

S&P Global

Commodity Insights

APIC 2025: PVC Session

Evolving Chlor-alkali Demand Catalyzed by Energy Transition

Alvin Ang

Director, Inorganics

16th May 2025

S&P Global

Commodity Insights



Antitrust Notice to all Delegates

S&P Global Commodity Insights is committed to full compliance with all applicable antitrust laws. Accordingly, this event will be conducted in strict compliance with both the letter and the spirit of all applicable antitrust laws.

S&P Global Commodity Insights expects participants to comply with all antitrust laws and not to use this event to coordinate their commercial activities. Any activity that could create even the appearance of a restriction or distortion of competition must be avoided. To ensure compliance with antitrust laws, S&P Global Commodity Insights and all participants shall keep strictly within the Conference agenda, as circulated.

In particular, S&P Global Commodity Insights prohibits any discussions/exchanges of information about any participant's individual, current or future: (1) prices (including discounts, rebates and reductions); (2) costs; (3) profits and profit margins; (4) capacity, output and sales; (5) supply and demand forecasts; (6) market shares and sales territories; (7) investments and marketing plans; or (8) unannounced capital expansion/closure plans.

Agenda

1. Chlor-alkali market recovery on steady demand growth amid moderating supply expansion over the next decade

2. Chlor-alkali consumption basking in the (sun)light of energy transition trends

3. Turbocharging chlor-alkali and PVC through sustainable integrated production

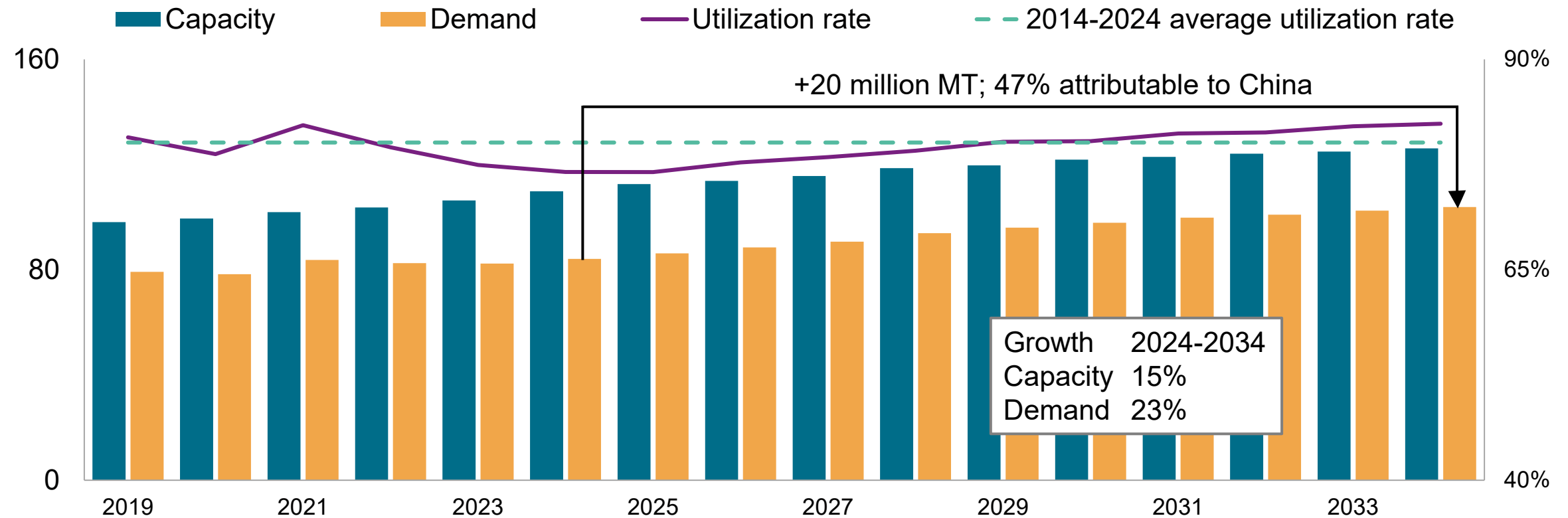
For discussion only - generated using Microsoft Copilot: soap bars as fruits, aluminum can and paper roll hanging, drain cleaner bottle as vines wrapped around branches, biodiesel shaped like a droplet, pills in a bird's nest, oil drums and pH scale as backdrop.



