

Asia Olefins - Navigating Turbulence

Duration of the Downturn, Near-term Market Outlook, and Potential Rationalization

May 31, 2024

Mike Park

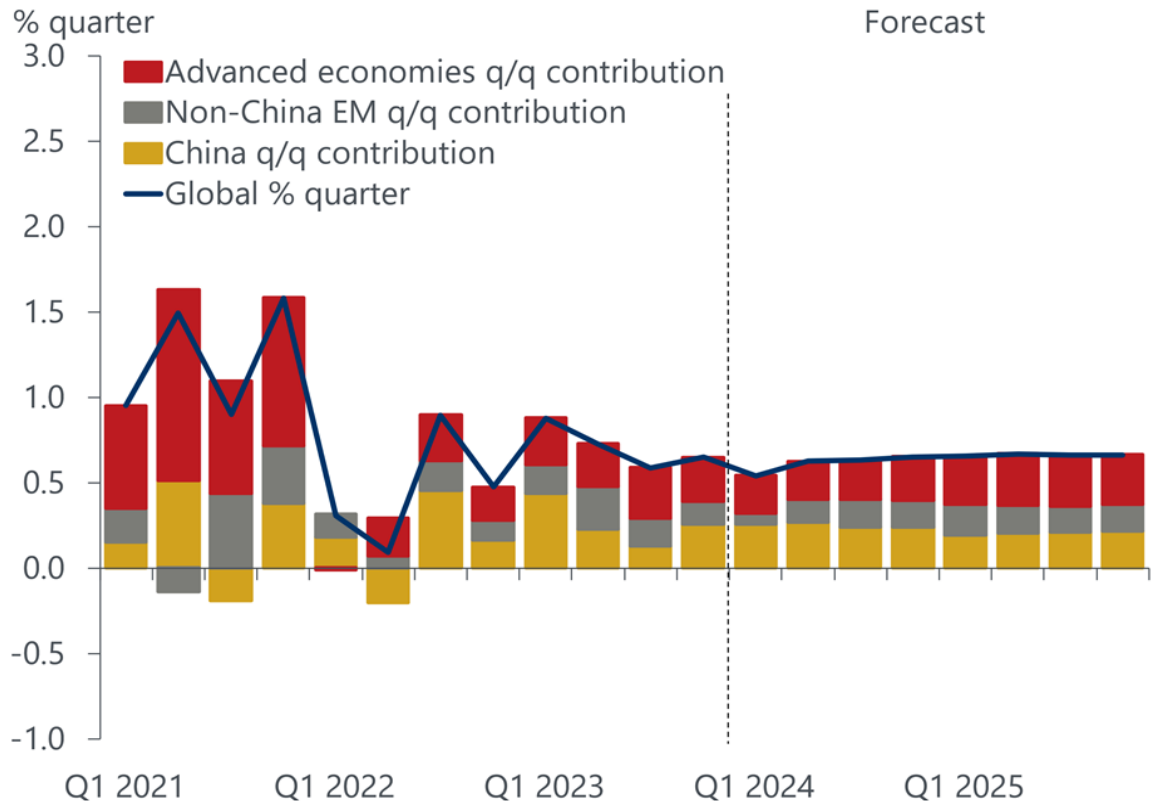
Director, Asia Olefins

Mike.park@chemicalmarketanalytics.com

Energy and Economy

Macro Outlook: The Worst Is Over, But Growth From Here Will Be Gradual

World: real GDP growth



Source: Oxford Economics/Haver Analytics

Summary of international GDP forecasts (% year)

	2022	2023	2024	2025
World GDP (US\$ weighted)	3.1	2.7	2.5	2.8
Advanced Economies	2.6	1.6	1.6	1.8
Emerging Markets	3.7	4.3	3.8	4

Source: Oxford Economics

Summary of key global economies' GDP forecasts (% year)

	2022	2023	2024	2025
US	1.9	2.5	2.7	1.8
Eurozone	3.5	0.5	0.6	1.8
Japan	0.9	1.9	0.5	0.9
UK	4.3	0.1	0.5	2
China	3	5.2	4.7	4.1
India	6.5	7.7	6.3	7.2
Brazil	3.1	2.9	0.9	1.8
Russia	-2.1	3.6	3	0.2

Source: Oxford Economics

Crude Oil: Bullish In The Second Half Of 2024, With A Gradual Decline Expected In 2025.

ICE Brent Price Forecast by Scenario



Source: Rystad, Energy, Chemical Market Analytics by OPIS

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Base Case Assumptions

- OPEC+ voluntary cuts complied with a 90% rate
- OPEC+ extends the 2.2 MMb/d voluntary cuts into the second quarter of this year
- OPEC+ Supply management remains in 2025 to avoid significant surplus
- Russian crude and condensate production averages 10.4 MMb/d in 2024
- No full blowout regional conflict

Key developments to monitor

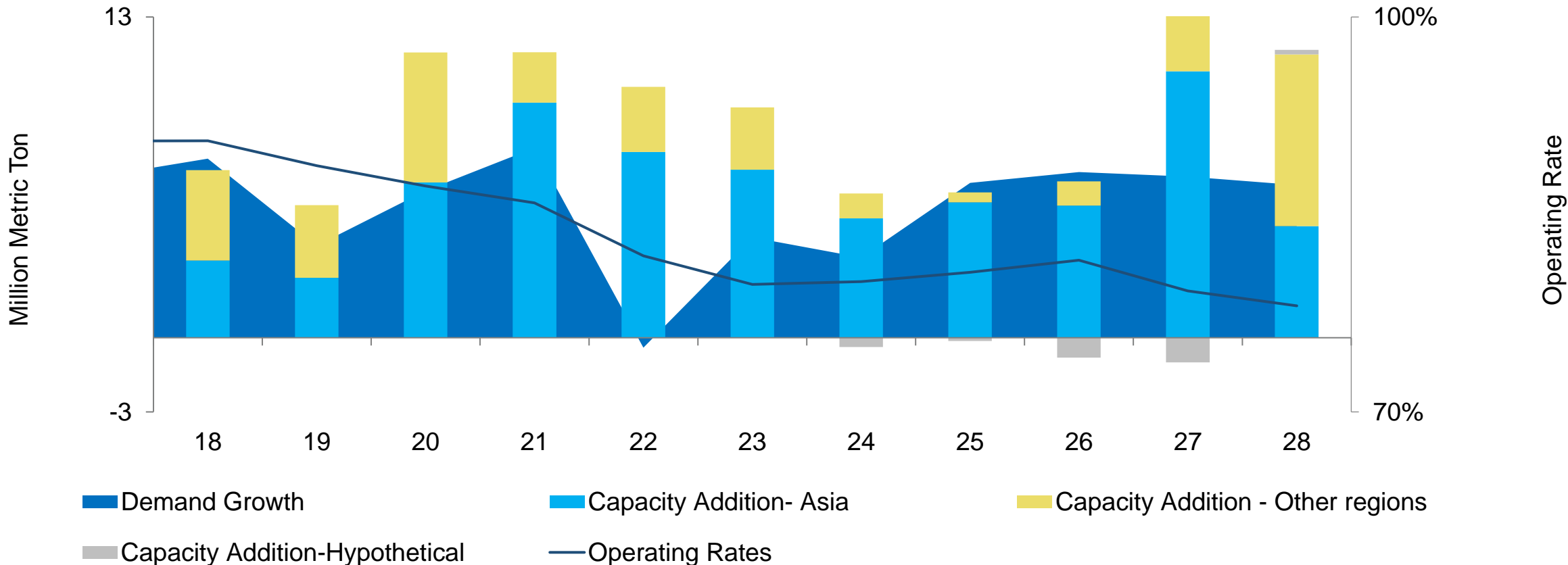
- Geopolitical developments in the Middle East and Ukraine-Russia
- Compliance on OPEC+ cuts; OPEC production policy changes during the second half of the year
- Global refinery runs ramp-up
- Macroeconomic environment

\$/bbl	Q1 2024	Q2 2024	Q3 2024	Q4 2024	Q1 2025	Q2 2025	Q3 2025	Q4 2025
Brent	82	90	89	88	90	87	86	82
WTI	77	86	85	85	85	83	82	79

