

Gasoline blending: Competition for aromatics feedstocks

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

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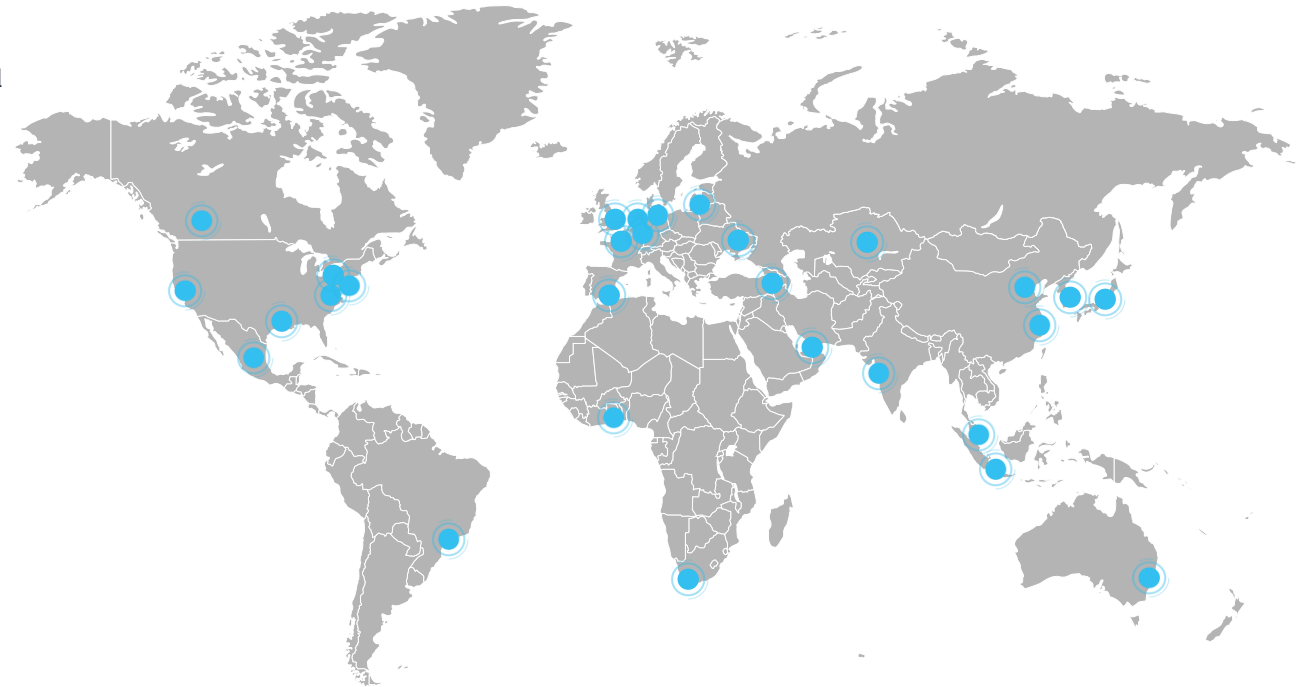
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- Fertilizers
- Agriculture
- Chemicals, including petrochemicals and oleochemicals
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- Market reporting, news, and analysis
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- Conferences

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



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Tenured industry experts

Argus consultants are experienced industry experts; Argus editorial colleagues work on their markets for years



Integrated view along the value chain

Pricing and analysis along the supply chain, from upstream crude via chemical feedstocks like naphtha and LPG to derivatives and end use sectors



Argus rigor for price reporting brought to chemical markets

Transparent methodologies, and internal and external audits

The Argus Chemicals service portfolio

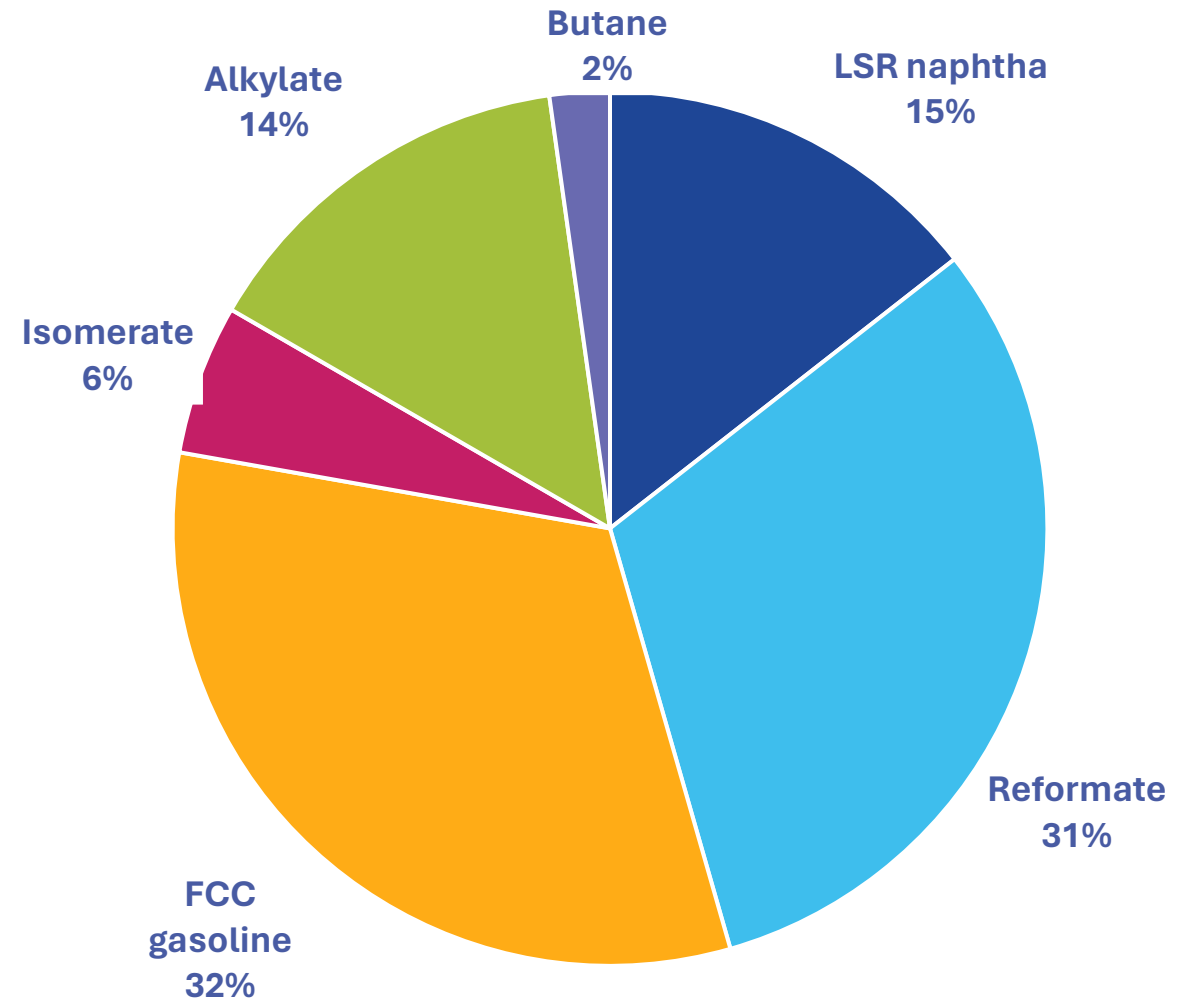
	Methanol & Octane	Light Olefins	Heavy Olefins	Aromatics	Oleochemicals	Polymers	Inorganics	Polyurethanes
Market reports	Methanol Daily	Ethylene & Derivatives	Butadiene	Benzene Daily	Glycerine	Global Polyethylene	Chlor-alkali & Derivatives	Isocyanates
	Methanol	Propylene & Derivatives		Benzene & Derivatives	Fatty Acids	Global Polypropylene	PVC & Vinyls	PO & Derivatives
	Fuels & Octane			Toluene Xylenes Daily	Fatty Alcohols	PVC & Vinyls		
Outlooks				Toluene, Xylenes / Isomers & PET	Pine Chemicals	Recycled Polymers		
	Methanol Outlook	Olefins Outlook	Butadiene Outlook	Benzene Outlook		Polyethylene Outlook	Chlor-alkali Outlook	
	MTBE Outlook	Olefins Margins	C5 & Hydrocarbon Resins	Toluene Xylenes Outlook		Polypropylene Outlook		
Analytics								
	Methanol Analytics	Ethylene Analytics	Butadiene Analytics	Benzene Analytics		Polyethylene Analytics	Caustic Soda Analytics	
	MTBE Analytics	Propylene Analytics		Toluene Xylenes Analytics		Polypropylene Analytics	Chlorine Analytics	

