Asia-Pacific Biofuels Forum

Singapore

9 September 2025



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Chair's Opening Remarks

Josefine Ahlström
SVP, Global Biofuels



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Asia Pacific Biofuels Market

To be, or not to be?

Jonty Richardson
Principal, Biofuels
Argus Media - Consulting Services



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Asia Pacific Biofuels Market

Outlook for the region as local mandates emerge + assessment of potential barriers to growth:

- Strong global growth and diverging regional trends
- Competition for feedstock intensifies
- Potential solutions: alternative feedstocks and production pathways

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Strong global demand growth: A closer look

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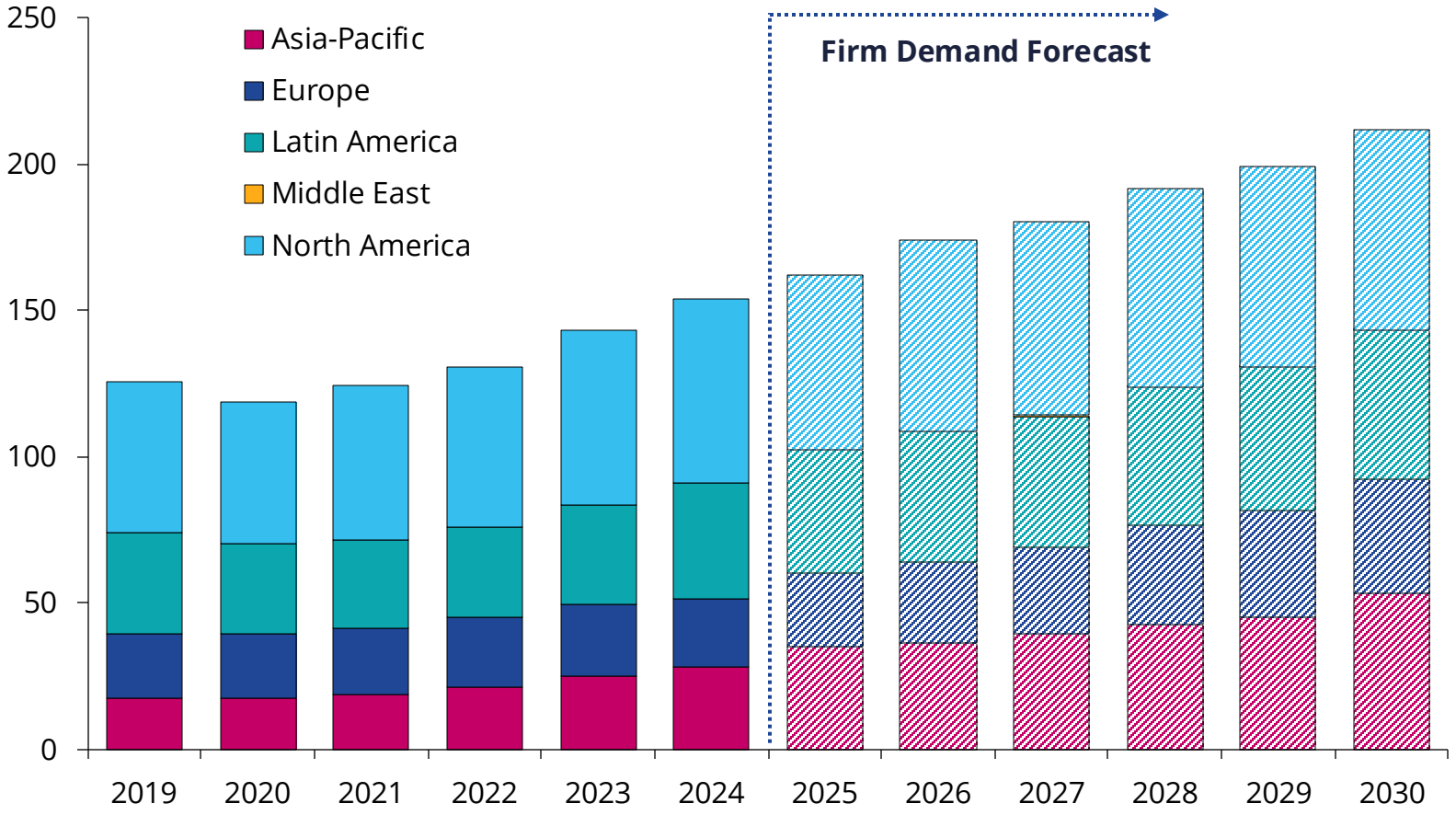
Global demand is forecast to grow by >40pc 2024-2030

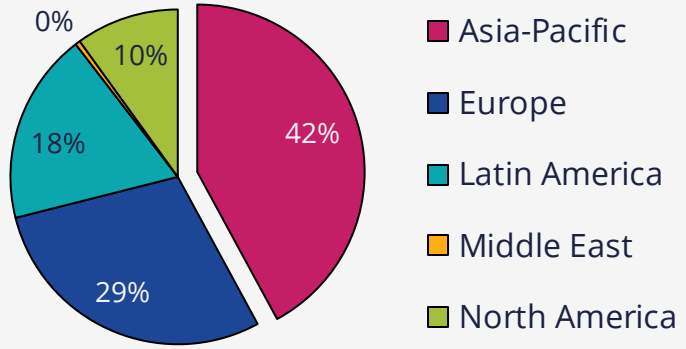
Global Biofuels Demand by Region (mn t)



Source: Argus Media – Consulting Services

~70mn t of growth
for total biofuels (including SAF, Renewable Diesel* (RD), biodiesel and ethanol.

Share of Global Demand Growth (2024-2030)



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Diverging regional trends:
1. Biofuels
2. Feedstocks

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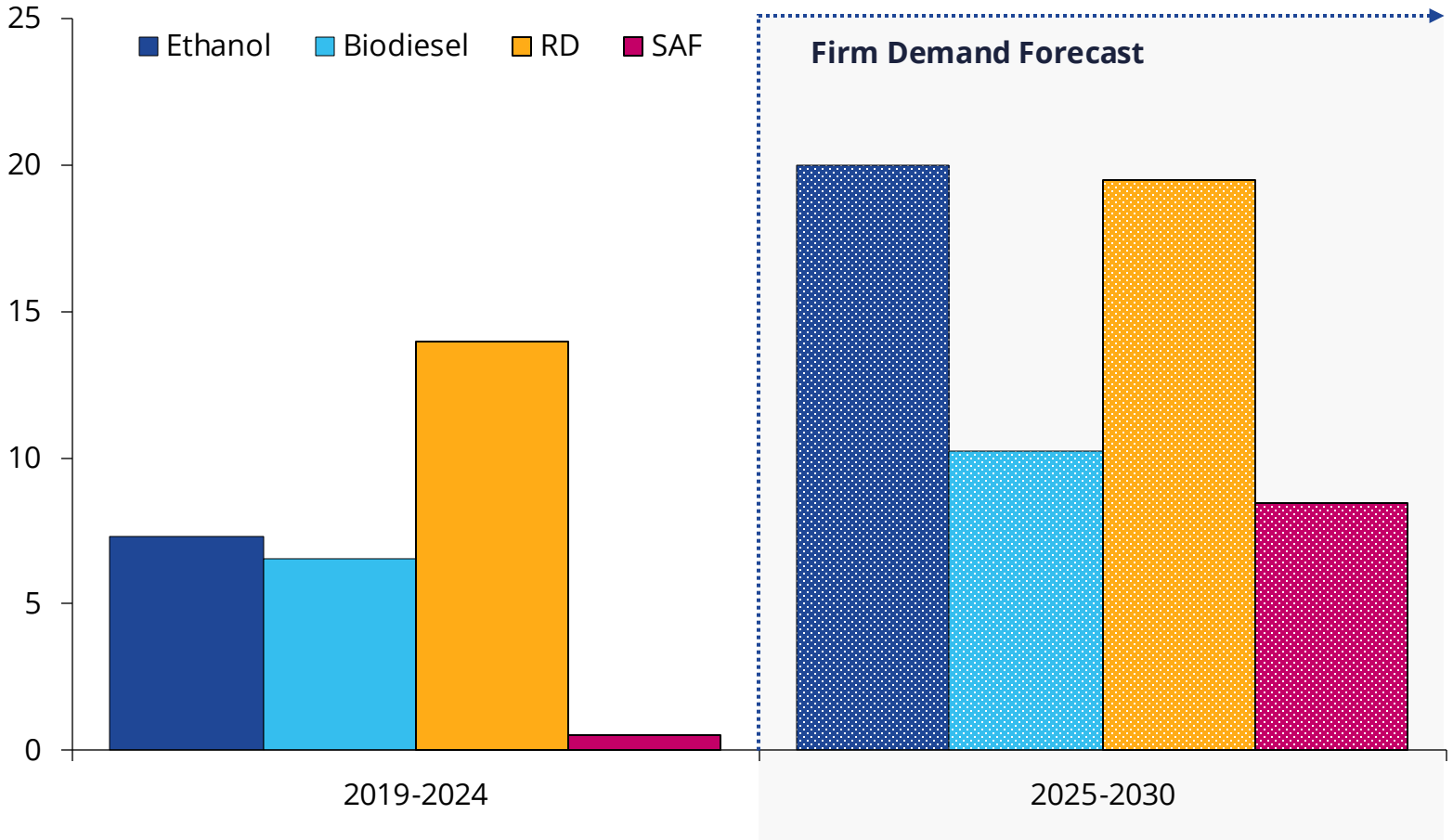
1. Firm Global demand growth is slowly shifting towards drop-in fuels like Renewable Diesel (RD) and SAF

Global Incremental Demand Growth *(mn t)*



Source: Argus Media – Consulting Services

50/50

~50pc of demand growth 2024-2030 from ethanol/ biodiesel and ~50pc to RD, SAF and bionaphtha.

Strong growth in APAC

~40pc of demand growth 2024-2030 comes from Asia Pacific

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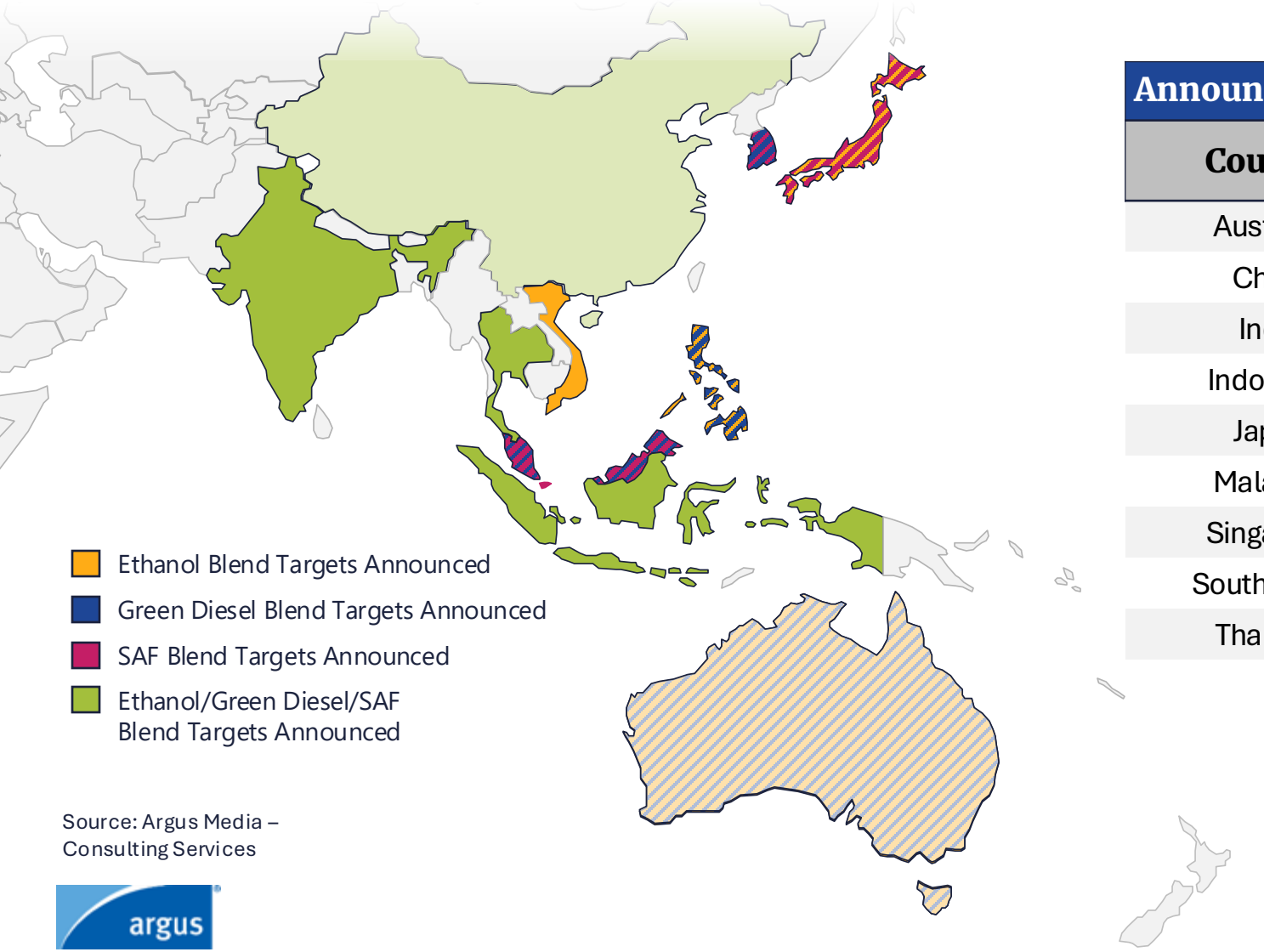
1. Asia Pacific – Policy will drive demand for ethanol and biodiesel, but the outlook for SAF is a little less certain



Source: Argus Media – Consulting Services

Announced Biofuel Blend Targets (%)

Country	Ethanol	Green Diesel (*of which RD*)	SAF (Firm)
Australia	-	-	-
China	10	-	?
India	20	5	5*
Indonesia	20	50	2.5
Japan	10	-	5/10#
Malaysia	-	20	1^
Singapore	-	-	3.0-5.0
South Korea	-	8 **(3)**	1*
Thailand	~10	†	3

^ Malaysia's discussed target of 1pc currently has no start-year.
#Japan proposed both 10pc volume or 5pc reduction in GHG intensity
** international aviation fuel only*
† volumetric target

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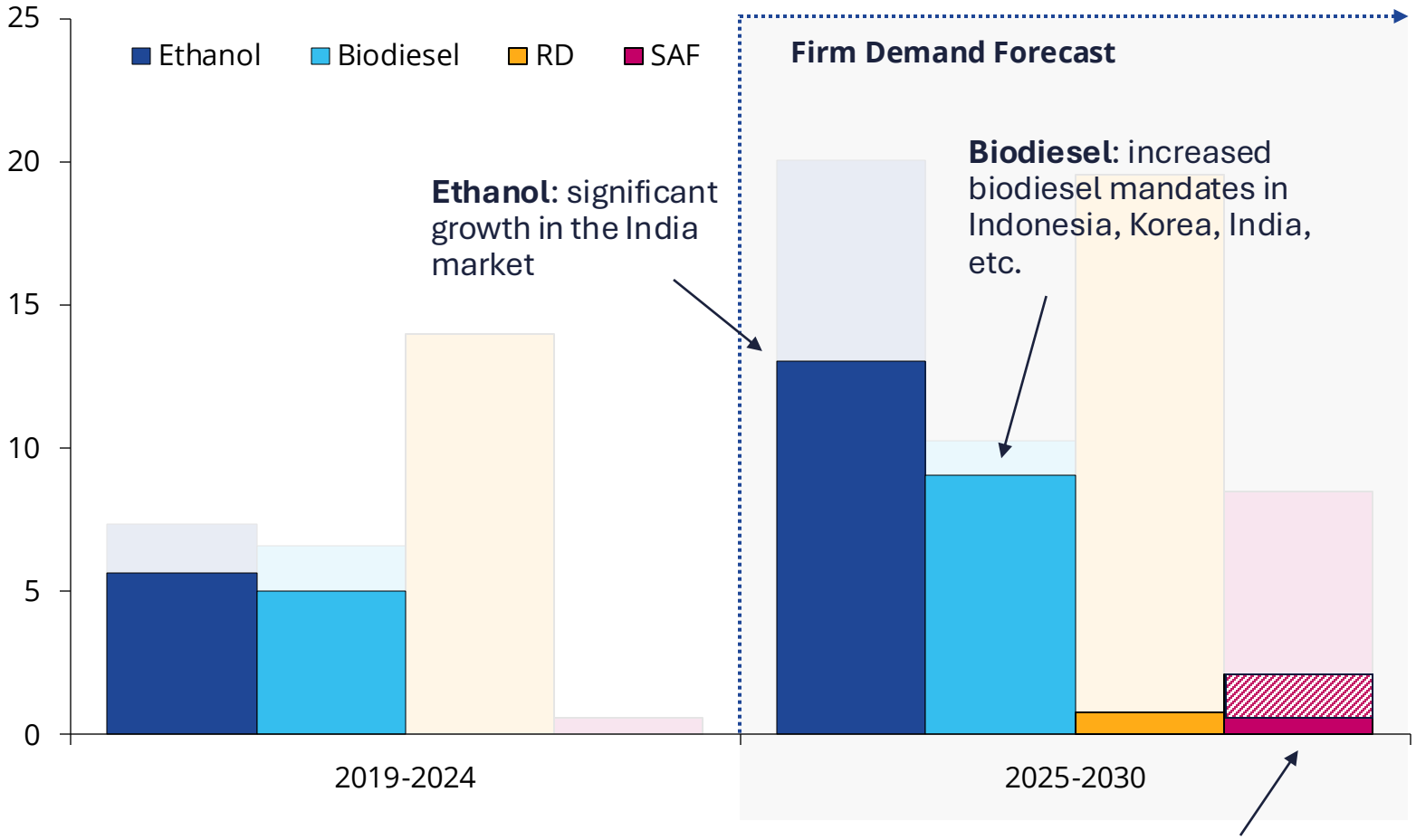
1. Asia Pacific – Ethanol and biodiesel account for majority of growth. Uncertainty regarding SAF demand

Asia Pacific Incremental Demand Growth vs. Global *(mn t)*



Firm vs. Announced: uncertainty surrounds ~2mn t of 2030 SAF demand in APAC.

To be or not to be?

APAC will drive a huge portion of global growth, but it will mostly come in the form of ethanol and biodiesel.

Feedstock types: crops vs. wastes

APAC policy has fewer restrictions on the eligibility of feedstocks.

Source: Argus Media – Consulting Services

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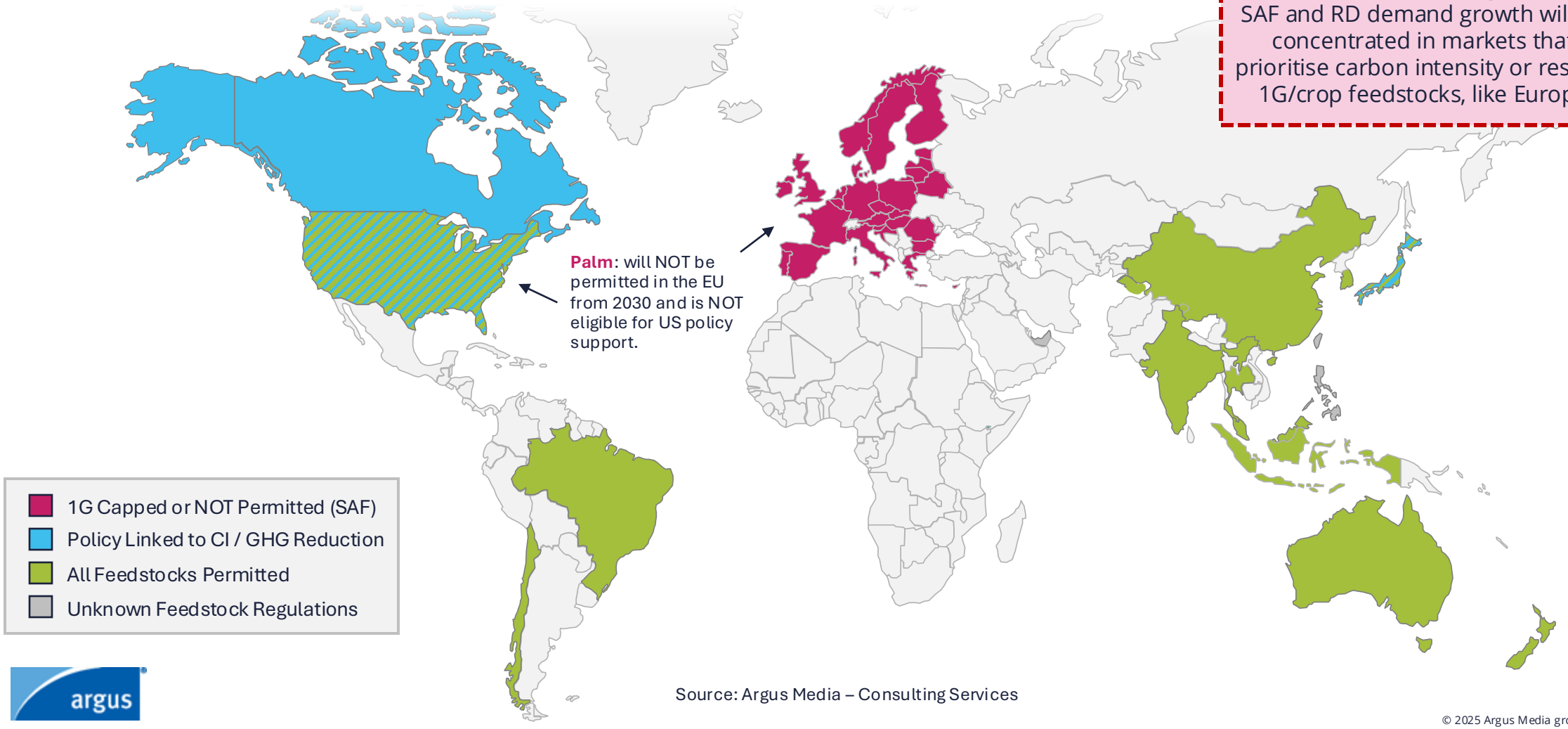
2. Feedstocks: Regulations regarding eligibility can vary significantly from region to region