Caustic soda demand growth is projected to exceed capacity additions

Operating rate to recover above the historical average from 2030

Global caustic soda supply & demand, million MT

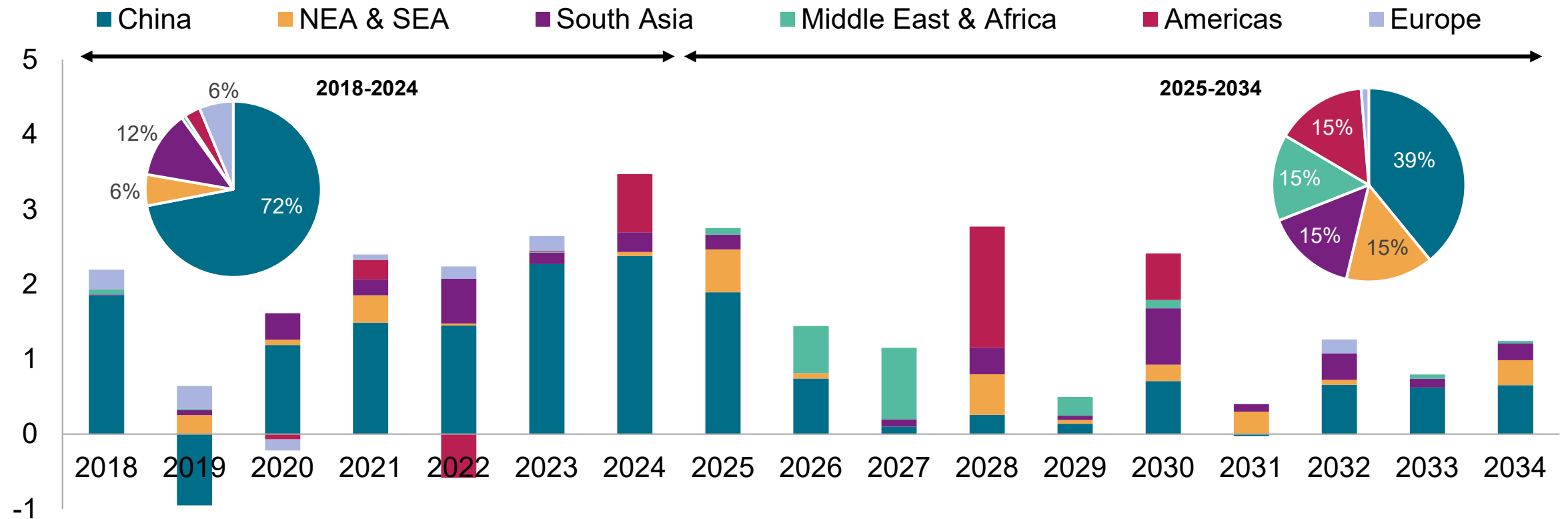


Source: S&P Global Commodity Insights.

Global caustic soda capacity growth to shift from China to other regions

Pace of capacity adds to slow down in China and the world as a whole

Caustic soda capacity growth by region, million metric tons

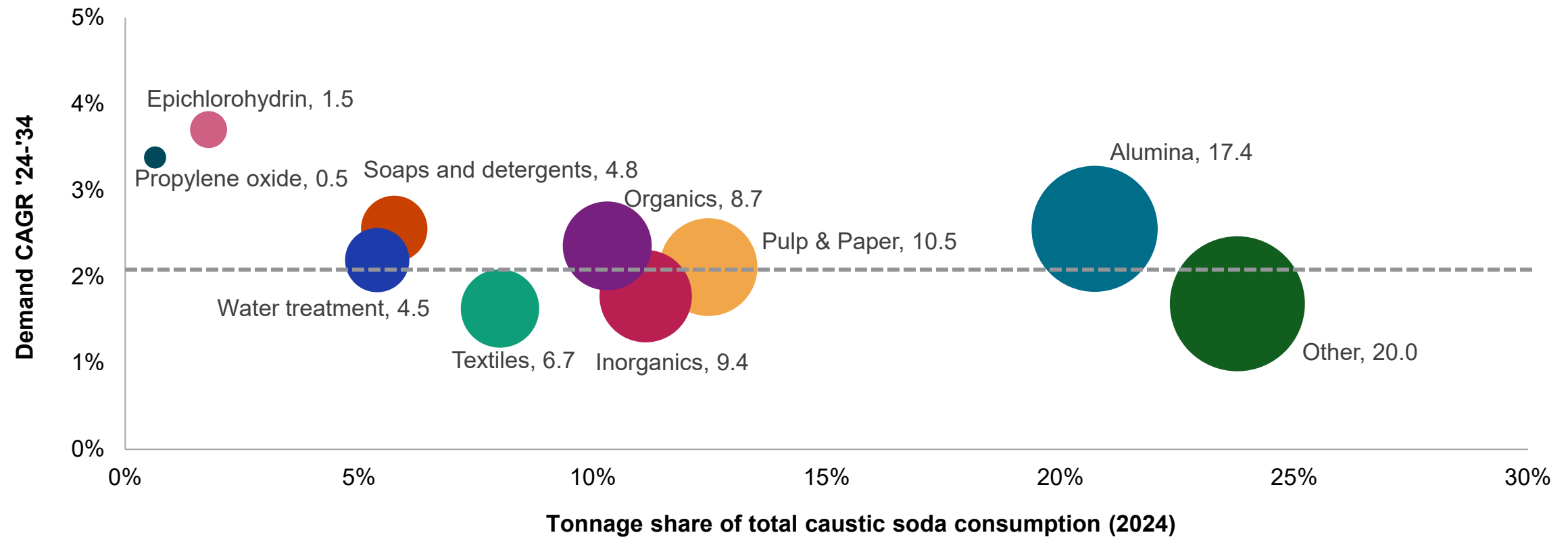


Source: S&P Global Commodity Insights.