Duration of the Downturn

Ethylene – 2nd Wave To Weigh On The Market In Mid-term

Global Ethylene Supply Demand

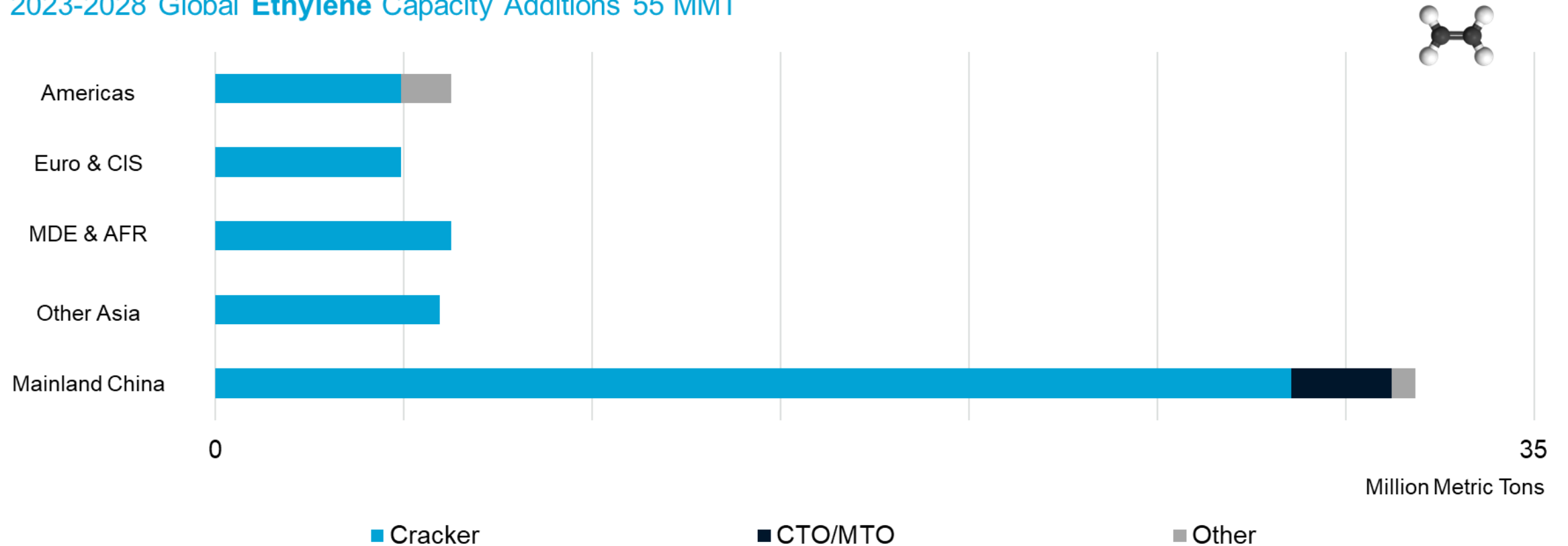


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Capacity Build-cycle Continues Driven By Mainland China's Aggressive Investment

2023-2028 Global Ethylene Capacity Additions 55 MMT

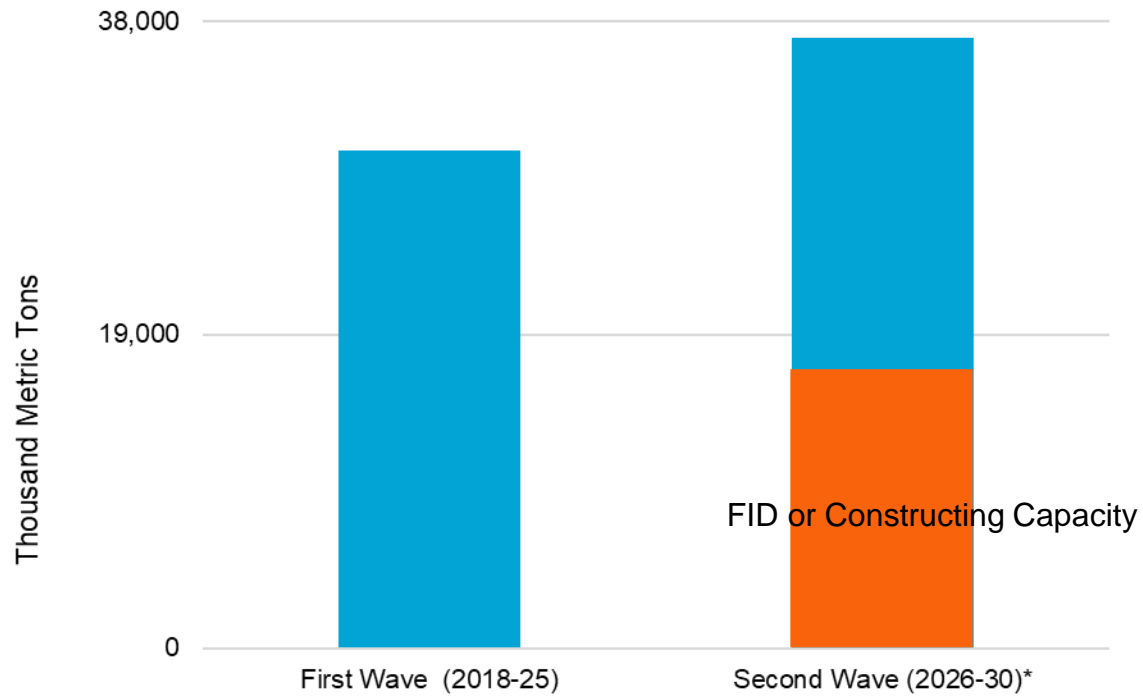


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Soes In Mainland China Is Keen To Increase The Chemical Yields Amid Energy Transition And Peaking Carbon In 2030

Total Ethylene Capacity: First Wave VS. Second Wave

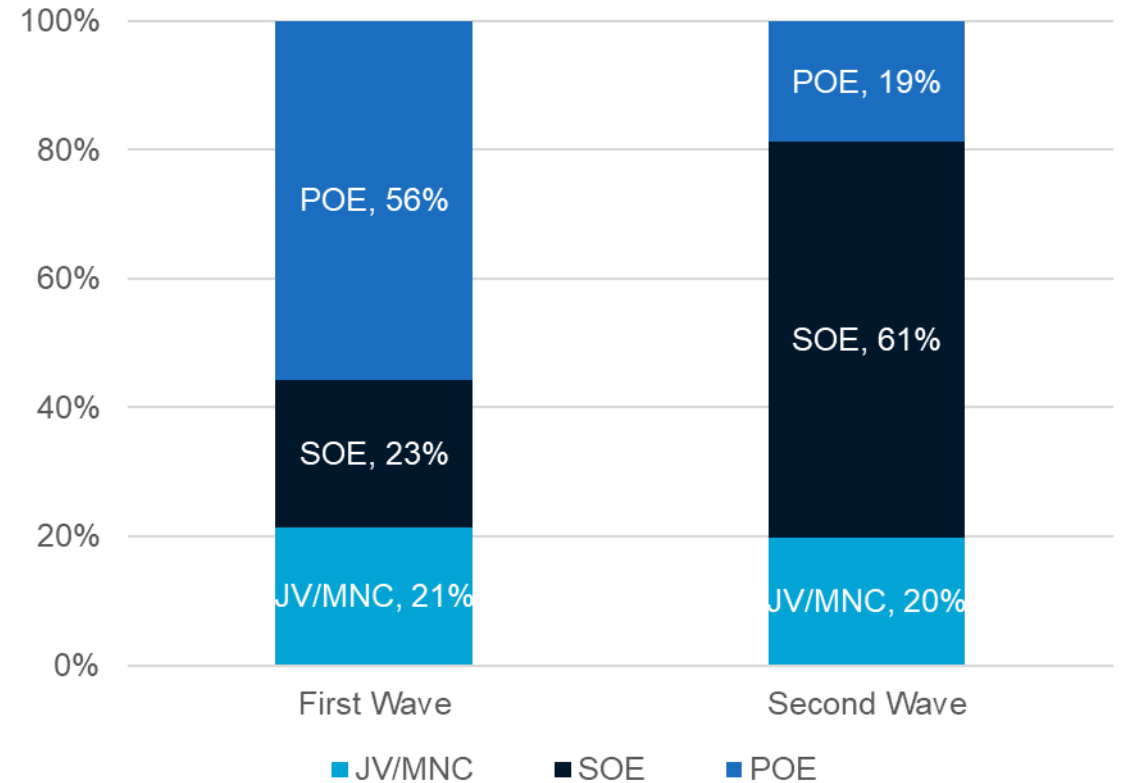


*Note: include all planned steam crackers

Source: Chemical Market Analytics by OPIS

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Chinese New Crackers by Shareholder:



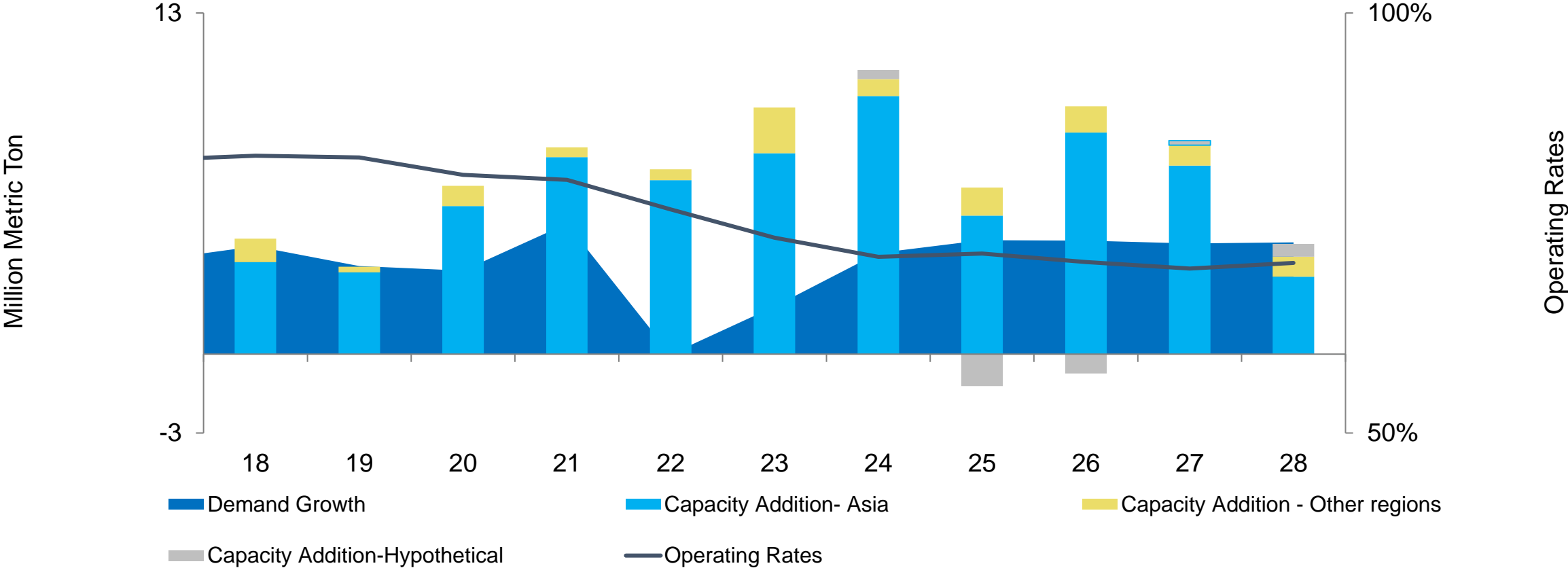
*Note: include all planned steam crackers

