

Plastics (PS-PP-PET)

FPI Fall Conference

November 2022

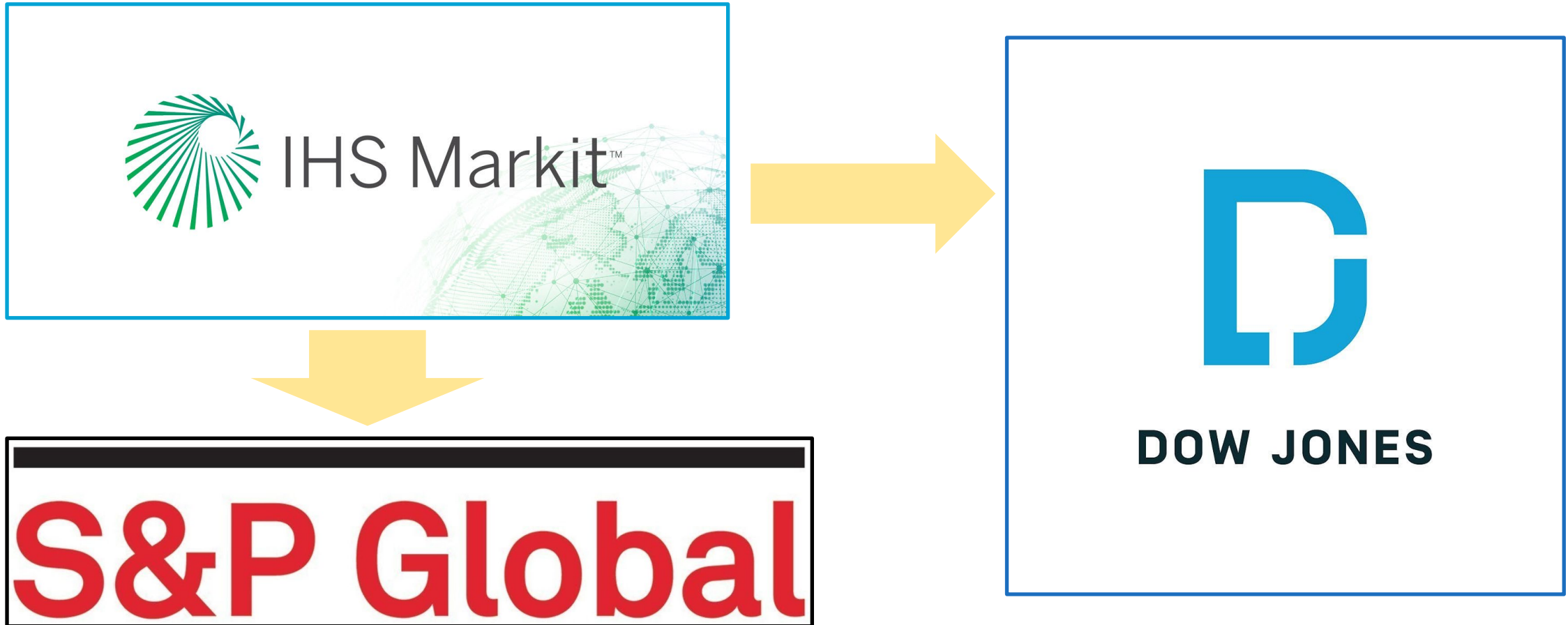
Peter Feng

Chemical Market Analytics

Executive Director Aromatics

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IHS Markit, Base Chemicals was acquired by Dow Jones



- News Corp and Dow Jones have completed the acquisition of the IHS Markit base chemicals business.
- The business will now operate under the name Chemical Market Analytics by OPIS, a Dow Jones company.
- Base Chemicals will sit within Dow Jones' Professional Information Business (PIB), joining Oil Price Information Service (OPIS), Coal, Metals & Mining (CMM) and PetroChem Wire (PCW), all recently acquired by Dow Jones.
- Dow Jones will play a leading role in new energy, chemicals and renewable vertical.
- The Chemical Market Analytics by OPIS, a Dow Jones company, business provides short-term and long-term market coverage for over 200 core building block chemicals, provided in Market Advisory Services (MAS), World Analysis (WA), Circular Plastics Service, and the Chemical Advisory Service.

The best-in-class
insights and services



Data and validation



People and procedures



Robust data delivery and
services

● Major Issues

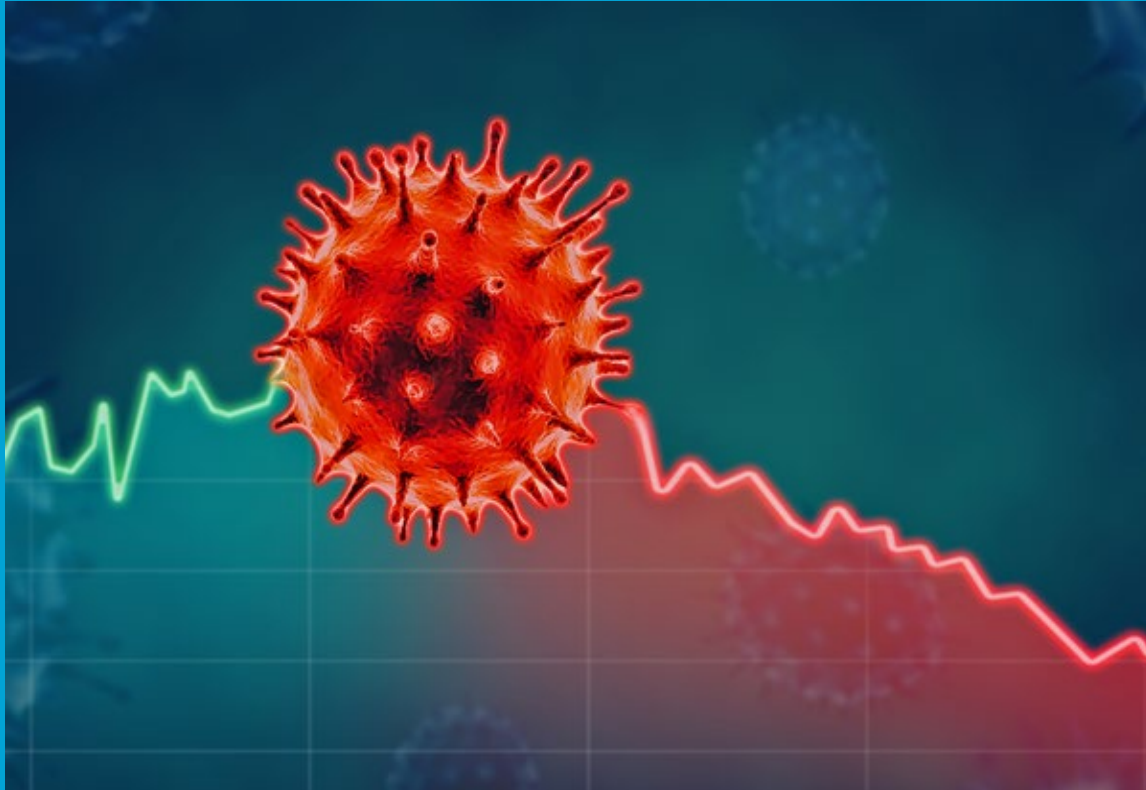
- The pandemic
- Russia/Ukraine conflict & energy crisis
- Logistics
- China self-sufficiency & risk of decoupling
- Sustainability

● Products

- PS
- PP
- PET



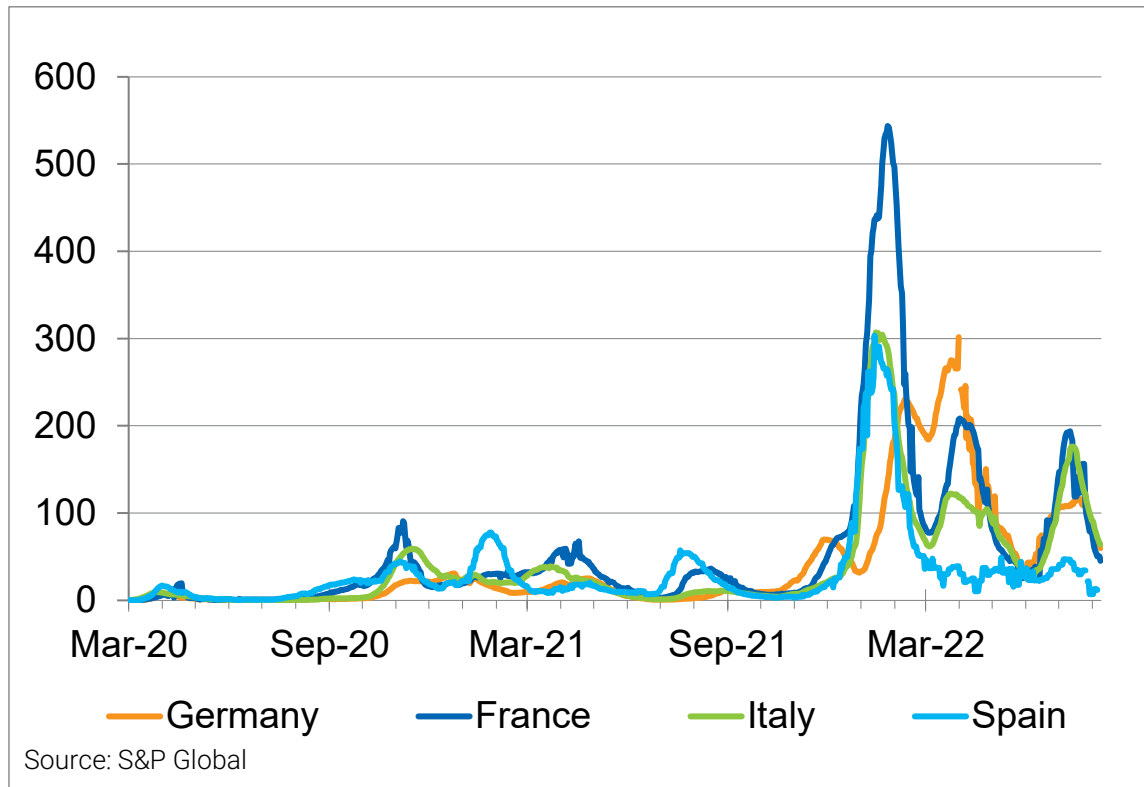
Recovery from the Pandemic?



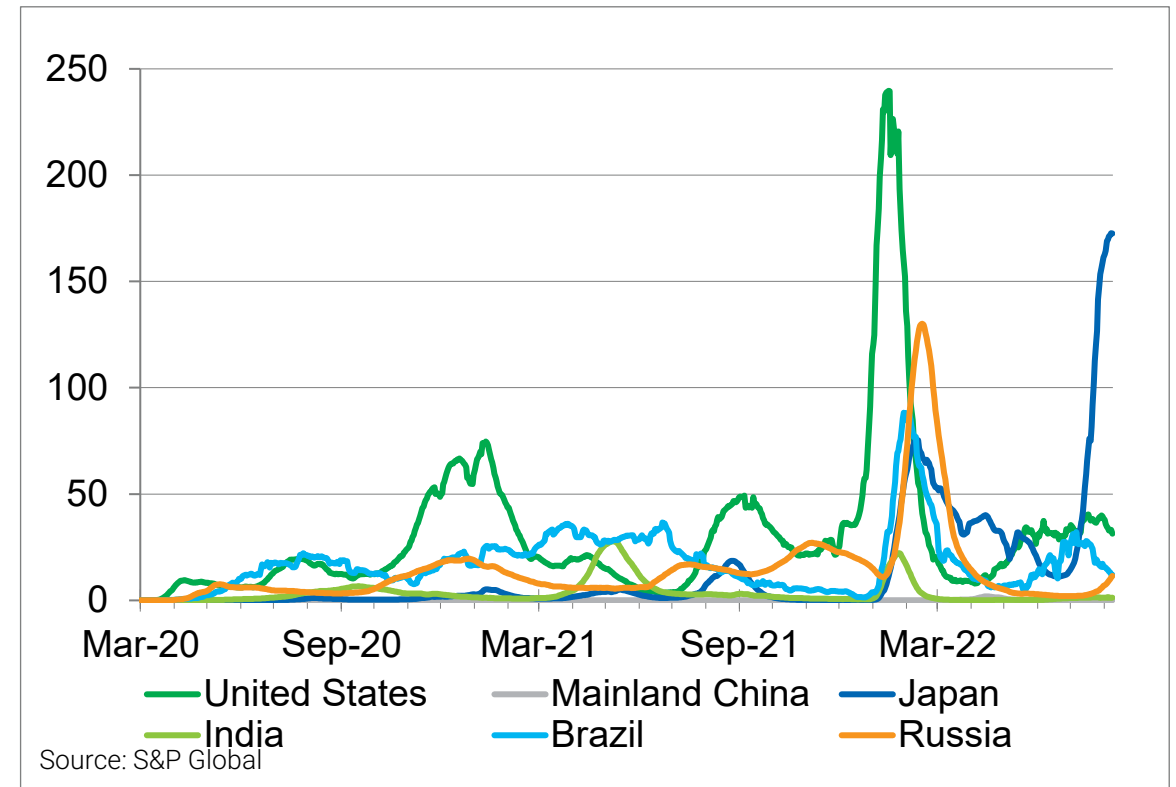
- Early 2020 Covid-19 swept across the world
- Historical references-Spanish flu
- Nearly 2.5 years later, most of the world is moving on
- China continues to pursue a zero covid policy

COVID-19 infection rates have declined, but new waves keep coming

New daily cases of COVID-19 per 100,000 people, seven-day moving average



New daily cases of COVID-19 per 100,000 people, seven-day moving average



Moving from one crisis to another crisis



Agricultural Age

- Grains
- Fertilizer



Industrial Age

- Crude oil
- Natural gas



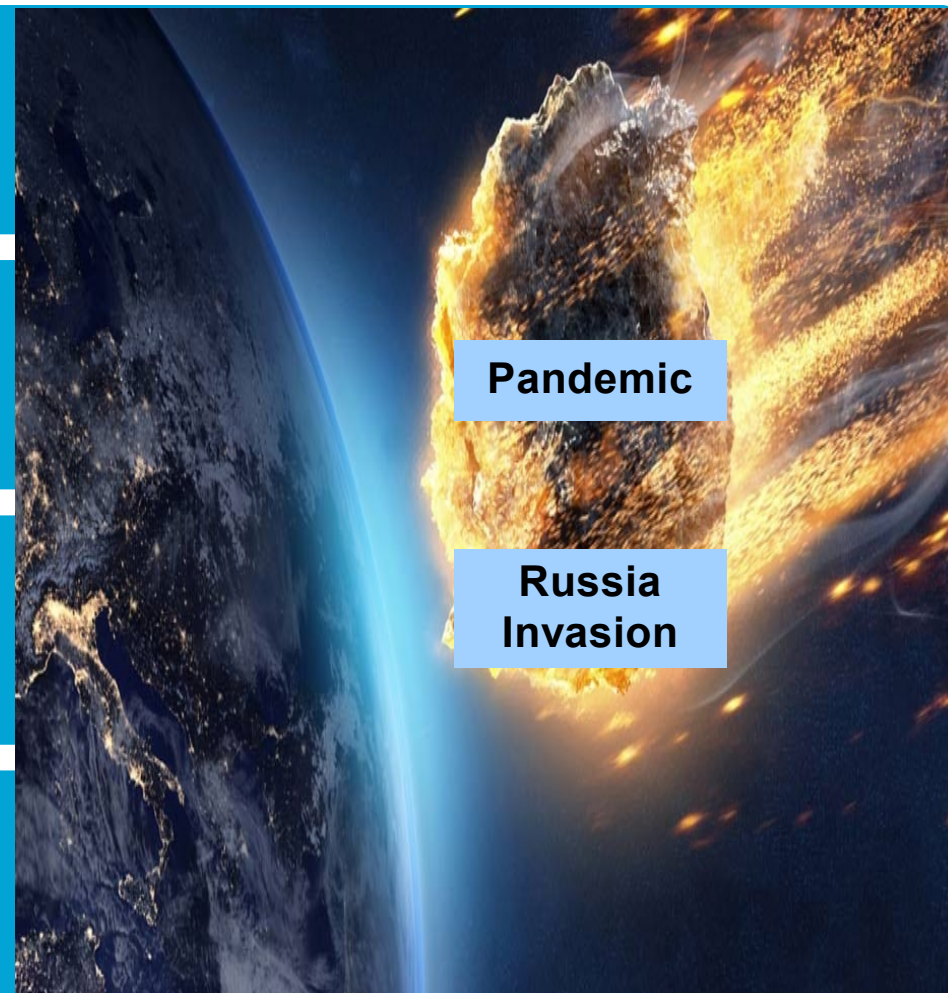
Information Age

- Semiconductors



Globalization

- Ships (bulk liquid, containers)
- Rail, Trucks, Drivers



Pandemic

**Russia
Invasion**



- 24 Feb 2022, Russia invaded Ukraine
- Energy has been a flash point
- Chemical feedstocks are derived from crude or natural gas