Caustic soda demand from alumina expected to grow strongly from a large base

Epichlorohydrin sees fastest growth rate, lackluster growth from textiles and others

Global caustic soda 2024 demand by application, million MT

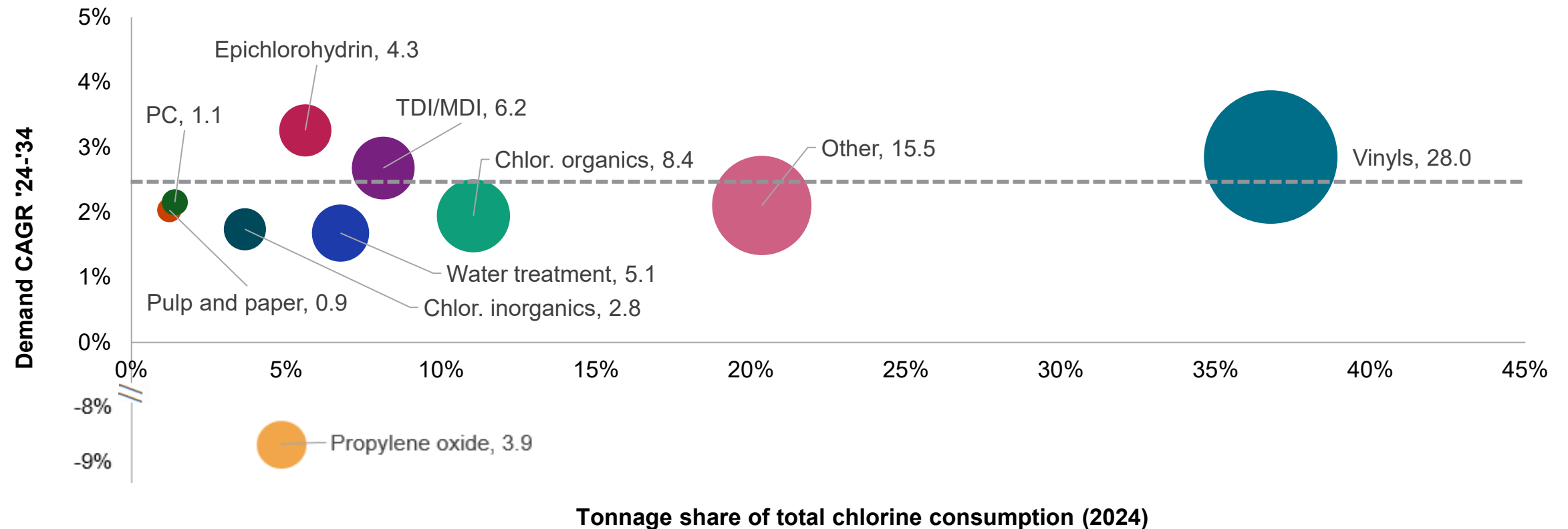


Source: S&P Global Commodity Insights.

Vinyls hold an outsized share of chlorine consumption

Chlorine demand to enjoy faster than average growth from epichlorohydrin and TDI/MDI

Global chlorine 2024 demand by application, million MT



Source: S&P Global Commodity Insights.

Agenda

1. Chlor-alkali market recovery on steady demand growth amid moderating supply expansion over the next decade

2. Chlor-alkali consumption basking in the (sun)light of energy transition trends

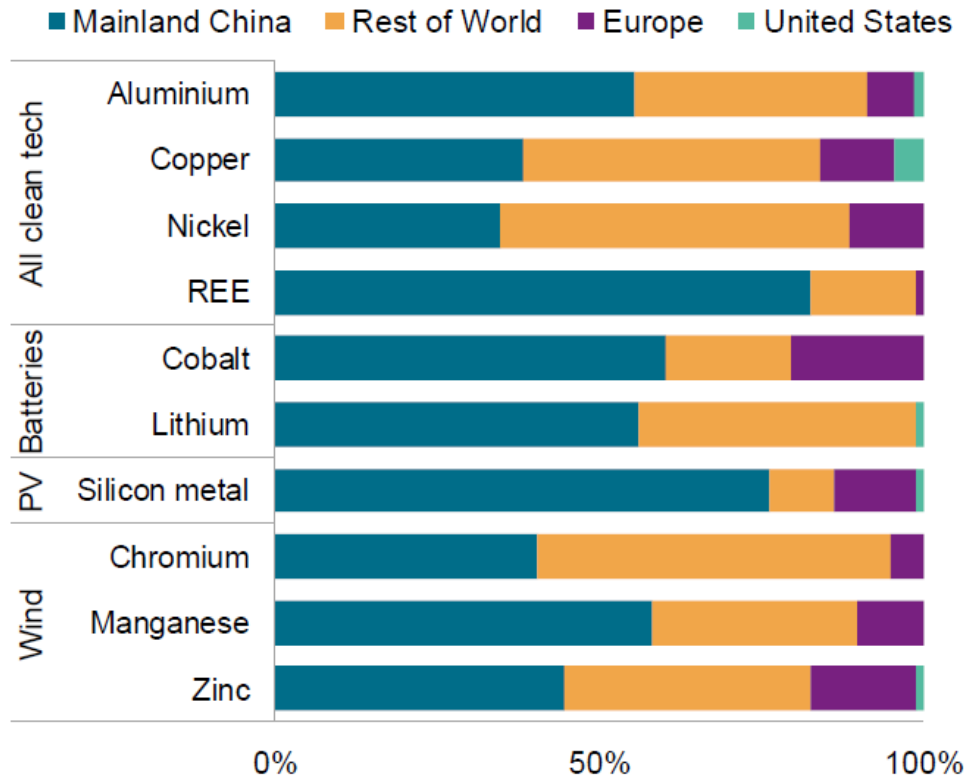
3. Turbocharging chlor-alkali and PVC through sustainable integrated production

For discussion purpose only – generated using Microsoft Copilot with the prompt: A landscape with a wind farm, solar panels, and electric vehicles.