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Propylene – The Industry Needs More Time To Digest The New Capacity Additions Since 2020

Global Propylene New Capacity vs Demand Growth

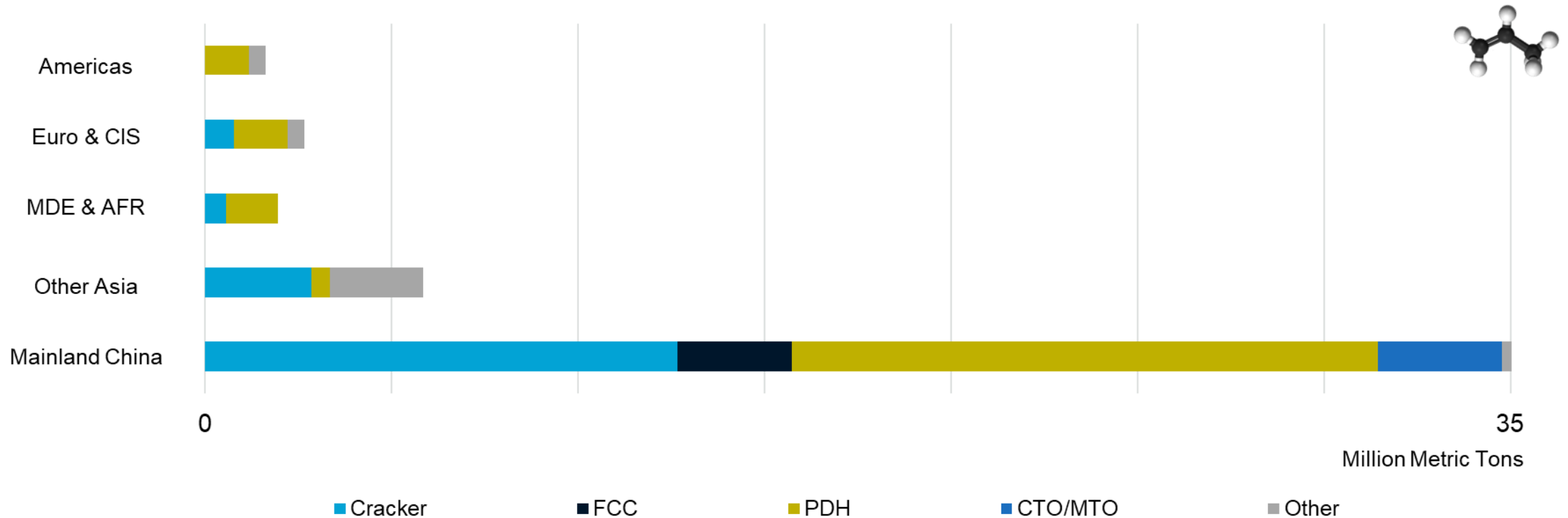


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The Majority Of The New Investment Is To Be In Mainland China; Pdhs With New Crackers

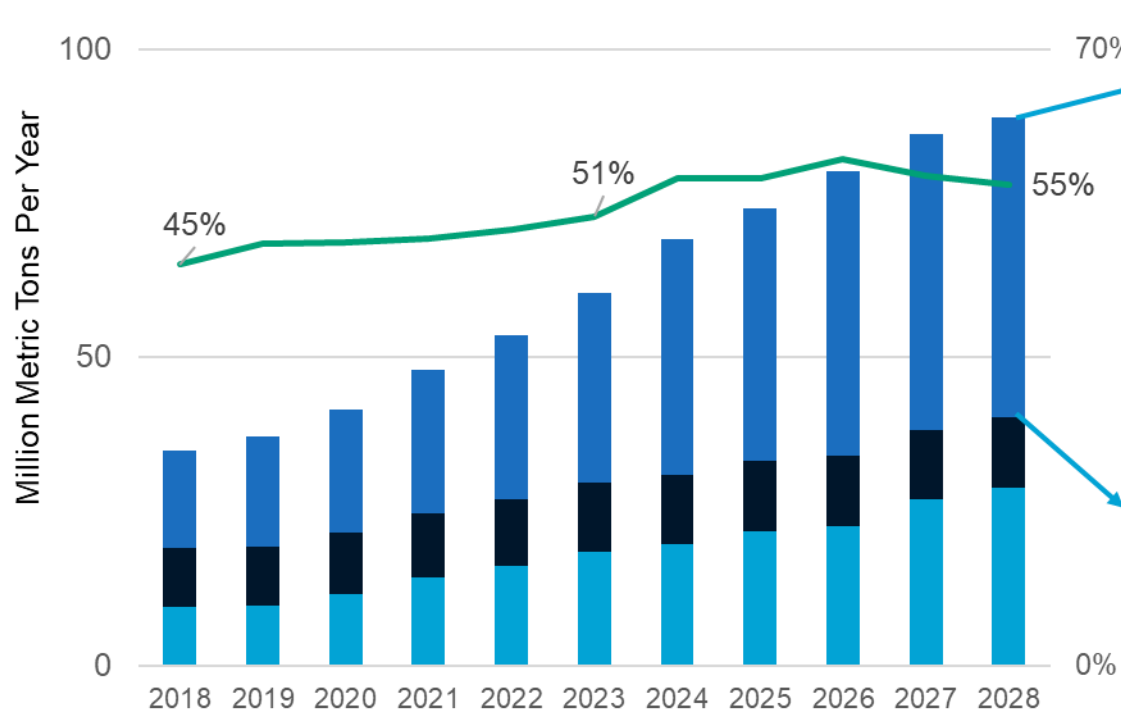
2023-2028 Global Propylene Capacity Additions 47 MMT



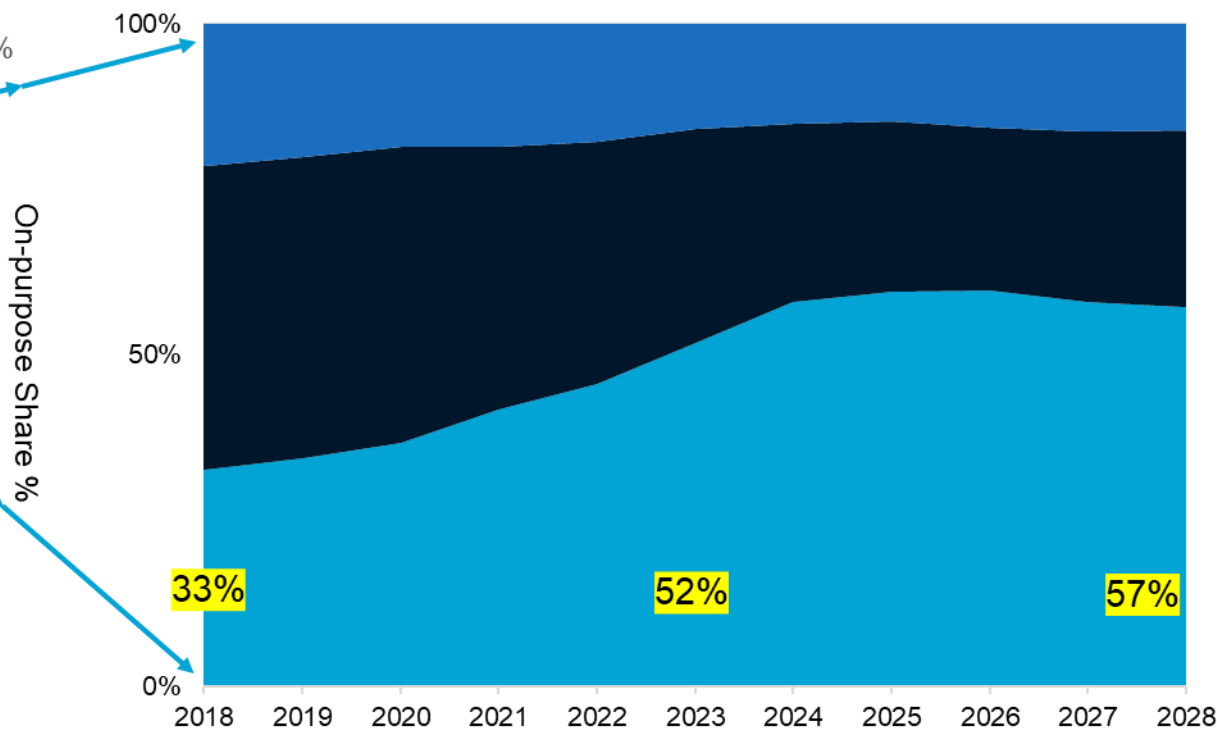
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Propylene capacity in Mainland China 2018-2028



