Global Economic Shifts & Energy Transition: *Implications for Petrochemicals*

[Sustainability and Circular Economy Session]

David Hanna
VP Business Development for N. Asia,
Argus Japan General Manager

APIC Fukuoka, May 2026

Agenda

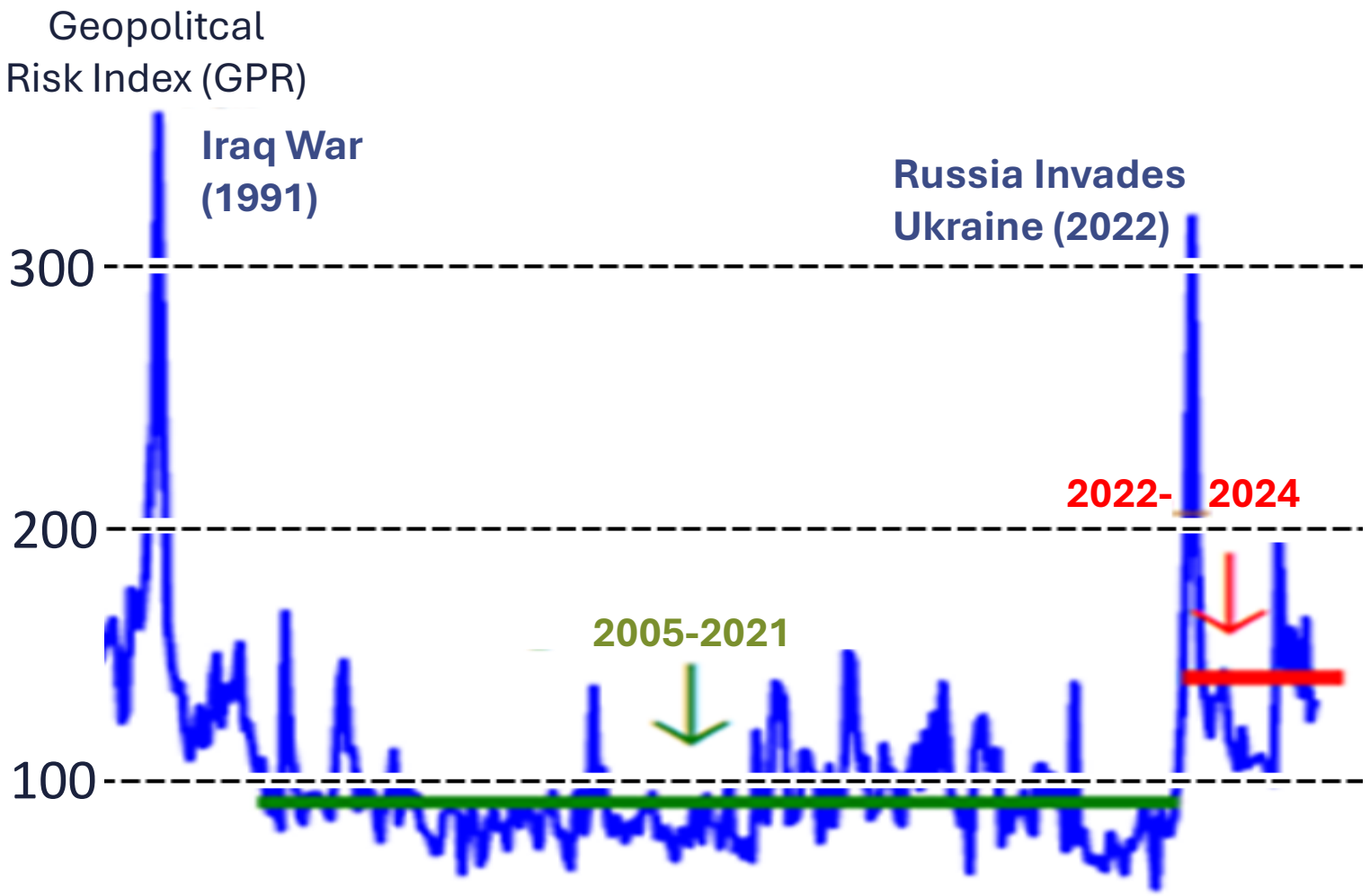
I. Hormuz and the growing importance of Geopolitical Risk

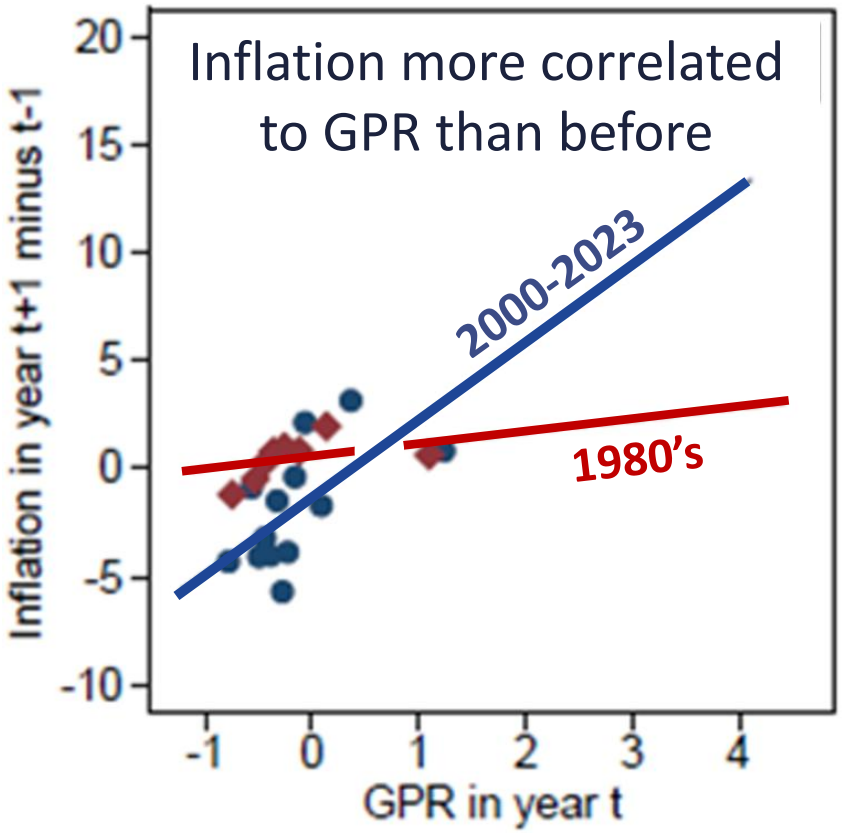
II. Impact on Energy Transisiton (GX) and Petchems

III. The new world order

I. Hormuz and the growing importance of Geopolitical Risk

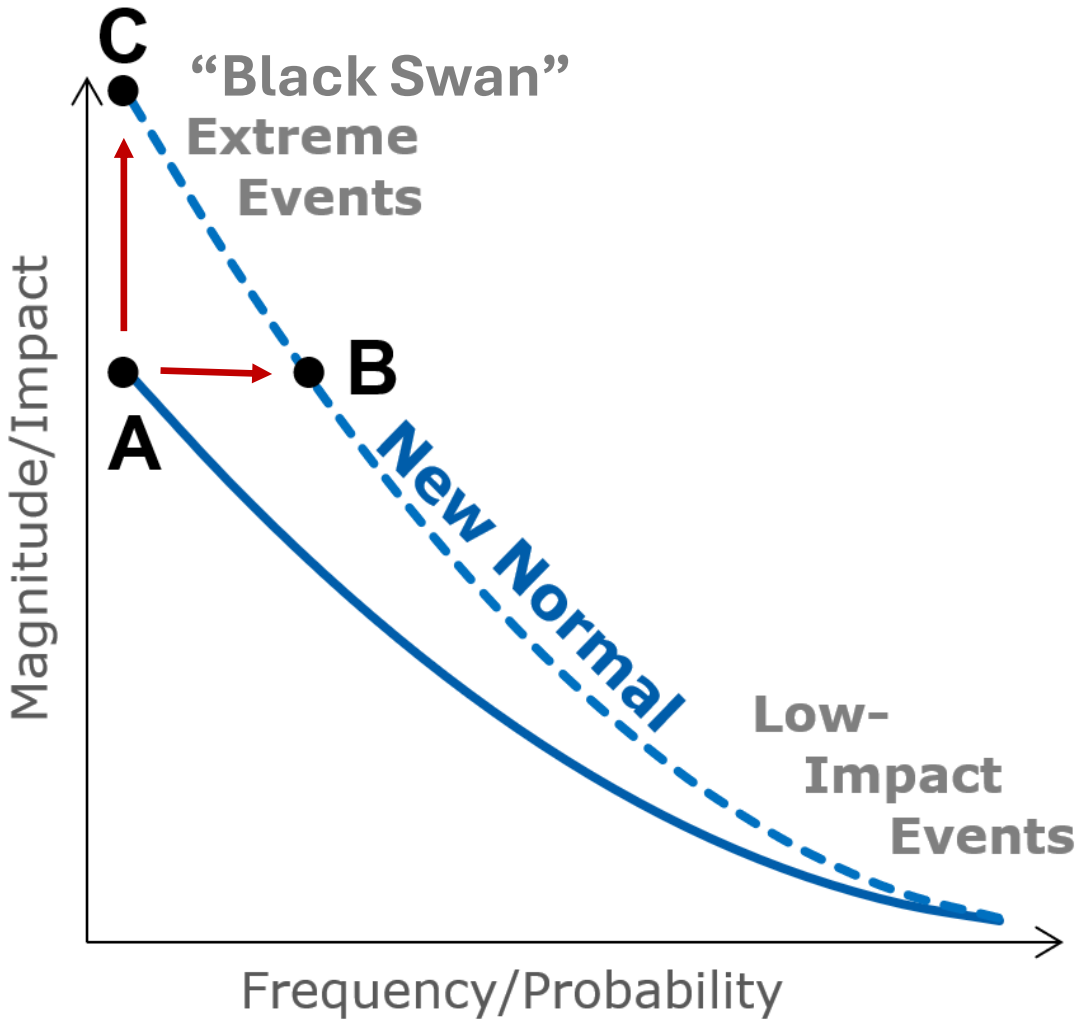
Geopolitics impacting markets more than before





(Source: Matteo Iacoviello, 2024)

Market shocks have become more frequent & deeper



- The "Pareto" distribution curve of black swan events has shifted upward:

  A → **B** = More frequent than before due to *greater extremes of bipolarity*

  A → **C** = More extreme & prolonged than before due to *deeper cascading*

- The main cause: *excessive interconnectivity*

- The Challenge: how to mitigate the impact of Exogeneous events that are beyond our control

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Three Types of Market Shocks

- **Demand-side** shock: Covid 2020
  → output cuts

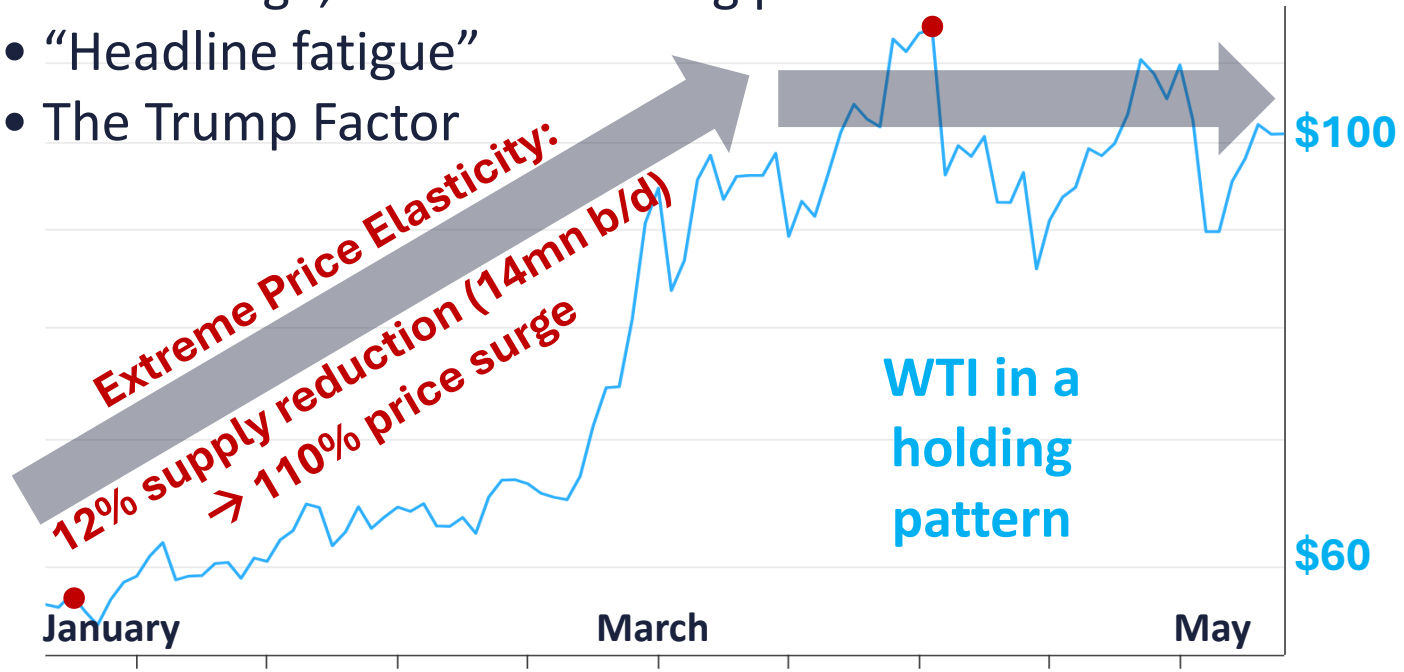
- ***Perceived* S or D shock:** Ukraine
  → rerouting of trade flows

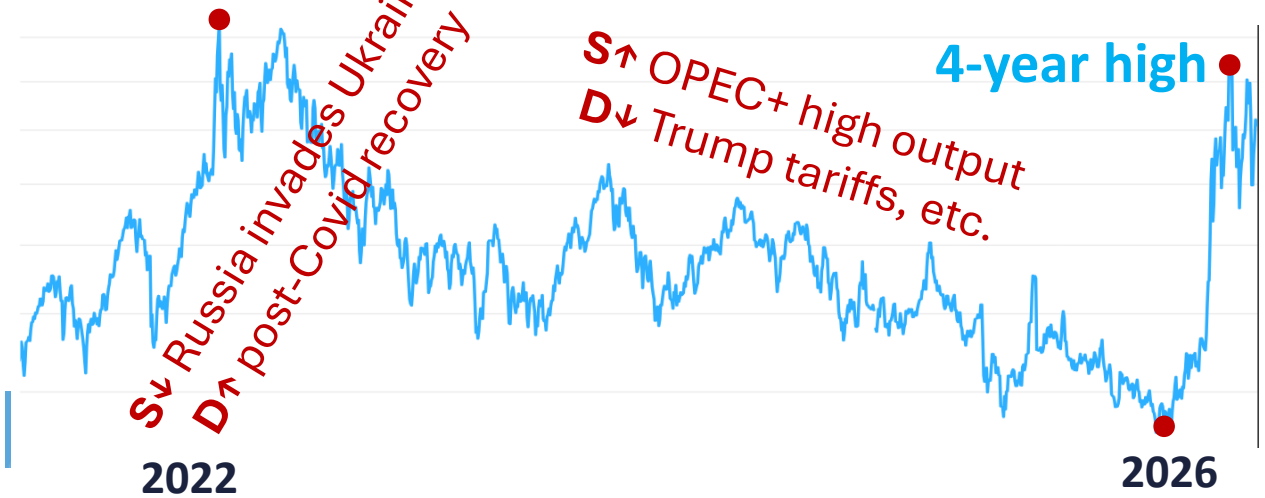
- ***Actual* supply-side shock:** Iran 2026
  → demand destruction

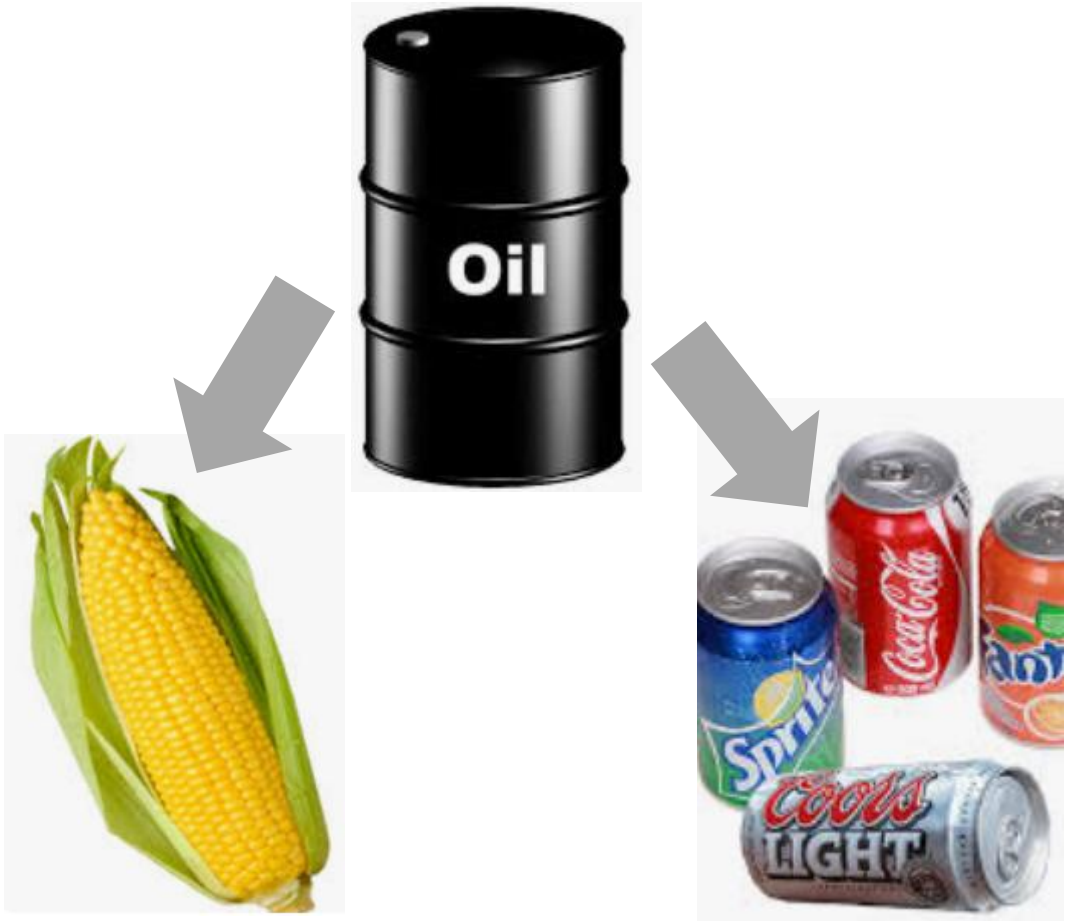
Two two-stage Reactions

Within Crude Market:

- Initial surge, now in a holding pattern
- "Headline fatigue"
- The Trump Factor







Cascading through commodity markets:

- first wave affected crude downstream, but now agriculture & metals also hit
- Fertilizers, aluminum, etc.

Japan's "Naphtha Shock" hits TV News

- Domestic gasoline & diesel prices have been flat due to gov. subsidy to refiners ($1-bln March)

- But no help for chems
  -- packaging
  -- medical
  -- construction

Japan's "Naphtha Shock" – 2

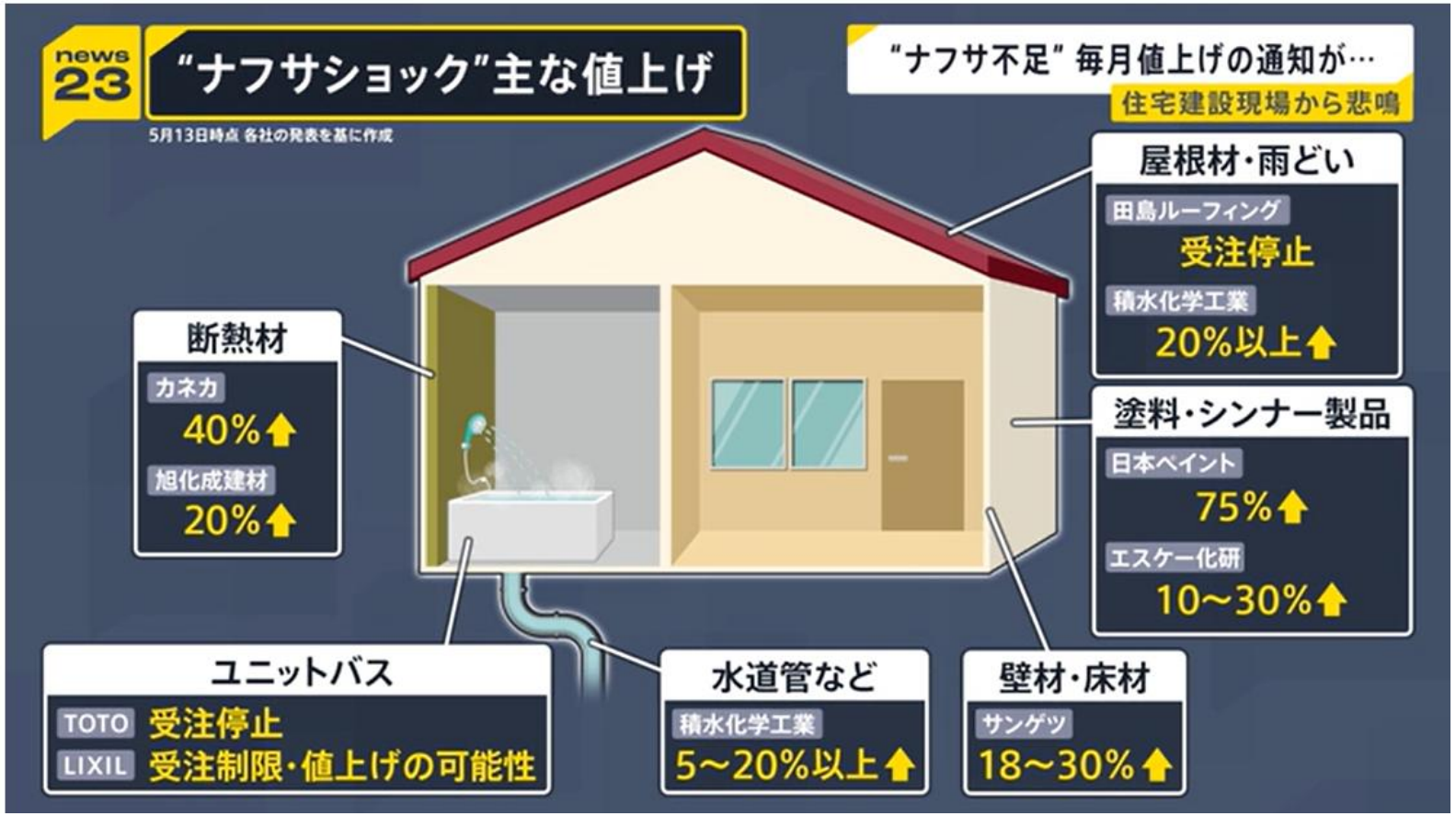
- Japan's **Aromatics** production fell 16% yoy in March…snack food maker **Calbee** switches packaging to black & white due to ink shortage

OKURA

GUNZE

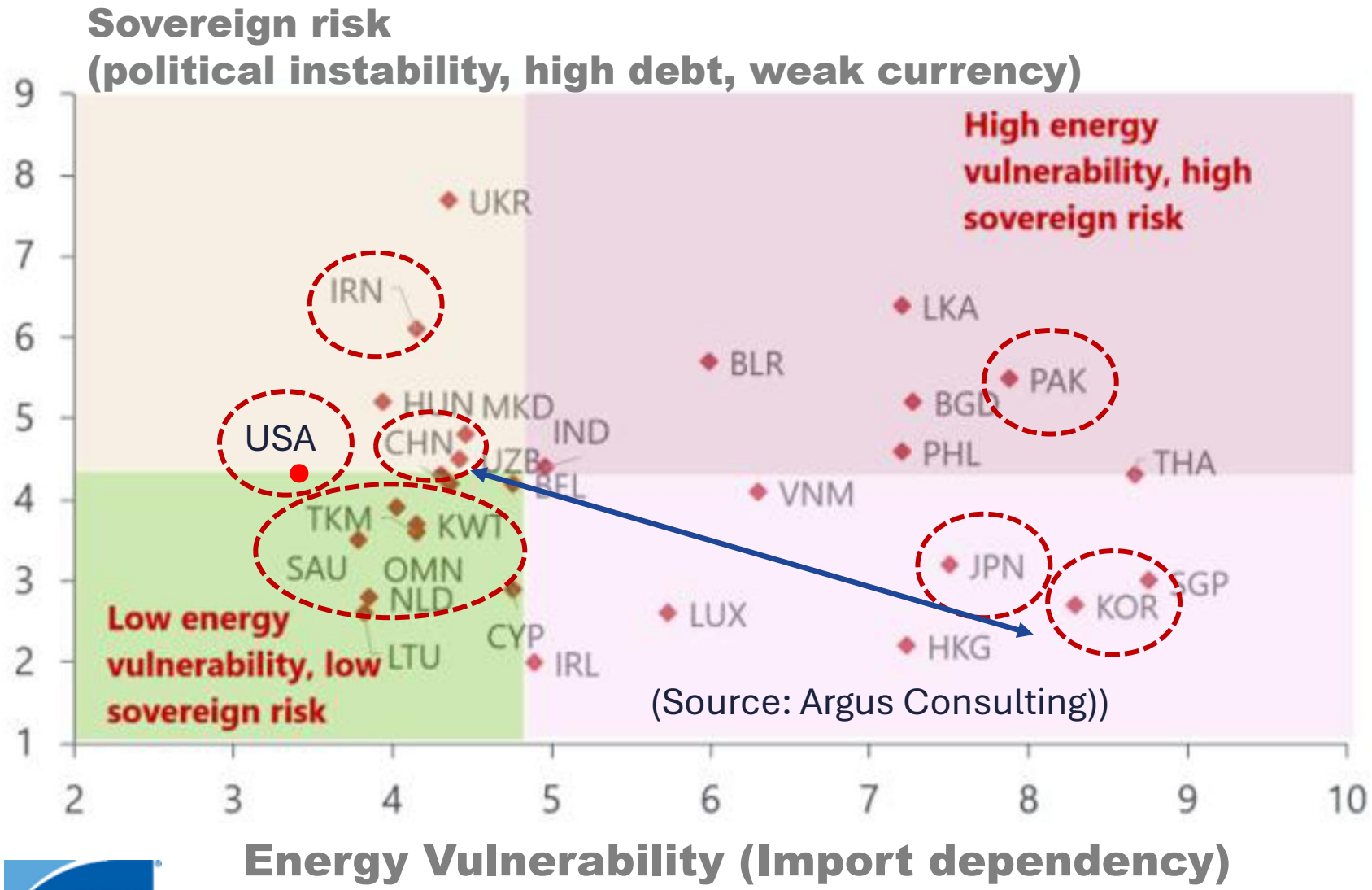
- Japan's **Polyethylene** production fell 27% yoy in March…plastic film makers **Okura** and **Gunze** raise packaging film prices by 20-30%

Japan's "Naphtha Shock" – 3



- **Nippon Paint** prices ↑ 75%
- **Sekisui Chemical Piping** prices ↑ 5-20%
- **Asahi Kasei** & **Kaneka** insulation prices: ↑ 20% and 40% (!)
- **Sangetsu Walling** prices ↑ 10-30%
- **Tashima** Roofing orders, **Toto** & **Lixil** unit bath orders: *halted*

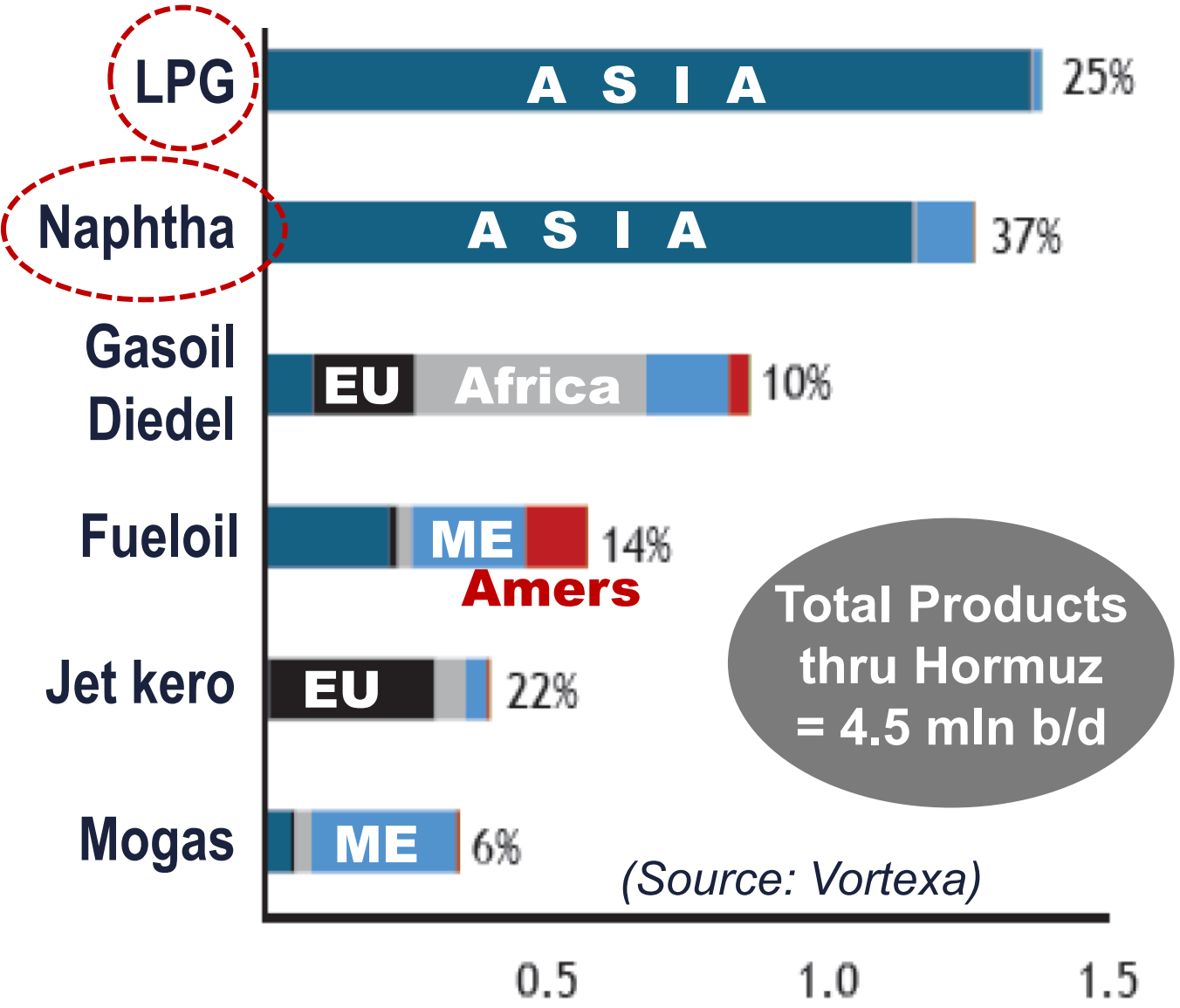
N. Asia highly vulnerable



(Source: Argus Consulting))

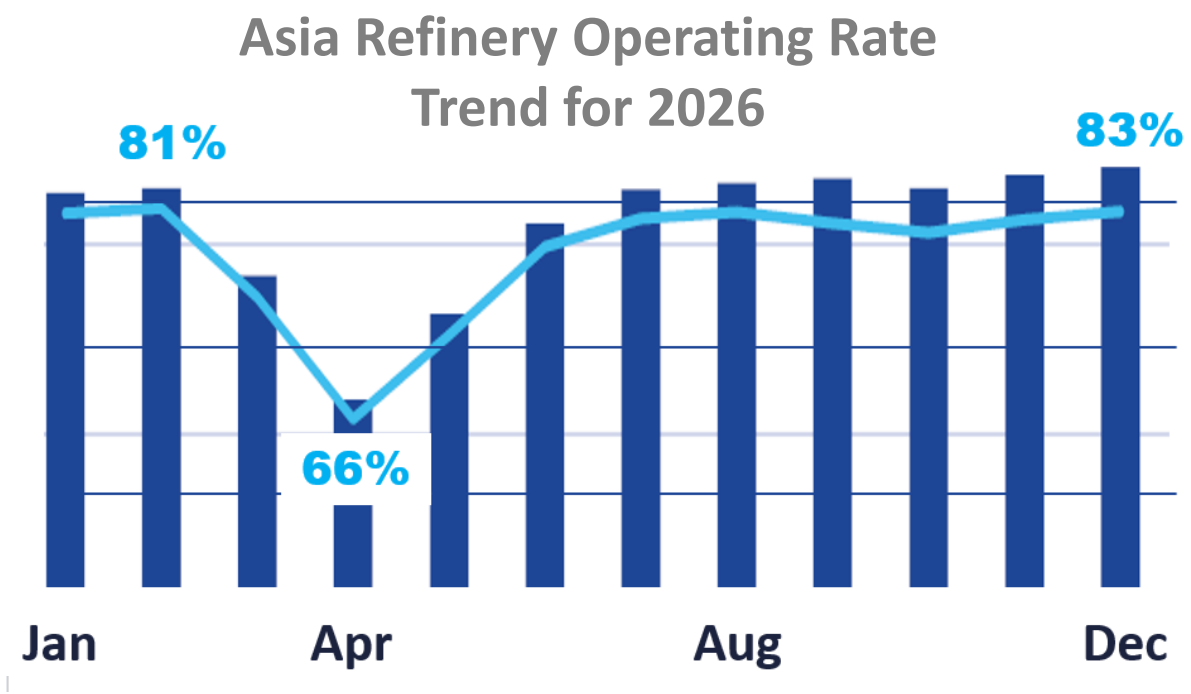
- Korea and Japan highly exposed, but stable
- South Asia worse off than North Asia
- Gulf states secure …for now

The US-Mideast problem becomes Asia's problem



- Naphtha has the largest risk exposure, with 37% of the world's naphtha passing thorough Hormuz
- *Japan relies on imports for 60% of its naphtha needs…Mideast accounts for 80% of imports (!)*
- within that flow, Asia accounts for 90%, similar ratios for LPG
- US and Europe have little exposure
- *Asia as a region, Petchems as a sector, are the most exposed*

How Asia is coping



- Japanese crude imports from the US have quadropled in May yoy, mostly WTI and Mars

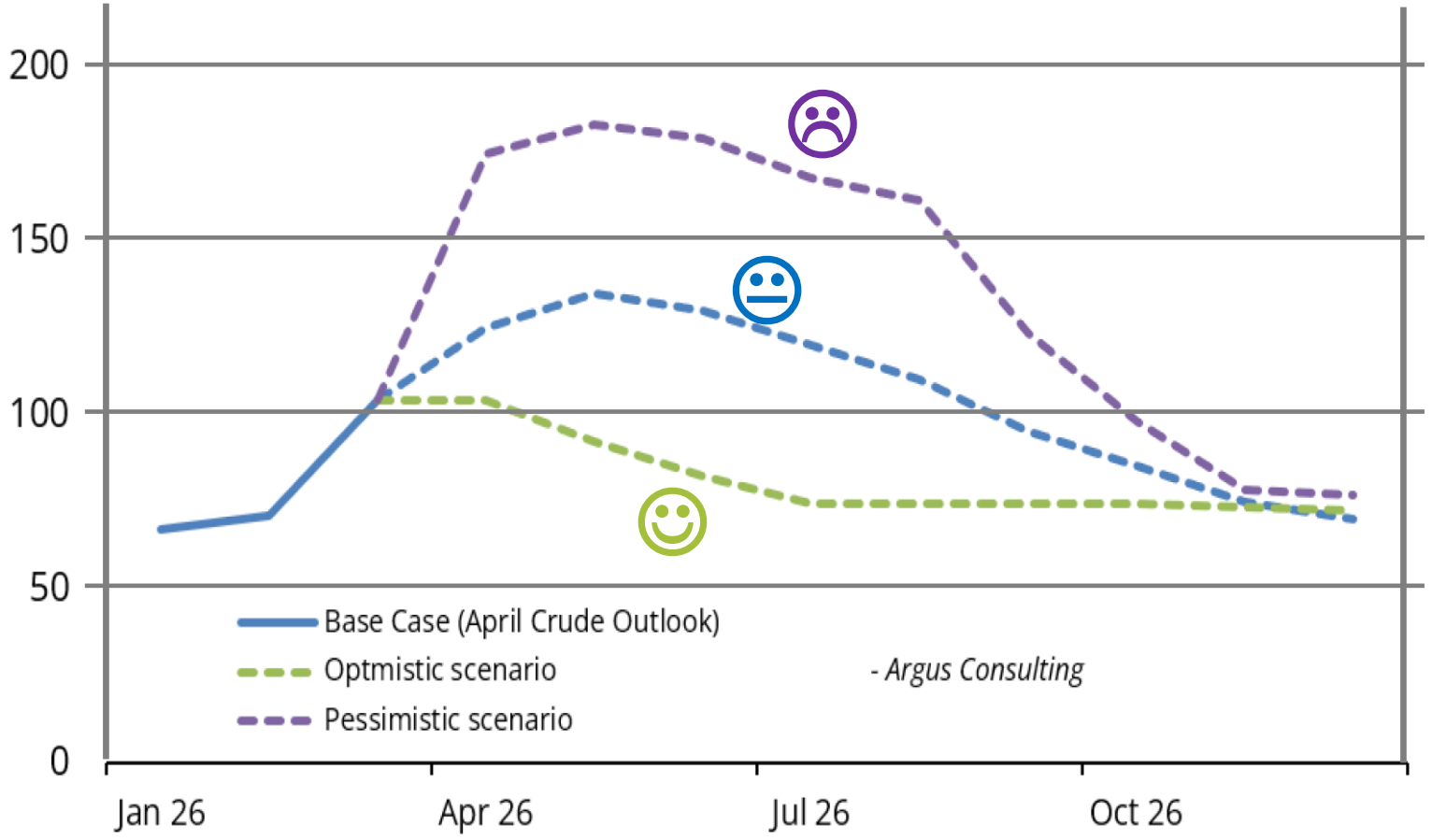
- Korea, already a big importer from the US saw crude imports grow 76% in March yoy

- US now Korea's largest naphtha supplier at 25%

- Japan and Korea buying more naphtha from N. Africa (Algeria) and LatAm (Peru)