In Feb 2022, Europe/Russian integration began to unravel



Source: National Geographic Society

- EU energy reliance on Russia
 - 27% - Crude Oil
 - 40% - Natural Gas
 - 46% - Coal
- Other impacts
 - Fertilizer/Grain
- The worst to come?
 - Russian crude oil price cap?
 - Natural gas cutoff
 - Plant shutdowns

Short term natural gas crisis



- Natural gas storage near full
 - Storage tanks over 90% full
- LNG ships
 - Backing up
 - Floating storage
- Backup plan
 - Chemicals is a large user of nat gas

- Crude Oil
 - Supply - OPEC+, Russian cutoff, SPR release
 - Demand - China, Recession
- Gasoline inventories are low, prices are high
- Strong octane impacts chemicals
- Diesel inventories are low, transportation
- Natural gas impacts
- This impacts PS, PP, PET

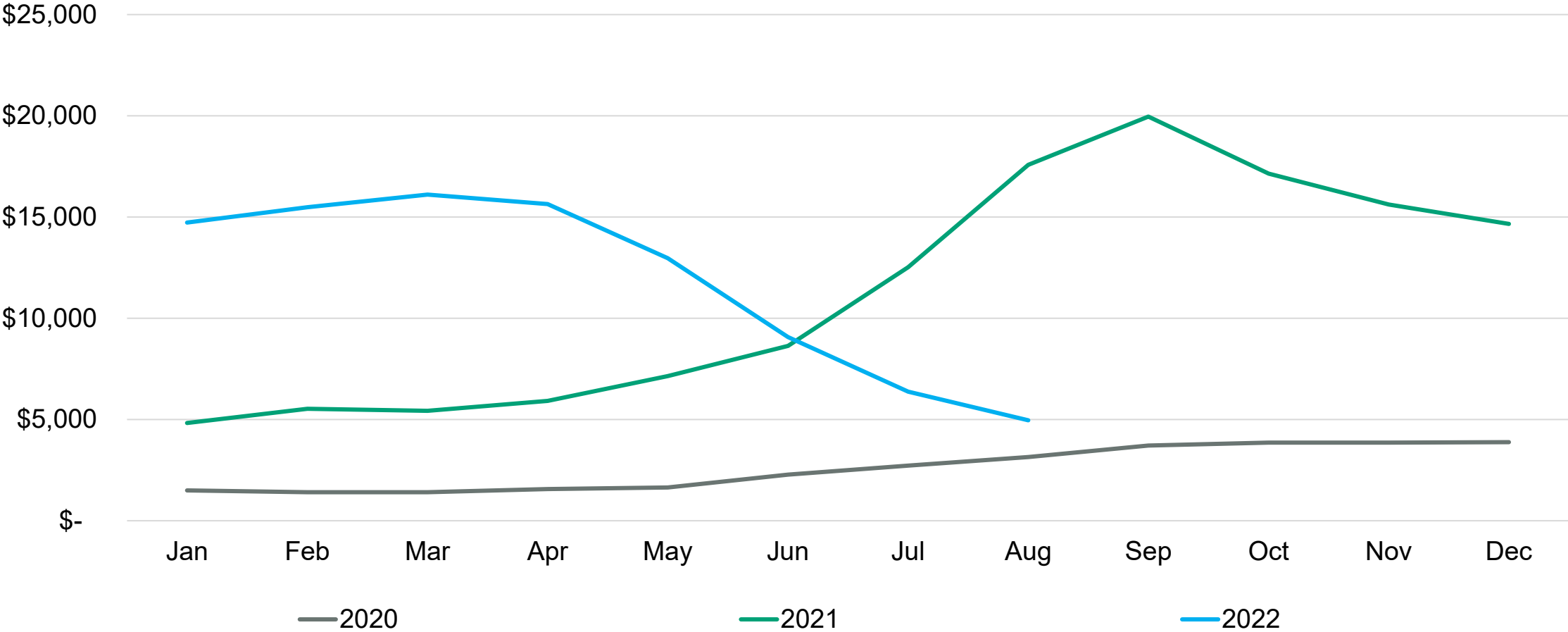




- Significant impacts on
 - Liquid freight
 - Container freight
 - Low river water levels
 - Rail labor agreements
 - Truck drivers and fuel
- Some improvement but challenges remain

Container Freight Cost East Asia to North America West Coast

40 ft container rates



China Self-Sufficiency & Risk of Decoupling

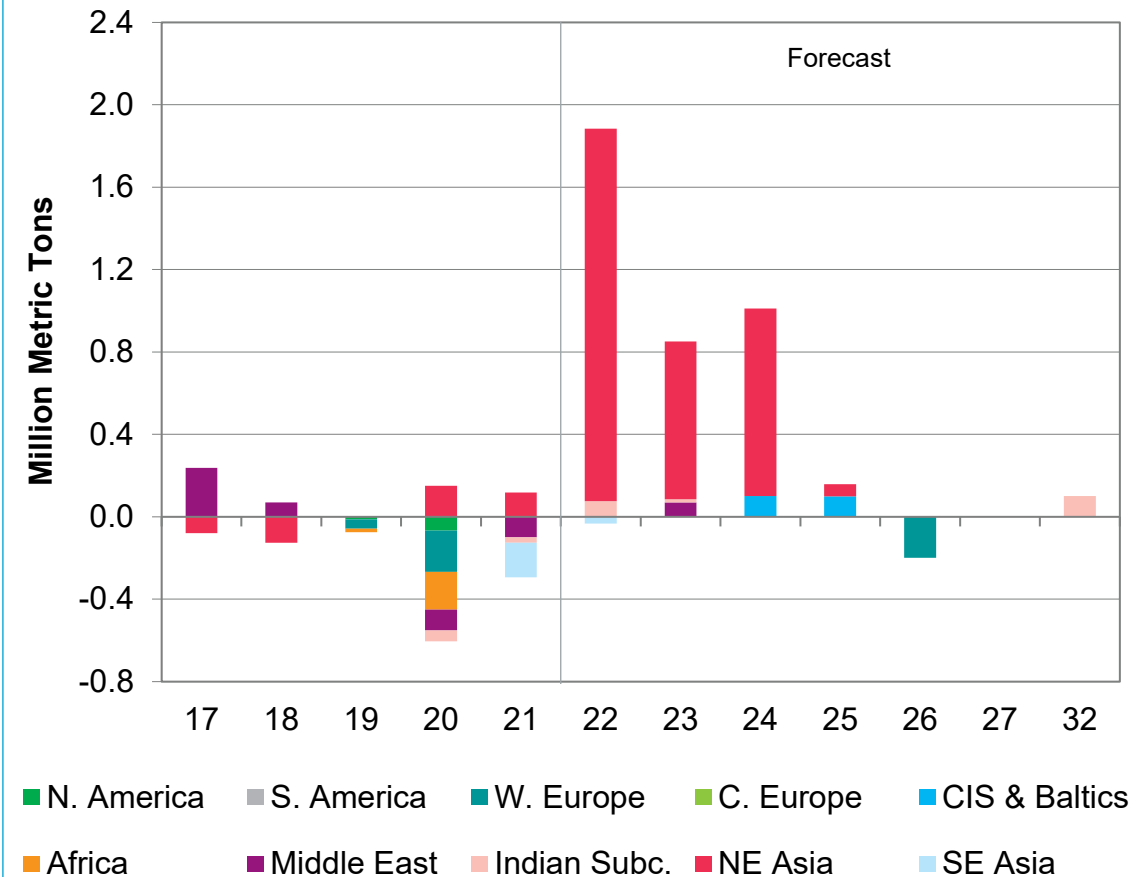


- 20th Communist Party Congress
- Strives to be self-sufficient
- Massive expansion in chemicals

A Wave Of PS Capacity Additions Ahead

- China will add 3.5 million tons in 2022/24
- Global operating rates falling to 65% in response
- Nizhnekamskneftekhim (NKNK) investment likely delayed
- Potential closure in Europe in the 25/26 timeframe

World Polystyrene Capacity Year-On-Year Growth

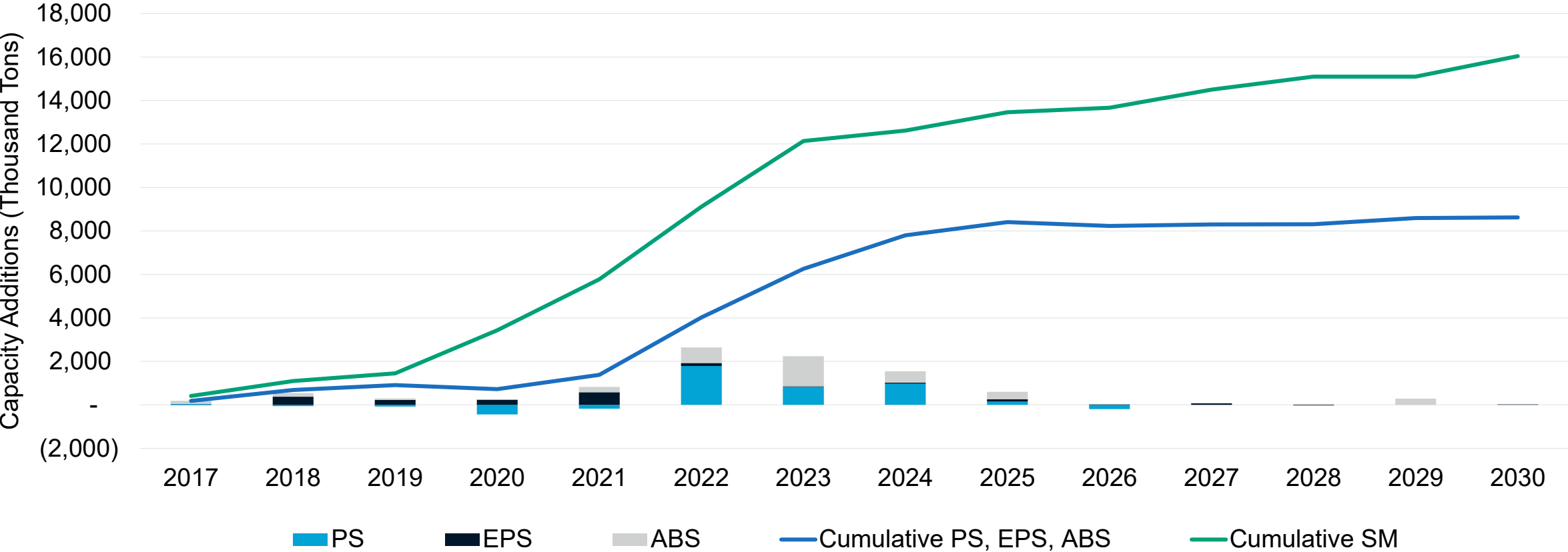


Source: Chemical Market Analytics by OPIS

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Global derivative capacity additions is large, mostly in Asia

Styrene Derivatives - Capacity Additions (In terms of SM)

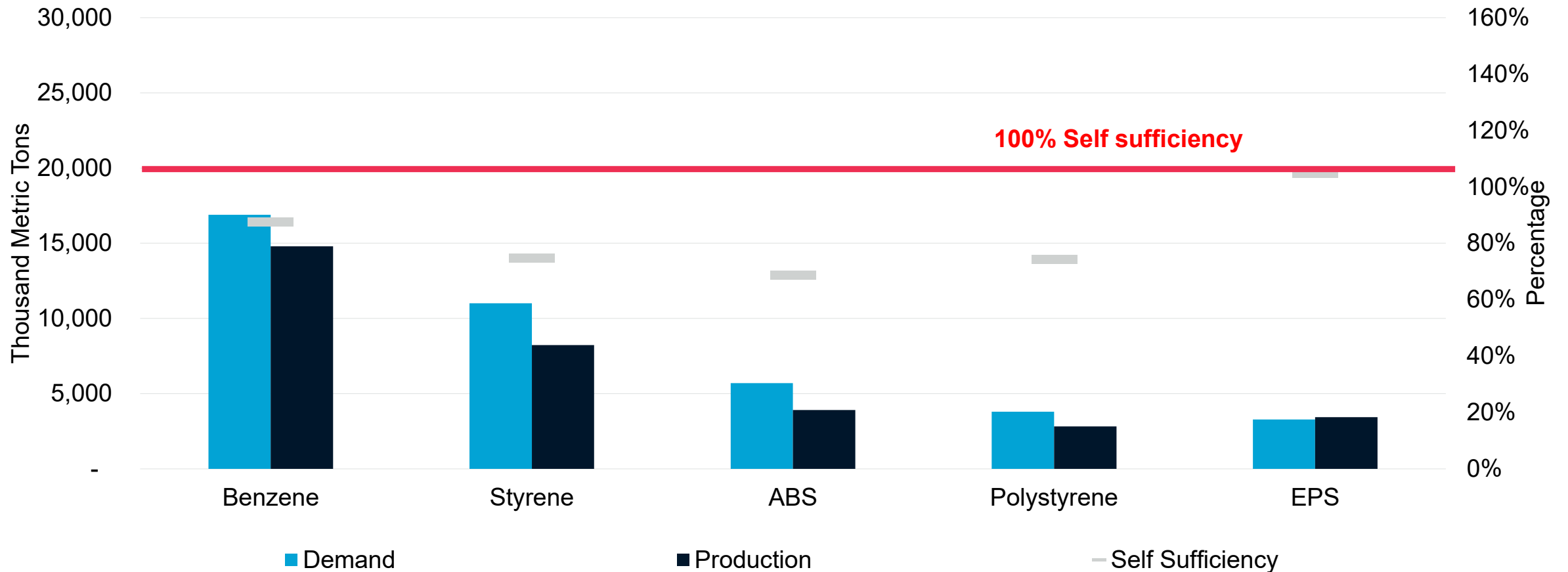


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Mainland China self sufficiency status - 2020

Mainland China Self Sufficiency 2020

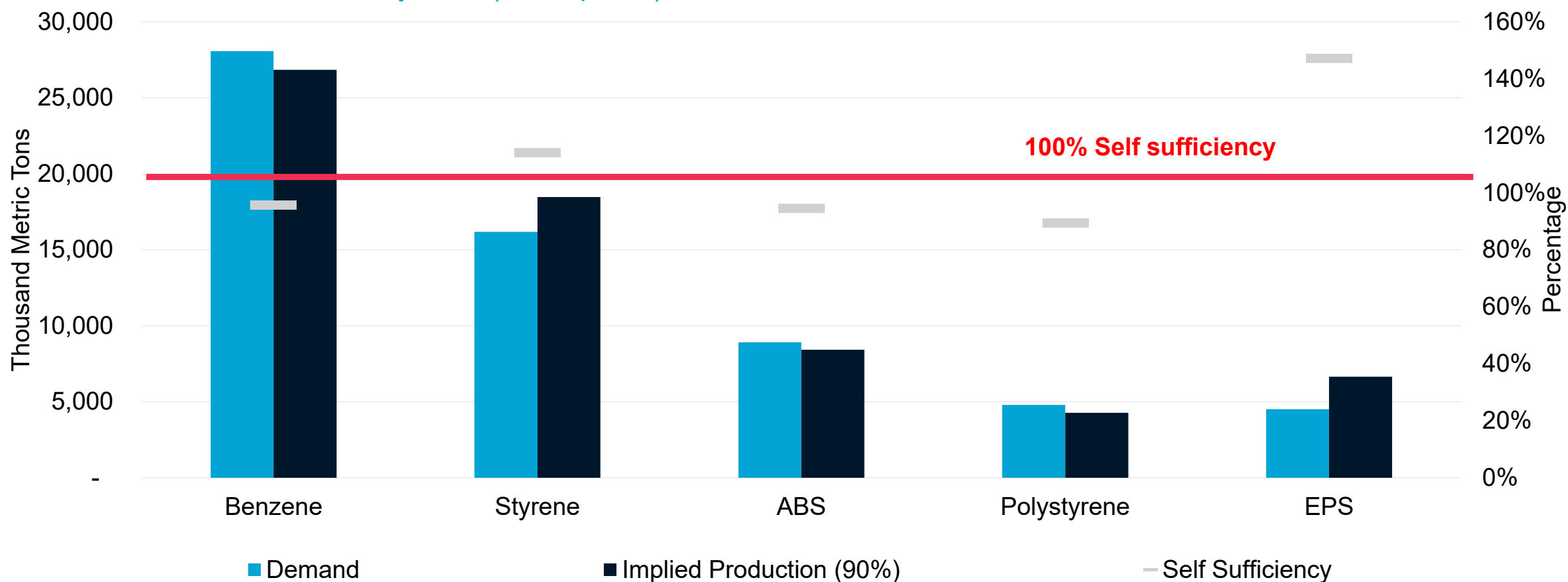


Source: Chemical Market Analytics by OPIS

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Mainland China self sufficiency status – 2027 (based on 90% op-rate)

Mainland China Self Sufficiency 2027 (90% op-rate)