Overview of Feedstock Regulations – Biofuels / SAF

Key Message:
SAF and RD demand growth will be concentrated in markets that prioritise carbon intensity or restrict 1G/crop feedstocks, like Europe



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Competition for feedstock is set to intensify

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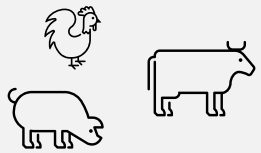
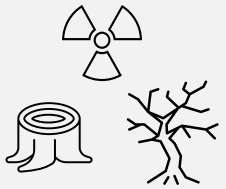
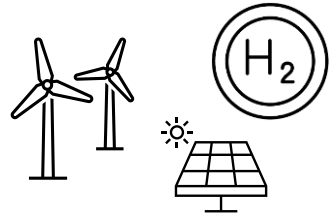
The EU has clear feedstock categories and is moving away from 1G / crop feedstocks, towards waste feedstocks

1G	Second Generation (2G)			Synthetic
Crops	Part C	Part B (Annex IX)	Part A (Annex IX)	RFNBO
Low Indirect Land Use Change • *Wheat* • *Sunflower Oil* • *Canola Oil*  ***High Indirect Land Use Change*** • *Palm oil* 	***NOT crops, but NOT include in EU lists*** • *Tallow / animal fats* • *Palm fatty acid distillate (NOT Permitted for SAF)* 	***Annex IX Part B (EU RED)*** ▪ *Used Cooking Oil* ▪ *Animal fats with high risk for human health* 	***Annex IX Part A (EU RED)*** ▪ *POME oil* ▪ *Tall oil* ▪ *Solid biomass* ▪ *Etc.* 	***Renewable fuel of non-biological origin*** ▪ *Green hydrogen-based e-fuels* 

Source: Argus Media – Consulting Services, European Union

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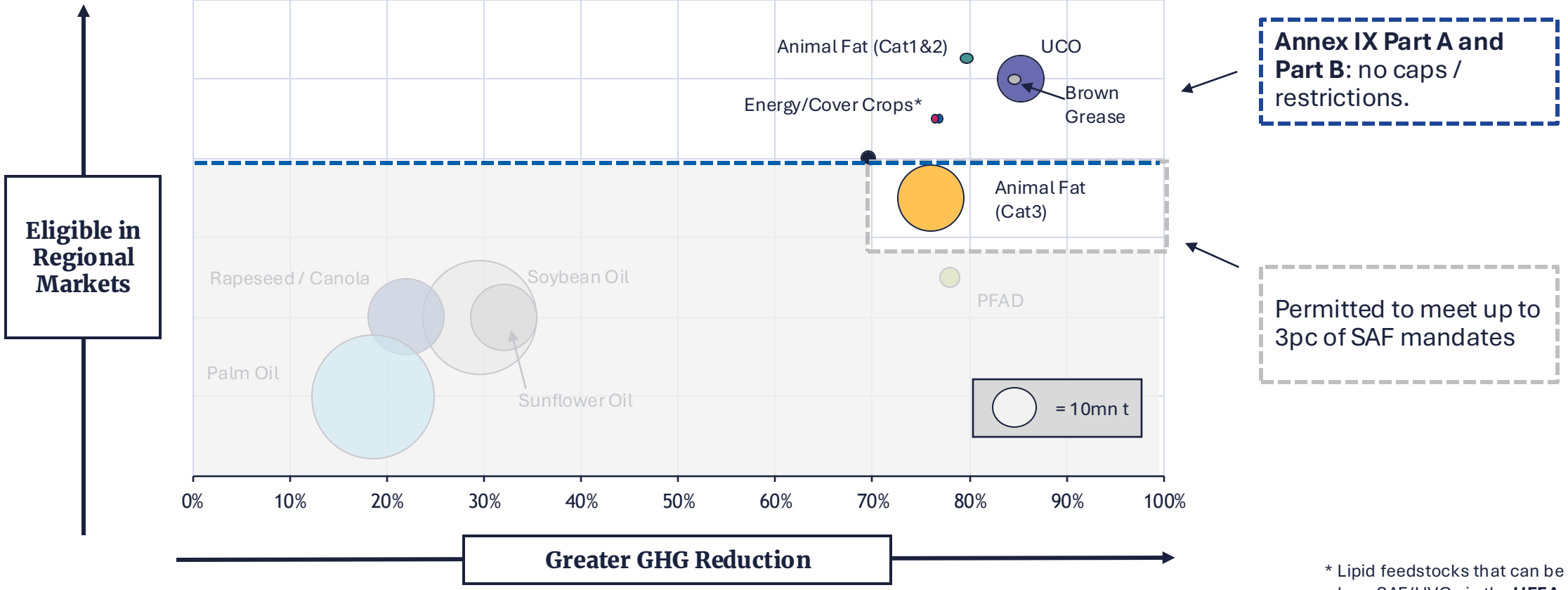
Eligible fats and oils used for HVO/SAF production are limited

Feedstock availability* by level of acceptance for SAF production (y) GHG reduction (x) – European Union



* Lipid feedstocks that can be used to produce SAF/HVO via the **HEFA** process (Hydrotreatment Esters and Fatty Acids)

Source: Argus Media – Consulting Services

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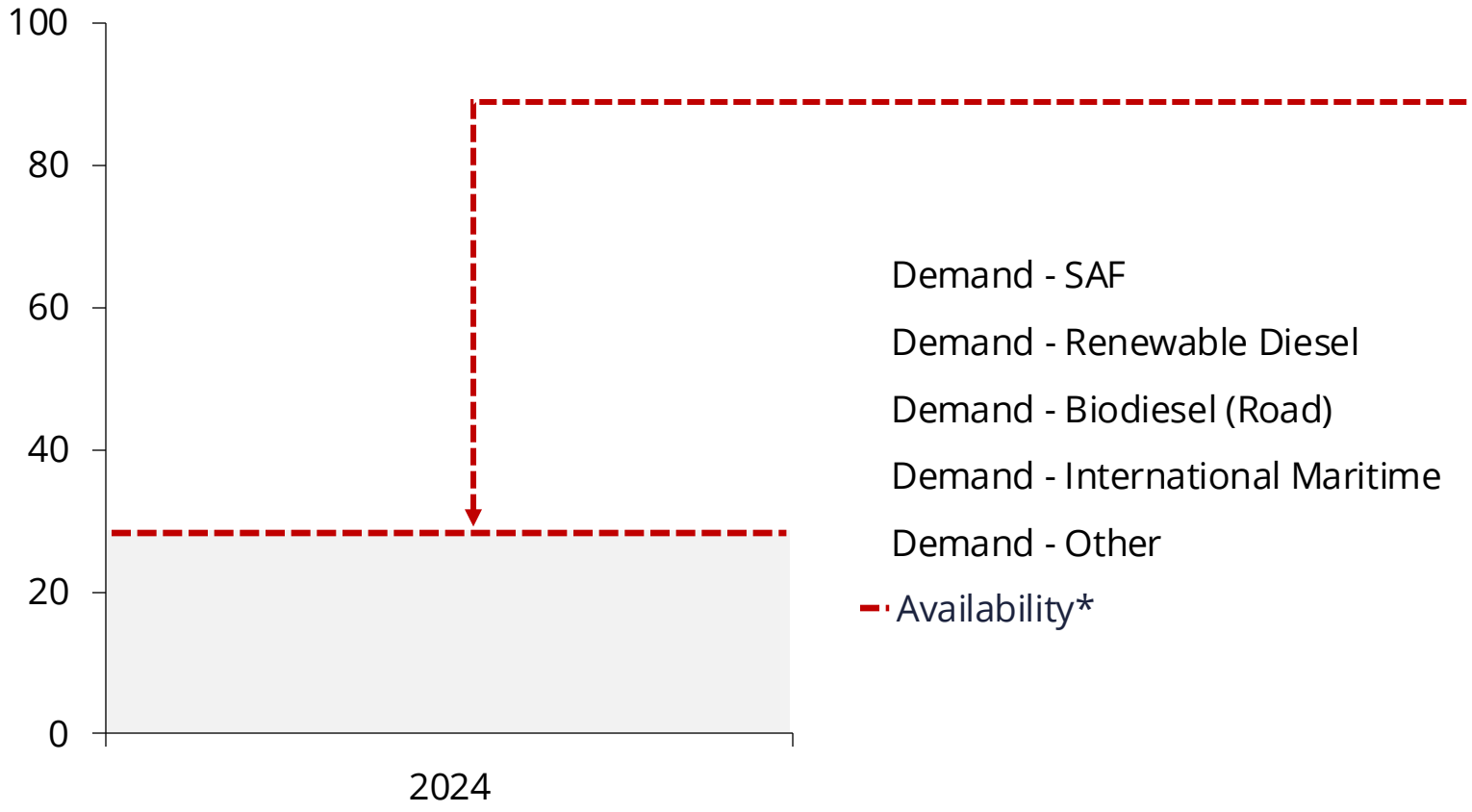
Around 30mn t of conventional waste and advanced feedstocks available in 2024

Global Feedstock Availability* (mn t)



*Conventional Waste and Advanced HEFA Feedstocks

Annex IX Part A, Part B and unclassified waste feedstocks that are currently used.

- UCO
- Brown grease
- Animal fats
- POME oil
- EFB oil
- Tall oil & derivatives
- Industrial waste
- etc.

Source: Argus Media – Consulting Services

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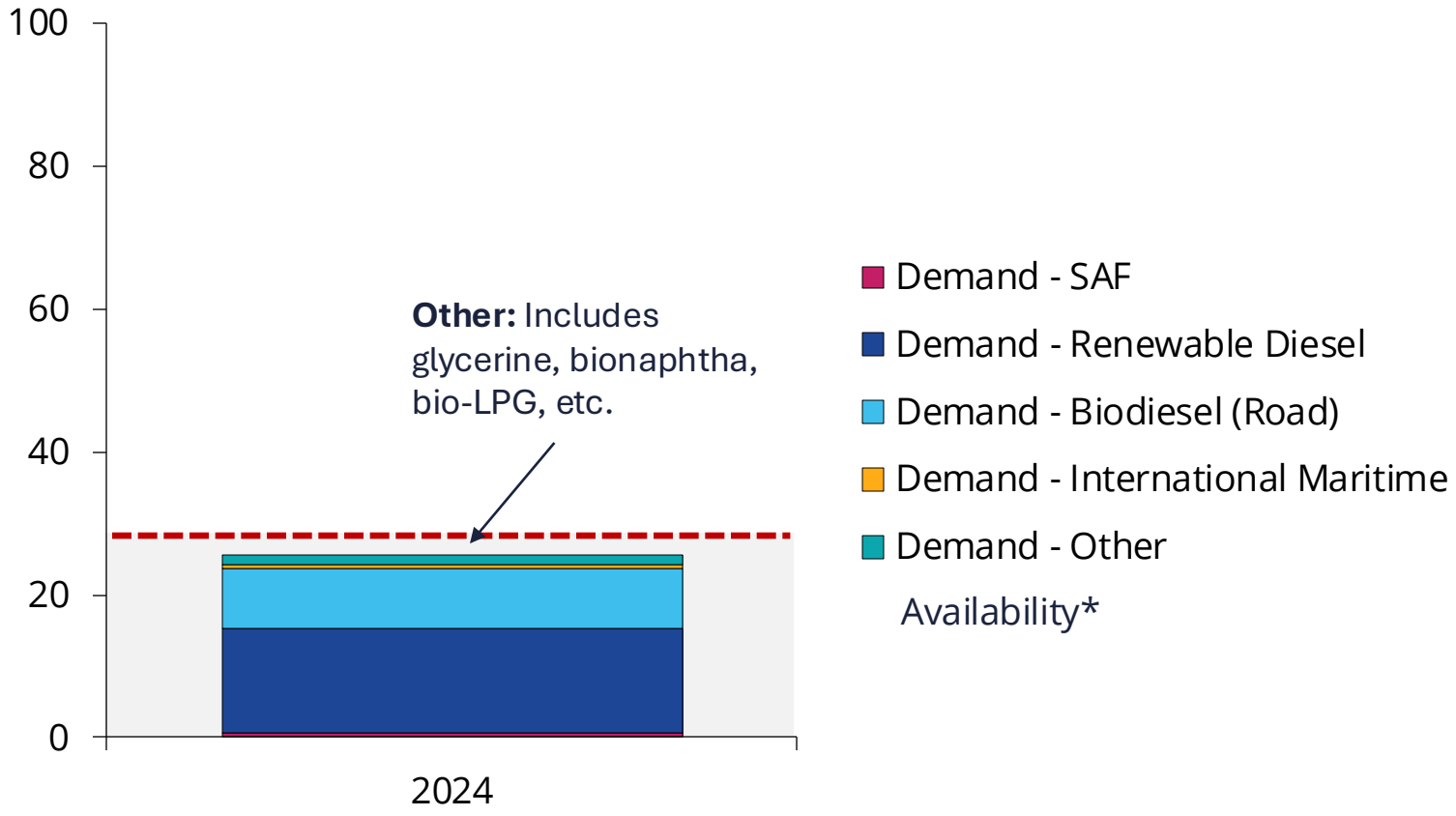
The majority of waste feedstocks are utilised for biodiesel and RD in the European and North American markets

Global Waste-Based Biofuels Demand vs. Availability* (mn t)



*Conventional Waste and Advanced HEFA Feedstocks

Annex IX Part A, Part B and unclassified waste feedstocks that are currently used.

>90pc of demand in EU/US

The EU's RED and credit-based mechanisms like the California LCFS have driven demand growth.

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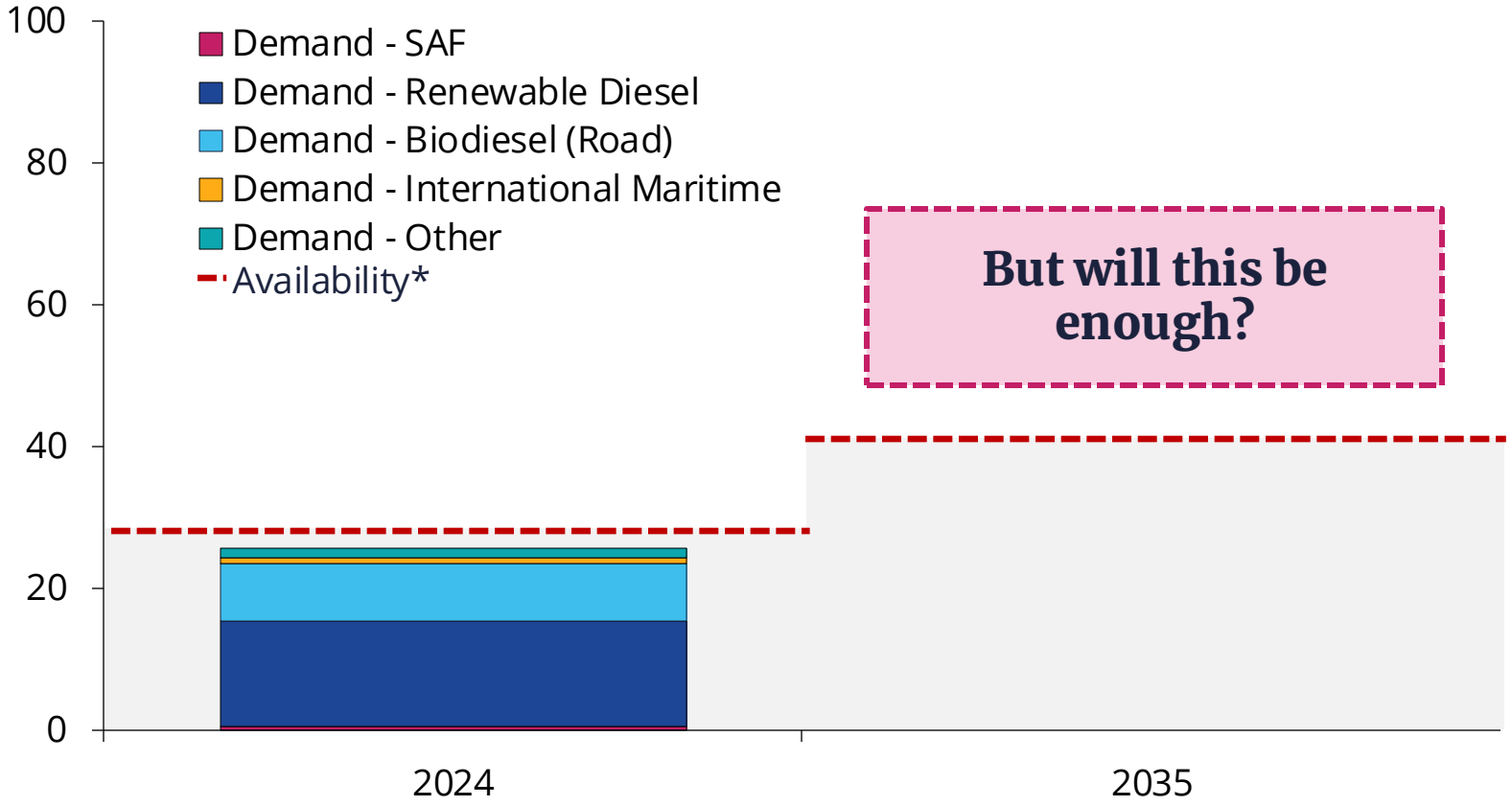
Existing sources are forecast to grow, but many waste feedstock streams are constrained

Global Waste-Based Biofuels Demand vs. Availability (mn t)



Annex IX Part A, Part B and unclassified waste feedstocks

Source: Argus Media – Consulting Services

Conventional waste feedstocks will grow

Total availability is forecast to grow from ~25mn t to more than 40mn t.

Growing UCO availability

A combination of rising collection rates and increased consumption of vegetable oils.

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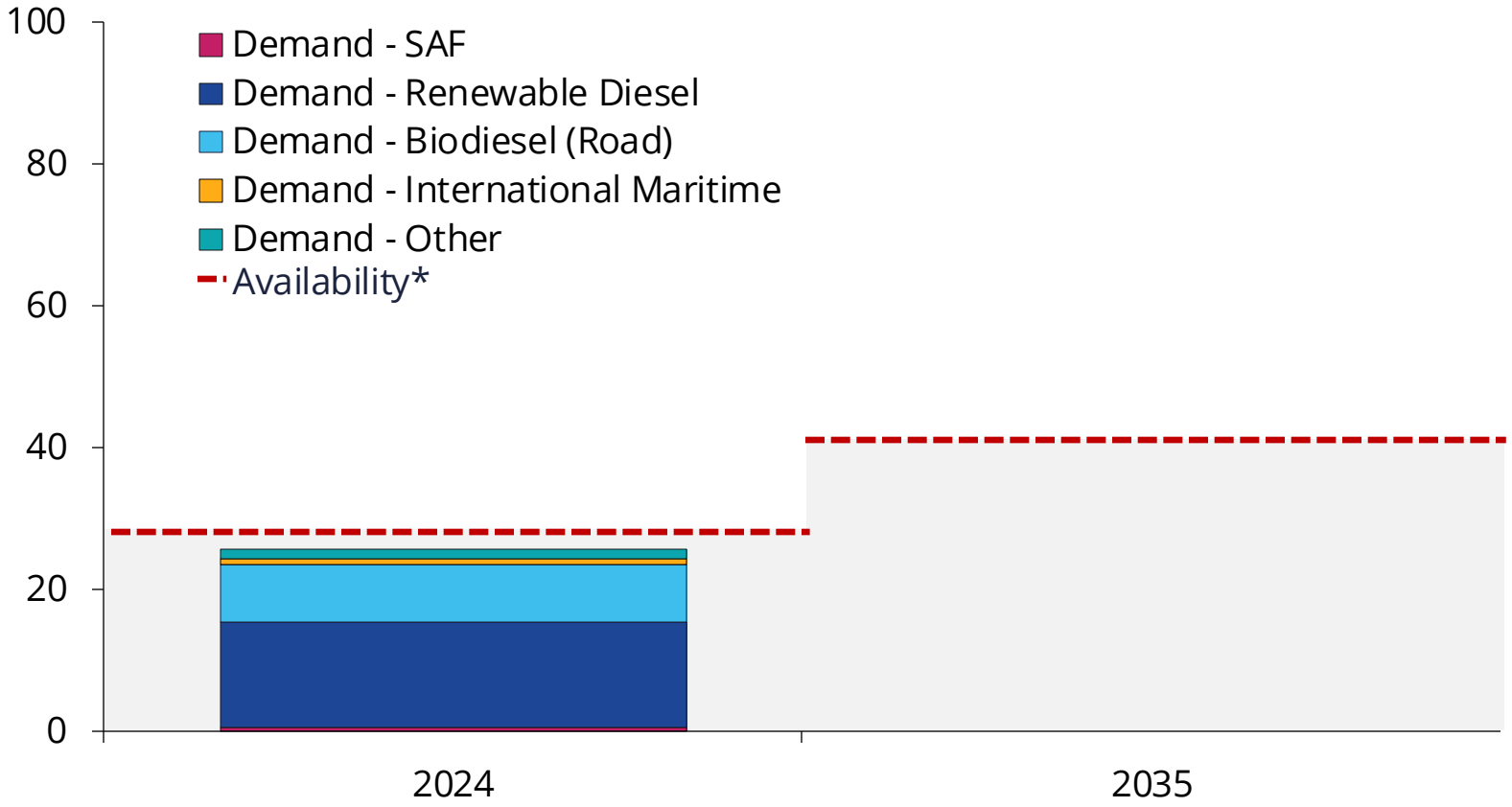
EU and UK SAF mandates will drive rapid growth in demand for waste feedstocks