| What caused octane shortage?

- Strong gasoline demand after pandemic.
- Stricter regulations on sulfur content of gasoline, “Tier 3”.
- European sanctions on Russian refined products led to surge in middle distillate prices.
- European and US refiners ran hard to compensate, and co-product naphtha was oversupplied.
- Lighter crude slate produced more paraffinic naphtha.

Typical gasoline blending components

- Gasoline is a cocktail of C4 to C13 hydrocarbons, made up primarily of FCC gasoline, LSR naphtha, reformate, alkylate, isomerate & normal butane.
- Blending volume contributors, mostly “sub-octanes”, is key to refiner profitability
- Performance components, “higher octanes”, lift the properties of the blend to meet performance and regulatory requirements



** Typical summer blend

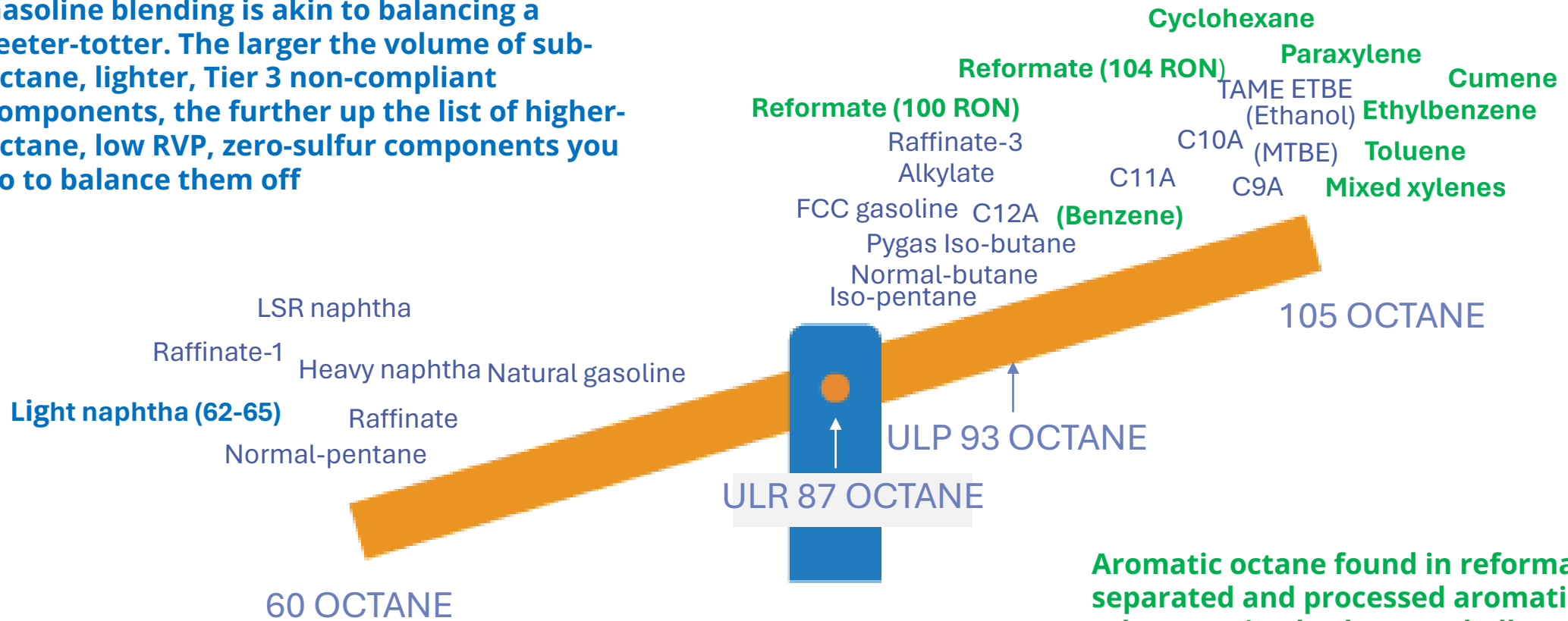
Primary blending components

Component	Process Unit Source	AKI (R+M)/2	RVP psia	Sulfur ppm	Limiting gasoline specification
Normal Butane	Distillation	90 - 92	70 - 74	2 - 6	RVP, V/L
Light Straight Run Naphtha	Crude Distillation	60 - 66	10 - 13	10 - 500+	Octane, RVP, V/L
Heavy Naphtha	Crude Distillation, Coker, Hydrocracker	58 - 64	1 - 1.5	40 - 500+	Octane, Sulfur
Reformate	Reformer	90 - 105	1 - 1.2	2 - 6	DI, T50, Benzene
FCC Gasoline (non-hydrotreated)	FCC	82 - 87	1 - 2	10 - 500+	Sulfur
Alkylate	Alkylation Unit	90 - 96	4 - 5	5 - 15	None
Isomerate	Isomerization Unit	78 - 83	7.8 - 8.5	3 - 10	RVP