On-purpose Propylene Capacity in Mainland China 2018-2028



■ Steam Cracker
 ■ FCC
 ■ On-purpose
 — On-purpose %

■ PDH
 ■ CTO/MTO
 ■ Others

Source: Chemical Market Analytics by OPIS

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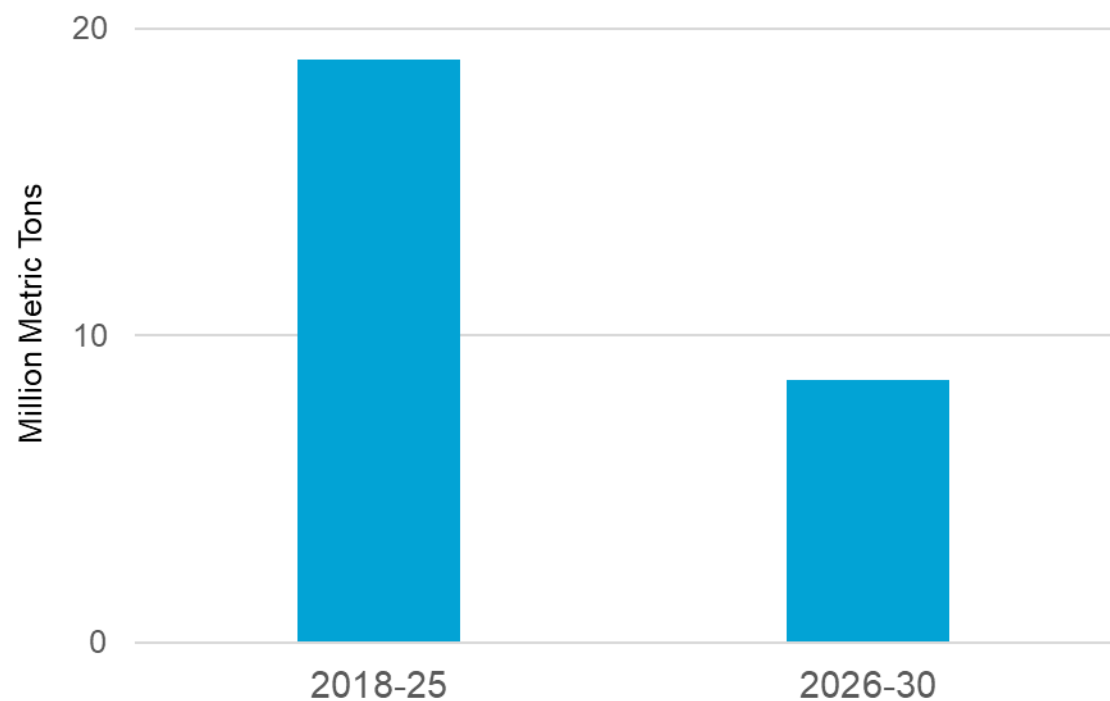
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On-purpose propylene capacity includes PDH, CTO, MTO, HS-FCC and other unconventional productions

Fewer New PDH Projects Beyond 2025; Poes Will Continue Leading Investment In PDH

Total PDH Propylene Capacity

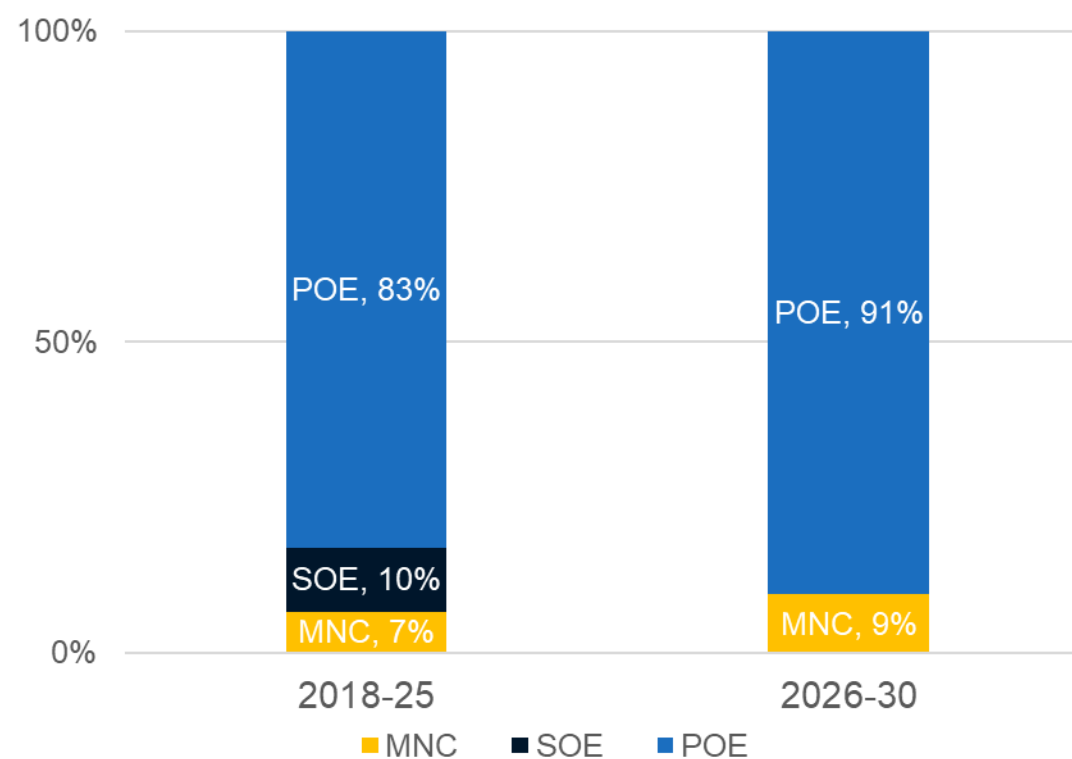


Note: Include all planned projects

Source: Chemical Market Analytics by OPIS

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Chinese PDH by Shareholder



Note: Include all planned projects

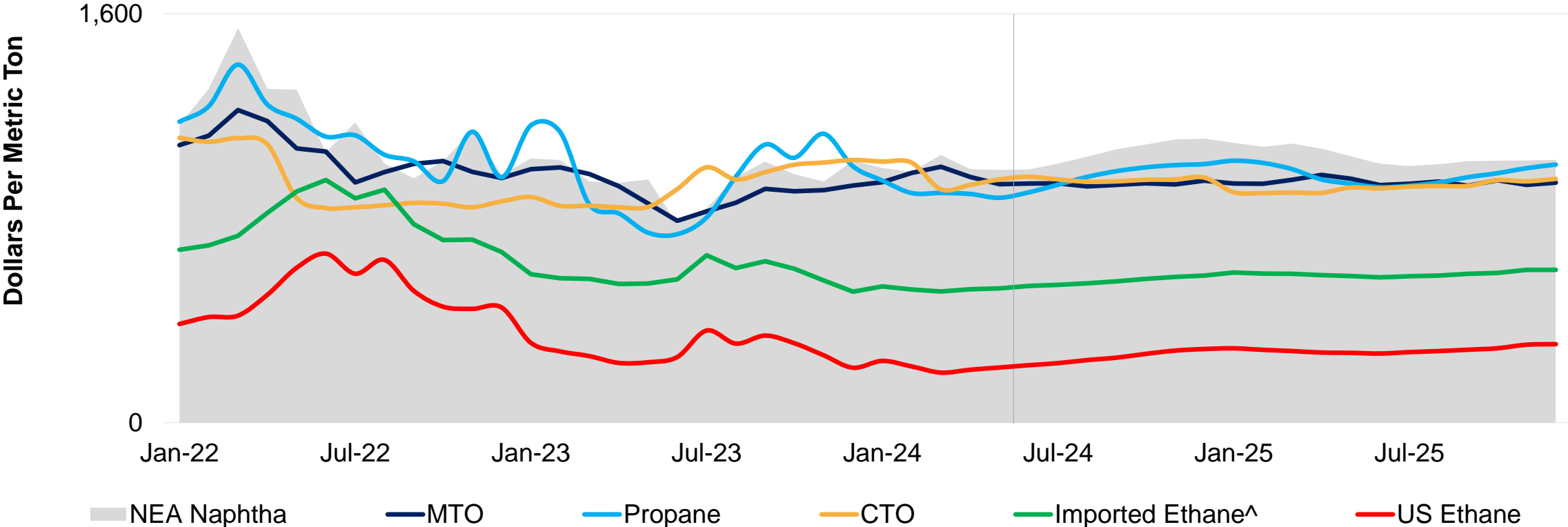
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Near-term Market Outlook

Naphtha To Remain Disadvantaged Against Lighter Feedslates Including Ethane And Propane

