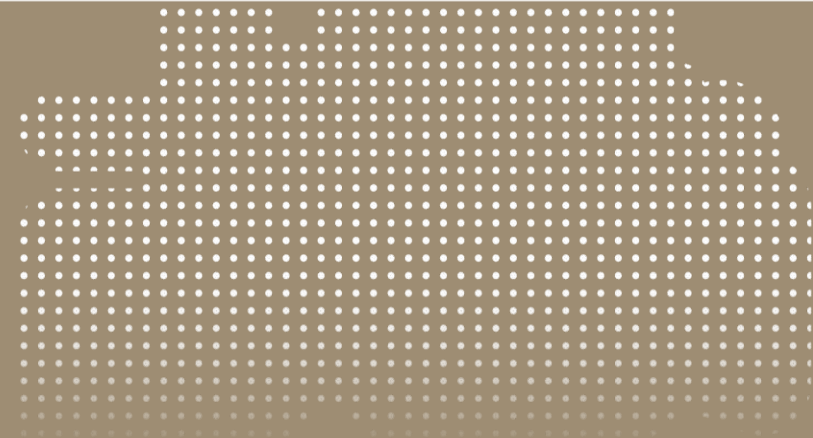


Navigating Asia's Petrochemical Future: Capacity, Cost & Competitiveness



Dr Richard Charlesworth

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Global Head, Industry Processes & Cost Analytics
S&P Global Energy
11th AMAI Alkali Industry Conference, Feb 2026, New Delhi



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A Glut of Capacity

High Cost, Low Competitiveness

The Elephant in the Room

The Second Elephant in the Room

Key Takeaways



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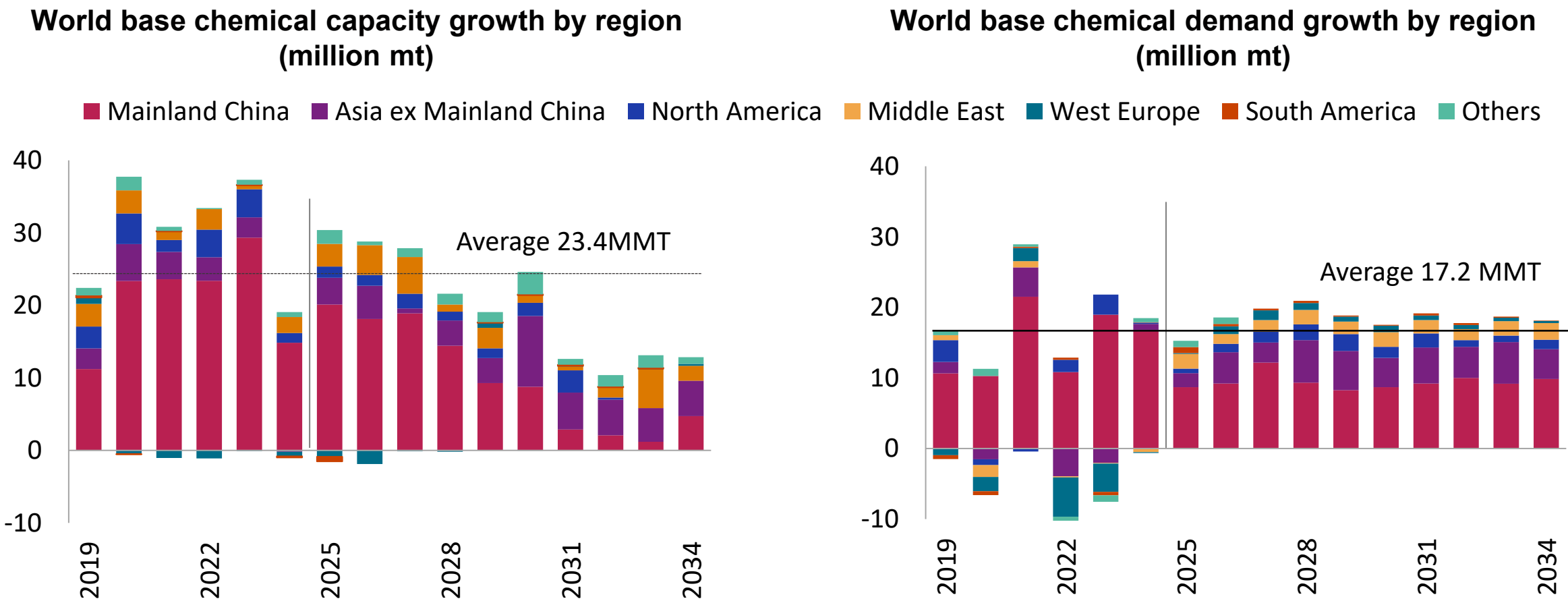
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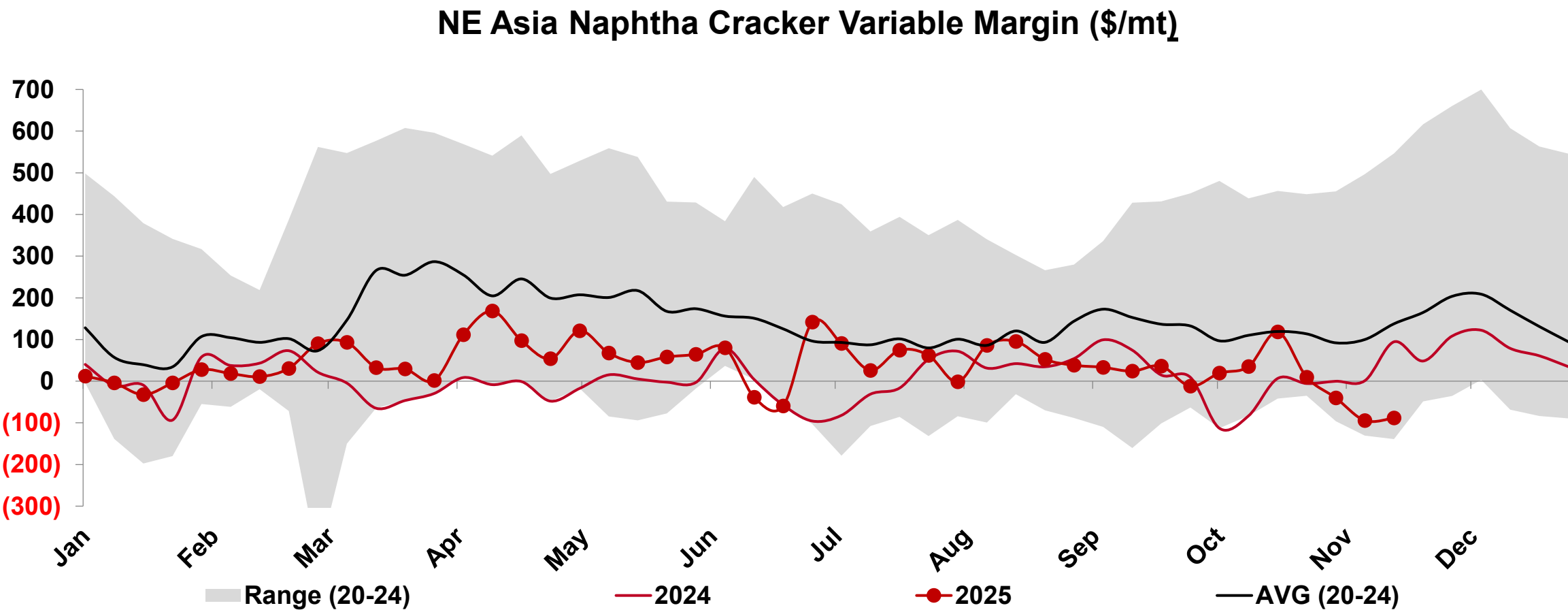
Tariffs uncertainties dampened demand growth in 2025 and 2026 just as most petrochemical value chains are oversupplied in the longest downturn for decades



Source: S&P Global Energy .

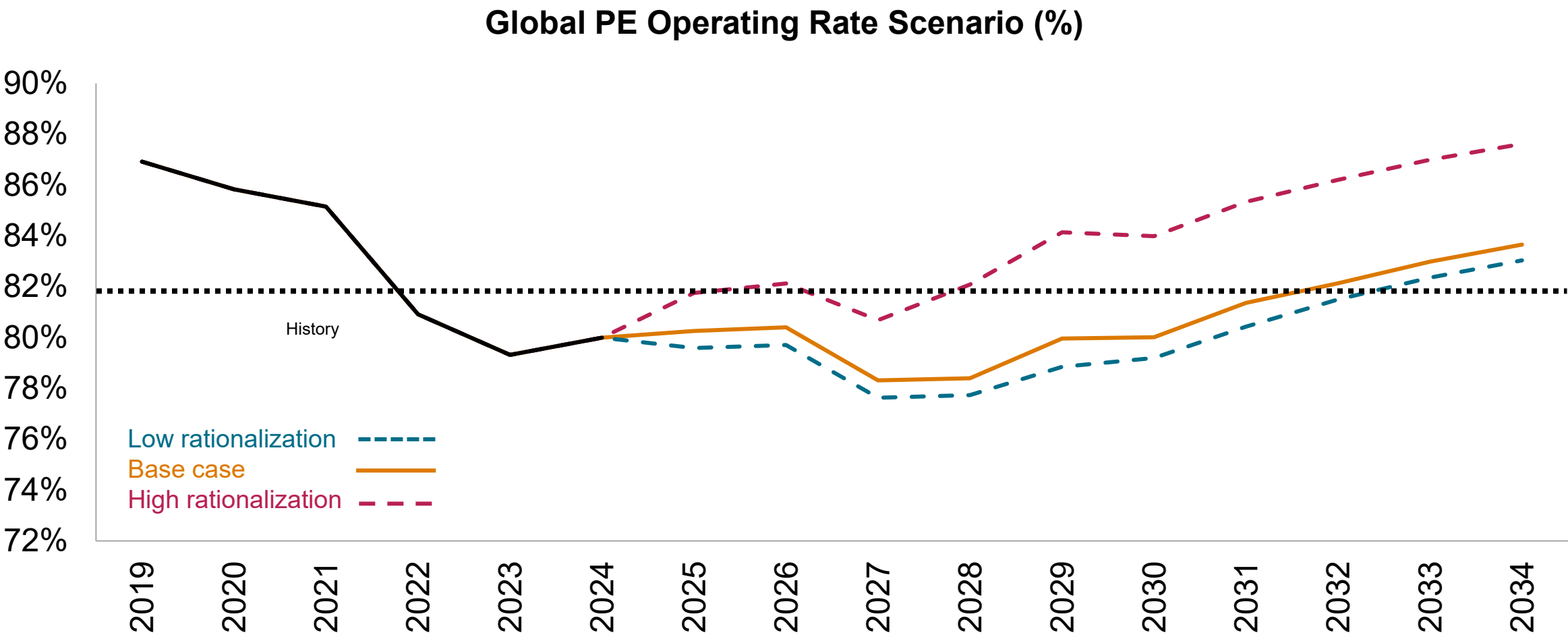
Base chemicals: ethylene, propylene, paraxylene, benzene, chlorine, methanol

Asian steam cracker variable margins continue to be just about positive – a bellwether for the industry in the region