- Japan bypassing naphtha shortage by importing condensate or xylenes from China

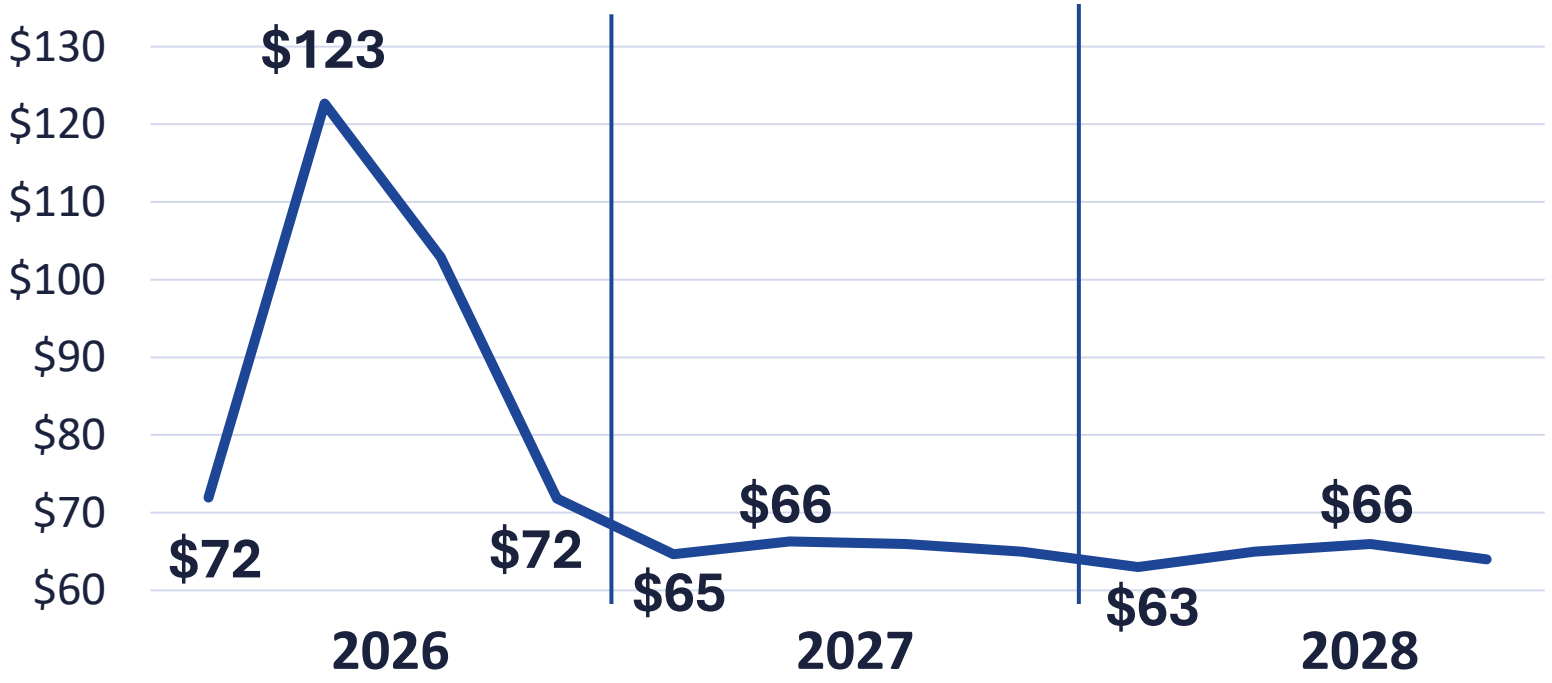
Hormuz crisis price scenarios this year

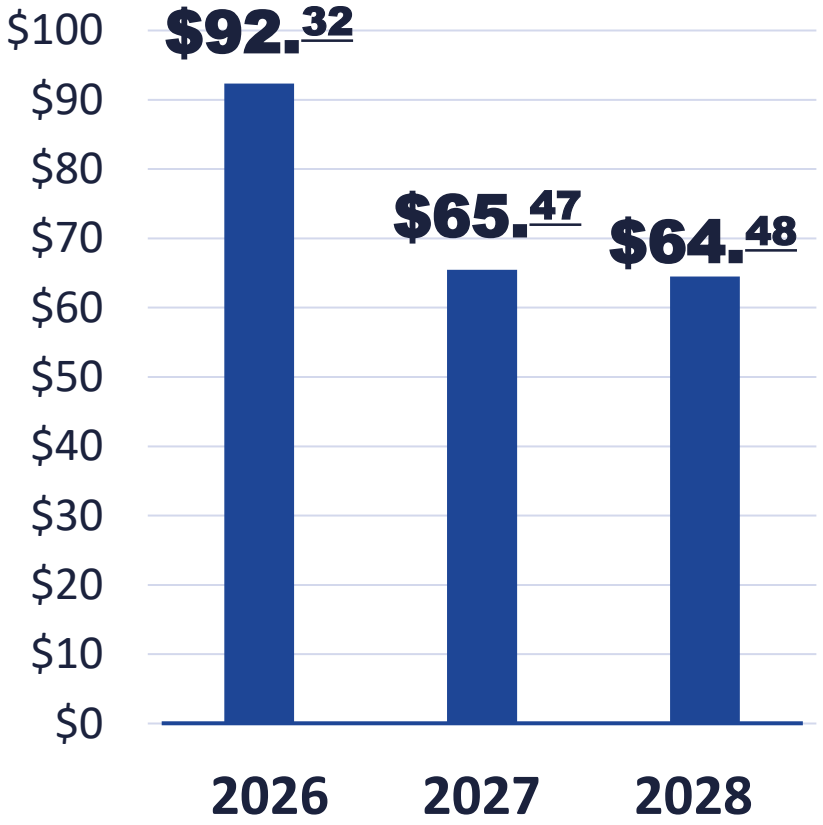


Argus WTI Price Forecast

- Too many unknowns to make a single prediction; must consider scenarios
- In the worst case, crude could peak at $170/b
- Even the best case sees prices above $100/b for at least another month

Argus WTI price forecast (as of April 4)

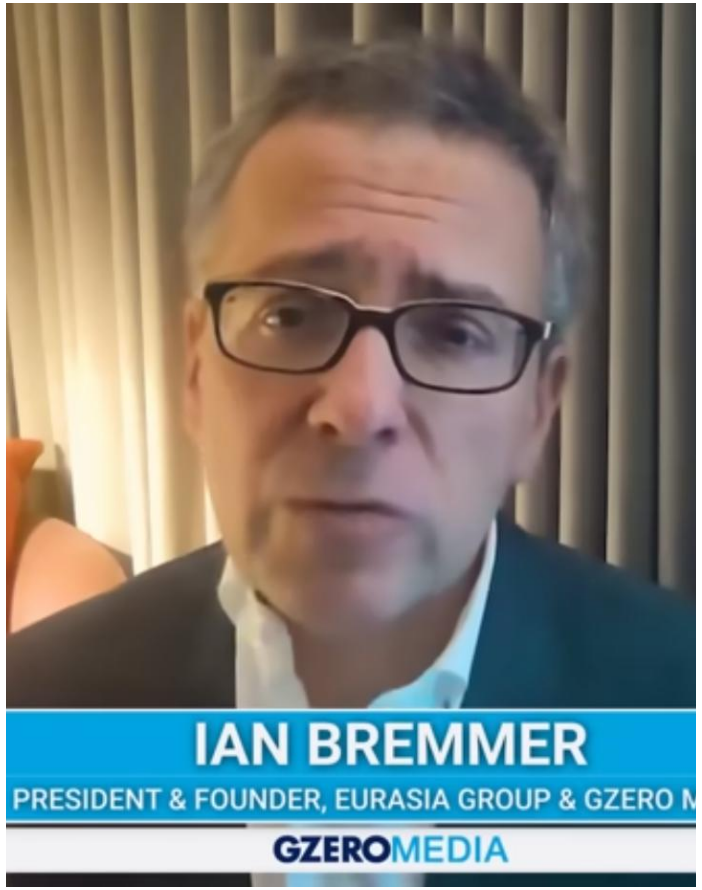




How Long will the Hormuz crisis last?

- Original expectation was 4 to 6 months because of US mid-term Elections in November, and the war is unpopular (41%, compared to 76% for 2003 Iraq War)
- But Trump's options seem to be binary: capitulate to Iran, or go all in
  → between the two options, #2 more likely
- Infrastructure damage and demand destruction will take years to recover
- We are in for the long haul
- Wild cards: Trump counter blockade aimed at China, Europe also growing inpaitient

How do Americans see the Iran War?



Interventions	Year	President	Initial Support
Iran War	2026	Trump	41%
Libya	2011	Obama	47%
Iraq	2003	Bush Jr.	76%
Afgan	2001	Bush Jr.	92%
Kosovo	1999	Clinton	58%
Persian Gulf	1991	Bush Sr.	82%
Panama	1989	Bush Sr.	80%
Grenada	1983	Reagan	53%
Vietnam	1955	Eisenhower	60%
Korean War	1950	Truman	75%
WWII	1941	Roosevelt	97%

Lowest Support Rate in US History

(Source: Voronoiapp)

- Trump elected for focus on domestic economy
- Burden sharing by EU for Ukraine, by Japan, Korea, Taiwan
- Iran seems to be an exception

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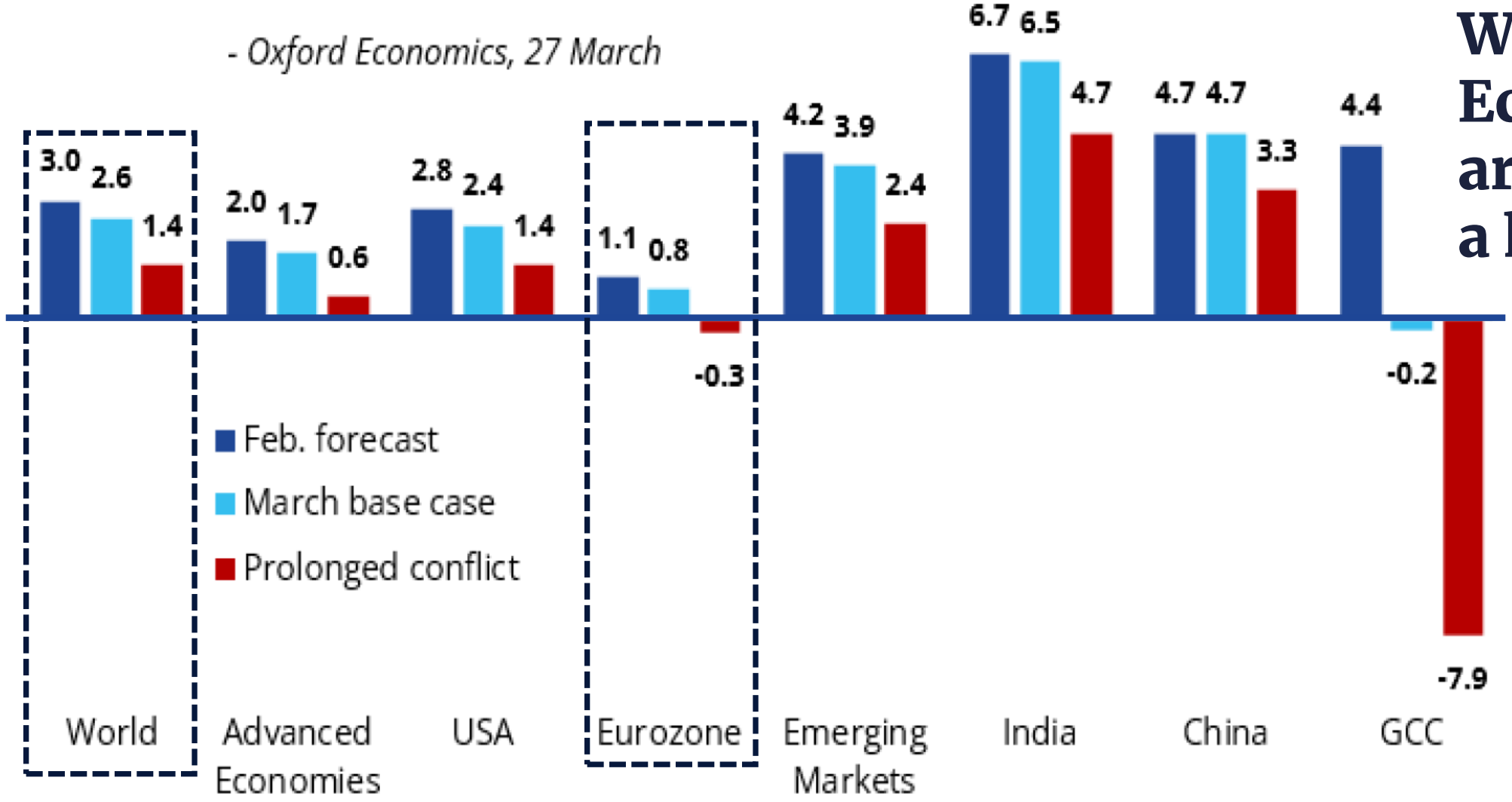


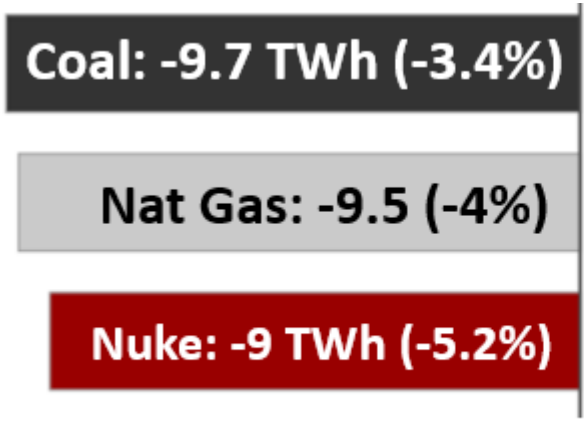
World Economies are taking a hit…

… but still surprisingly resilient

- 1-month → limited inflation, CB's policy unchanged
- 3-months → CB's delay rate cuts, or raises rates slightly
- 6-months → Rate hikes to control inflation

II. Impact on Energy Transisiton (GX) and Petchems

Impact on Energy Transition

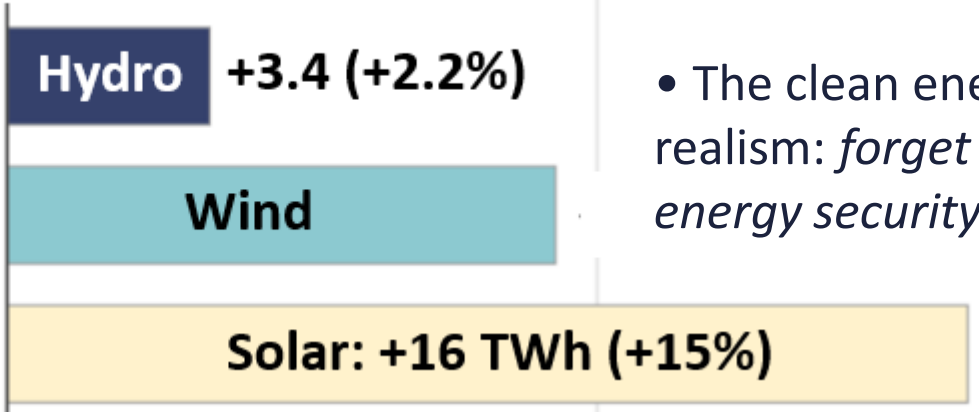


- Solar, Wind etc. are not yet able to make up for the estimated 20-mln b/d gap in oil equivolent energy from the Hormuz closure.

- the rapid deployment of renewables since 2019 has prevented a much worse economic scenario. -IEA

- The world added over 2,000 gigawatts (GW) of renewable capacity between 2022 and 2025, providing a structural buffer that did not exist during previous energy shocks.

World Power Generation
YoY March 2026 chg
(IEA, Posoco, Crea)



- The clean energy cause has evolved from idealism to realism: *forget about the environment, now it's about energy security*

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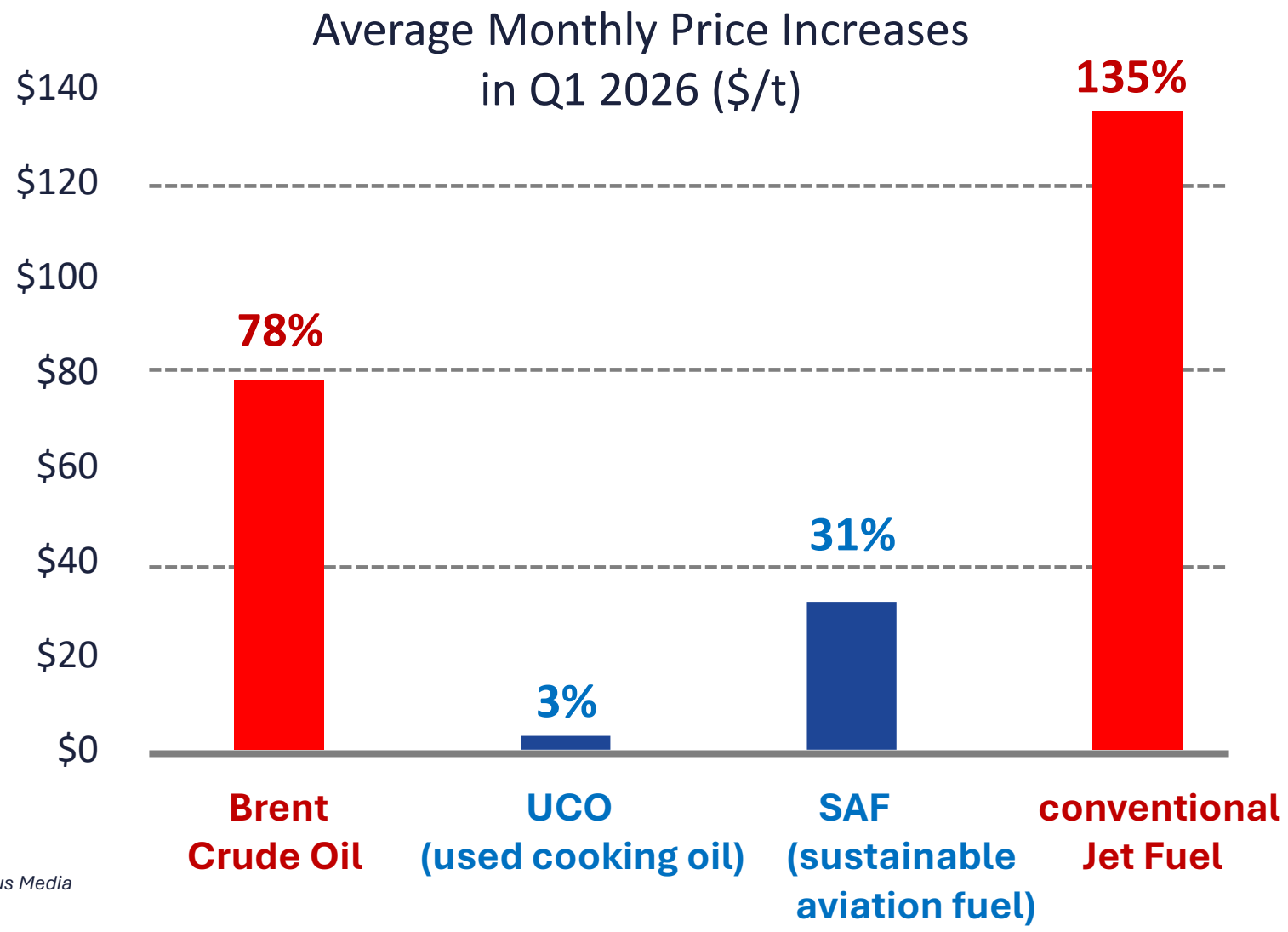
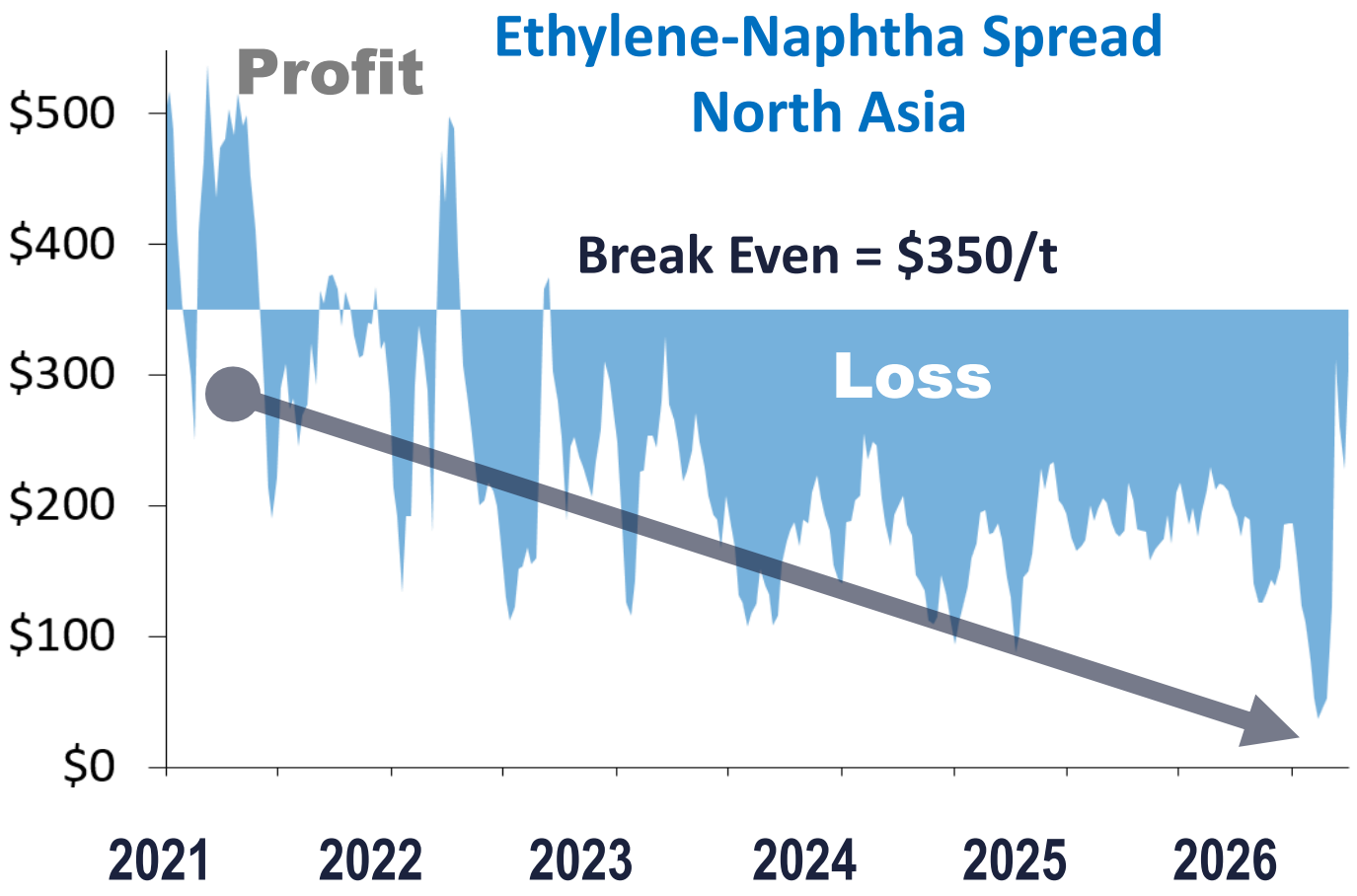
Biofuels has proven to be a safe haven



Source: Argus Media

Cracking margins were already in the red before Hormuz



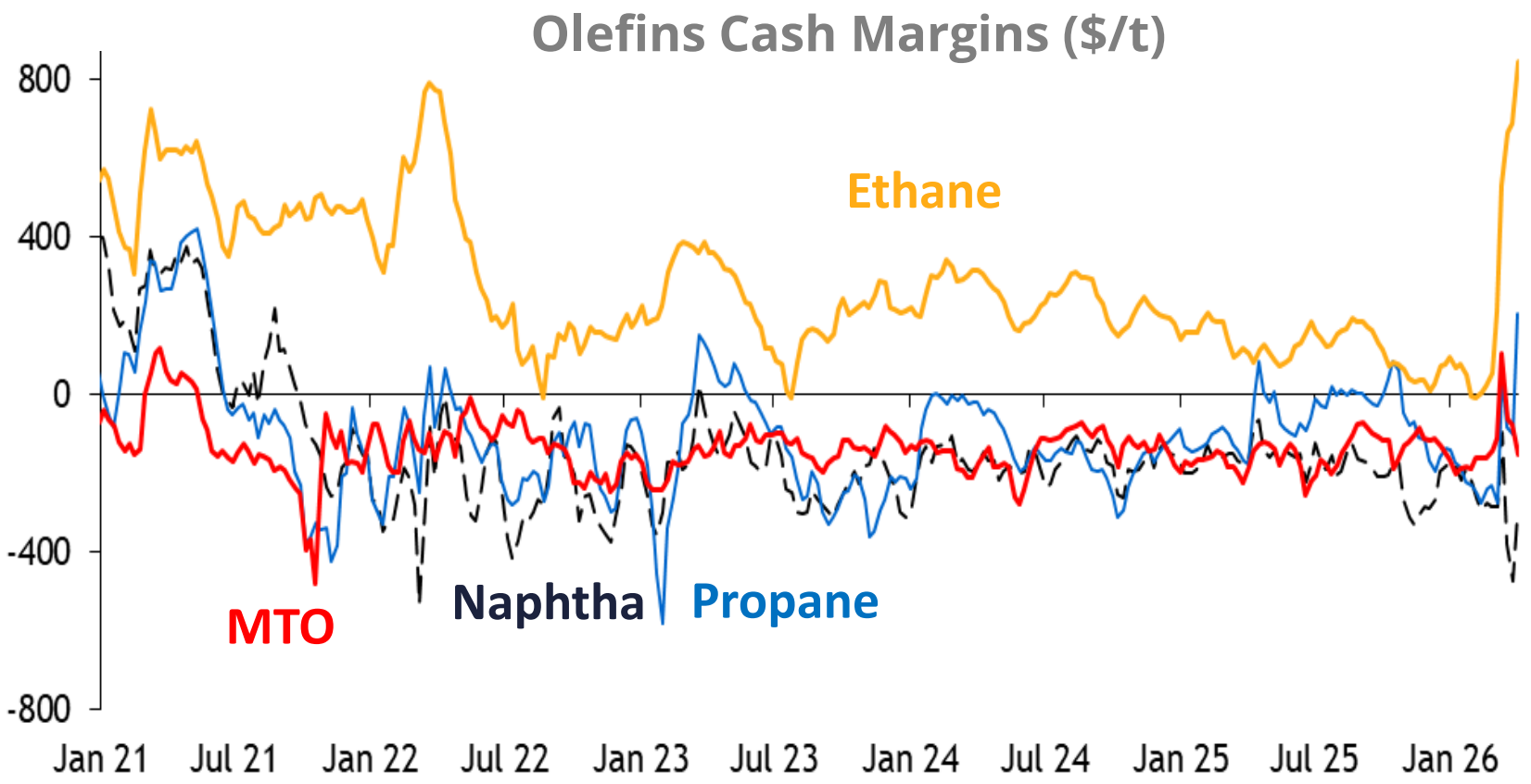
- Operators did not keep much inventory in the recent downcycle, due to weak margins → at least six crackers on FM

- 60-70% of crackers in Asia are using naphtha as feedstock, followed by LPG and ethane.

- Increasingly negative cracking margins since 2022 have prompted producers to go for total shutdowns.

- Refineries with integrated crackers can last longer…for now

China stays resilient with flexibility in cracking



- China became the bright spot during this crisis with cracker run rates stay high because of flexibility in cracking.

- CTO, MTO, ethane crackers with high flexibility for propane, resulting in increased enquiries to buy Chinese olefins on an FOB basis.

- More exports can be expected as China is long

- But no one will be spared if the ME tensions are prolonged.

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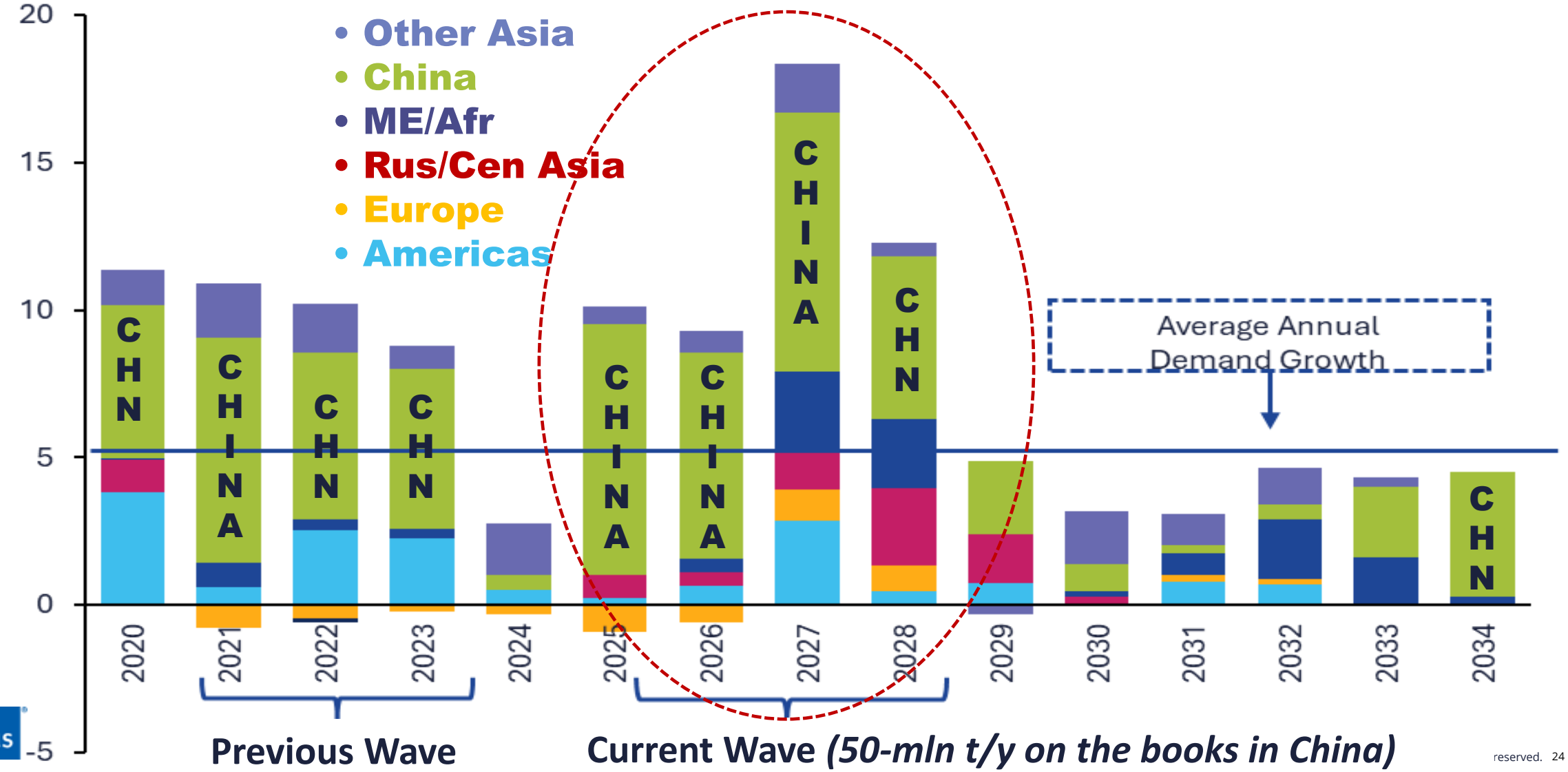
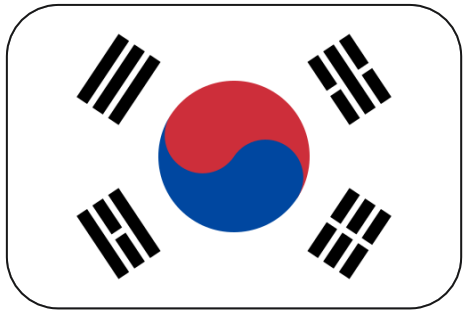
Iran War will delay, but not eliminate capacity tsunami from China



Company	Country Subdivision	Source	Refinery Integr Yes/No	2024	2025	2026	2027	2028
Jincheng Petrochemical	Shandong	KCOT	Yes	700				
Zhejiang Petrochemical	Zhejiang	to add new furnace, from own refinery off gas, each add 200kt	Yes	600				
Ineos Sinopec Tianjin Nangang	Tianjin	Naphtha, ethane	No	1,200				
Yulongdao Refining & Petchem No1	Shandong	mostly naphtha	Yes	1,500				
Huatai Shengfu	Zhejiang	to add ethane furnace	No		250			
ExxonMobil	Guangdong	crude (or naphtha)	No		1,600			
Wanhua Chemical No.2	Shandong	ethane/butane, naphtha 50:50	No		1,200			
PetroChina Jilin Petrochemical	Jilin	mostly naphtha	Yes		1,200			
CNOOC Daxie	Zhejiang	refinery deep catalytic	Yes		250			
Shenghong No.1	Lianyungang	Naphtha, LPG, ethane, change existing feedstock to ethane	Yes		400			
Chambroad	Shandong	KCOT	Yes		300			
PetroChina Guangxi Petrochemical	Guangxi	mostly naphtha	Yes		1,200			
Yulongdao Refining & Petchem No2	Shandong	mostly naphtha	Yes		1,500			
Wanhua Chemical No.1	Shandong	Replace existing propane feed to ethane	No		200			
BASF Zhanjiang	Guangdong	mostly naphtha	No			1,000		
~~Satellite Lianyungang No.3~~	~~Jiangsu~~	~~Ethane~~				~~1,500~~		
Sinopec Luoyang Petrochemical	Henan	mostly naphtha				1,000		
Huajin Aramco Petrochemical	Liaoning	mostly naphtha				1,600		
PetroChina Dushanzi Tarim Oilfield	Xinjiang	Ethane				1,200		
SABIC Zhangzhou Gulei	Fujian	mostly naphtha				1,800		
Lanzhou Petrochemical	Lanzhou	mostly naphtha				1,200		
Sinopec Maoming Petrochemical	Guangdong	naphtha, LPG				1,000		
Rongsheng New Materials	Zhejiang	mostly naphtha					1,500	
BASF-YPC No2	Jiangsu	mostly naphtha					1,000	
Sinopec Qilu Petrochemical	Shandong	Replace existing cracker; mostly na	Yes				1,000	
CNOOC Shell No 3	Guangdong	mostly naphtha	Yes				1,600	
Sinopec Yangzi Petrochemical	Jiangsu	mostly naphtha	Yes				1,000	
PetroChina Lanhai New Materials	Jiangsu	Ethane, LPG	No					1,200
Sinopec Yueyang	Hunan	mostly naphtha	Yes					1,000
Sinopec Zhenhai No.3	Zhejiang	mixed feed	Yes					1,500
Sinopec Zhongke Zhanjiang No.2	Guangdong	mostly naphtha	Yes					
Sinopec Shanghai	Shanghai	mostly naphtha	Yes					
PetroChina Dalian Petrochemical	Dalian	mostly naphtha	Yes					
Sinopec Tahe Refining	Xinjiang	crude	Yes					
PetroChina Huhehaote	Inner Mongolia	Ethane	Yes					
Subtotals				**4,000**	**8,100**	**8,800**	**6,100**	**3,700**

Seven world-scale plants this year alone, and another five next year

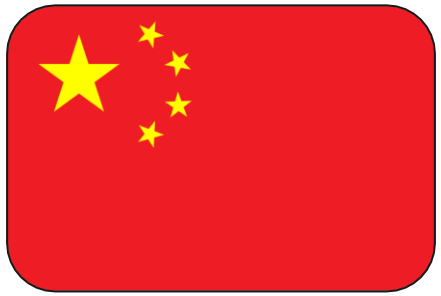
Acceleration of rationalization



- Hyundai and Lotte merger was approved in February. In the long term, exports will be reduced, but Korea will still be highly dependent on China market

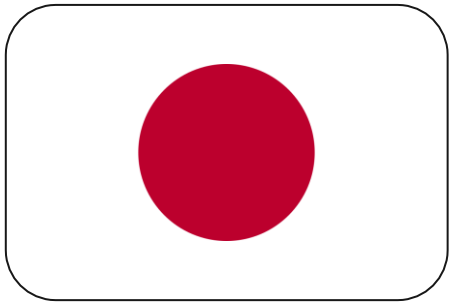
- Korea to retire 2.7 – 3.7mn t/yr of ethylene capacity.

- Ten producers sent consolida-tion plans in late 2025



- China “anti-involution” (反内卷) campaign to rein in excessive competition

- Petchem units over 20 years old may be ordered shut



- Ethylene capacity to be cut from 6.16-mln t/r to 4.4 by 2030, reducing the total number of units to eight.

- Mitsubishi Chem, Asahi Kasei, and Mitsui Chems in West Japan (Mizushima, Osaka)

- Idemitsu and Mitsui Chems, Maruzen and Sumitomo Chem in East Japan (Chiba); plus Eneos in Kawasaki

III. The new world order

Long-term consequences of the US War on Iran
(adapted from Shane Oliver, AMP)

- **Inflation**

- Double punch of Hormuz closure and Trump tariffs
- Central Banks ability to rein in inflation eroded

- **Accelerated shift away from Mideast**
  to US and other sources of oil

- Accelerated shift away **from fossil fuels**
  to new energy
  - Nuclear is back
  - The return of King Coal

- **Bigger government, more public debt**
  - NATO, Japan, Korea stepping up
  - Growth of Industrial Military Complex

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"The more things change, the more they stay the same"

- **No, the Oil Economy is not going away**
  → Renewables & Fossil fuels will continue to exist side by side
  → crude demand may peak before 2030 but will remain at/above 100-mln b/d thru 2050 supported by petchem demand (via naphtha or COTC)
  → Supply Longevity estimated at 40-150 years (!)

- **No, globalization is not dead**
  → there is a limit to how much production can be on-shored
  → **"China Plus One" Pivot:** Rather than bringing operations back to Japan, the dominant strategy has been diversification into SE Asia (Vietnam, Thailand, Philippines).
  → Gov subsidies cannot overcome the practical reality of China's economic significance

- **No, the dollar will not be dethroned as the leading global currency**
  → RMB trade mostly among China allies
  → hindered by geopolitical rivalry
  → US financial & legal institutions still robust
  → Global usage has grown to 8%, but still below the BGP, Euro

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"The more things change" – 2

- **No, the US-China Rivalry is not "Cold War II"**
  → interdependence will remain high, even with "loose coupling"
  → economy issues trump over ideological differences;
  most geopolitical tensions come down to wealth issues
  → Rivalry will only intensify but it will be managed thru direct engagement

- **No, current trade routes will not be radically rewired**
  → oil shipments thru the Panama Canal to Asia have surged 70% by use of small vessels,
  but it can never replace Hormuz in the long term bc of physical constraints
  → all-year shipping through the north Arctic Route is not expected until the 2040's or later

- **No, the world is not moving from a bi-polar to a multi-polar order**
  → Economic/wealth issues over Ideology…

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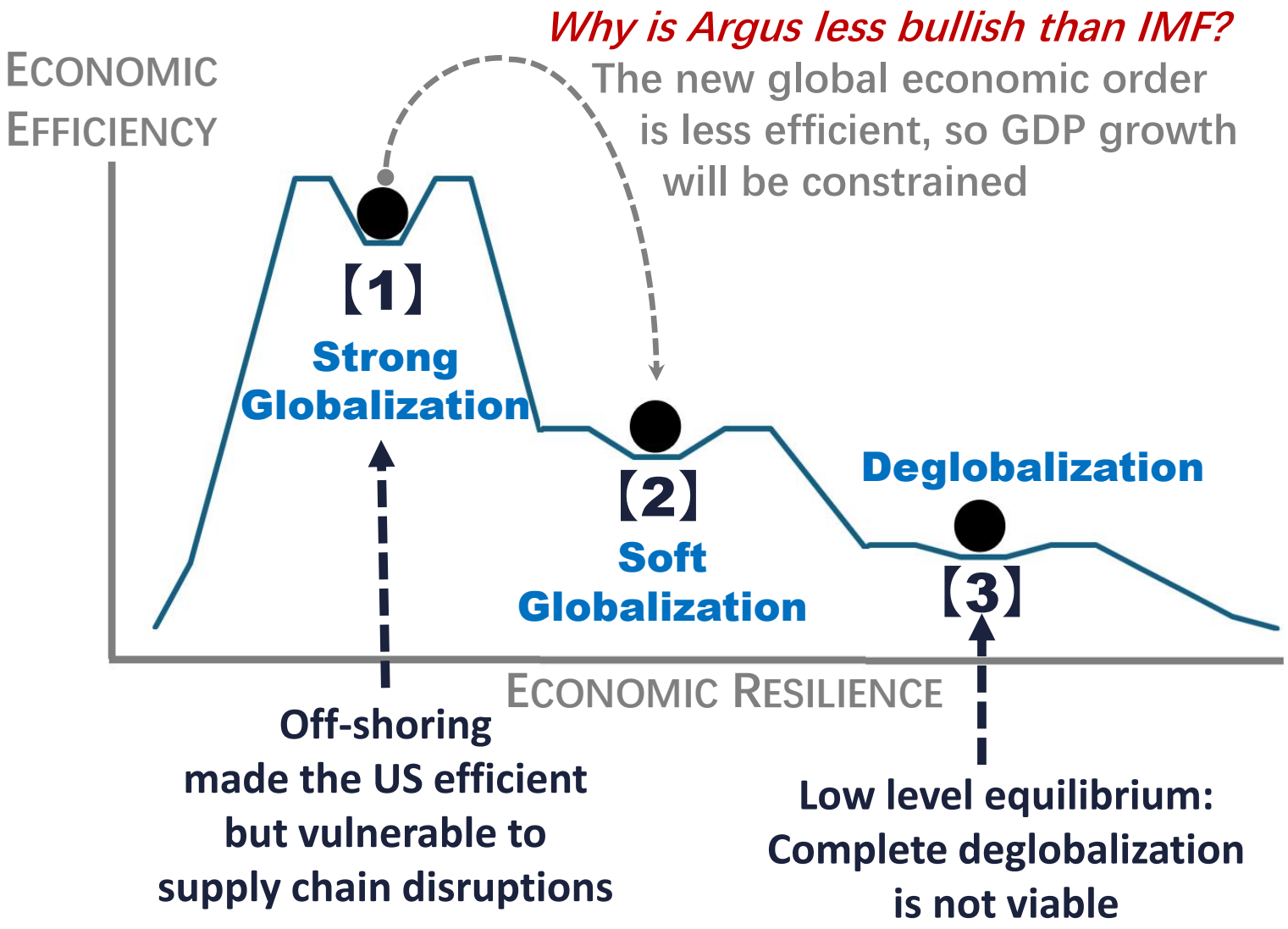
"Mini-Multilateralism," "Middle Powers" "Global South"

	CPTPP	G10	RCEP	BRICS	Quad
US		✓			✓
Canada	✓	✓			
UK	✓	✓			
Japan	✓	✓	✓		✓
China			✓	✓	
S. Korea			✓		
Australia	✓		✓		✓
N Z'land	✓		✓		
ASEAN	✓		✓		
India				✓	✓
EU		✓			
Russia				✓	
Mexico	✓				
Peru	✓				
Chile	✓				
Brazil				✓	

Mini-Multilateralism is driving the global economy to a lower equilibrium state



- **Three scenarios** for economic stability; we are moving from the 1st to the 2nd, from strong mutual dependencies to **"loose coupling"** but not **"decoupling"**
- **Trade-Off:** the new equilibrium of is less Efficient in generating wealth but more Resilient to supply chain disruptions, greater redundancy
  → *Argus GDP forecast is lower than that of EIA*
- In an economy of overlapping networks, **Sanctions and Tariffs** are less effective

Thank you!