Blending Quality:
 Highly favorable
 Favorable
 Neutral
 Unfavorable
 Highly unfavorable

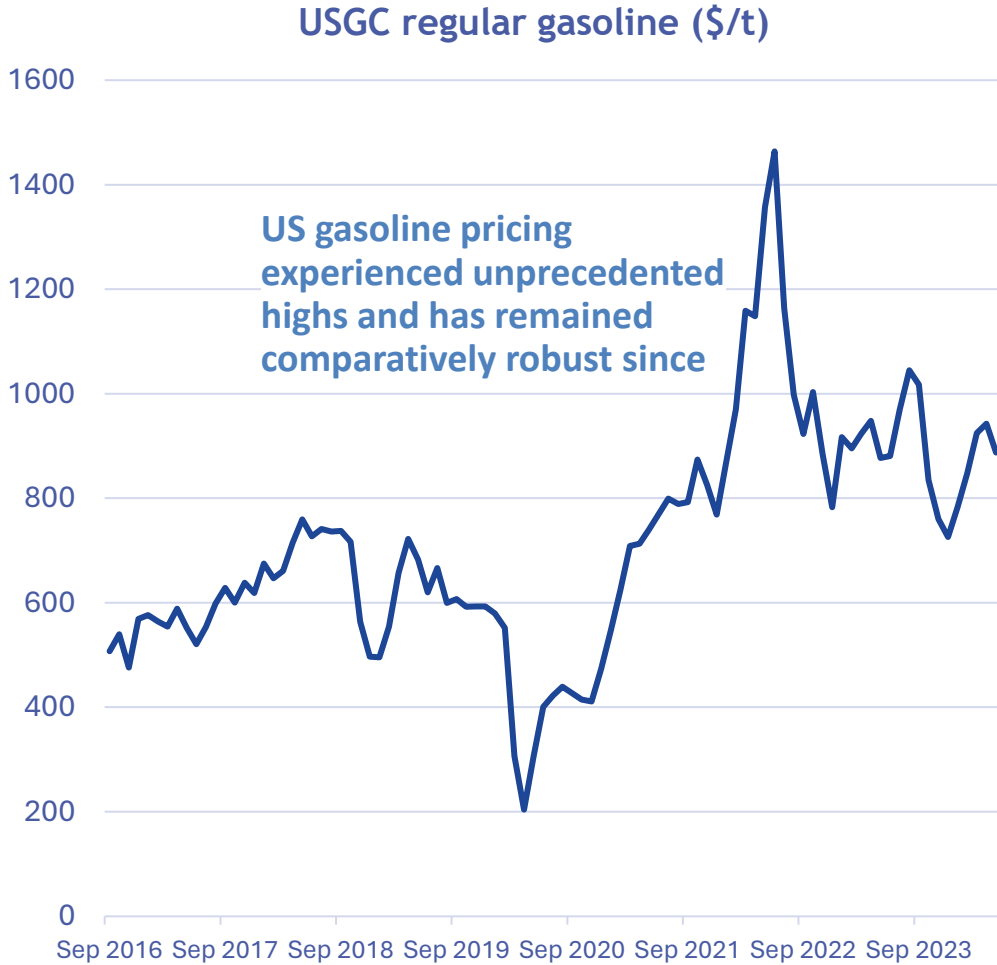
Gasoline component blending

Gasoline blending is akin to balancing a teeter-totter. The larger the volume of sub-octane, lighter, Tier 3 non-compliant components, the further up the list of higher-octane, low RVP, zero-sulfur components you go to balance them off

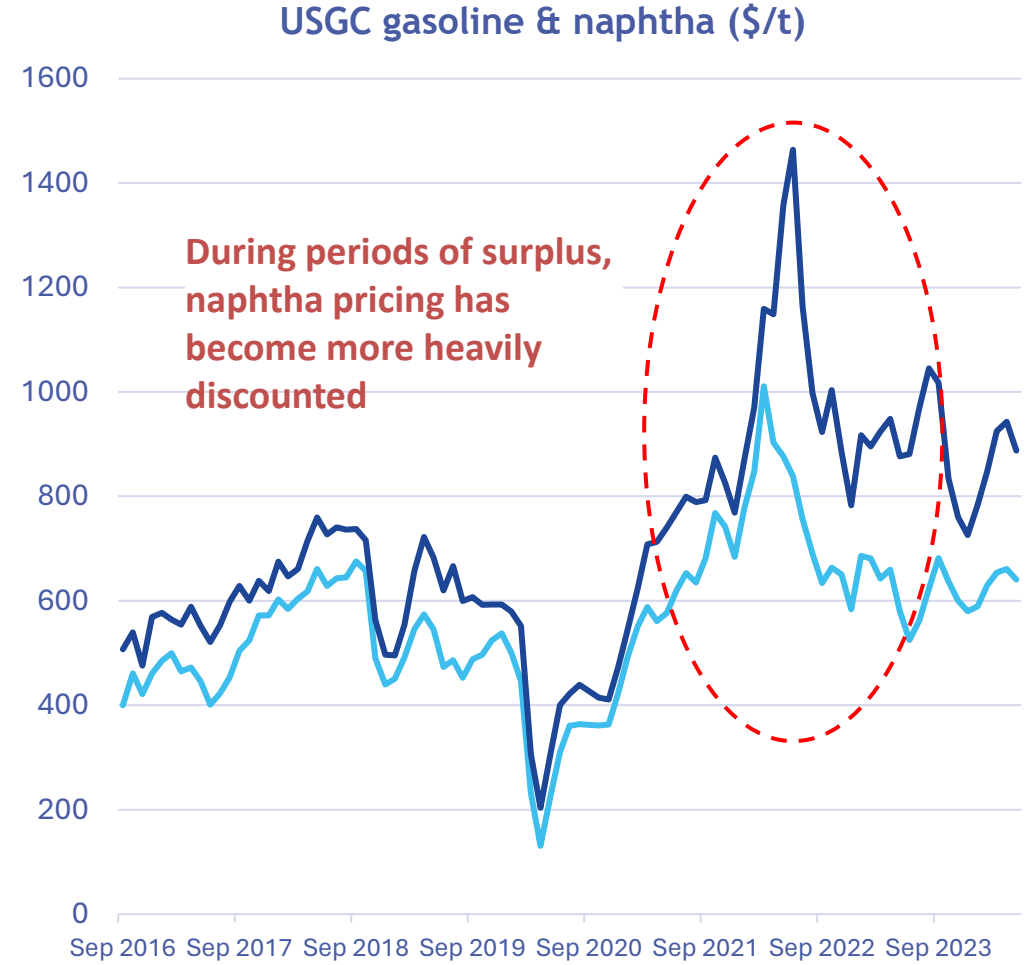


Aromatic octane found in reformat, and separated and processed aromatics such as toluene, mixed xylenes, ethylbenzene and cumene, is now critically important to refiners & blenders for blending off sub-octanes in a Tier 3 gasoline environment