Ethylene Production Cost



Note: ^based on US imported Ethane

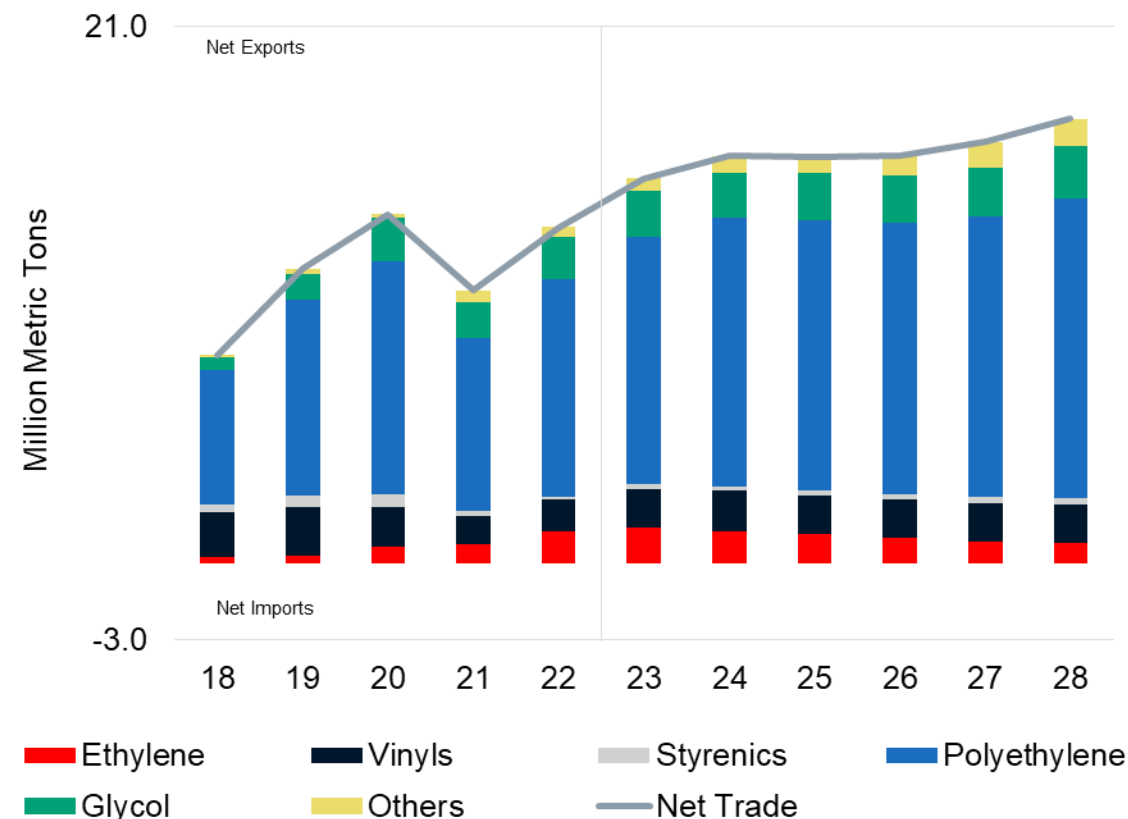
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North America Ethylene Equivalent Exports To Peak In 2024

Company	Location	Eth Cap / KTA	Derivative	Startup
Gulf Coast Growth Ventures	San Patricio County, TX	1,800	PE,EOX	2022
Bayport Polymers	Port Arthur, TX	1,000	PE	2022
Shell	Monaca, PA	1,500	PE	2022
Nova Chemicals	Sarnia, Canada	408	PE	2022
Shintech	Plaquemine, LA	170	VCM	2023
LACC LLC	Lake Charles, LA	400		2025
CP Chem/Qatar	Orange, TX	2,080	PE	Mid 2027
DOW Net Zero	Fort Saskatchewan, Canada	1,285 + 600	PE	2028 - 2030

North America: Ethylene Net Equivalent Trade

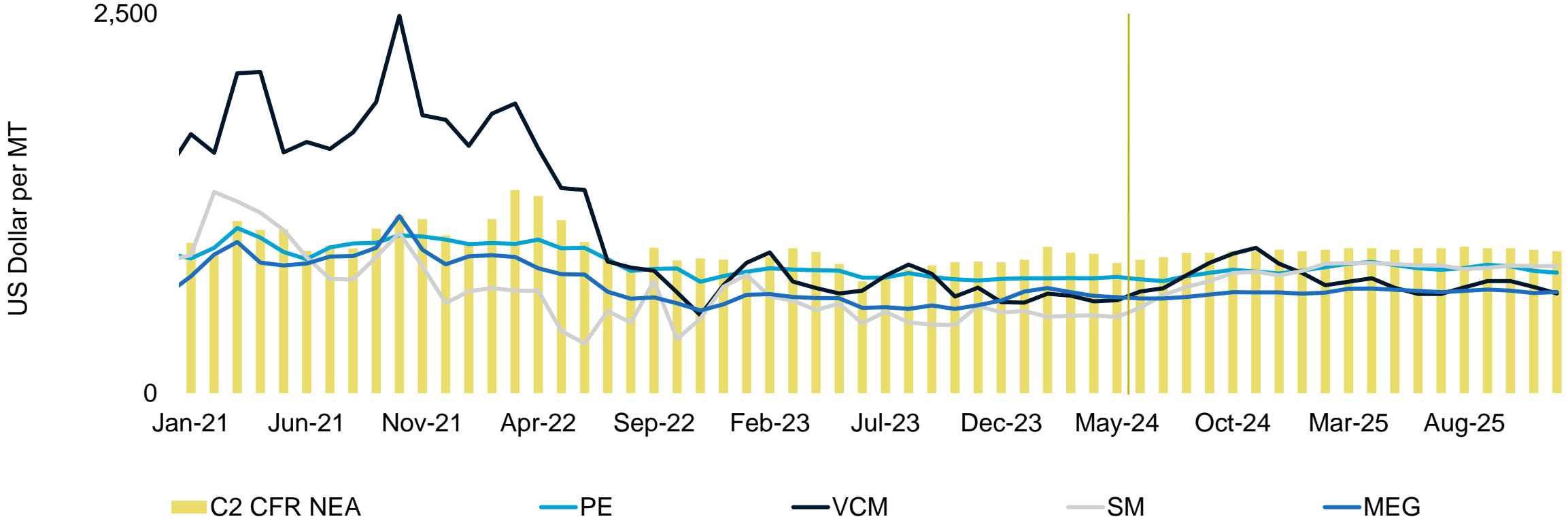


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Weak Downstream Affordability To Prevent The Sudden Hike In Ethylene Monomer Prices

Ethylene Affordability based on Variable Cost

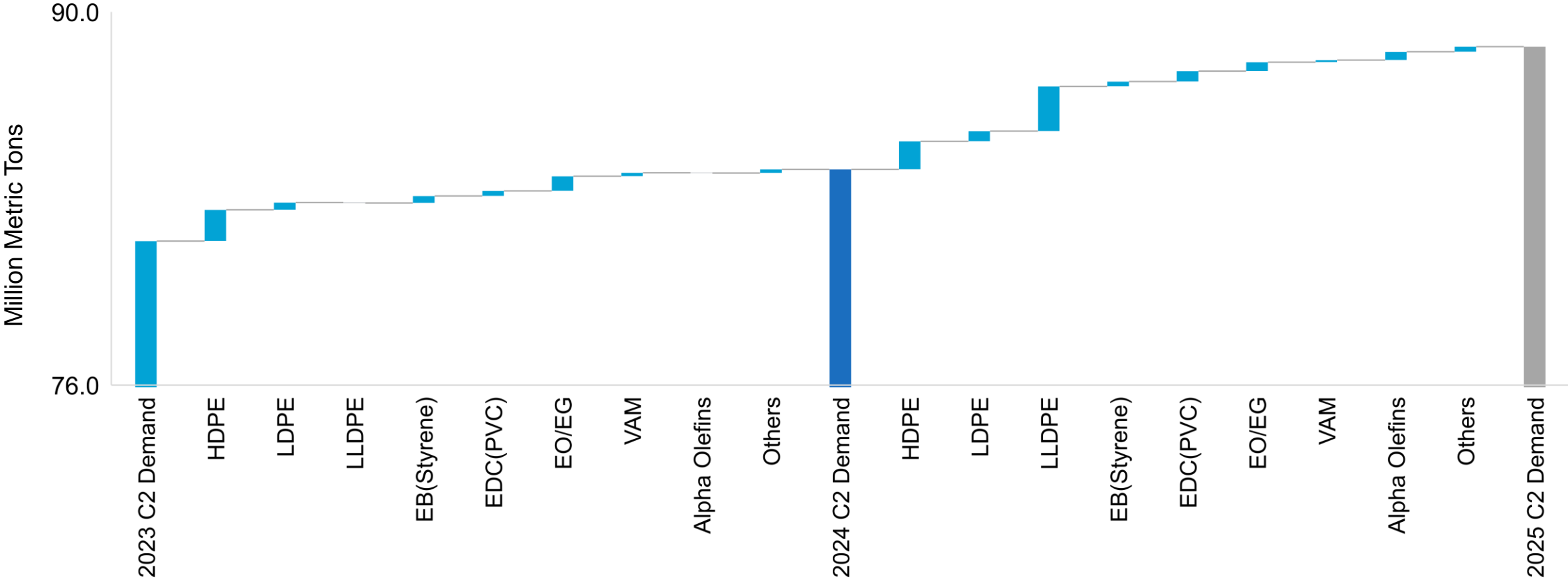


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Ethylene Demand Growth To Improve In 2025