Source: S&P Global Energy

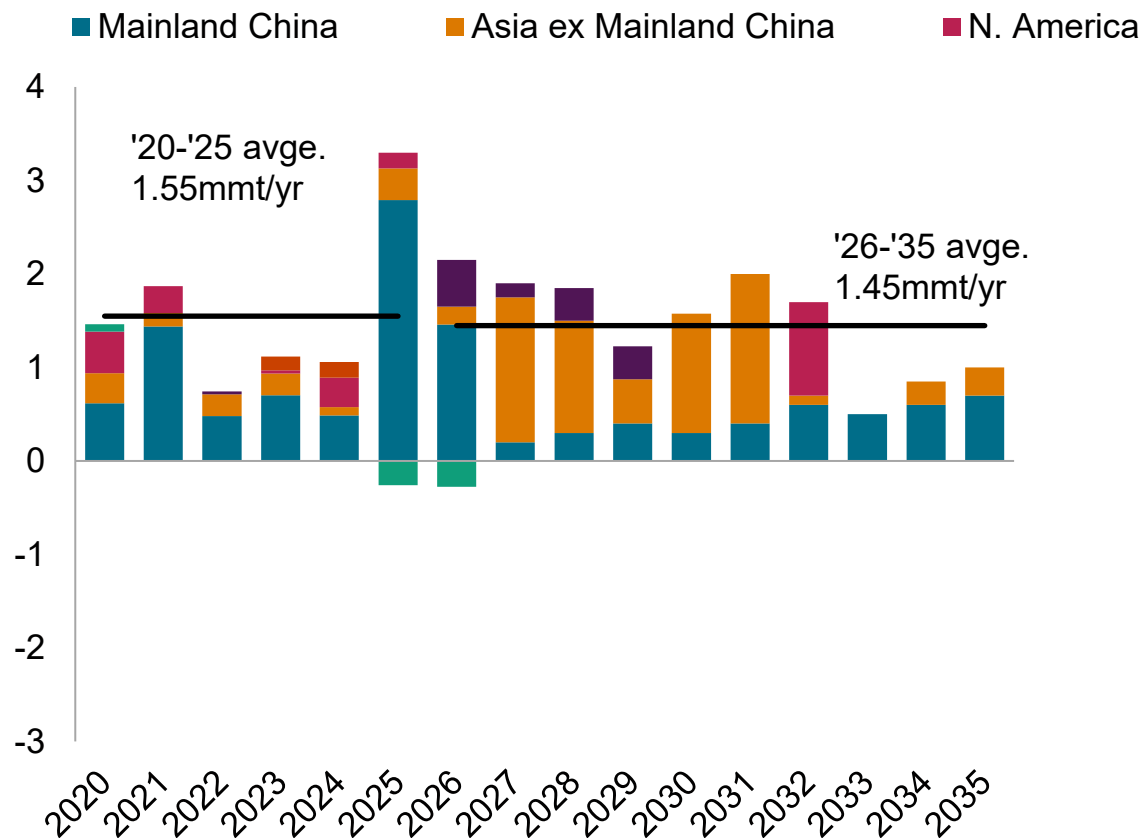
Even with announced cracker closures, operating rates will struggle to rebound without further rationalization



Source: S&P Global Energy

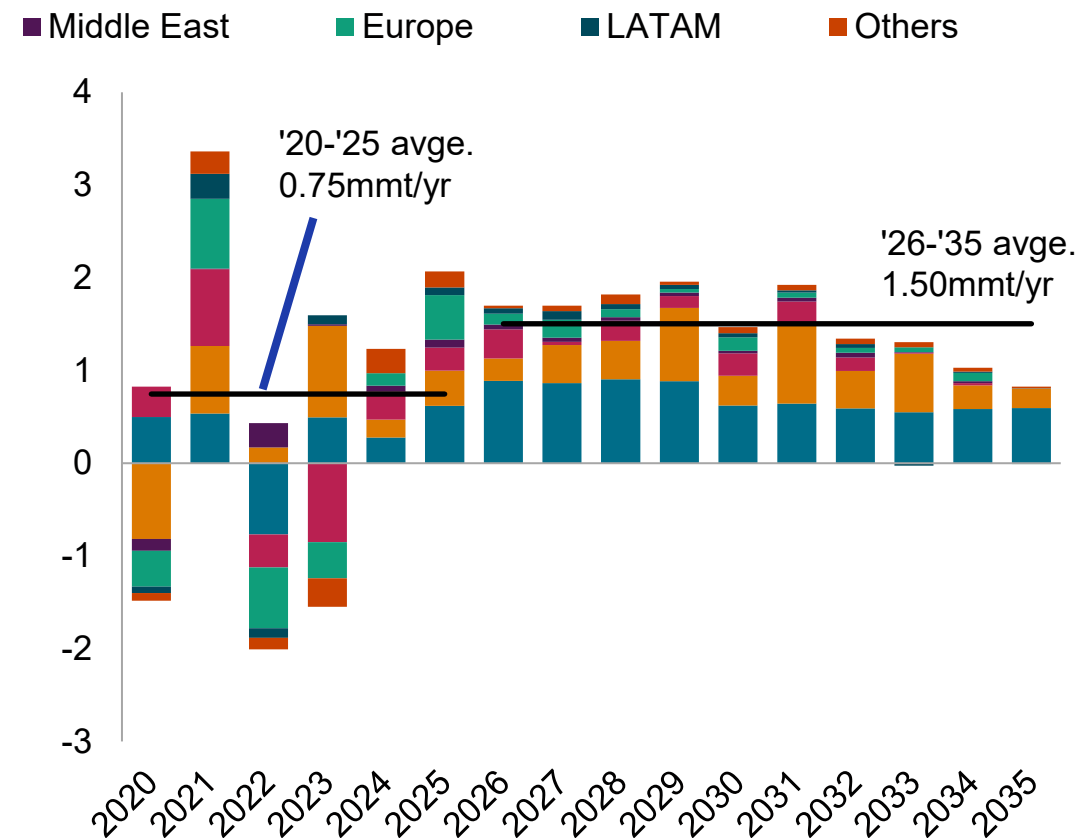
PVC market rebalancing: capacity-demand convergence signals recovery ahead

World PVC capacity growth by region (million mt)



Source: S&P Global Energy

World PVC demand growth by region (million mt)