USGC gasoline & naphtha prices disconnected



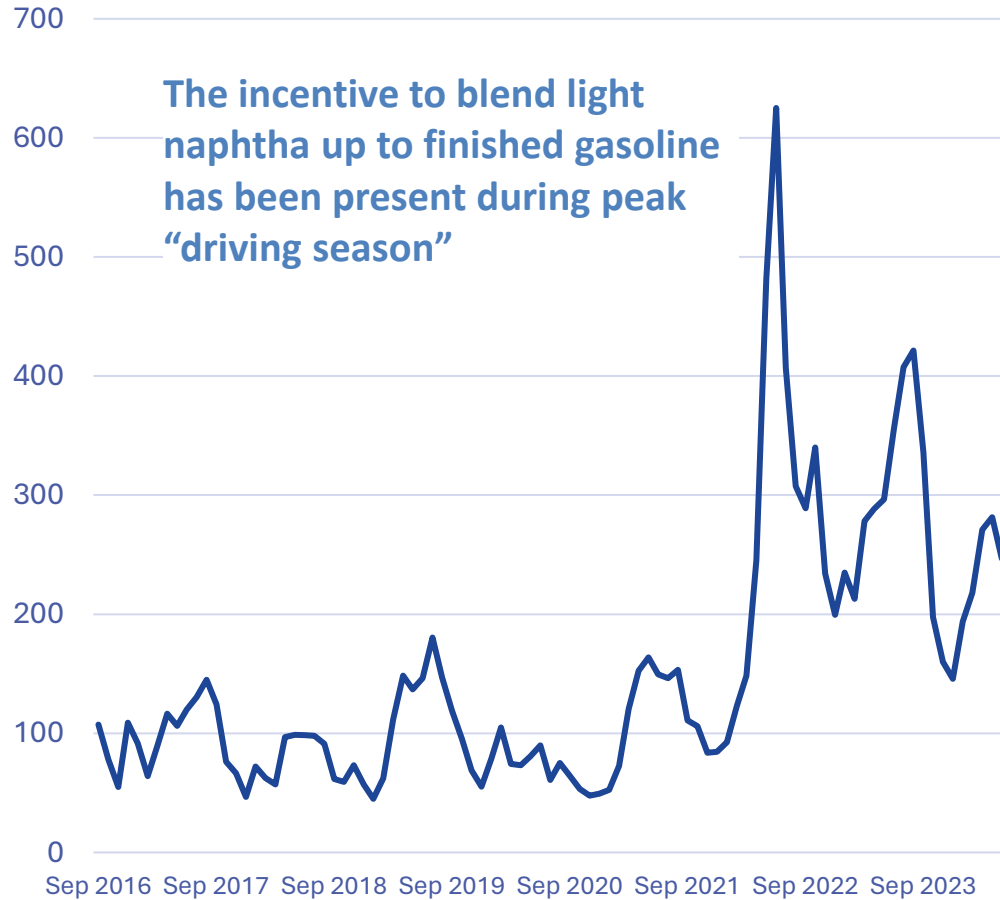
Source: Argus Media



Source: Argus Media

US octane values have seen large spikes

Naphtha-gasoline spread (\$/t)



Source: Argus Media

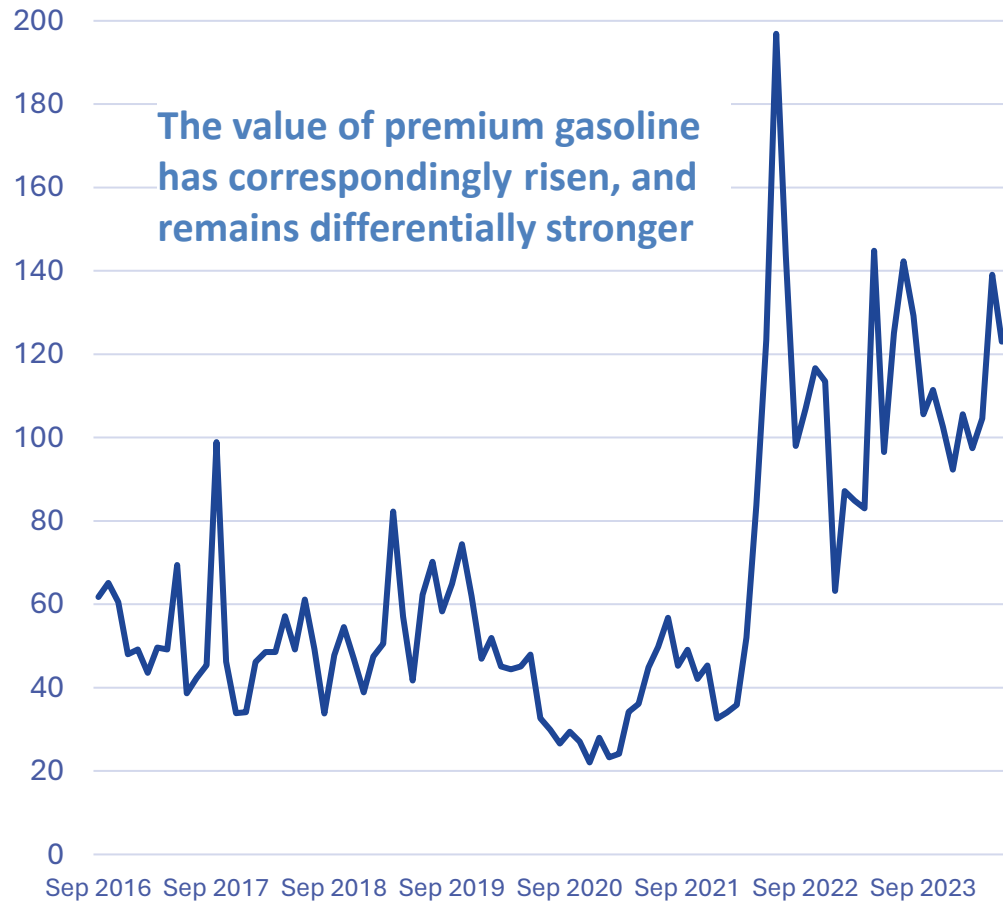
Reformate-gasoline spread (\$/t)



Source: Argus Media

Blend values for aromatics have also spiked

Unleaded regular-premium gasoline spread (\$/t)