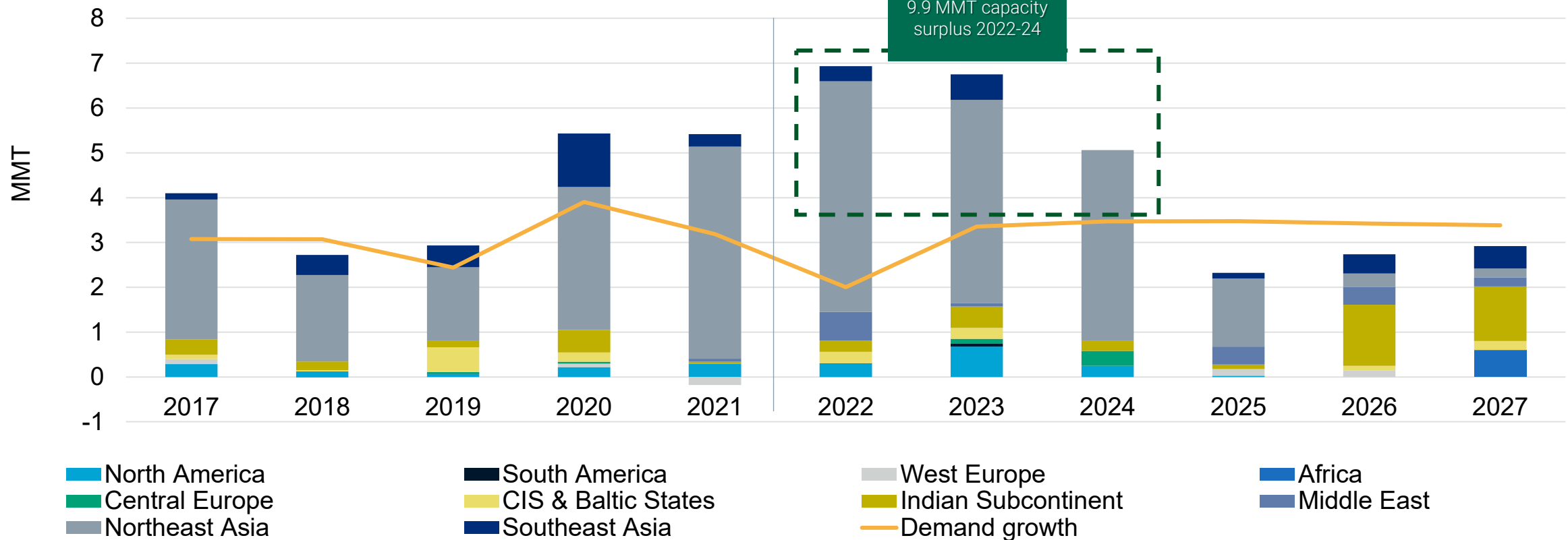


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Too much new PP capacity near term

World Total PP Capacity Additions vs. Demand Growth

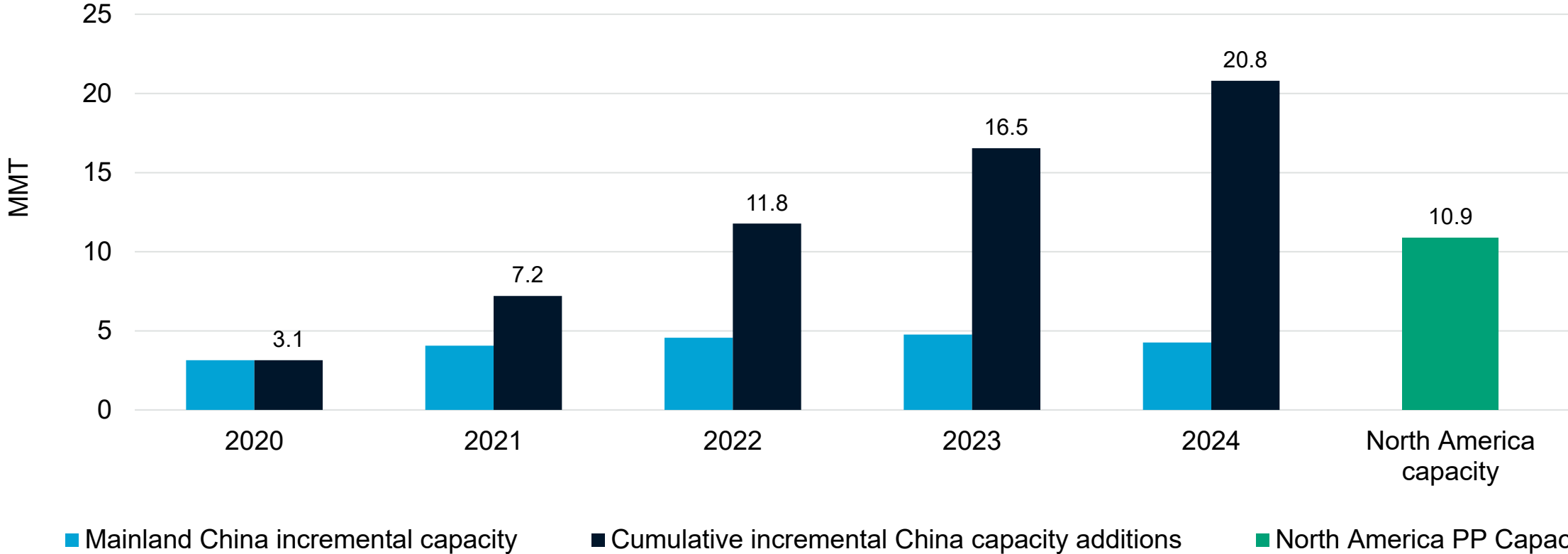


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Mainland China is adding twice the size of North American Capacity by 2024

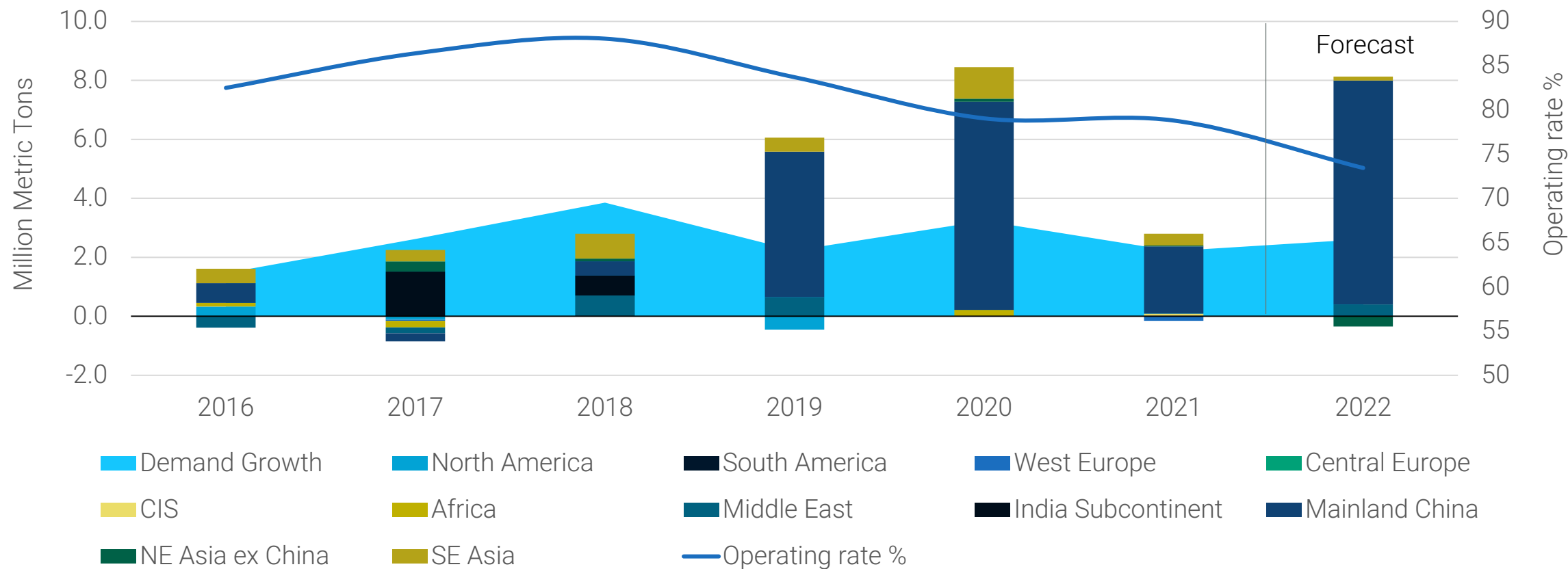
Mainland China new additions vs. Size of North American capacity



Source: Chemical Market Analytics by OPIS

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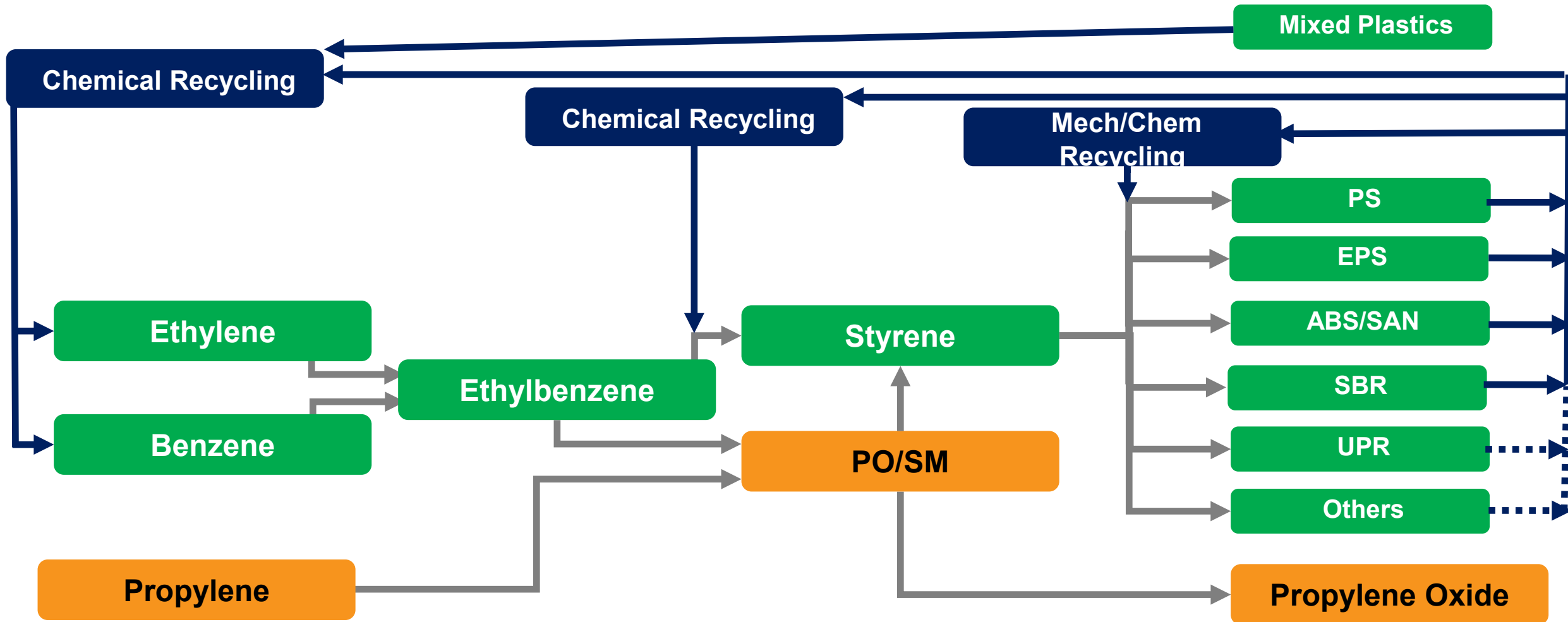
Paraxylene global market overview



Source: Chemical Market Analytics by OPIS

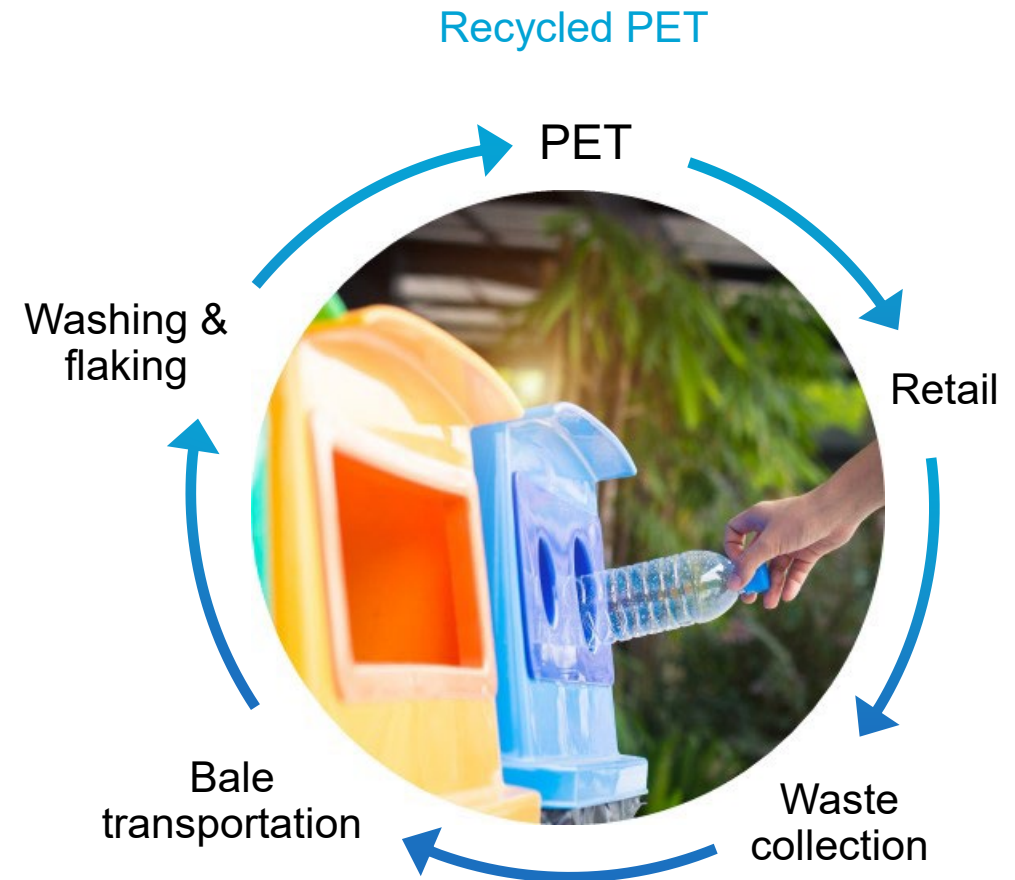
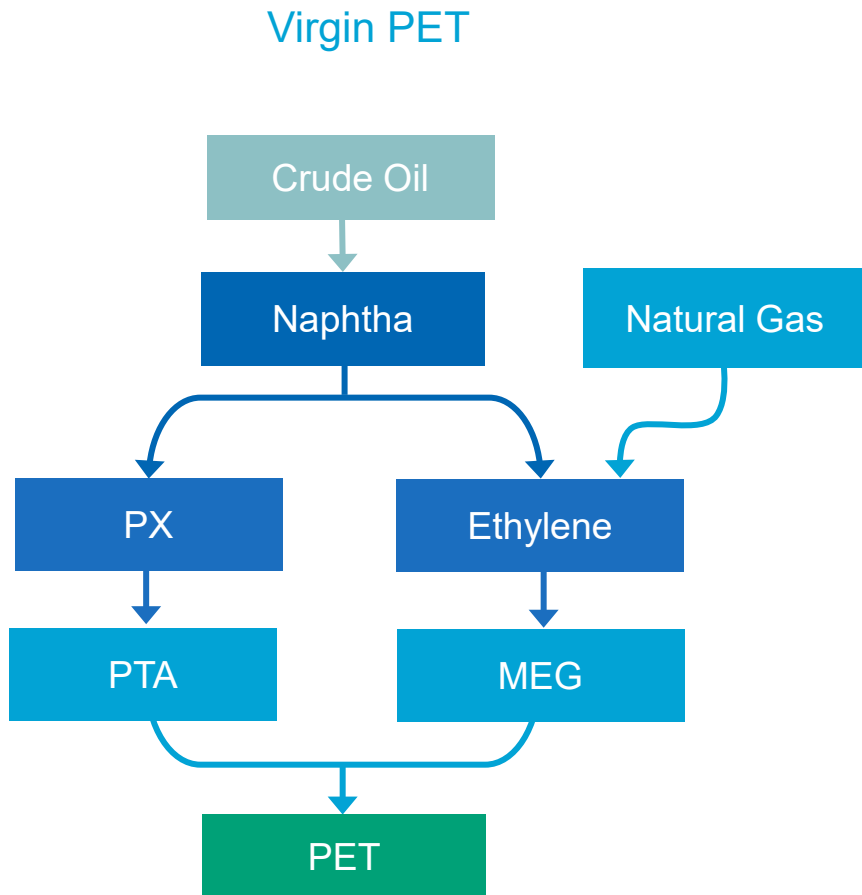
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Recycled PET is the most advanced