Global Waste-Based Biofuels Demand vs. Availability* (mn t)



Annex IX Part A, Part B and unclassified waste feedstocks

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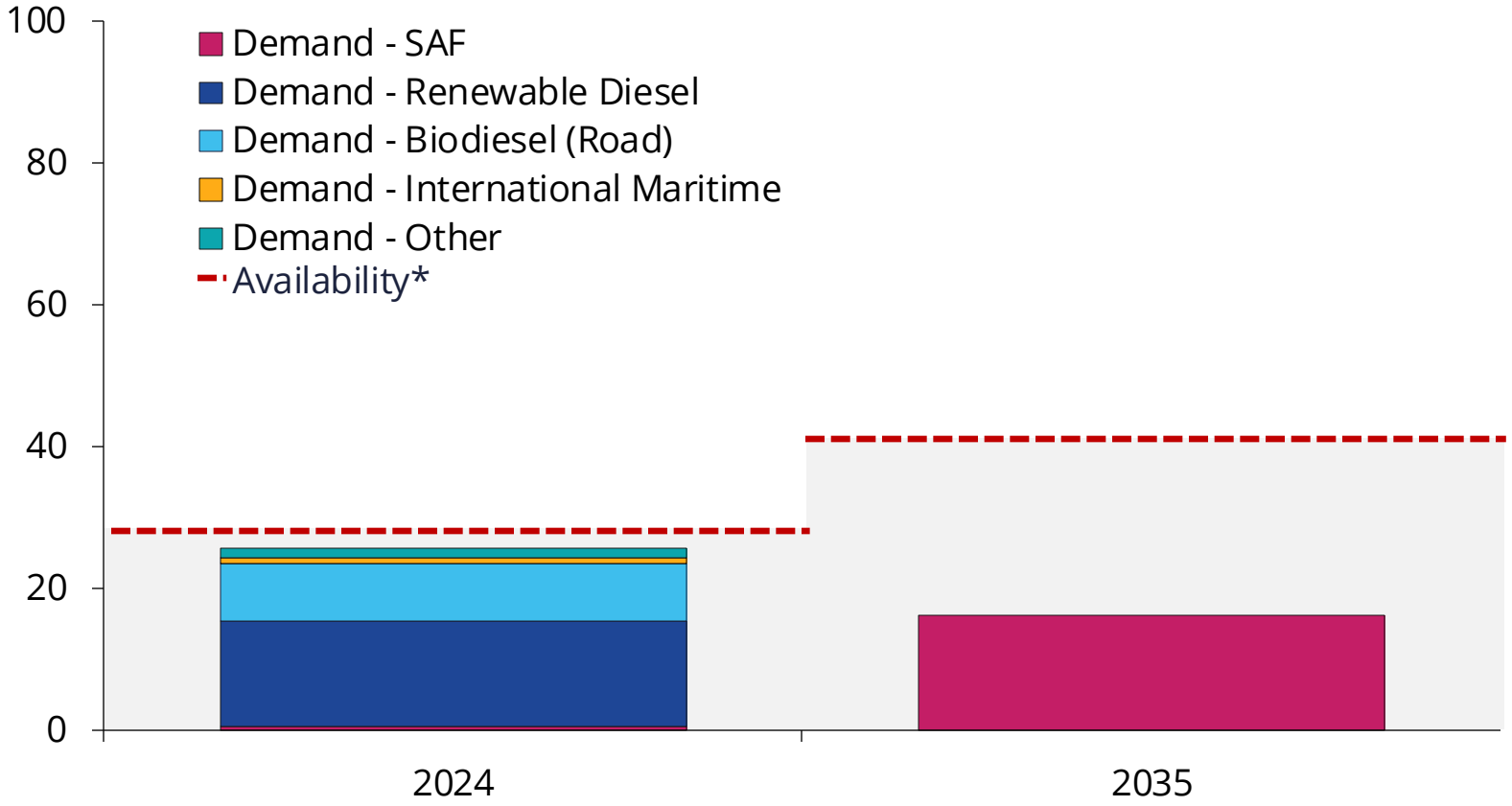
EU and UK SAF mandates will drive rapid growth in demand for waste feedstocks

Global Waste-Based Biofuels Demand vs. Availability* (mn t)



*Annex IX Part A, Part B and unclassified waste feedstocks

Source: Argus Media – Consulting Services

~15 mn t to meet growing SAF demand

The EU-wide SAF mandate will rise to 20pc (of which 5pc e-SAF) by 2035 + UK SAF mandate, etc.

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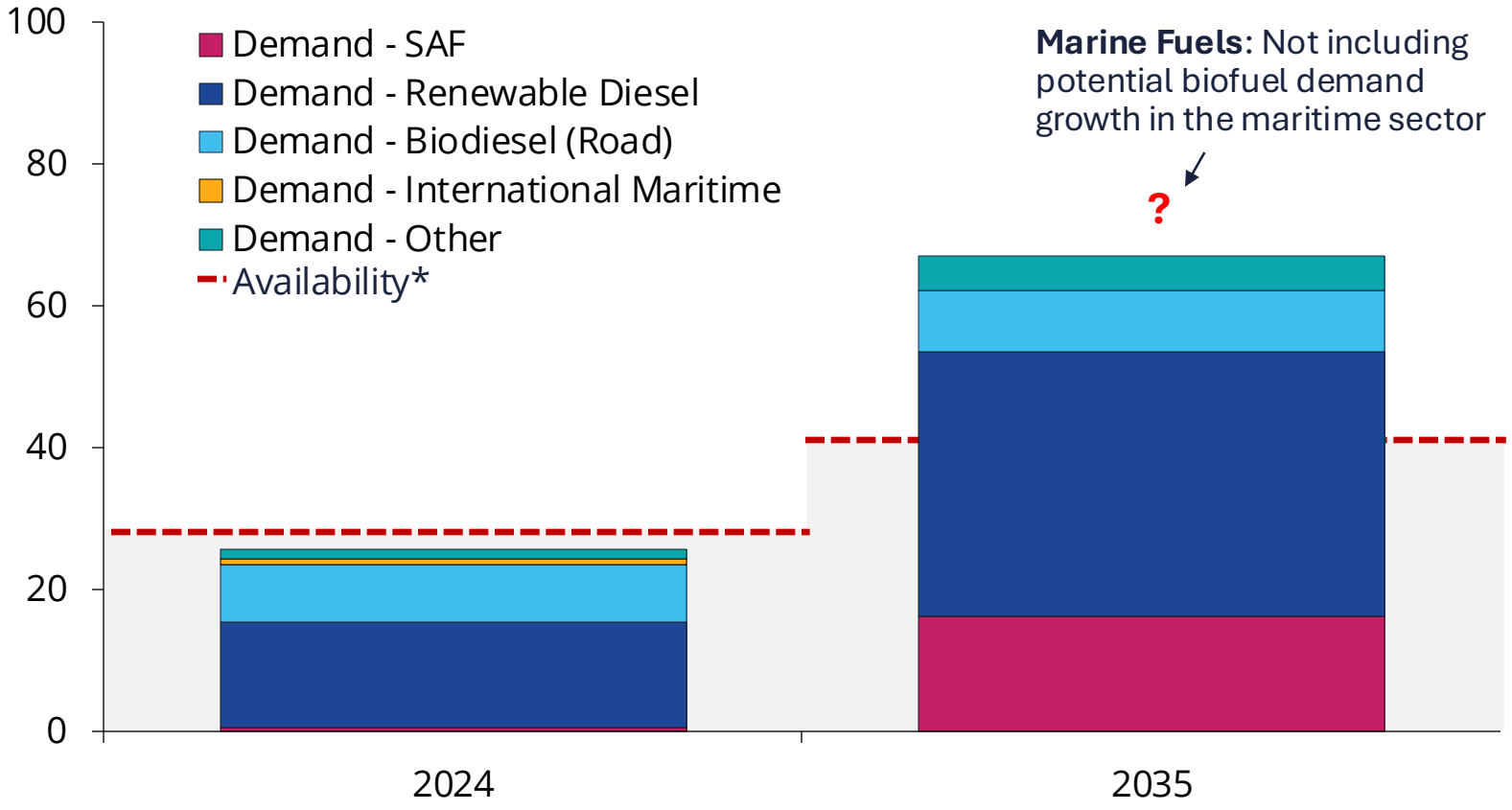
RED III will drive growth in demand for RD from eligible feedstocks

Global Waste-Based Biofuels Demand vs. Availability* (mn t)



*Annex IX Part A, Part B and unclassified waste feedstocks

Source: Argus Media – Consulting Services

~15 mn t to meet growing SAF demand

The EU-wide SAF mandate will rise to 20pc (of which 5pc e-SAF) by 2035 + UK SAF mandate, etc.

RED III

14.5% GHG reduction by 2030 Or 29% Renewable energy by 2030 (transposition in progress).

Key Message: Firm demand for waste feedstocks will far exceed forecast availability from existing streams, even before accounting for potential demand from the maritime sector

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Feedstock bottlenecks: additional risk factors

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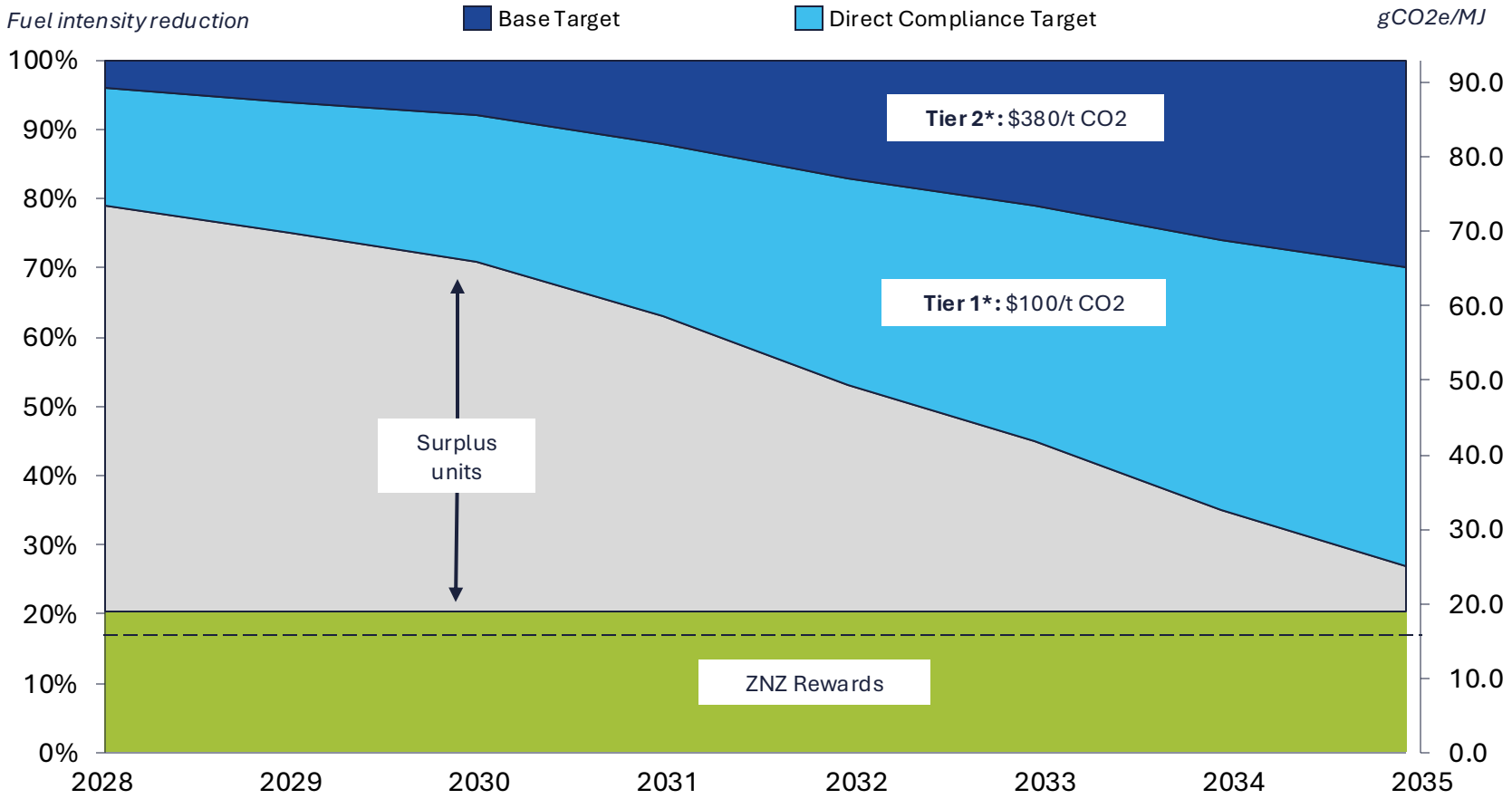
There are several factors that could compound the forecast feedstock shortfall

1 Marine Fuels: IMO two-tier GHG pricing mechanism



** Based upon current $/t CO2 figures announced, applicable 2028-2030.*

1. **Marine Fuels**: announced IMO policy could directly incentivise biofuel use in the maritime sector

2. **Feedstock nationalism / trade flow restrictions**: Indonesia have already restricted exports

3. **APAC SAF Consumption:** There is significant upside to demand and consumption of domestic feedstocks

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Potential solutions: New feedstocks streams

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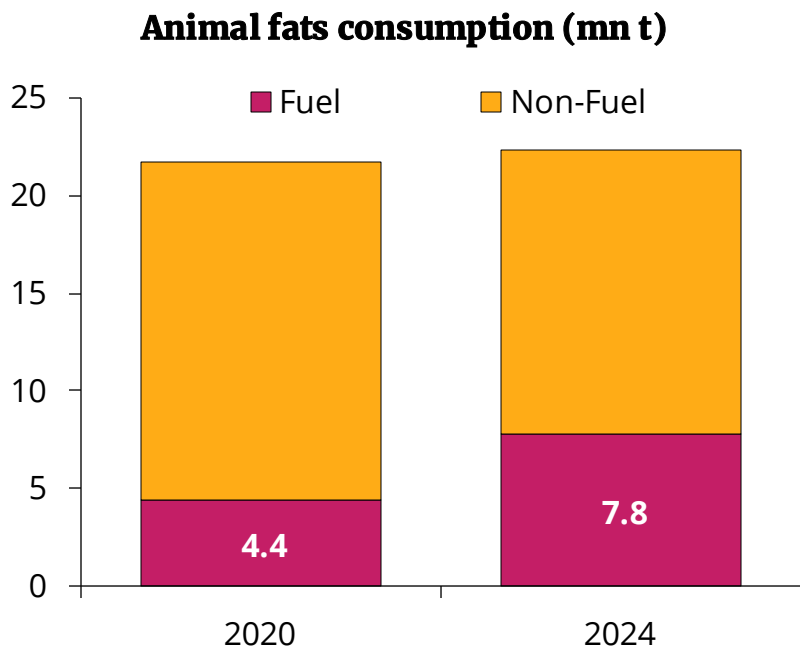
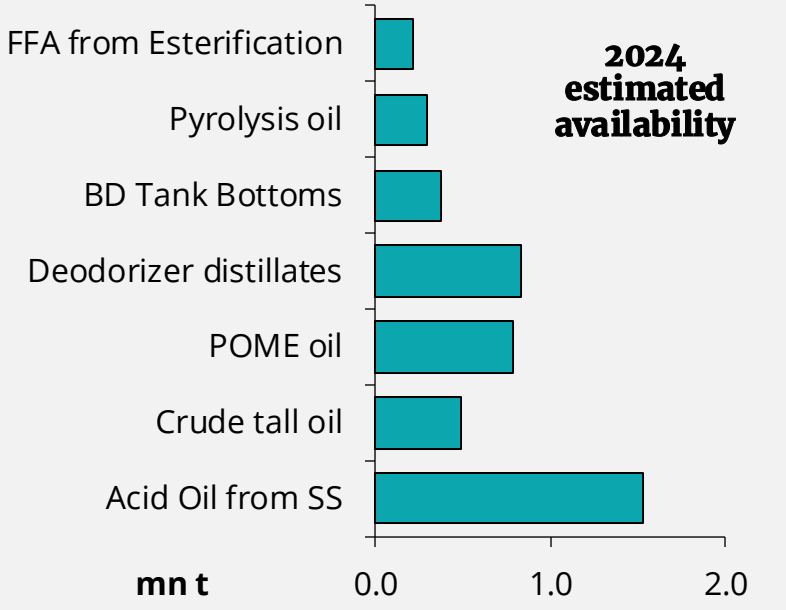
Options 1 & 2 have clear limitations – leaving option 3

Option 1: Diversion from non-fuel uses (some)



Option 2: Utilizing a wider range of waste feedstocks



Source: Argus Consulting

Option 3: Rotation Crops and crops grown on severely degraded land

CORSIA Default Life Cycle Emissions Values (HEFA Process)

Fuel Feedstock	Core LCA Value	ILUC LCA Value	LCA Value (gCO_2e/MJ)
Carinata oil	34.4	**-12.7**	21.7
Camelina oil	42	-13.4	28.6
Jatropha oil	46.9	**-24.8**	22.1

***March 2024 amendment to Annex IX for to Directive (EU) 2018/2001**: intermediate and degraded crops highlighted as potential options for Part A (for aviation) and Part B (road).*

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3. Advanced Plant Oils: growing interest from a wide range of stakeholders

Initiators	Crop	Potential Eligibility	Locations
RioTinto	**Pongamia**	**Part A (aviation)** **Part B (other)**	Queensland, **Australia**
nuseed bp	**Carinata**	**Part A (aviation)** **Part B (other)**	**Argentina**, United States, Uruguay, Brazil, Europe, Australia
IDEMITSU	**Pongamia**	**Part A (aviation)** **Part B (other)**	Queensland, **Australia**
UPM	**Carinata**	**Part A (aviation)** **Part B (other)**	Uruguay, Brazil

Source: Argus Media – Consulting Services, Company announcements

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Potential solutions: New production pathways

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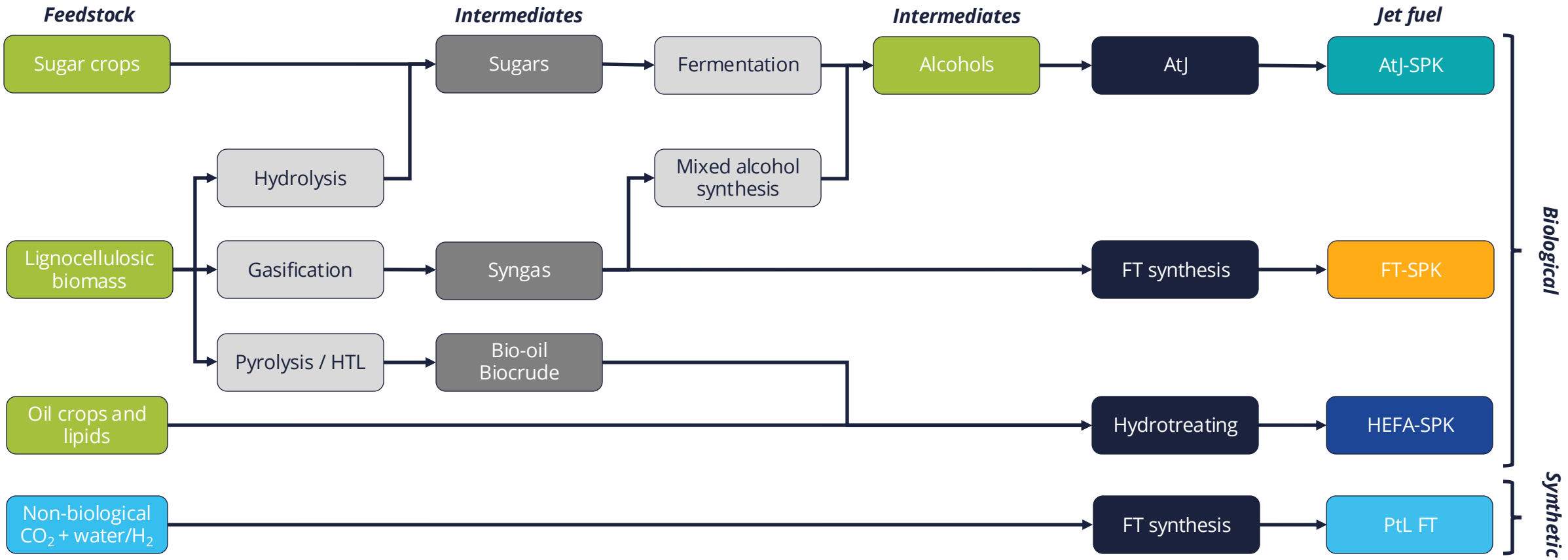
There are multiple pathways for SAF production