Chlor-alkali consumption to grow along with the progress in Energy Transition

Processing

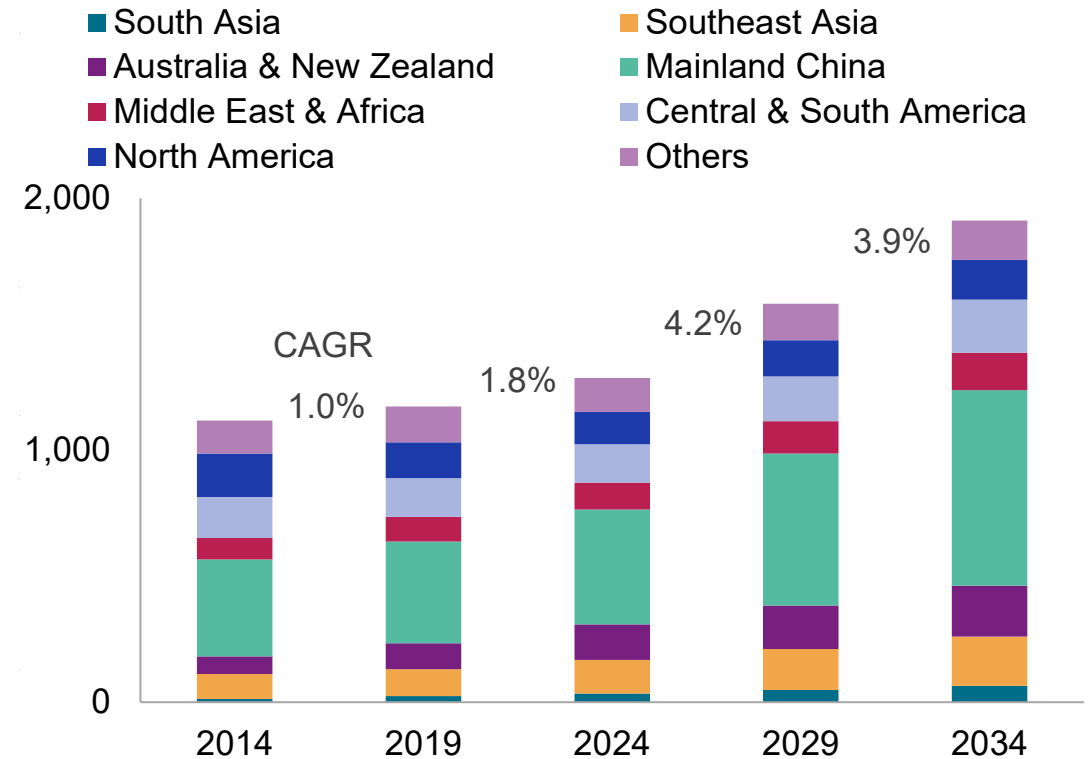


As of April, 2023.

REE = rare earth elements.

Source: European Commission 2023, "Study on the Critical Raw Materials for the EU", retrieved on April 19, 2023 (https://single-market-economy.ec.europa.eu/publications/study-critical-raw-materials-eu-2023-final-report_en), S&P Global Commodity Insights.

Gross output from mining of metals and stone, US\$bn, real



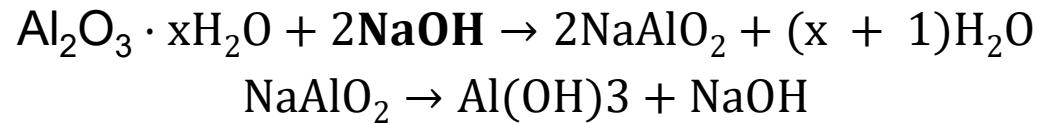
Source: S&P Global Market Intelligence.

Aluminium is boosting caustic soda consumption as it rides the cleantech wave

17.4MMT of caustic soda were consumed globally for alumina production in 2024

Caustic soda is used to dissolve alumina

Bayer process (>90% of the global production)