S&P Global
Energy

Sophie Su
Associate Director, Asia Methanol & Derivatives

Esther Ng
Global Lead Specialist (Methanol)

Methanol Rebalanced:

—— Trade Shifts, Fuel Growth, and the Carbon Challenge

APIC 2026

Agenda

- Methanol Market Overview
- Low Carbon Methanol
- ST market dynamics
- Pricing
- Key takeaways

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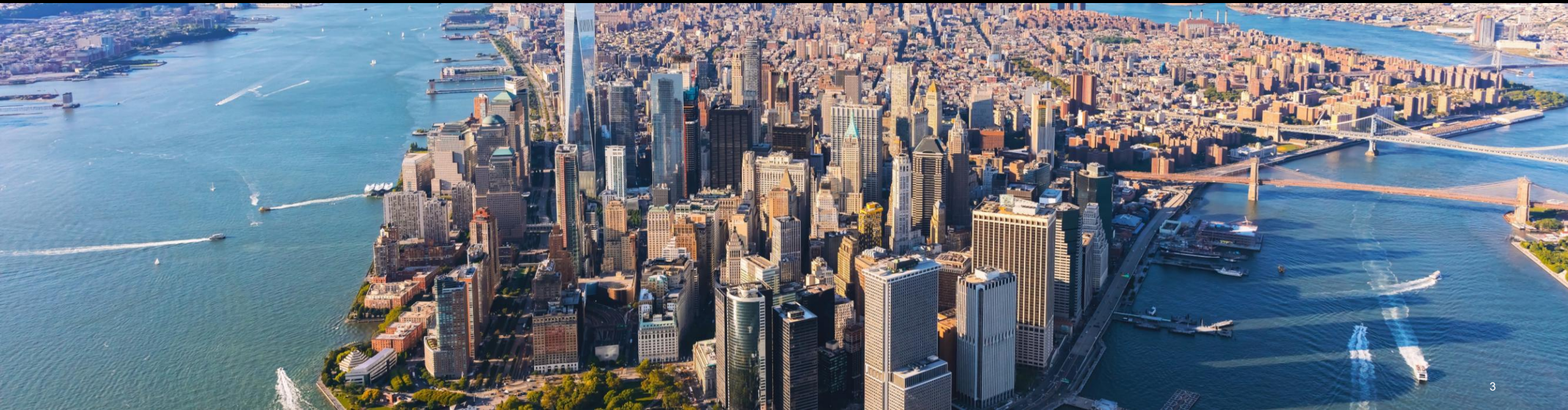
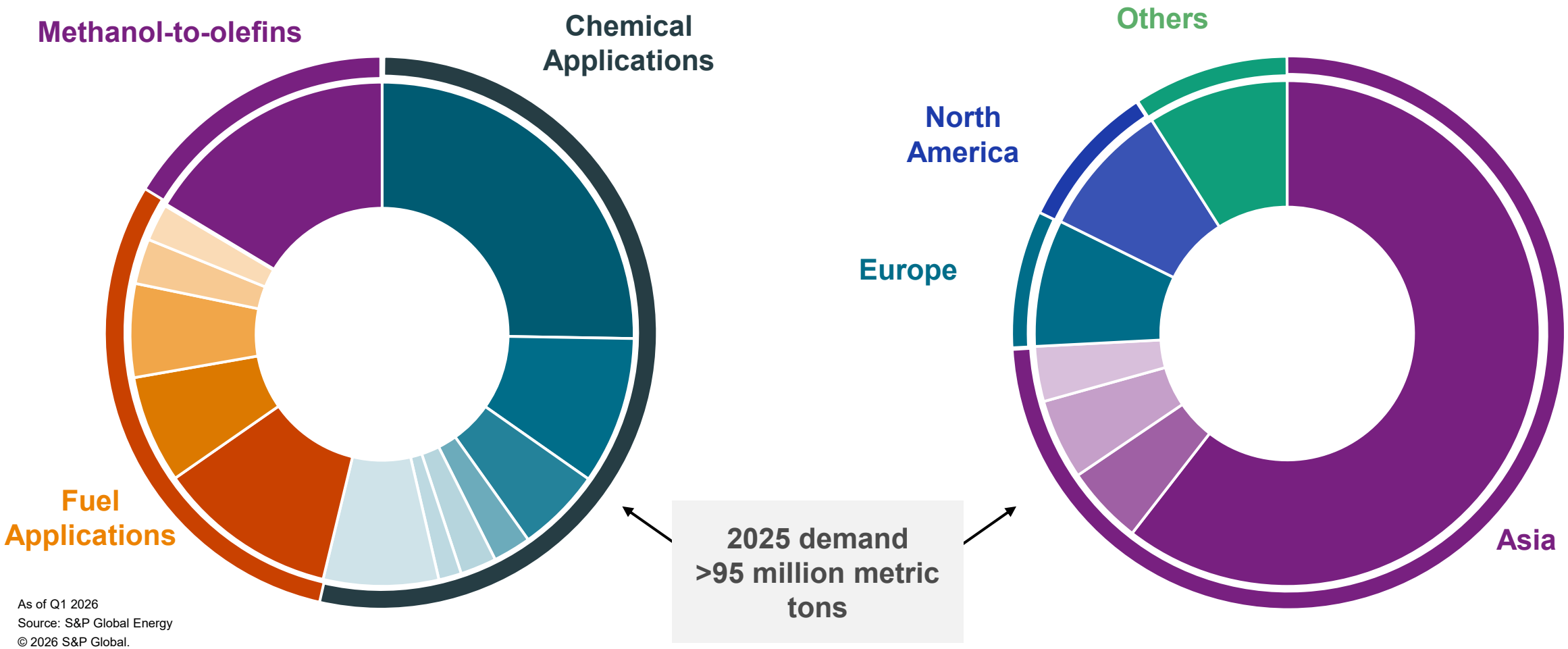
Global market Overview



Methanol is primarily used as chemical feedstock with consumption concentrated in Asia

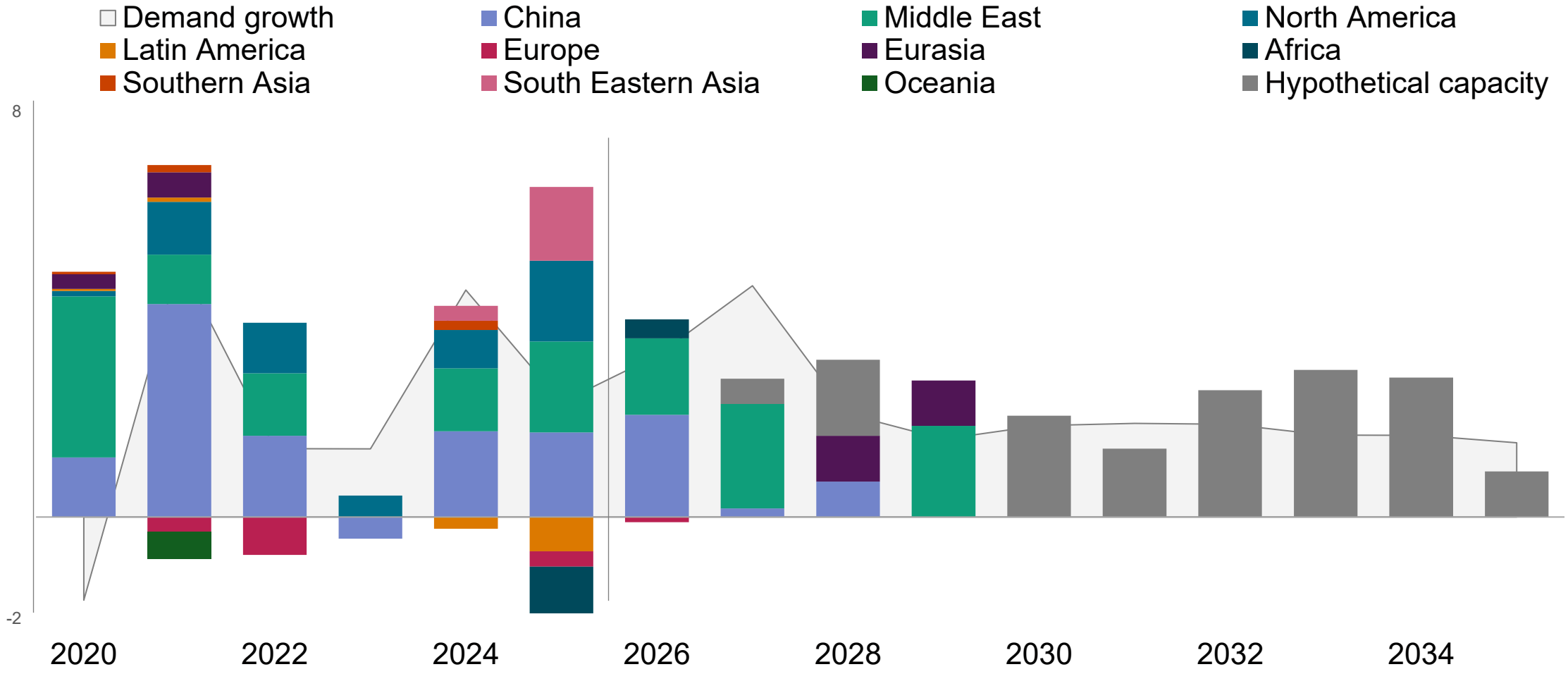


As of Q1 2026
Source: S&P Global Energy

S&P Global
Energy

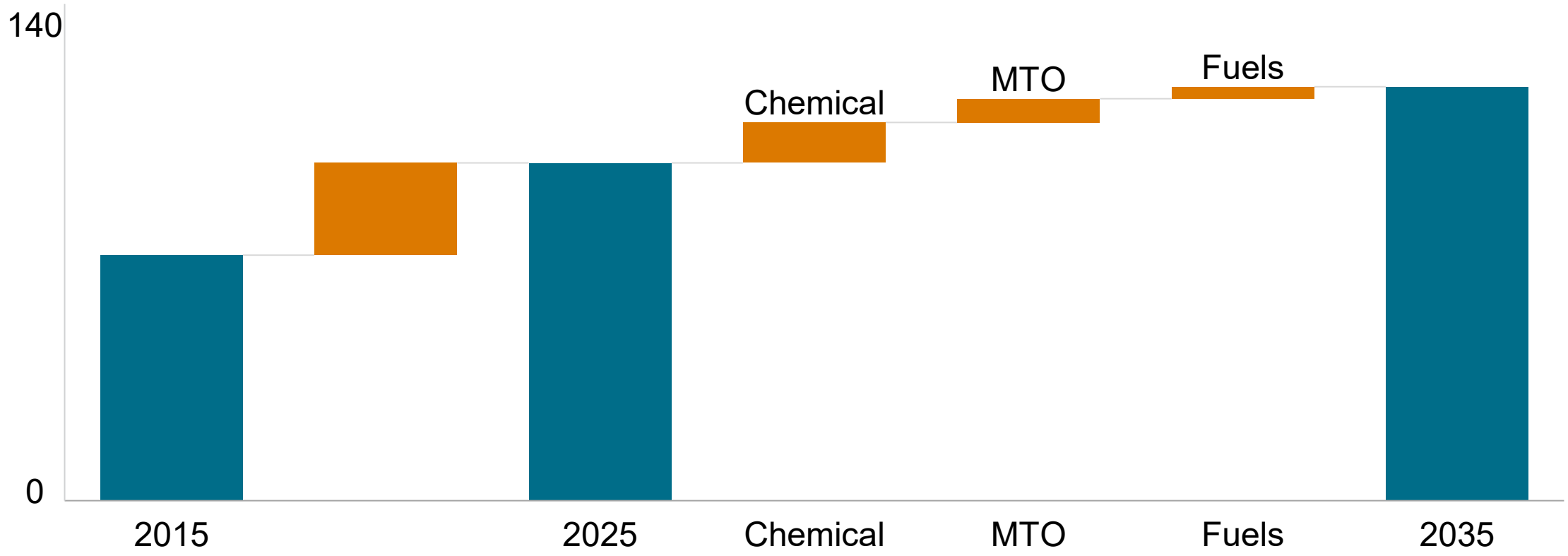
Recent commissioning has left market oversupplied yet new investments will be required in near future to meet growing demand

Methanol capacity vs. demand growth (MMT)



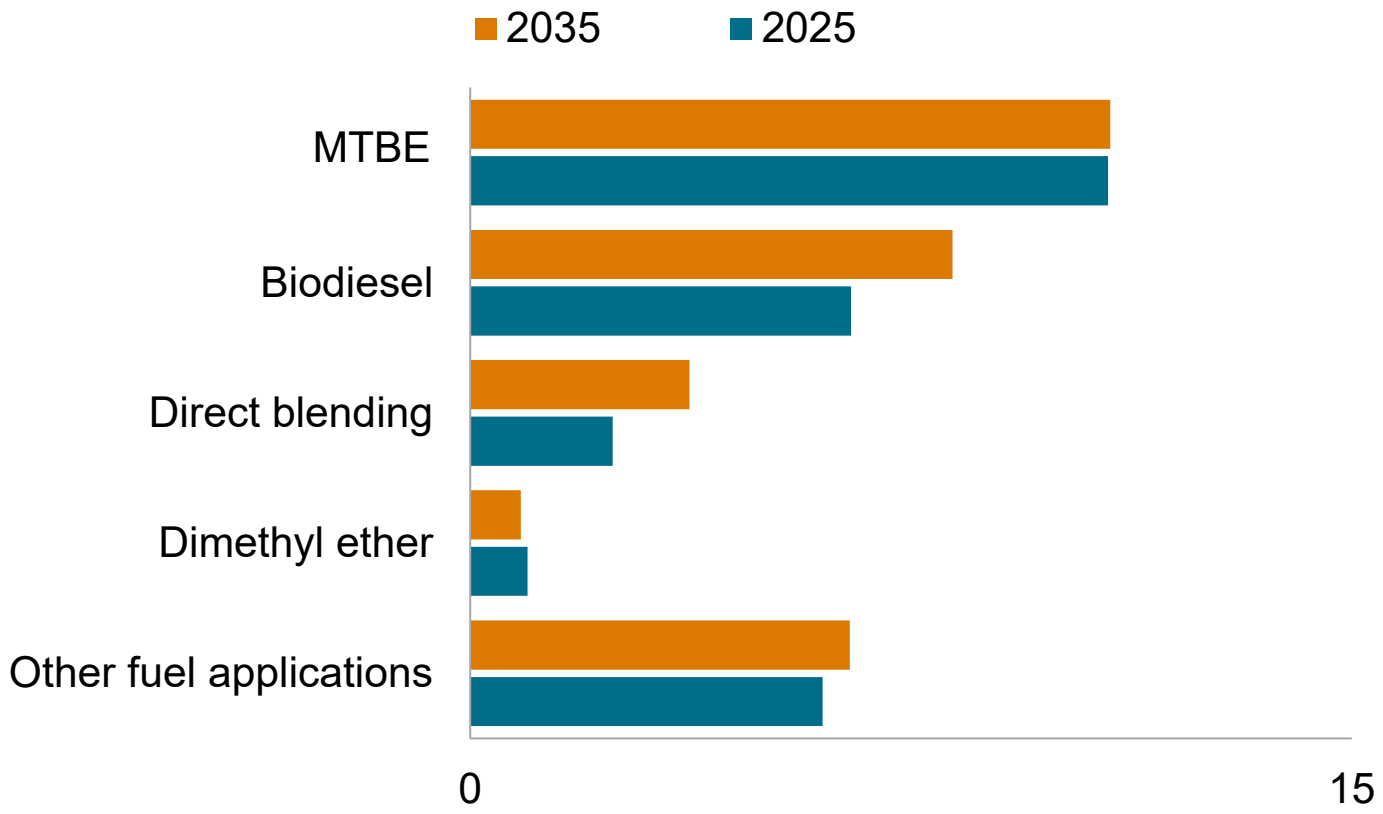
Chemical applications will drive global methanol demand

Conventional methanol demand growth 2015-35 (MMT)



Peak gasoline consumption and regulations will impact the dynamic into fuel applications

Methanol demand into fuel applications (MMT)



- Gasoline demand peak 2026
- Diverging trends by applications and regions
- Biodiesel growth driven by regulation

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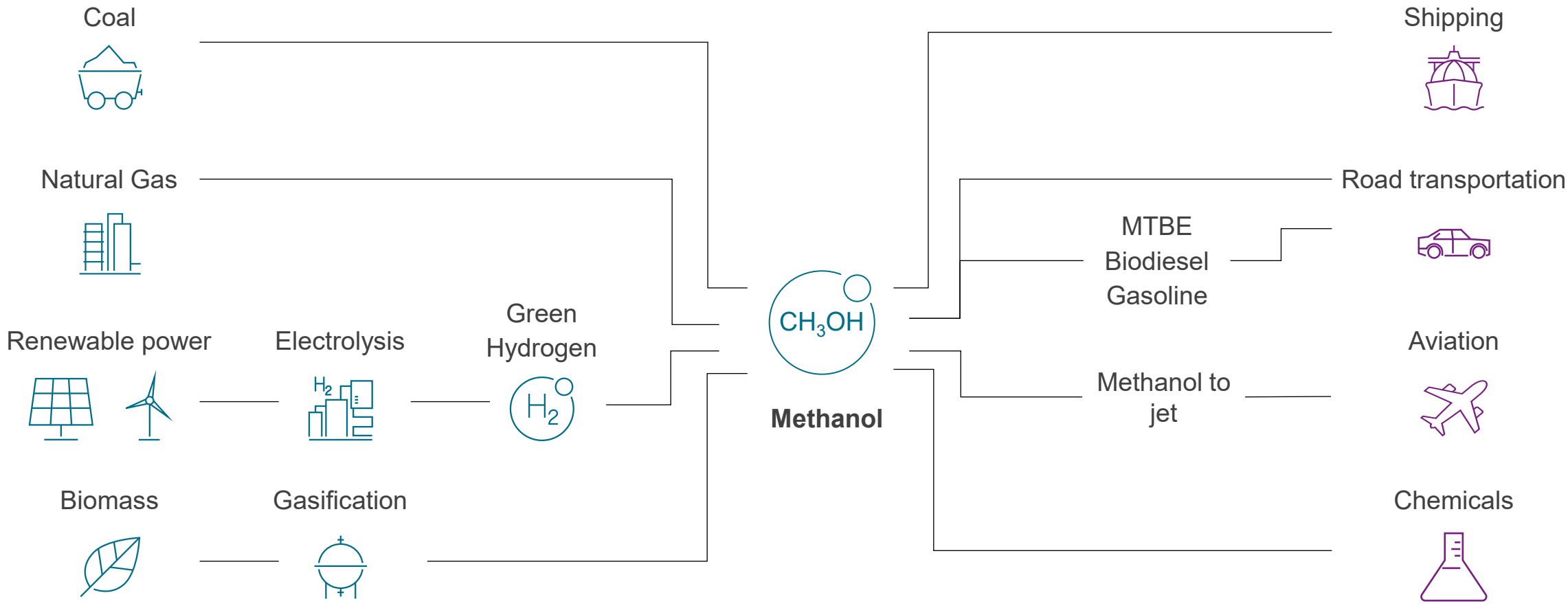
Energy

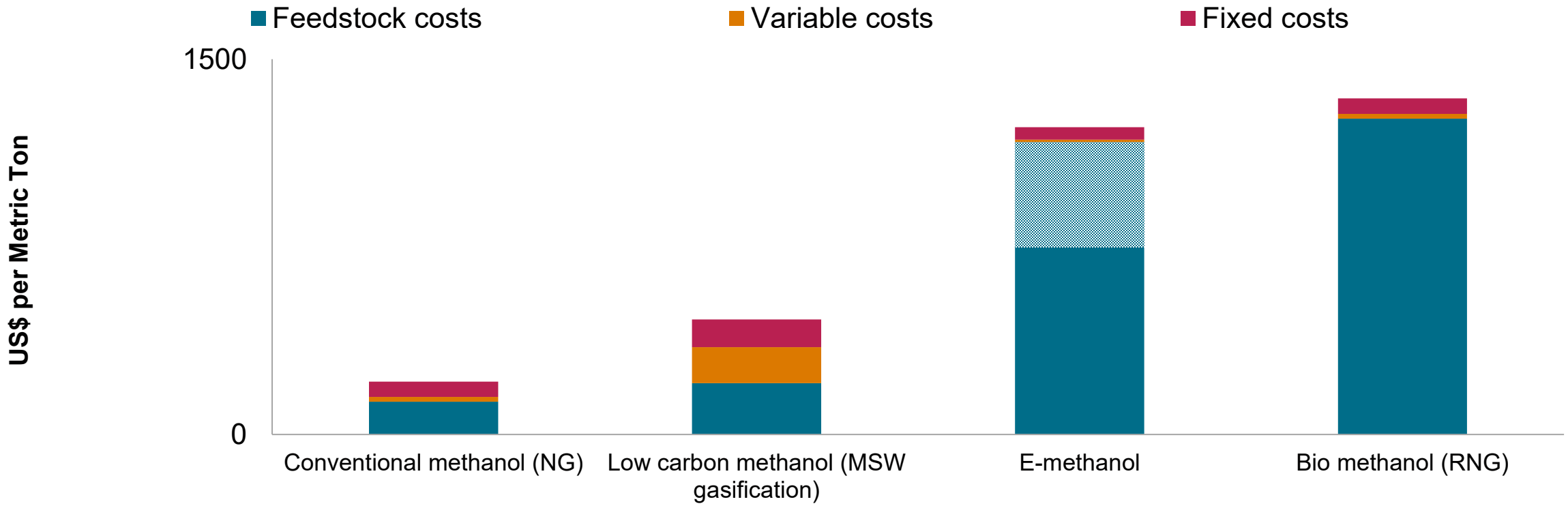
Low Carbon Methanol

Methanol offers a fantastic platform to decarbonize several industries



Producing low carbon methanol costs significantly higher compared to conventional methanol

Production cost estimates by process routes



As of Q1, 2025

Notes: shaded blue section for e-methanol represents the impact of depreciation on H2 production

Source: S&P Global Energy

S&P Global Energy

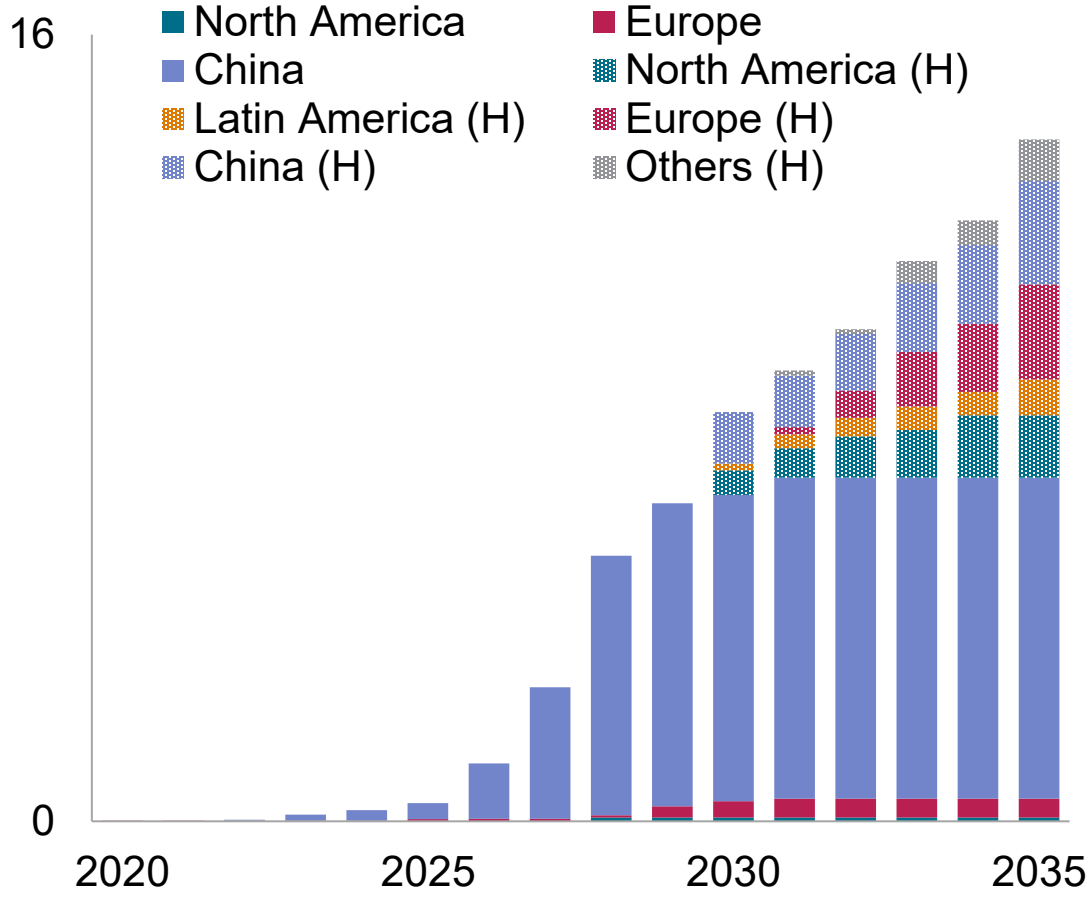
China is leading the way, making low-carbon methanol a reality

First commercial projects commissioned in China and Europe in 2025

Wave of new commissioning anticipated in

Many projects under review but FIDs delayed

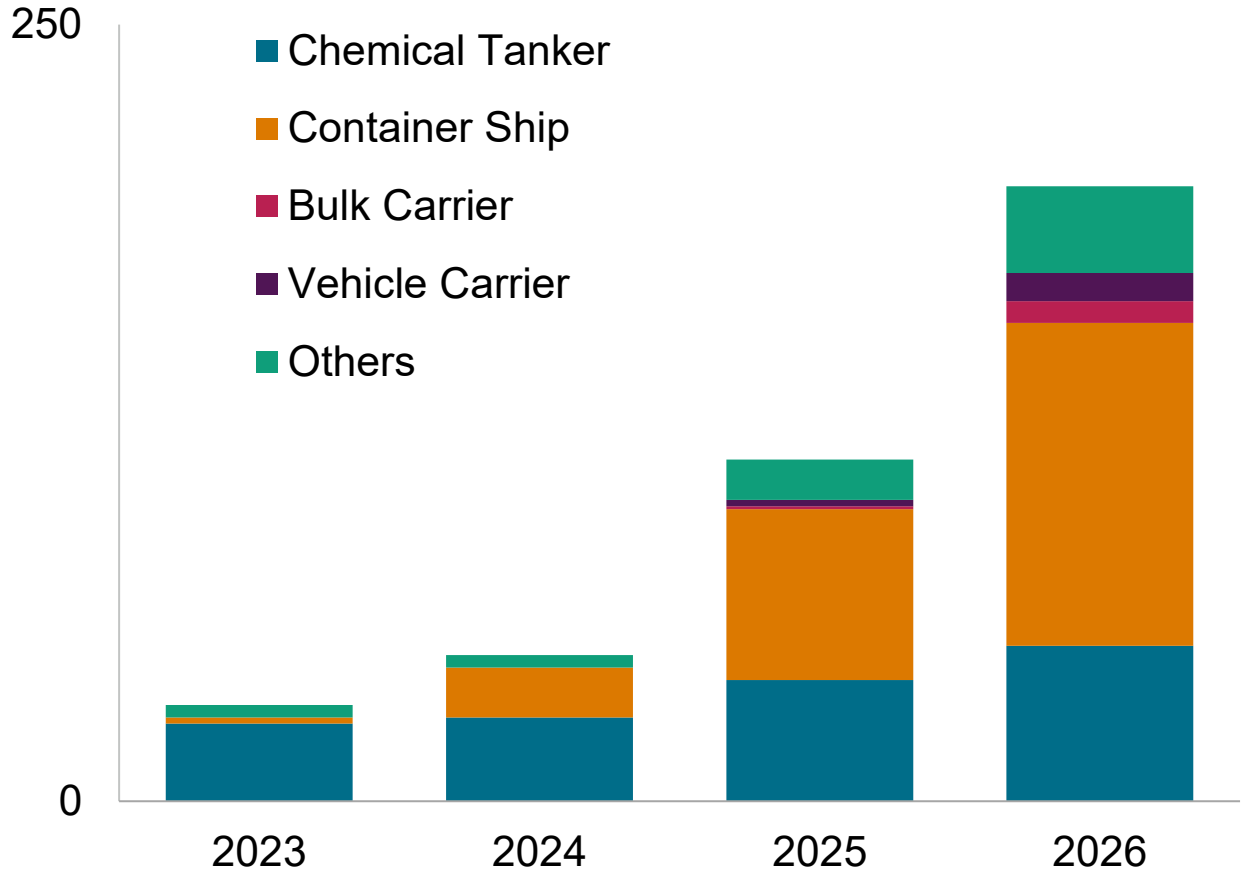
Low-carbon methanol capacity development



*H stands for hypothetical capacity

2025 was a transformative year for methanol bunkering

Dual-fuel methanol ready vessel fleet



- 56 vessels delivered in 2025
- Close to 200 vessels by end 2026
- Major shipping companies investing in methanol technology
- Bunkering developments across multiple countries and ports

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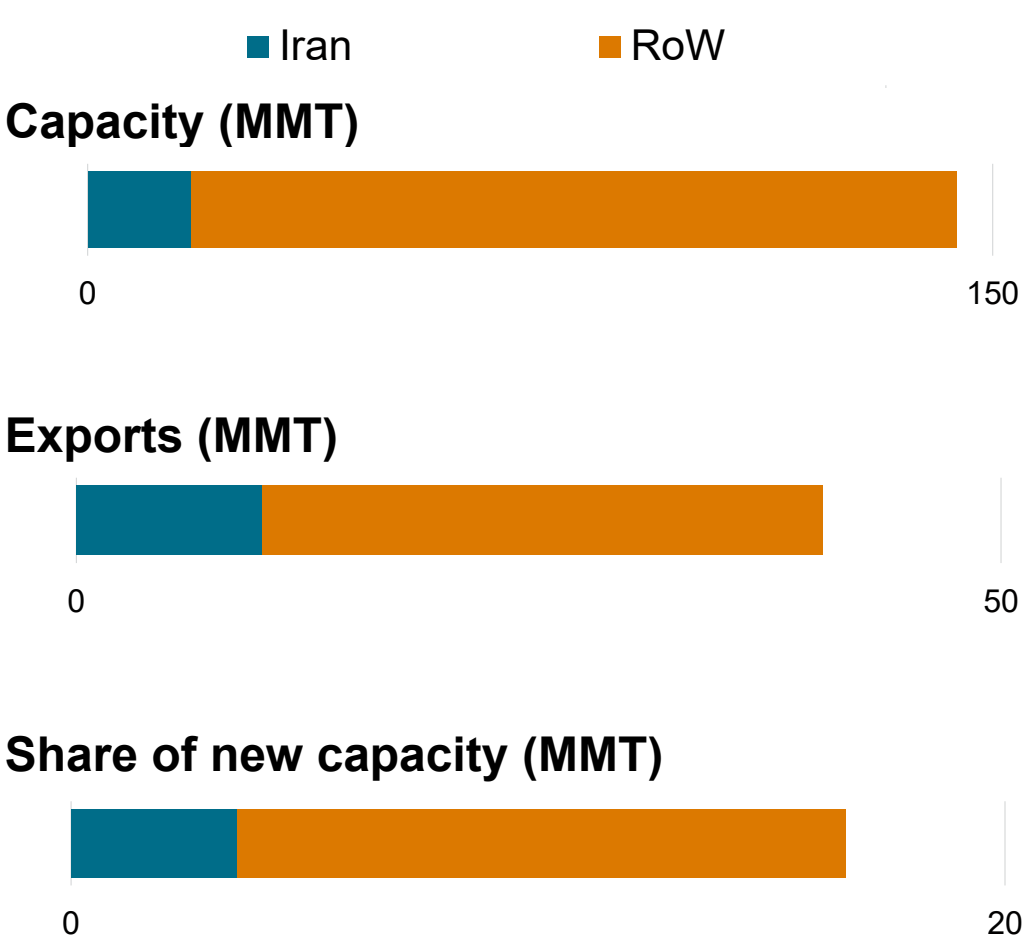
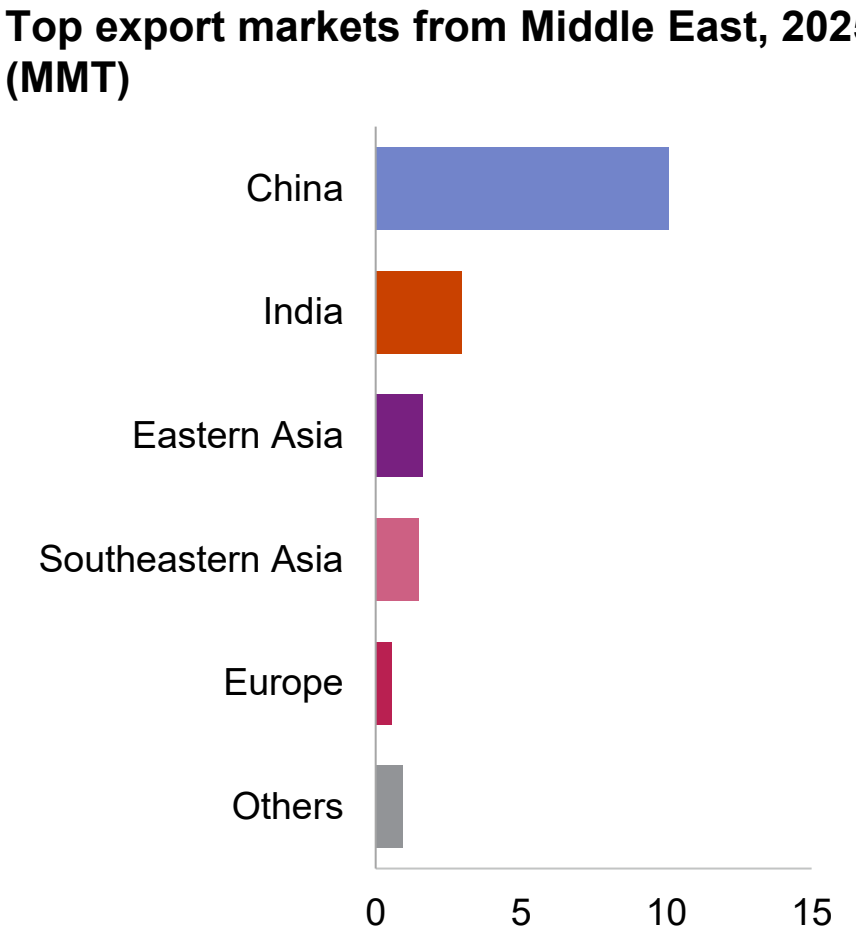
Regional Methanol Market Impact

The war in Iran is a major reset for the methanol industry





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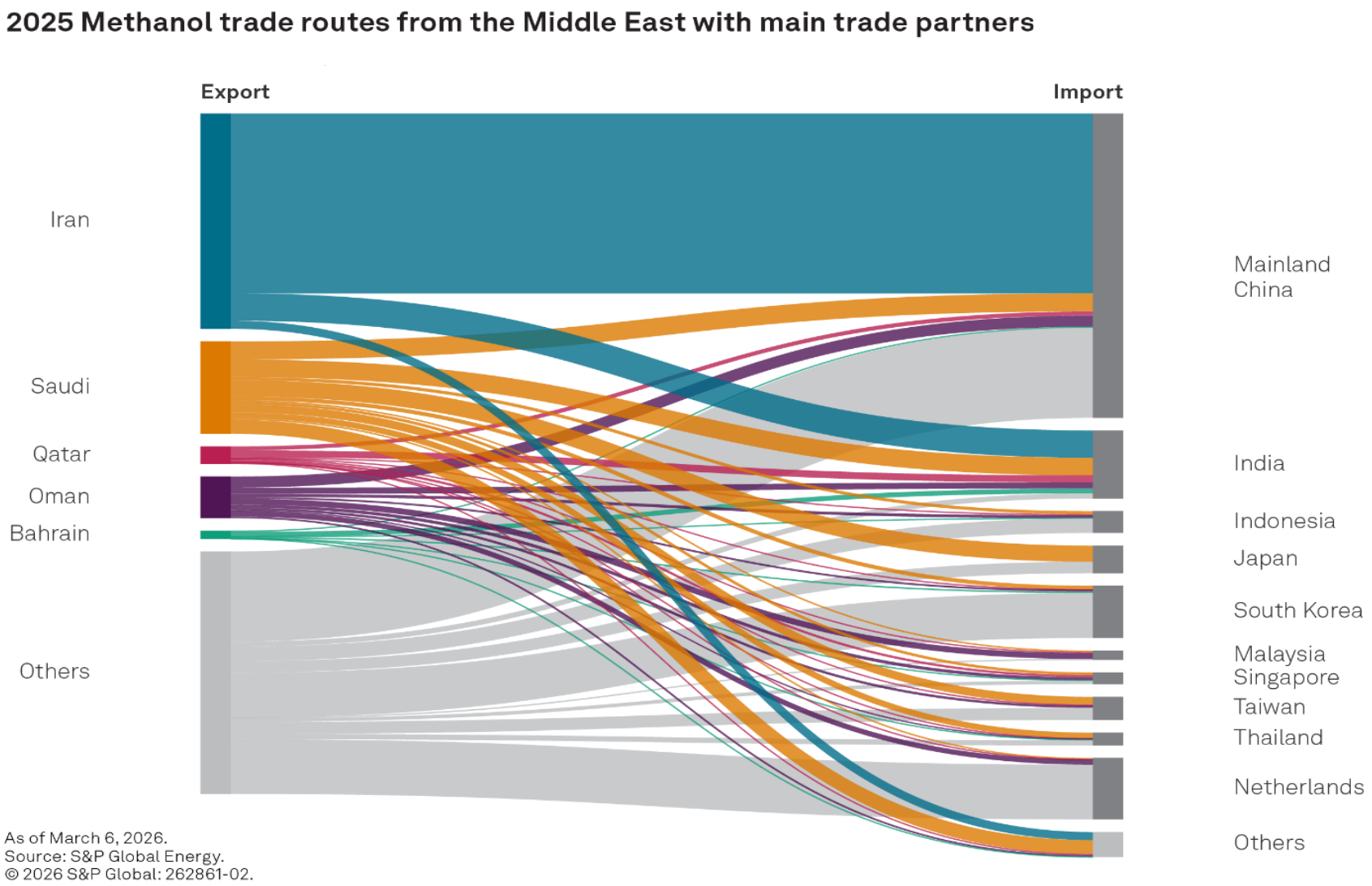
2025 Methanol Global Trade Flow