Source: S&P Global Energy

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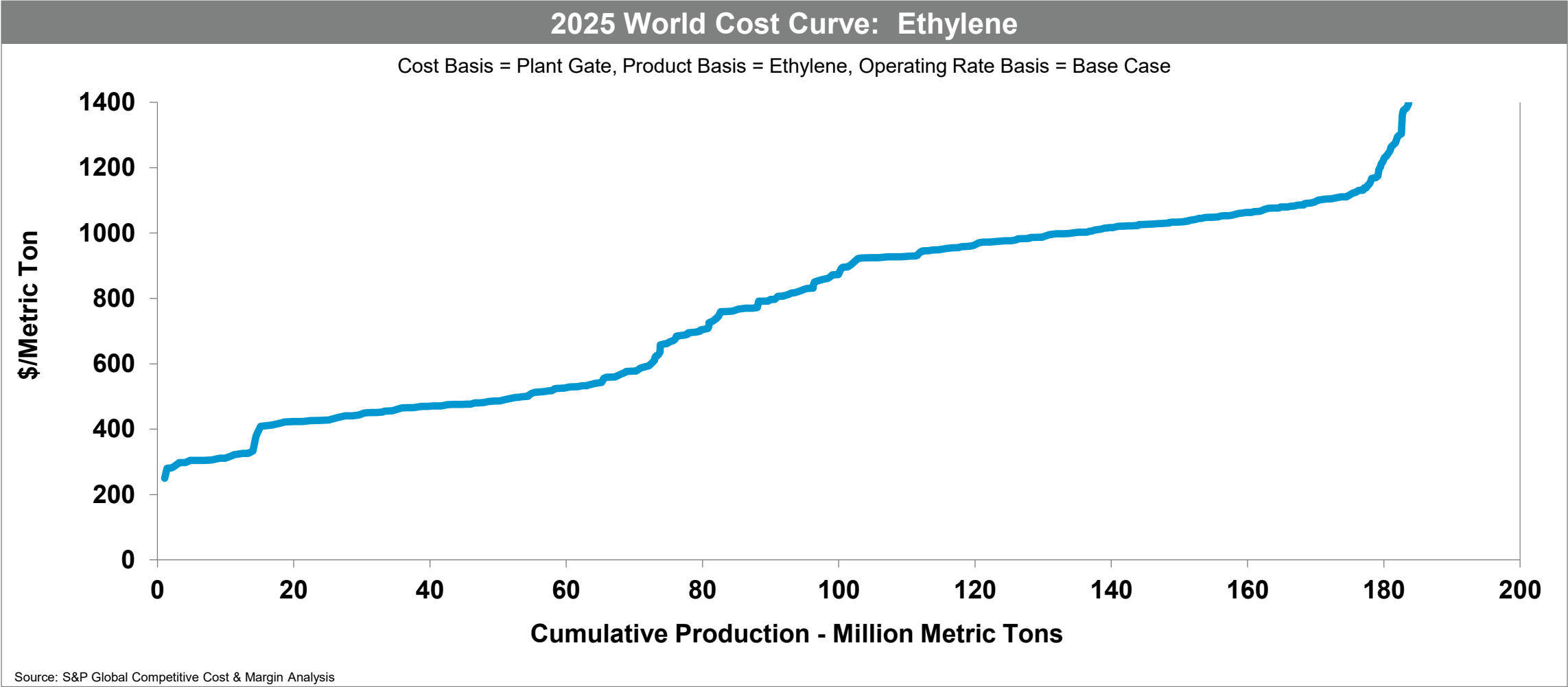
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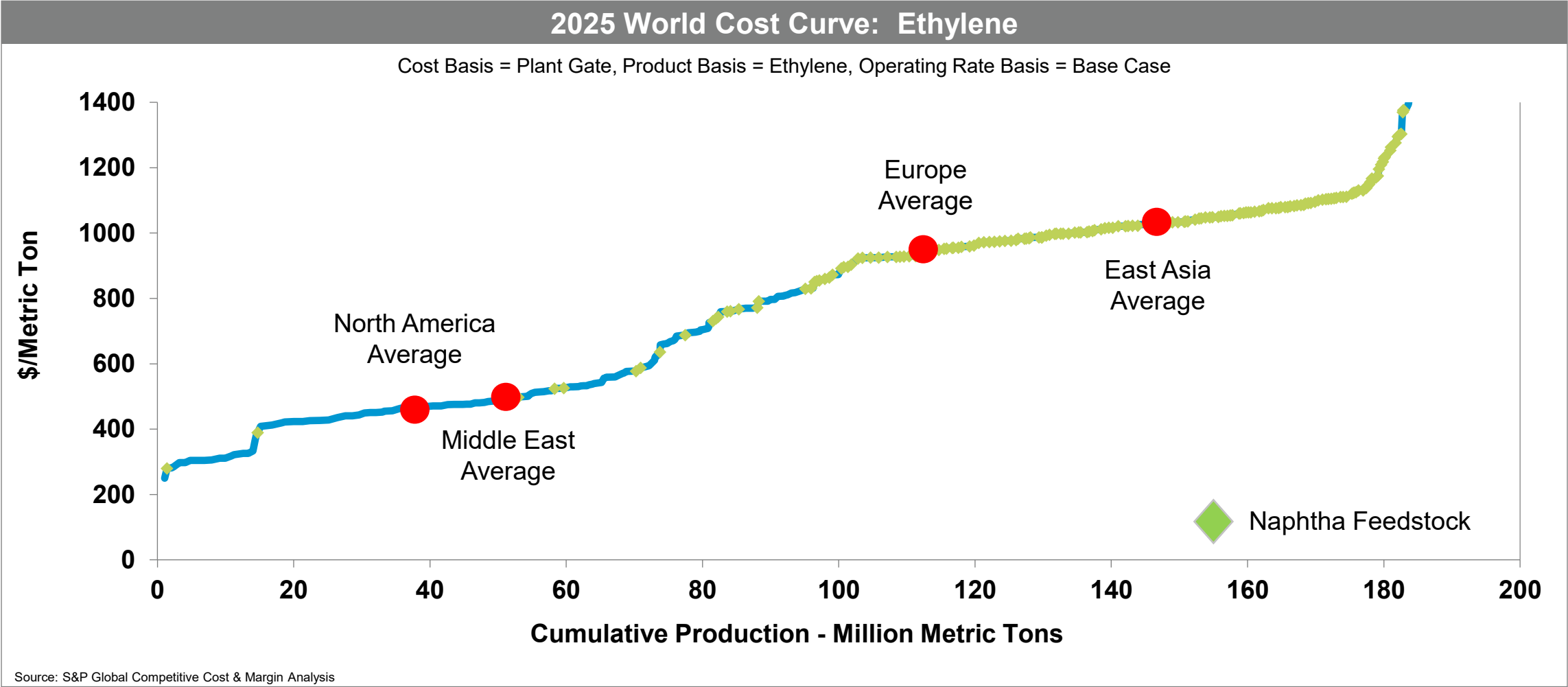
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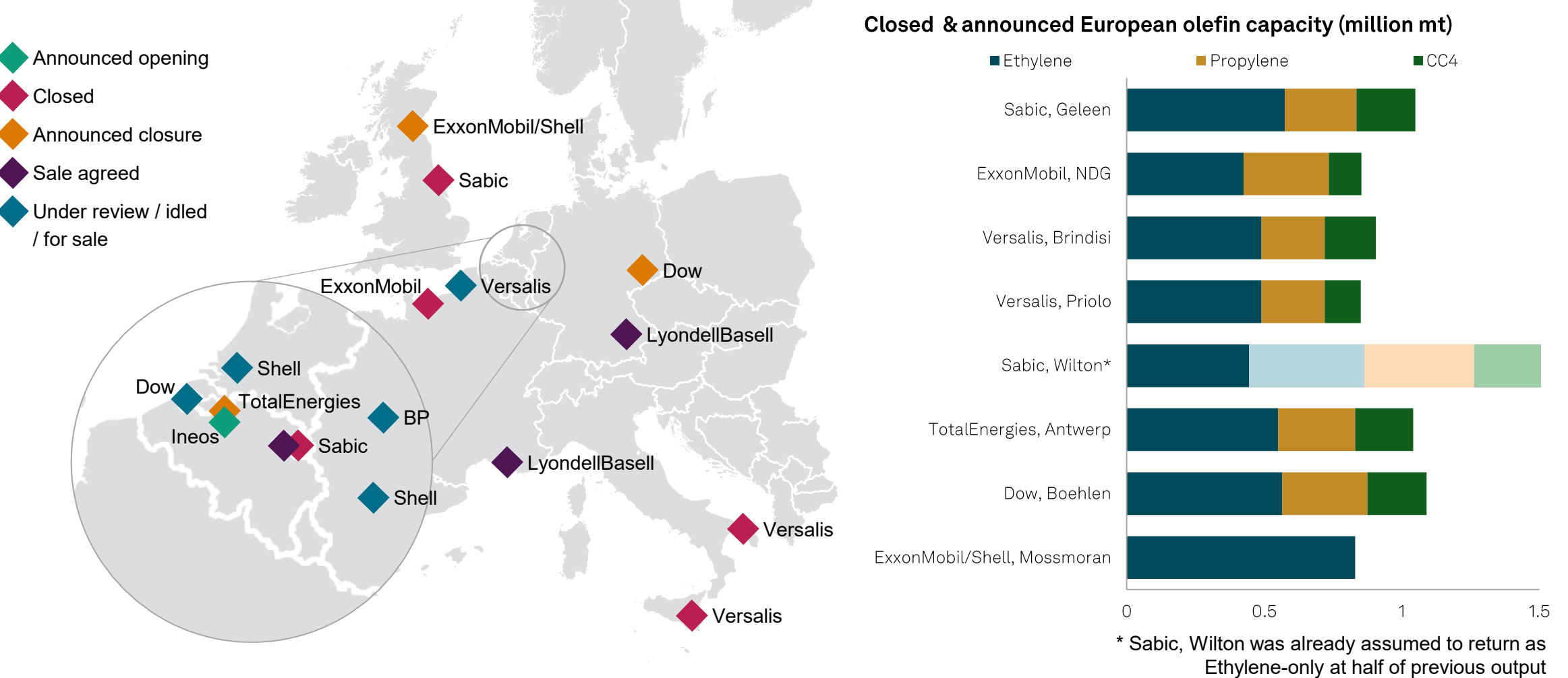
The cash cost curve for ethylene is steep due the different feedstocks, technologies, regional feed prices and other regional cost differences



US and Middle East NGLs continue to be advantaged versus expensive naphtha feedstock in Europe and East Asia

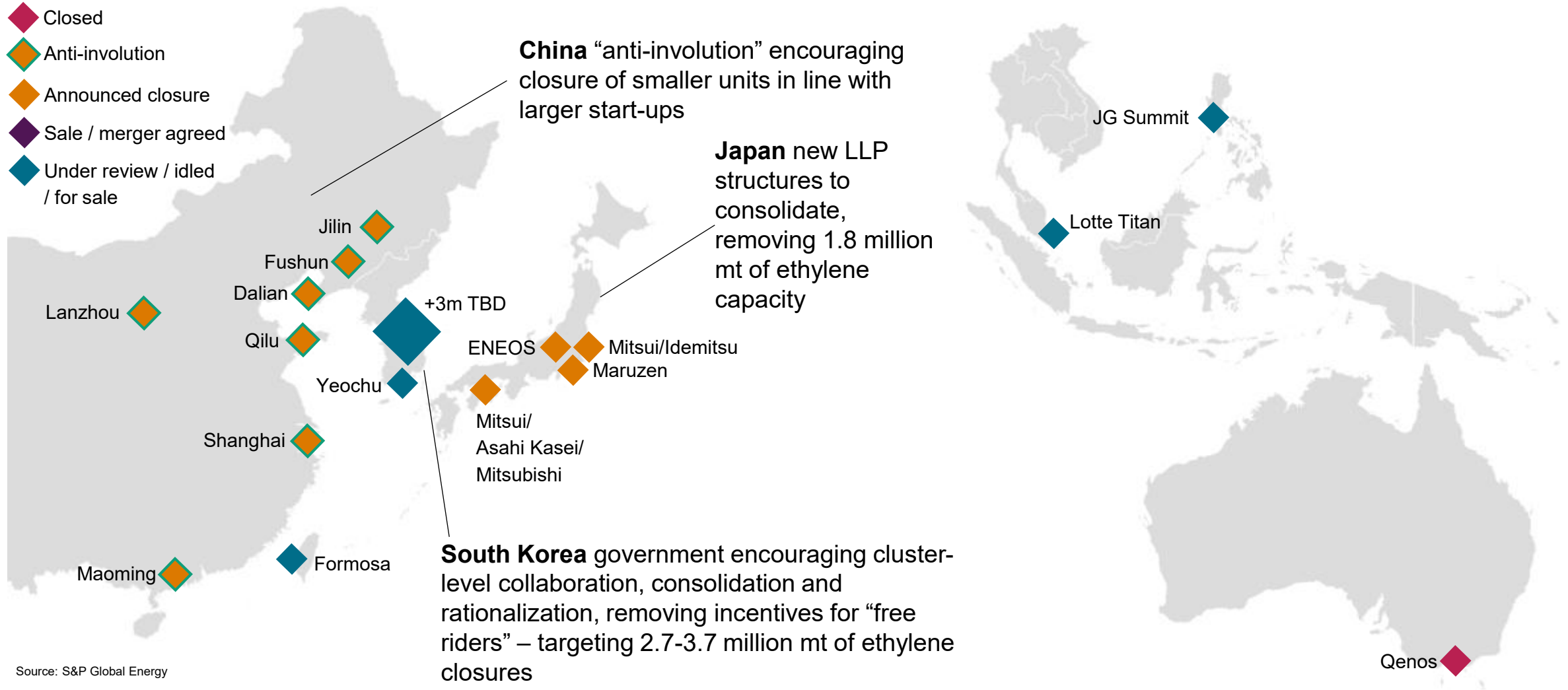


Hence eight European crackers have been closed or announced to close by 2027 and numerous others remain for sale, under offer, under strategic review or idling

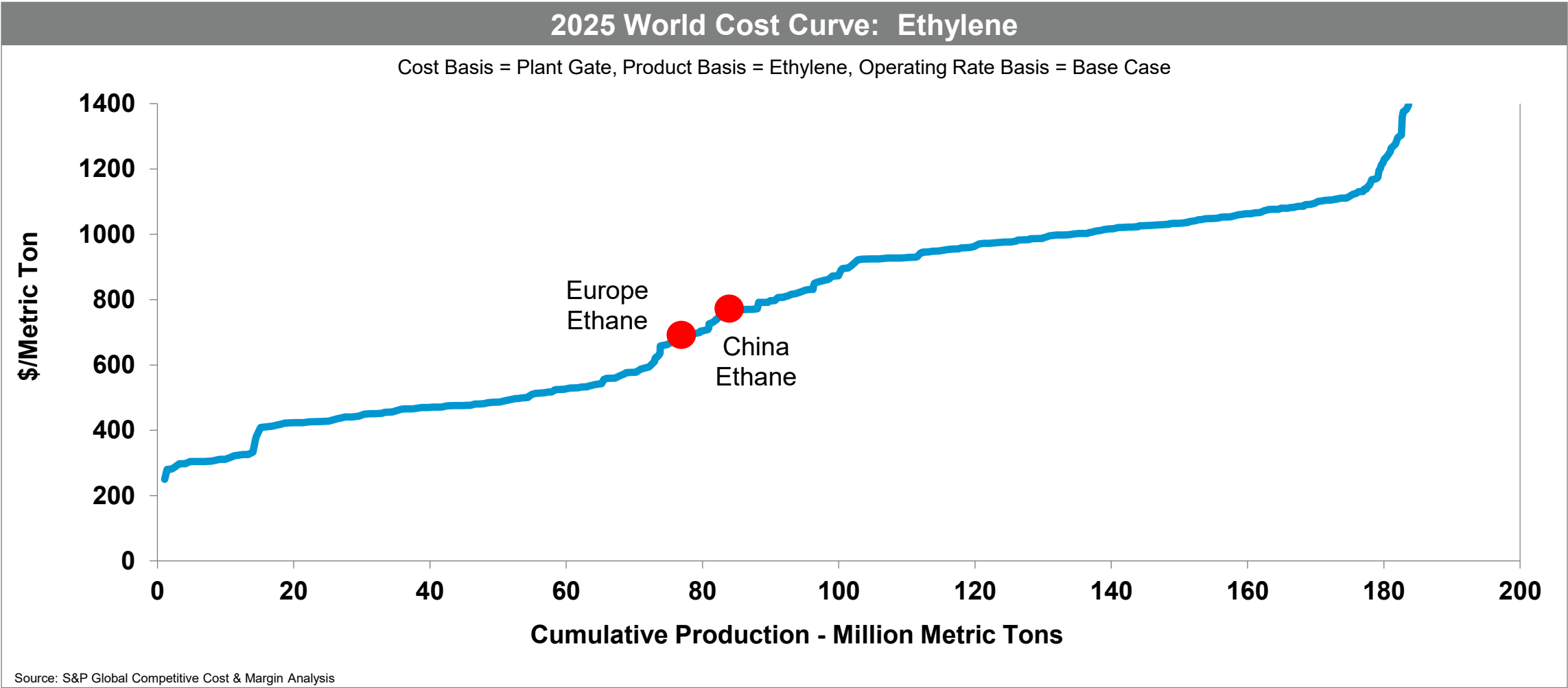


Source: S&P Global Energy

As the other high-cost region, Asia has also started a process of rationalization, though ownership structures offer different drivers and decision-making