Key Message: Each of the options for SAF production has strengths and weaknesses

Source: Argus Media – Consulting Services

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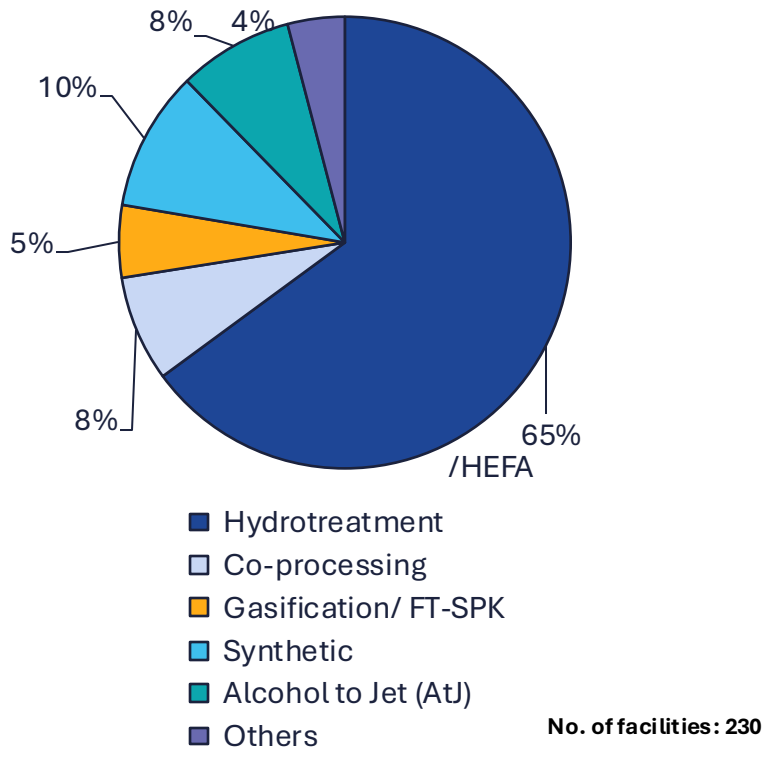
HEFA continues to dominate the firm capacity outlook, with alt. pathways each facing different potential barriers

Technology	Feedstocks	Feedstock availability	Demand for Finished SAF	Production costs
HVO / HEFA	UCO, POME, etc.	**Low**	**High**	**Low**
AtJ	1G ethanol	**High** (of crop)	**Lower** (Not permitted for EU SAF mandate)	**Moderate – Low** (but likely to price lower)
	Cellulosic ethanol	**High Potential**	**High**	**Medium – High**
Gasification + FT	agricultural residues, MSW, etc.	**High Potential**	**High**	**High**
PtL (e-SAF)	Green Hydrogen + CO2	**High Potential** (CO2 restrictions)	**Short Term – Low Long Term – High**	**High**

Global Total (Firm + Announced) SAF Capacity (2035)



No. of facilities: 230

Source: Argus Media – Consulting Services

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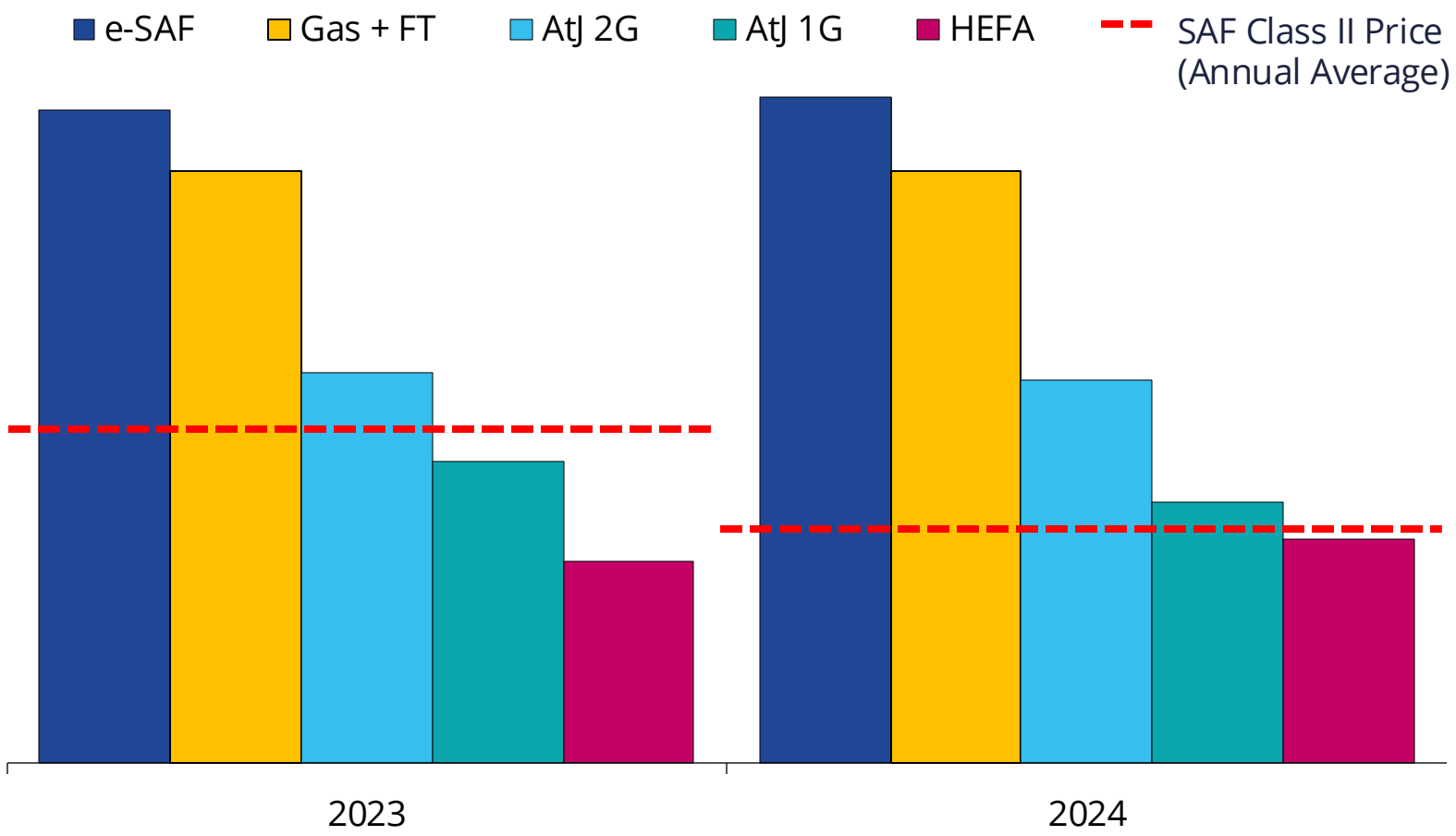
Either higher SAF prices or lower production costs are needed

Estimated Net Cost of SAF production ($/t of SAF in NW Europe)



Source: Argus Media – Consulting Services

Something needs to change

SAF prices between $2,000-$2,500t would be insufficient to drive investment in alt. pathways (without gov't support).

Key Message:
There is potential in the longer-term, but recent price levels leave HEFA as the only attractive option.

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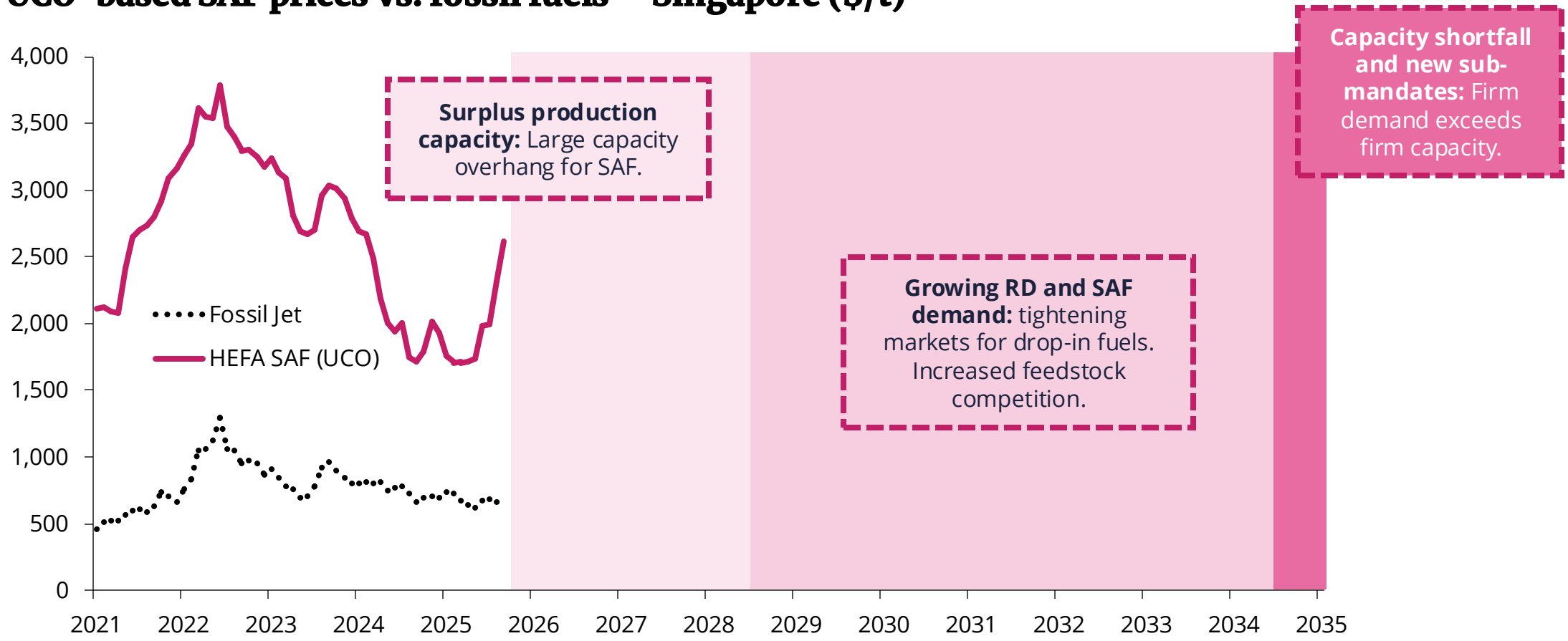
In the longer-term, prices will need to rise to support investment in capacity

UCO-based SAF prices vs. fossil fuels – Singapore ($/t)



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To be, or not to be?

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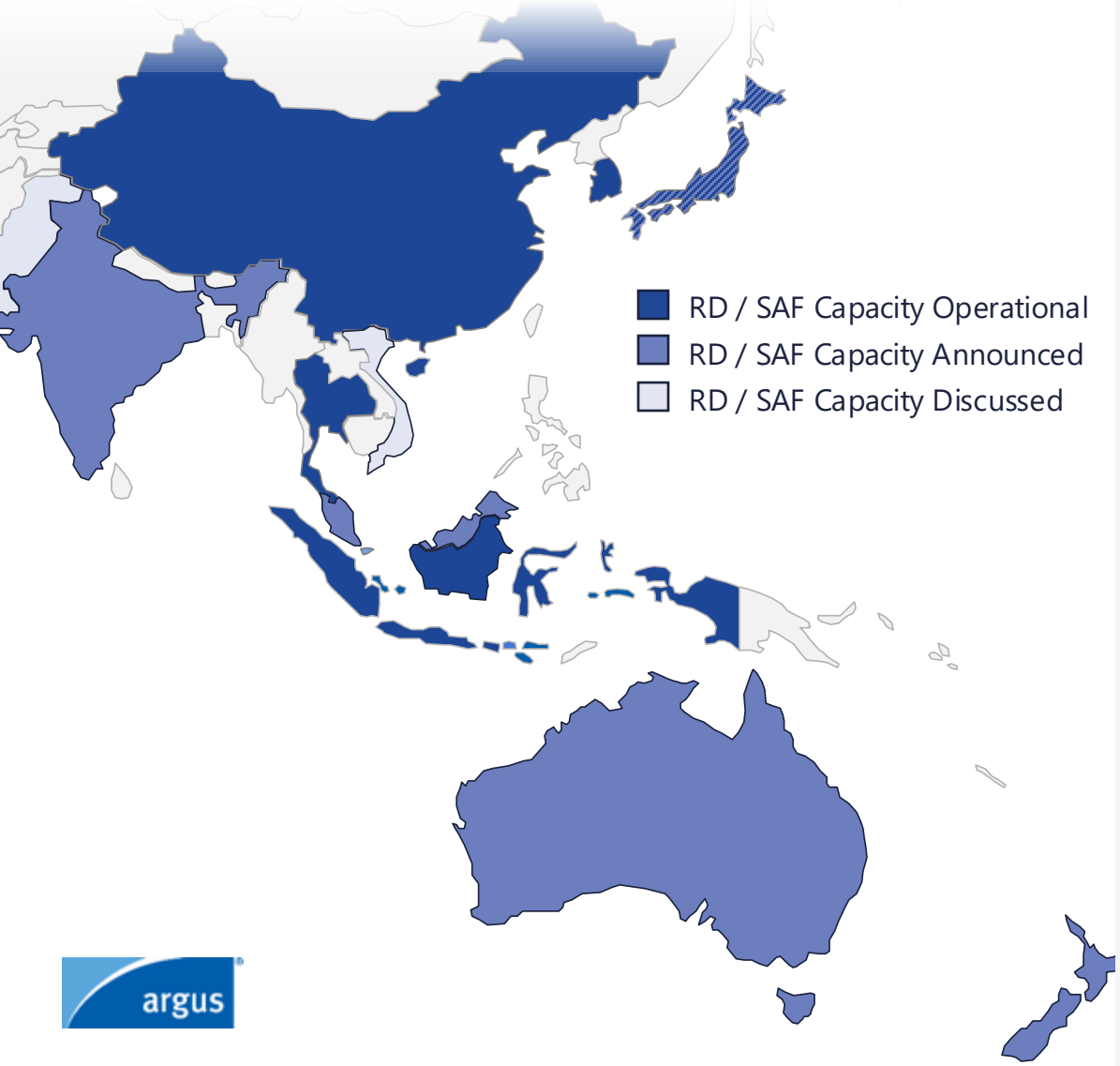
Conclusions: To be. The Asia Pacific market has a key role to play, even if SAF demand in the region is uncertain



APAC: demand set to grow

But predominately crop-based biodiesel and ethanol.

Waste feedstock bottlenecks

New feedstock streams will be needed if mandates are to be met.

APAC feedstock availability

Essential source of feedstocks but flows likely to change dramatically.

Feedstock nationalism / trade flow restrictions

APAC Policy / SAF consumption

Source: Argus Media – Consulting Service

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Asia Pacific Feedstocks

Driving global biofuels markets

Lindsey Liu
Senior Analyst



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Key themes Asian feedstocks

- Policy changes impacting feedstock flows and bringing uncertainty
- Strong feedstock pull with growing regional SAF & HVO production
- New flows emerging on Indonesian export bans and Australian export flows picking up
- Feedstocks commoditising – more spot liquidity, growing price exposure and futures contracts launched

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Argus pricing of the Asian Biofuels market – daily market activity reported to Argus from a wide net of contacts

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Pricing daily feedstocks from sourcing to production



UCO pricing

- China, Straits of Malacca, Indonesia, Vietnam
- Domestic China
- Asian fob export but also Europe & USGC
- Specs both HEFA SAF/HVO & biodiesel production
- RED Europe & EPA US compliant

+ BGME, POME oil, refined POME, RBD palm olein & Australian Tallow

Argus settled biofuels futures

Asia Pacific	Europe	Americas
• UCO fob China (ICE) • UCO fob Straits of Malacca (ICE) • UCOME fob China (ICE) • UCOME fob Straits of Malacca (ICE)	• SAF (ICE) • HVO (ICE & CME) • UCO (CME) • UCO (ICE) • Biodiesel (RME, UCOME, FAME 0) • Rapeseed Oil (CME)	• UCO (CME) • NYH biodiesel (ICE)

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Relevant policies affecting Asia Pacific feedstock flows

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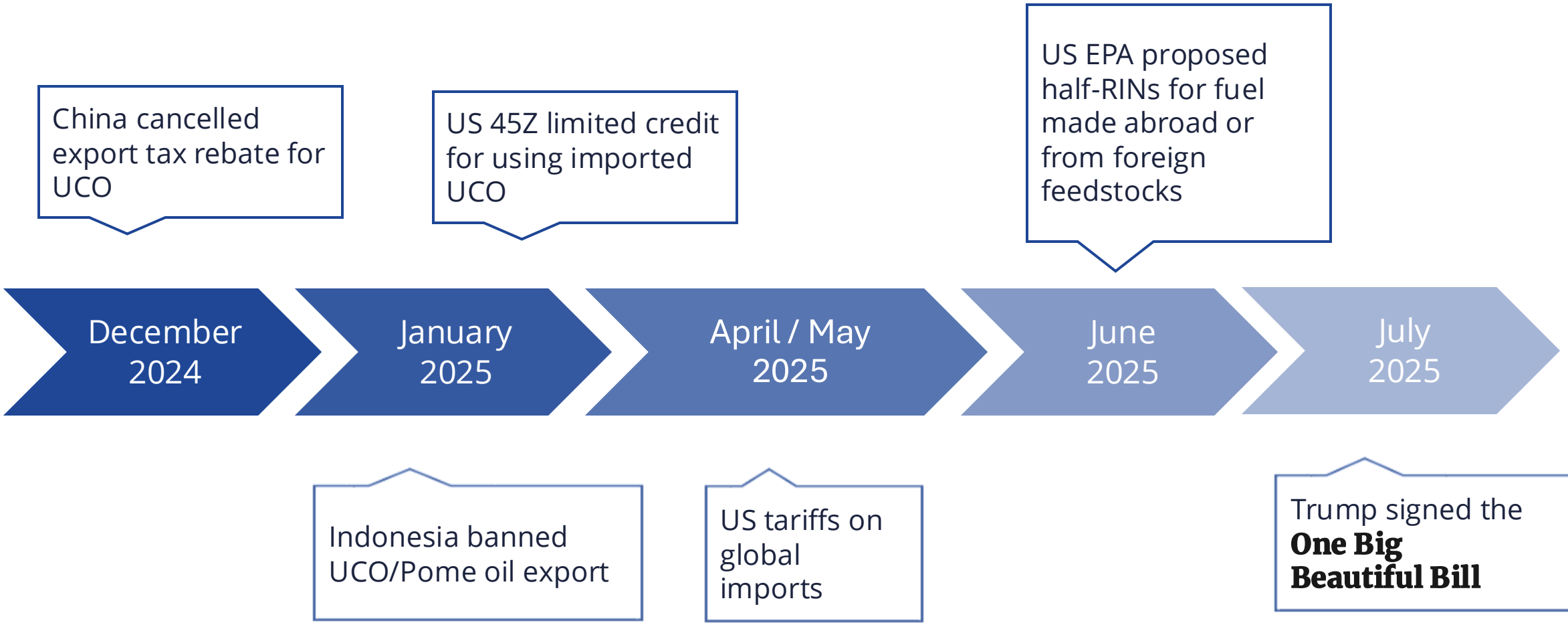
Global policies have affected Asian feedstock trade flows, bringing uncertainties to the market



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US shifts away from Asian feedstocks due to policy changes

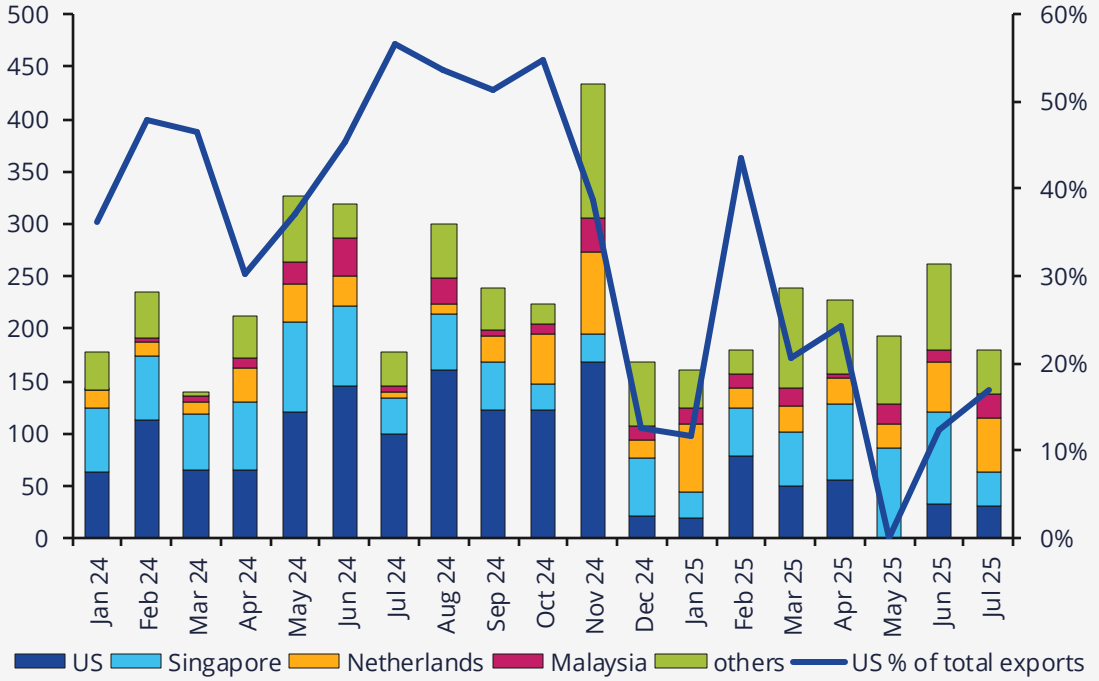
	Blenders Tax Credit	Clean Fuel Production Credit (45Z)	One Big Beautiful 45Z
Status	EXPIRED	Superseded	Version passed into law
Duration	Expired December 2024	2025-2027	2025 - 2029
Beneficiary	Blender	Producer	Producer
Base Rate Credit Amount	$1.00/gal for RD $1.25-1.75/gal for SAF	$1.00/gal for RD $1.75/gal for SAF.	$1.00/gal for RD $1.00/gal for SAF.
Feedstock Restrictions	▪ No restrictions on feedstock source	▪ No restrictions on feedstock source	▪ **ONLY feedstocks from U.S., Canada and Mexico***

**Amendments to feedstock eligibility apply to transportation fuel produced after Dec 31, 2025.*

EPA Policy – Imported Feedstocks

Proposed applying a **0.5x multiplier to RINs from fuels utilizing imported feedstocks**

China UCO export (kt)



Source: GTT

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Indonesia's export ban dampen feedstock exports- market moves to export refined feedstocks