Asia – Ethylene Demand Growth in 2024-2025

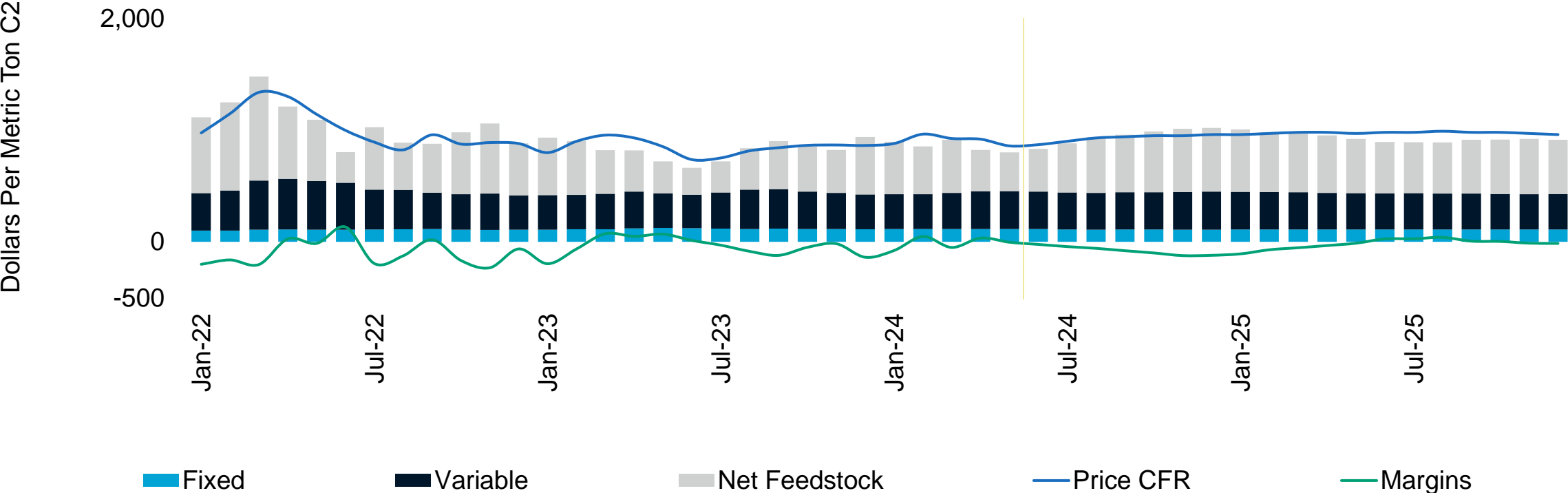


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Naphtha Cracker Margin To Gradually Improve In 2025

NE Asia Naphtha Cracker Economics (Integrated with BDE/BTX)



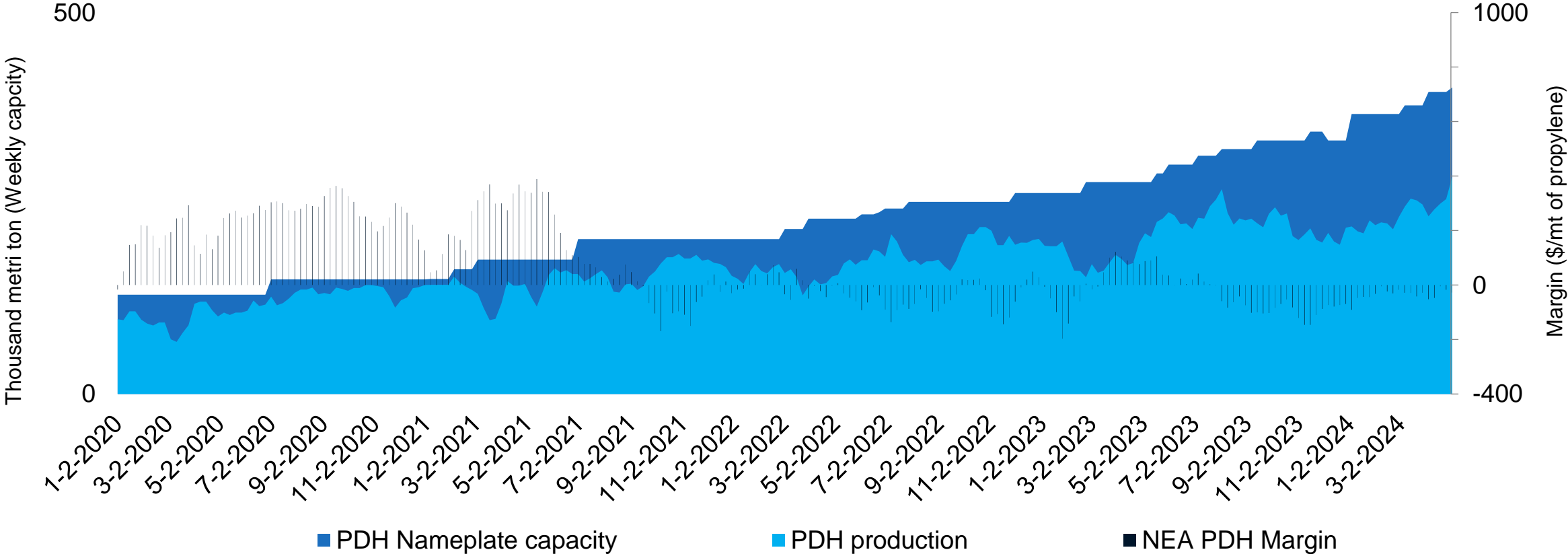
Notes: 94% of crackers are integrated with BDE or BTX based on C2 capacity per location

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Propylene: PDH Sector To Balance The Market Through Flexible Production

Mainland Chinese PDH Production trend

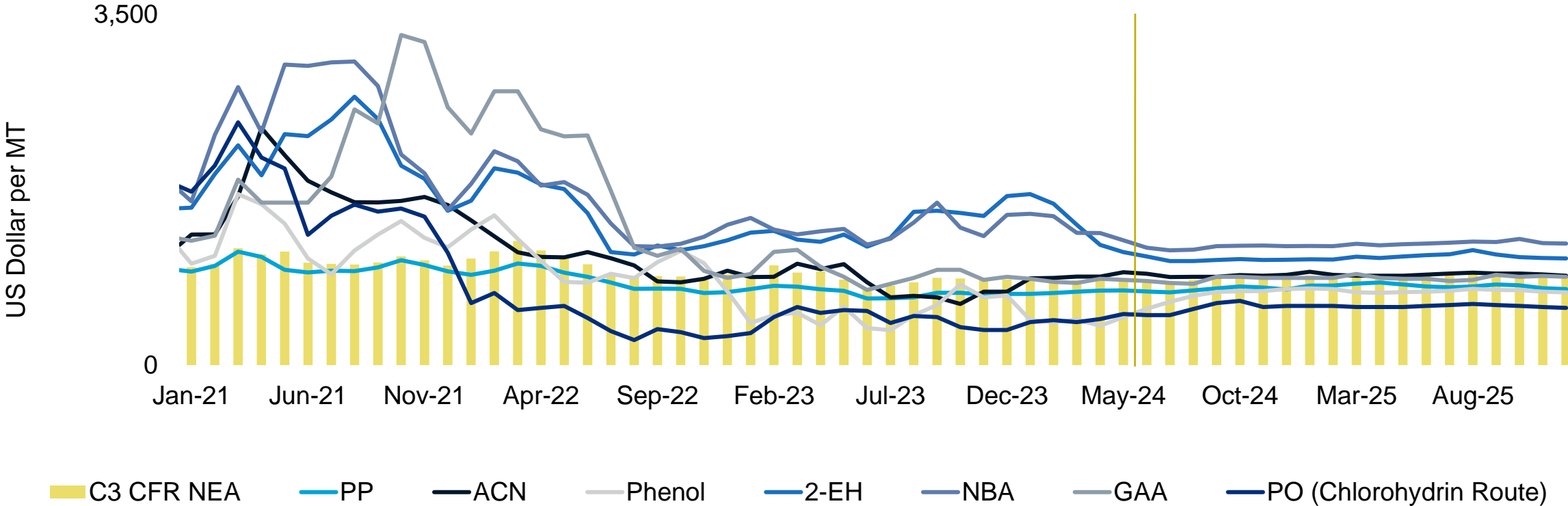


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Weak Downstream Affordability To Cap The Upside Potential Of The Monomer Prices

Propylene Affordability based on Variable Cost (Merchant Analysis)

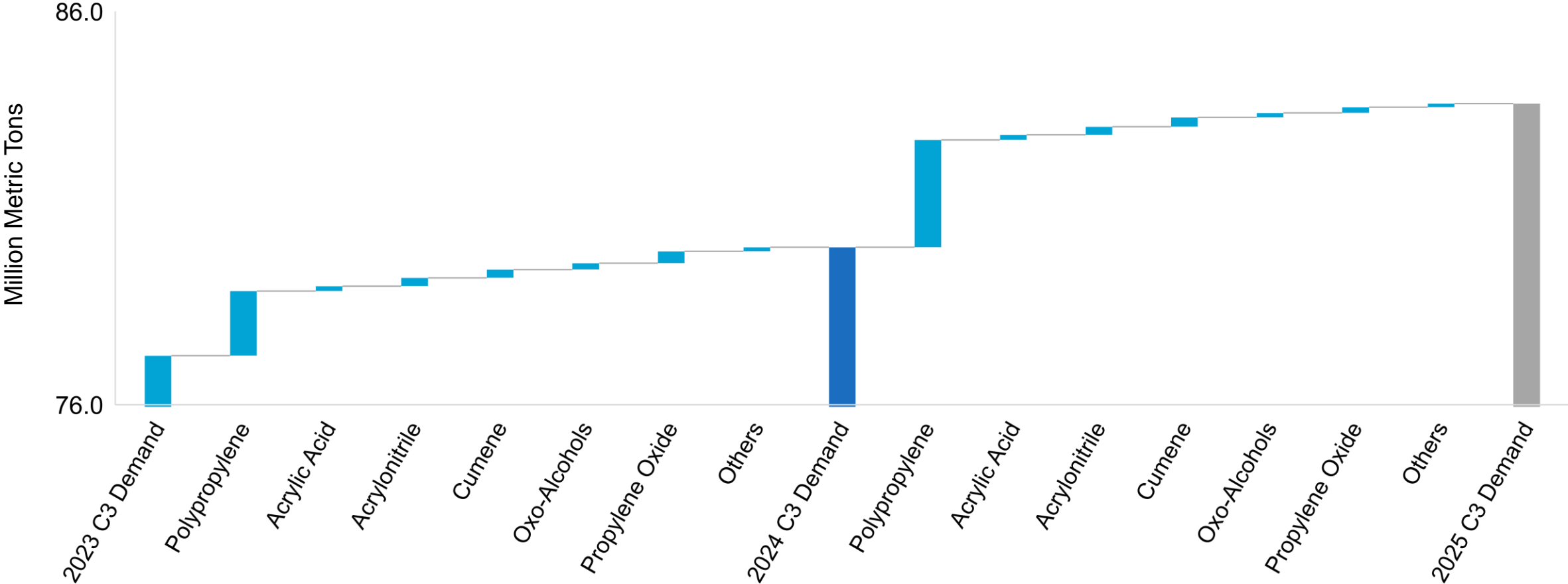


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Propylene Demand Growth To Improve In 2025