The good news: Importing ethane into the high-cost regions is attractive



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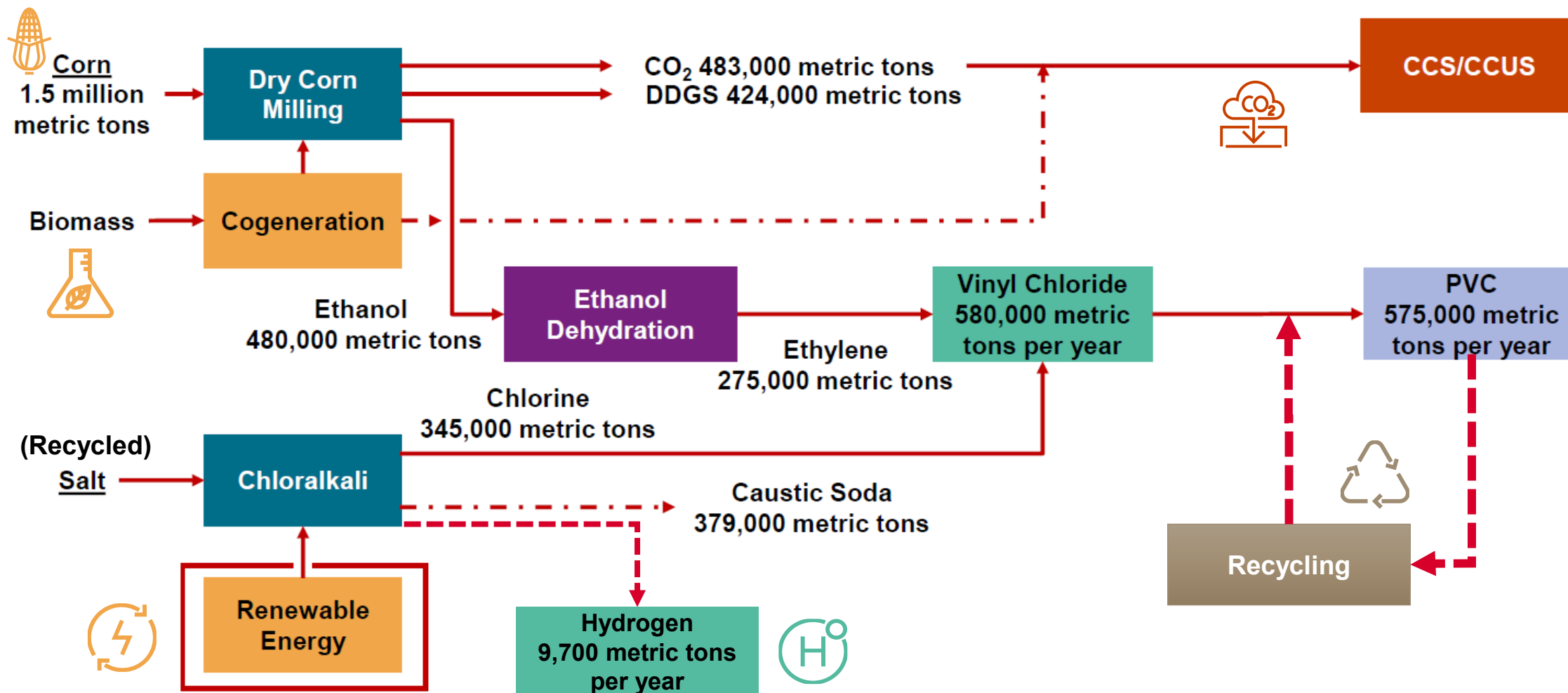
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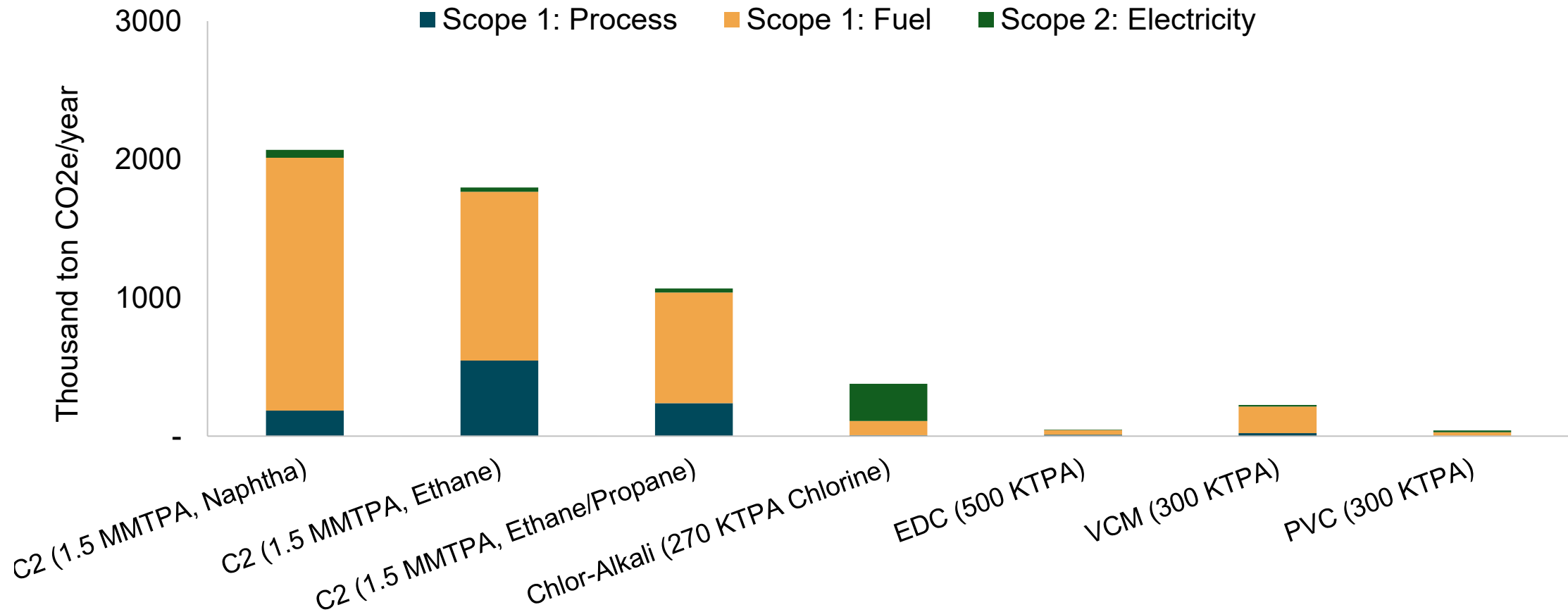
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The elephant in the room is top-down net-zero targets. What are the technology options for the chlor-alkali chain to meet the targets from the bottom up?

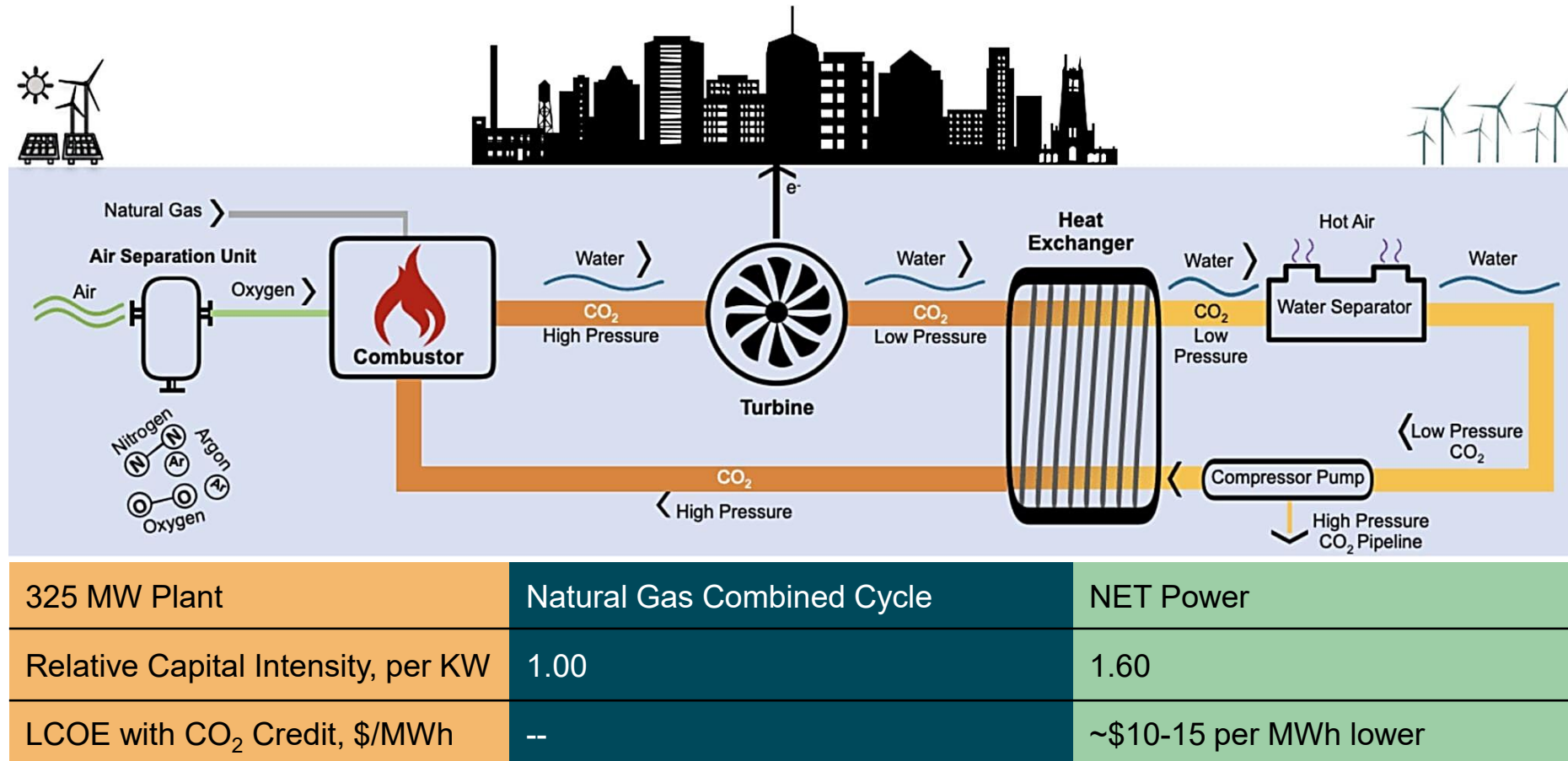


Good news for chlor-alkali chain: within any petrochemical complex, emissions are dwarfed by those from a cracker