Source: Argus Media

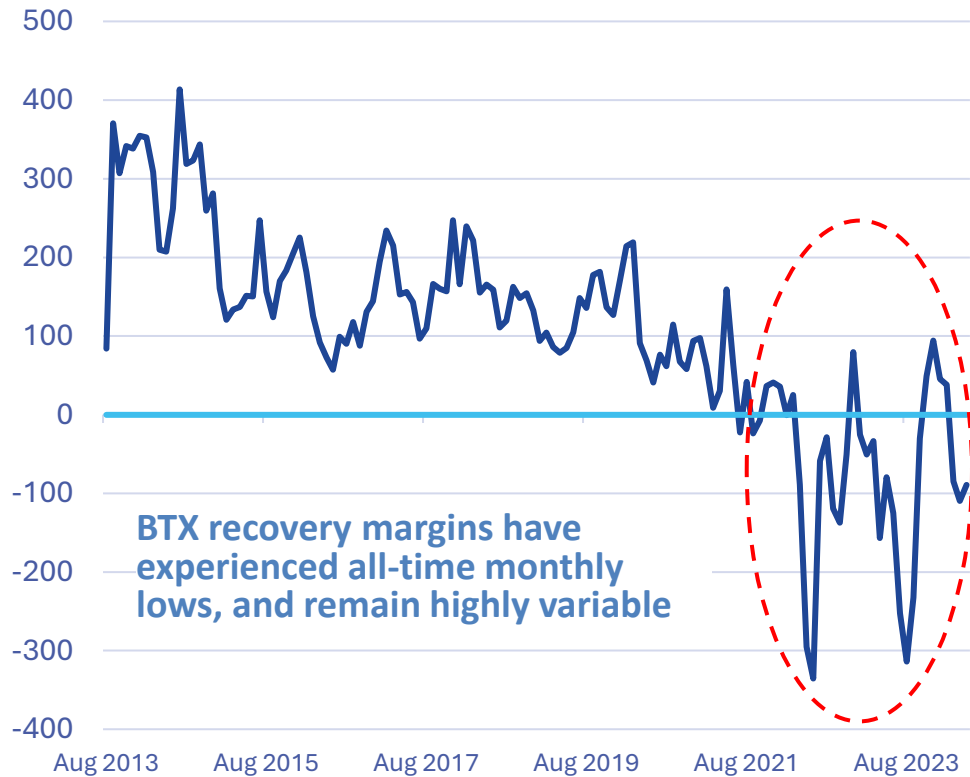
Toluene blend value (\$/t)



Source: Argus Media

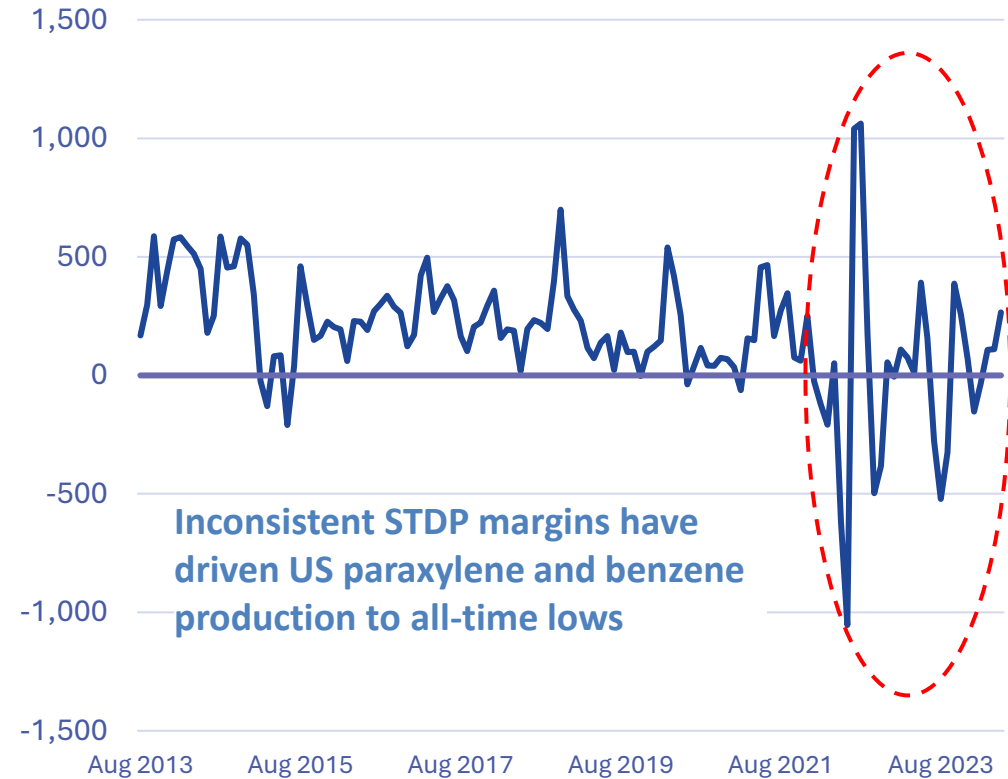
High octane values impacted BTX margins

US BZ cp vs USGC extraction b/even (\$/t)



Source: Argus Media

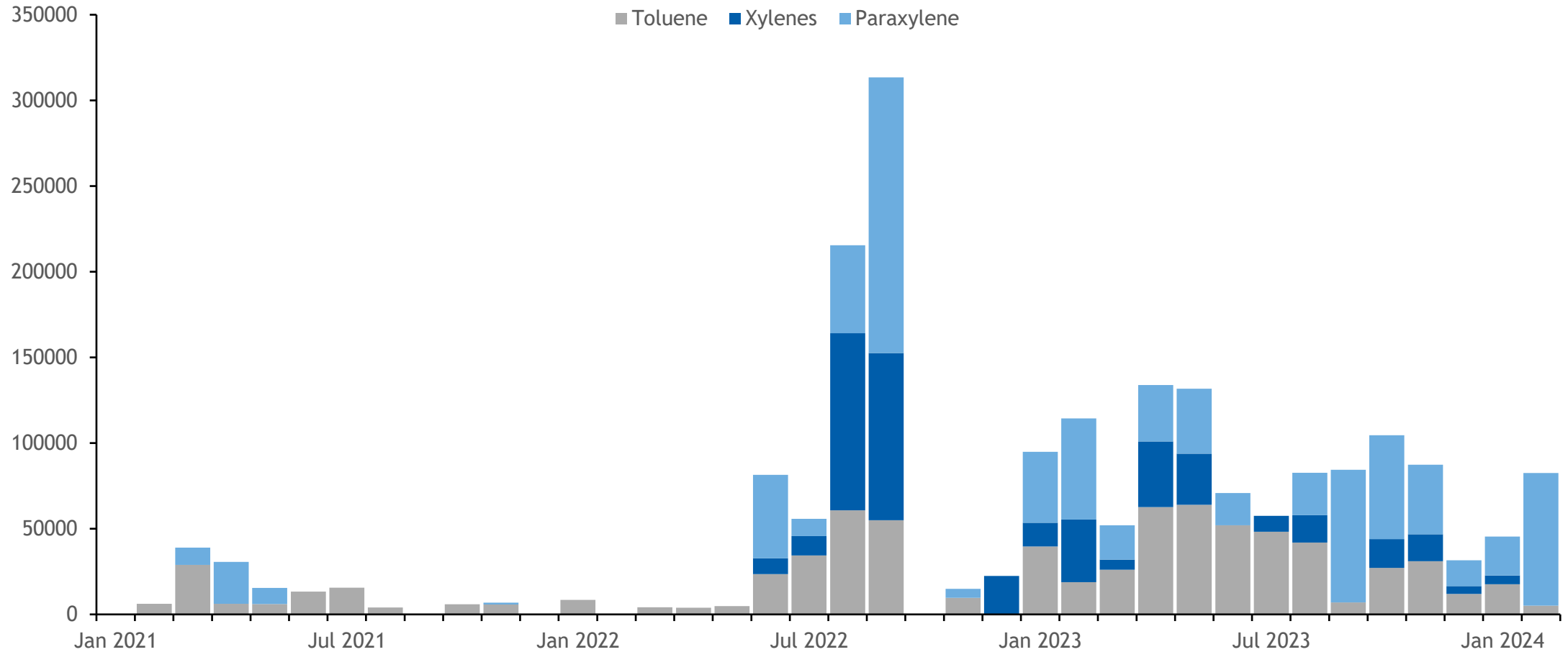
US BZ cp vs USGC STDP b/even (\$/t)