8 Jan 2025

Indonesia temporarily stops issuing UCO, Pome oil export approvals

Jan - Apr

Ministerial stakeholder meetings

May

Raised export levies on UCO & POME

Now

- Little hope for ban to be lifted
- Refined Pome, UCO exported

Impacts

- Fall in Indonesian Pome oil& UCO exports
- Instead export refined & pre-treated Pome oil & UCO (not incl in ban)

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China UCO prices at 3-y high with growing domestic demand

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Growing Chinese HEFA SAF & HVO production could reduce UCO export volumes



Shandong Haike Petrochemical	Dongying, Shandong
Capacity	500kt
Status	Operational

Panjin Pengyao	Panjin, Lianong
Capacity	50kt
Status	Planned - 2025

Beijing Haixin	Rizhao, Shandong
Capacity	200kt
Status	Operational

Ecoceres	Zhangjiagang, Jiangsu
Capacity	350kt
Status	Operational

Jiaao	Guanyun, Lianyungang
Capacity	500kt
Status	Operational

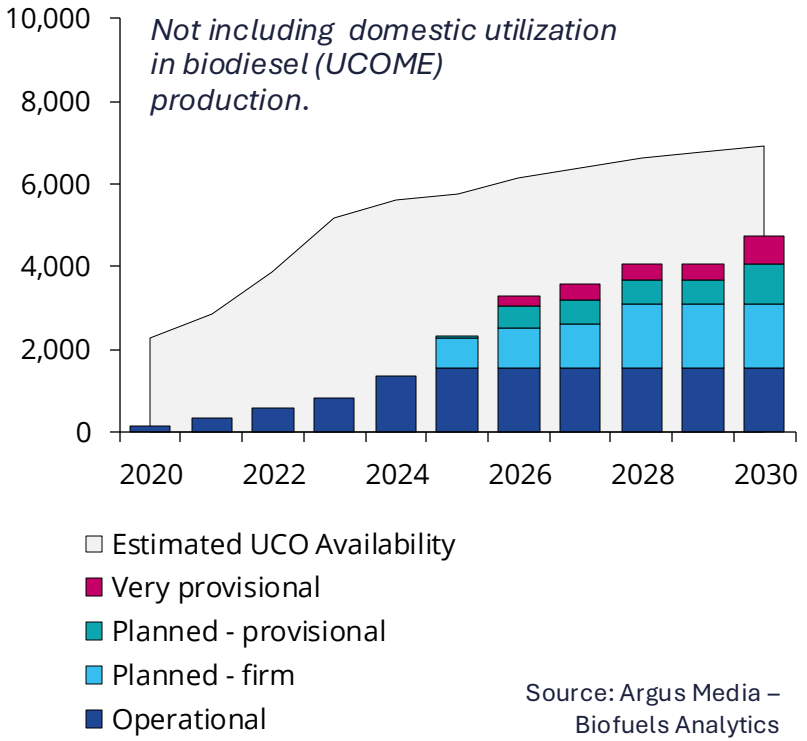
Blue Whale Bioenergy	Jiaxing, Zhejiang
Capacity	500kt
Status	Planned - 2025

Henan Junheng	Puyang, Henan
Capacity	300kt
Status	Operational

Operational / Recent Start-up

Planned – Firm

China Estimated UCO Availability vs. HEFA Capacity (kt)



Source: Argus Media – Biofuels Analytics

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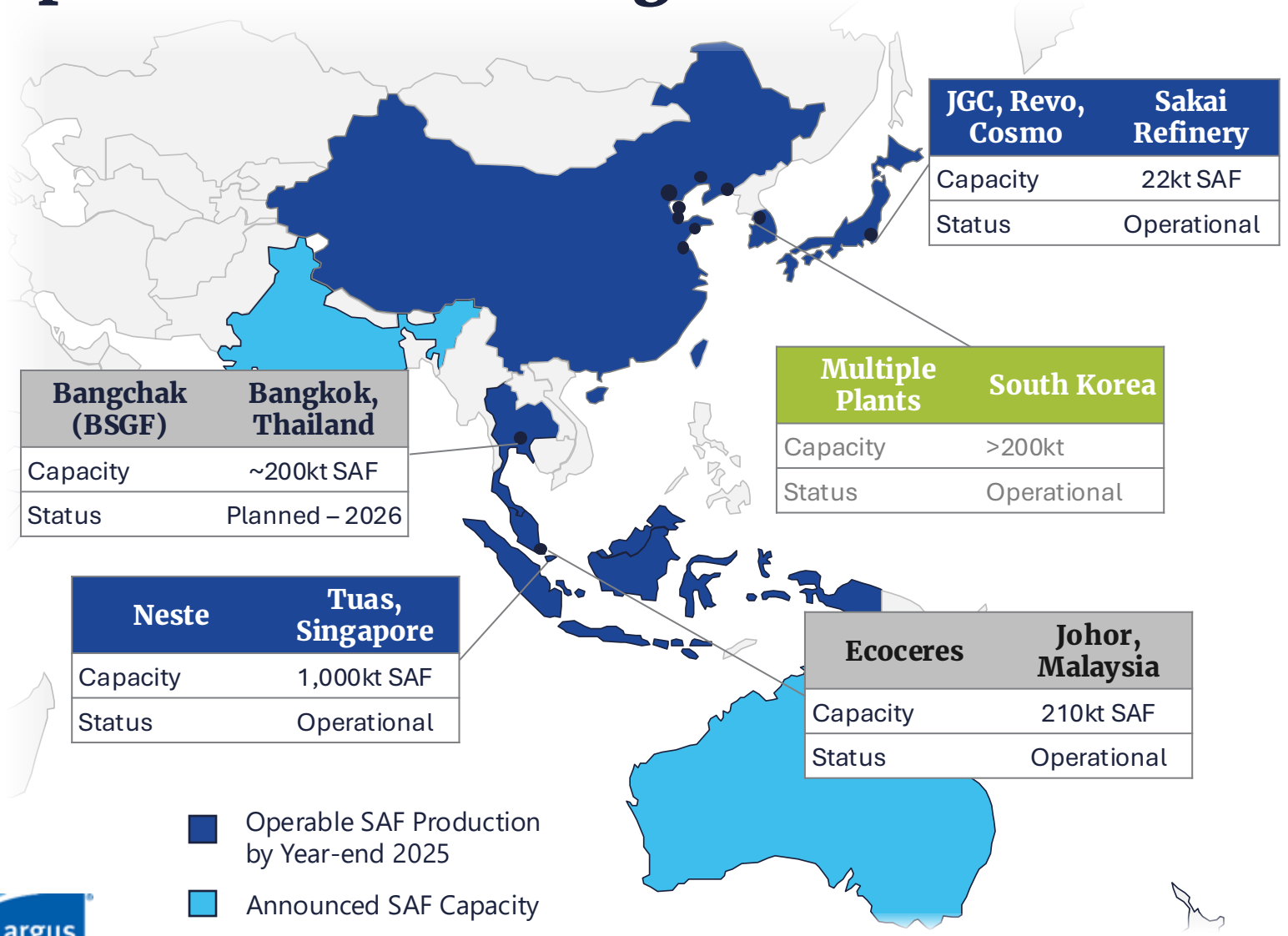
Feedstock demand from regional HEFA SAF & HVO production expected to continue grow



Trade flows have started to shift

The ramp up of production in Singapore has seen increased inflows of UCO and tallow.

Competition for Regional Feedstocks

New plants in Malaysia, Thailand, Japan, etc. are likely to impact the regional feedstock balance

Recent Start-up (Co-processing)
Recent Start-up – HEFA-SPK
Planned – Firm

Source: Argus Media – Consulting Services

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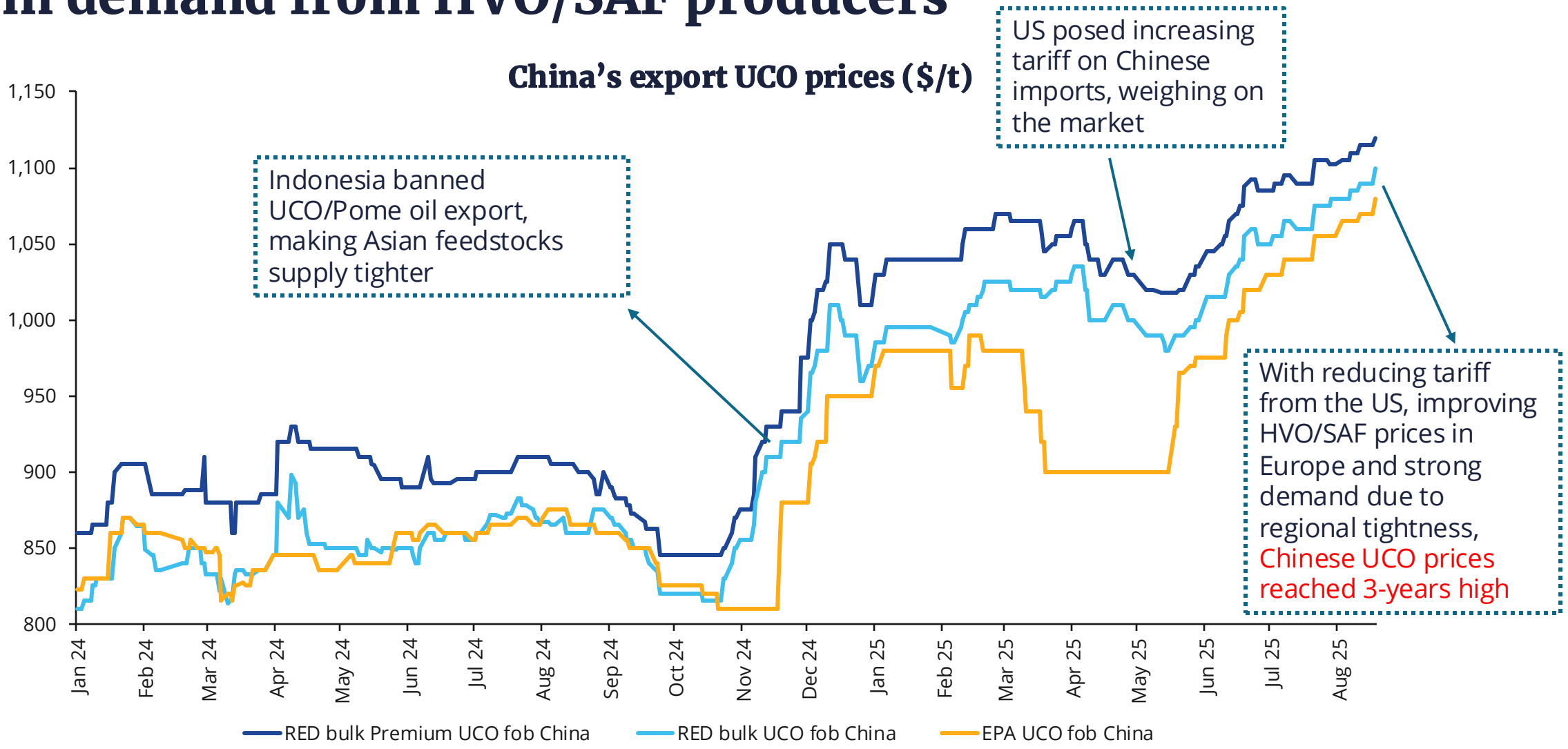
Chinese UCO prices at 3-years high due to tight supply and firm demand from HVO/SAF producers



Source: Argus

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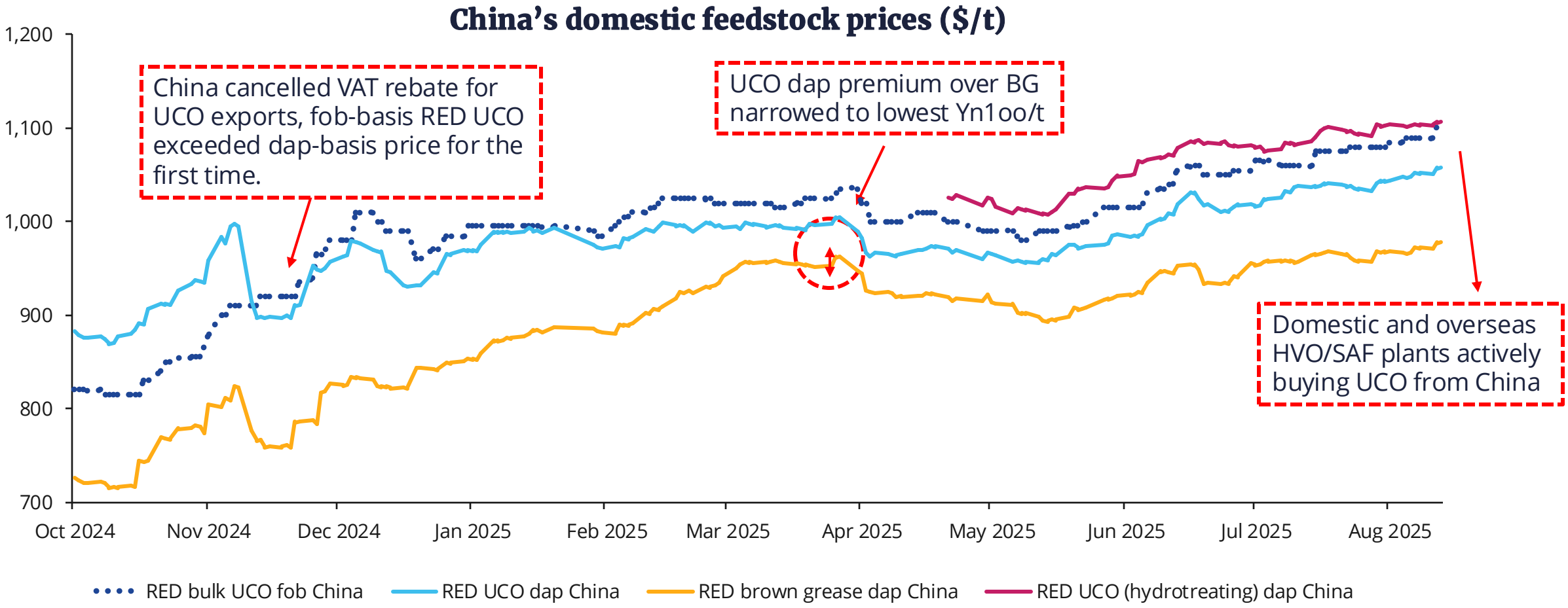
Increasing liquidity of Chinese domestic UCO as Chinese and overseas HVO/SAF production grows



Source: Argus

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Launched pricing of UCO (hydrotreating) dap China to reflect feedstock cost as Chinese SAF production grows

China's UCO exports over Jan-Jul (mn t)		
Jan-Jul 2024	Jan-Jul 2025	Y-o-Y growth rate
1.59	1.44	-9.2%

RED UCO (hydrotreating) dap China
(Launched in April)

Key specs suitable for Chinese hydrotreating plants			
Free fatty acids (FFA)	Iodine value (IV)	Chloride (total)	Metals (total, excluding phosphorus)
max 10pc	min 70g/hg	Max 50ppm	max 100ppm

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Indonesia export ban drives changes in the Southeast Asian market

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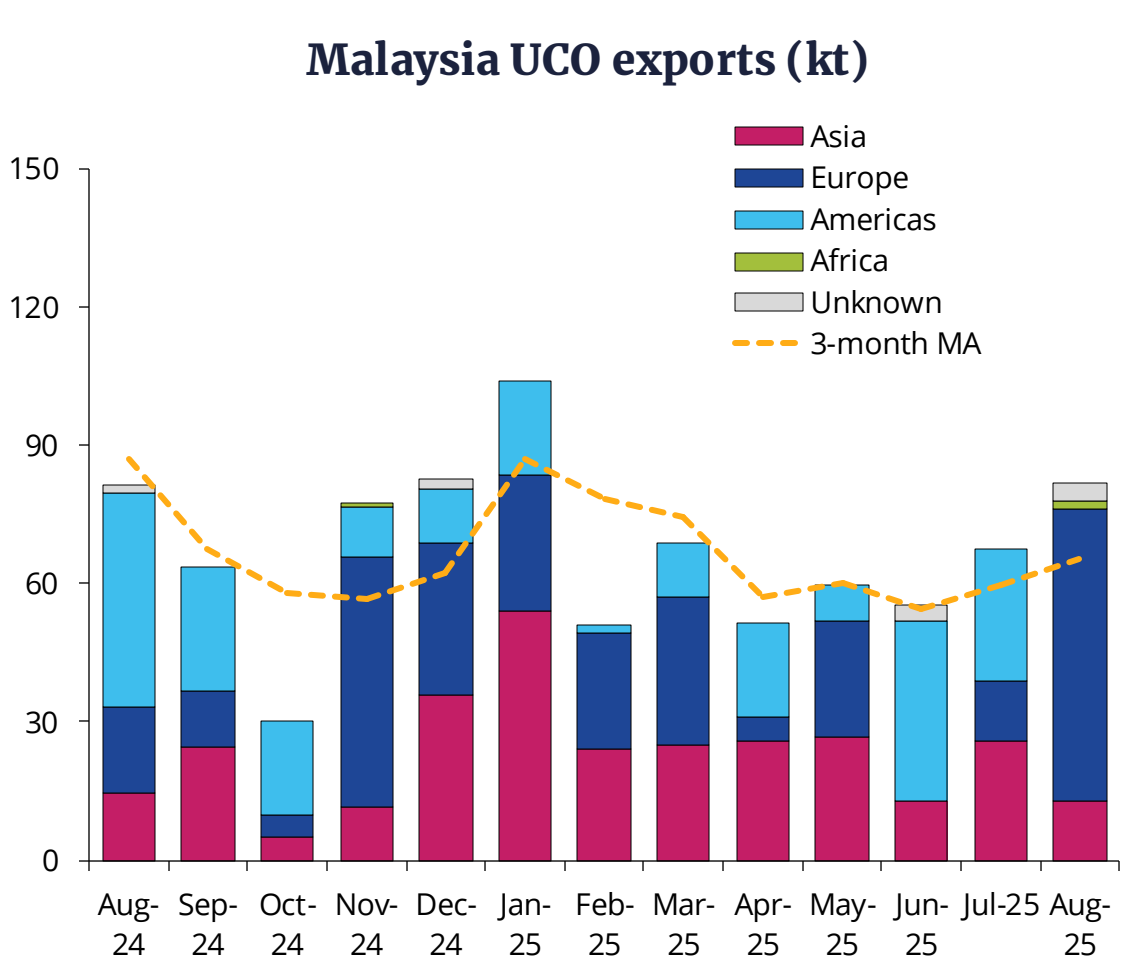
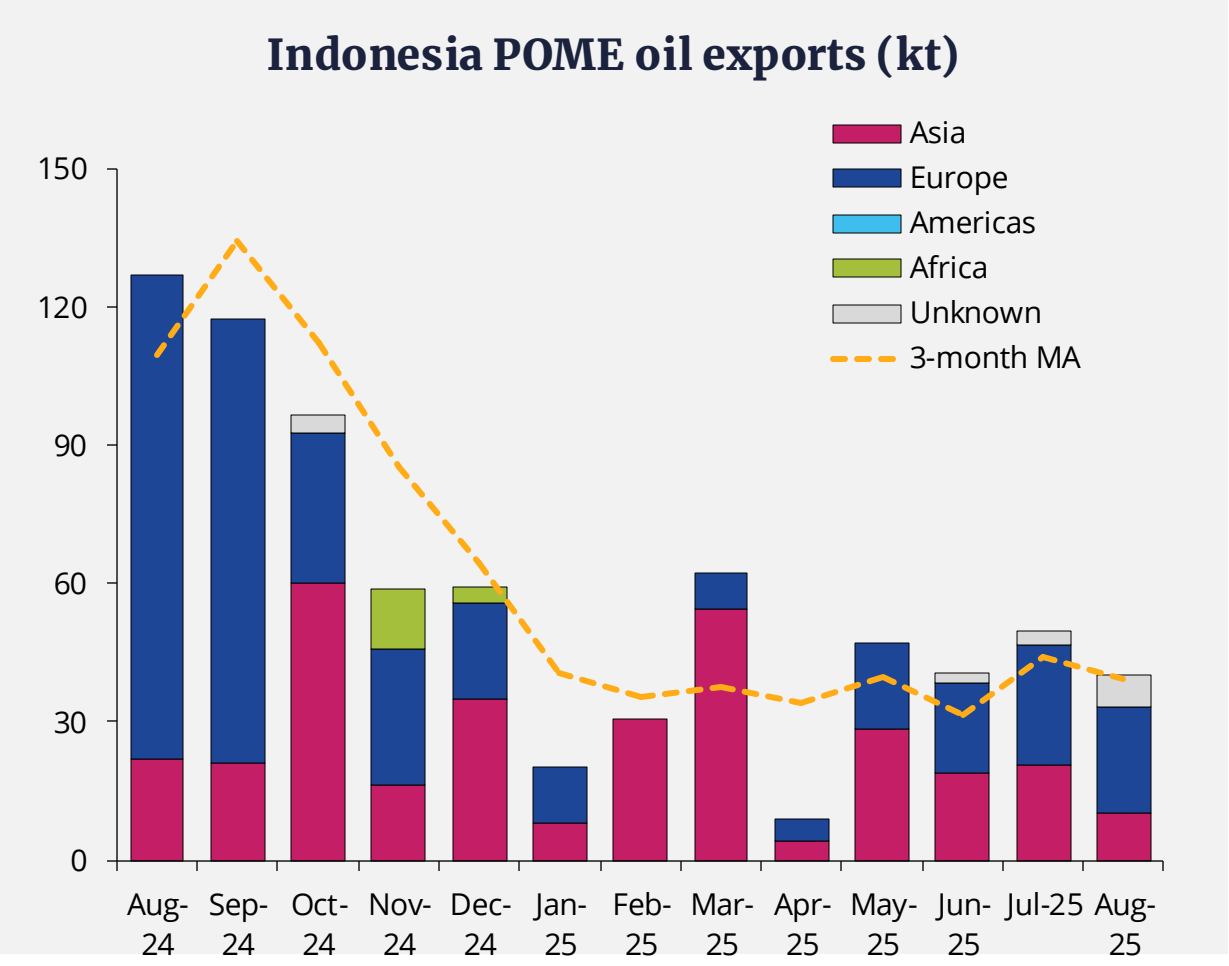
Since the ban, Indonesia Pome exports dropping & Malaysia UCO exports pivoted to the US