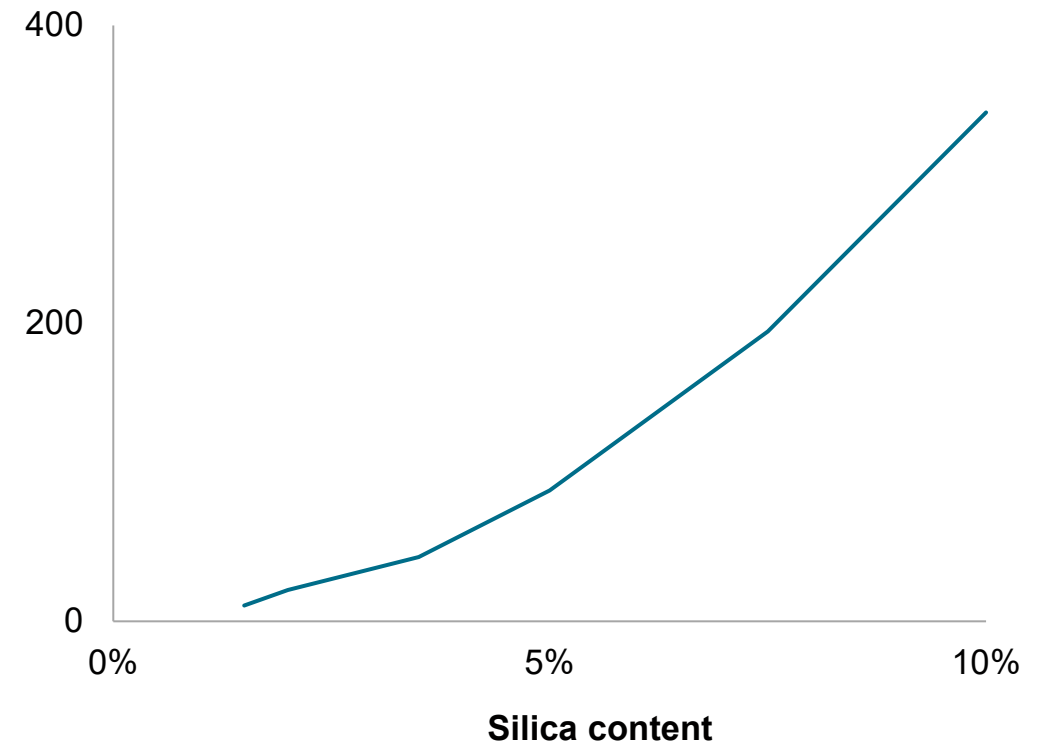


$$\frac{80g \text{ NaOH}}{102g \text{ Al}_2\text{O}_3} \approx 0.784 \text{ kg NaOH per kg of Al}_2\text{O}_3$$

Besides recovery, consider causticization efficiency (35%), hydrolysis loss (1.59%), soda loss (15%), and silica content in the bauxite ore (alumina, Al_2O_3) in the final consumption →

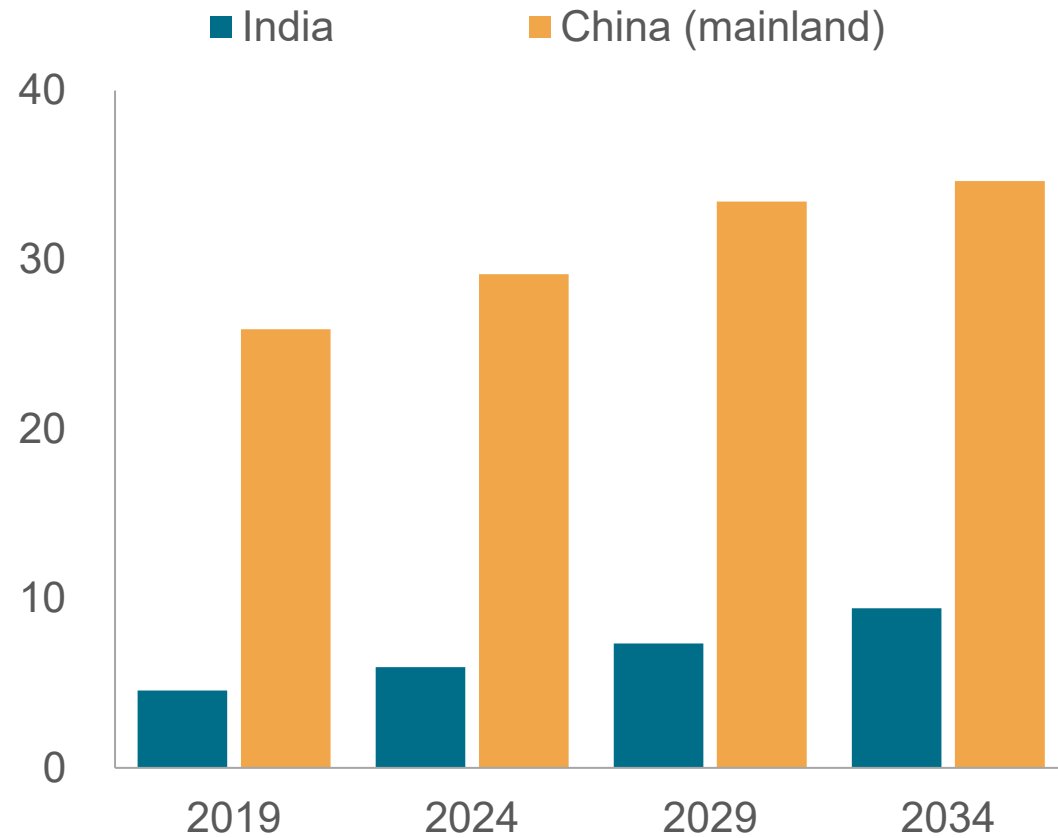
More caustic soda used for higher silica bauxite