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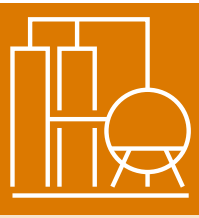
Three main themes to watch

Energy

Product prices and regions impacted differently

Price evolution since Feb 28

Feedstock



Crude, naphtha and LPGs flows affecting refineries & crackers operations

MTBE, MMA, VAM most exposed

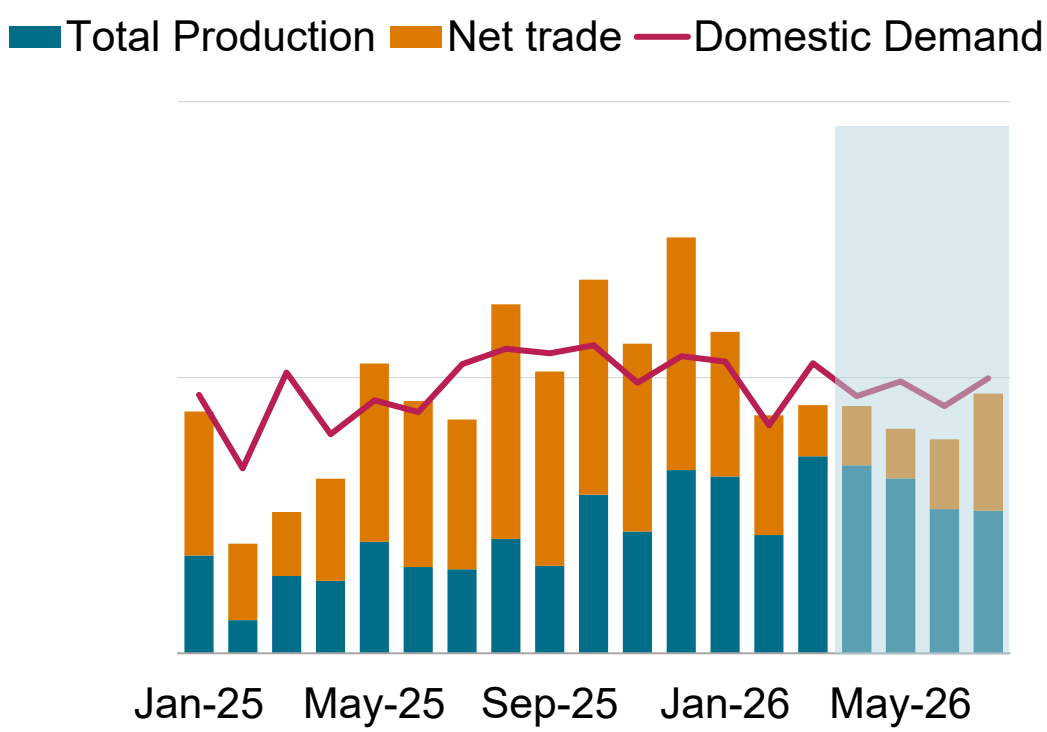
Freight

Freight rates and regional disruptions beyond the GCC

Europe particularly exposed across methanol and downstream chemicals

Short term methanol market regional outlook

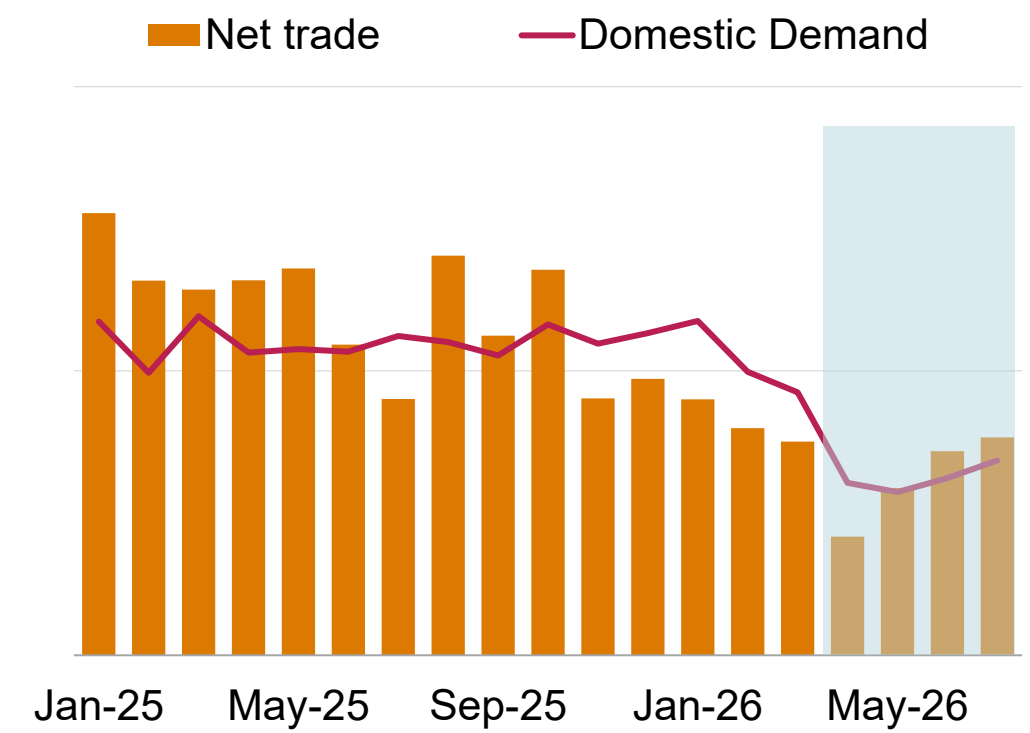
China Production and Demand



As of March 2026

Source: S&P Global Energy.

NEA ex China Supply and Demand

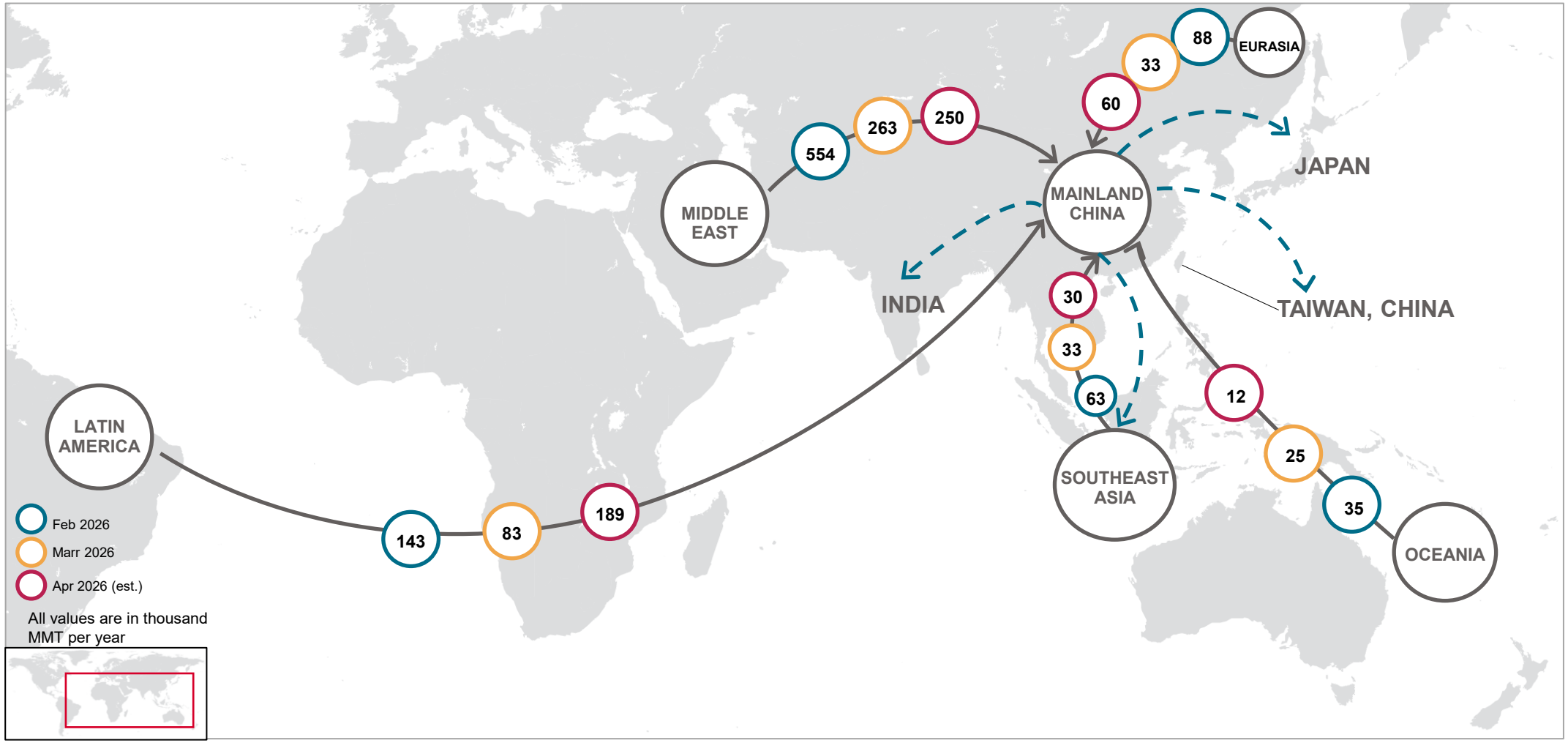


As of March 2026

Source: S&P Global Energy.

Mainland China Methanol Trade flow Change

Mainland China Methanol Trade flow Change



Date compiled Apr.2026.
Source: S&P Global Energy.

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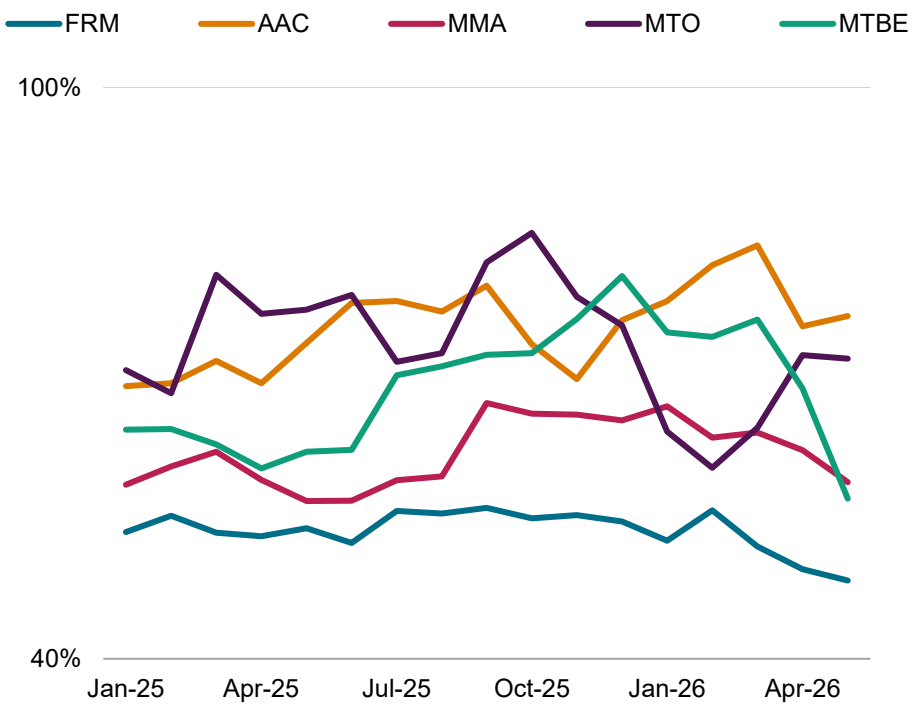
Energy

China methanol downstream

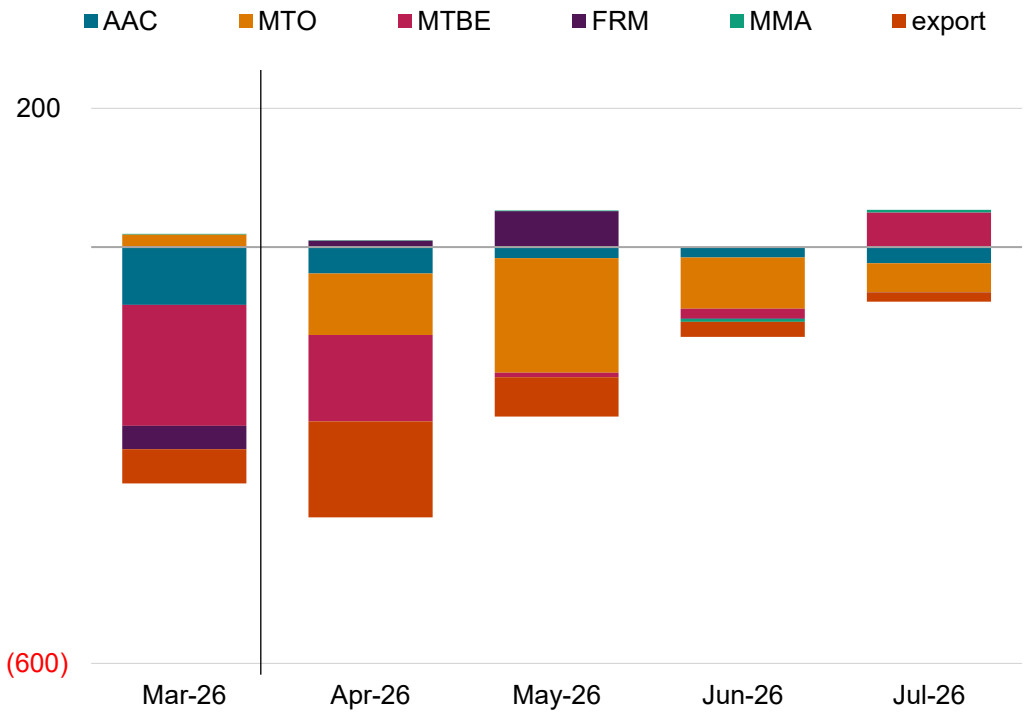
China Downstream OR



As of Apr 2026

Source: S&P Global Energy.

Middle East war impact on Chinese methanol downstream (kt)



As of Apr 2026

Source: S&P Global Energy

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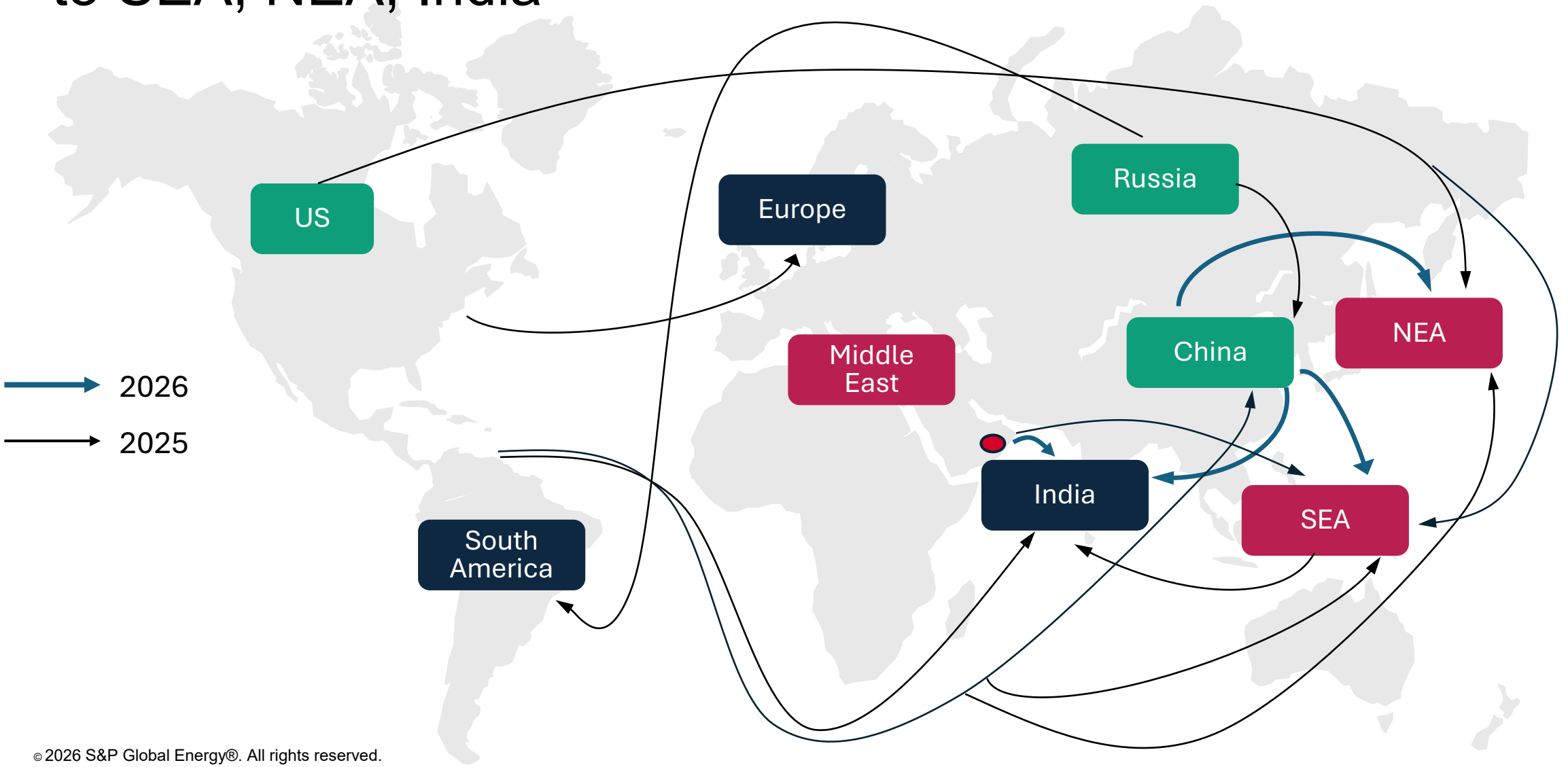
Energy

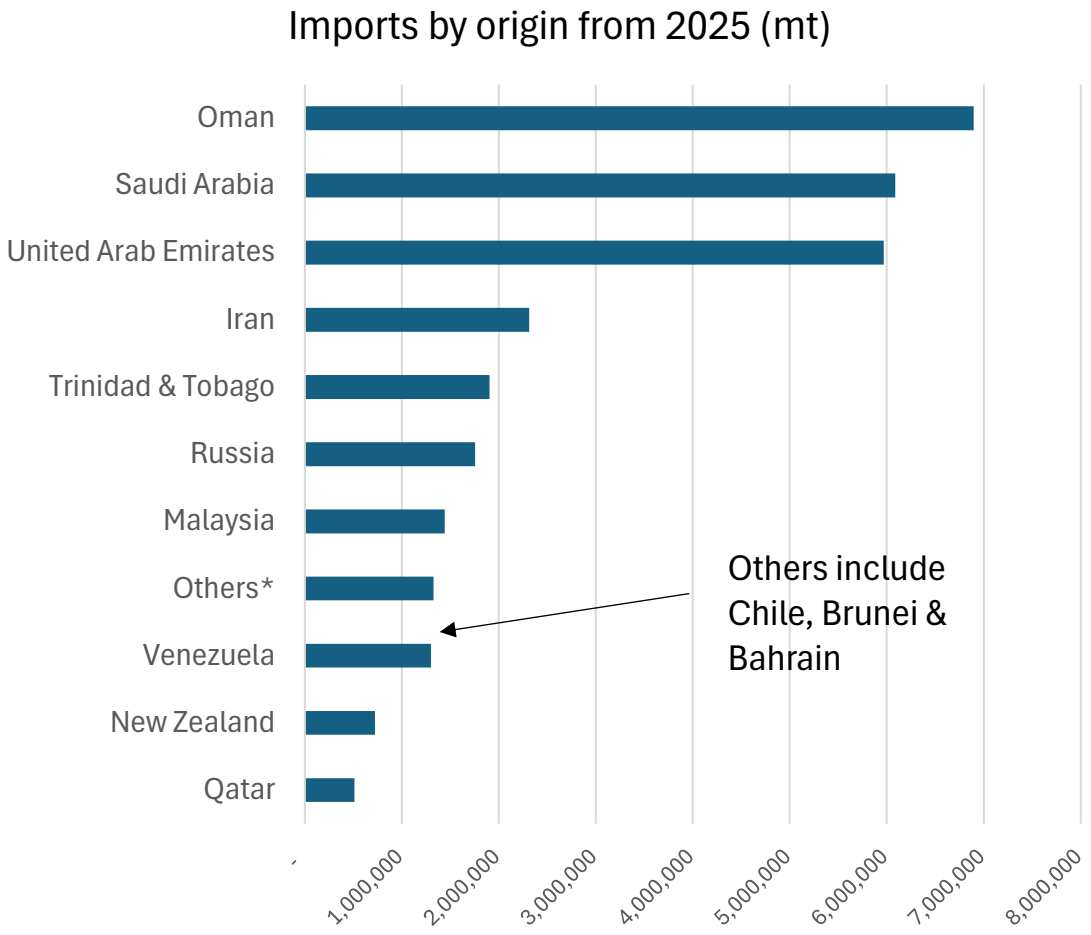
Pricing

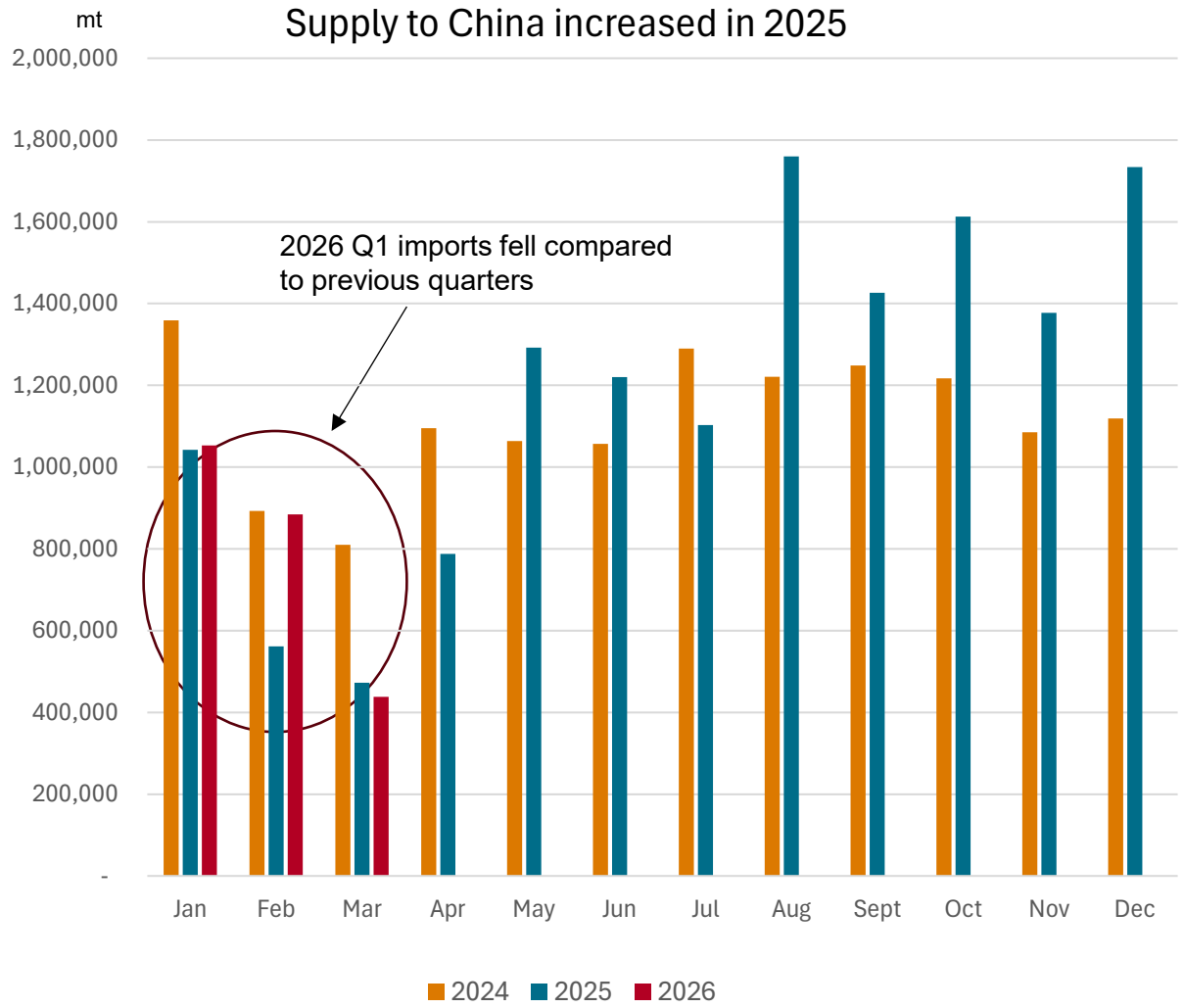
Conventional methanol market

US-Iran war halts ME to Asia trade flow, China offers volume to SEA, NEA, India



China imports a significant volume from the Middle East





Source: Chinese customs data

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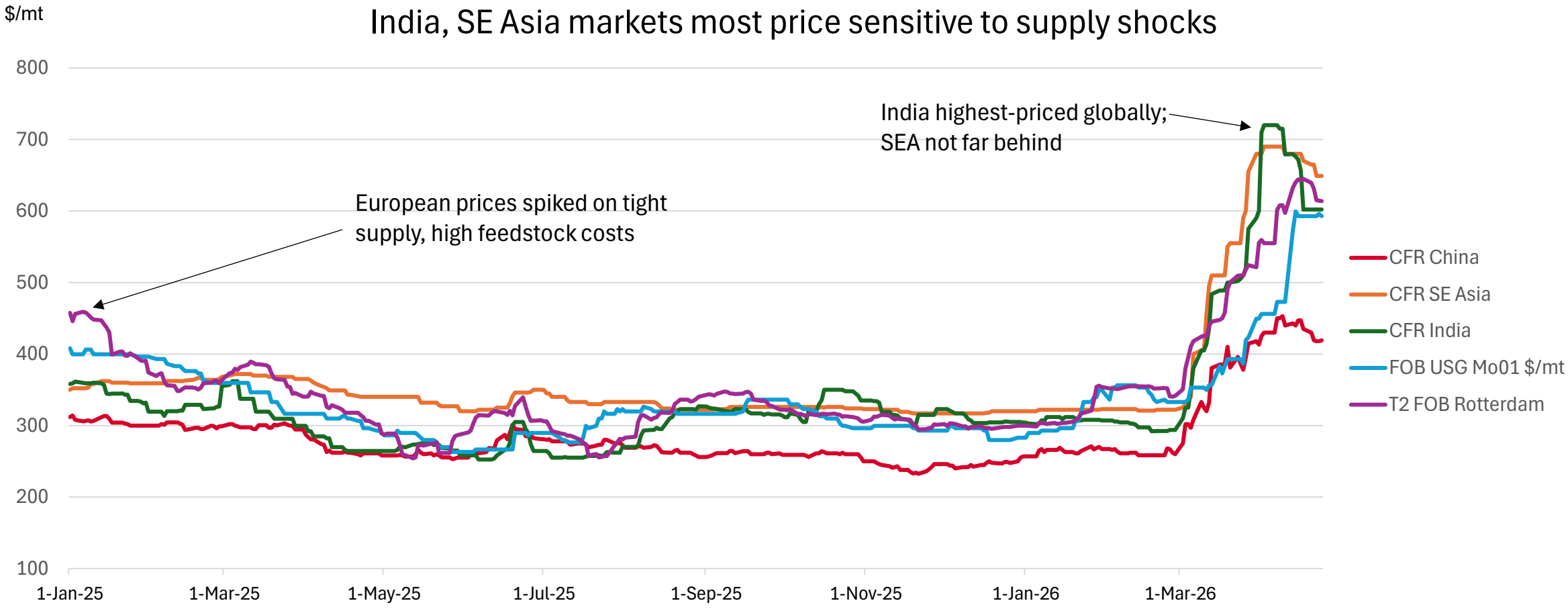
Methanol prices surge to new highs on US-Iran war



Source: S&P Global Energy

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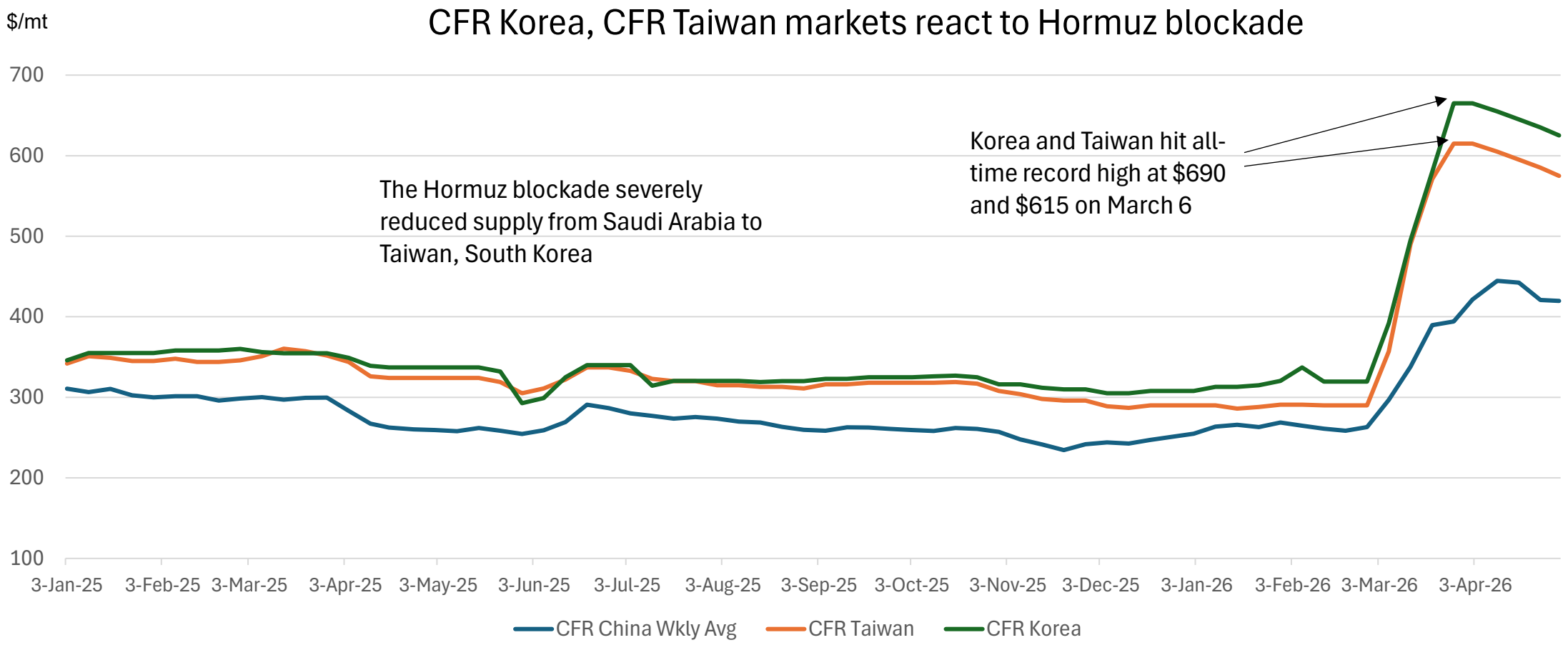
Methanol prices surge to new highs on US-Iran war



Source: S&P Global Energy

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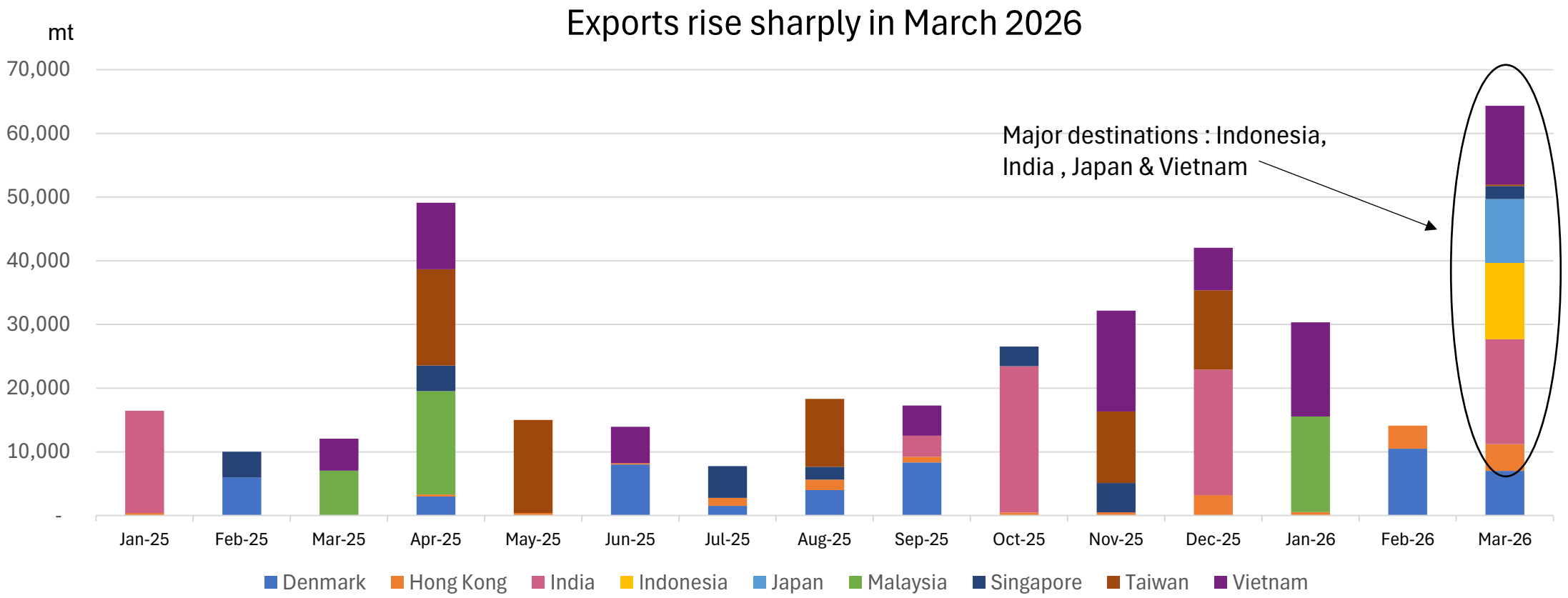
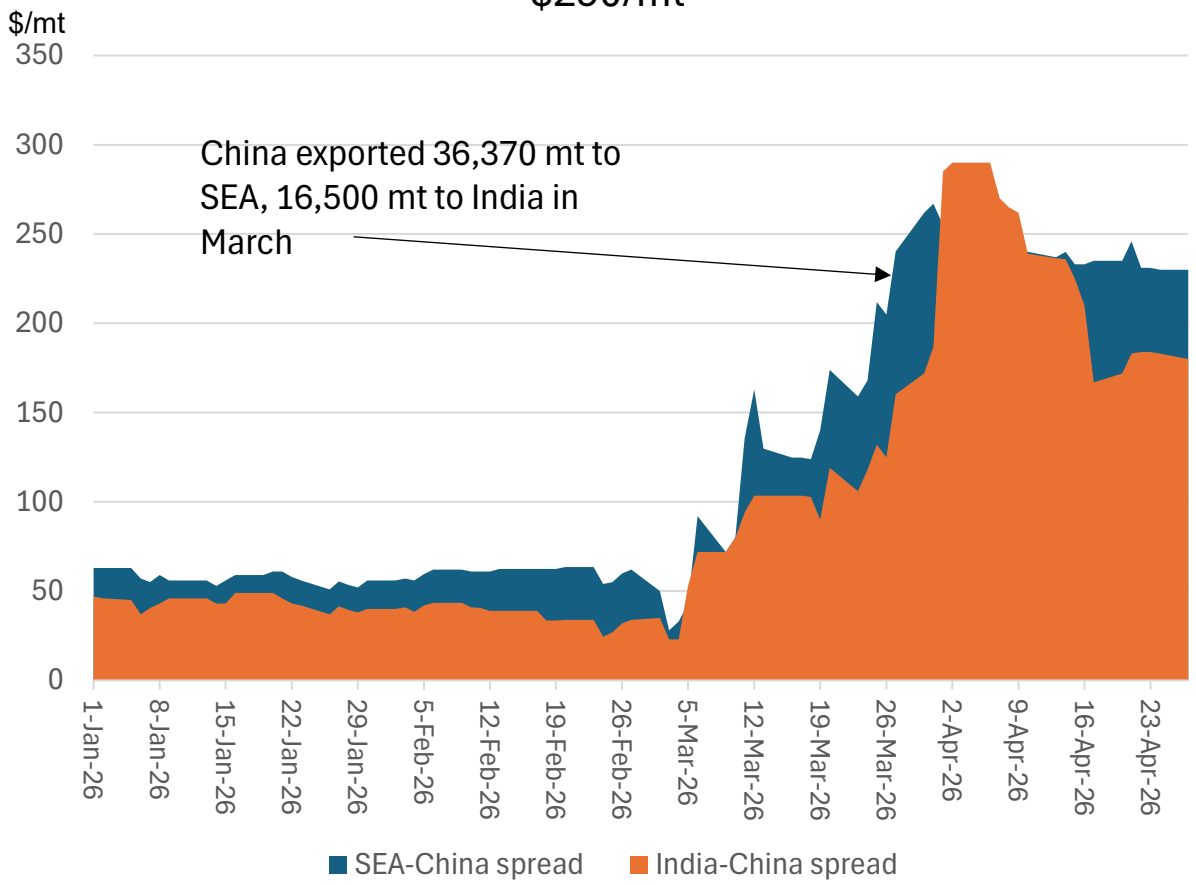
China’s methanol exports rise to a 7-year high