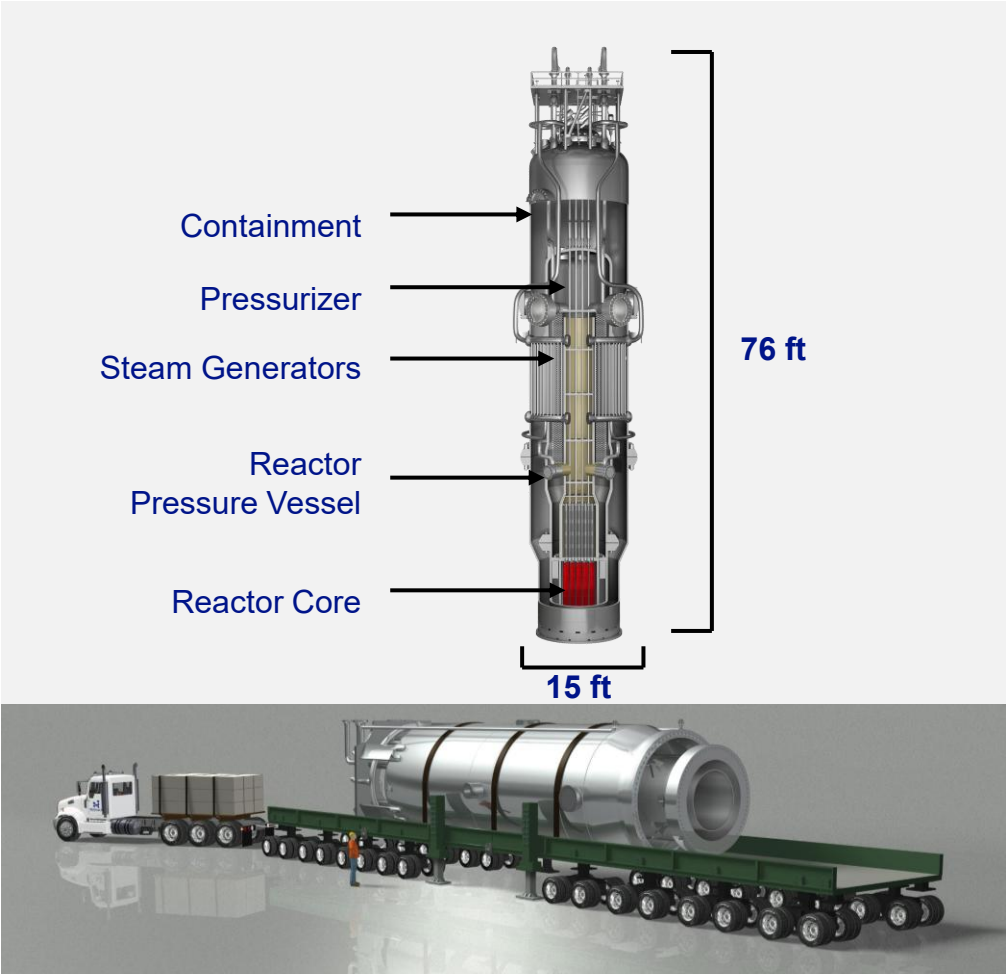
Source: S&P Global Refinery & Petrochemical Integrator & Decarbonizer (RAPID)

Low carbon power? Solar and Wind of course. However NET Power has developed a process using supercritical CO₂ as the turbine operating medium



Source: Powermag.com & : PEP Review 2021-02, Electric Power via the Allam Cycle

NuScale Power Module™ (NPM) is the first small modular reactor (SMR) to receive design approval from the U.S. Nuclear Regulatory Commission



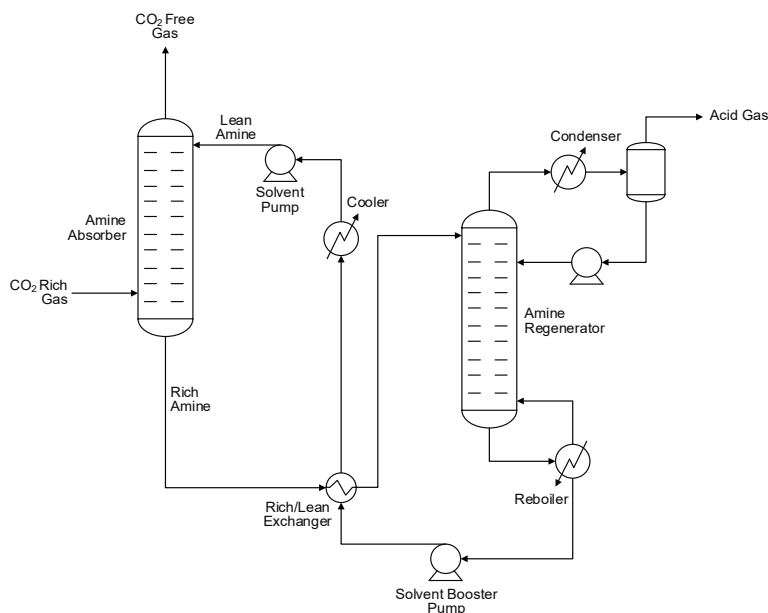
Source: NuScale WPC 2025 Presentation

- > Groundbreaking technology features a **fully factory fabricated** SMR referred to as a NuScale Power Module™ consisting of an **integral nuclear steam supply system** in which the reactor core, steam generators and pressurizer are all contained in a single vessel
- > **Simple design** eliminates reactor coolant pumps, large bore piping and other systems and components found in conventional reactors
- > Simplicity results in an extremely **strong safety case** and **reduced capital and operational costs**
- > Modules can be incrementally added to match load growth

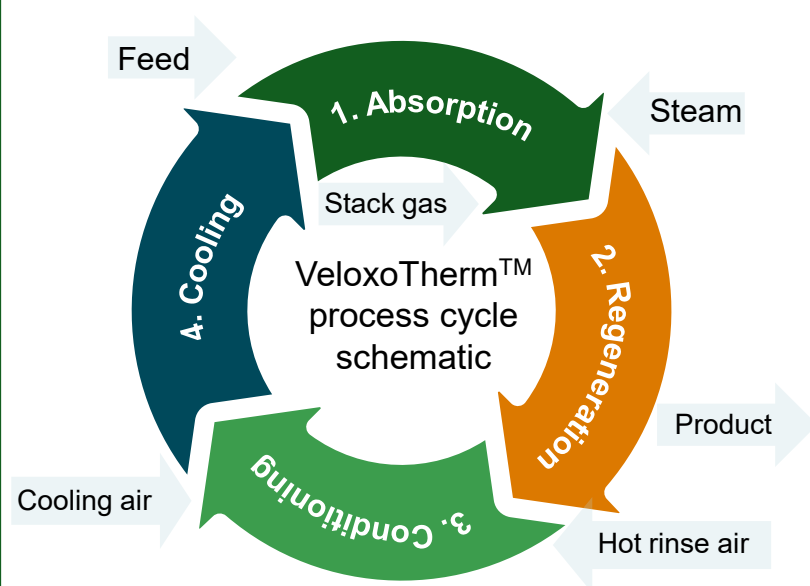
NuScale Power Module™ Specifications	
Electrical Capacity	77 MWe
Modules per Plant	Up to 12 (924 MWe)
Design Life	60 years
Fuel Supply	Existing light water reactor nuclear fuel
Safety	Walk-away safe
Emergency Planning Zone (EPZ)	Supports site boundary EPZ

Carbon capture solutions from big to small concentrations are available and in development