Energy prices have a large influence on virgin PET prices



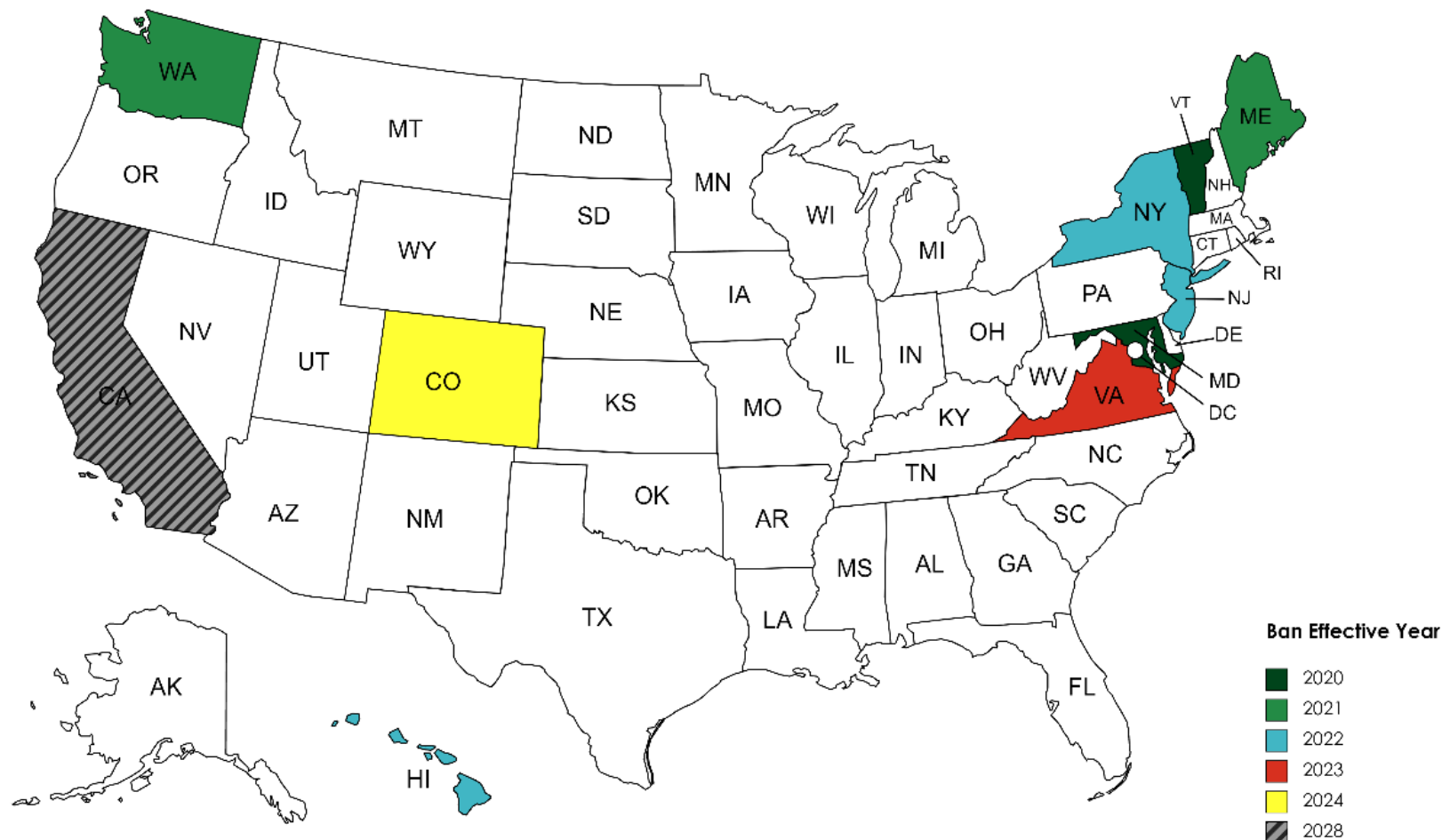
Pressure Continues Greenpeace Study - Circular Claims Fall Flat Again

- In 2021, only 5 percent of plastics was recycled, Recycling decreasing.
- China stopped accepting waste plastic in 2018
- PET & HDPE had reprocessing rates of 20.9% & 10.3% respectively, down from 2020.



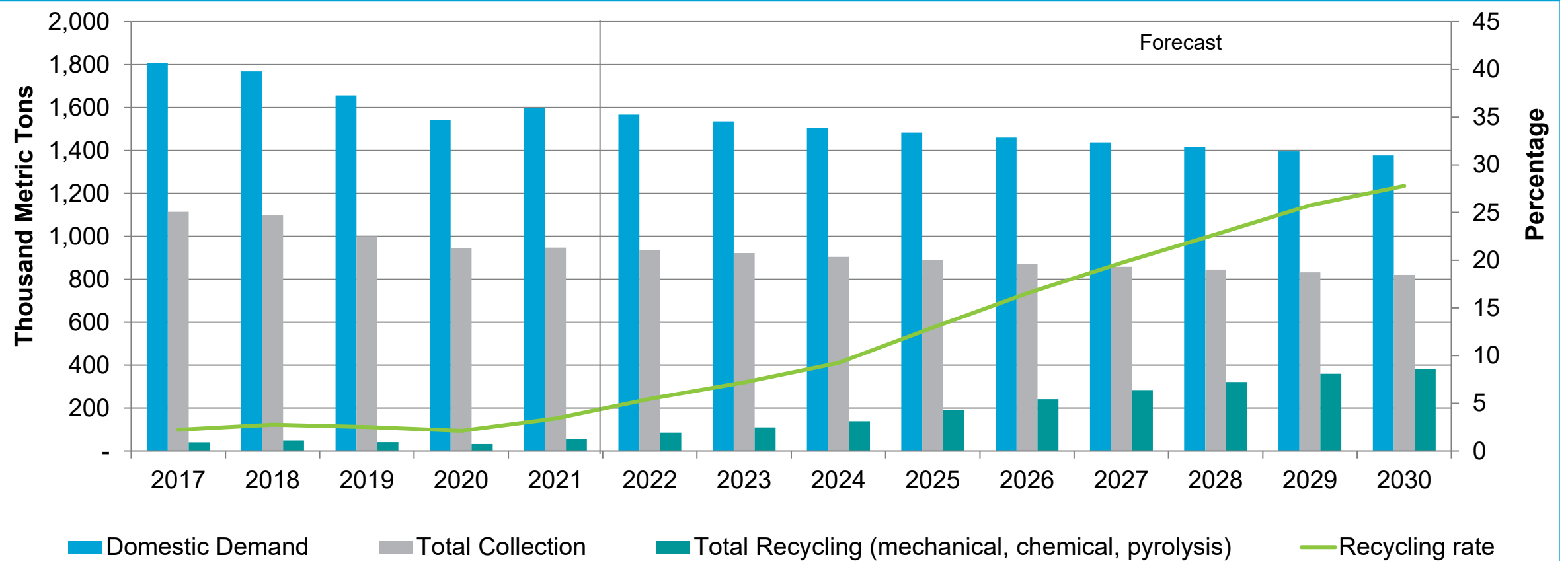
US Statewide Single Use Bans – Continued pressure

- **New California Law**
- ***PS food packaging must be recycled 30% by 2028***
- Reduce plastic demand by 10% 2027 to 25% by 2032
- Must be recyclable or compostable by 2032.
- Increase recycling rate to 65% by 2032
- Producers-Responsibility Law & \$5B fund over 10 years



PS recycling rate will significantly increase, led by Europe

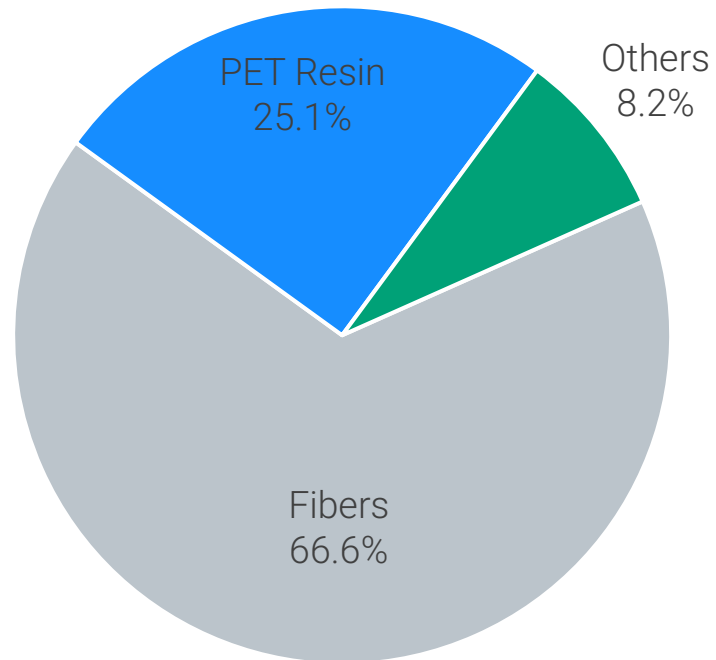
Europe – PS recycling rate



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Fiber segment absorbs the most part of recycled PET

Recycling Demand by Segment



8.0 Million Metric Tons in 2021

Source: Chemical Market Analytics by OPIS

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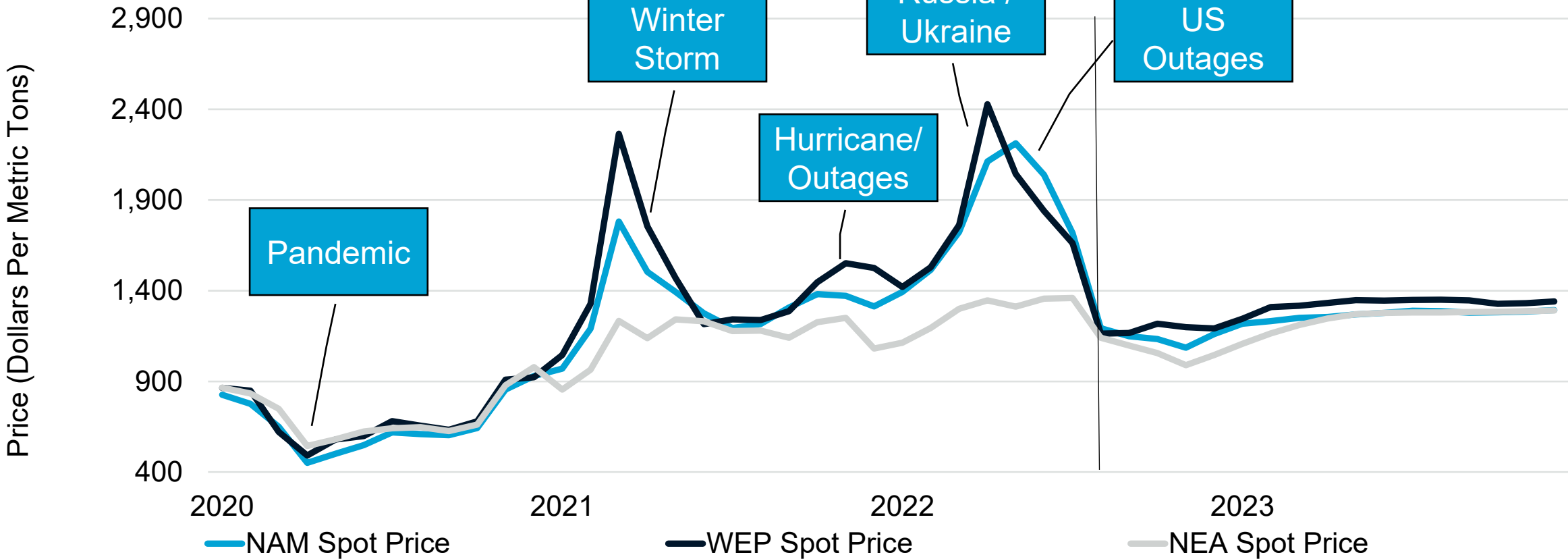
- “Bottle to Bottle” recycling is still a small portion of RPET, globally. PET replacement in sheet and B2B applications is only at 25% of overall RPET demand.
- Recycling into fibers is the most cost-effective way. The fibers industry will be able to consume any imaginable increases in PET collection.
- B2B demand is expected to grow slowly in China and India due to lack of PCR mandates and food contact regulations.
- Containers will have to compete for available RPET flakes with the fibers industry

Polystyrene



Feedstocks have been impacted by multiple black swan events

Global Styrene Price Comparison

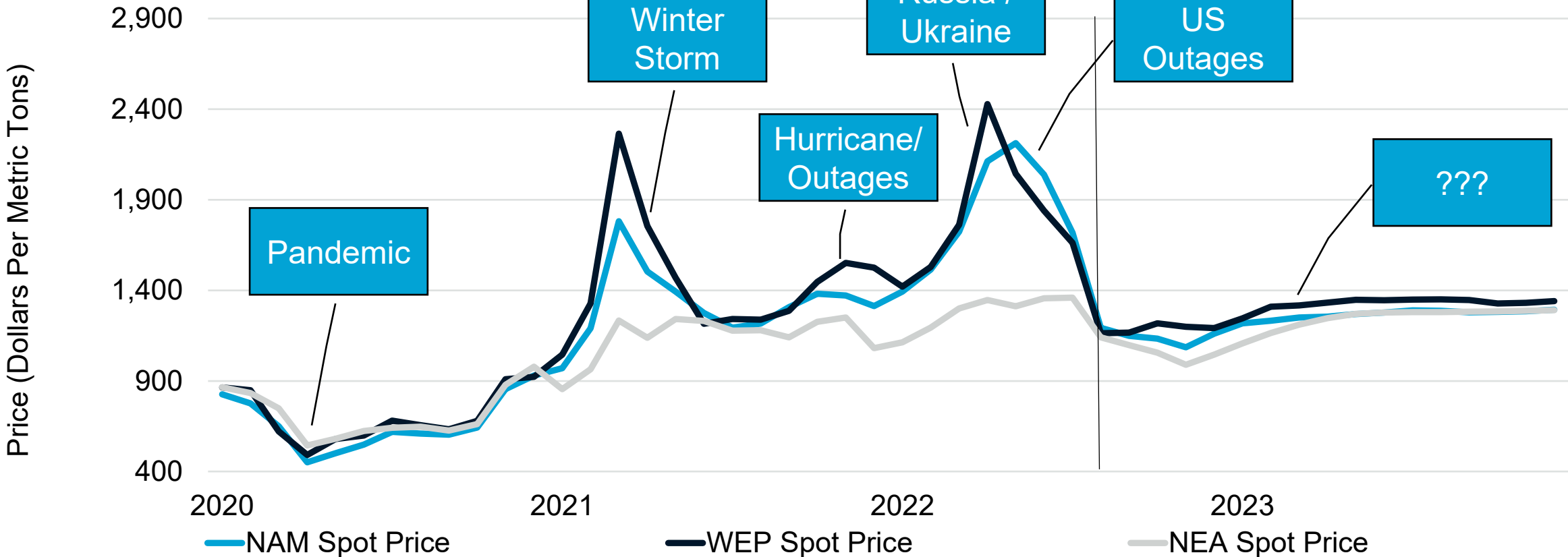


Source: Chemical Market Analytics by OPIS

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Feedstocks have been impacted by multiple black swan events

Global Styrene Price Comparison

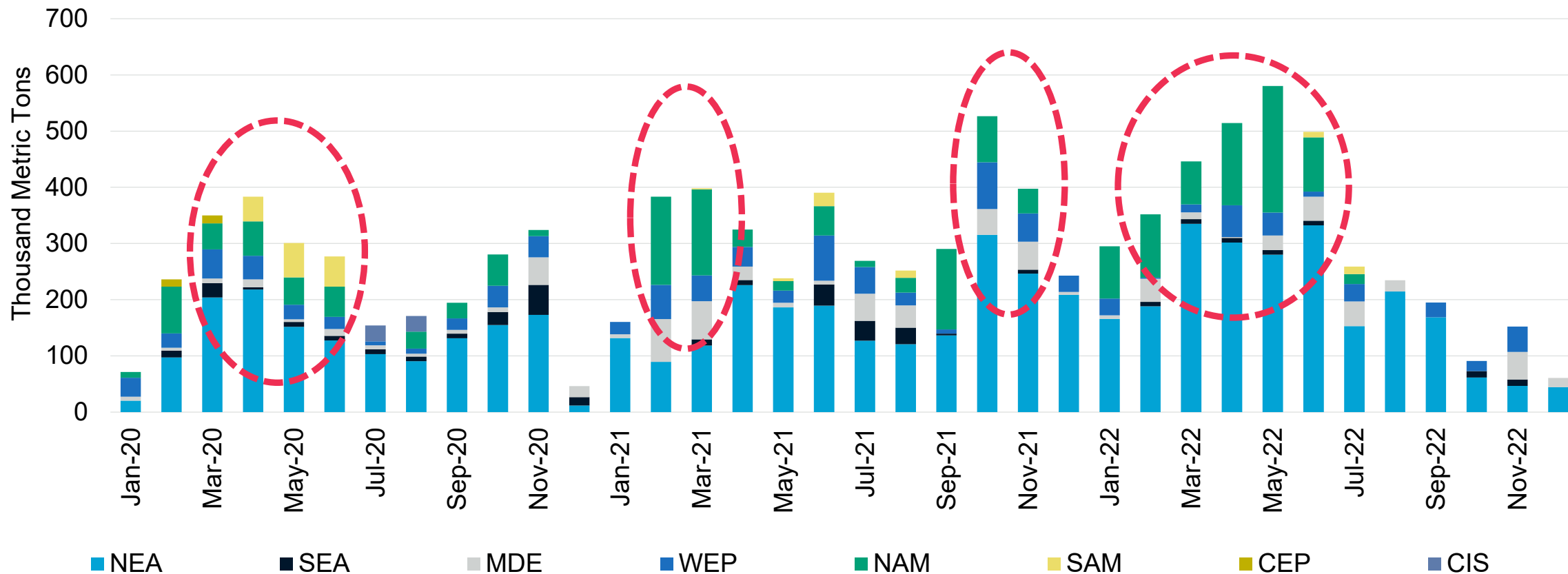


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All SM-PS producers in US had 1H 22 SM turnaround