Caustic soda (with recovery) kg / MT alumina



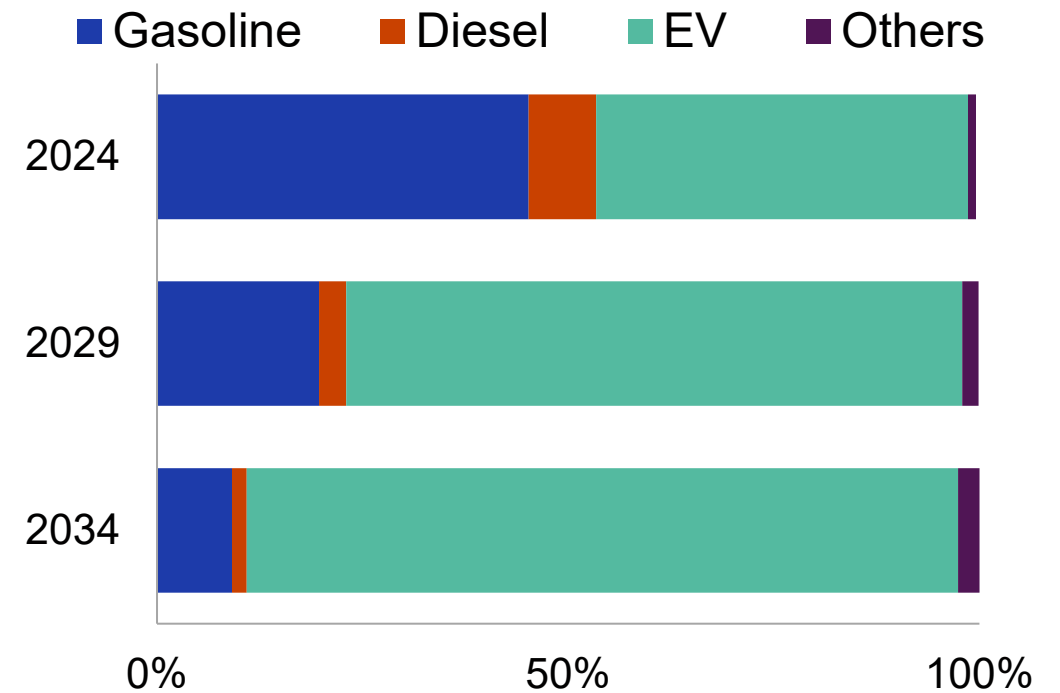
Sustained uptrend in EVs entails more caustic soda for aluminum & battery metals

Vehicles Production, million



Source: S&P Global Mobility.

EV share forecast of new LV sales of four regions



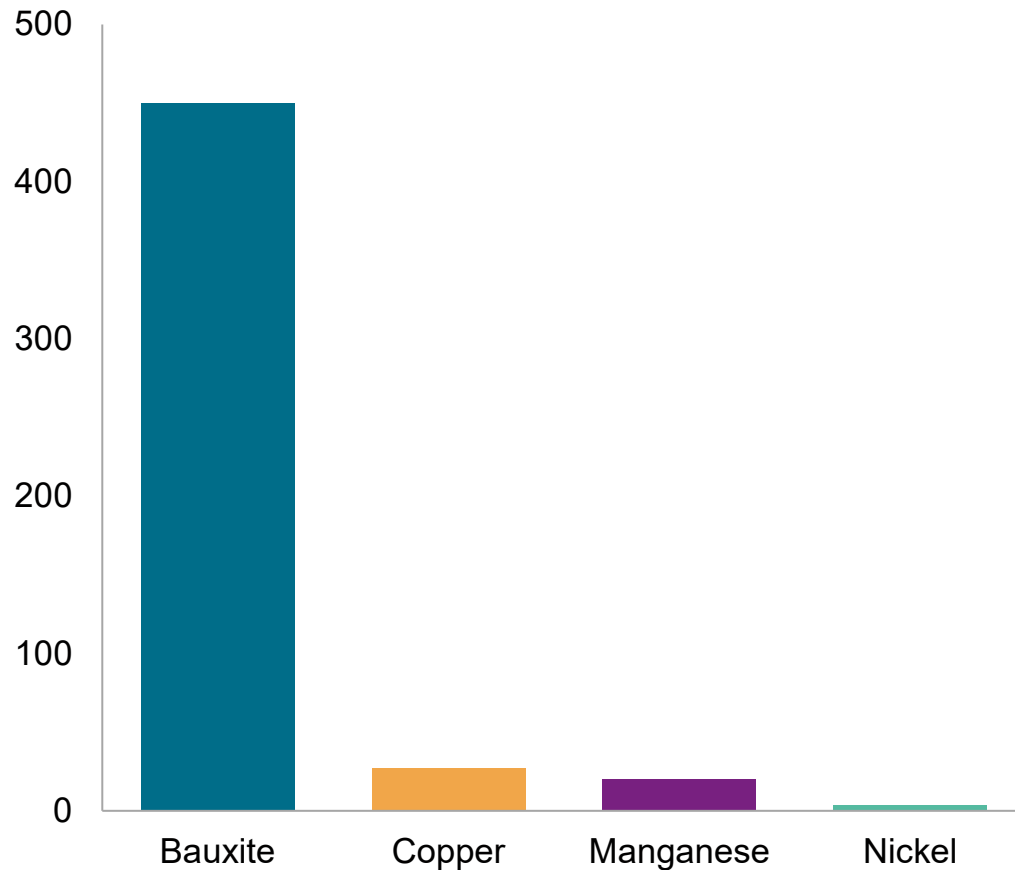
* Four regions include US, Europe, China, India

Data compiled August 2024
Source: S&P Global Commodity Insights.