Source: Kpler terminal

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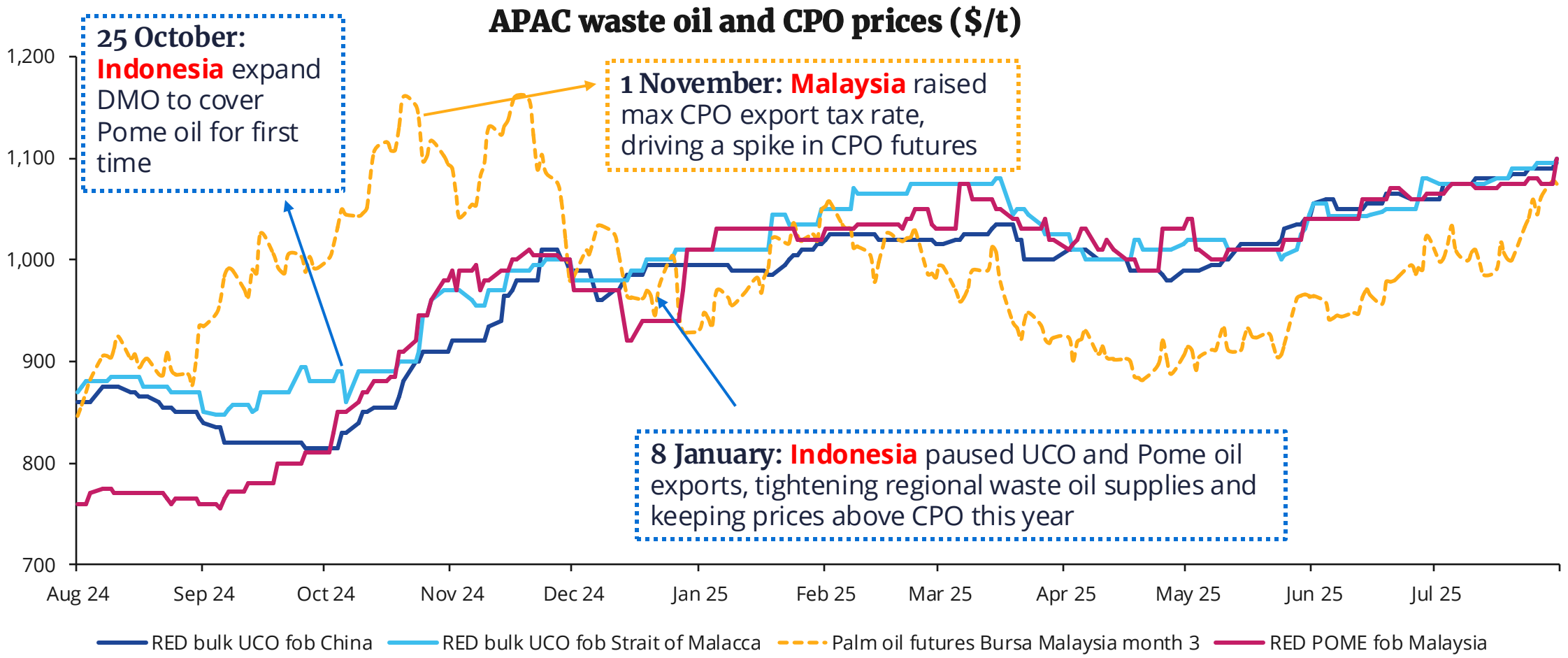
Prices were already up significantly between Oct–Jan due to various policy changes across the region



Source: Argus

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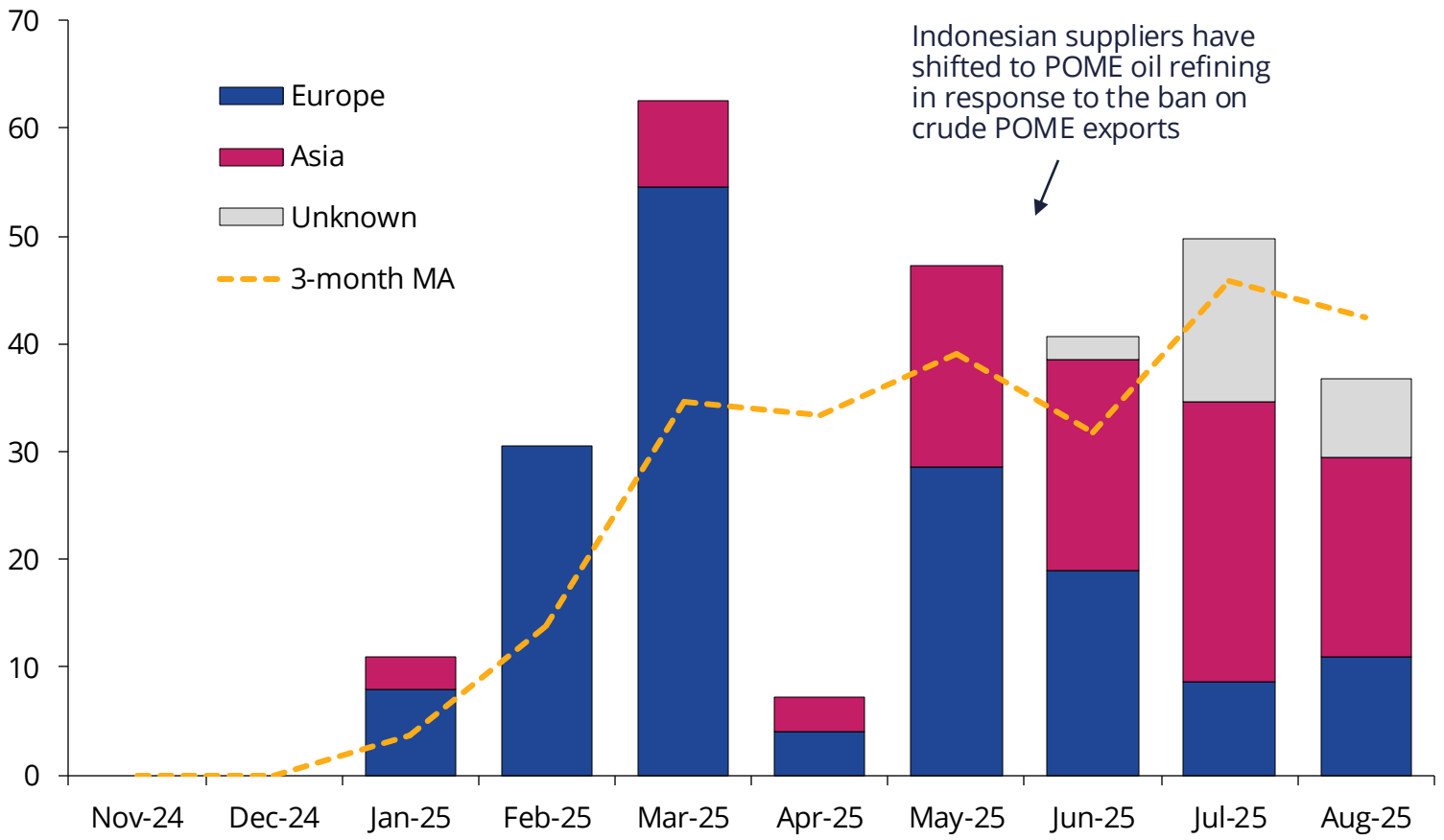
Launching pricing for Indonesian refined POME oil to show true value of this new feedstock flow

Indonesia refined POME oil exports (kt)



Source: Kpler terminal

Refined POME Oil fob Indonesia

Key Specification Changes	POME oil	Refined POME oil
FFA	min 30pc	max 5pc
M&I	Max 3pc	max 1pc
IV	-	50-55g/hg
Total metals	-	max 100ppm
Lovibond color	-	RED>3.0

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Australian waste oil exports grow

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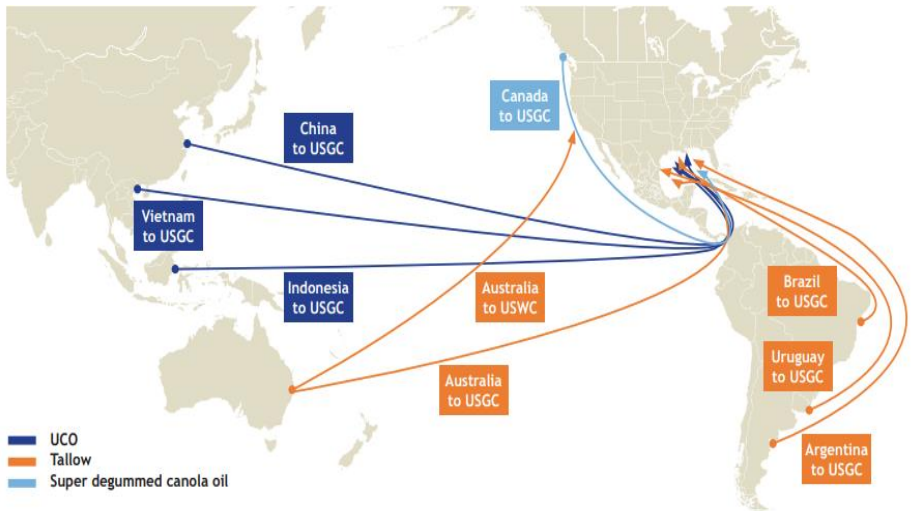
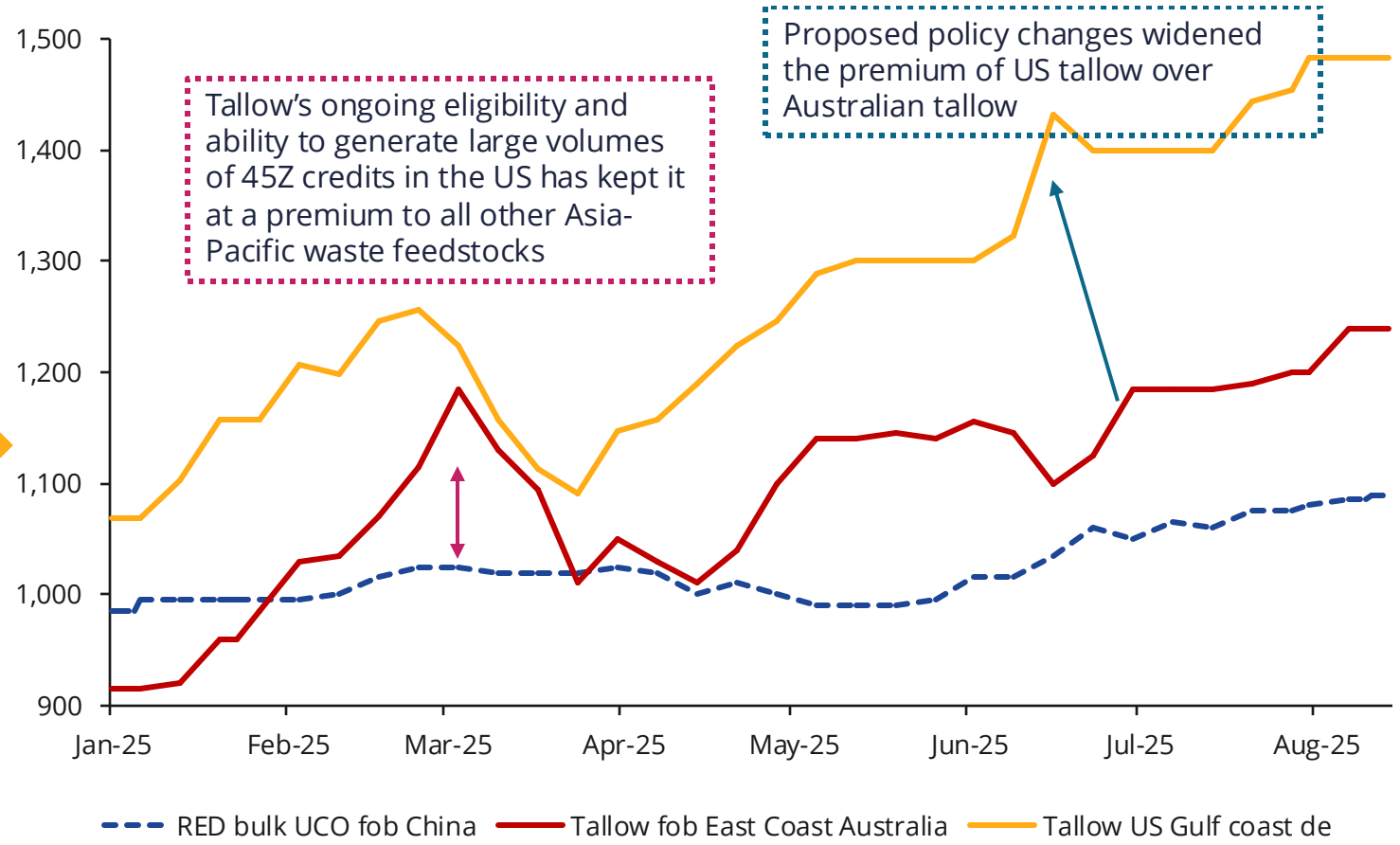
LCFS programs have boosted imports of low-CI feedstocks to the US but will new policies may change trade flows



Australia, US tallow vs China UCO ($/t)



Source: Argus

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Conclusions

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Conclusions: Feedstock markets are steeped in uncertainty and set to undergo significant change



Regulatory Uncertainty

International policy changes, particularly the adjustments in the US market starting from 2026, will continue to bring uncertainties to the APAC feedstock demand.

Growing Feedstock Consumption

Growing regional SAF/HVO capacity has the potential to significantly impact feedstock trade.

Robust Price Assessments

Argus will continue to monitor the market and promptly respond to the quickly changing needs of market.

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Sustainable Aviation Fuel Taking Off:

The ins and outs of the SAF market

Alvin Chew
Vice President, Refined Products & Biofuels



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Agenda

- Surplus SAF capacity contributed to downward pressure on SAF prices; Asian production heading to Europe
- Opportunity for Asia to supply HVO/Renewable Diesel to likely short European market
- Chinese UCOME diverted to SG for bio-bunker after ADD, demand for alternative marine fuels set to rise

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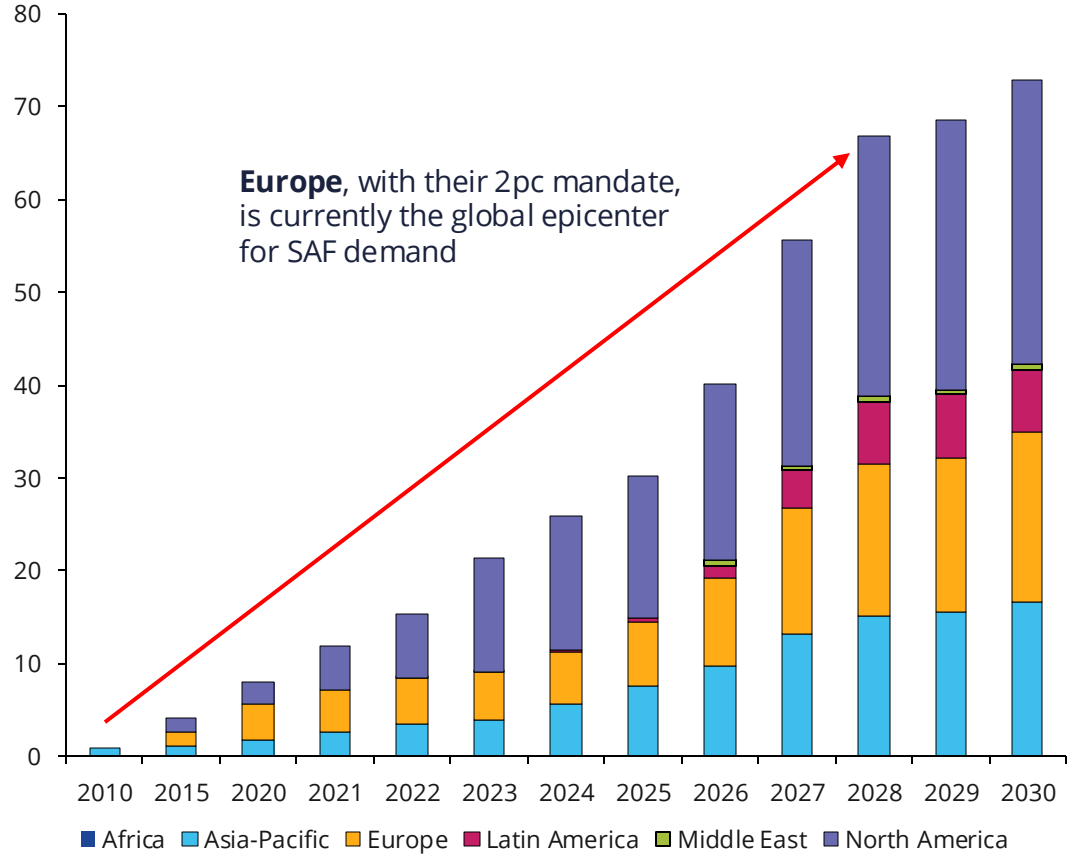
Surplus of SAF capacity has contributed to downward pressure on SAF prices, dropped by 22pc since 2022

Global RD/SAF Nameplate Capacity (mn t)



Argus RED SAF fob ARA (US$/t)



Source: Argus Media Global SAF/HVO Refinery Database
All pathways included

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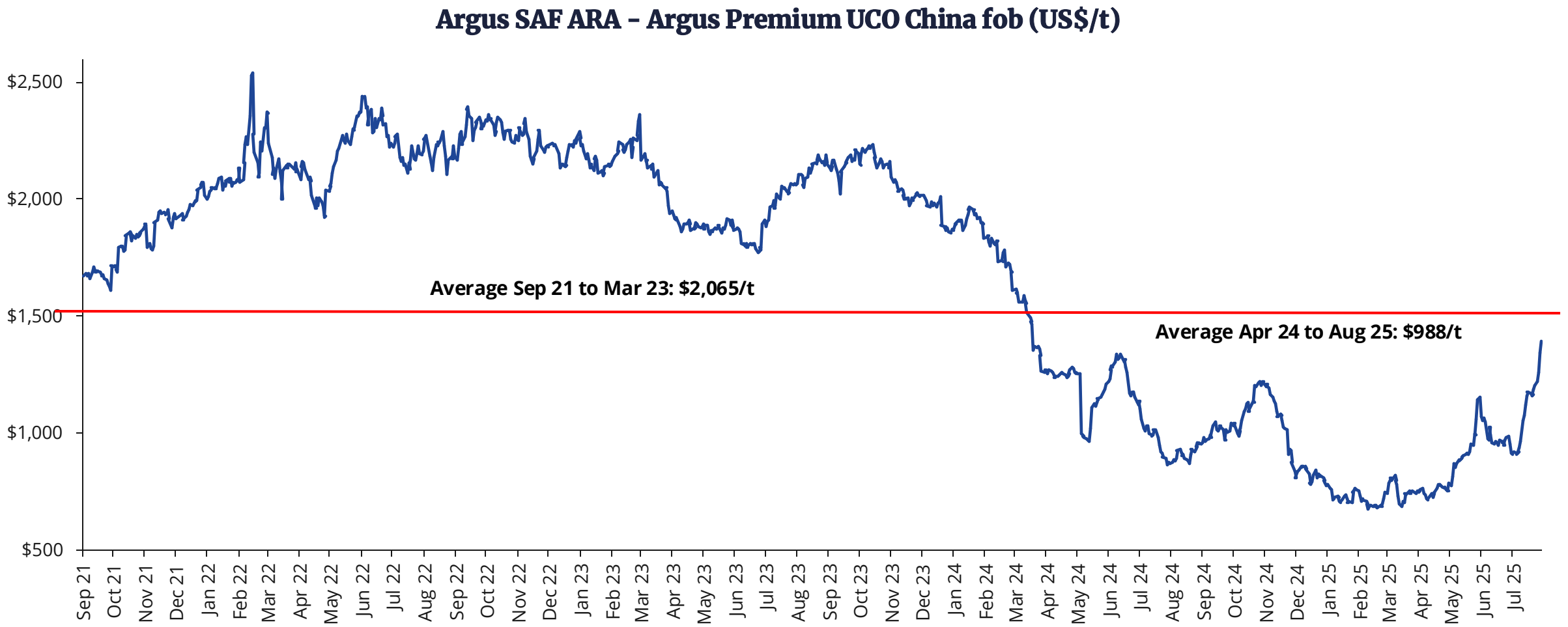
Average SAF premium over UCO less than half of pre-2023 levels