Source: Argus Media

More aromatic octane is flowing to the US

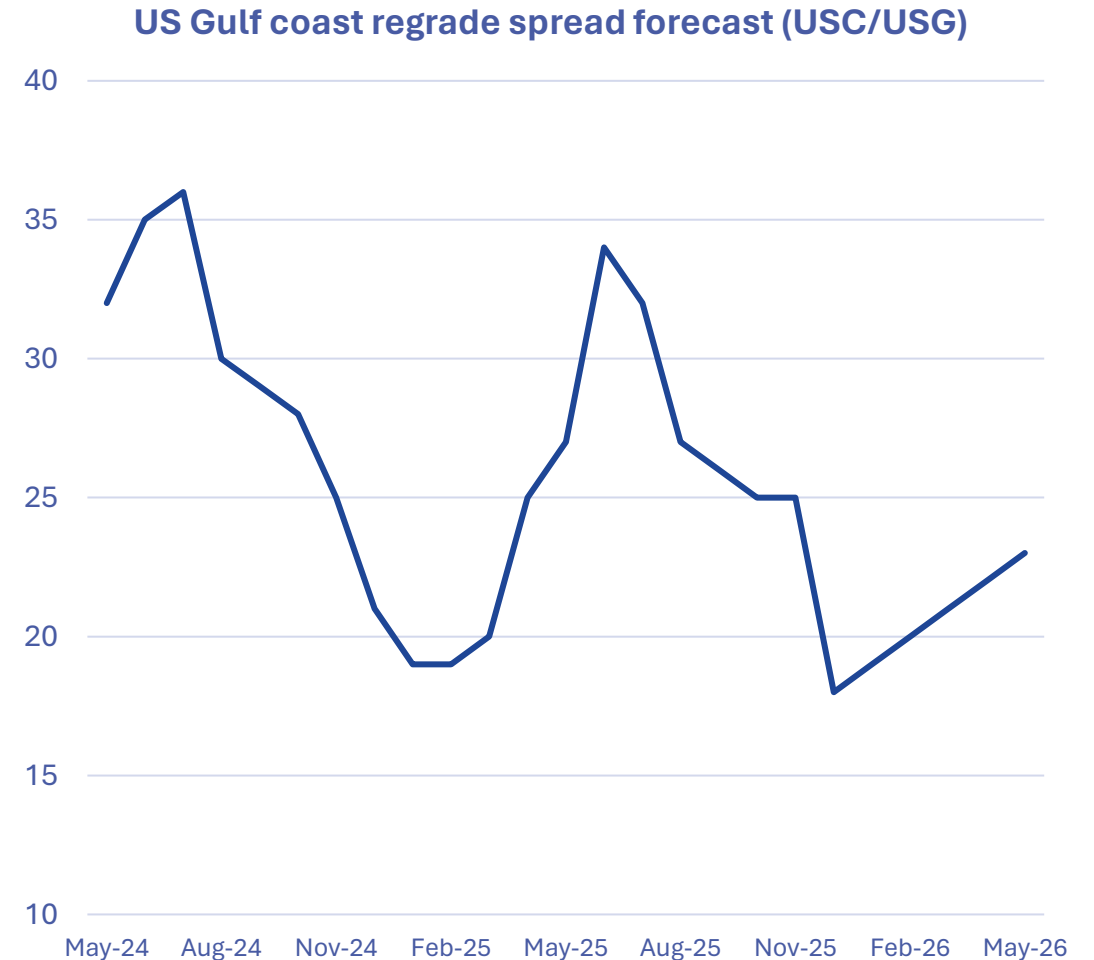
US BTX Imports from Asia 2021-2024 (t)