Bauxite/Alumina production surpasses other metals by far

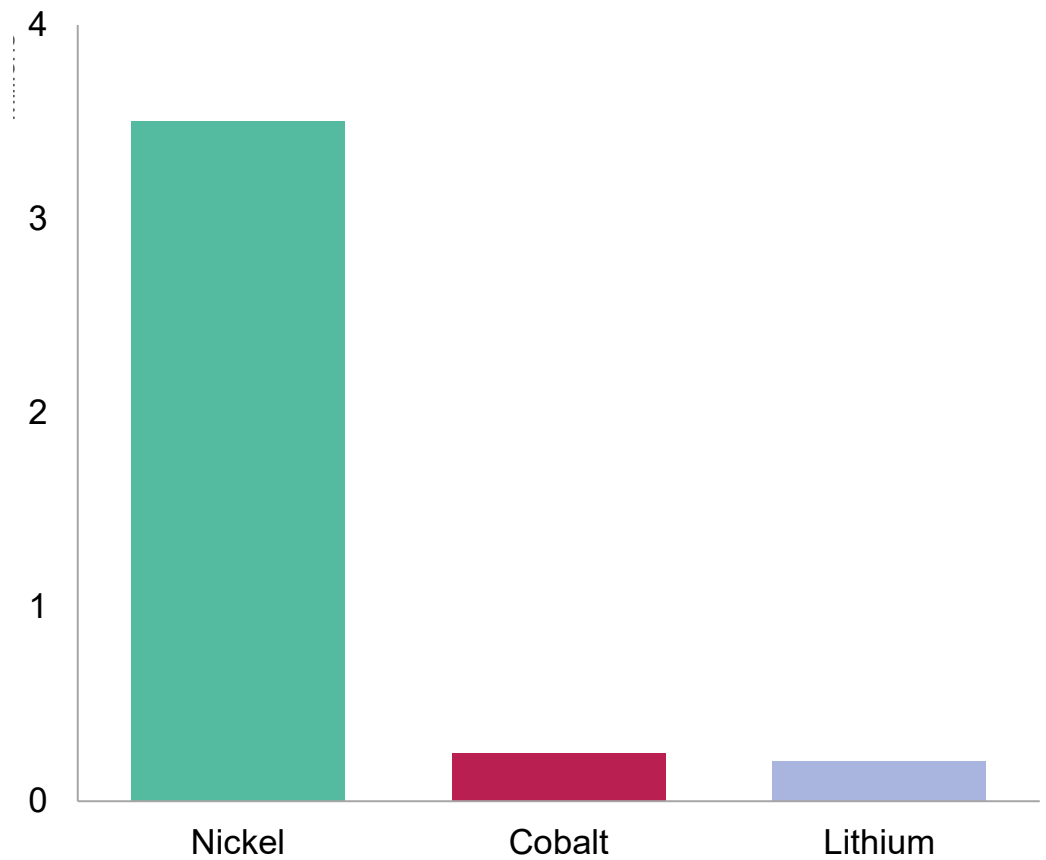
Nickel is used in batteries, wind turbines, etc., but is <1% of bauxite; lithium/cobalt is 6-7% of nickel

Global production 2024 estimated, million MT



Source: US Geological Survey (USGS); S&P Global Commodity Insights.