Global Styrene Production Capacity Losses in 2020-2022

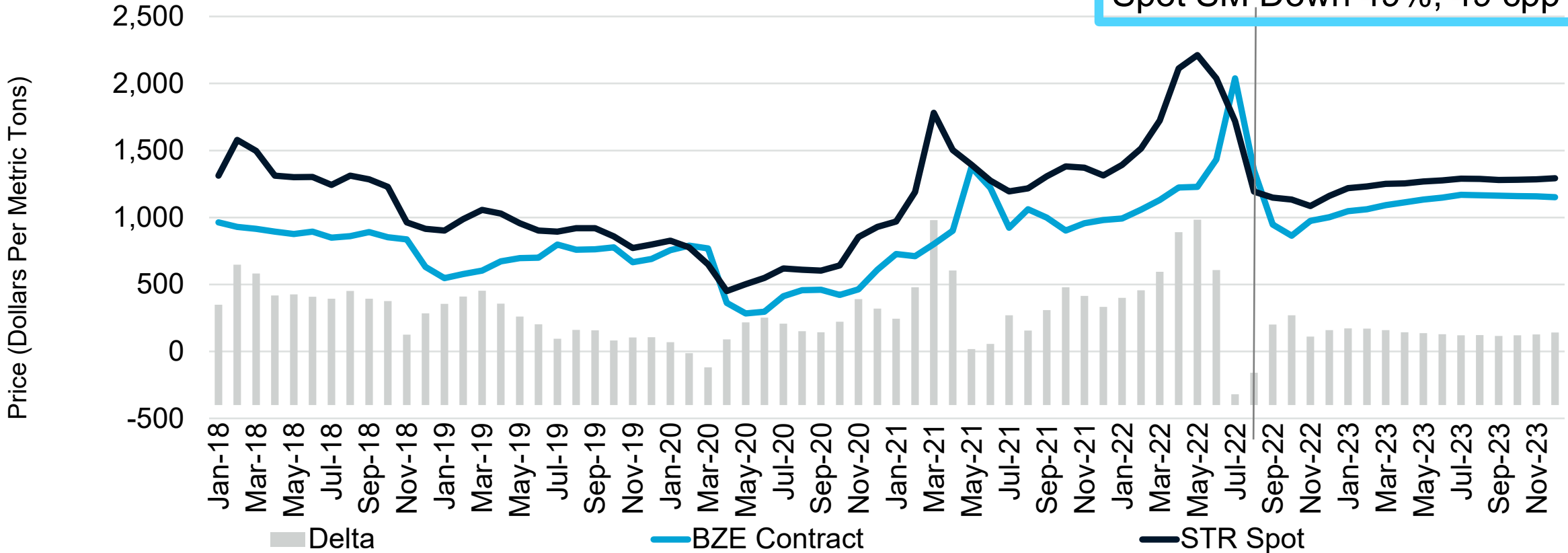


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Benzene spikes after SM restarts, leading to 20 cpp PS increase

NAM Benzene and Styrene Comparison

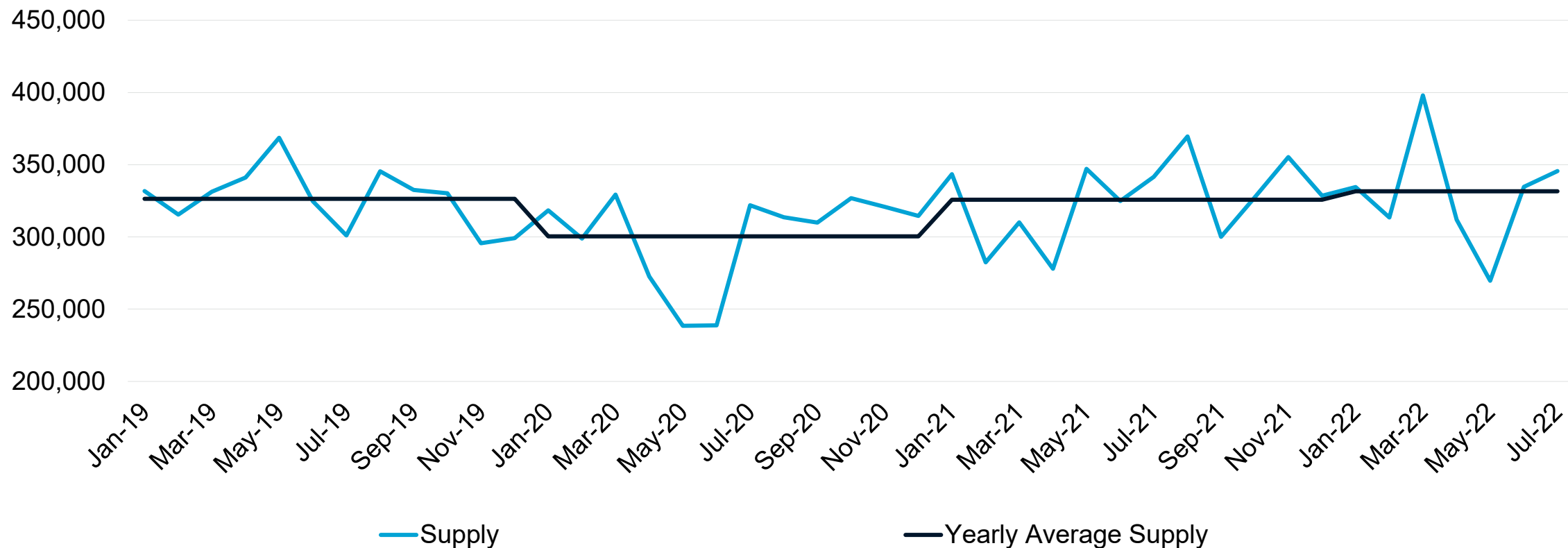


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PS production has recovered from the pandemic

North America PS Production

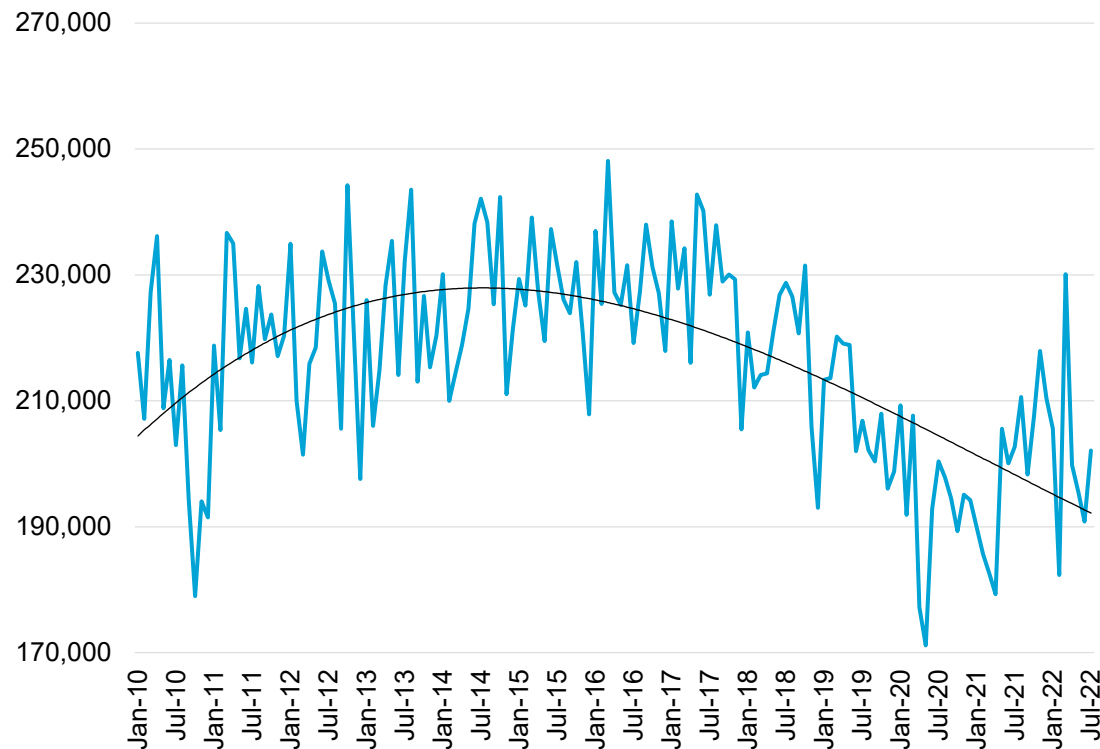


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Packaging & foam demand rebounded during the pandemic

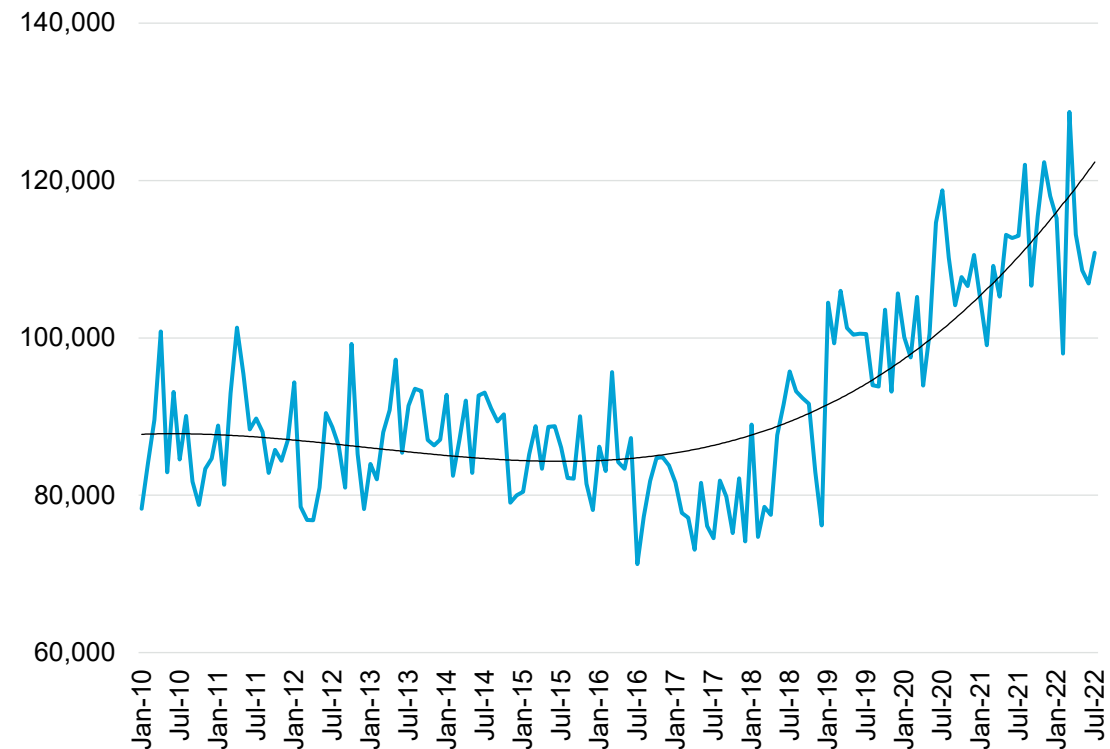
Packaging/One-time Use



— Packaging/One-time Use

Note: Y-Axis scale is different

Foam



— Foam

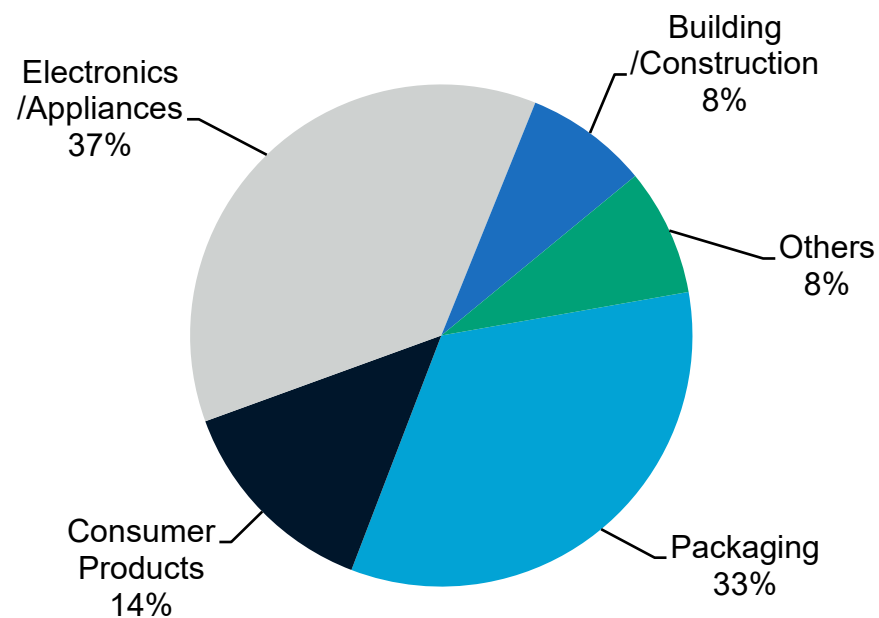
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World: 2022 Polystyrene Demand by End Use



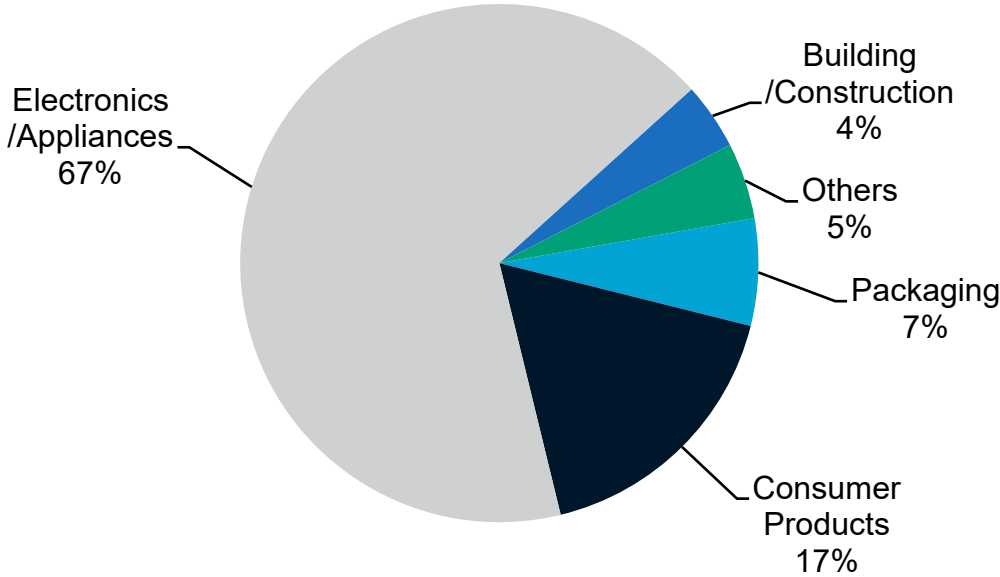
Demand = 11.3 Million Metric Tons

Source: Chemical Market Analytics by OPIS

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Polystyrene demand – packaging shrinking & appliances growing

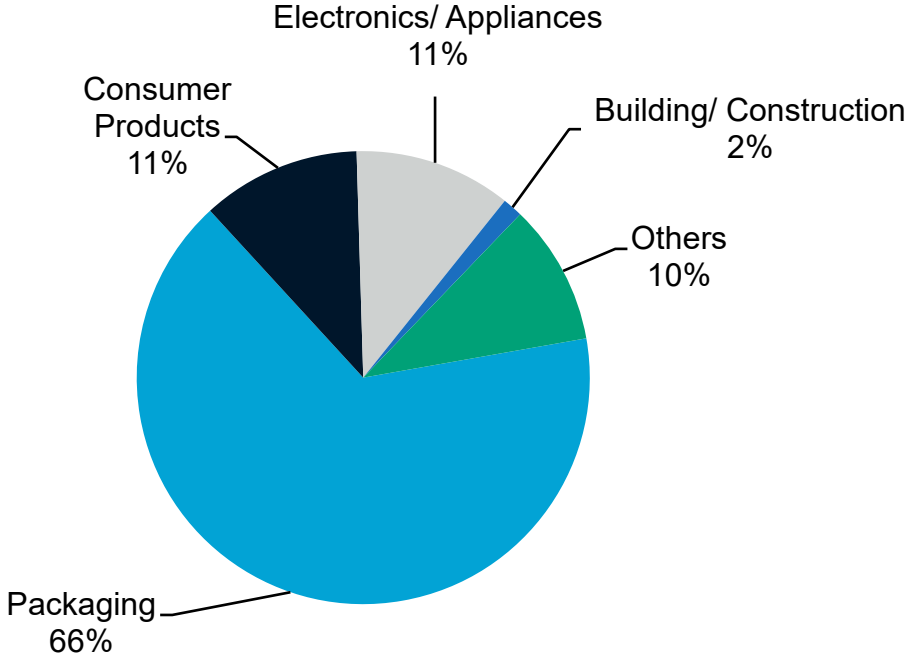
China (mainland): 2022 Polystyrene Demand by End Use



Domestic Demand = 3.9 Million Metric Tons

Source: Chemical Market Analytics by OPIS © 2022 Oil Price Information Service, LLC.