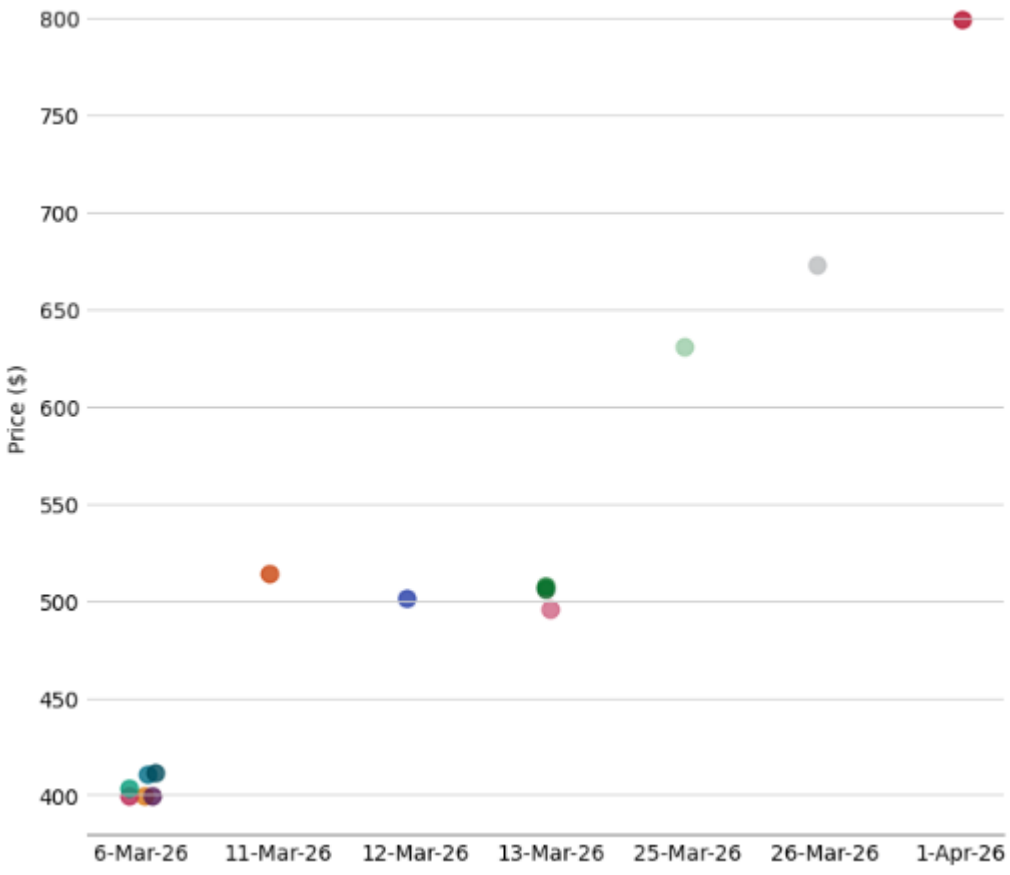
Source: Chinese customs data

US-Iran war opens SEA, India-China arbitrage

Spread between China and SEA/India jumps to $260-$290/mt



Uptick in SEA, India trading activity



Source: S&P Global Energy, Chinese customs data

S&P Global Energy

Fragmentation of China methanol market

Domestic (Import parity basis$/mt)		Differential	Export ($/mt)
Feb	269	$10-$15 (pre-war)	FOB China offer 280-285
12-Mar	322	$88	FOB China offer 420
20-Mar	374	$136-$146	FOB China offer 510-520
1-Apr	401	$139	FOB China offer 540
8-Apr	400	$210-$220	FOB China offer 610-620
30-Apr	399	$101	FOB China 10kt deal at 500

Chemical (Import parity basis $/mt)		Differential	Maritime ($/mt)
27-Mar	398	$82	3kt, deal at 480 CFR Taicang, Lc30;
10-Apr	390	$145	3kt, deal at 535 CFR Taicang, Lc30

Source: S&P Global Energy

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Energy

Pricing

Low Carbon Methanol Market

IMO MEPC 84 – Key outcomes

➡️ No agreement on the Net Zero Framework
Negotiations are ongoing, with no final framework, pricing mechanism, or implementation timeline agreed

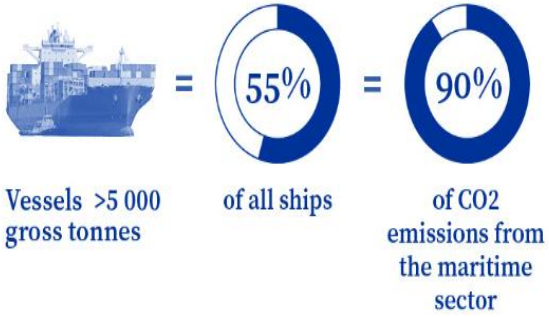
➡️ No carbon price set
Indicative figures circulating — such as $100 or $380/mt of CO_2e — remain proposals only and do not constitute confirmed policy

➡️ NZF remains under consideration.
The mechanism was not rejected, but no decisive progress toward adoption was made

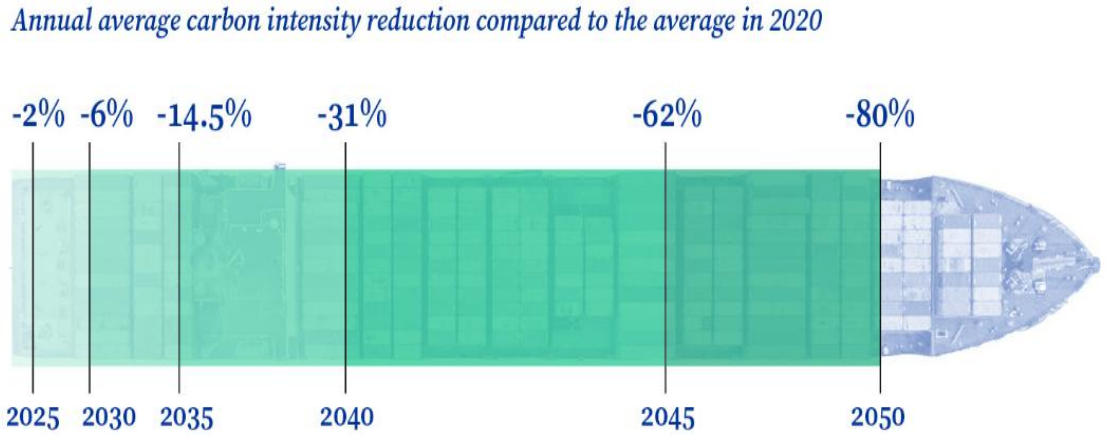
➡️ Consensus on the need for a global measure
There was broad agreement that shipping requires a uniform, IMO-led global framework to avoid regional fragmentation

FuelEU Maritime Prevails

The FuelEU maritime regulation will oblige vessels above 5000 gross tonnes calling at European ports (with exceptions such as fishing ships):

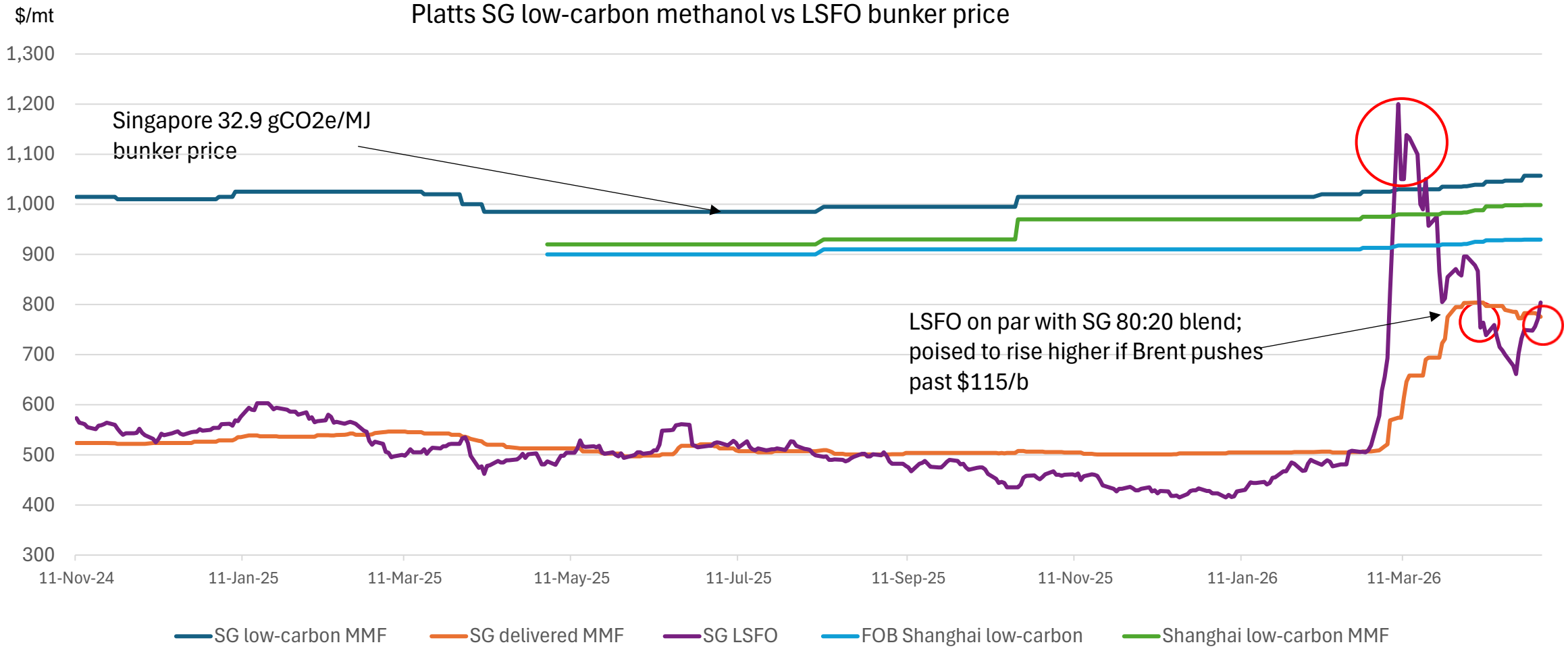


→ to **reduce** the **greenhouse gas intensity** of the energy used on board as follows



Source: IMO, Council of the European Union

LSFO trades higher than LCM in March, before easing in April



Source: S&P Global Energy

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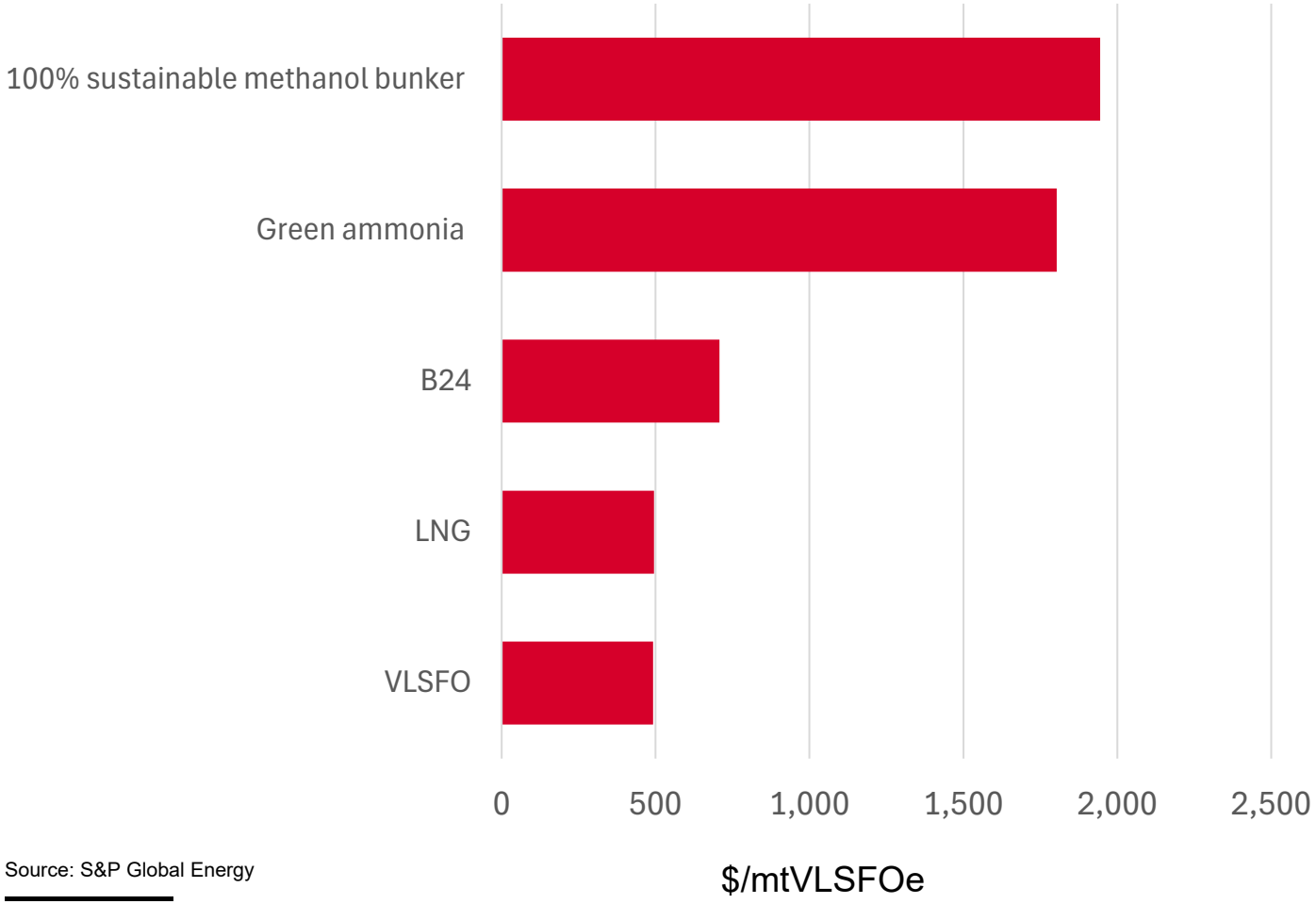
Competition among maritime fuels remains strong

March average prices: Singapore/Far East bunkers on an energy-equivalent basis



High methanol prices on an energy-equivalent basis compared to LNG, biodiesel

- Low compliance requirements favouring LNG

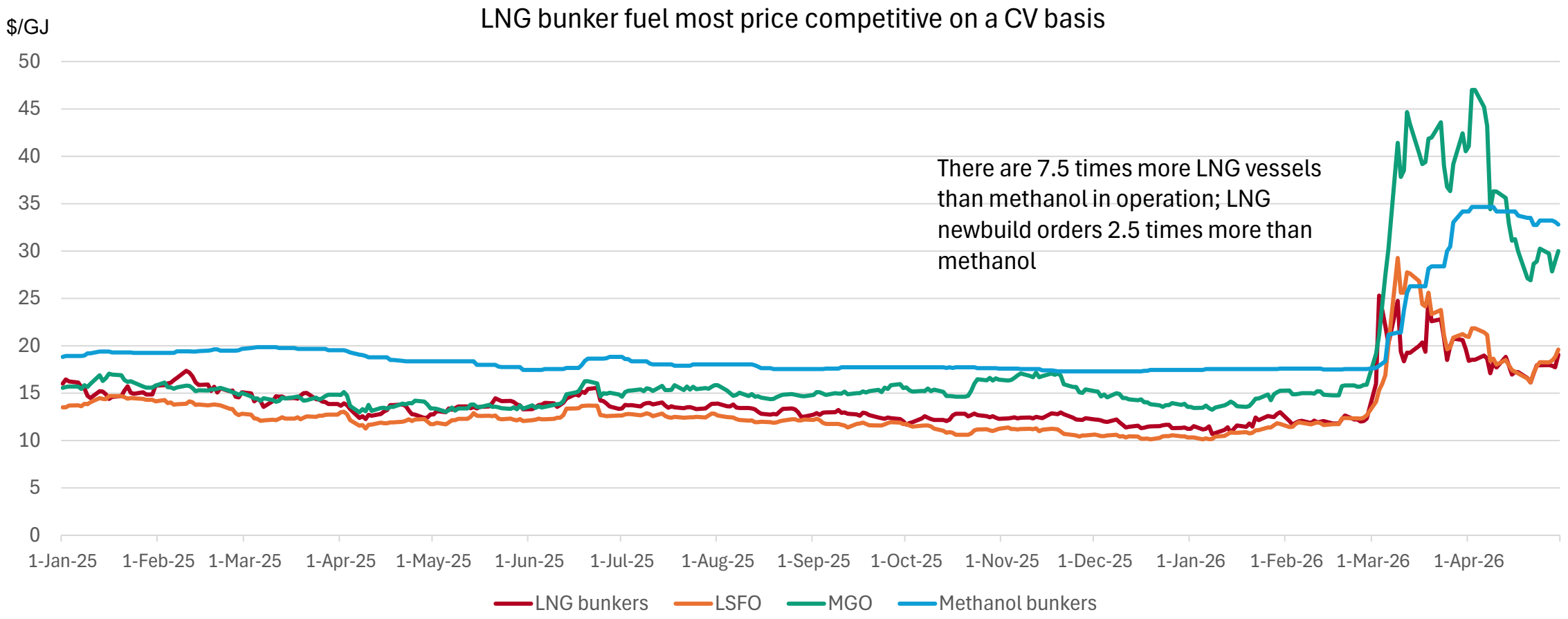
Multi-fuel future possibilities slow adoption and scaling of methanol marine fuel

- Shipowners grappling with choice: ammonia, methanol, hydrogen, LNG
- Competition for bio feedstocks with aviation, road transport, land-use conflicts

Source: S&P Global Energy

S&P Global Energy

Comparison of fuels by calorific value $/GJ



Source: S&P Global Energy

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Conclusion

- Methanol faced with capacity and affordability challenges.
- Demand growth supported by macro economic fundamentals and downstream economics.
- US-Iran war halts Iran, Saudi Arabia and Qatar trade flow to Asia. Prices soar to an all-time high.
- Arbitrage between China and SEA, India and NEA opens. Oman and China step up supply to India, SEA and NEA
- Low-carbon methanol bunker demand lackluster in Europe a year after FuelEU Maritime mandate come into force. Trading activity in Asia thin, prices stable due to lack of liquidity.
- FuelEU Maritime remains the sole driver of maritime decarbonization.
- Demand and supply of low-carbon methanol bunkers expected to pick up by 2030.

Platts Global Methanol Team Contact Info

Esther Ng
Global Methanol Lead
esther.ng@spglobal.com

Amanda Chia
Senior Analyst, Methanol & Derivatives
amanda.chia@spglobal.com

Sophie Su
Associate Director, Asia Methanol & Derivatives
sophie.su@spglobal.com

Fumiko Dobashi
Manager, Asia Chemicals
fumiko.dobashi@spglobal.com

Kamna Kapoor
Senior Price Reporter, India Methanol
kamna.kapoor@spglobal.com

Luke Warren
Associate Price Reporter, Europe Chemicals
luke.warren@spglobal.com

Andre Mikhail
Price Reporter, US Chemicals
andre.mikhail@spglobal.com

Maria-Eleni Tsimeki
Manager – Intermediates
maria-eleni.tsimeki@spglobal.com

Cheong Su Yeen
Associate Editorial Director, Asia Chemicals
suyeen.cheong@spglobal.com

Akshay Malhotra
Associate Director, Americas Lead, Methanol & Derivatives
akshay.malhotra@spglobal.com

Olivier Maronneaud
Global Analytics Lead, Methanol & Derivatives
olivier.maronneaud@spglobal.com

Maria Tsay
Petrochemicals Global Director
maria.tsay@spglobal.com

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Price · Predict · Perform

Recycled Plastics:
Capacity, Regulation, and Pricing- What's Shaping the Market

Helen McGeough, Global Lead Plastics Recycling & Sustainability

Bala Ramani, VP APAC Consulting

APIC 2026
Asia Petrochemical Industry Conference
FUKUOKA, JAPAN

Agenda

01 Global landscape for mechanical recycling – can capacity keep up with demand

02 Global regulatory developments and their impact on demand for recycled plastics

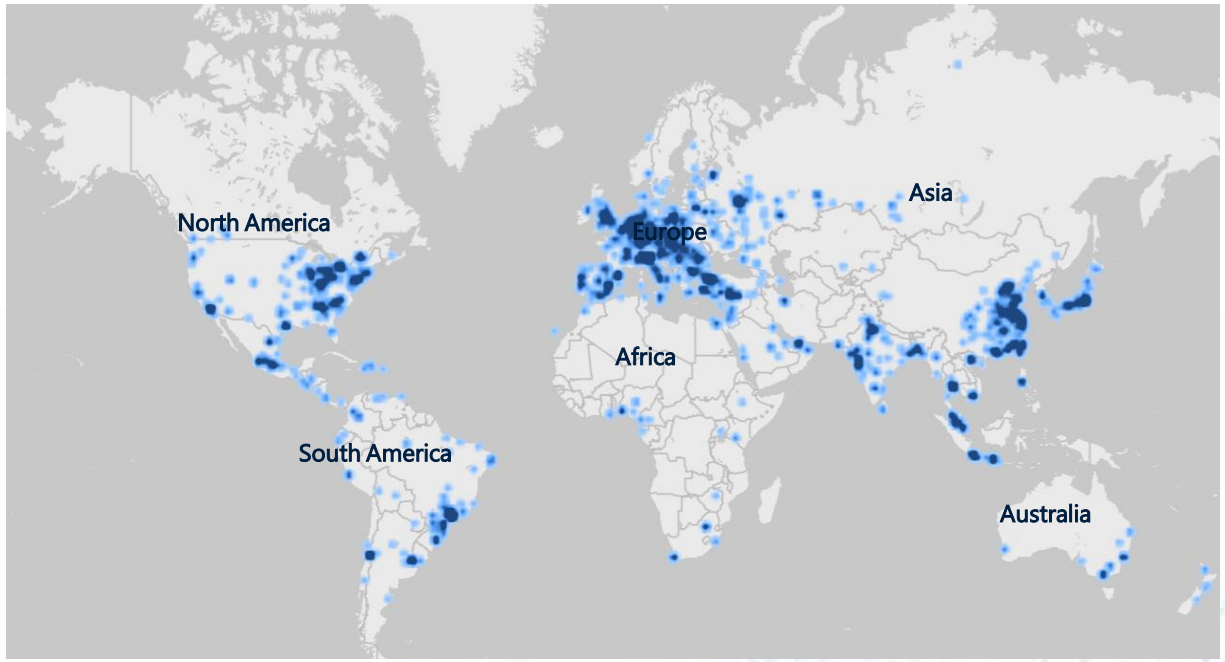
03 Pricing trends for recycled plastics in key markets and what this means for the industry

04 Plastics Pyrolysis: Developments and outlook

Mechanical recycling is relatively established in comparison to nascent but fast developing chemical recycling industry

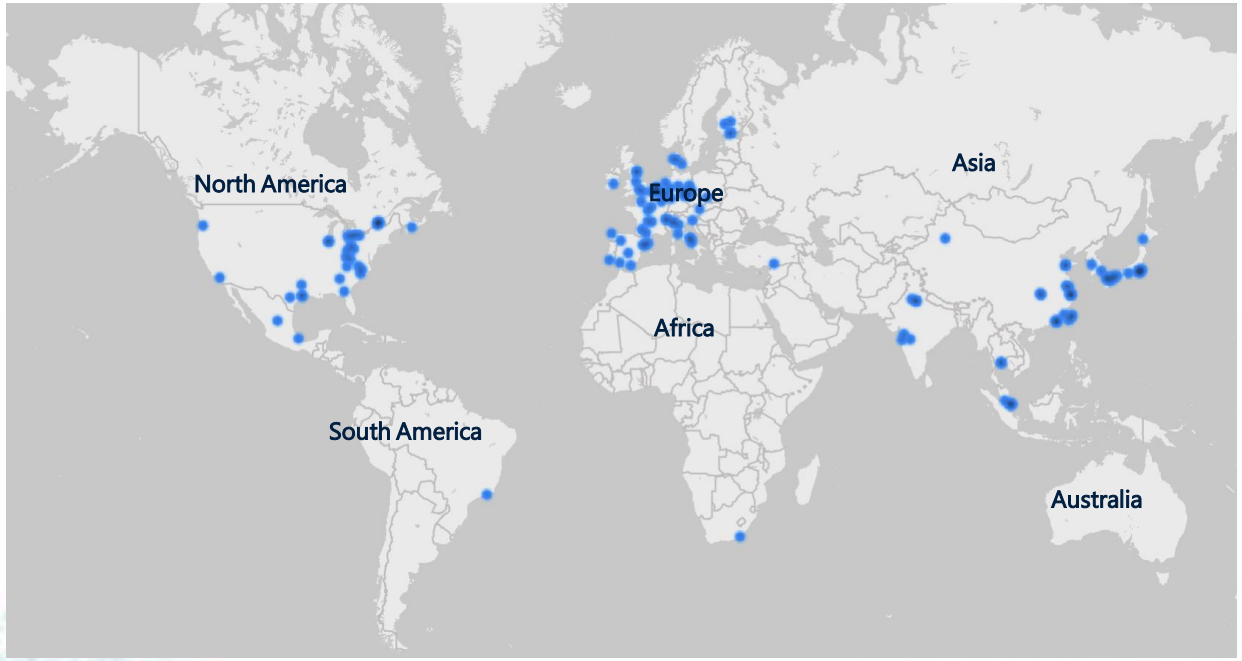
Asia dominates installed mechanical recycling capacity, representing 42% of global share

Mechanical Recycling Supply Tracker



Mechanical recycling plants*, operating and construction***
~2400 plants globally

Chemical Recycling Supply Tracker



Chemical recycling and dissolution plants**, operating and construction***
~160 plants globally

* *Includes PET, PE and PP capacities*
** *Chemical recycling includes pyrolysis-based projects (all types, excludes tyre pyrolysis), glycolysis, hydrolysis, methanolysis projects; for all relevant polymers and all plant scales (both pre-commercial and commercial)*
*** *Includes commissioning*

Source: ICIS Recycling Supply Tracker – Mechanical, 2026; ICIS Recycling Supply Tracker – Chemical, 2026

Each region has distinct drivers due to fundamentally different regulatory frameworks, market structures and underlying economics

Three core drivers for recycling market growth

North America

- Economics-driven procurement
- Brand pledges and consumer pressure
- State-level legislation – recyclate mandates and EPR

Europe

- EU-wide legislation – recyclate mandates and EPR with eco-modulation
- Brand pledges and consumer pressure
- Broader sustainability policy agenda

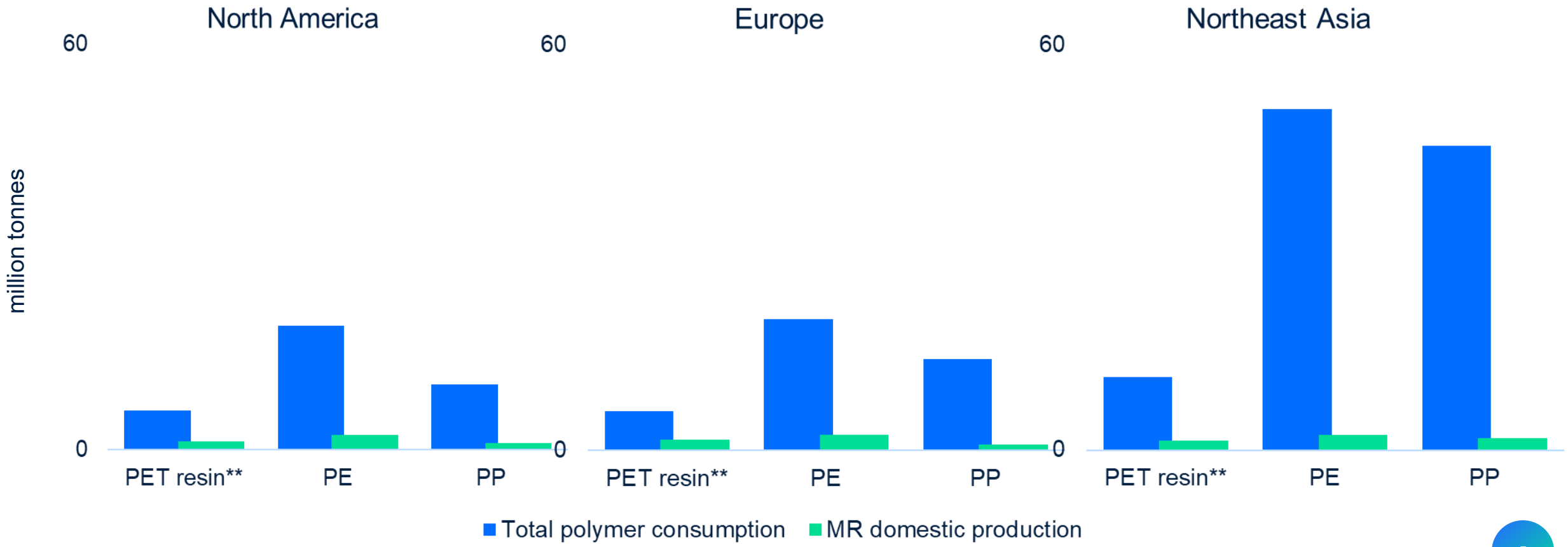
Asia

- Export-oriented manufacturing
- Drive to develop local infrastructure following waste import bans
- Material recovery as an income source for the informal sector

Source: ICIS Analysis

Recycled polyolefin market penetration lags behind rPET in all regions with rPP the least developed market

Recyclate output does not exceed 12% of domestic polymer consumption for rPE or rPP in any region



*Europe includes both EU, non-EU countries and Turkey

** PET resin includes bottle grade resin, which is most commonly used in bottle and container packaging

Source: ICIS Supply & Demand Database and Recycling Supply Tracker – Mechanical, 2026

Regional legislation can impact global recycling markets

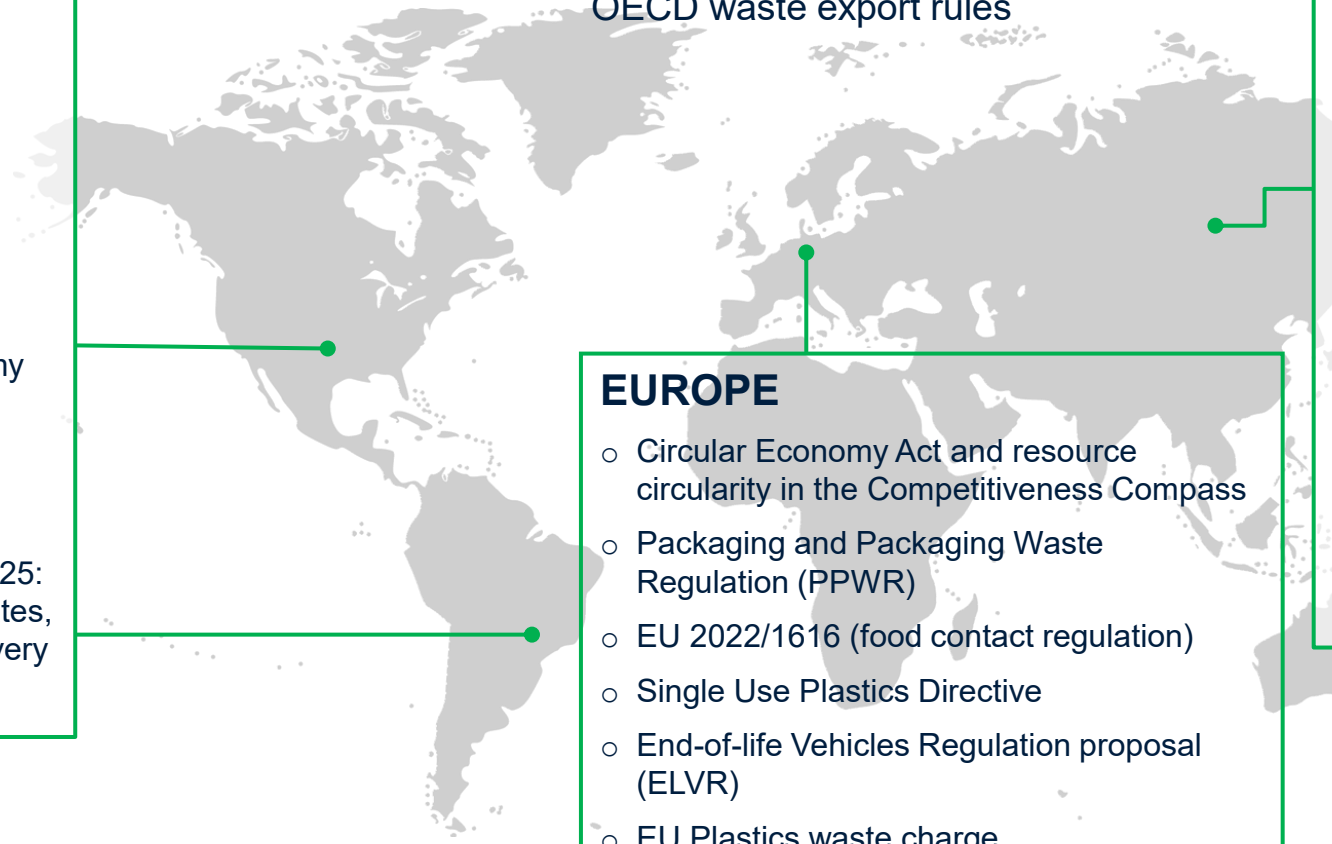
It drives long-term demand but also increases compliance costs for companies and determines need to reshape procurement strategies in the increasingly complex macro environment

AMERICAS

- Recycling and composting accountability Act
- Recycling infrastructure and accessibility Act
- US state EPR and PCR requirements
- CA provincial EPR
- CA Action Plan on Zero Plastic Waste
- Mexico Circular Economy Law (LGEC); binding principles for circular design, waste reduction and EPR
- Brazil decree 12,688/2025: recycled content mandates, binding targets for recovery and reuse

GLOBAL

Basel convention
UN Global Plastics Treaty
OECD waste export rules



EUROPE

- Circular Economy Act and resource circularity in the Competitiveness Compass
- Packaging and Packaging Waste Regulation (PPWR)
- EU 2022/1616 (food contact regulation)
- Single Use Plastics Directive
- End-of-life Vehicles Regulation proposal (ELVR)
- EU Plastics waste charge
- Country specific plastic packaging taxes

ASIA PACIFIC

- Country specific EPR, and SUP Bans
- Expanding DRS in many Asian jurisdictions
- Plastic waste trade restrictions in almost all countries
- Growing acceptance of food-contact applications, including China possibly in 2026
- Mandates for rPET use in most jurisdictions, including India from 2025
- China - New national standards related to recycled plastics being implemented in 2026
- ASEAN-wide / coordinated plans and actions, e.g.
  - ASEAN Municipal Solid Waste Management Enhancement (AMUSE)
  - Regional Action Plan for Combating Marine Debris

** Not exhaustive list which includes both adopted and drafted legislation*

EU regulation creates strong demand drivers for high quality recyclate into packaging and automotive applications

The upcoming Circular Economy Act could introduce new incentives for recycling into other sectors such as textiles and electronics

Packaging and Packaging Waste Regulation (PPWR)

Minimum recycled content targets	2030	2040
For contact sensitive packaging made of plastic other than PET (excluding single-use plastic beverage bottles)	10%	25%
Single-use plastic beverage bottles	30%	65%
Remaining types of plastic packaging	35%	65%

Proposed regulation on End-of-Life Vehicles (ELVR)

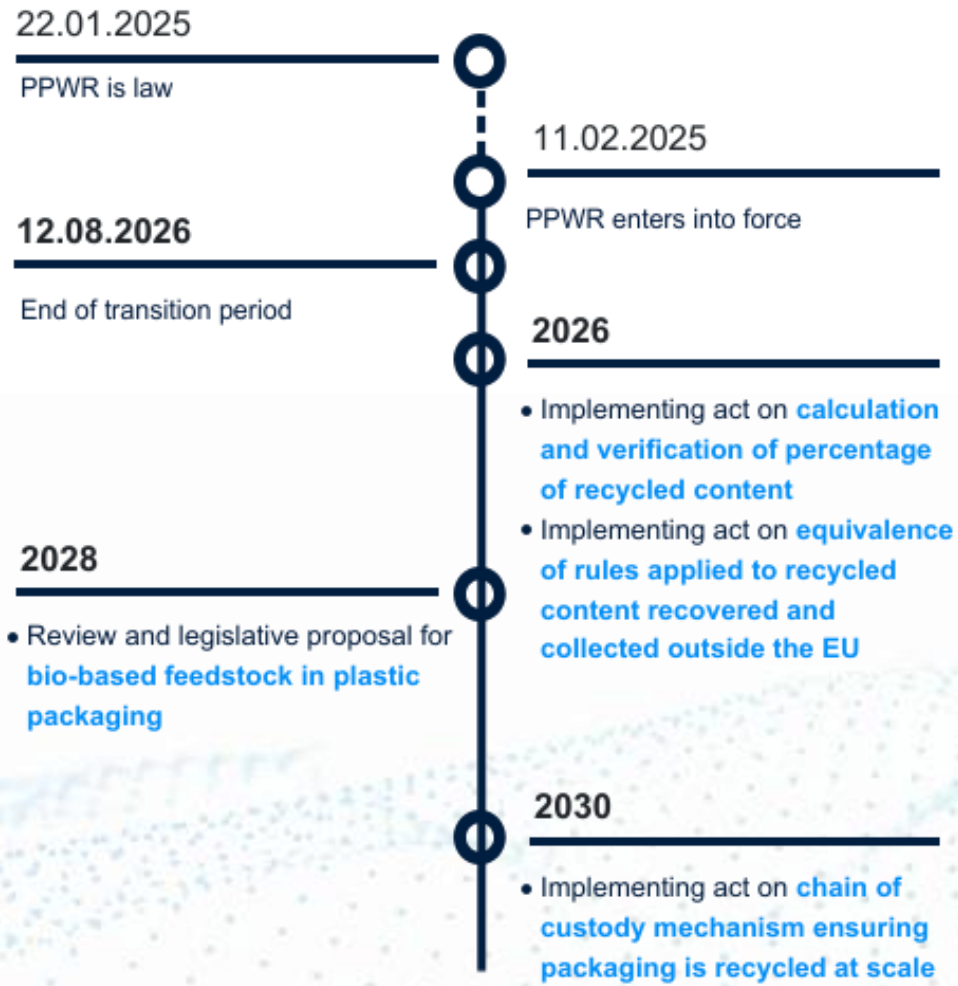
Minimum recycled content targets	+6 years	+10 years
	After entry into force	
For new vehicles with 20% of recycled content sourced from end-of-life vehicles (closed loop)	10%	25%

Key challenges:

- Ambitious minimum recycled content targets set for all packaging
- Food contact solution for non-PET polymers challenge
- Reuseability targets
- Chemical recycling status

However, uncertainty with implementation and enforcement might become a challenge for the industry to meet ambitious targets

Key milestone schedule for PPWR secondary legislation



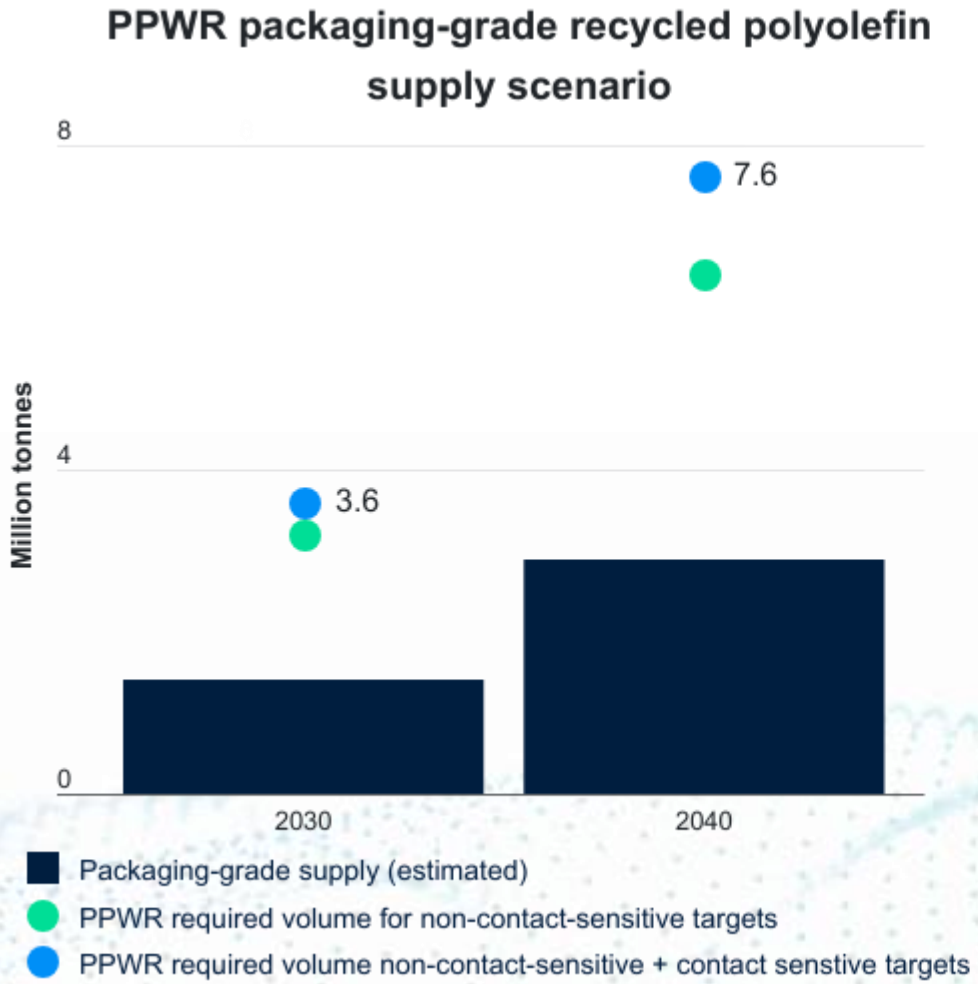
Source: ICIS Analysis

Key uncertainties delaying investments in European recycling:

- Equivalence rule for imports
- Role of bio-based policy
- Mass-balance accounting approach
- Enforcement mechanisms
- Roles of economic operators

Europe risks falling short of 2030 targets at current rate of investment

A shortfall of 1.8 million tonnes is currently estimated on non-contact-sensitive 2030 targets alone*



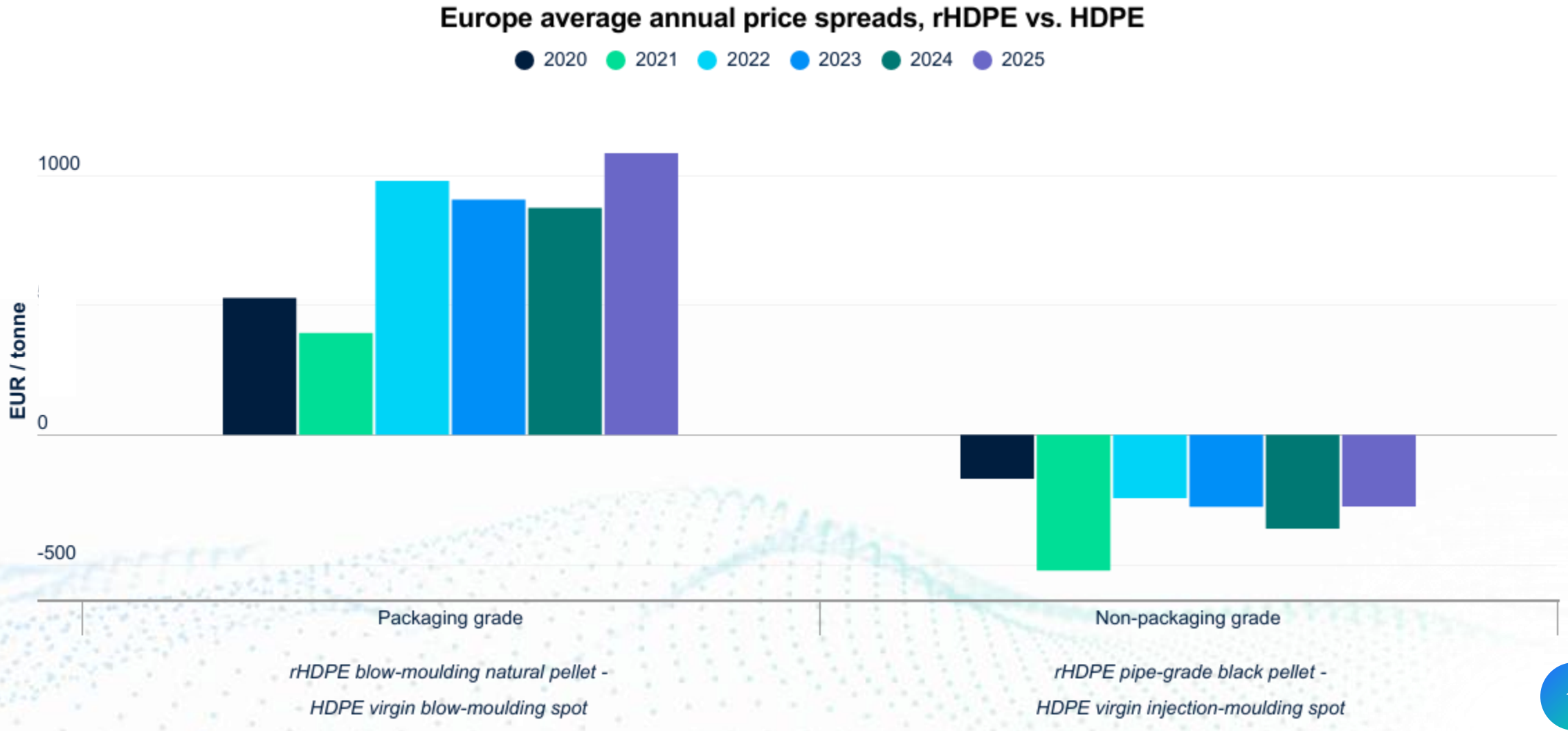
Pathways for meeting PPWR mandates

- **De-risk investments to accelerate domestic capacity expansion** — *Most preferable*
- **Expand scope to allow bio-based plastics**
- **Avoid prohibitive equivalence rules for imports**

** Preliminary estimate. Final estimation is to be released by ICIS shortly*
Source: ICIS Supply and Demand database, ICIS Analysis 2026

The EU example demonstrates that legislation can drive price premiums for high quality recyclate

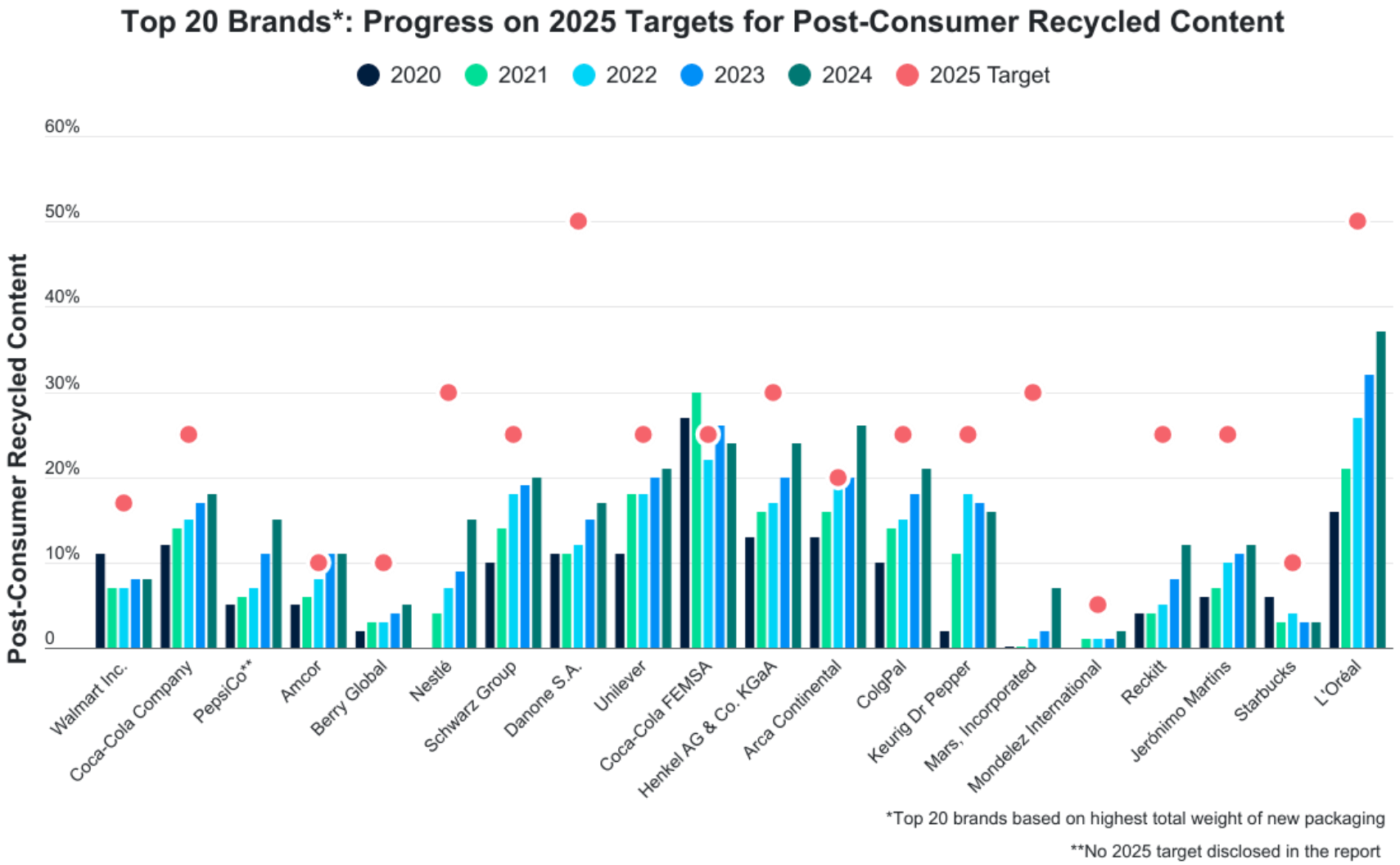
Case study for European rHDPE illustrating the impact of PPWR mandates on packaging grades



Source: ICIS Pricing

The sustainability agenda is competing with tough macroeconomic conditions

Global brands lagging in their commitments while many recyclers struggle to deliver financial results



Source: Ellen MacArthur Foundation Global Commitment Progress Reports 2025, adapted by ICIS

Bankruptcies – the realities

“The recent wave of recycling plant closures in Europe is due to the interplay of multiple complex factors.”

“…ownership profiles can influence the risk of closures”

“...local government policies or infrastructure can impact the sector..”

“Breaking down the closures and investments by polymer illustrates stark differences across markets…”

Recycling legislation in Asia Pacific is developing but fragmented

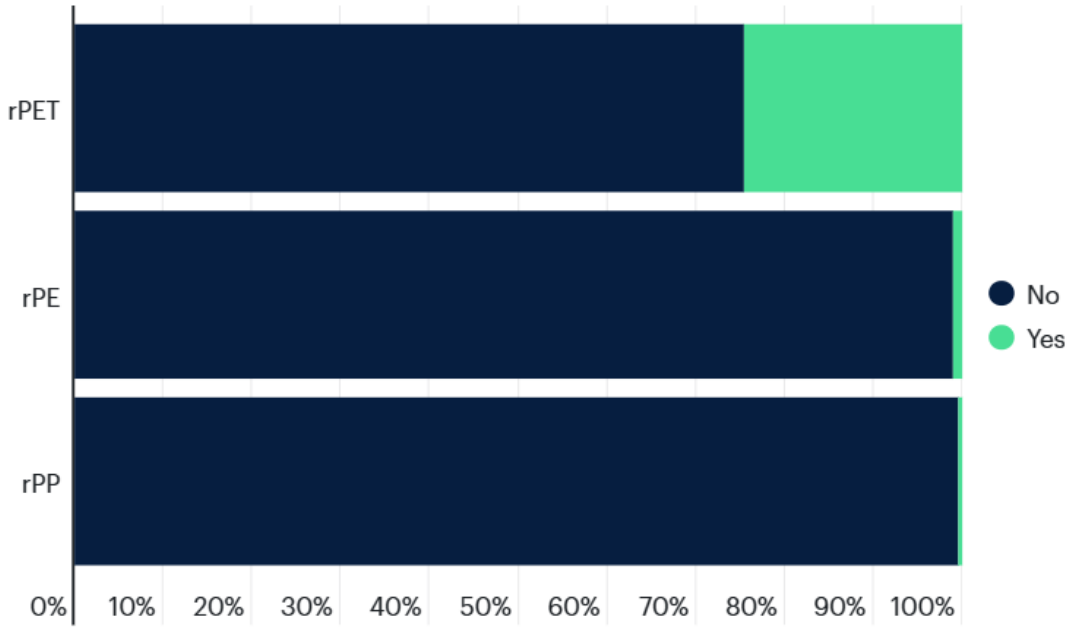
To date only Japan and India have implemented mandatory recycled content targets

Source: ICIS analysis, May 2026

Packaging focus generates challenges for APAC recycled polyolefins

APAC food-grade vs non-food-grade recycling capacity by polymer

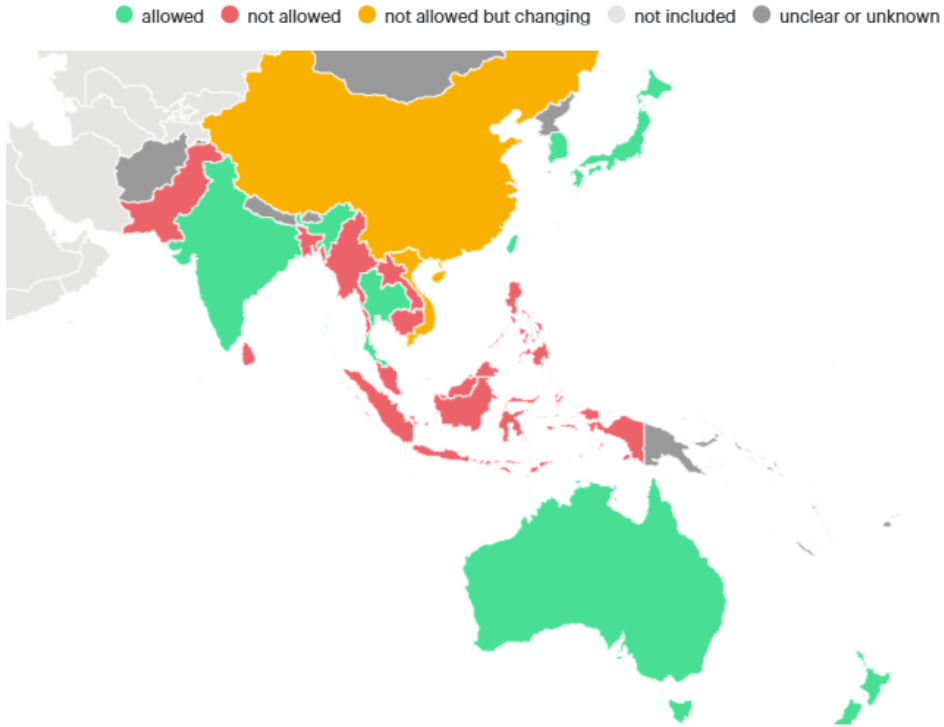
Share of total mechanical recycling capacity eligible for food-grade applications, by polymer. Includes all globally recognised certifications (i.e. FDA, EFSA).



Source: ICIS Mechanical Recycling Supply Tracker, May 2026

Recycled plastics use for food-grade application APAC

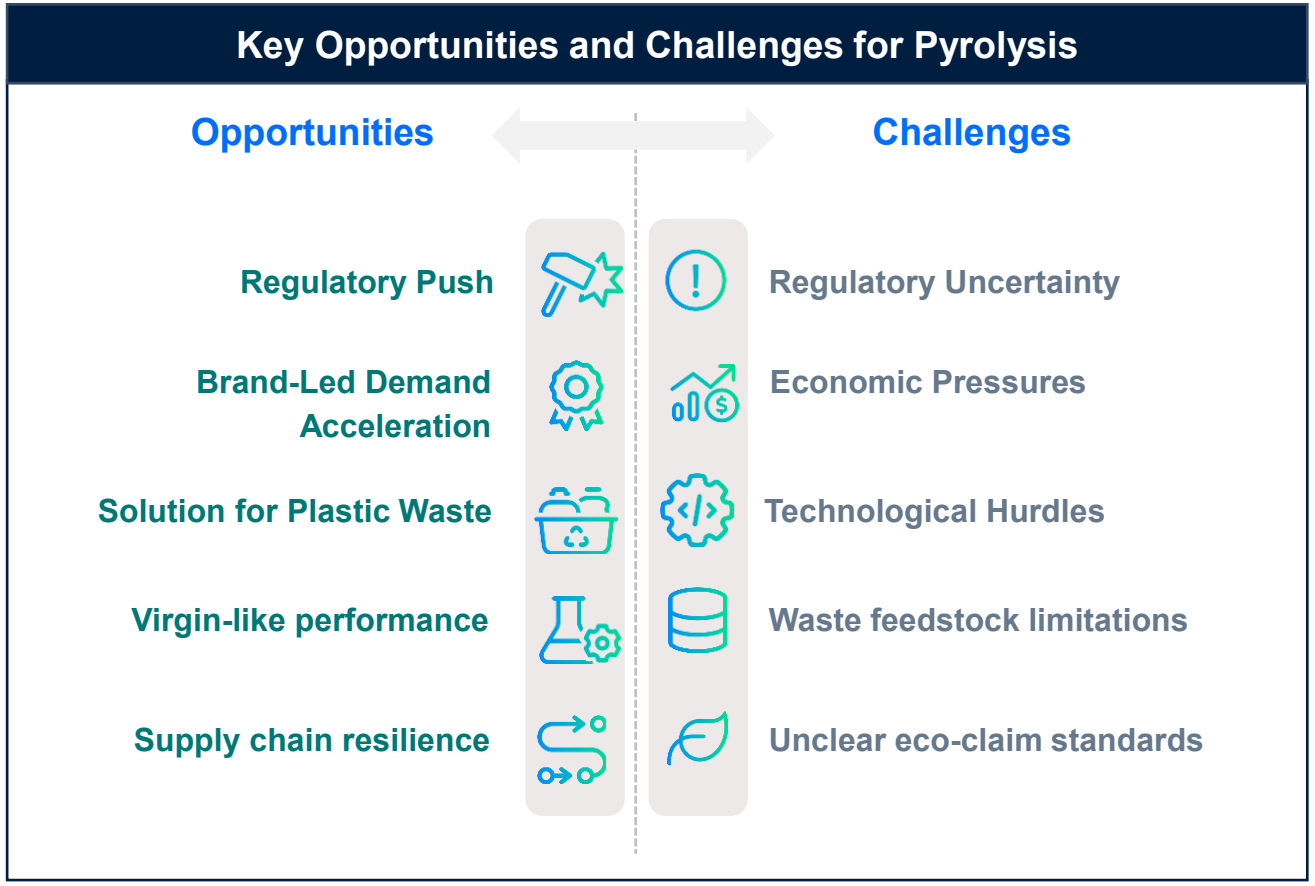
Jurisdictions explicitly allowing use of recycled plastics in food-grade applications



Source: ICIS data analytics, as of May 2026

Regulation and brand commitments are driving Pyrolysis & Circular Polymers demand although the market continues to face uncertainties.

Opportunities and Challenges for Chemical Recycling via Pyrolysis

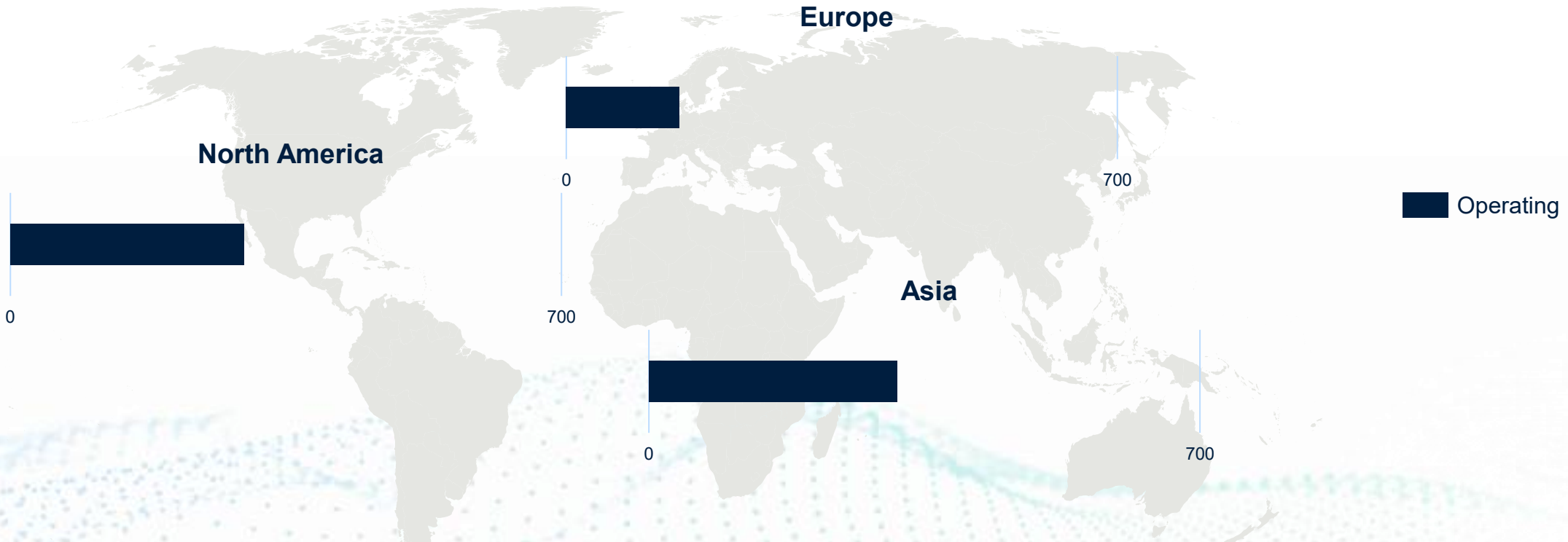


- Demand for circular polymers is being driven by a confluence of **regulatory pressures**, **corporate sustainability commitments** and **increasing consumer demand** for eco-friendly products.
- These forces, combined with the ability of pyrolysis derived polymers to produce high-quality recyclates suitable for sensitive applications, positions them as a **key solution** in addressing **the global plastic waste crisis** and **achieving ambitious net-zero targets**.
- Despite this, **challenges remain** in the sector which are inhibiting the uptake of investment.

Chemical recycling via pyrolysis is a nascent market, with limited operating capacity at ~750 kt

Most of this capacity does not operate continuously due to challenges such as inconsistent feedstock and variable output slates

Global Operational Pyrolysis Capacity by Region, thousand tonnes

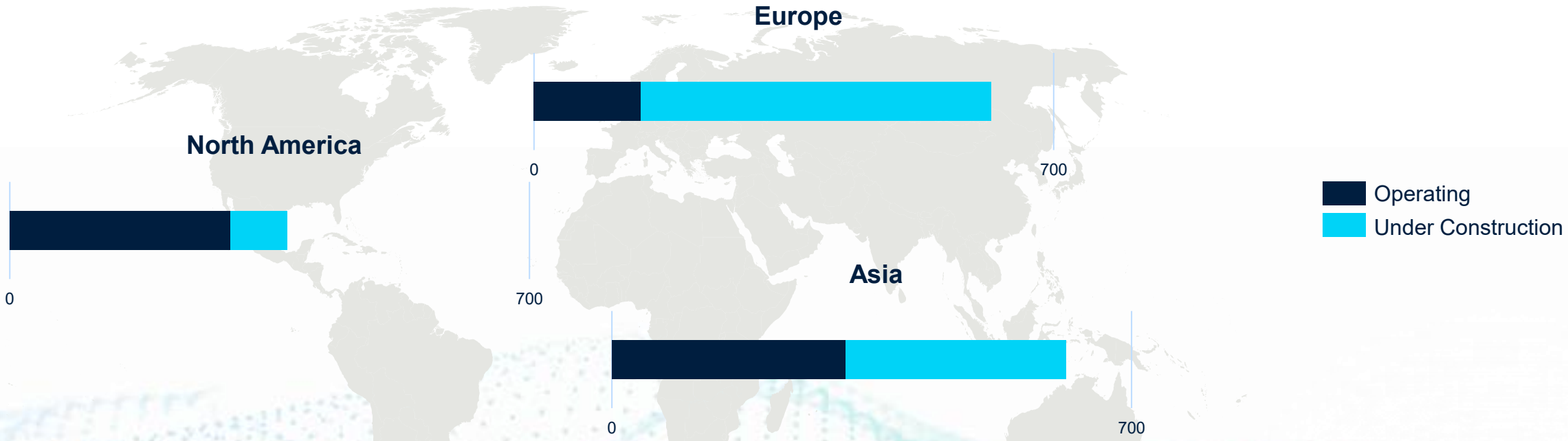


Source: ICIS Recycling Supply Tracker – Chemical

Global pyrolysis capacity could reach ~1.6 million tonnes by 2030

Improvements in waste collection and sorting will be critical to the successful implementation of these projects

Global Pyrolysis Capacity by Region (2030), thousand tonnes



Source: ICIS Recycling Supply Tracker – Chemical

Emerging recycled content mandates are creating demand signals for Circular Naphtha and Circular Polymers

The Pyrolysis Opportunity for Asia is Multifold

- **EU Packaging**
  PPWR · 35% recycled content in packaging by 2030
- **EU Automotive**
  ELV Regulation · 25% recycled plastic in vehicles
- **India**
  PWMR · 60% recycled content in rigid packaging by 2028
- **Asian exports to EU**
  PPWR embedded in products sold into the EU market
- **Circular naphtha**
  Feedstock from regional plastic waste

European supply unlikely to keep pace with demand

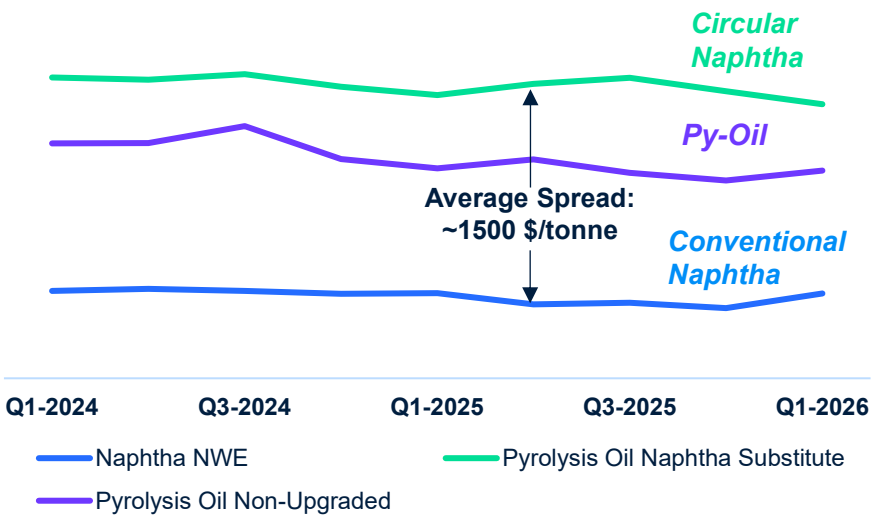
Asia's Export Oriented Converter Led Demand

Feedstock Security

Circular polyolefins are expected to command significant premiums over virgin polyolefins due to high production costs and limited supply

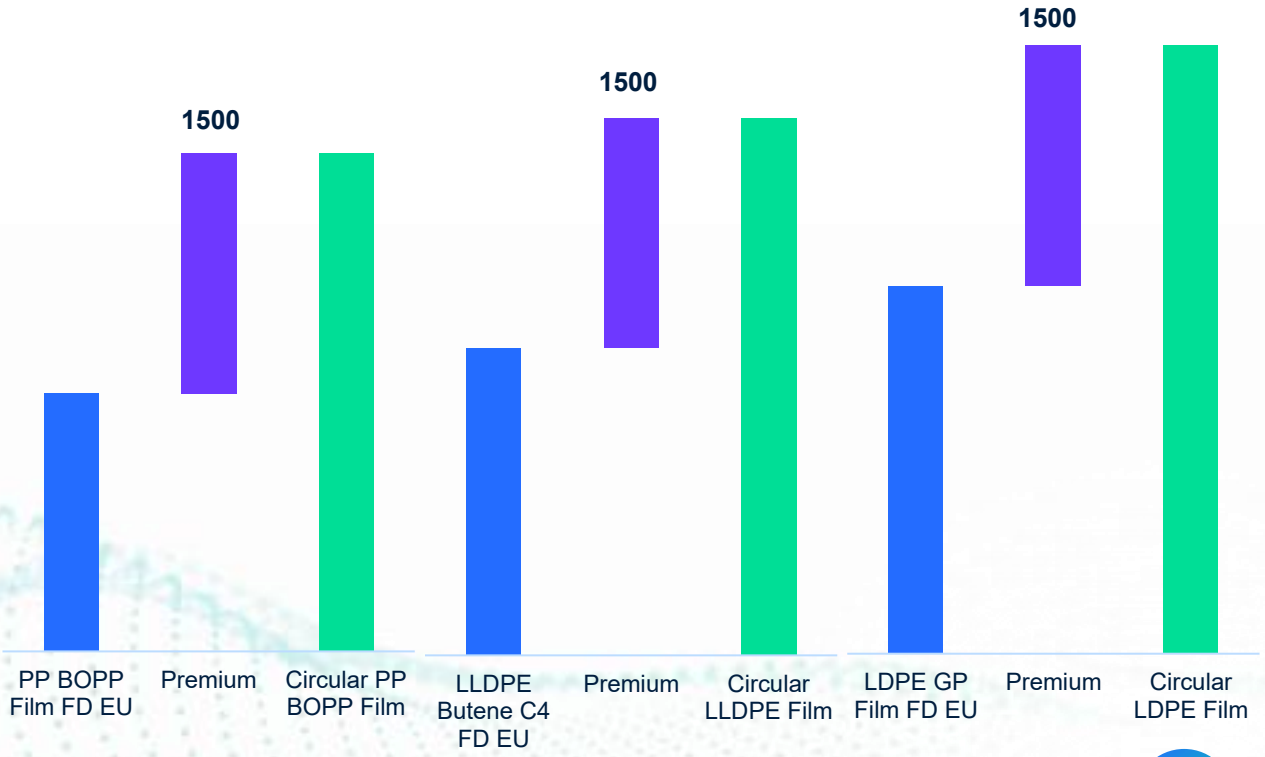
However, as scale and availability grow, premiums are expected to taper over the long term

Europe: Pyrolysis oil vs Naphtha Spread USD/tonne



Applying the spread to virgin polyolefins prices

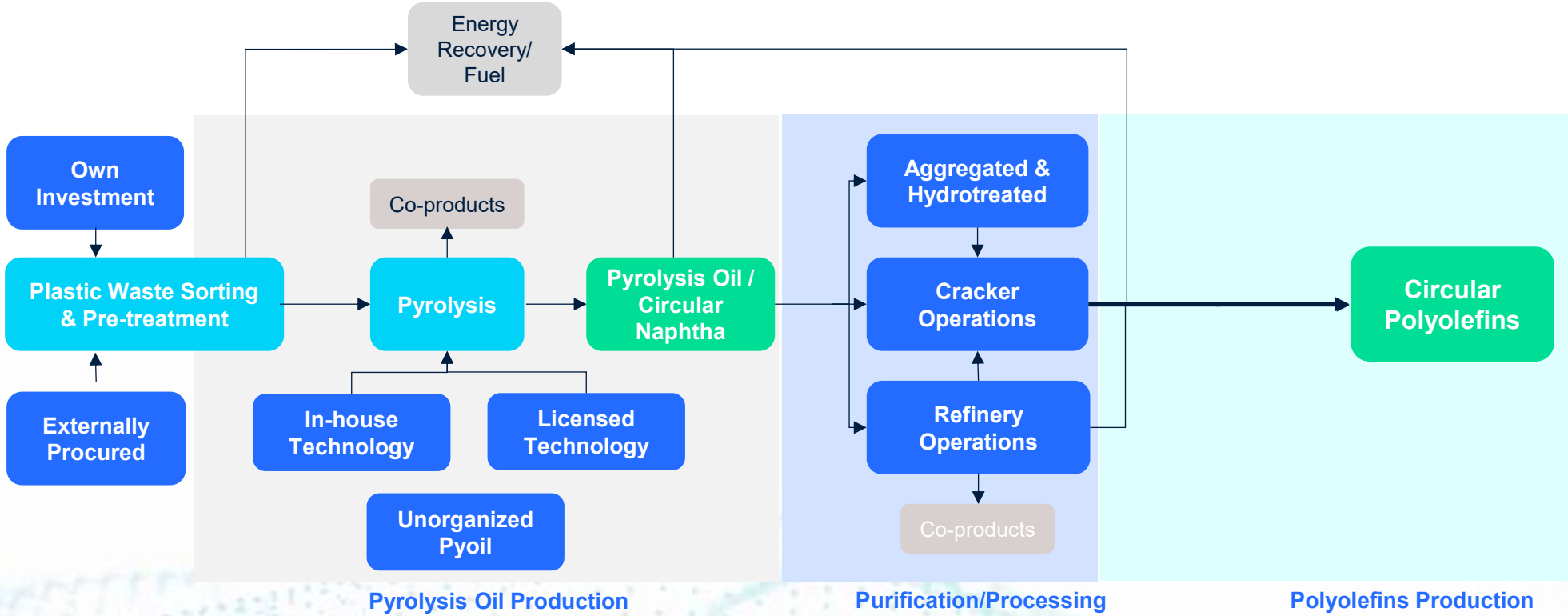
Europe: Likely Circular Polyolefins Prices USD/tonne



Source: ICIS Pricing

Polyolefins producers can maximize the value of pyrolysis oil integration by strategically aligning feedstock procurement, technology, and processing configurations

Securing consistent quality and quantity of plastic waste is proving as a key strategic advantage



Access to Plastic Waste

Access to Pyrolysis Technology

Processing Configuration

Source: ICIS Consulting

From Progress to Scale

The Case for Asia

- Feedstock scale, manufacturing capacity and growing policy momentum
- Both mechanical and chemical recycling gaining traction

The Gaps That Remain

- Market access, regulatory clarity and demand signals still developing
- Conditions for investment confidence still developing

Need for Collaboration

- Producer commitments, policy frameworks and commercial models need convergence
- Collective direction will set the pace of scale

Thank you

Helen McGeough, Global Lead Plastics Recycling & Sustainability, helen.mcgeough@icis.com

Bala Ramani, VP APAC Consulting, bala.ramani@icis.com

I·C·I·S | Price • Predict • Perform

Biochemicals and Circular Feedstocks

Navigating Policy, Market Dynamics, and Industry Outlook

APIC 2026, Fukuoka, Japan

Timo Tumuscheit
VP Business Development, Chemicals

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

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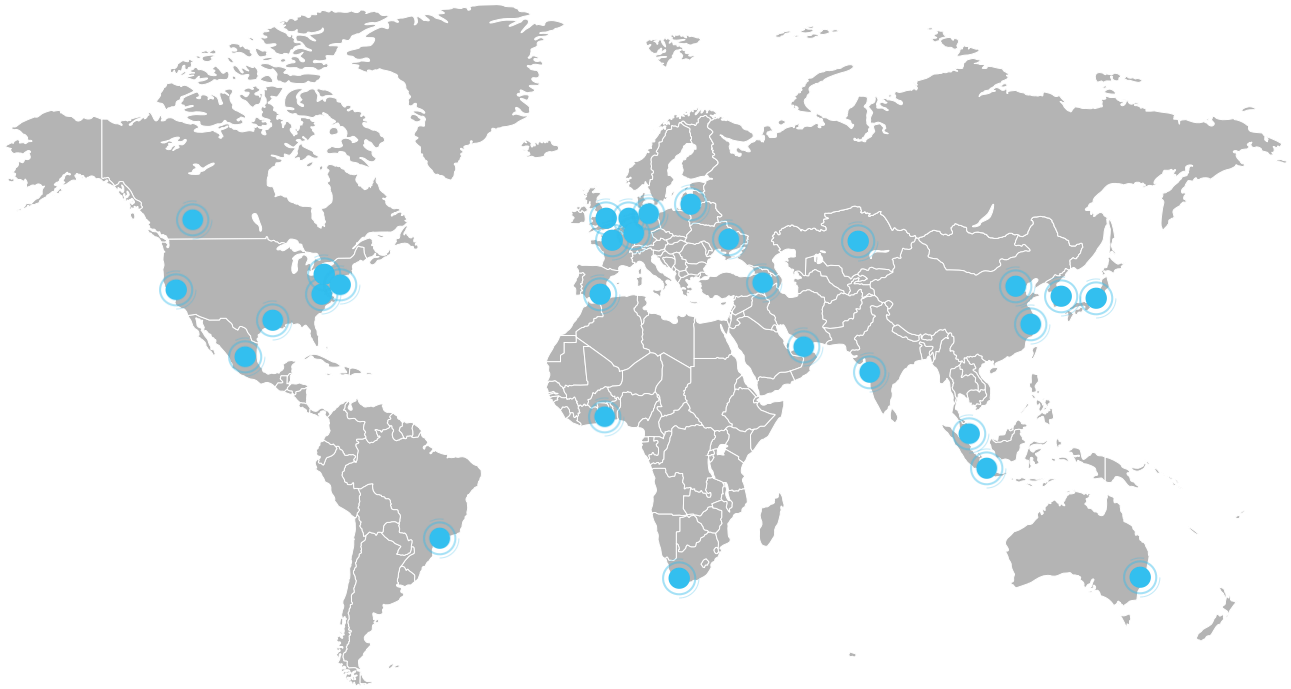
- Asia-Pacific LPG
- Coal
- European steel
- US and European environmental markets

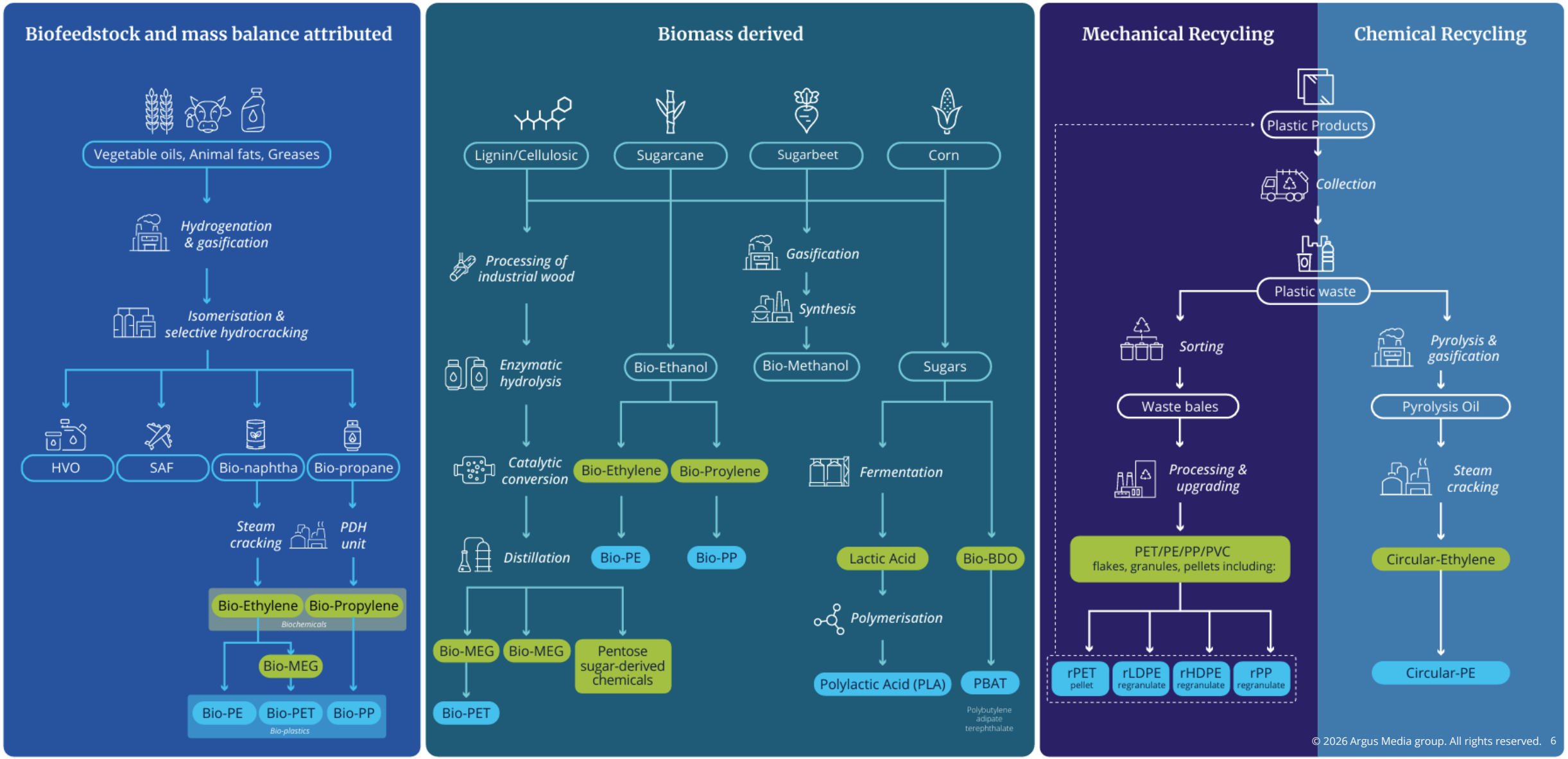


Contents

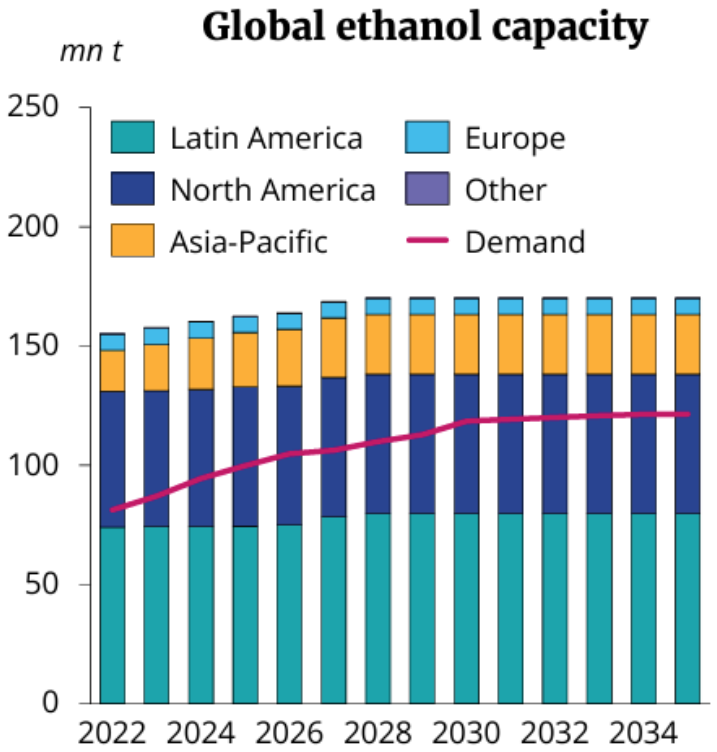
- Sustainable feedstocks unlocked
- Biochemicals & recycled polymers prices
- Recycling and circularity mandates
- Chemical recycling landscape & outlook
- Argus circular workspace solutions