Source: GTT, Argus TX Analytics

US Gulf coast forecast octane values

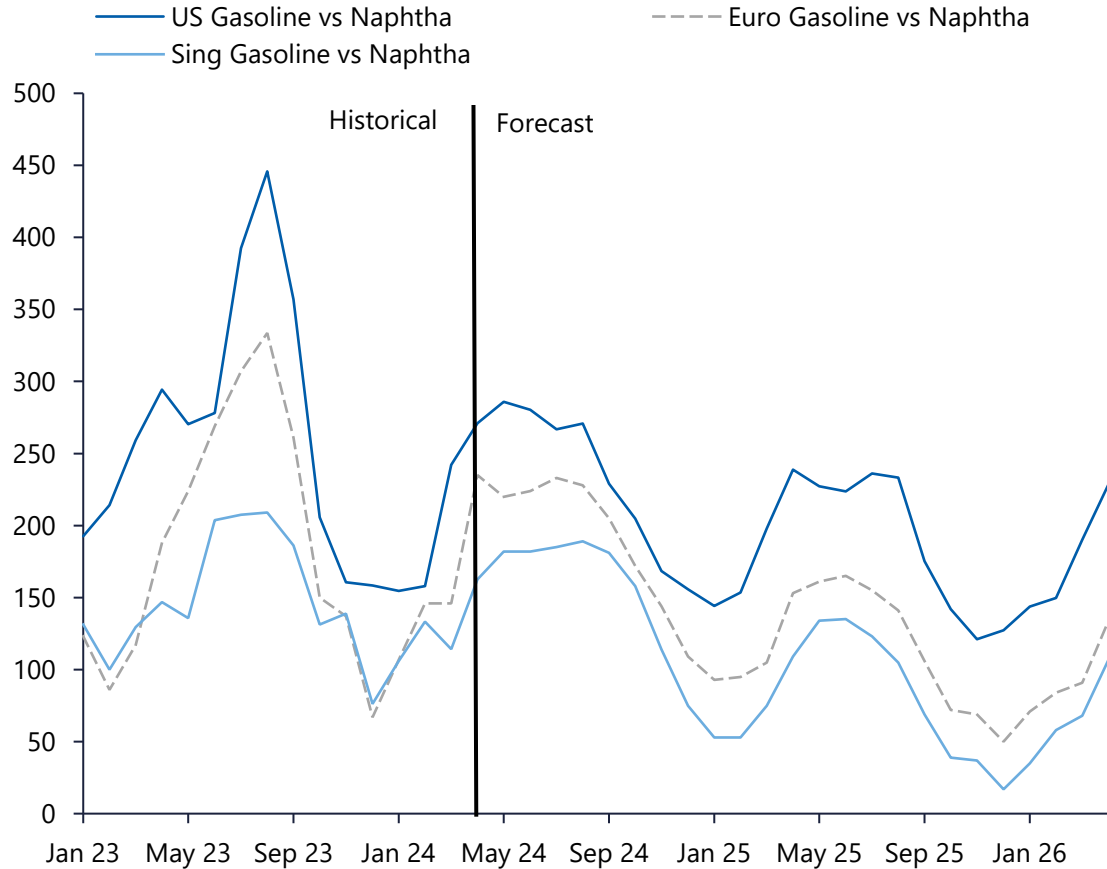
- Drivers of octane value are expected to become less intense over time, and the implications for alternative values for aromatics in gasoline will moderate.
- Naphtha market fundamentals have improved and are expected to further close the discounts to gasoline.
- Refiners have made considerable investments to increase the flexibility of their naphtha processing complexes, which also helps improve the octane generation across many of their upgrading units.