Source: Argus Media

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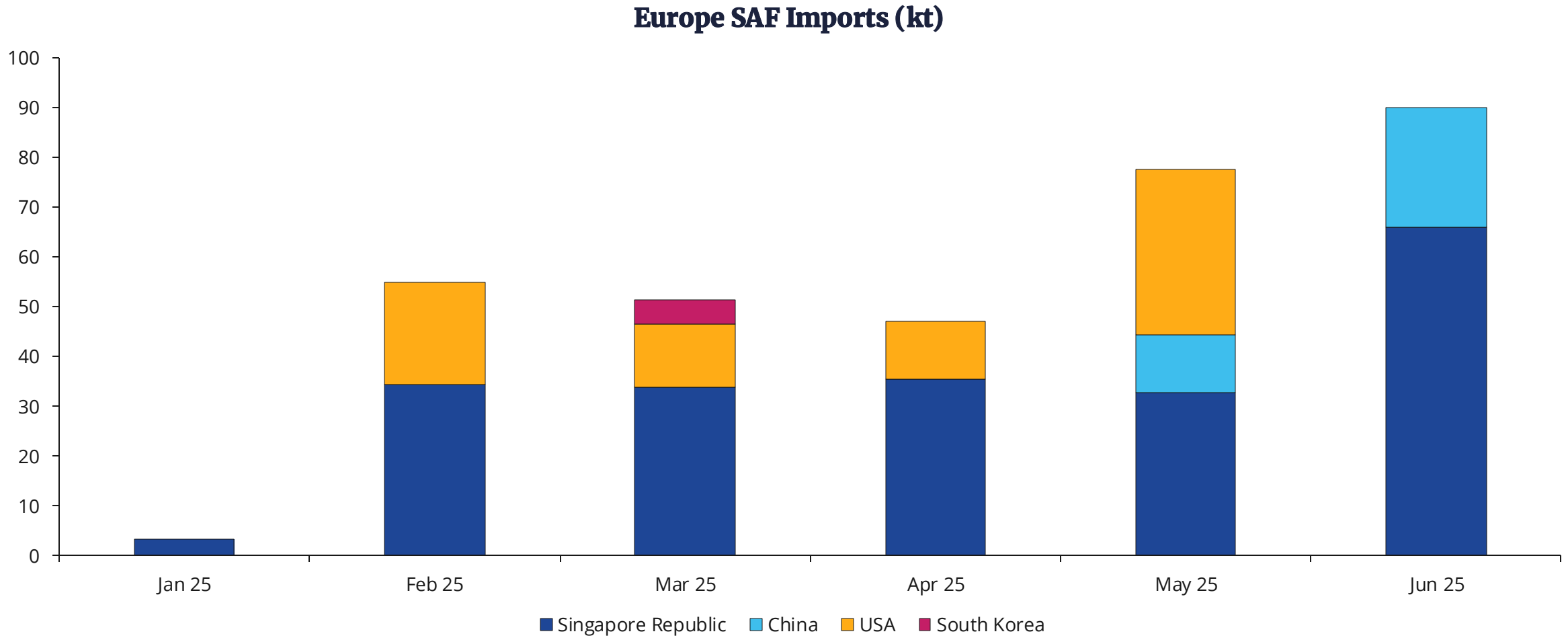
Current absence of Asian SAF mandates means most Asian production heading to Europe



Source: Shipping data, Argus Consulting

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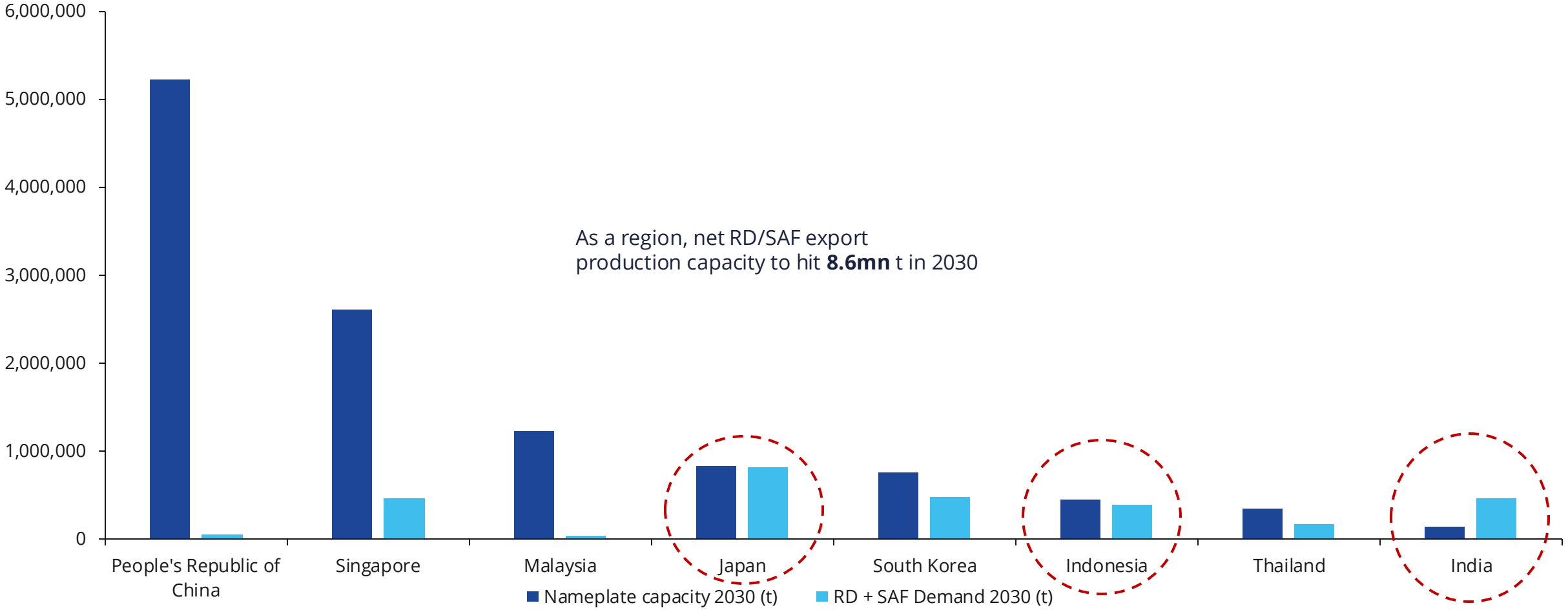
With the lack of Asian SAF mandates, Asia expected to remain net exporter of HVO/SAF in 2030



Source: Argus Media Global SAF/HVO Refinery Database (all pathways included, including only planned and operational)
Argus Biofuels Analytics Q3 2025

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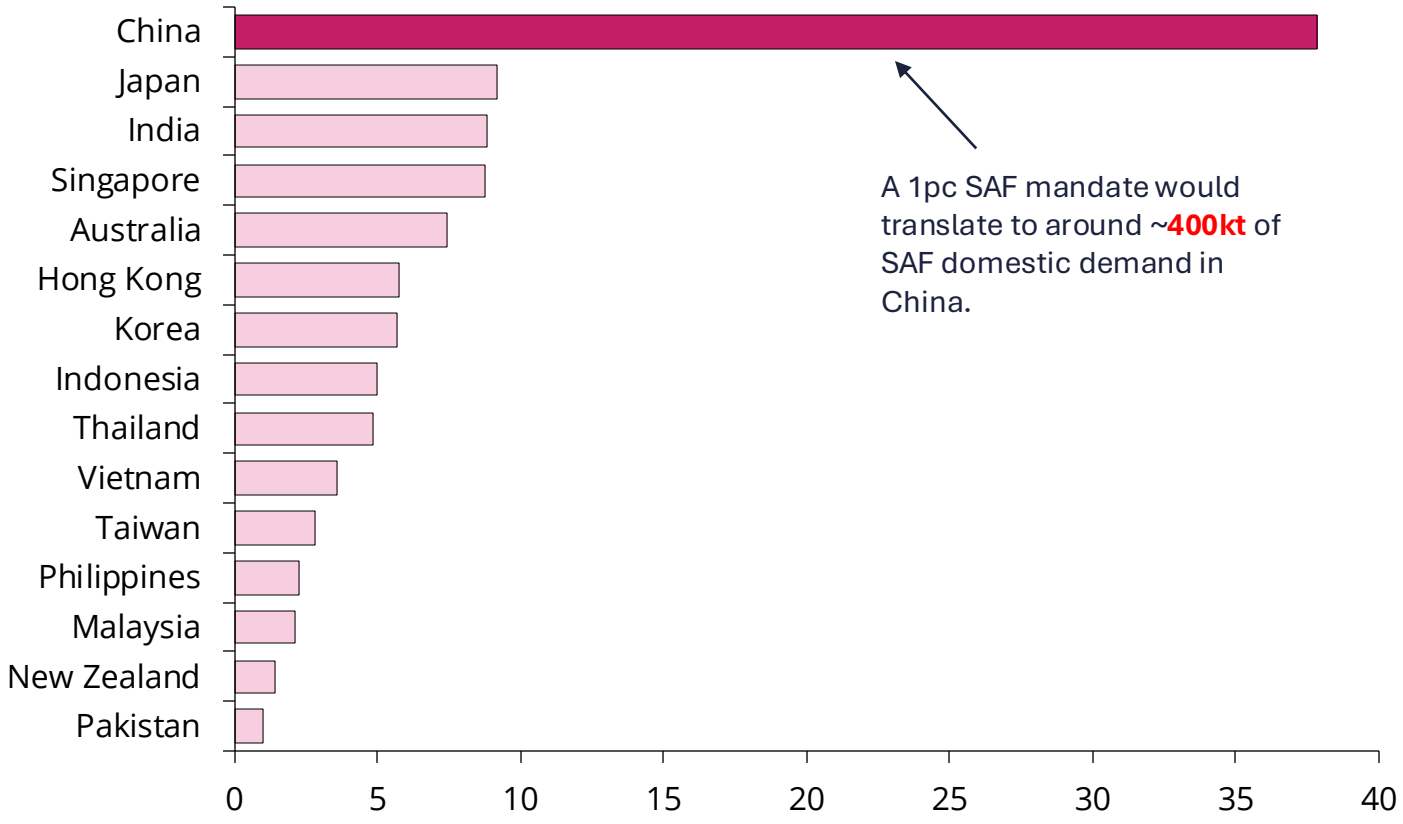
China could announce “sweeping” policies soon, with signs pointing towards an increase in domestic SAF consumption

Asia Pacific Jet Fuel Demand – 2024 (*mn t*)



Source: Argus Media – Consulting Services

Green Finance policies for the SAF industry announced by the Central Bank in July 2025

1. Seek to cover from collection, trade, services, equipment and certification
2. SAF industry given “strategic position”
3. “Targeted green finance support will help to reduce cost of SAF use, to accelerate SAF consumption from pilot to large-scale application”

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The fossil jet and SAF are disconnected markets with their own unique price determining factors



	HEFA-SPK SAF	Fossil Jet
Feedstocks	UCO	Crude Oil
Production Technology	HEFA	Refining of Minerals Oils
Demand	Regulations	Aviation Demand & Economic Outlook
Freight	MRs & part cargoes	LRs
Market Participants	Standalone HEFA Plant	Integrated Oil Refinery



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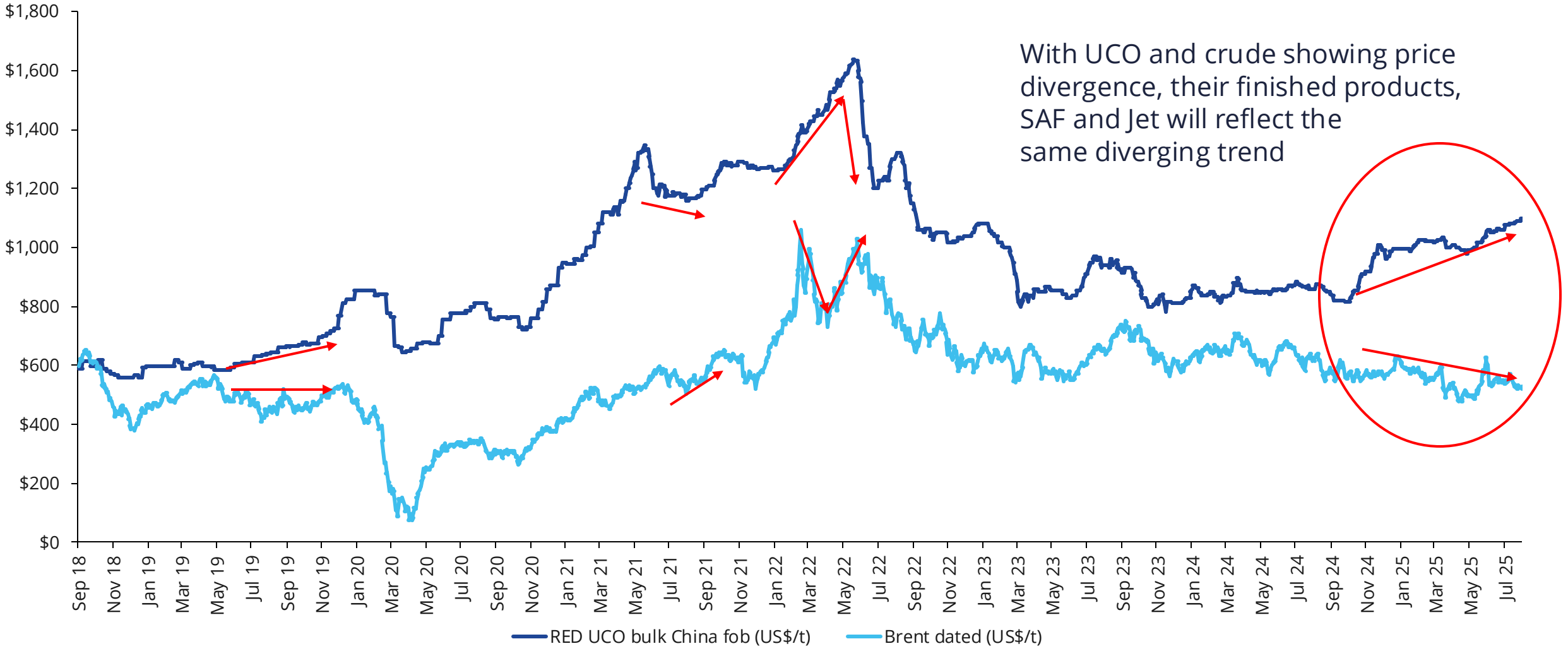
UCO and the crude oil markets show obvious divergence



Source: Argus

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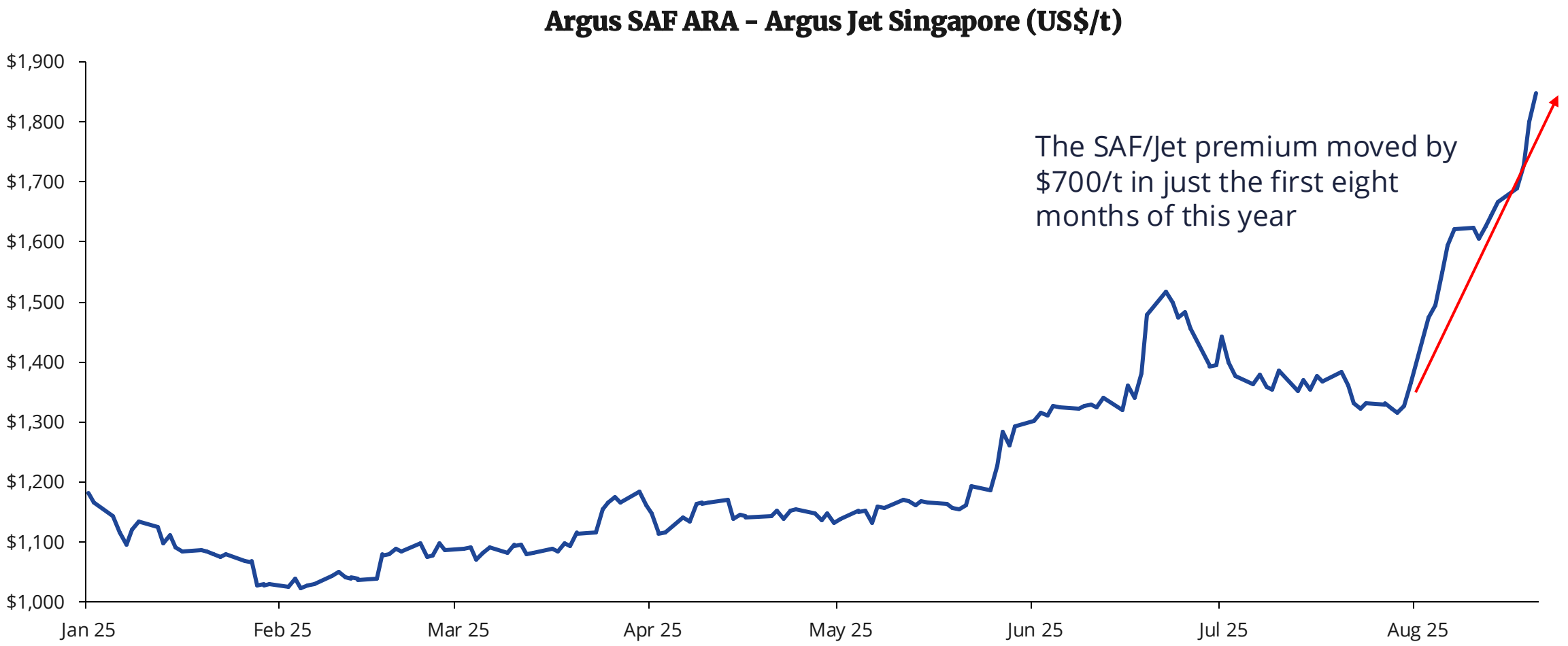
Volatile price spread between SAF and fossil jet. Using fossil jet price + fixed premium to price SAF highly risky



Source: Argus

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+ **Premium** ≠



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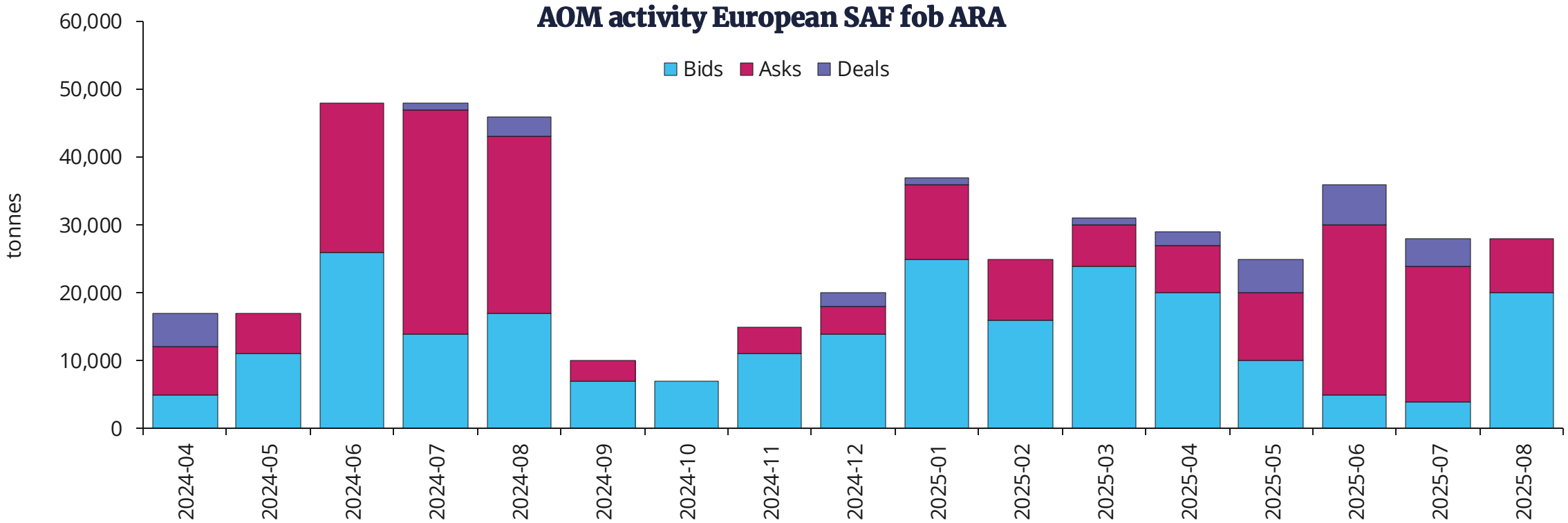
Argus SAF benchmark emerging in Europe – liquidity on Argus Open Markets pricing platform underpinning ICE futures contracts for SAF



- **30,000 t** HEFA-SPK SAF traded on AOM, about **420,000 t** worth of bids and offers
- 9 companies already active in the screen, more than **30** with access
- First trades on ICE Exchange SAF futures contract settled on Argus fob ARA SAF pricing

Source: Argus

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Opportunity for Asia to supply HVO/Renewable Diesel (RD) to a likely short European market

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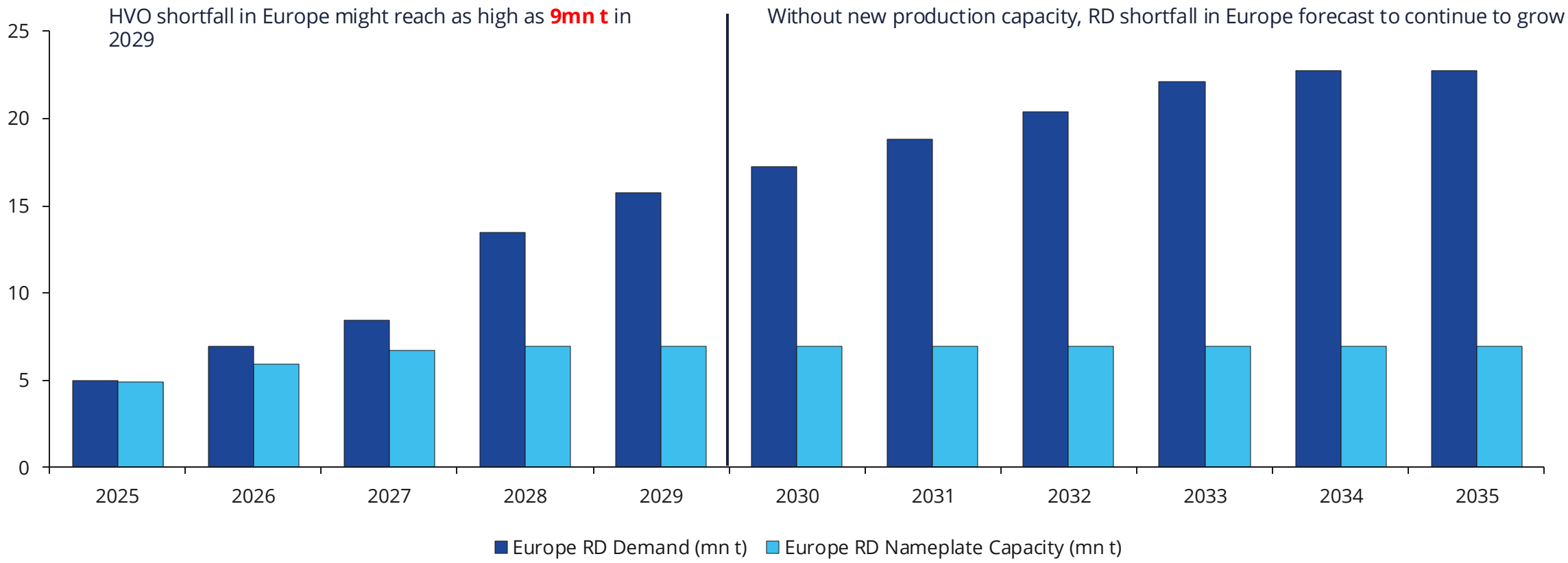
Opportunity for Asia to supply HVO/RD to a likely short European market