North America: 2022 Polystyrene Demand by End Use



Domestic Demand = 2.0 Million Metric Tons

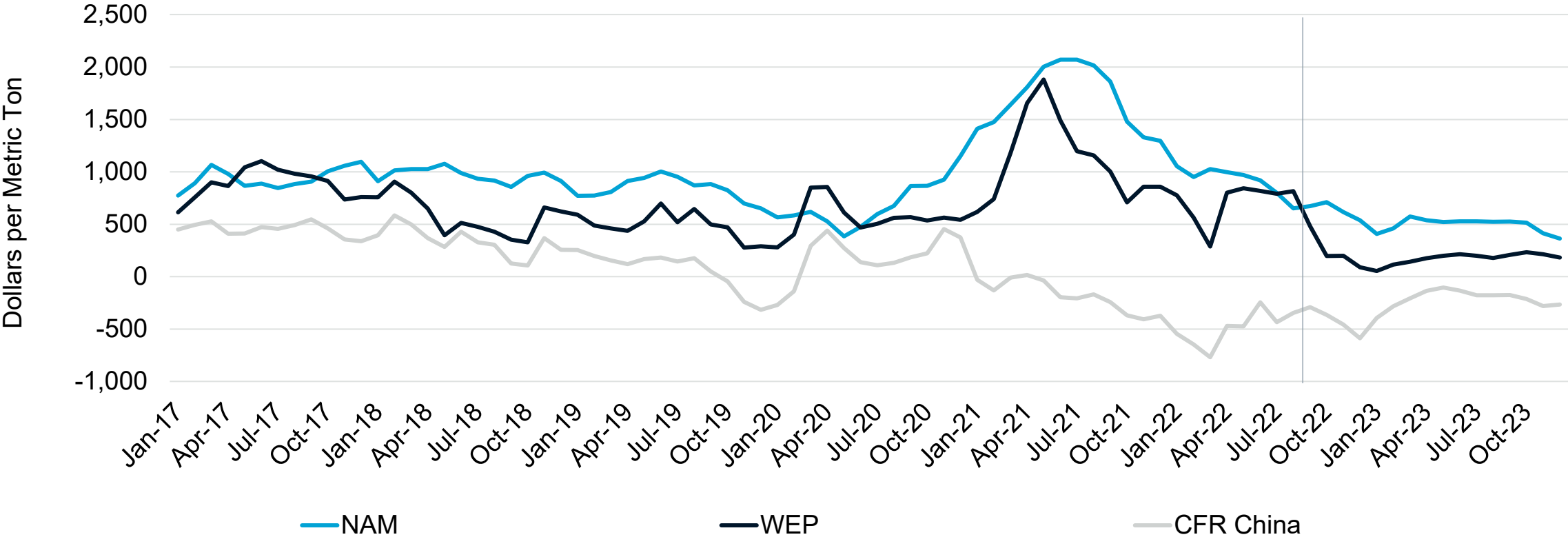
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Polypropylene



Historic run ends for polyolefin producers

Combined PE-PP Margins by Region



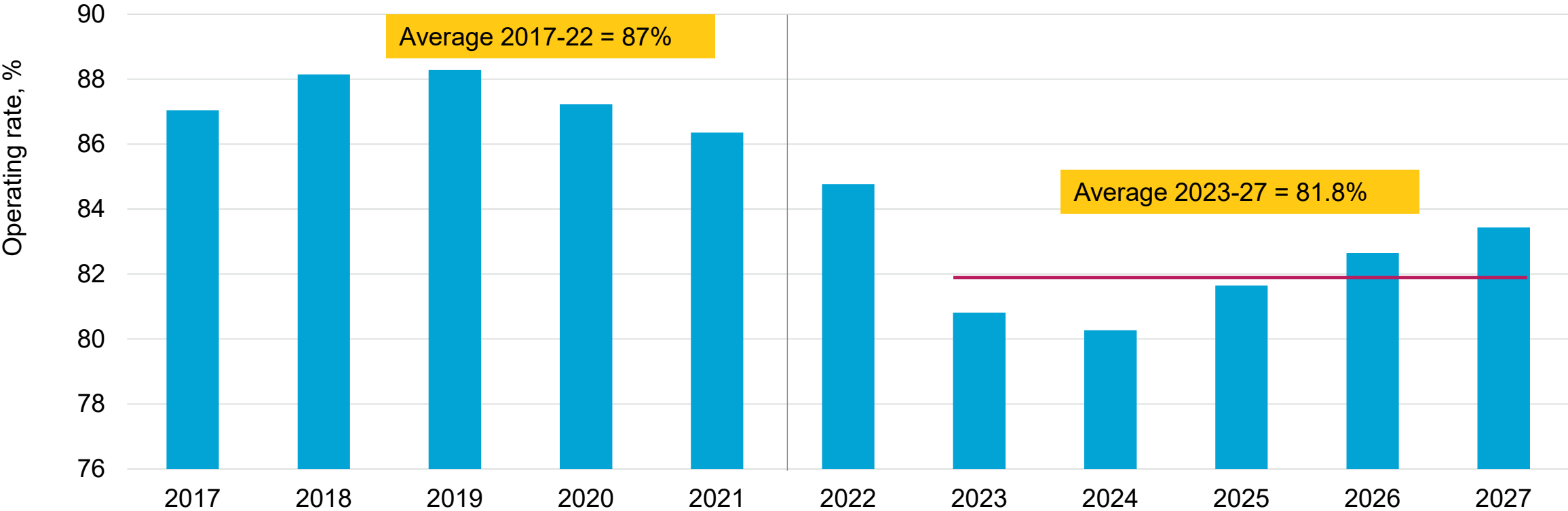
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Global operating rates expected to drop lower

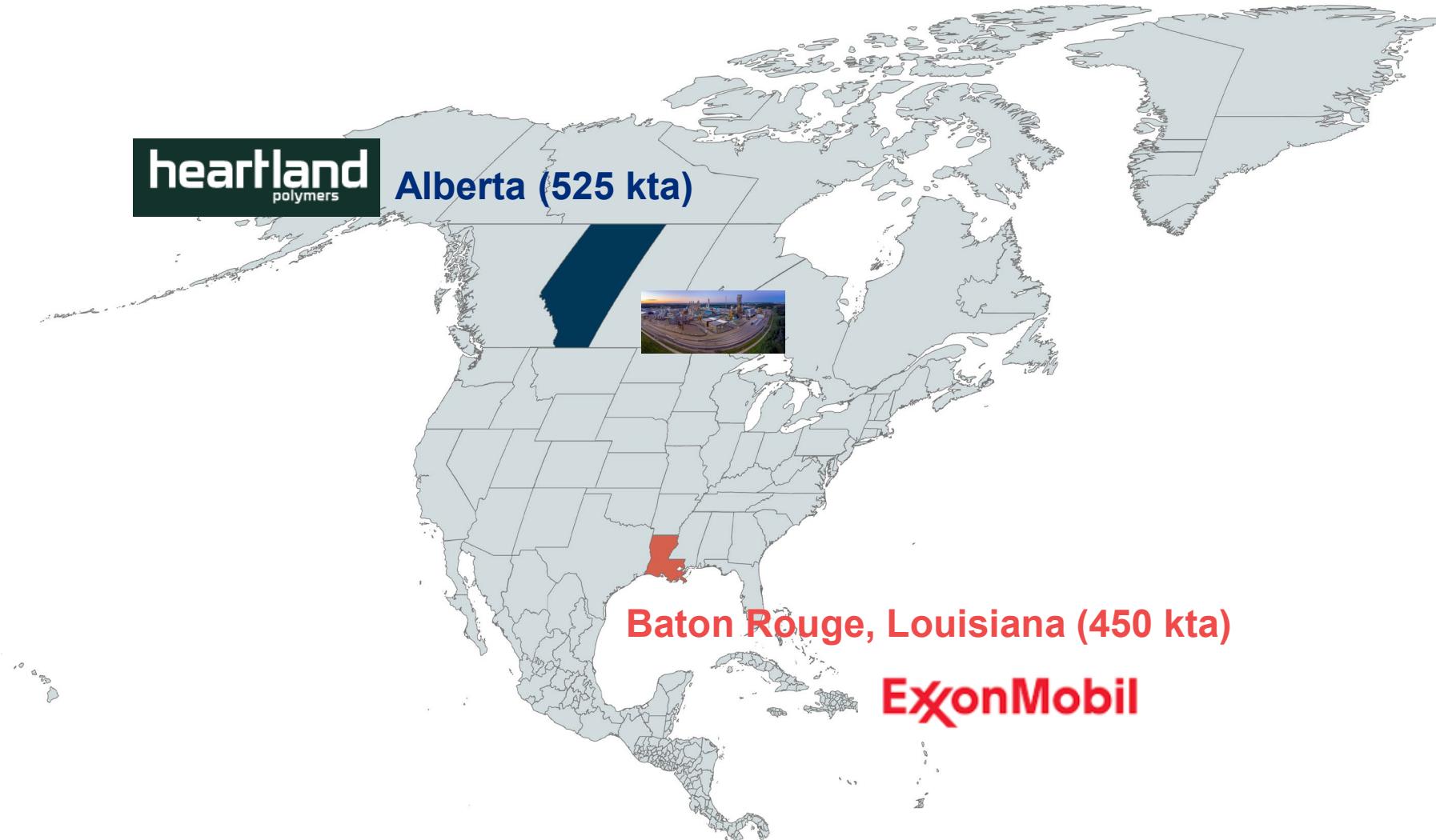
Impact of economic slowdown, capacity growth, logistics

Global PP Operating Rates



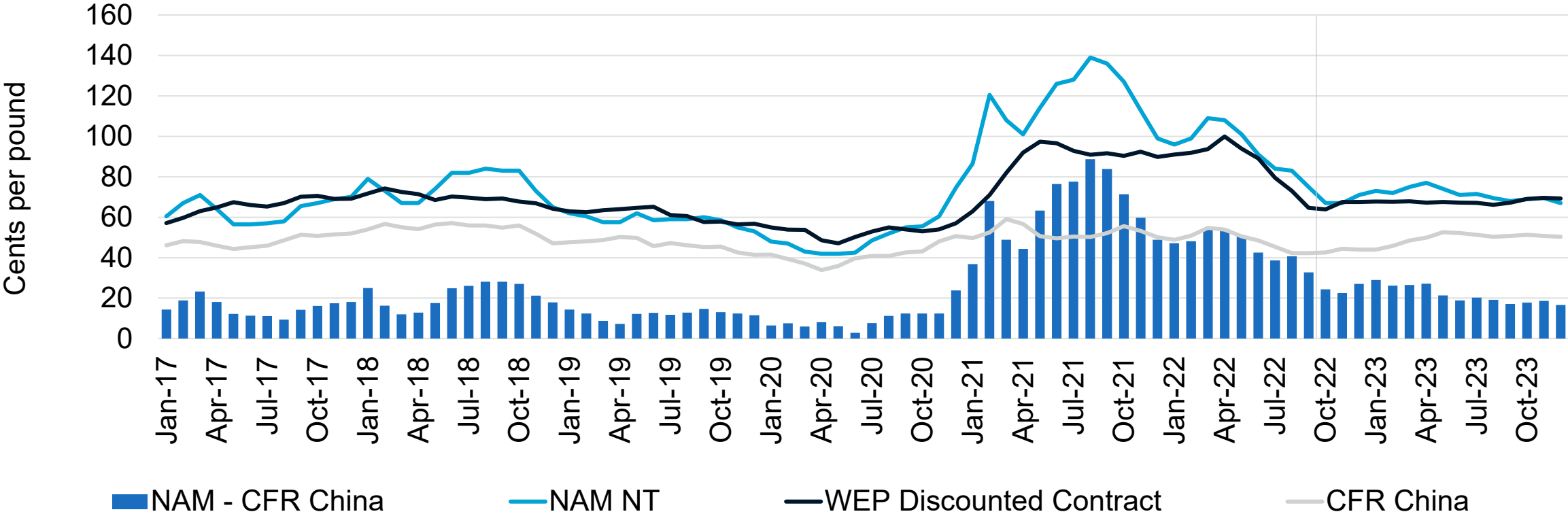
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Geography matters – divergent price

PP Prices by Region

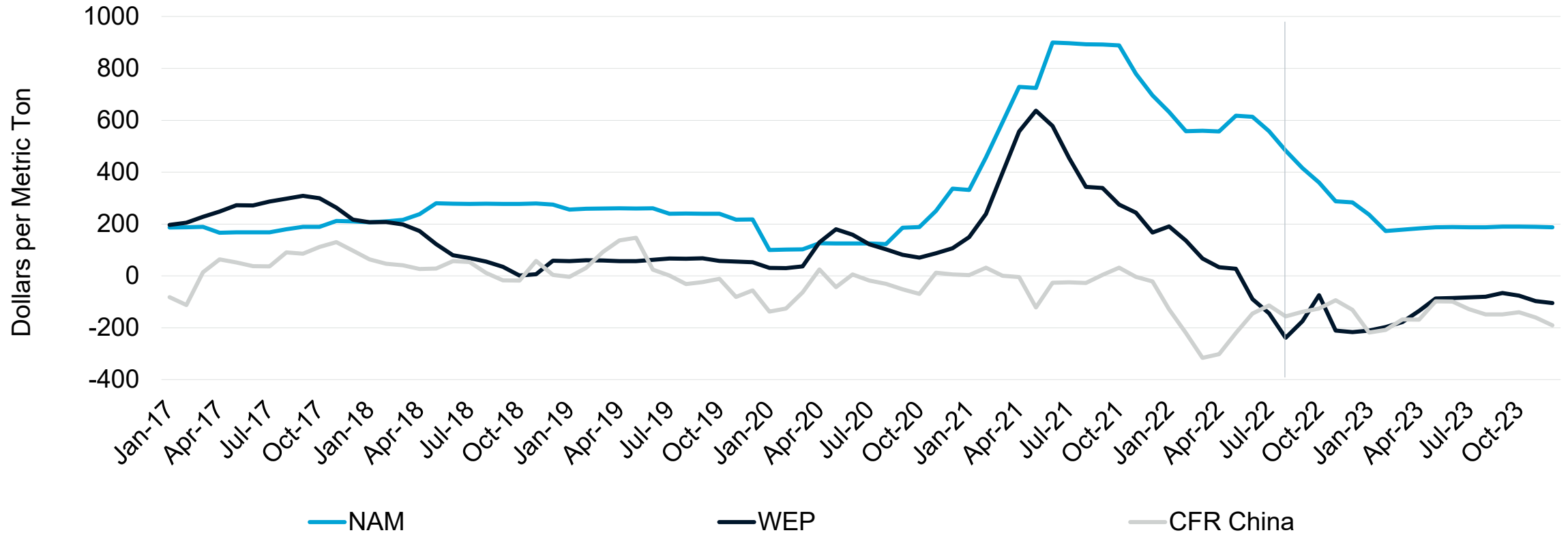


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Tough market environment for producers ahead

PP Non-integrated Margins by Region

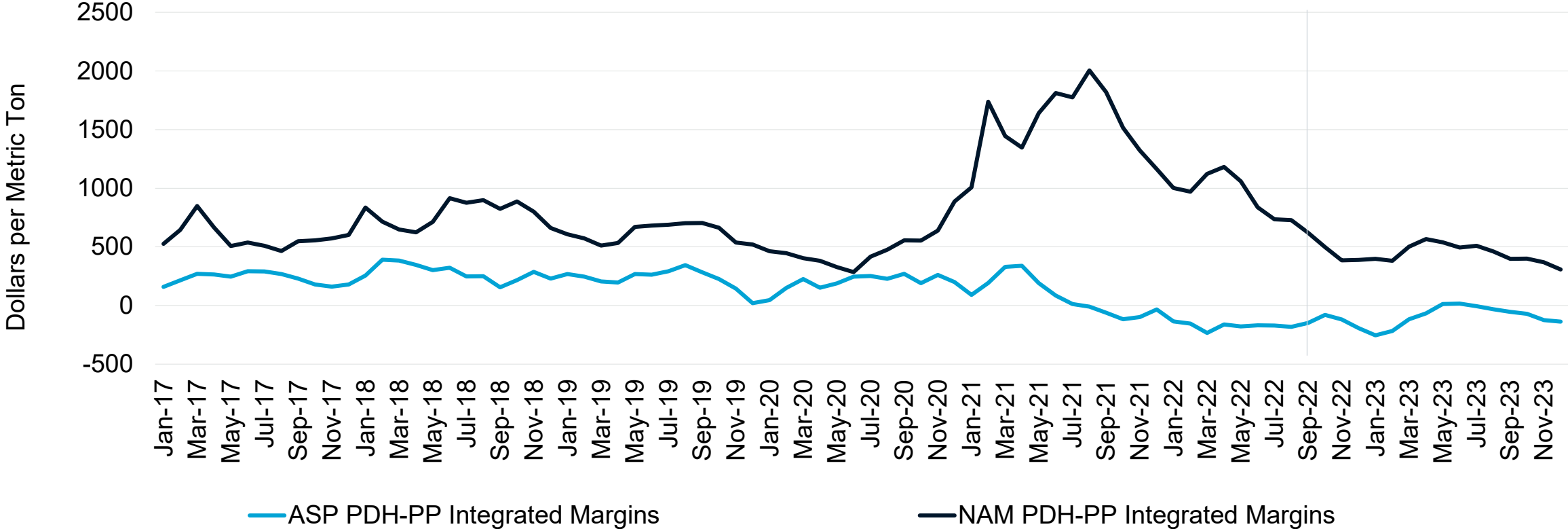


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High propane prices could challenge PDH-PP profitability next two years