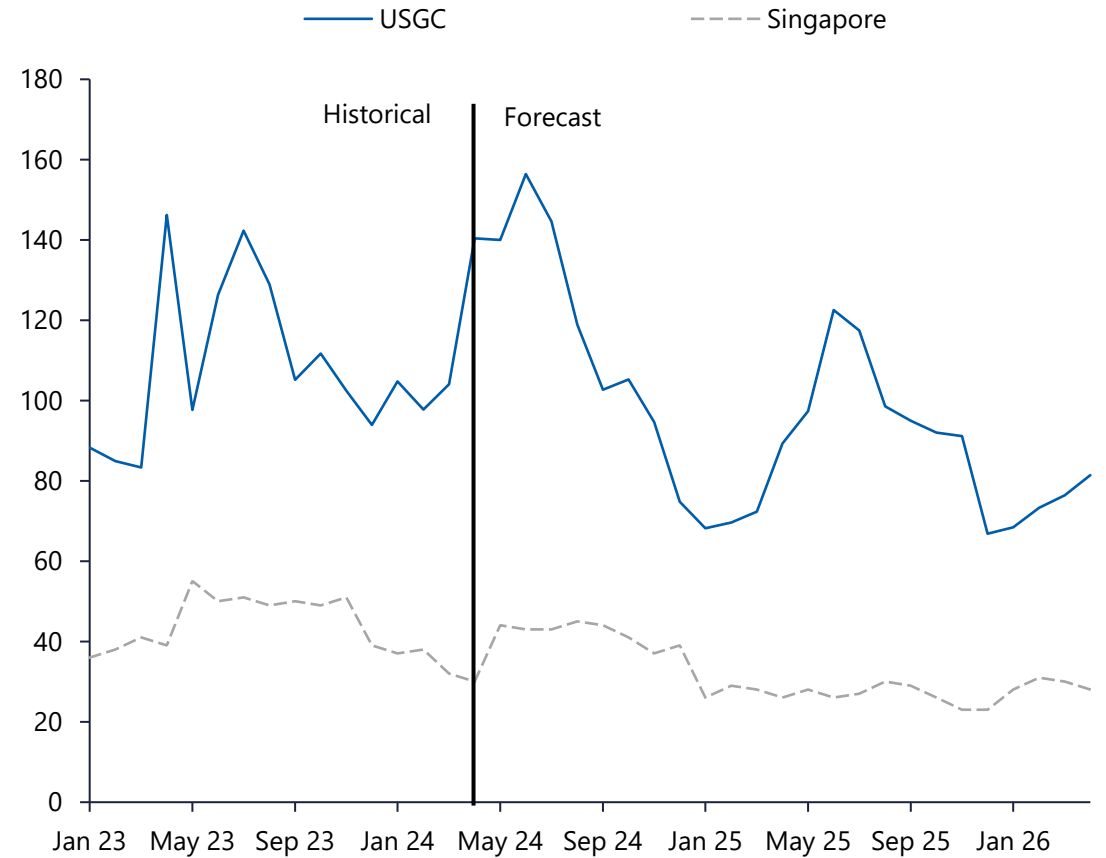
Source: Argus Media

Global gasoline fundamentals outlook

Global Gasoline vs Naphtha

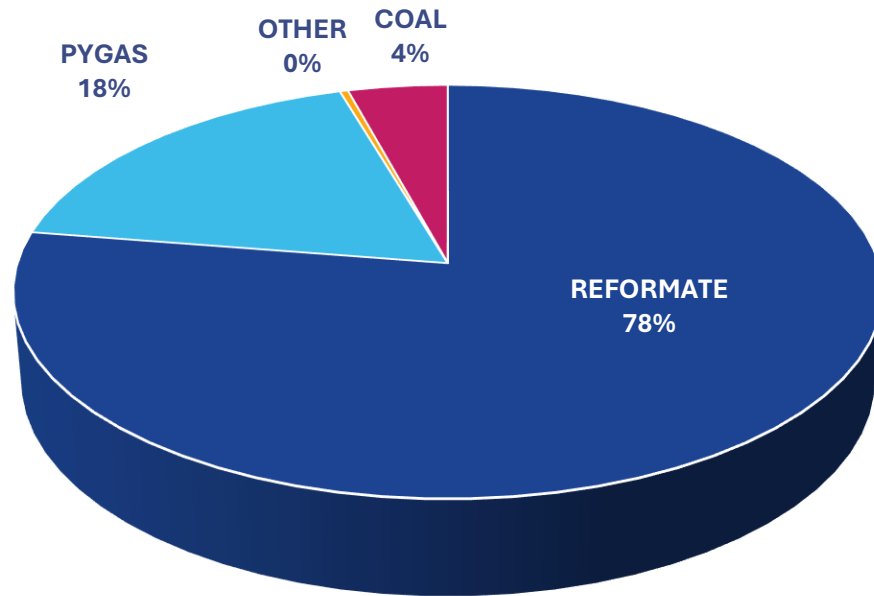


Regular versus Premium Gasoline

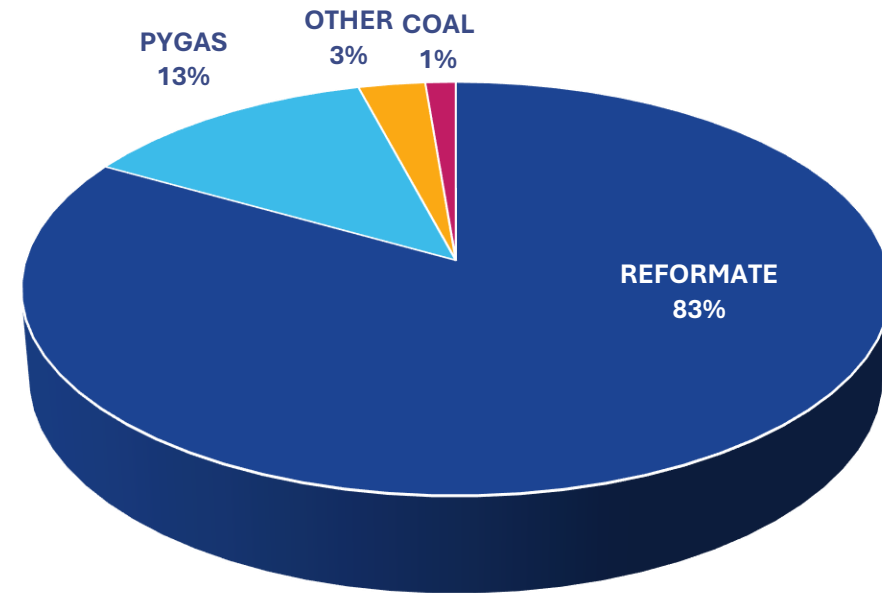


Refinery sources dominate global BTX supply

Global BTX Production, 2023



North America BTX Production, 2023

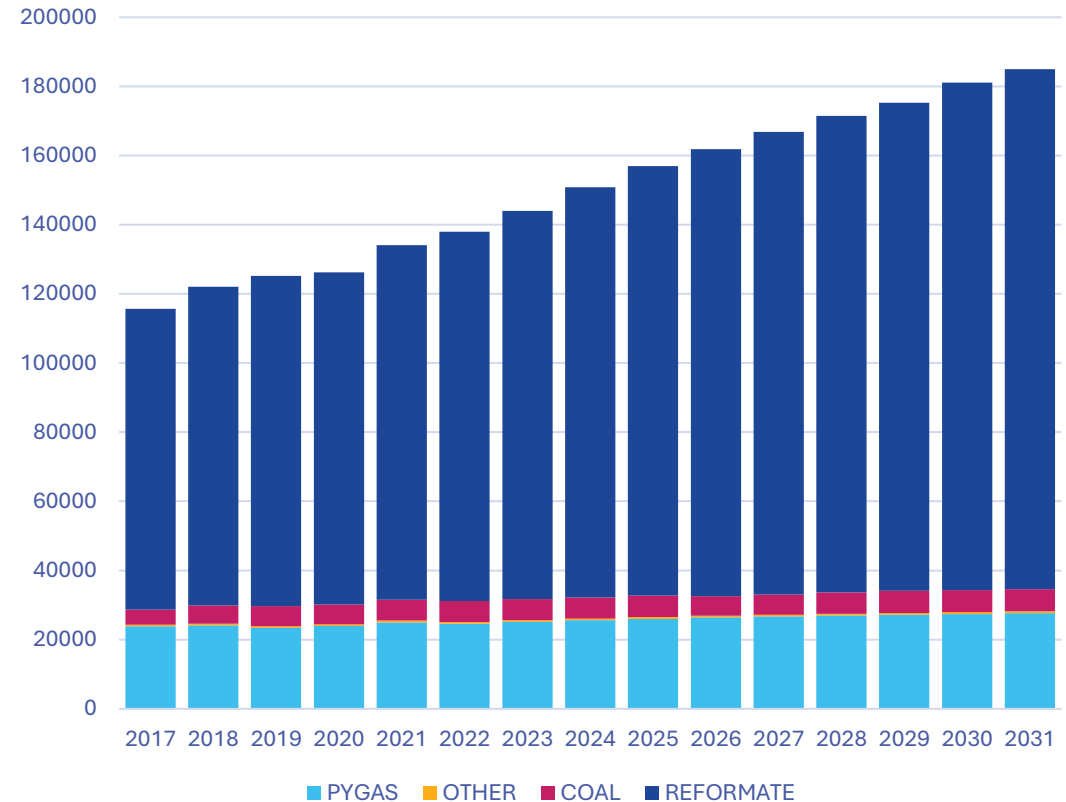


BTX supply is dominated by refineries, but high alternative values in US gasoline are crimping incremental production

Global BTX supply growth is all from refinery sources

- The driver for BTX supply growth leans on the refineries.
- Pygas supply growth is meager as new olefin crackers are running a lighter slate of feeds.
- Coal-based supply growth has already stagnated due to environmental pressure on coking operations in China, and conversion of steel production to electric arc furnaces.

Global BTX production by source ('000t)



BTX supply growth in North America is lagging as refiners have struggled to free up cost competitive feed

The focus of the BTX markets is firmly east of Suez



The focus on the burgeoning but cyclical growth in Asia however, has left gaps in investment elsewhere.

Europe



- Lighter feed cracking across the steam cracker fleet has removed large volumes of potential BT feed supply
- Refinery CDU closures have reduced feed to associated BTX capacity
- No significant new BTX plants have been built in over 25 years due to a lack of investment returns
- BTX derivative capacity is still being expanded as the fleet is upgraded to sustain competitiveness
- EU15 paraxylene net trade has swung to 400,00tpy net imports and benzene net imports have nearly doubled to 1.6 mn t/y

Feed availability in Europe is structurally diminishing but can be highly variable

A BTX supply “hole” has opened in US Gulf



- Ethane cracking
- Refinery closures
- No new Gulf coast BTX plants have been built in over 25 years
- Americas BTX derivative capacity is still being slowly expanded due to advantaged olefins supply and low utility costs
- North American paraxylene net imports have doubled to 700,000 t/y. and US benzene net imports have exceeded 1.75 mn t/y

In 20 years the US has transformed from a major BTX exporter to a net importer

Conclusions

- Octane values surged due to a “perfect storm” of geopolitical, regulatory and market events.
- The peaks in octane values have been less severe in each blending season since 2022.
- Lack of BTX investment and changes in refining and ethylene production west of Suez have made those regions more dependent on BTX imports from the east.
- Keys to watch: paraxylene margins in Asia, refinery closures in mature markets, possible easing of geopolitical tensions.

Thank you

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