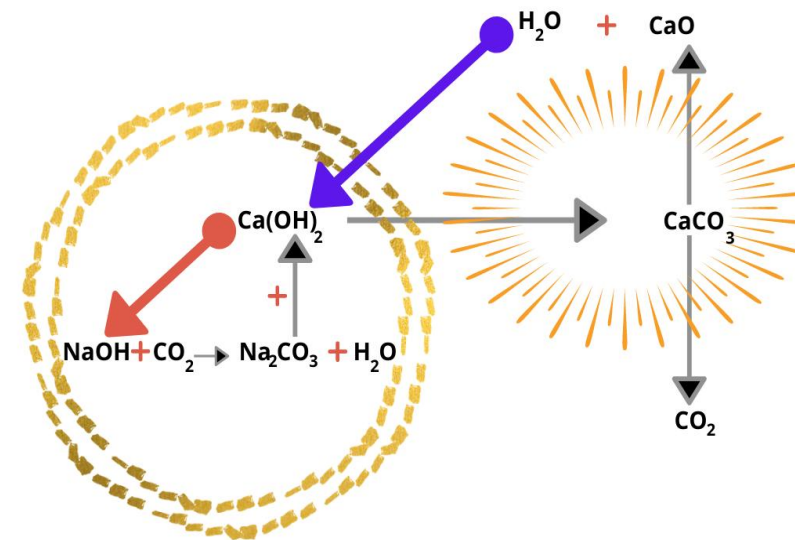
Solvent absorption



Rapid temperature swing absorption

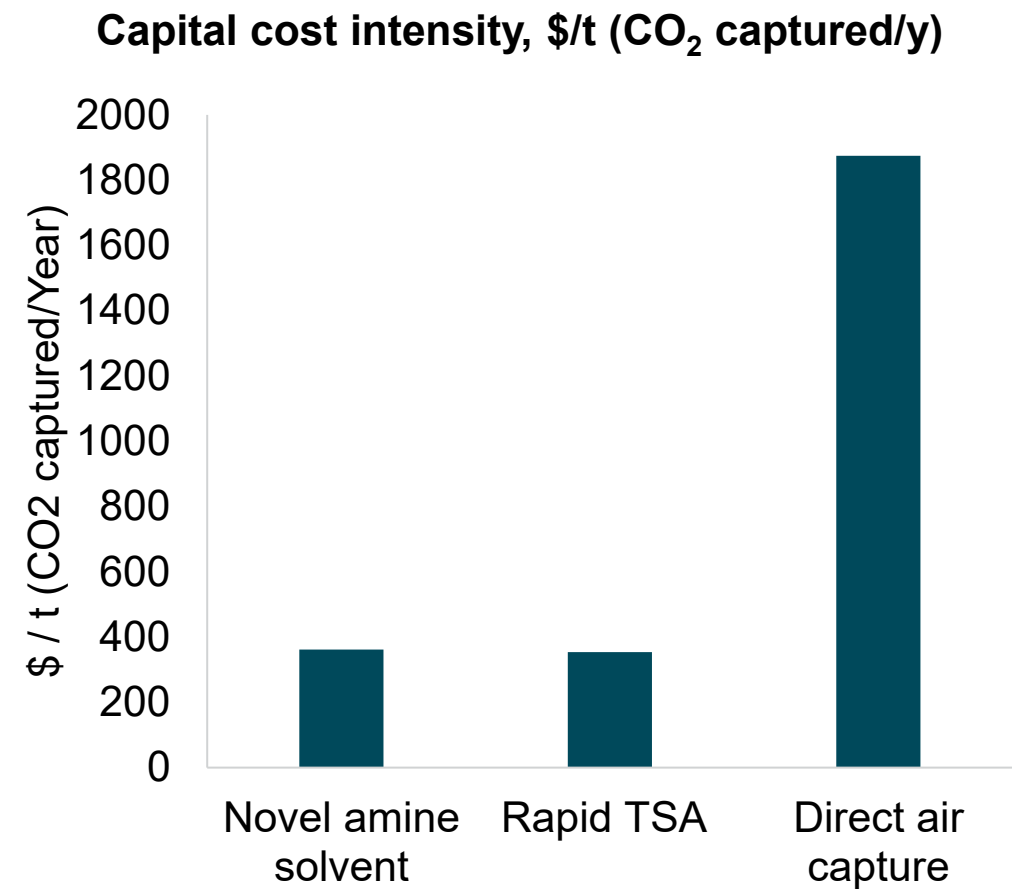
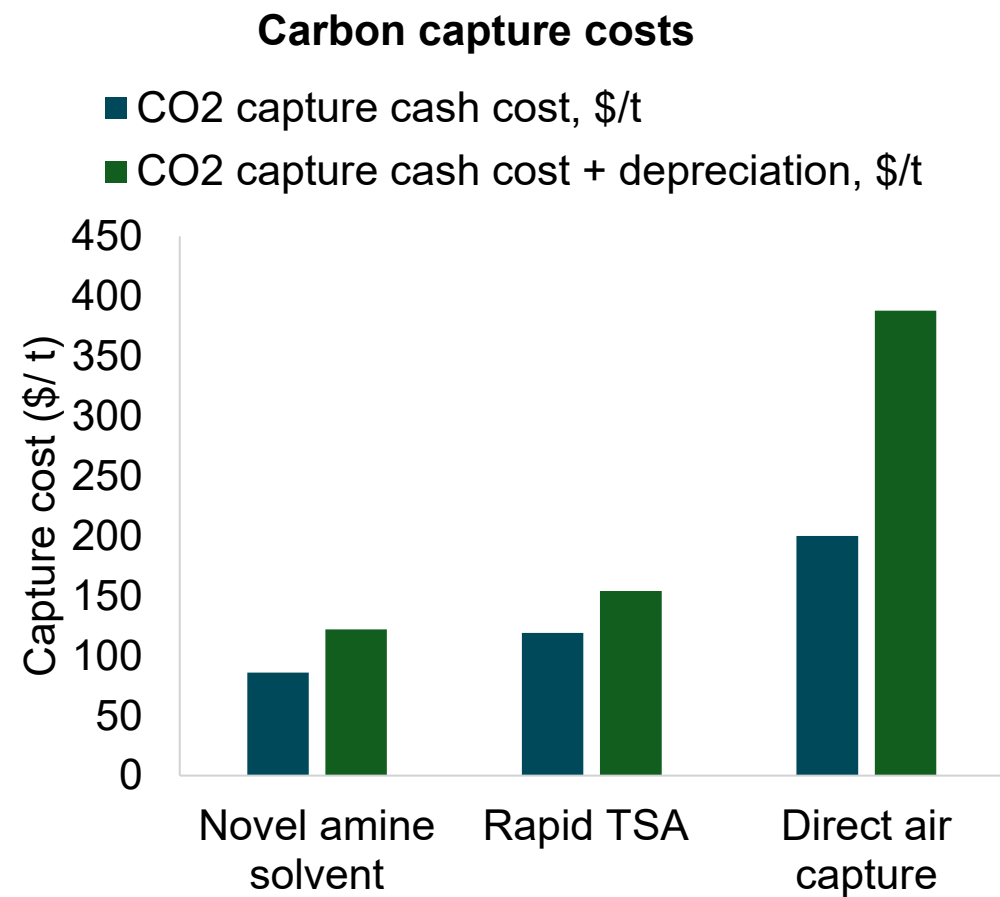


Direct CO₂ capture with caustic absorber



Source: S&P Global Markit Process Economics Program (PEP) Report 180F Next Generation Carbon Capture

Carbon capture economics (SE Asia, 2025) show decreasing CO₂ concentrations lead to increasing cost



TSA = Temperature Swing Absorption
Source: S&P Global Markit Process Economics Program (PEP) Report 180F Next Generation Carbon Capture

Decarbonizing the industry will cost a lot! But how much?

Case Study: Existing chlor-alkali/
EDC/VCM/PVC complex in S. Asia

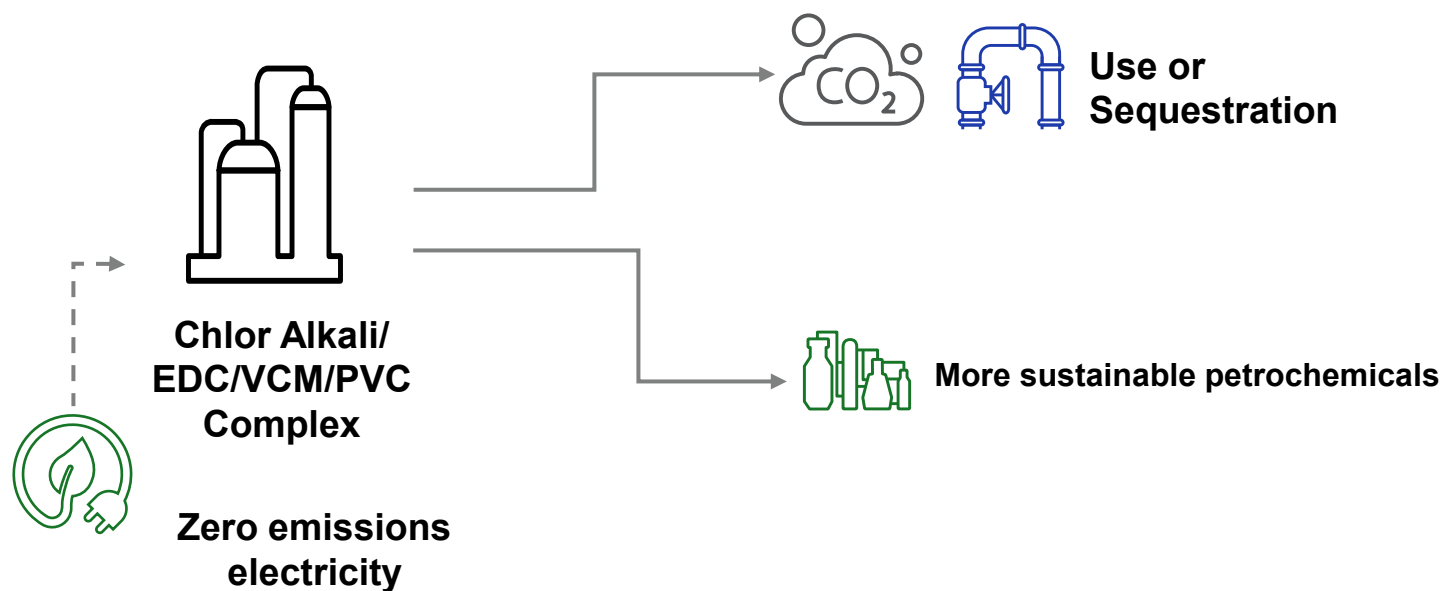
270 KTPA chlorine downstream to
300 KTPA PVC

Balanced EDC and VCM production
and caustic soda credits

Scope 1 and Scope 2 emissions
abatement from 2029

Carbon capture and sequestration

Zero-emissions Netpower electricity
production



Source: S&P Global Refinery & Petrochemical Integrator & Decarbonizer (RAPID)

Substantial product premiums and/or carbon credits will be needed to maintain future financial performance

Substantial CAPEX and increased OPEX



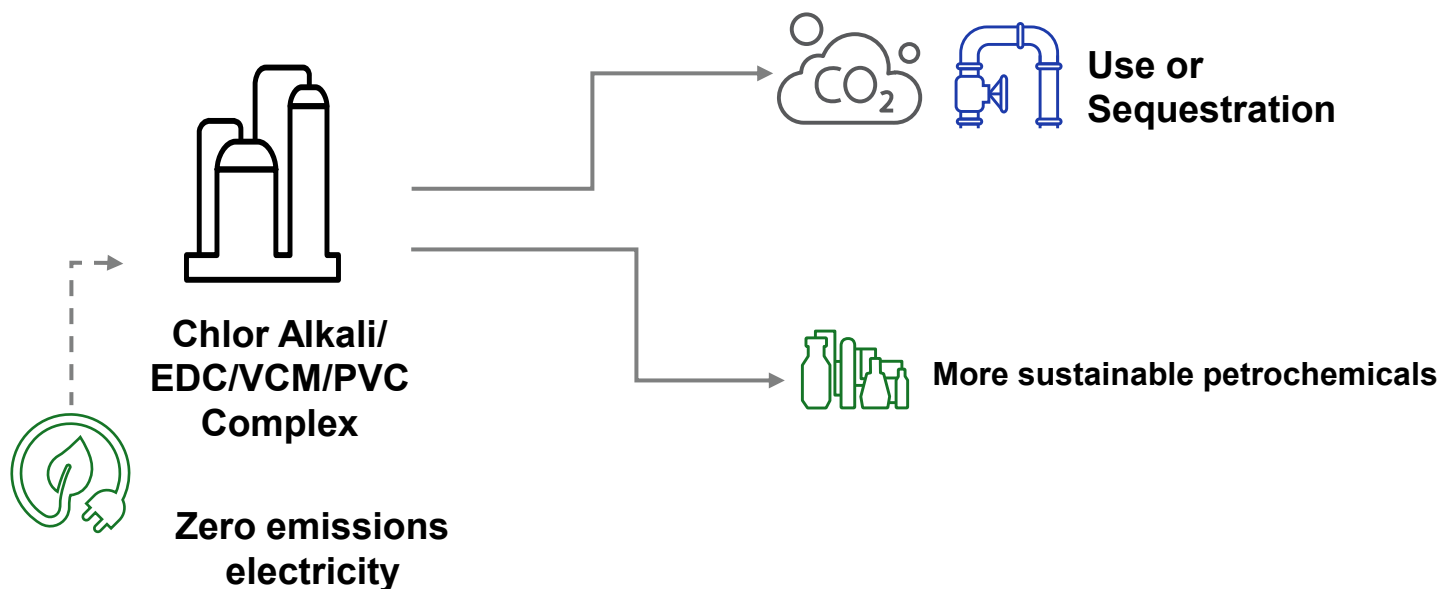
CAPEX of approx. \$850 million to achieve 80% carbon emissions reduction