Asia – Propylene Demand Growth in 2024-2025

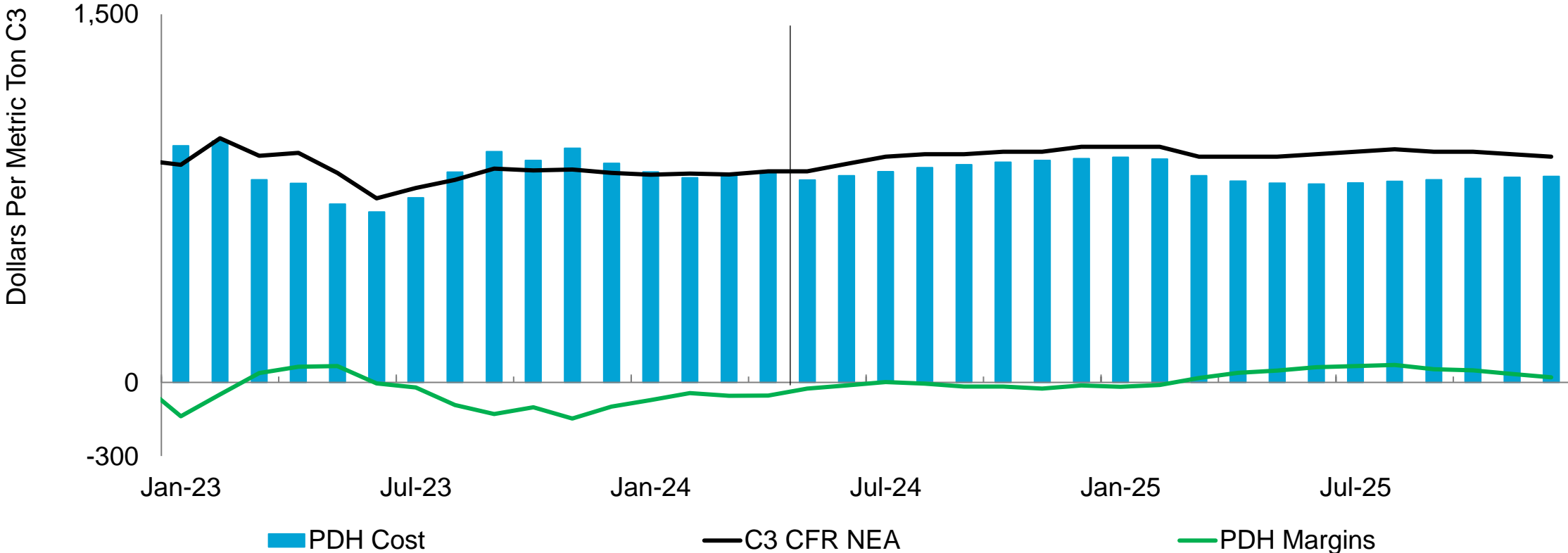


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PDH Producer Margin To Remain Squeezed Throughout Next Year

PDH Cost and Margin



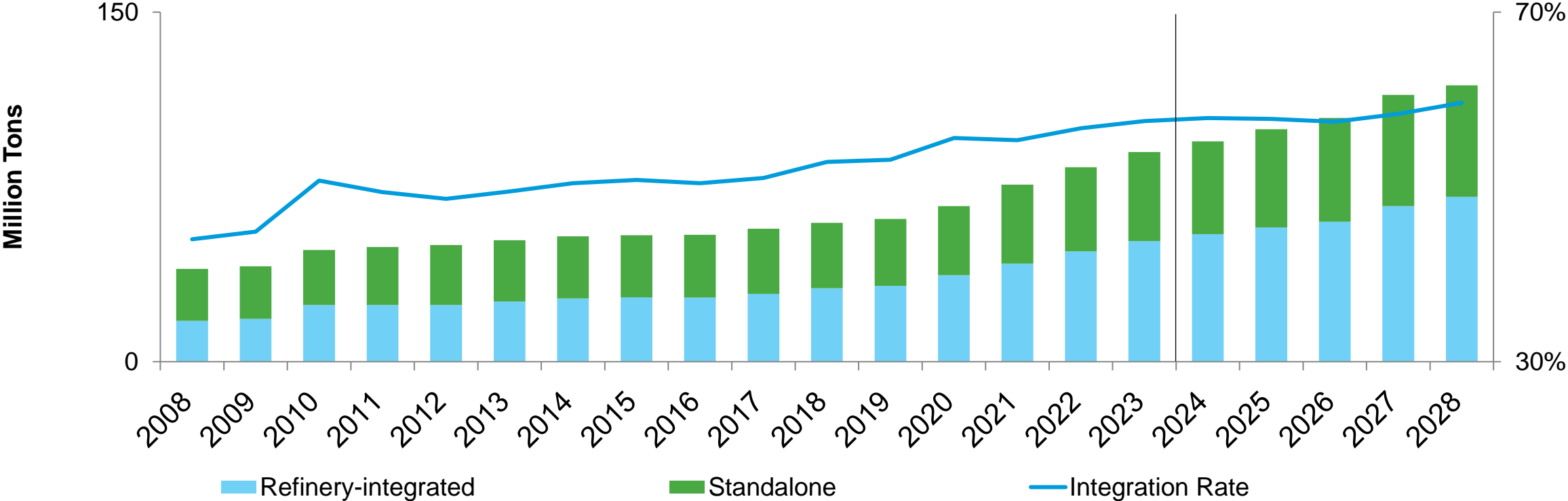
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How The Market Restructure

Refinery-cracker Integration Rates To Increase In Asia; Standalone Crackers are In A Risk

Refinery- Cracker Integration in Asia

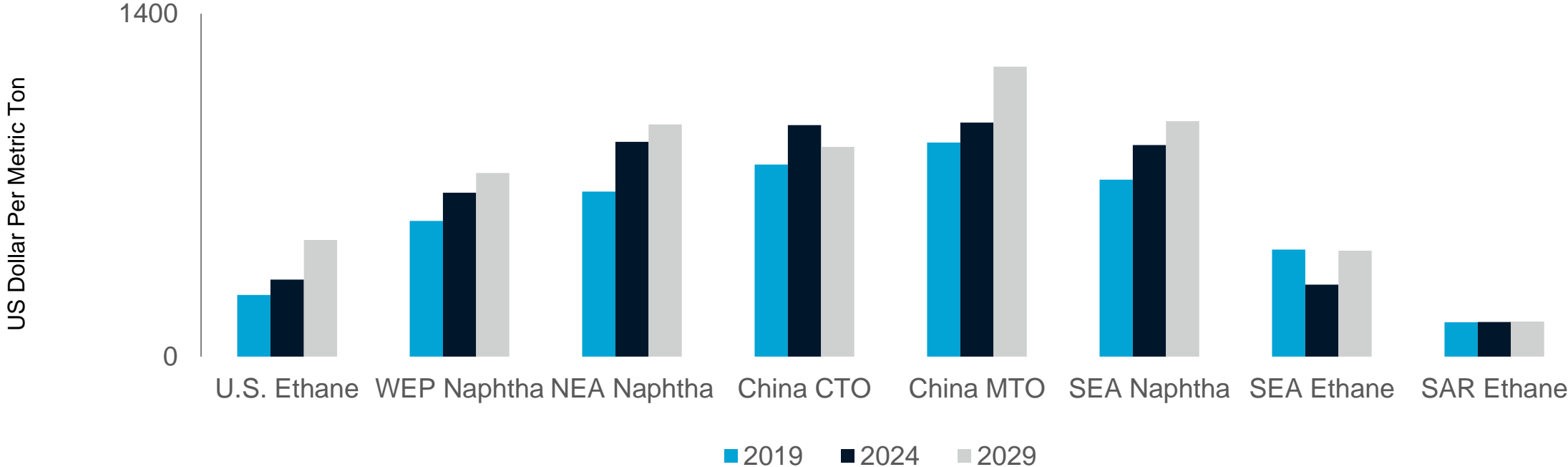


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Ethane-based Producers Remain In An Advantaged Position In The Longer Run