Europe RD Demand vs Supply (mn t)



Source: Argus Media Global SAF/HVO Refinery Database (all pathways included, including only planned and operational)
Argus Biofuels Analytics Q3 2025

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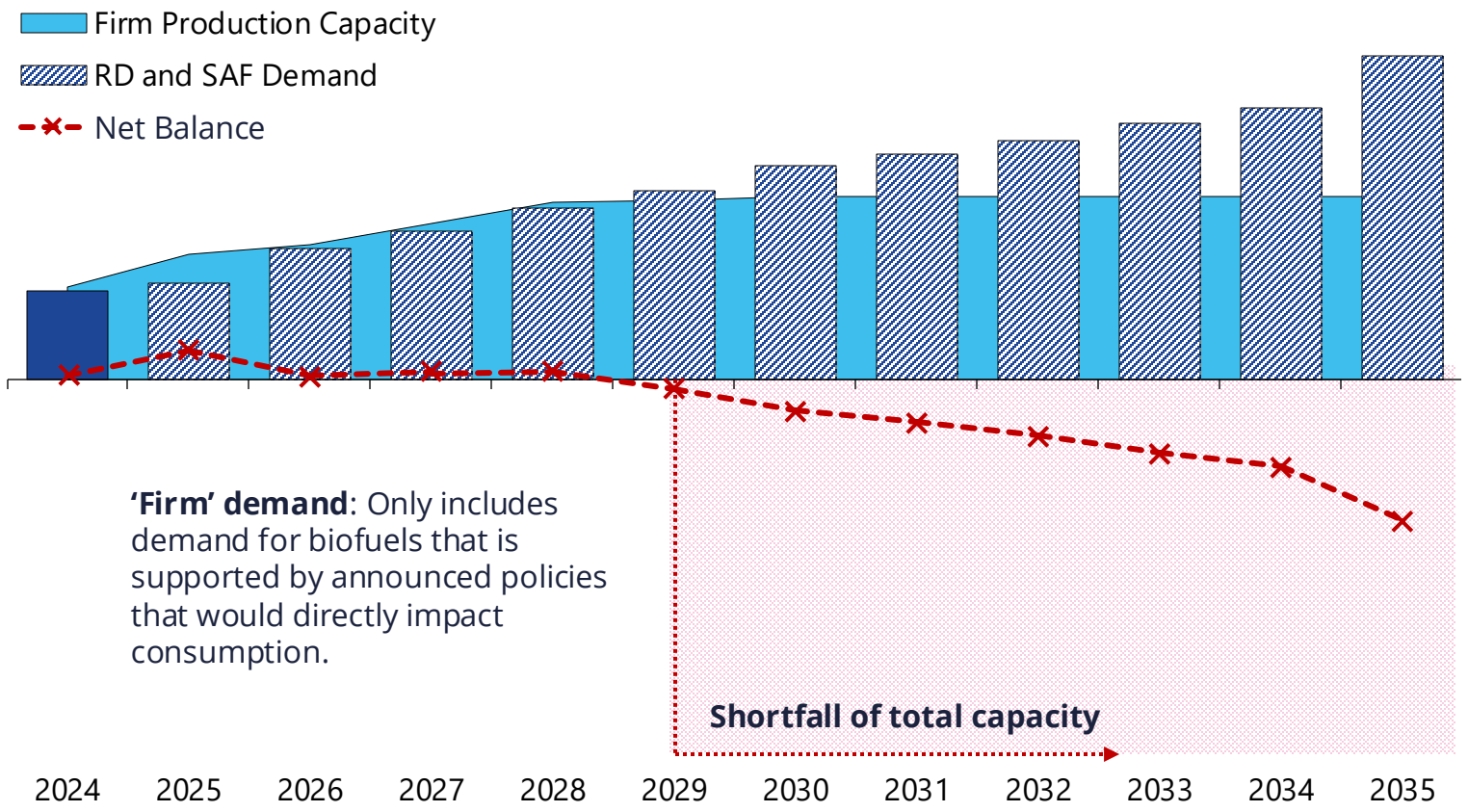
Firm demand for RD and SAF exceeds capacity in late 2020s

Global RD and SAF Capacity vs. 'Firm' Demand (mn t)



Source: Argus Media – Argus Biofuels Analytics

SAF capacity surplus

Persists beyond 2030, with a shortfall only developing in 2035...

HVO/RD demand growth

Announced policies in Europe and North America will drive significant growth in RD demand.

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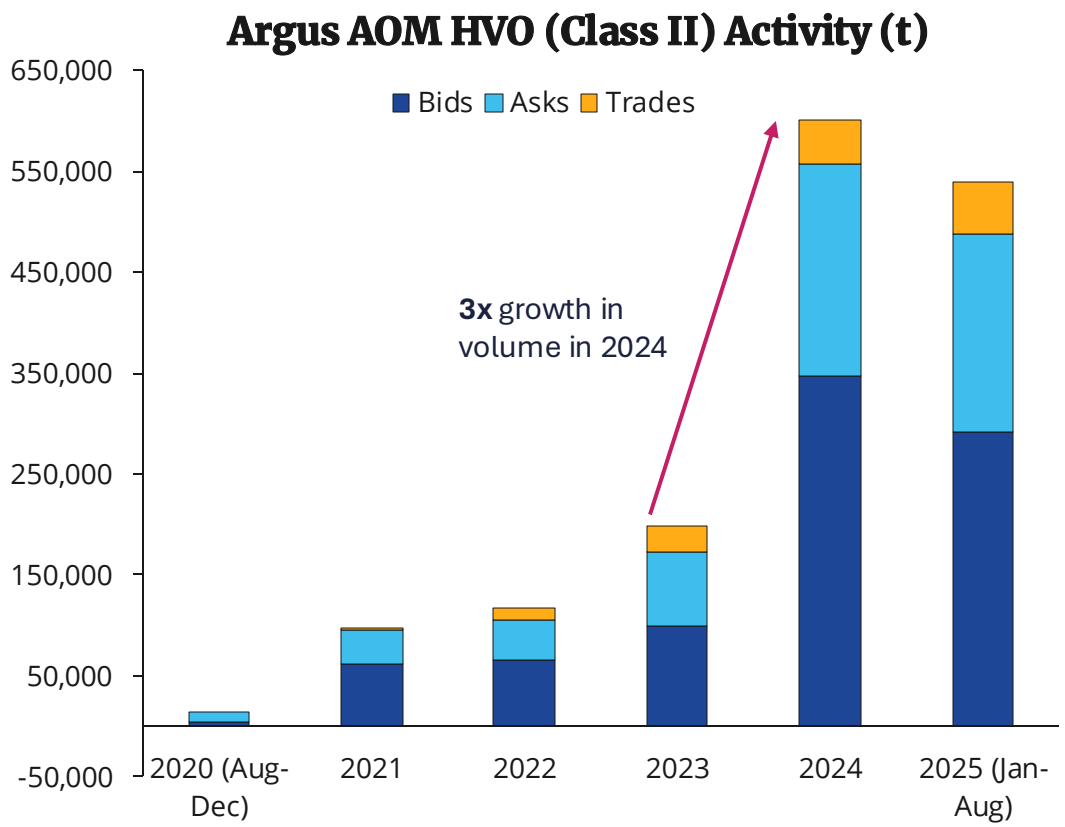
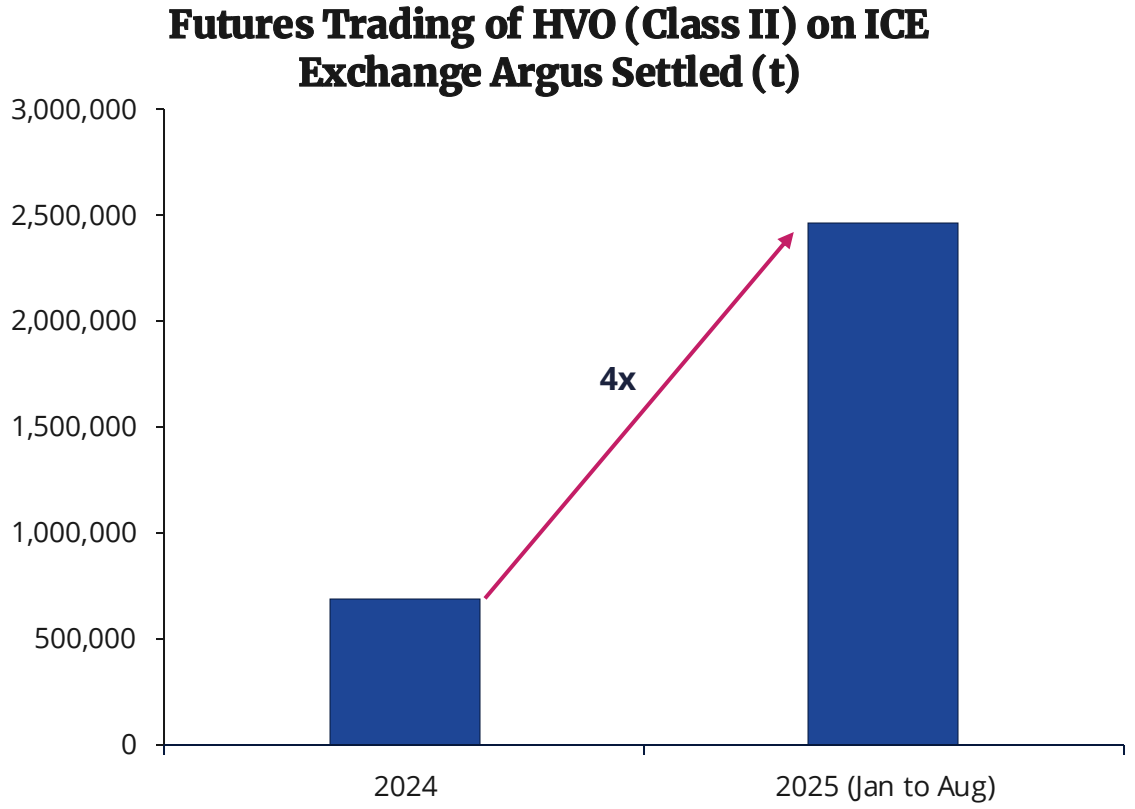
As HVO demand grows, so does physical market liquidity with emerging Argus HVO pricing benchmark

By August this year, HVO AOM bids, offers and trades already same as 90pc of all AOM activity for 2024



Close to quadrupling HVO futures volume traded for 2025 Aug YTD vs all of 2024



Source: Argus & ICE

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Chinese UCOME flowing to Singapore for bio-bunker, demand for alternative marine fuels set to rise

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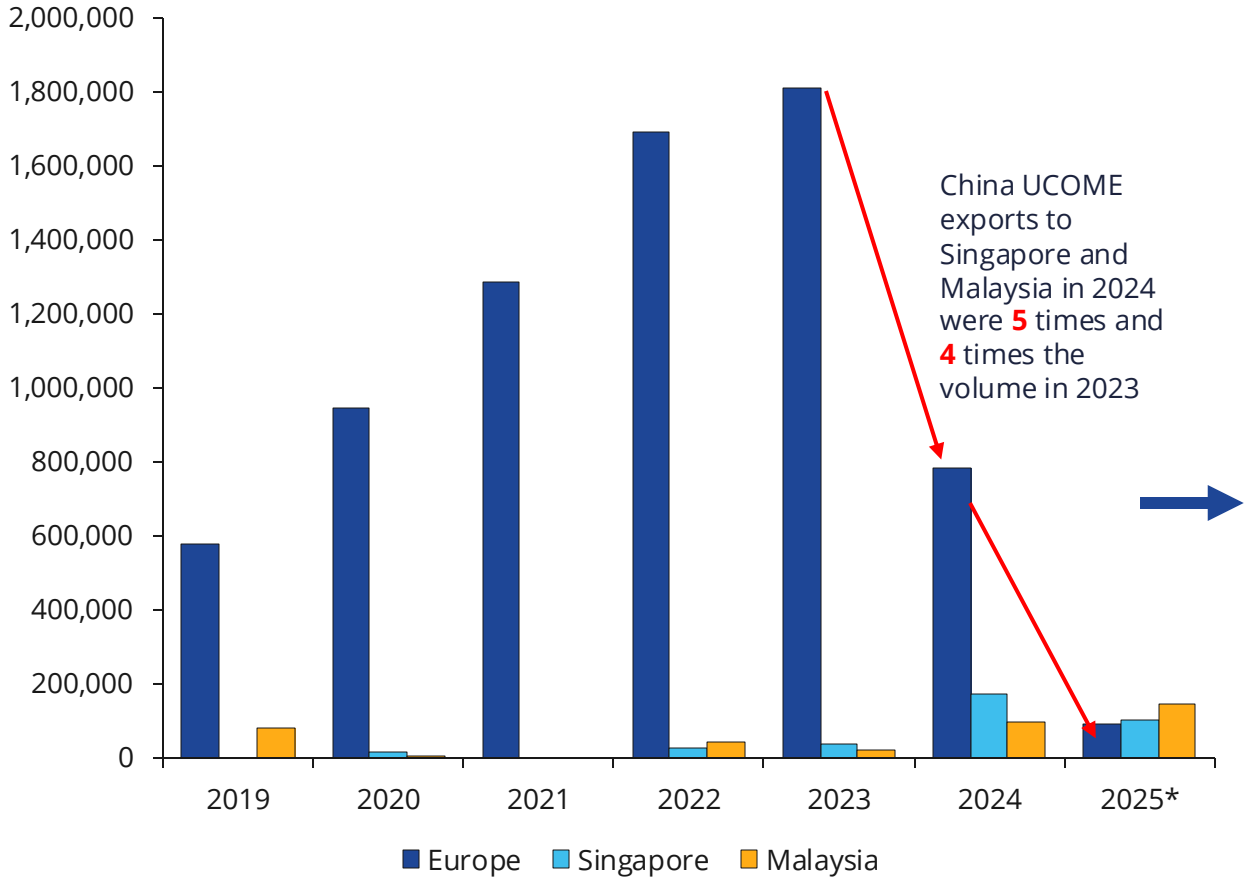
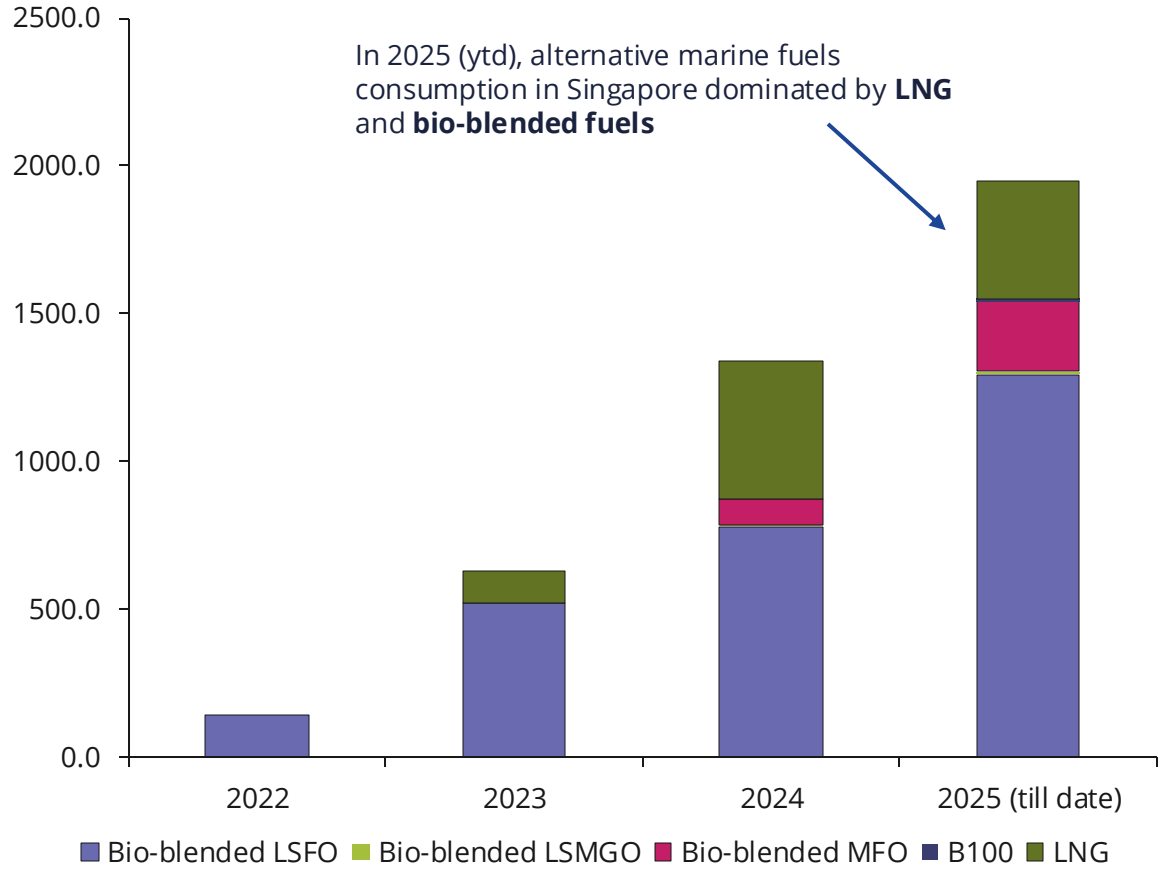
After ADD on Chinese UCOME, exports were diverted to Singapore and Malaysia in record breaking volumes

China UCOME Exports (mt)



Singapore alternative marine fuels 2022-25



Source: Customs Data, HS Code 38260000 & Marine Port Authority of Singapore
**till Q2 2025*

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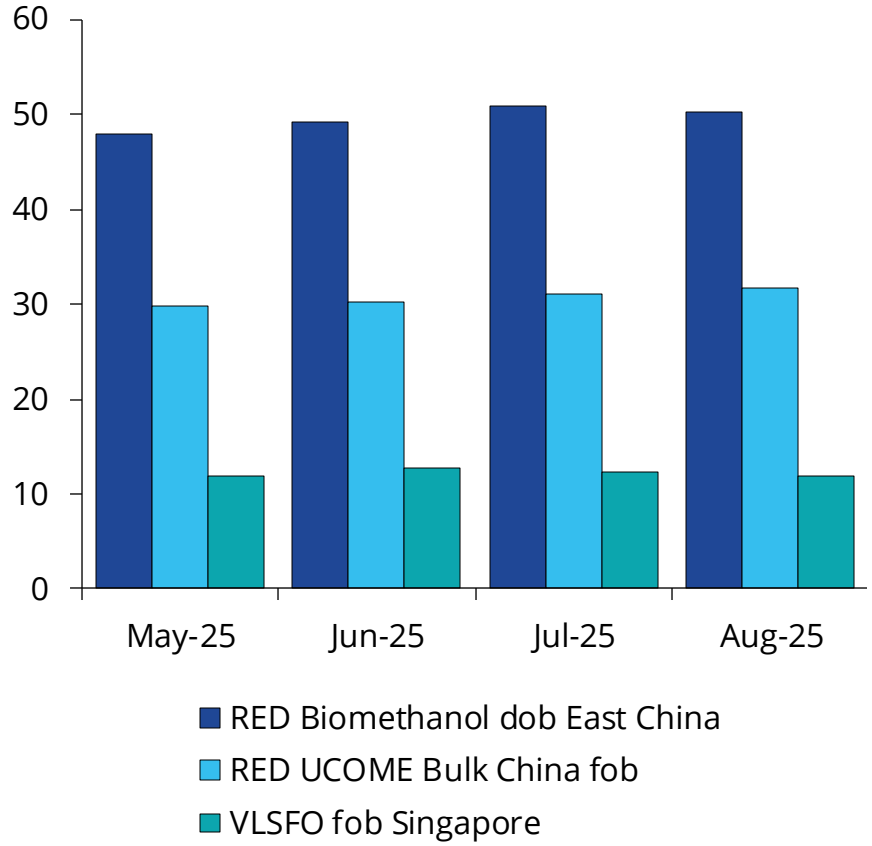
Launched biomethanol assessments to provide price visibility on this growing trade flow



Argus actively tracks over **80** Chinese green methanol projects, totaling **17mn t**

Marine Fuels Price Comparison – April-September ($/GJ)



Source: Argus Media

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Conclusions

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Conclusions

- Surplus SAF capacity contributing to downward pressure on SAF prices
- With the SAF and fossil Jet markets being disconnected, important using pricing reflecting the actual physical SAF market
- Growing HVO trade flow underpinned by emerging Argus HVO benchmark and growing futures trading activities
- Demand for alternative marine fuels set to rise; Argus provides full suite of alternative marine price assessments

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We are keen to your feedback on SAF and its impact.

Please scan the QR code to input your feedback and thoughts.

In partner with Asia SAF Association (ASAFA)

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Q&A