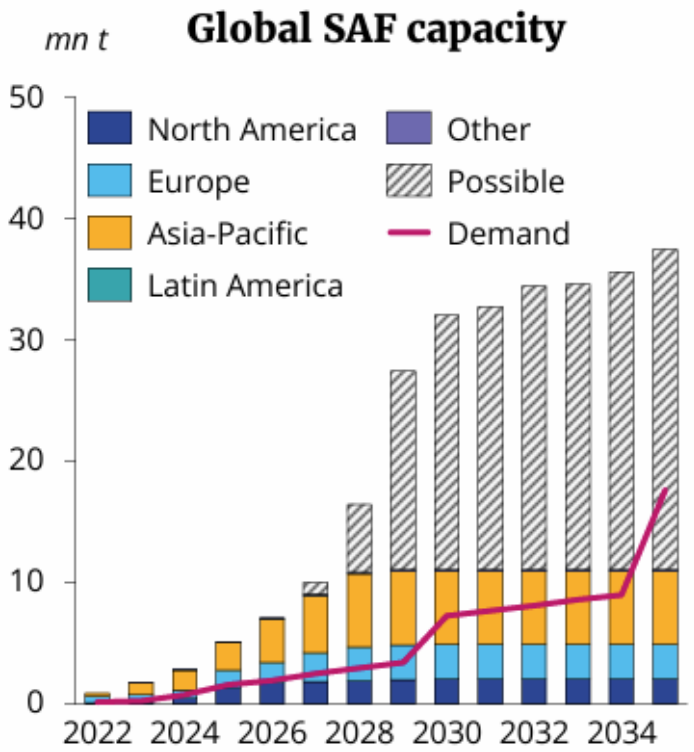
Sustainable feedstocks unlocked

The routes to sustainable chemicals and plastics

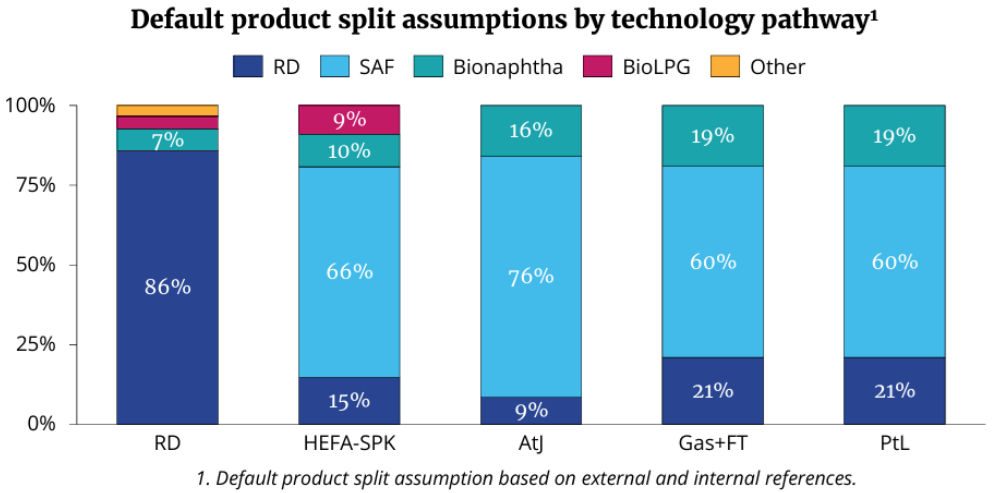


Global ethanol, SAF, and bionaphtha capacities





- Global ethanol capacity expected to reach 163.6 MMt in 2026
- Global SAF capacity reached 6 MMt in 2026, projected to grow to 9 MMt in 2027
- SAF bionaphtha yield 10-20% → resulting in approx. 600 kt to 1.2 MMt in 2026
- Asia's bionaphtha capacity ~360 to 720 kt (based on operational SAF plants)



1. Default product split assumption based on external and internal references.

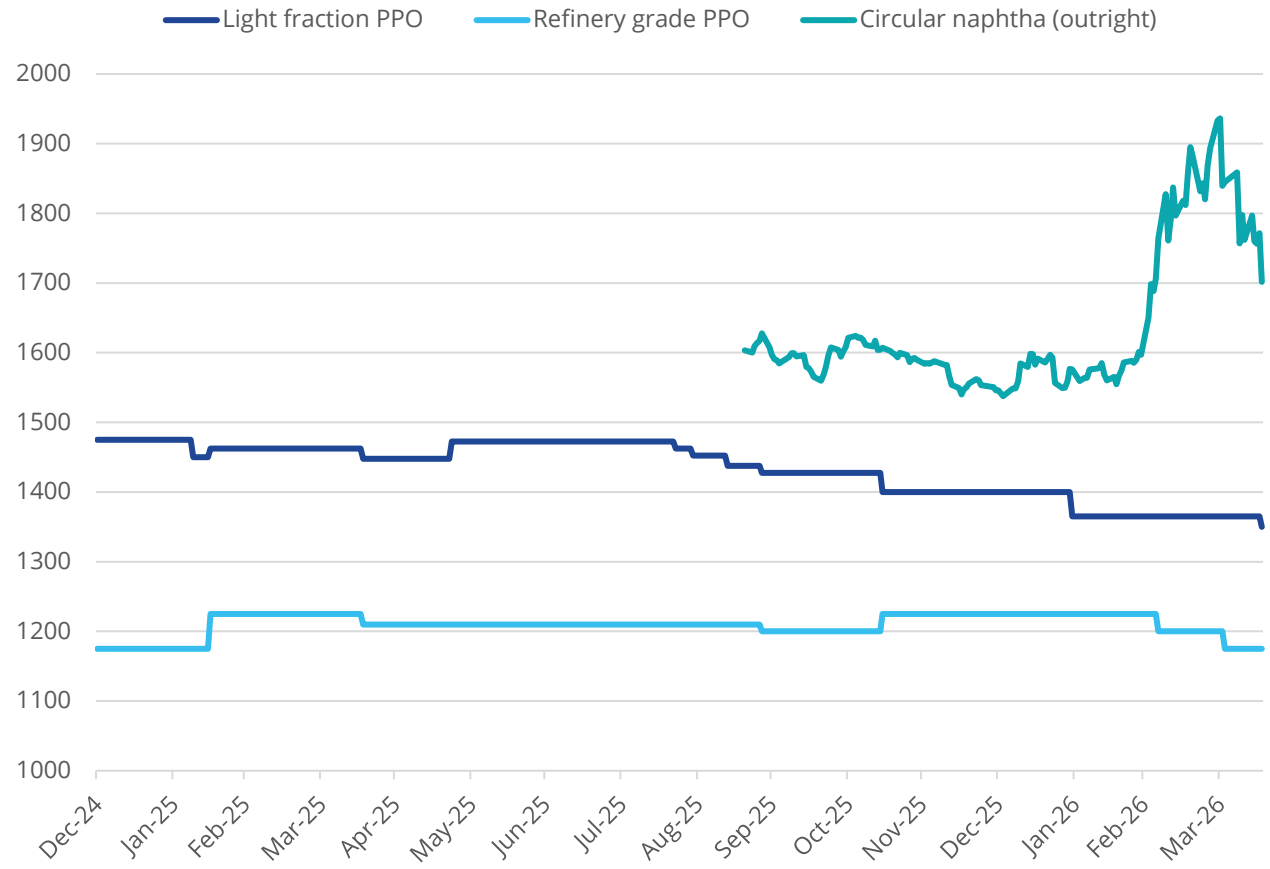
Source: Argus Biofuels Analytics

Bionaphtha follows conventional naphtha's volatility

- New assessment split between ISCC+ chemical feedstock and ISCC EU RED bionaphtha
- Europe: Limited role in gasoline blending to meet renewable transport mandates
- Asia: Primarily used as a drop-in substitute for fossil naphtha in low-carbon chemicals, driven by voluntary demand
- Price trend: Supported by tighter supply (regional outages) and a shift toward HVO over SAF (reducing byproduct output)
- Chemical demand muted with few indications and all eyes on conventional naphtha

PPO pricing softens since start of conflict

NWE circular feedstock prices (€/t)



- Prices: European PPO prices have softened since the start of the US–Iran conflict
- Demand: Circular feedstocks deprioritized amid crisis; limited volumes constrain substitution for fossil feedstocks
- Operations: Planned cracker maintenance has further reduced demand
- Trade flows: Mostly refinery-grade (“full-range”) PPO to upgraders/refineries
- Light fraction PPO: Very limited demand for direct cracker blending
- Circular naphtha: Still trades at a premium to fossil; premium cut by ~$150/t since conflict onset, but levels remain largely notional

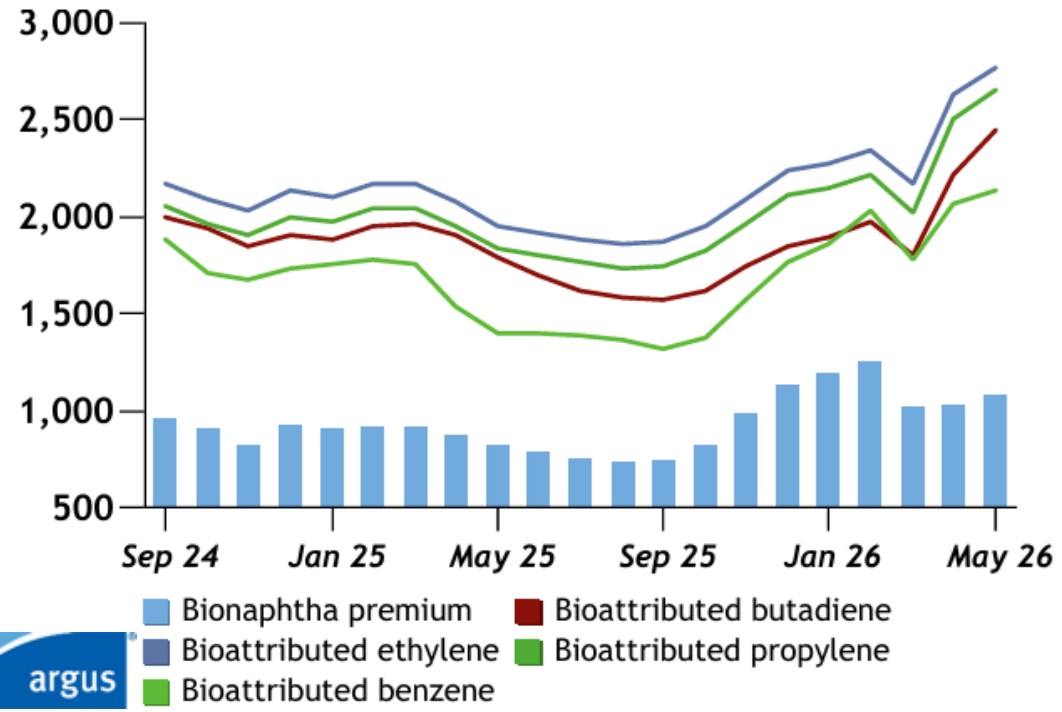
Biochemicals & recycled polymers prices

Argus biochemicals prices on a cost-plus basis

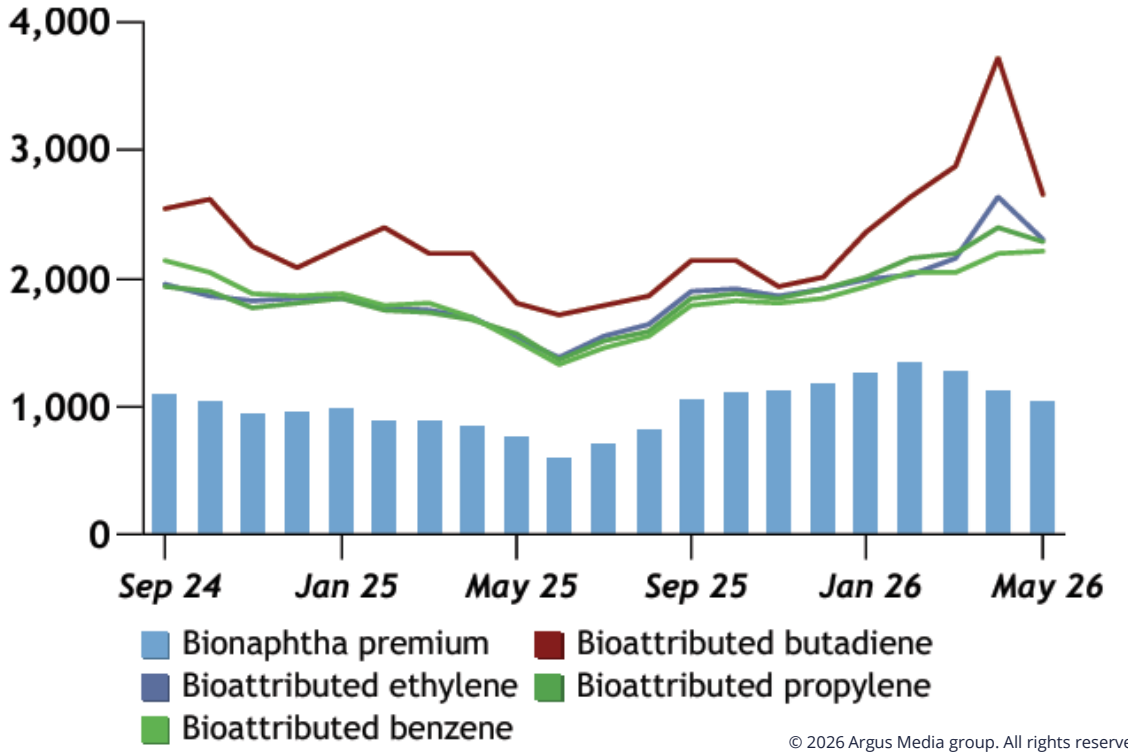
Western Europe feedstock premiums - 13 May				€/t
	Timing	Price	Change	±
Bionaphtha-naphtha premium	Apr 26	1,072.2	+36.7	▲
Biopropane-propane premium	Apr 26	685.3	-10.0	▼

Asian feedstock premiums - 13 May				$/t
	Timing	Price	Change	±
Bionaphtha-naphtha premium	Apr 26	1,032.0	-96.7	▼

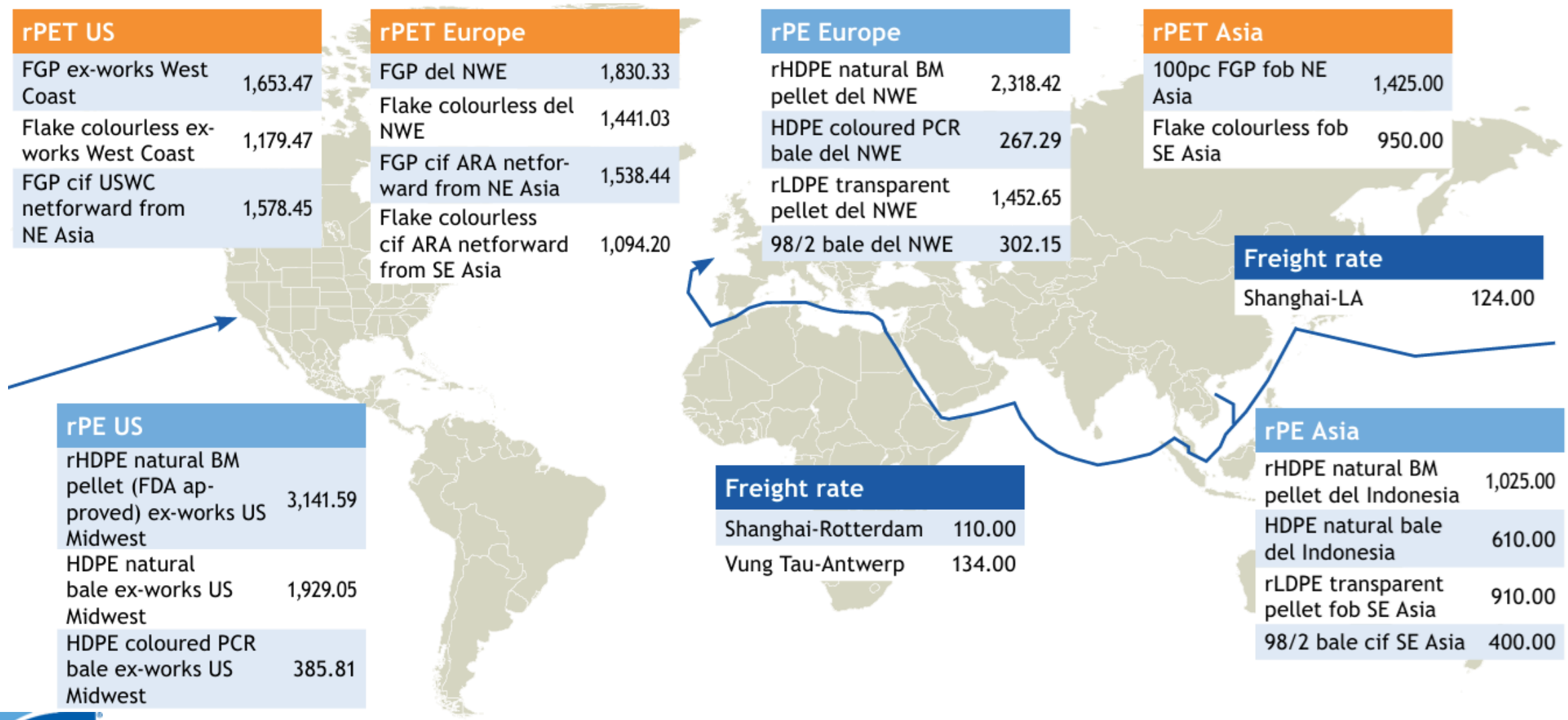
European bionaphtha bioattributed chemical prices €/t



Asia bionaphtha bioattributed chemical prices $/t



Global recycled polymer prices as of 15.5.2026 in $/t



rPET US	
FGP ex-works West Coast	1,653.47
Flake colourless ex-works West Coast	1,179.47
FGP cif USWC netforward from NE Asia	1,578.45

rPET Europe	
FGP del NWE	1,830.33
Flake colourless del NWE	1,441.03
FGP cif ARA netforward from NE Asia	1,538.44
Flake colourless cif ARA netforward from SE Asia	1,094.20

rPE Europe	
rHDPE natural BM pellet del NWE	2,318.42
HDPE coloured PCR bale del NWE	267.29
rLDPE transparent pellet del NWE	1,452.65
98/2 bale del NWE	302.15

rPET Asia	
100pc FGP fob NE Asia	1,425.00
Flake colourless fob SE Asia	950.00

Freight rate	
Shanghai-LA	124.00

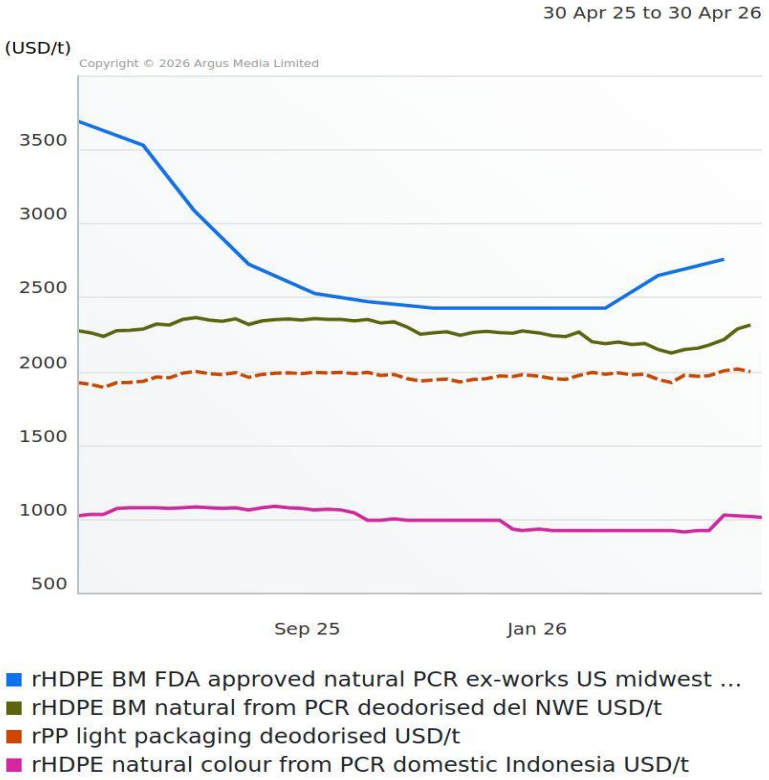
rPE US	
rHDPE natural BM pellet (FDA approved) ex-works US Midwest	3,141.59
HDPE natural bale ex-works US Midwest	1,929.05
HDPE coloured PCR bale ex-works US Midwest	385.81

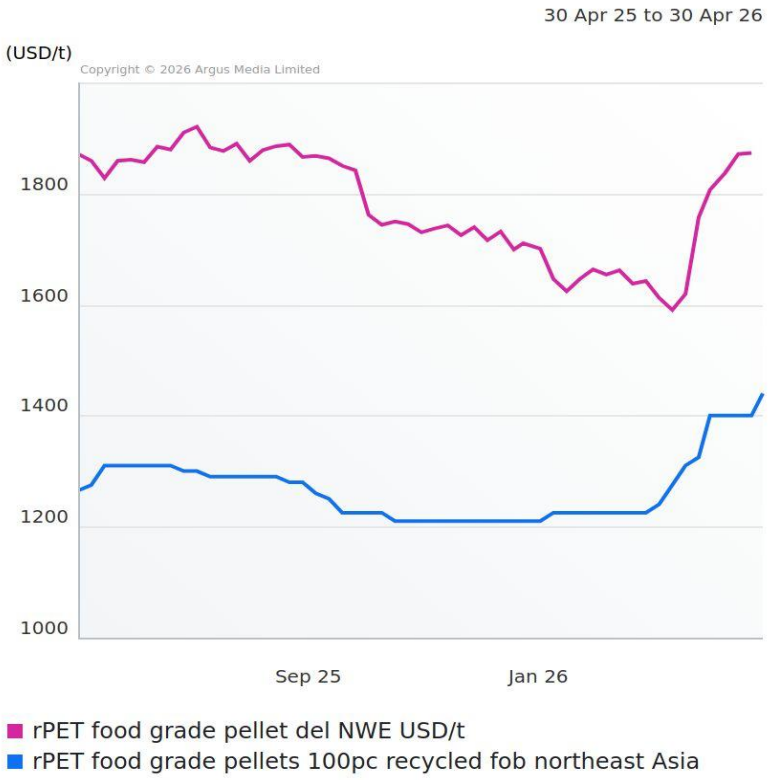
Freight rate	
Shanghai-Rotterdam	110.00
Vung Tau-Antwerp	134.00

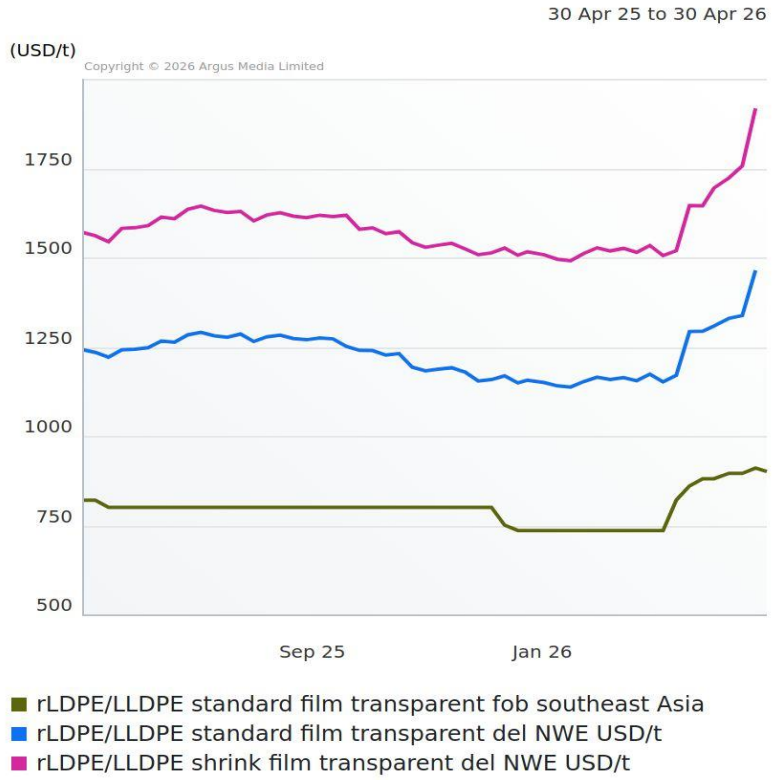
rPE Asia	
rHDPE natural BM pellet del Indonesia	1,025.00
HDPE natural bale del Indonesia	610.00
rLDPE transparent pellet fob SE Asia	910.00
98/2 bale cif SE Asia	400.00

argus

Recycled polymers mostly rise with virgin market



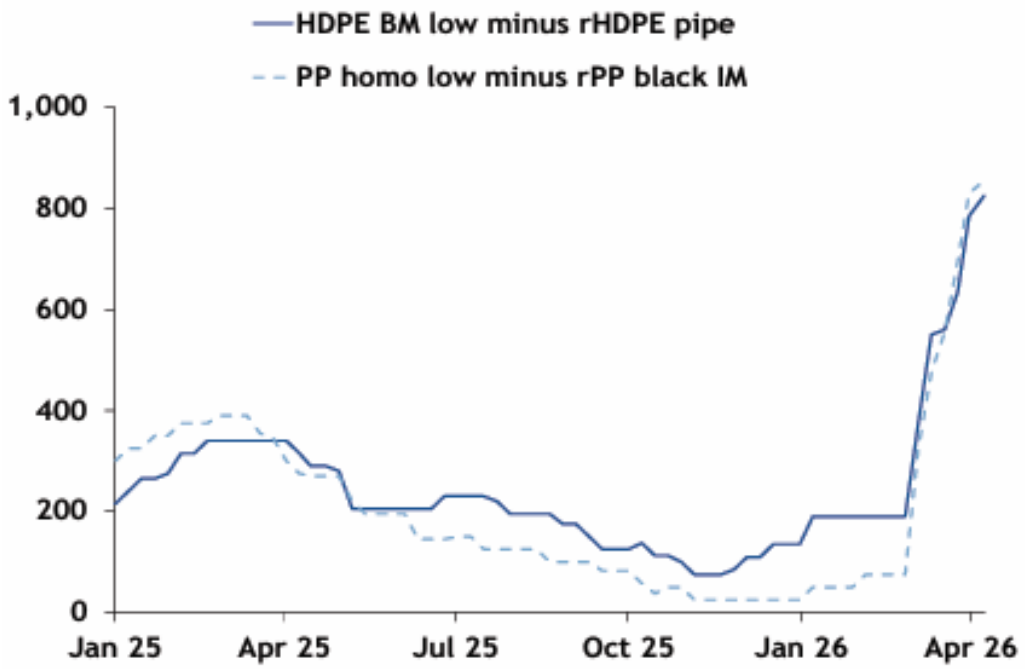




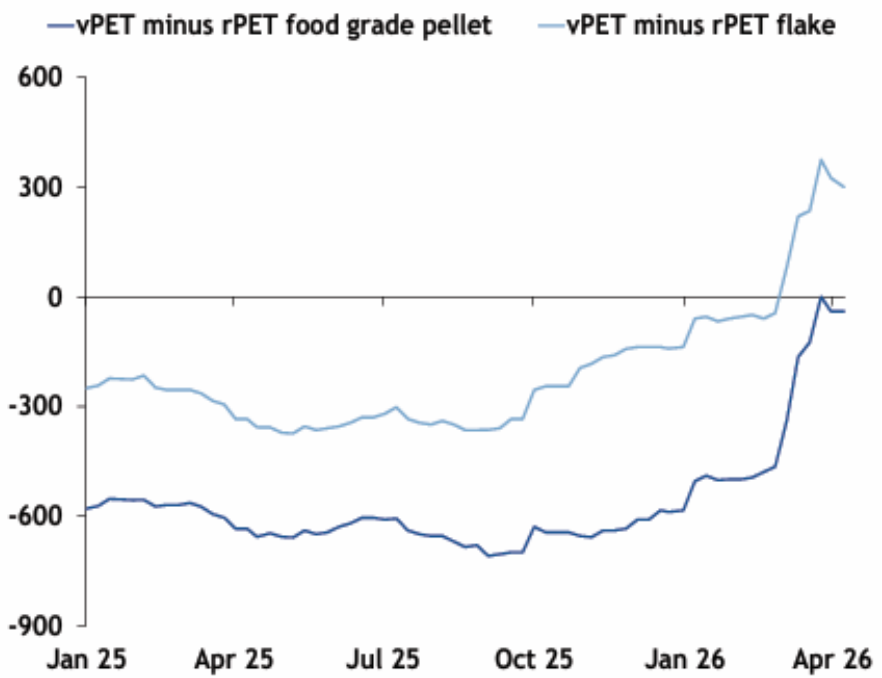
- Demand: Increased uptake of recyclates, especially for cost-sensitive / lower-spec applications
- Market dynamic: Rally largely supply-driven, raising recycler concerns on demand sustainability and margins
- rPET: Prices strengthened on tight supply, firm demand, higher logistics/fixed costs, and some speculative buying

Recycled polymers cost advantage reach new heights

vPE vPP prems to rPE PP, spot NWE €/t



vPET premiums to rPET, spot NWE €/t



- Competitiveness: Recycled polymers in Europe reached record highs vs virgin in April
- Driver: Severe disruption to Middle East polymer/feedstock exports tightened virgin supply
- Pricing: Virgin vs recycled spread at widest level on record (Argus assessments) for polyolefins & PET

Recycling and circularity mandates

EU recyclate and circularity mandates – overview

Single-Use Plastics Directive (SUPD)

From 2025, SUPD mandates 25% recycled PET in beverage bottles, increasing to 30% by 2030 to drive demand for food-grade recyclates.

Packaging and Packaging Waste Regulation (PPWR)

Effective 2025/2026, PPWR sets minimum recycled content targets (by 2030) and recyclability requirements for almost all plastic packaging.

Waste Shipment Regulation (WSR)

From November 2026, WSR bans plastic waste exports to non-OECD countries, with stricter controls and enhanced traceability rules for waste shipments starting from May.

End-of-Life Vehicles Regulation (ELVR)

Starting 2032 (if adopted as expected this year), ELVR requires 15% recycled plastic in new vehicles, rising to 25% in 2036, with measures to promote closed-loop recycling of vehicle-derived plastics.

SUPD kick-starts demand → PPWR scales system-wide → WSR secures feedstock → ELV adds long-term automotive pull

The EU Waste Shipment Regulation (WSR) will ban plastic waste exports outside OECD from Nov ‘26

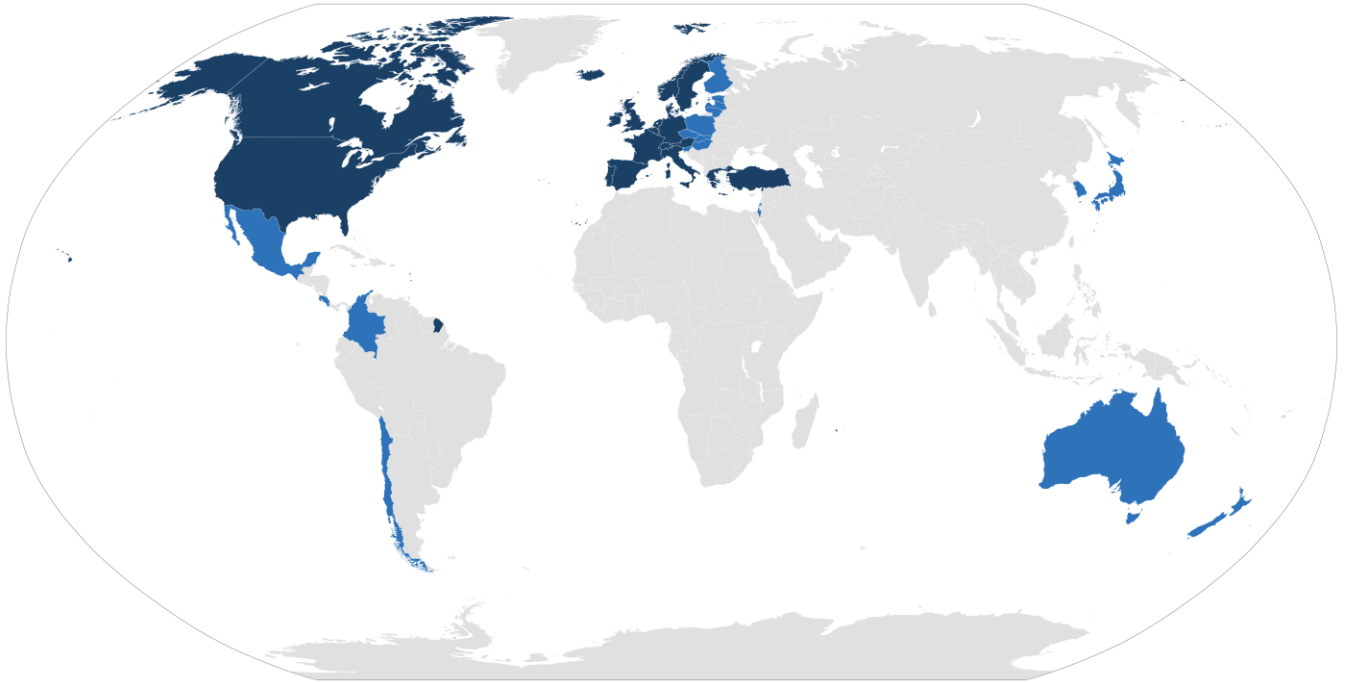
20 May 2024
- WSR enters into force

21 May 2026
- Extra-EU shipments of plastic waste subject to the “prior notification and consent procedure”
- DIWASS digital waste management system introduced for intra-EU shipments

21 Nov 2026
- Plastic waste exports to non-OECD countries banned for at least 3 years

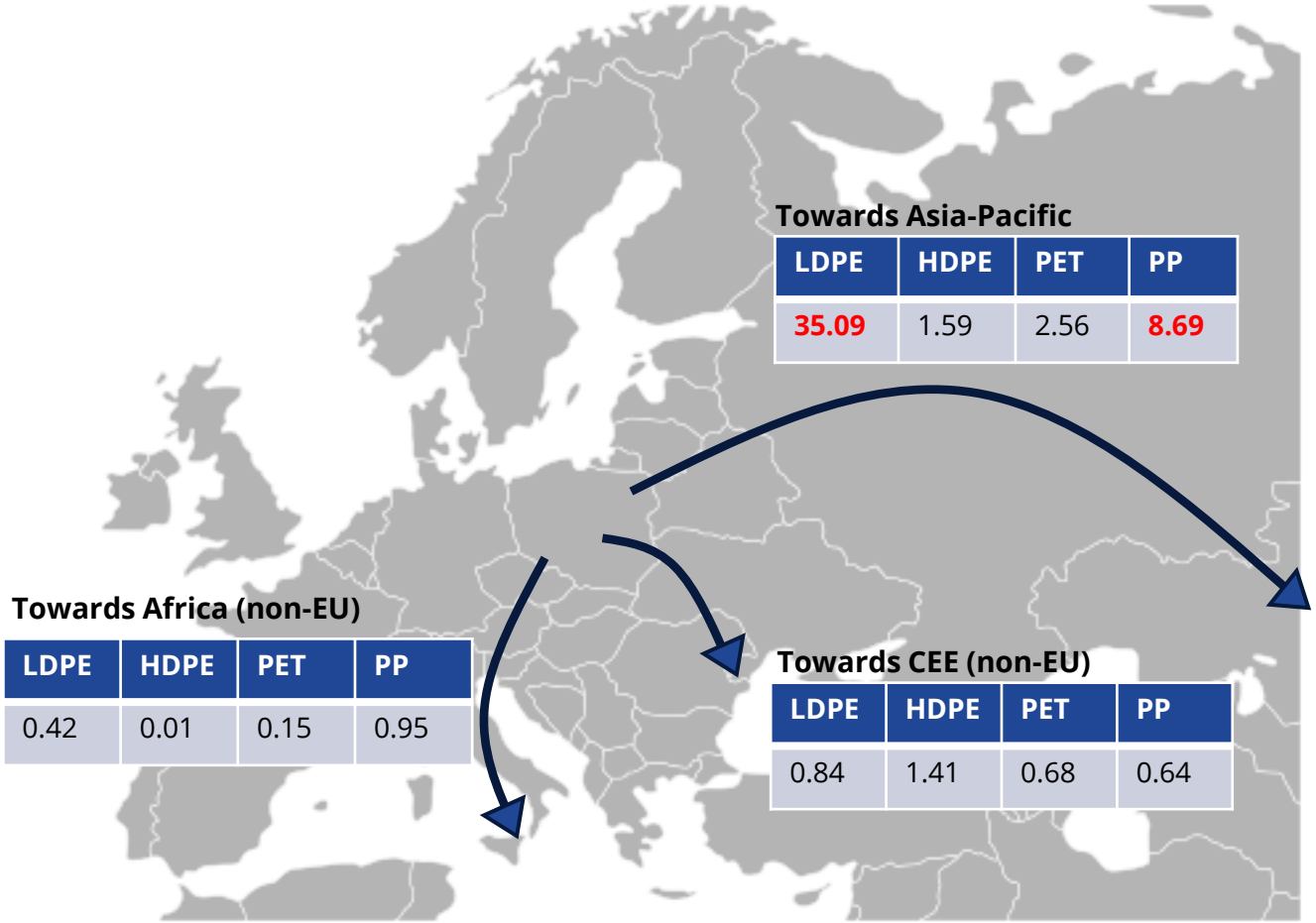
21 May 2027
- Exporters ensure that independent audits are carried out, demonstrating that facilities receiving waste manage it in an environmentally sound manner