PP Integrated Margins by Region

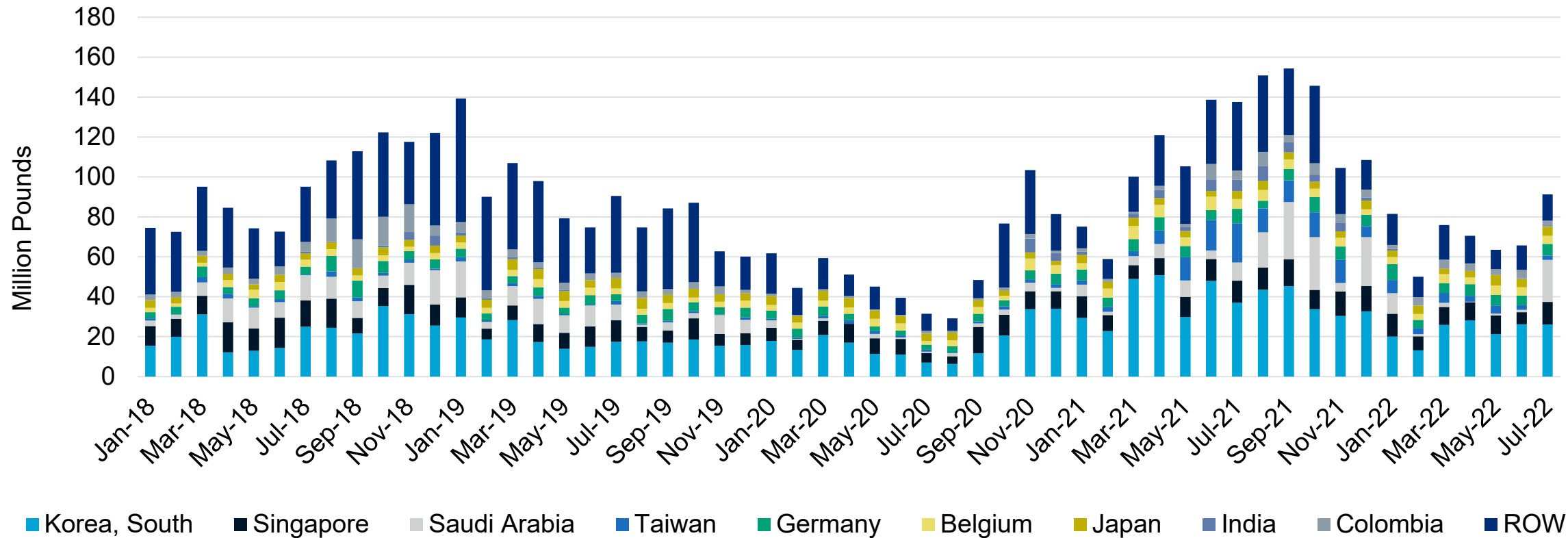


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US PP resin imports are declining with lower arb with Asia

US PP resin imports by country (excludes CAN/MEX)



Source: Global Trade Atlas

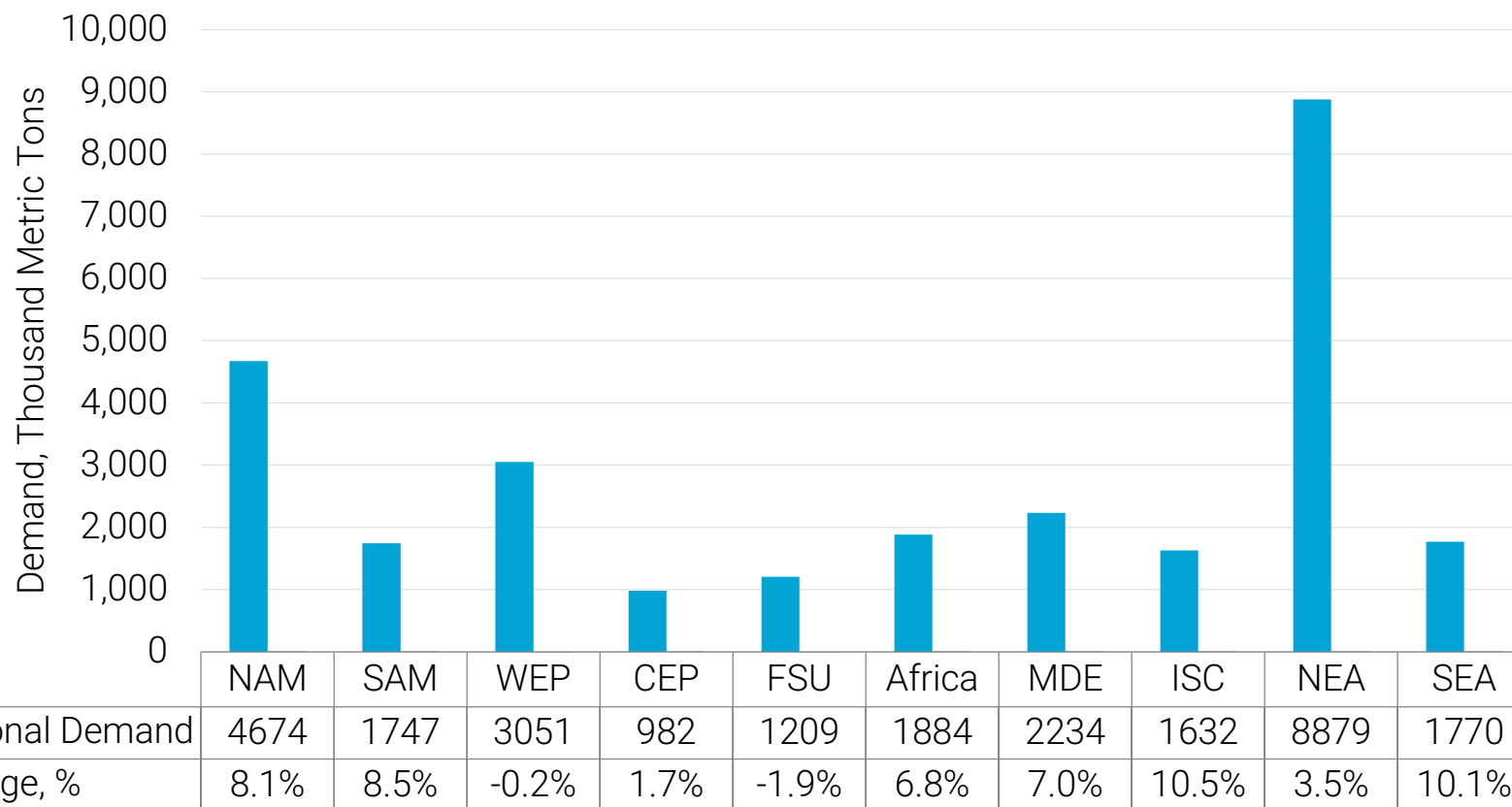
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PET



Global PET Resin Demand by Region 2022

2022 regional PET demand

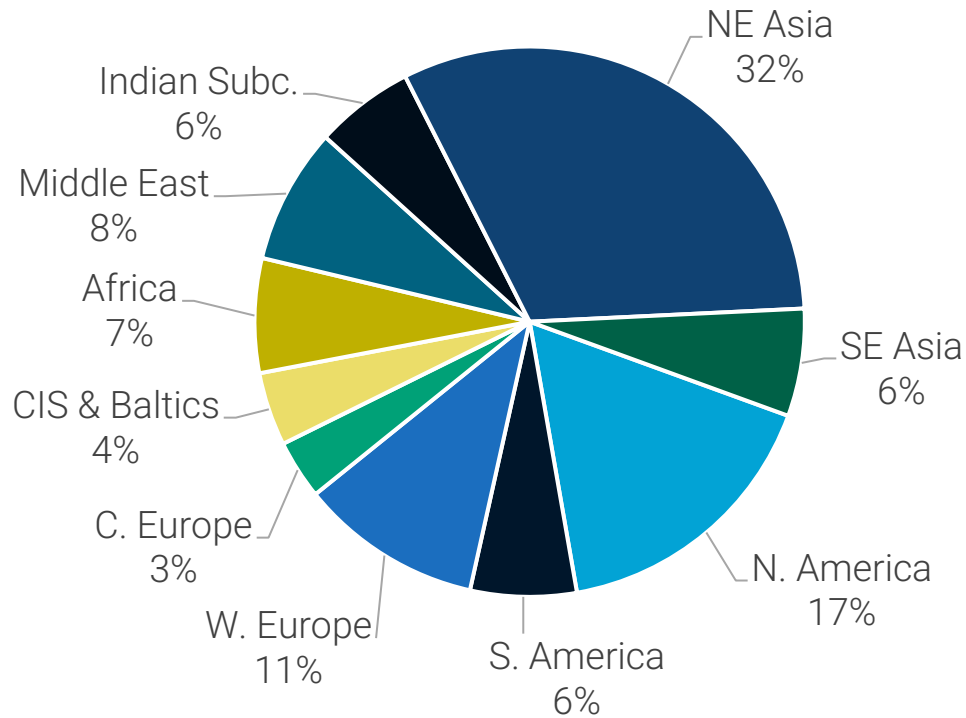


Source: Chemical Market Analytics by OPIS

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Global PET Resin Demand

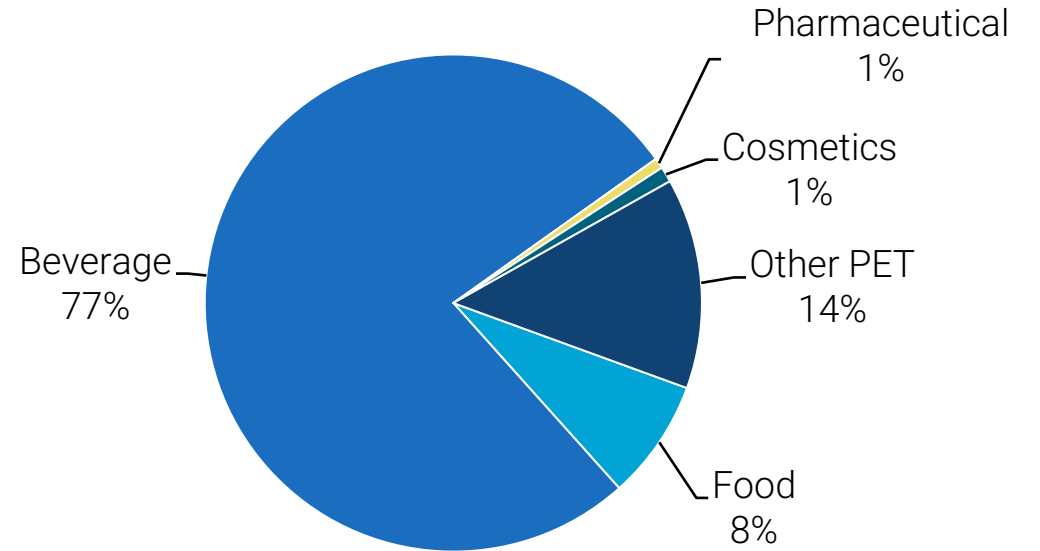
World: 2022 PET Demand By Region



Source: Chemical Market Analytics by OPIS

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World: 2022 PET Demand

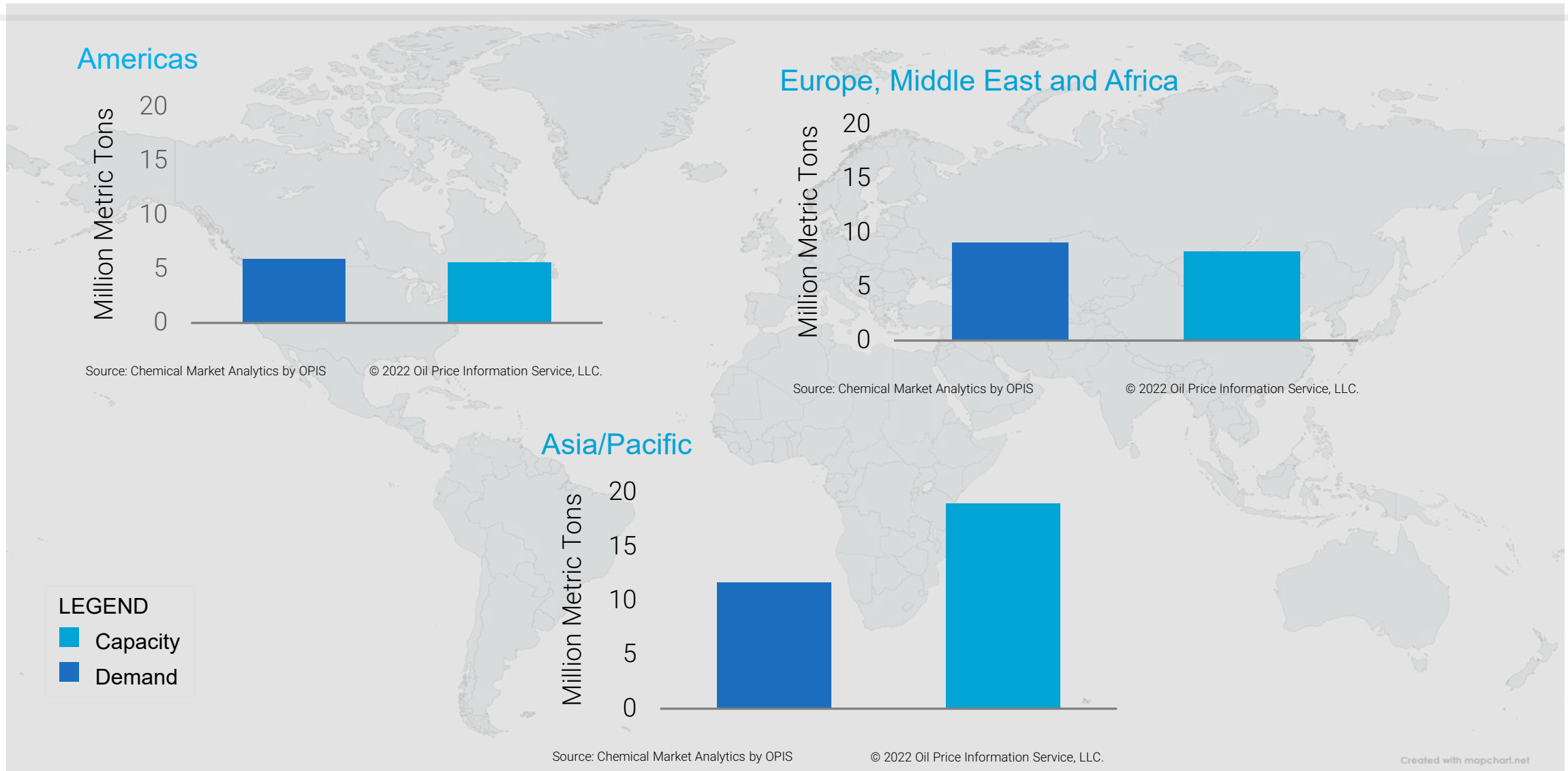


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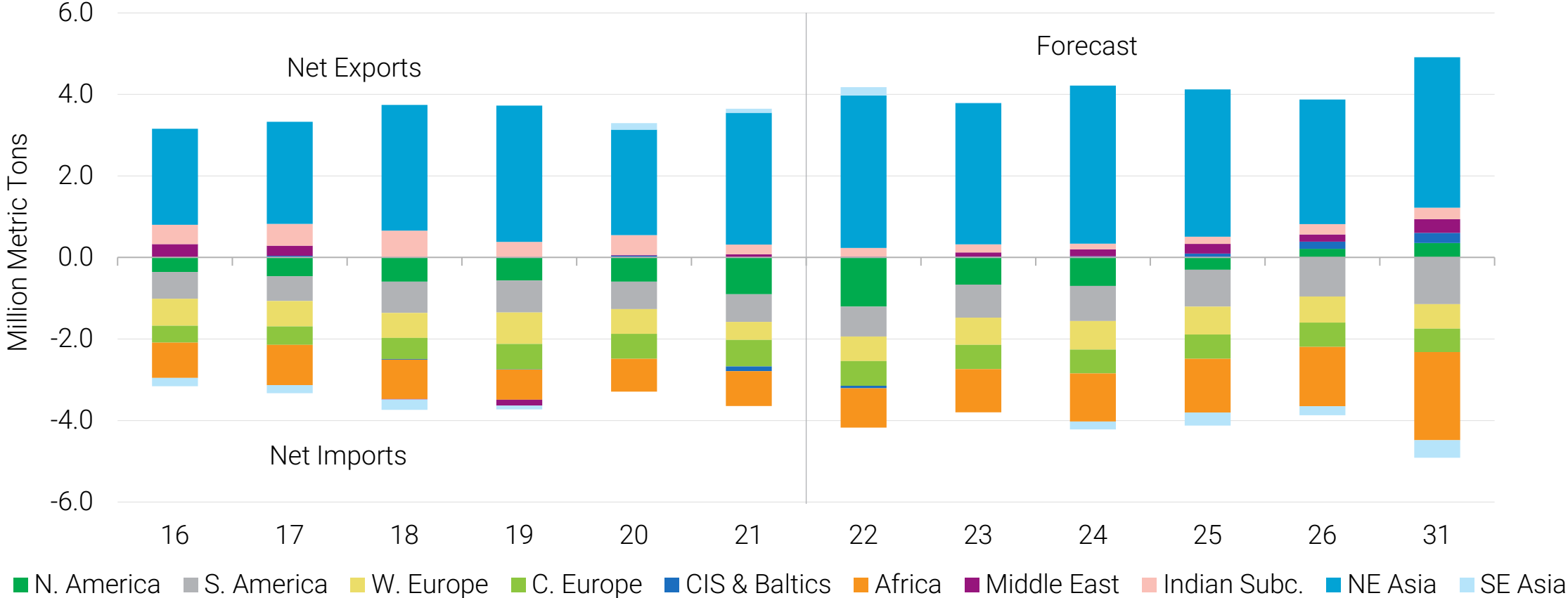
Demand = 28.0 Million Metric Tons