World Light Olefin Cash Cost Comparison



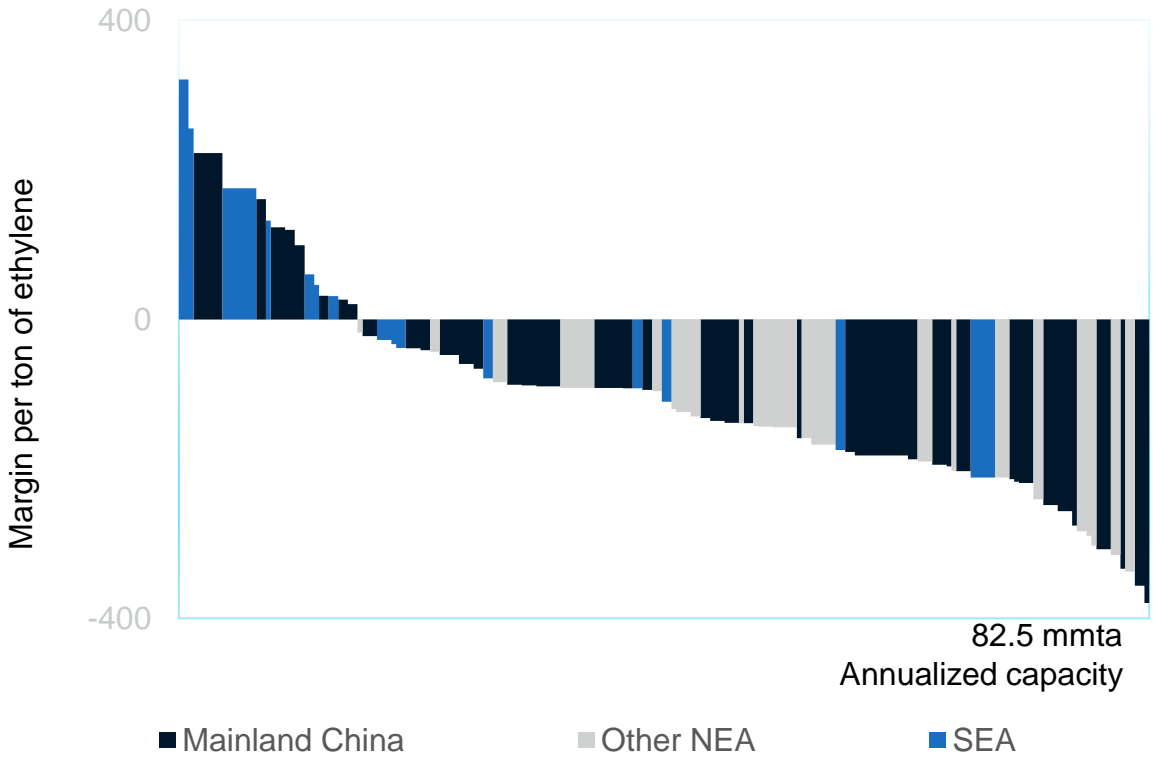
* Per ton ethylene except for CTO/MTO
*CTO/MTO : Cash costs and TFI based on one ton of total olefin basis (50/50 ethylene/propylene)

Source: Chemical Market Analytics by OPIS

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Site Margin Could Differ In Cracker/PDH Sector; Feedslate, Downstream Integration, Downstream Sales, And Others

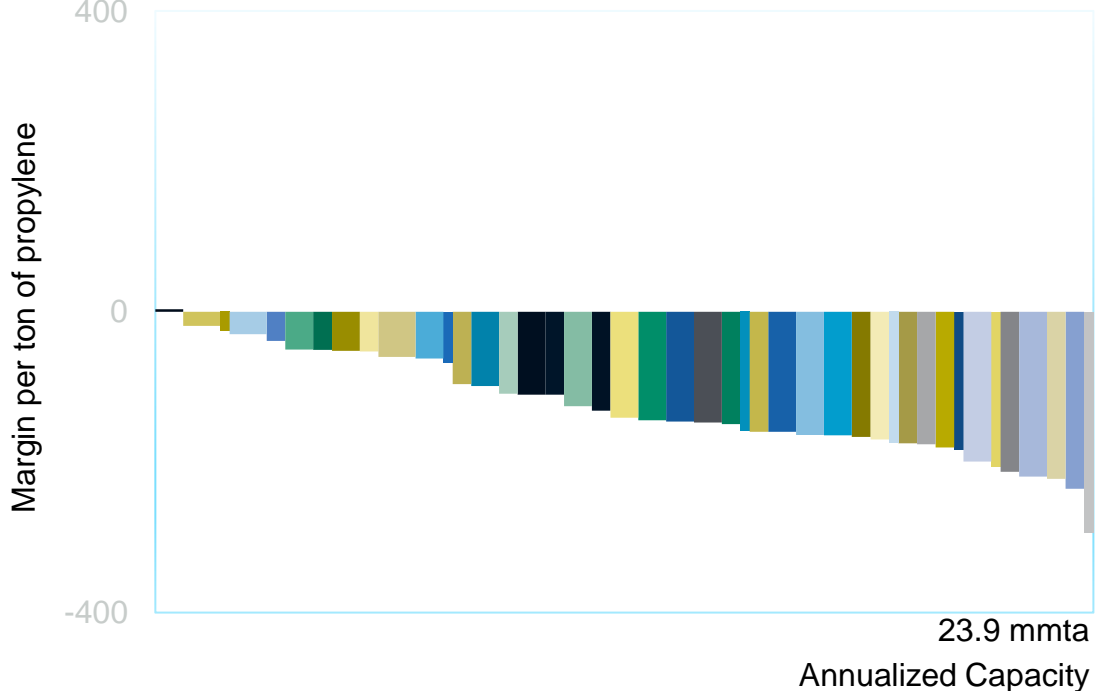
Asia Standalone Cracker Site Margin - 2024



Source: Chemical Market Analytics by OPIS

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Asia PDH site margin* - 2024



Source: Chemical Market Analytics by OPIS

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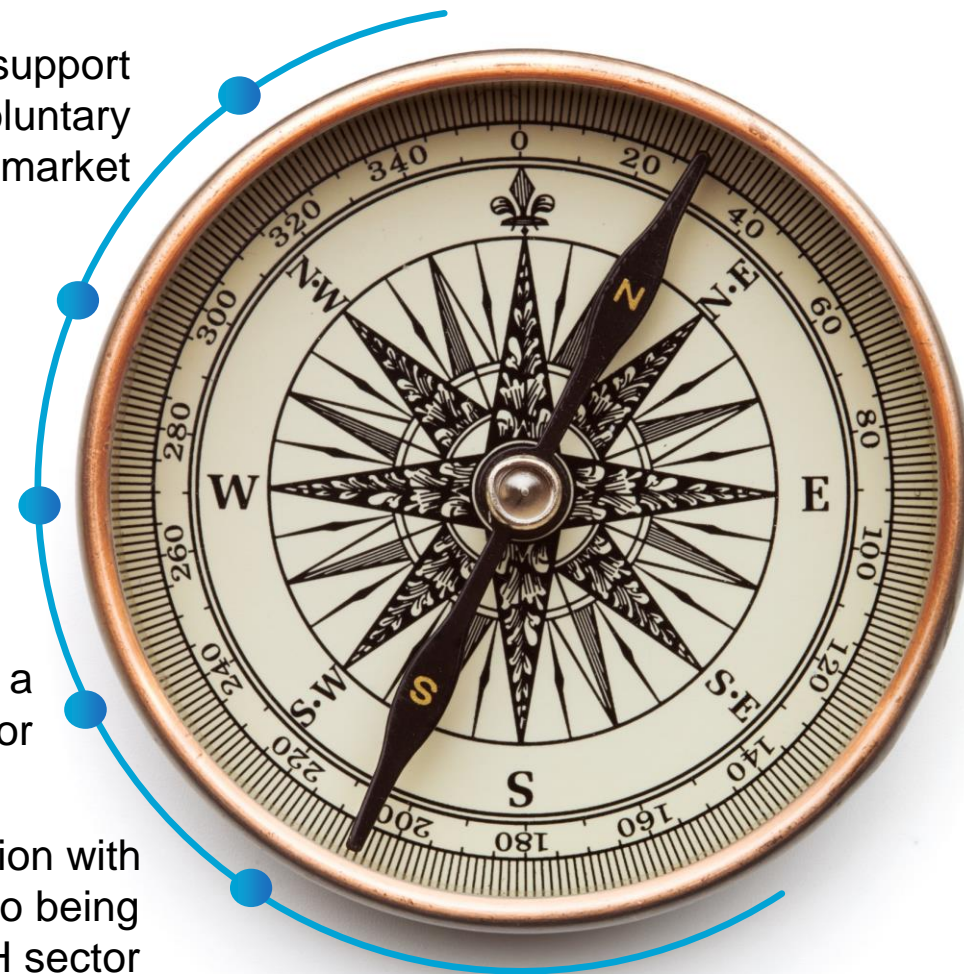
Fewer capacity additions and higher demand growth to support the olefins market sentiments in 2025, although the voluntary cuts remain essential to balance the market

2nd wave of new cracker investment in mainland China during 2026-2030 to remain downside risk in mid-term outlook

Increasing refinery-cracker integration rates and extended build-up cycle to potentially trigger capacity rationalization in Asia.

Lighter feedslates with a diversified downstream mix to remain a key to being competitive among the standalone cracker sector

Flexible monomer and downstream production with diversified product sales routes to remain a key to being competitive among the PDH sector



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Customer Service

support@chemicalmarketanalytics.com

North America: +1 888.301.2645 (toll-free within the U.S.)

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