21 May 2029
- Non-OECD countries can submit request indicating willingness to receive plastic waste and demonstrating their capacity to manage such waste in an environmentally sound manner



Flexible PE waste will be most affected

EU-27 non-OECD plastic waste exports ('000t/month in 2025)



Towards Asia-Pacific

LDPE	HDPE	PET	PP
35.09	1.59	2.56	8.69

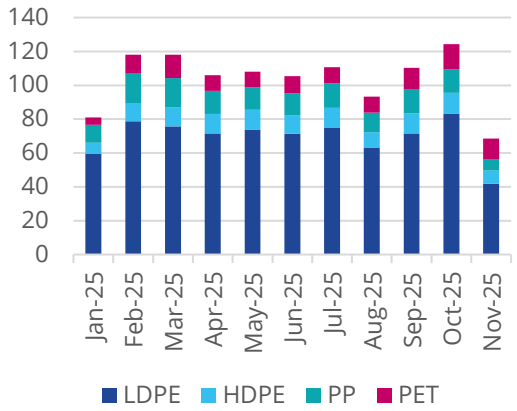
Towards Africa (non-EU)

LDPE	HDPE	PET	PP
0.42	0.01	0.15	0.95

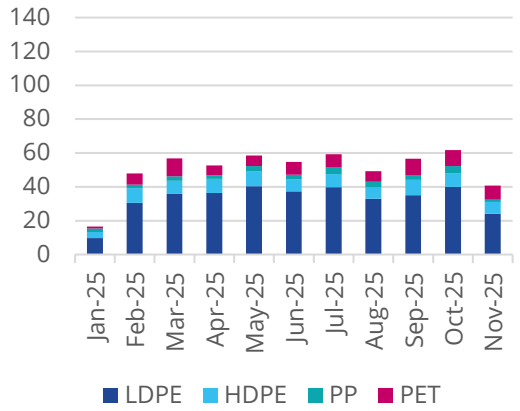
Towards CEE (non-EU)

LDPE	HDPE	PET	PP
0.84	1.41	0.68	0.64

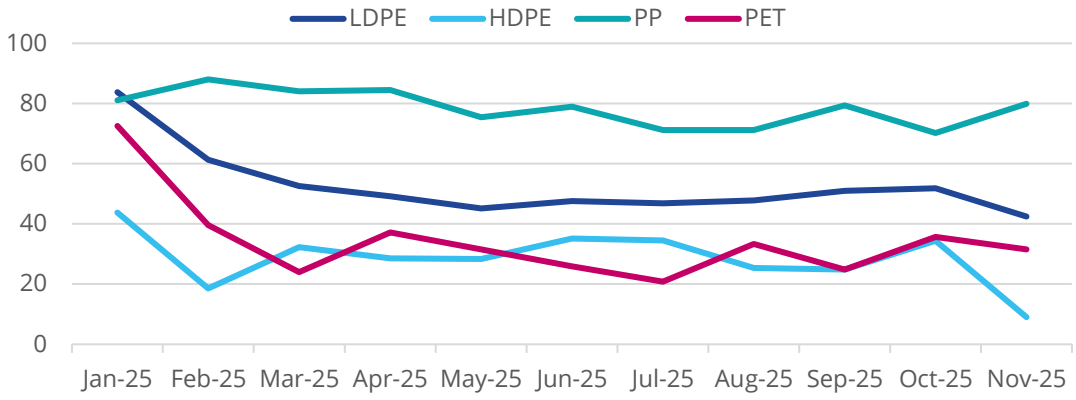
EU-27 plastic waste exports



...of which OECD-bound ('000t)



Percentage of exports going to non-OECD countries



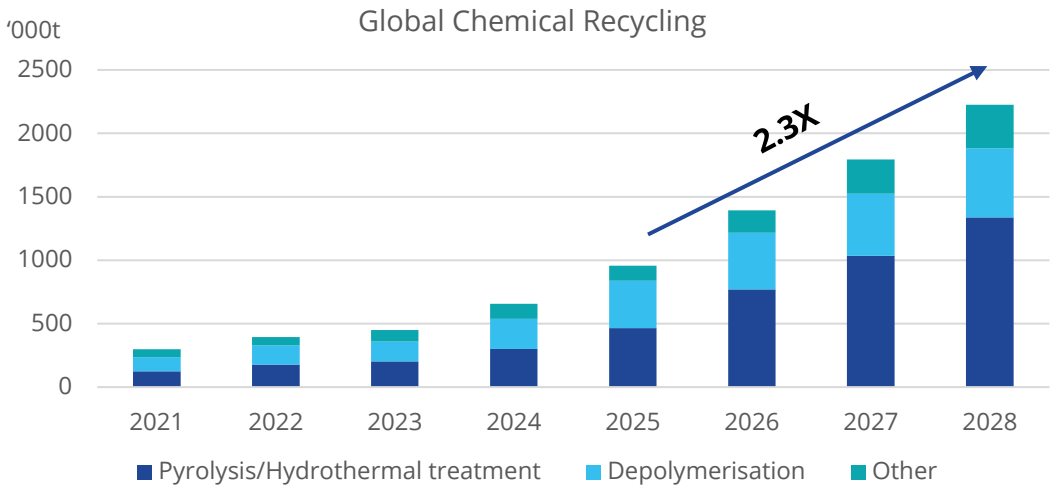
Source: Global Trade Tracker

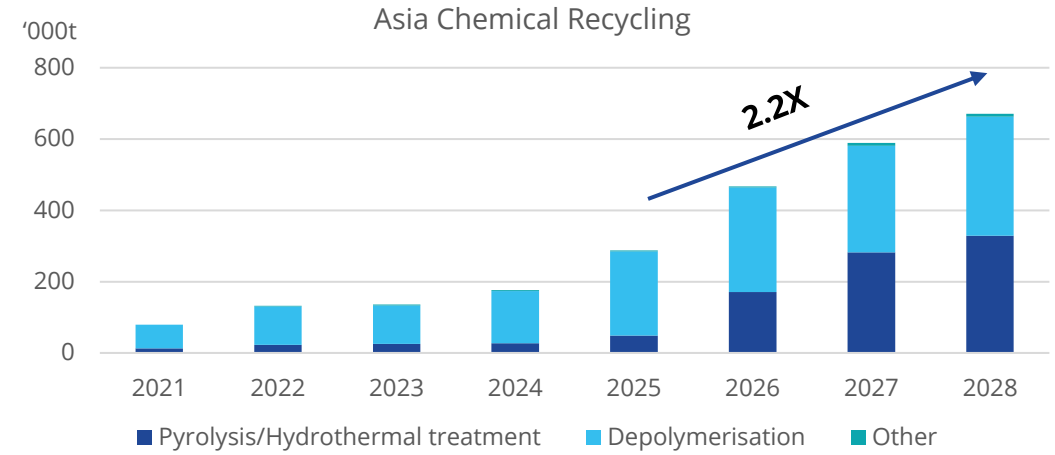
Asia recyclate and circularity mandates – overview

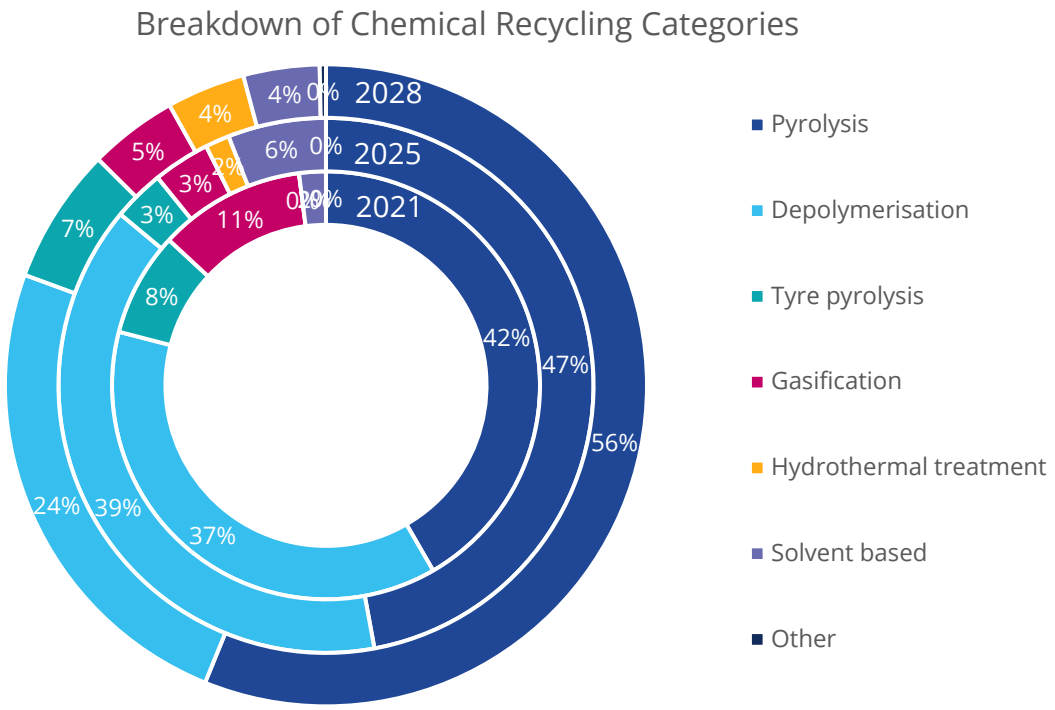
Country	Legislation/Policy Name	Core Requirements	Timeline
Singapore	Resource Sustainability Act	Mandatory packaging data reporting; EPR for beverage containers; improved recycling rates.	EPR scheme starts in April 2026.
Malaysia	National Roadmap on Zero Single-Use Plastics 2018–2030	Phasing out single-use plastics; promoting recycled content in packaging.	phased targets until 2030.
Malaysia	**Customs (Prohibition of Imports) Order**	**Stricter controls and a strong stance on plastic waste imports.**	**Effective July 2025.**
Thailand	Plastic Waste Management Roadmap 2018–2030	Reducing single-use plastics via eco-friendly alternatives to achieve a circular economy.	Targets until 2027.
Thailand	**Ban on Plastic Waste Imports**	**Comprehensive ban on plastic waste imports proposed by the Ministry of Natural Resources and Environment.**	**Effective January 2025.**
Indonesia	Producer Waste Production Roadmap	Producers must reduce packaging waste by 30% by 2029; encourages recycled material use.	Issued December 2019.
Indonesia	**Ban on Plastic Waste Imports**	**Ban on plastic waste imports.**	**Effective January 2025.**
Japan	Guidelines for the Use of Recycled Materials in Food Containers and Packaging	Establishes safety guidelines for using recycled materials in food contact applications.	December 2025.
Japan	Voluntary Action Plan for Recycled Plastics in the Automotive Industry	Industry-government target for new cars to contain an average of 15% recycled plastic from the early 2030s.	June 2025.
South Korea	**Act on the Promotion of Saving and Recycling of Resources**	**Beverage companies using >5,000 tons of PET must include ≥10% recycled content; expands to ≥30% by 2030.**	**January 2026.**
China	Action Plan for Promoting the Application of Recycled Materials	Boost high-quality recycled plastic capacity, establish a graded supply system, and support chemical recycling.	December 2025.
China	Released 9 national standards related to recycled plastics	Unified standards and recyclable design guidelines will comprehensively evaluate material quality, traceability, and environmental impact to boost recycling rates and consumer trust.	February 2026

Chemical recycling landscape & outlook

Rapid expansion of chemical recycling capacities

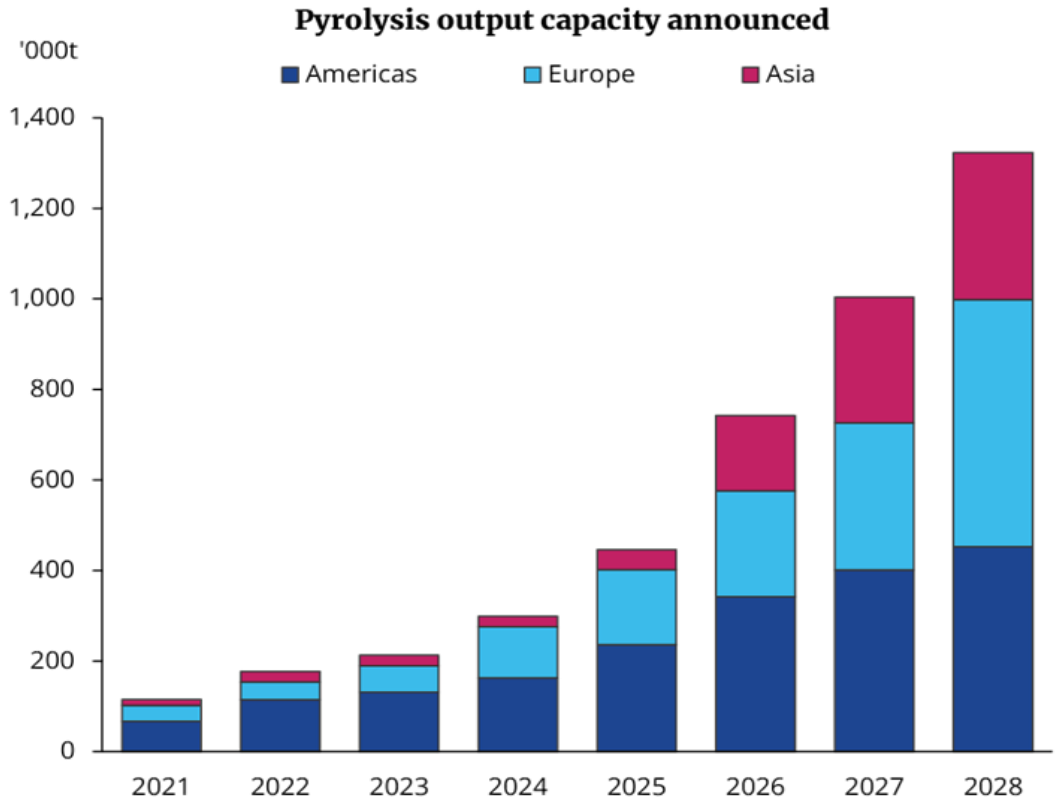


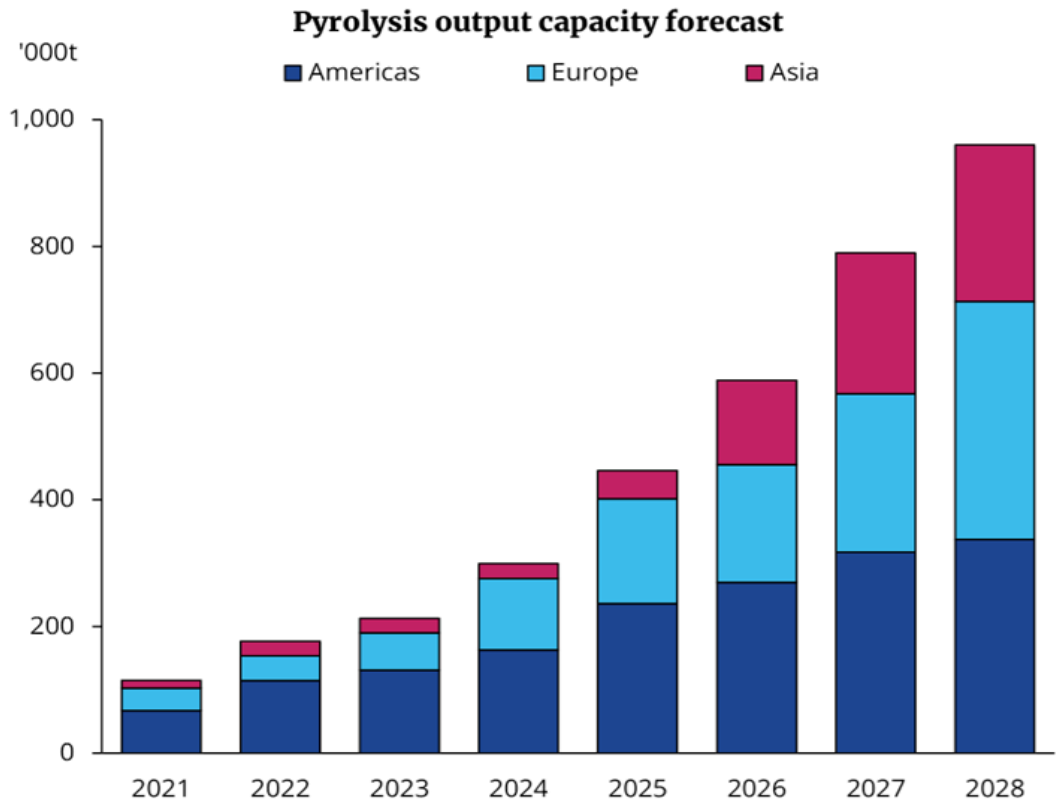




- Global capacity reached 960 kt/yr by 2025, while Asian capacity stood at nearly 300 kt/yr
- Pyrolysis is expected to boom in the coming years, with its market share rising from 42% in 2021 to 56% in 2028

Chemical recycling capacity: announced vs forecast





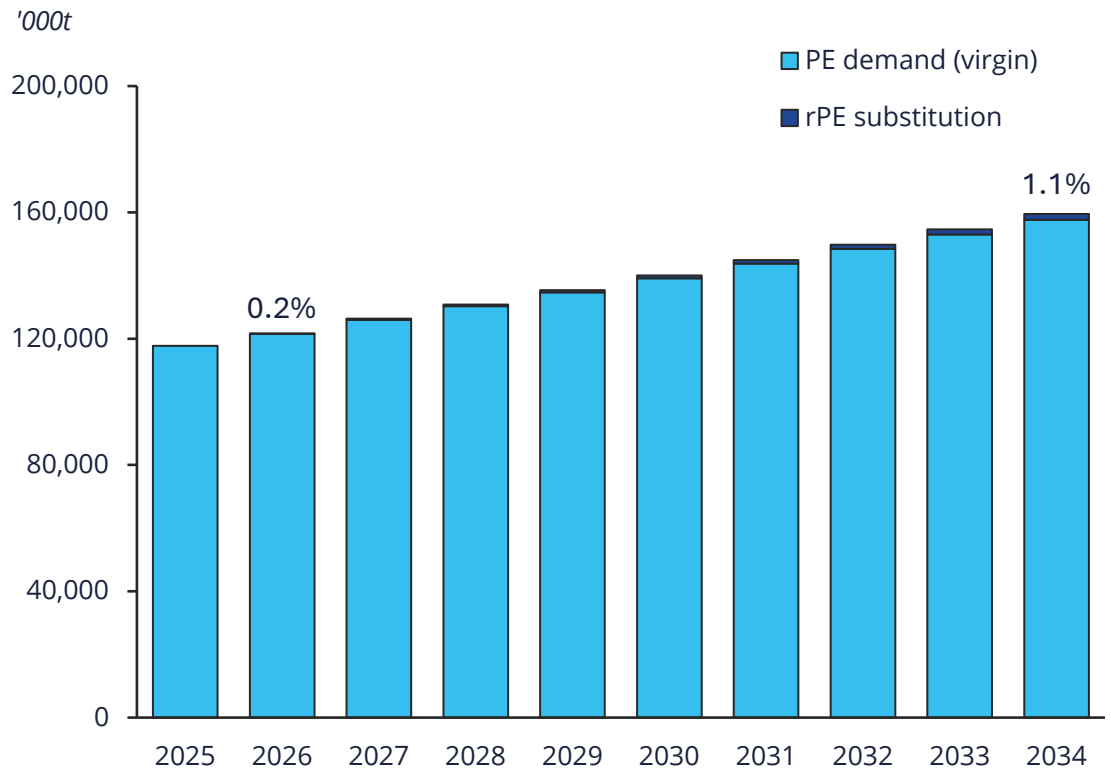
**Delays are very common in the pyrolysis industry, and we have made an assessment based on the likelihood of individual projects coming on line.*

- Capacity outlook: Strong growth in both announced and forecast capacity, accelerating from 2025 onward
- Regional split: Europe & Americas lead in share, but Asia shows fastest growth
- Execution gap: Announced capacity consistently exceeds forecasts, gap between ambition and realizable supply

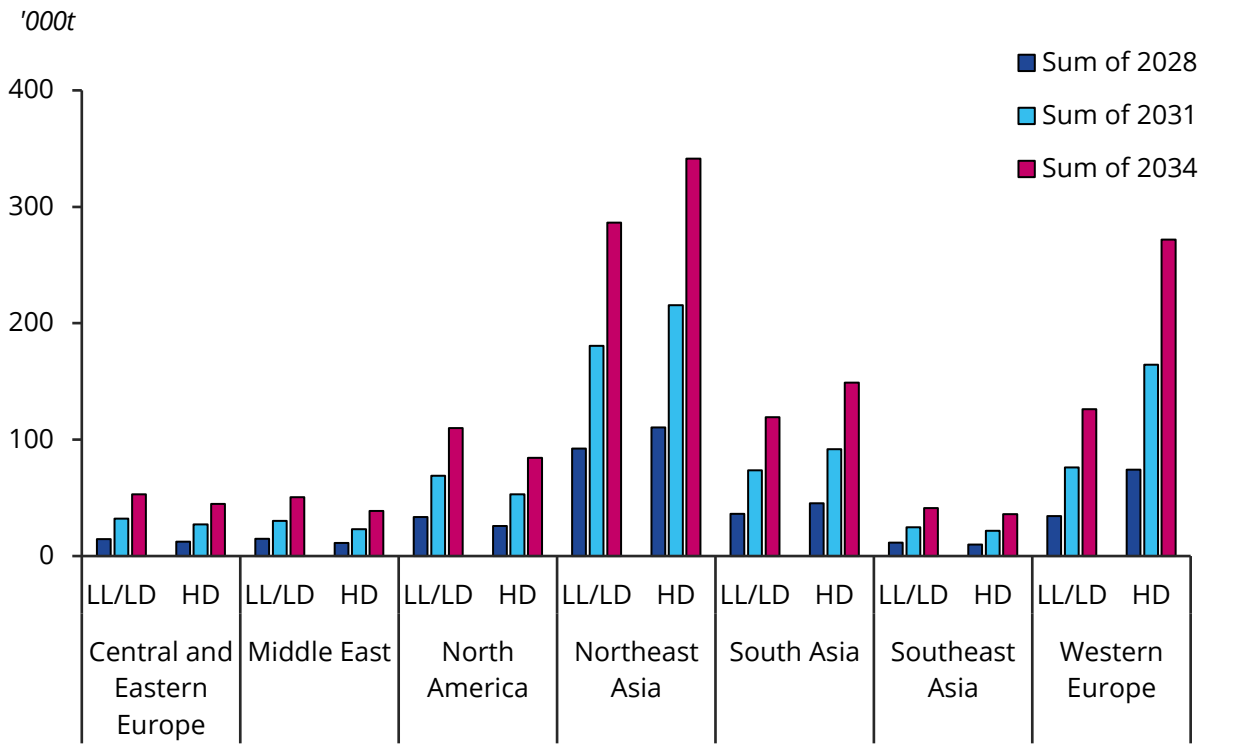
PE vs rPE demand and substitution volumes

Recycled resin demand moderates GDP-driven resin demand growth

PE and rPE demand into traditional virgin applications



rPE volumes substituting virgin PE demand

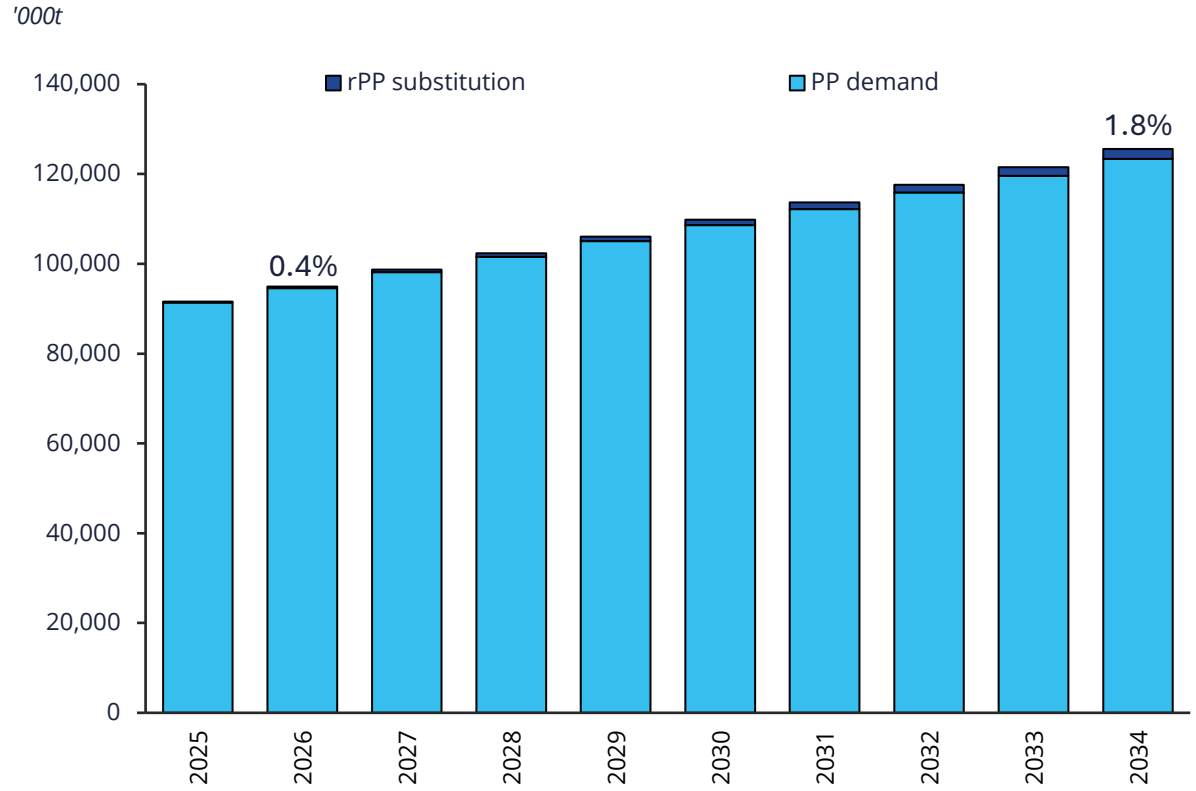


Source: Argus Polyethylene Analytics

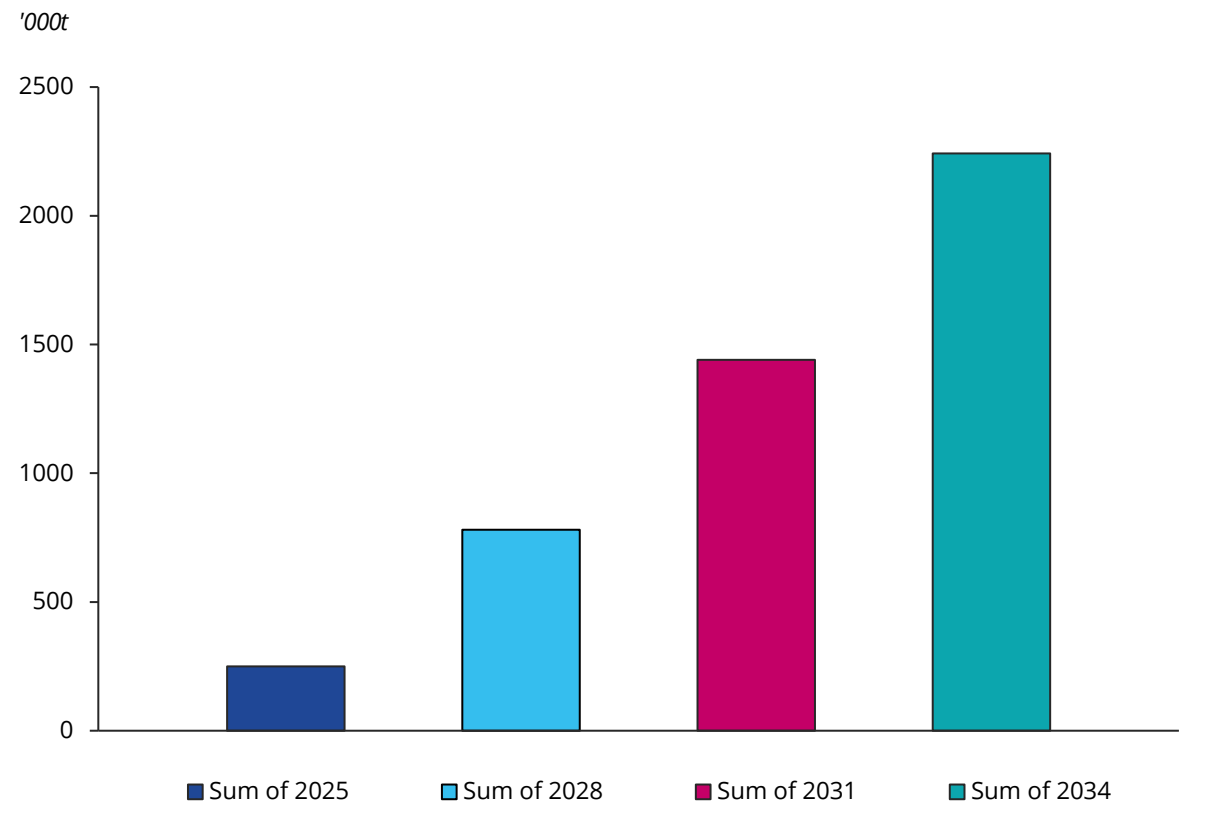
PP vs rPP demand and substitution volumes

Recycled resin demand moderates GDP-driven resin demand growth

PP and rPP demand into traditional virgin applications



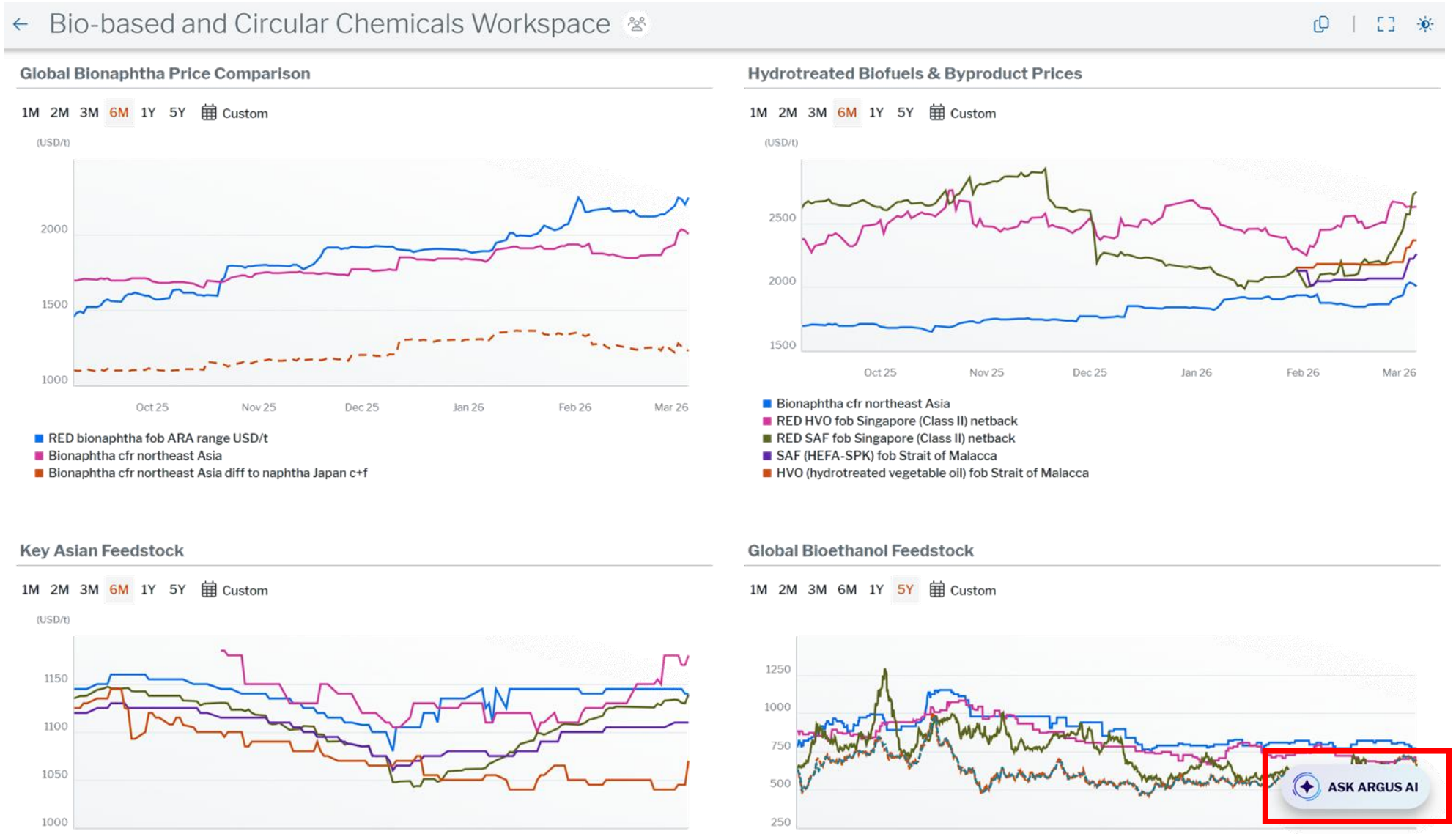
Global rPP volumes substituting virgin PP demand



Source: Argus Polypropylene Analytics

Argus circular workspace solutions

Ability to create customizable circular workspace



Ability to create customizable circular workspace

Bio-based and Circular Chemicals Workspace

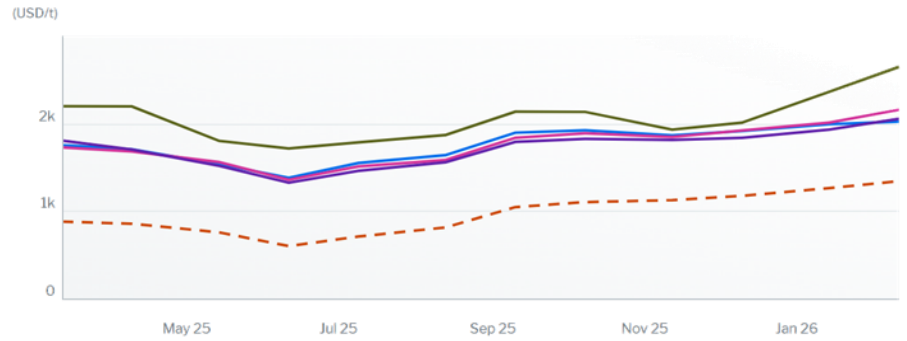
Bioattributed chemical calculated prices

Argus bio-naphtha-attributed chemical prices are calculated based on market premiums for bionaphtha over fossil fuel-based naphtha feedstocks and standard fossil-fuel based chemical prices. The bioattributed calculations do not include any additional premiums that might be sought by producers and intermediaries, nor do they exclude any premiums or discounts in underlying chemical references.

Argus is starting to survey the market for feedback and development of market-based biochemical price assessments.

Asia bioattributed mass-balanced prices

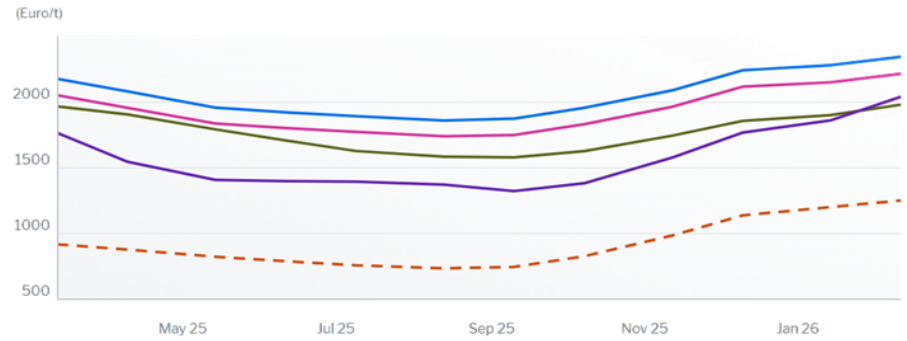
1M 2M 3M 6M 1Y 5Y Custom



- Bionaphtha chemical feedstock premium Asia month 1
- Bioattributed ethylene Asia month 1
- Bioattributed propylene Asia month 1
- Bioattributed butadiene Asia month 1
- Bioattributed benzene Asia month 1

European bioattributed mass-balanced prices

1M 2M 3M 6M 1Y 5Y Custom



- Bionaphtha chemical feedstock premium Western Europe month 1
- Bioattributed ethylene Western Europe month 1
- Bioattributed propylene Western Europe month 1
- Bioattributed butadiene Western Europe month 1
- Bioattributed benzene Western Europe month 1

Asia bioattributed mass-balanced calculated prices

Description	Units	Period	Price	Change	% Change	Date
Bioattributed ethylene Asia	USD/t	Jan-2026	2,020	29 ▲	1.46 % ▲	11 Feb 26
Bioattributed propylene Asia	USD/t	Jan-2026	2,155	147 ▲	7.32 % ▲	11 Feb 26

European bioattributed mass-balanced calculated prices

Description	Units	Period	Price	Change	% Change	Date
Bioattributed ethylene Western Europe	Euro/t	Feb-2026	2,341	65 ▲	2.86 % ▲	11 Feb 26
Bioattributed propylene Western Europe	Euro/t	Feb-2026	2,211	65 ▲	3.03 % ▲	11 Feb 26

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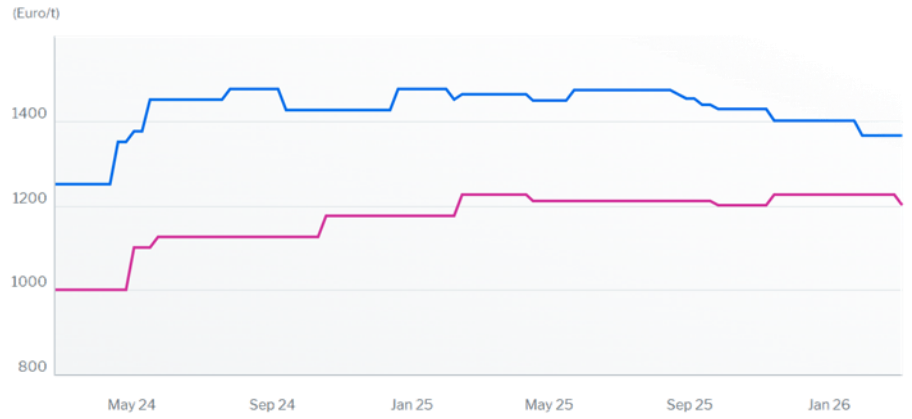
Ability to create customizable circular workspace

Bio-based and Circular Chemicals Workspace

Pyrolysis oil fca Europe (€/t)

1M 2M 3M 6M 1Y 5Y Custom



- Pyrolysis oil plastic-derived light fraction fca Europe
- Pyrolysis oil plastic-derived refinery grade fca Europe

Global rPET food grade pellet $/t

1M 2M 3M 6M 1Y 5Y Custom

- rPET food grade pellets 100pc recycled fob northeast Asia
- rPET food grade pellet del NWE USD/t

Pyrolysis oil prices

Description	Units	Period	Price Low	Price	Price High	Date
Pyrolysis oil plastic-derived light fraction fca Europe	Euro/t	prompt	1,280.00	1,365.00	1,450.00	06 Mar 26
Pyrolysis oil plastic-derived refinery grade fca Europe	Euro/t	prompt	1,100.00	1,200.00	1,300.00	06 Mar 26

rPET prices

Description	Units	Price	Date
rPET food grade pellets 100pc recycled fob northeast Asia	USD/t	1,240.00	06 Mar 26
rPET food grade pellet del NWE USD/t	USD/t	1,612.16	06 Mar 26

Global rHDPE, rPP packaging grades $/t

1M 2M 3M 6M 1Y 5Y Custom

NWE/SE Asia rLDPE/LLDPE transparent $/t

1M 2M 3M 6M 1Y 5Y Custom

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Thank you !

Further information

In the first instance please contact:

Timo Tumuscheit

Email: timo.tumuscheit@argusmedia.com

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