Americas and Europe are in balance, but Asia is heavily overbuilt on PET (2021 figures)



Global export dominated by Asia

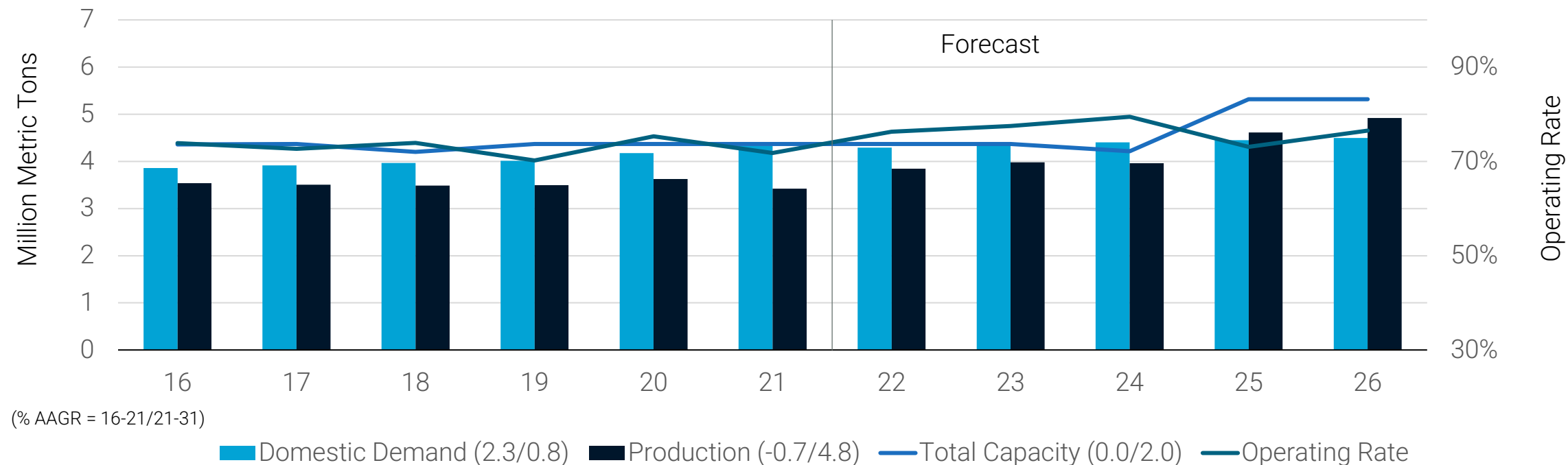
Regional PET Net Trade



Source: Chemical Market Analytics by OPIS

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North America: PET Supply & Demand



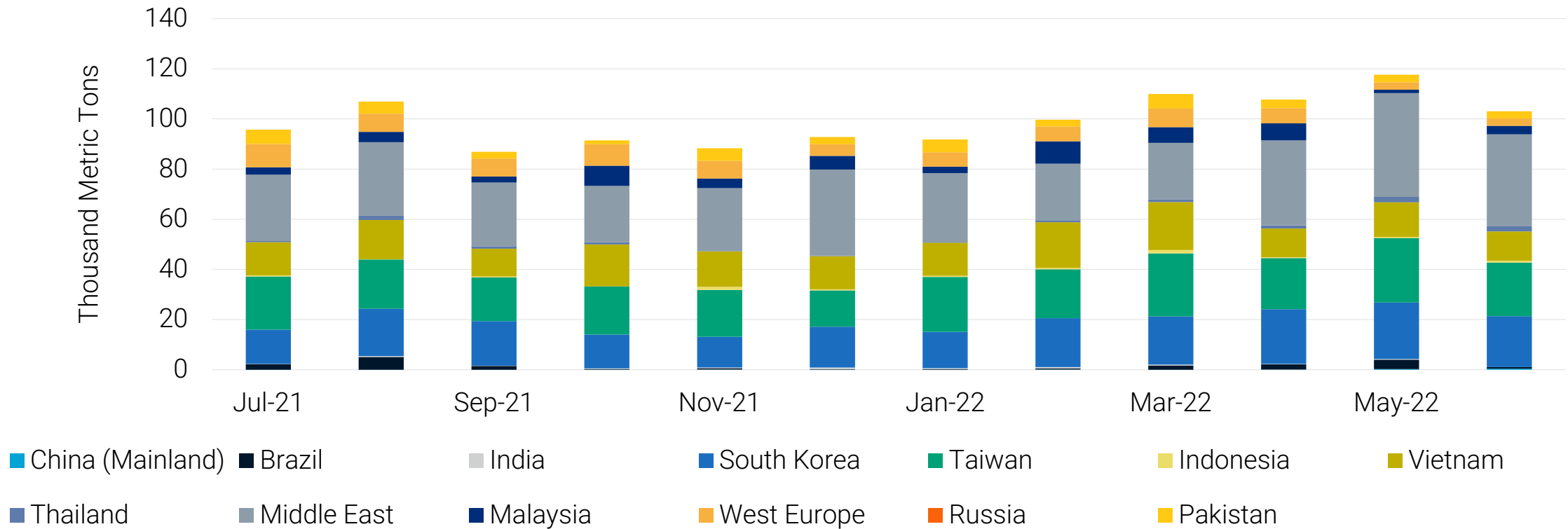
Source: Chemical Market Analytics by OPIS

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Non-USMCA PET imports in 2022

Middle East, Taiwan and South Korea remain the largest exports to US (ex-USMCA)

US Non-USMCA PET Imports

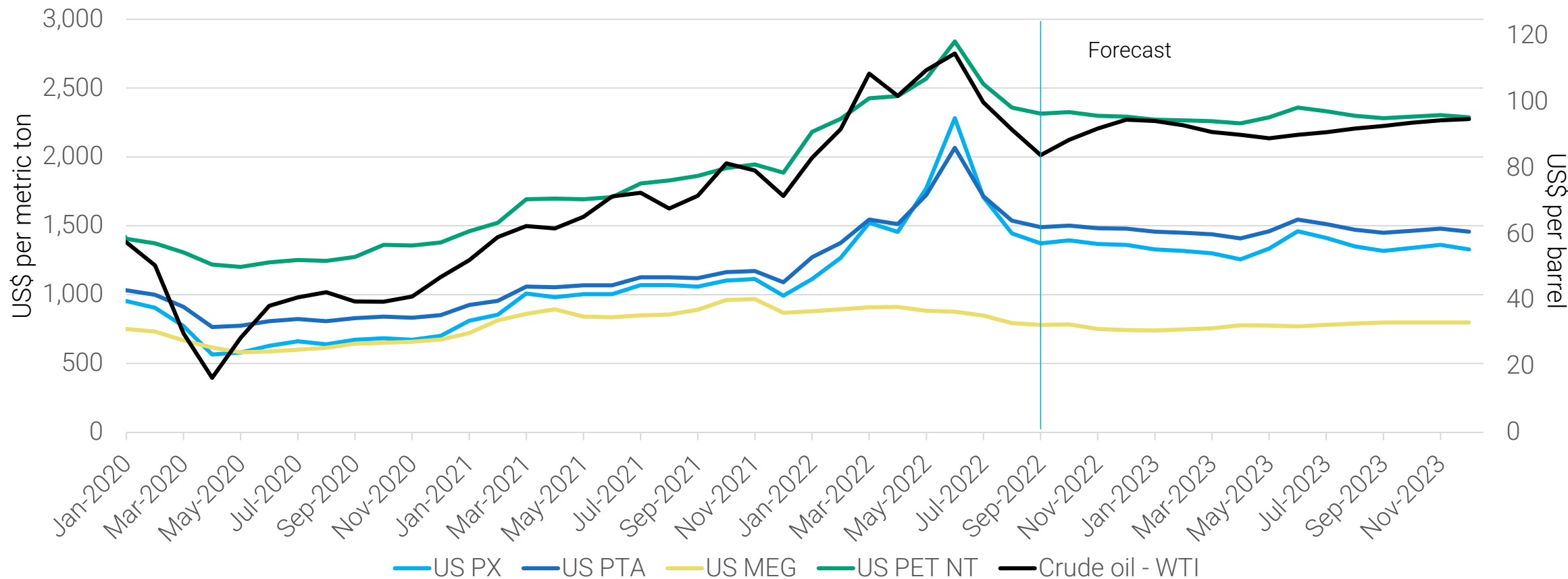


Notes: USMCA replaces NAFTA Trade Agreement

Source: Chemical Market Analytics by OPIS

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PET and raw material prices

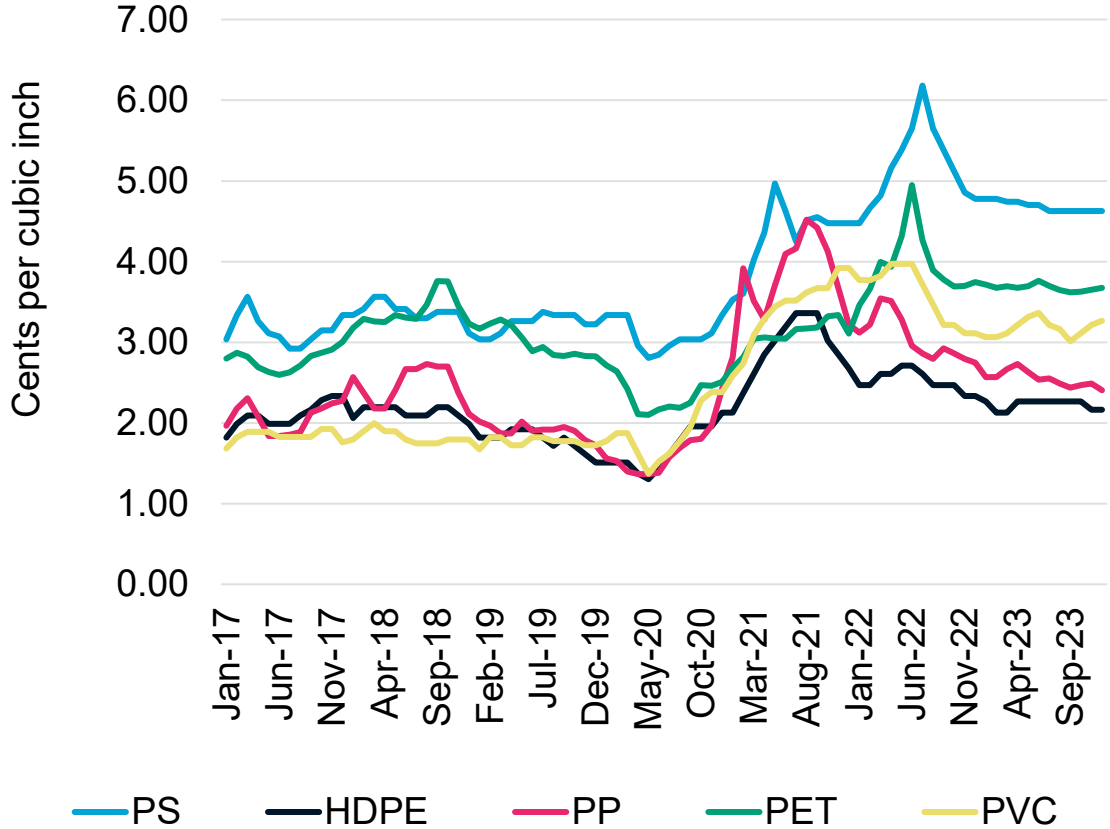


Source: Chemical Market Analytics

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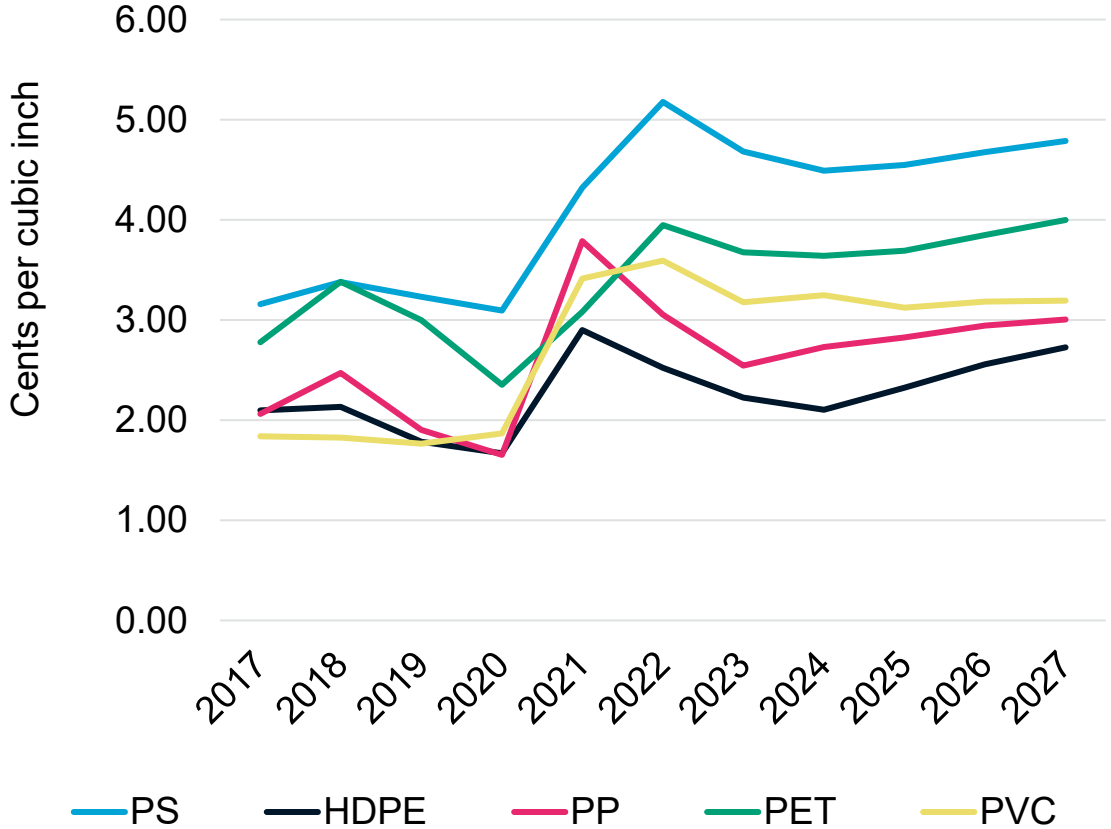
In summary – PS & PET remain relatively expensive

North America Density Adjusted Plastics



Source: Chemical Market Analytics by OPIS © 2022 Oil Price Information Service, LLC.


North America Density Adjusted Plastics



Source: Chemical Market Analytics by OPIS © 2022 Oil Price Information Service, LLC.

- Demand is slowing across multiple market segments. PS, PP and PET are all showing a decline in demand
- Benzene & RGP have bottomed in Oct. MX remains elevated due to strong gasoline/octane markets
- Polymer prices are forecast to bottom and then increase in the winter.
- Market Risks are high
 - Russia/Ukraine conflict
 - Federal reserve interest rate increases/economy
 - MS River water levels, Railroad strike, Ship rates
 - US hurricane season is over





Pandemic is ending, energy crisis coming

Logistical disruptions continuing, some improvement

China self sufficiency/decoupling

Sustainability pressures increasing, recycling growing

PS, PP & PET demand is softening. PP is leading the way.

PS prices have reached a short term bottom

PP capacity increasing

PET imports continuing, will CCP start up?

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