25-year EBIT reduced by over \$3 billion



EBIT parity:
~400 \$/ton “low-carbon” polymer product premium or
~250 \$/ton of CO₂ credit for emissions avoided



Source: S&P Global Refinery & Petrochemical Integrator & Decarbonizer (RAPID)

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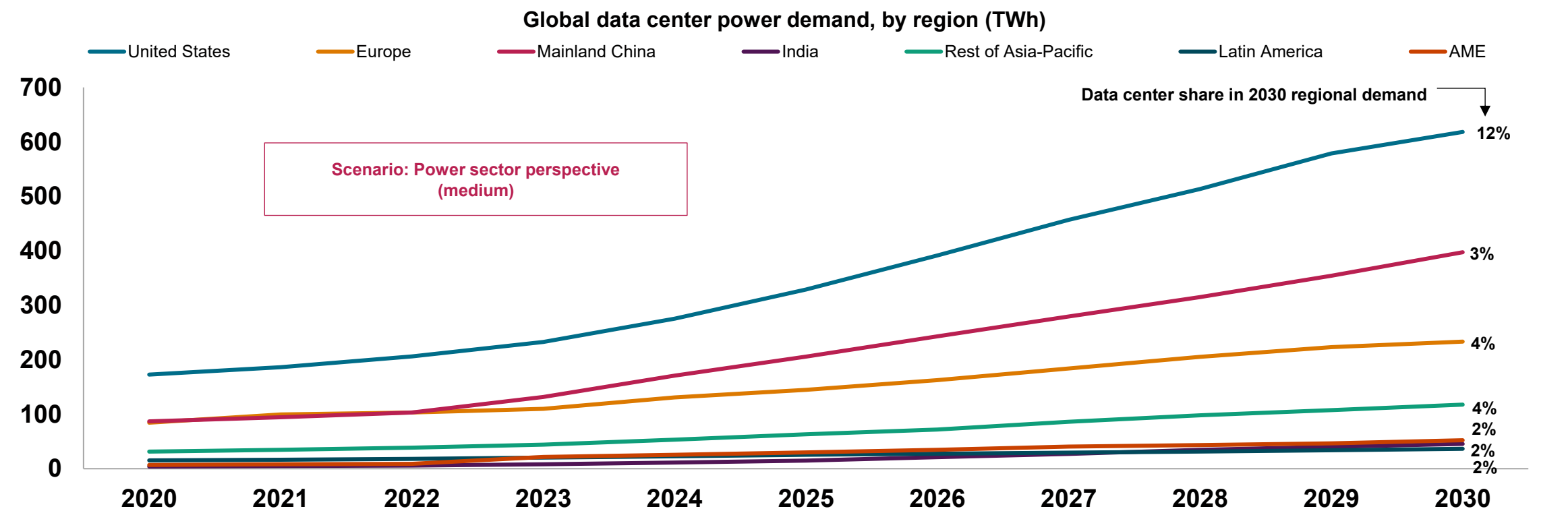
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The 2nd elephant is specific to chlor-alkali. Will power demand growth from commercial & industrial activity, cooling loads and data centres increase prices?



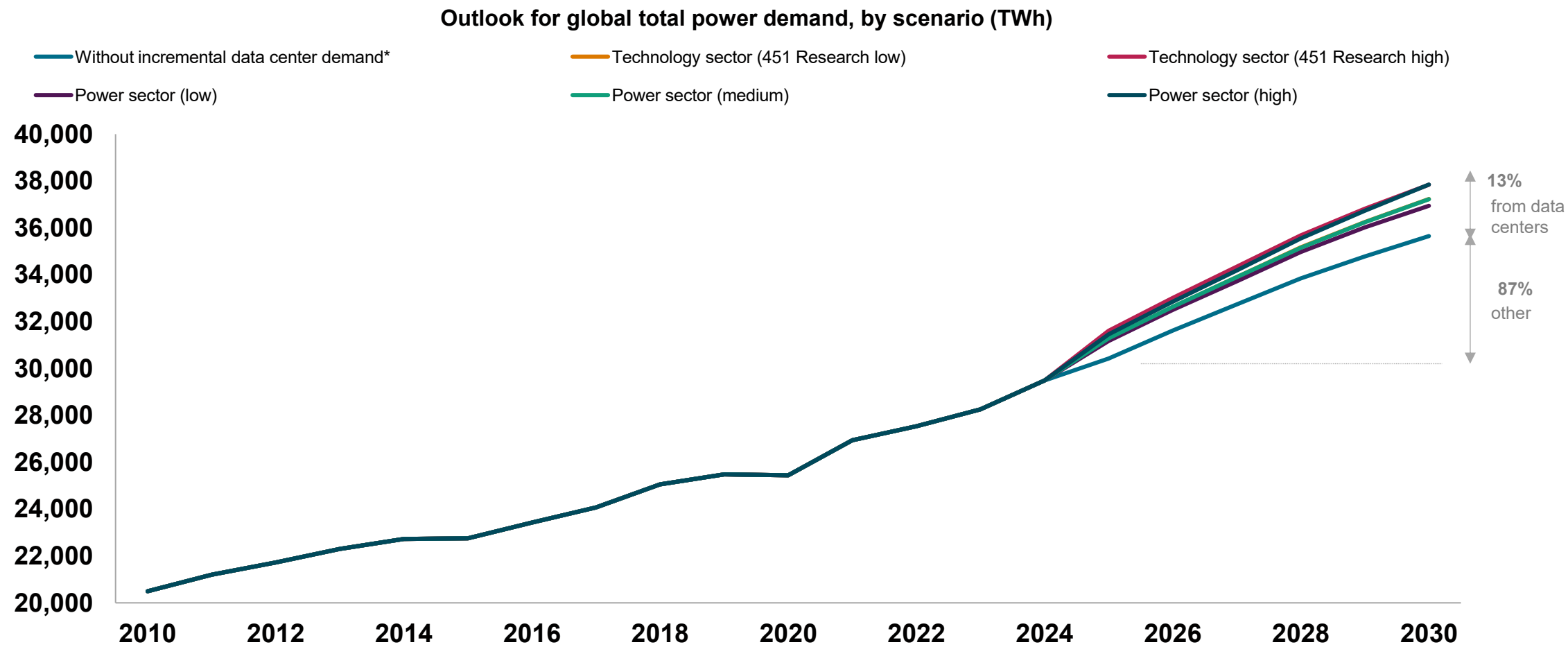
As of November 2025.

Note: CAGR = compound annual growth rate; APAC = Asia-Pacific.

* Variations in the historical levels of data center power demand stem from substantial variations in the data across the limited sources of information available. For example, the International Energy Agency says “studies for the European Union show that the share of data centers’ consumption in total electricity demand in 2022 could range between 1.8% to 3.5%. In the United States, estimates range between 1.3% to 4.5% in 2022, and in China, they can range from 1.9% to 2.9% [...] In some individual countries, the range of uncertainty is even greater.” (<https://www.iea.org/reports/electricity-mid-year-update-july-2024>) In our research, estimates of historical data center demand could vary by a third or more for North America, China, India, Latin America, and Africa and the Middle East. Differences are due to the inclusion versus exclusion of cryptocurrency mining and/or enterprise data centers (i.e., data centers owned by organizations whose primary business is not data center leasing services), differences in assumed data center utilization and efficiency rates, and a broader lack of reporting to official institutions.

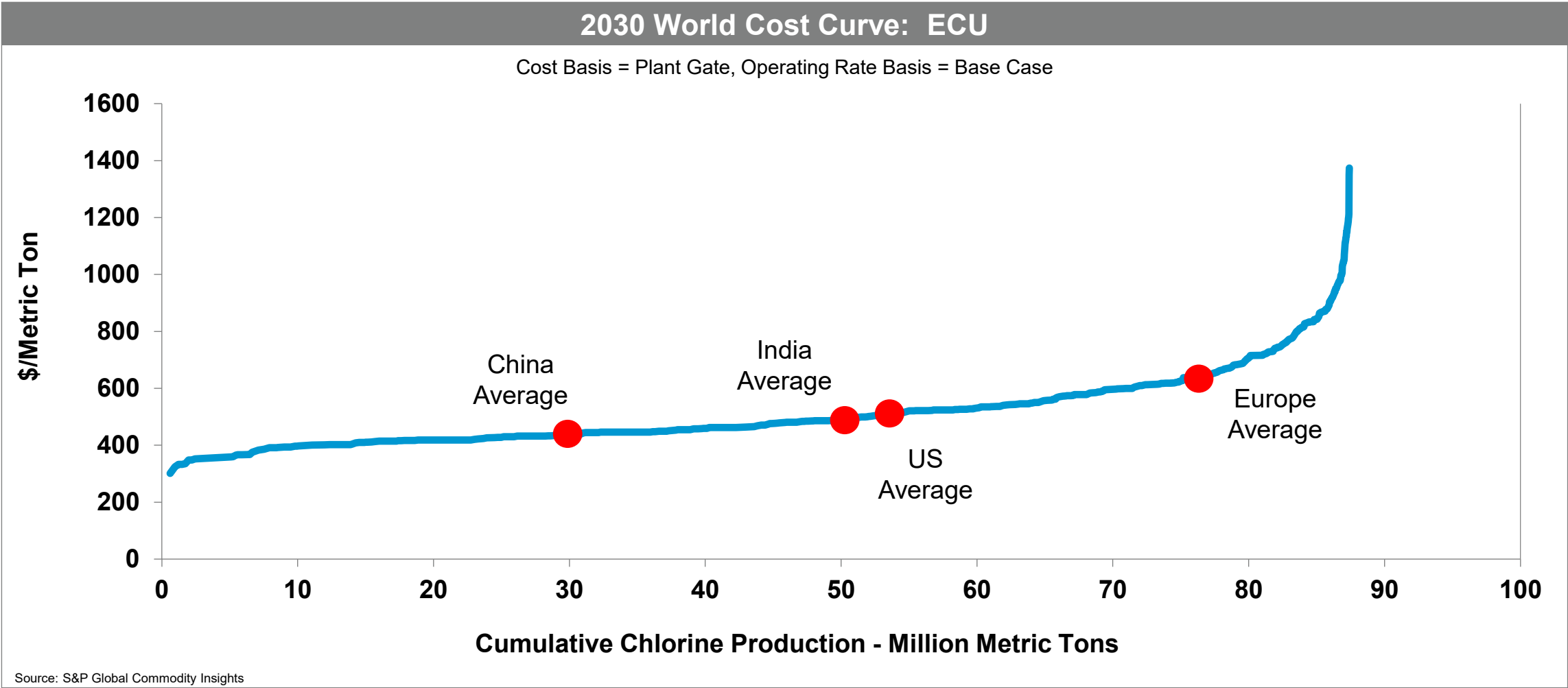
Source: S&P Global Energy, 451 Research Datacenter Market Monitor Sep. 2025.

Data centers are only expected to account for a small proportion of global power demand growth during 2025–30. Growth from existing sectors is much larger.

