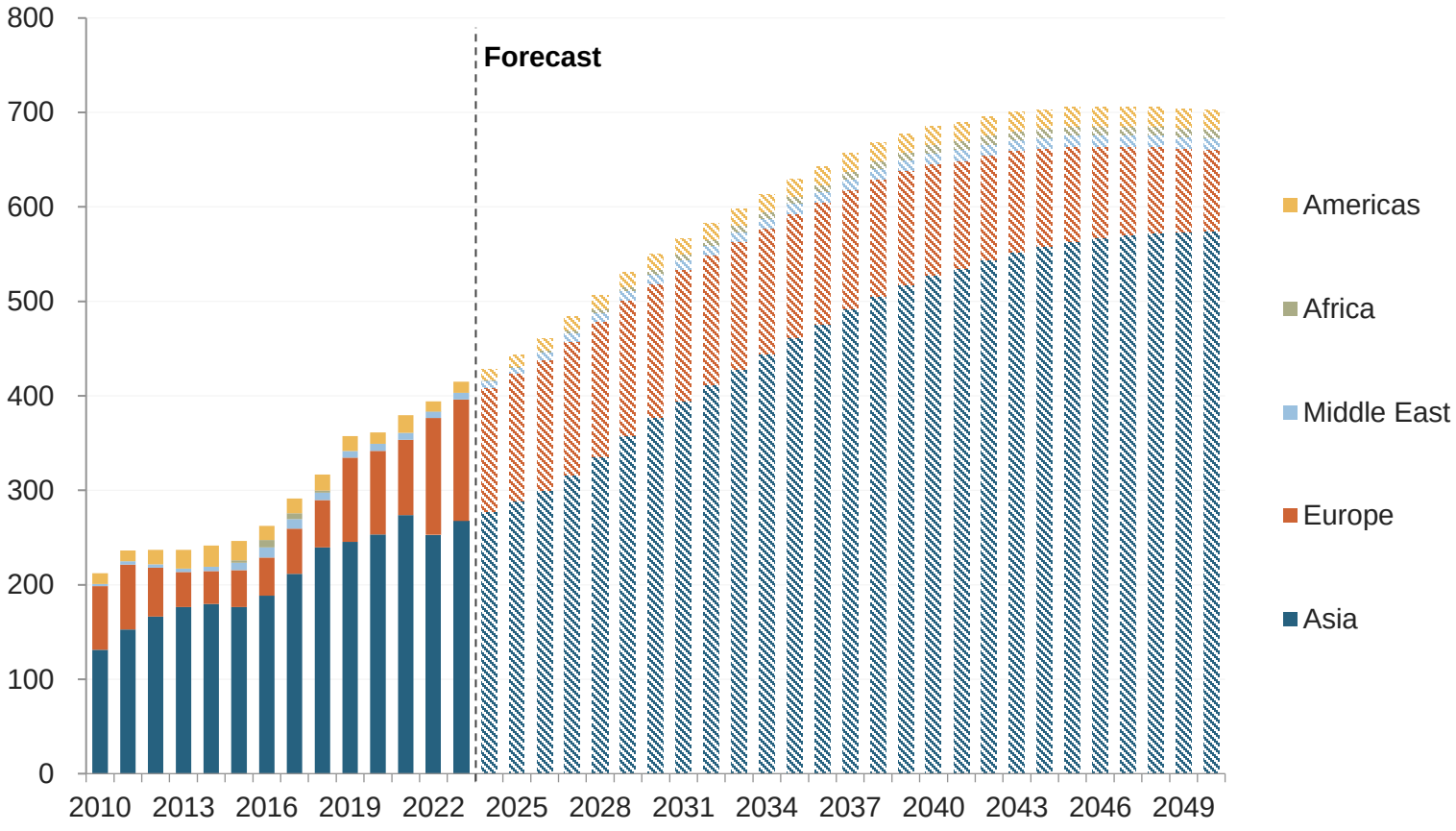


Source: FGE LNG ODS

- **Tight 2H 2021-2025:** A tight European gas market pulls LNG from global markets. Supply growth dries up due to an earlier slowdown in FIDs, while Asian demand continues to grow.
- **Long from 2027 to the early 2030s:** A wave of supply hits the market. Europe continues to soak up LNG to phase out coal, while lower prices attract Asian players back into the market. Some time will be needed to absorb the new LNG supply.
- **Tight from mid-2030s?:** New FIDs will be needed to fill a growing supply-demand gap post-2035.

LNG demand sees strong growth until the late-2040s as gas underpins the transition away from coal

Global LNG Demand by Region, mt



Source: FGE LNG ODS

- **LNG demand remains resilient despite the energy transition.** Practical considerations such as security and reliability of supply reinforce the importance of natural gas.
- **Asia remains the heart of the LNG market and drives strong demand growth.** Developing Asian economies begin to shun coal, further supporting LNG demand.

Thank You

If you have any questions regarding this presentation, please contact us at

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S&P Global Commodity Insights

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