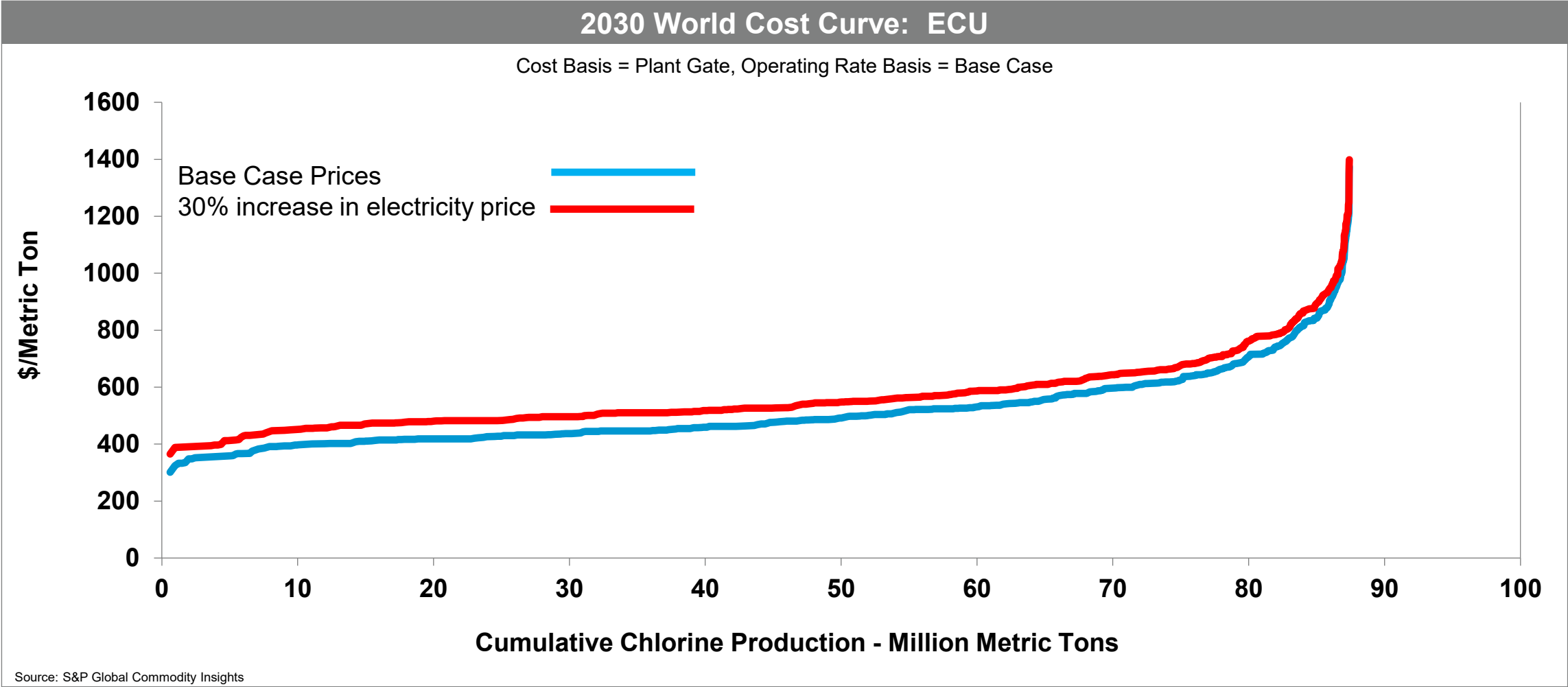


As of November 2025.
Note: Incremental = above 2024 levels.
Source: S&P Global Energy, 451 Research Datacenter Market Monitor September 2025
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ECU cash costs are driven by electricity and fixed costs – very different compared with other petrochemicals



A 30% increase in 2030 electricity forecasts would increase overall cash costs by around \$60/ton



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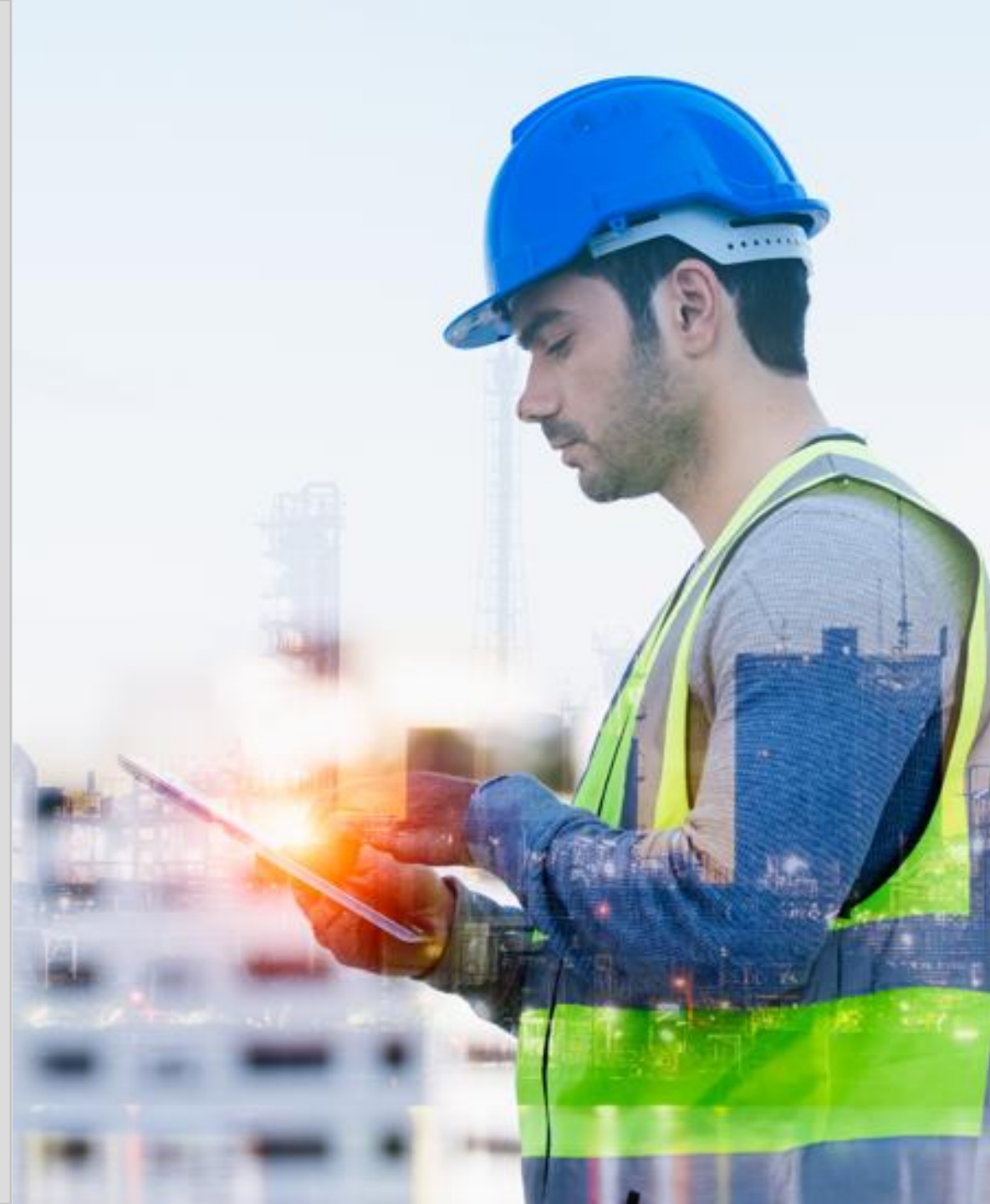
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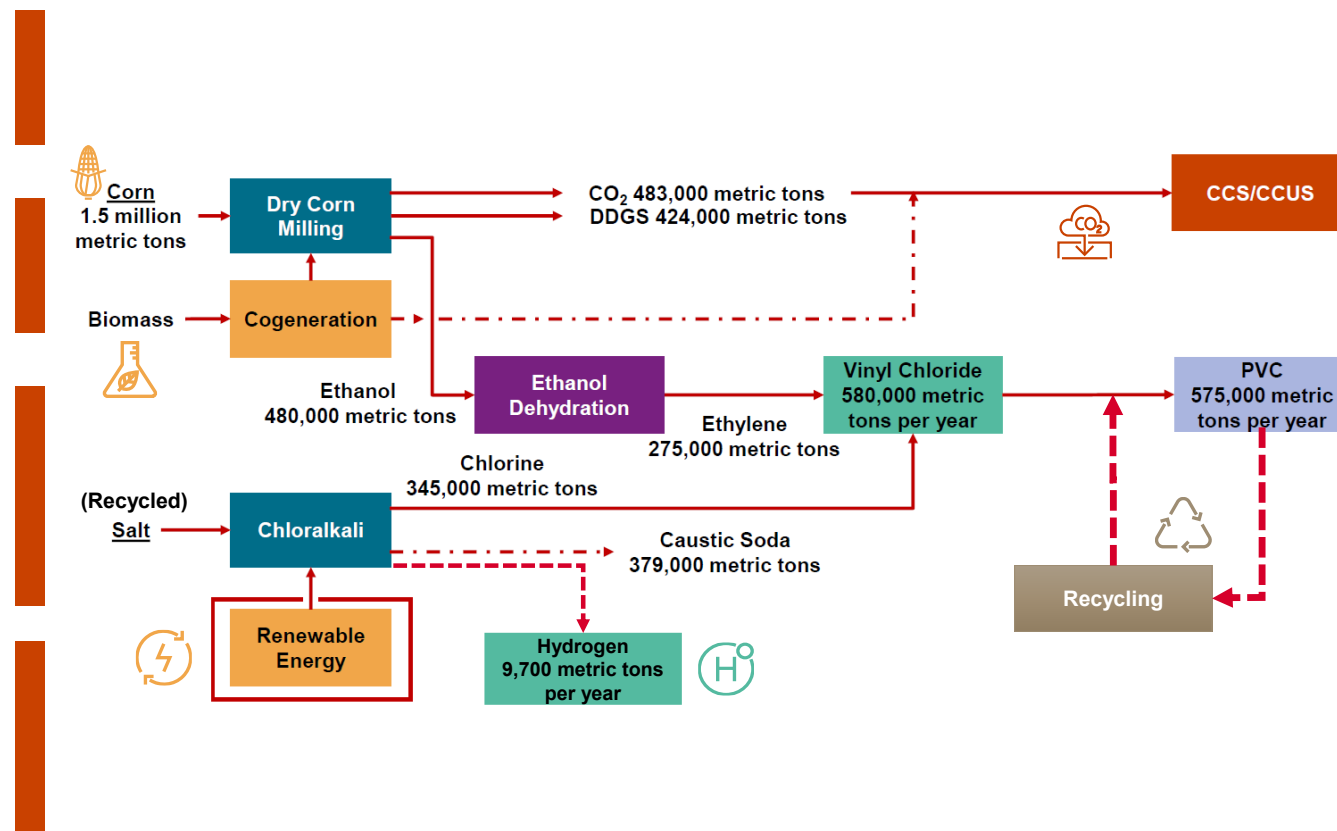
Key Takeaway: Asia's petrochemical future faces rationalization, huge investment for decarbonization and threat of increasing electricity costs to chlor-alkali

Asia's chemical industry is higher cost in the supply-driven extended downturn

Substantial CAPEX and OPEX is required to achieve decarbonization targets

Government policy-driven carbon credits and/or green-product premiums will be needed to offset the EBIT decline

The chlor-alkali industry may face additional threat from increasing power costs from rapid growth in many sectors



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