Global production 2024 estimated, million MT

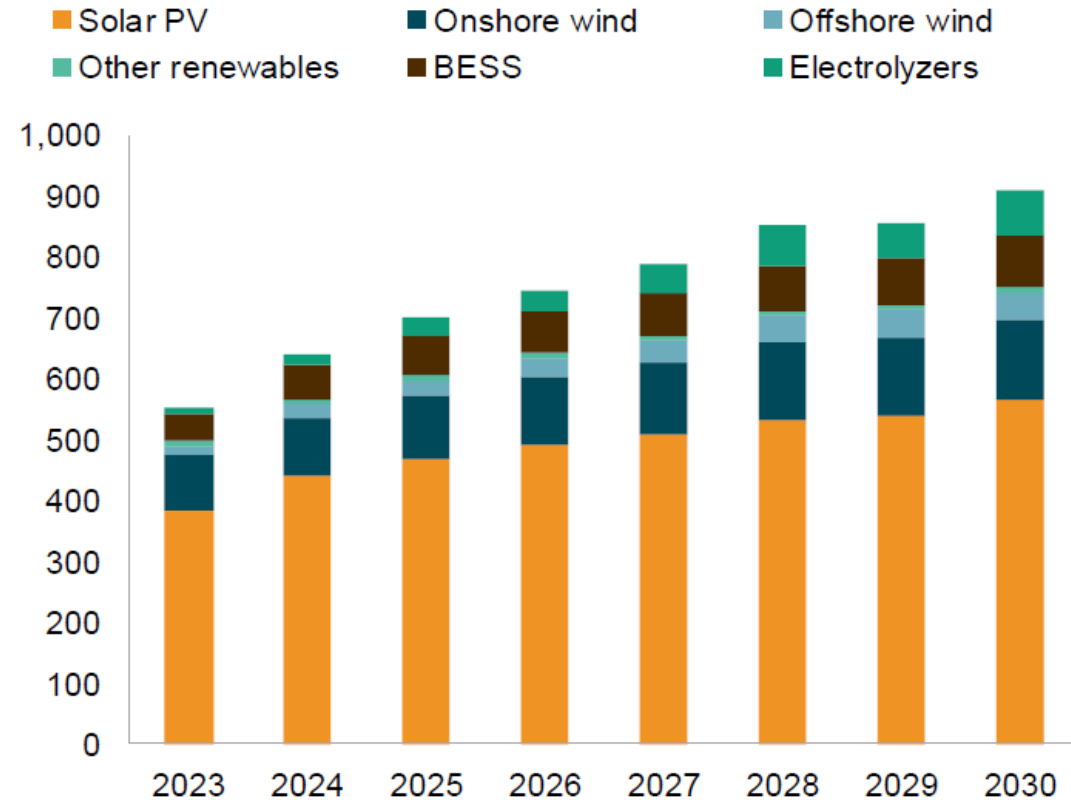


Source: US Geological Survey (USGS); S&P Global Commodity Insights.

Chlor-alkali demand to shine on the surge in clean tech expansions

Chlor-alkali is consumed in the production of solar panels and wind turbines

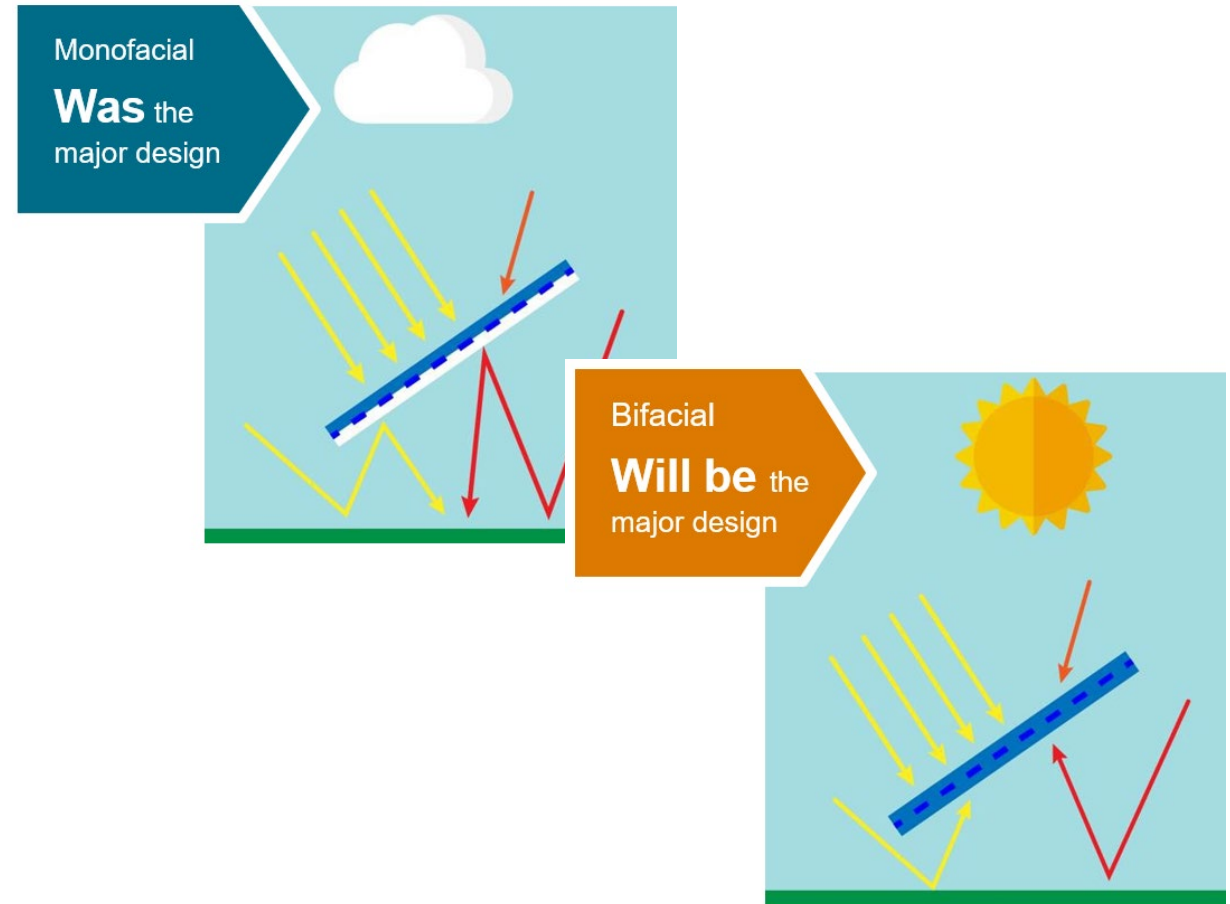
Annual clean tech capacity additions, by technology



As of Sept. 11, 2023.

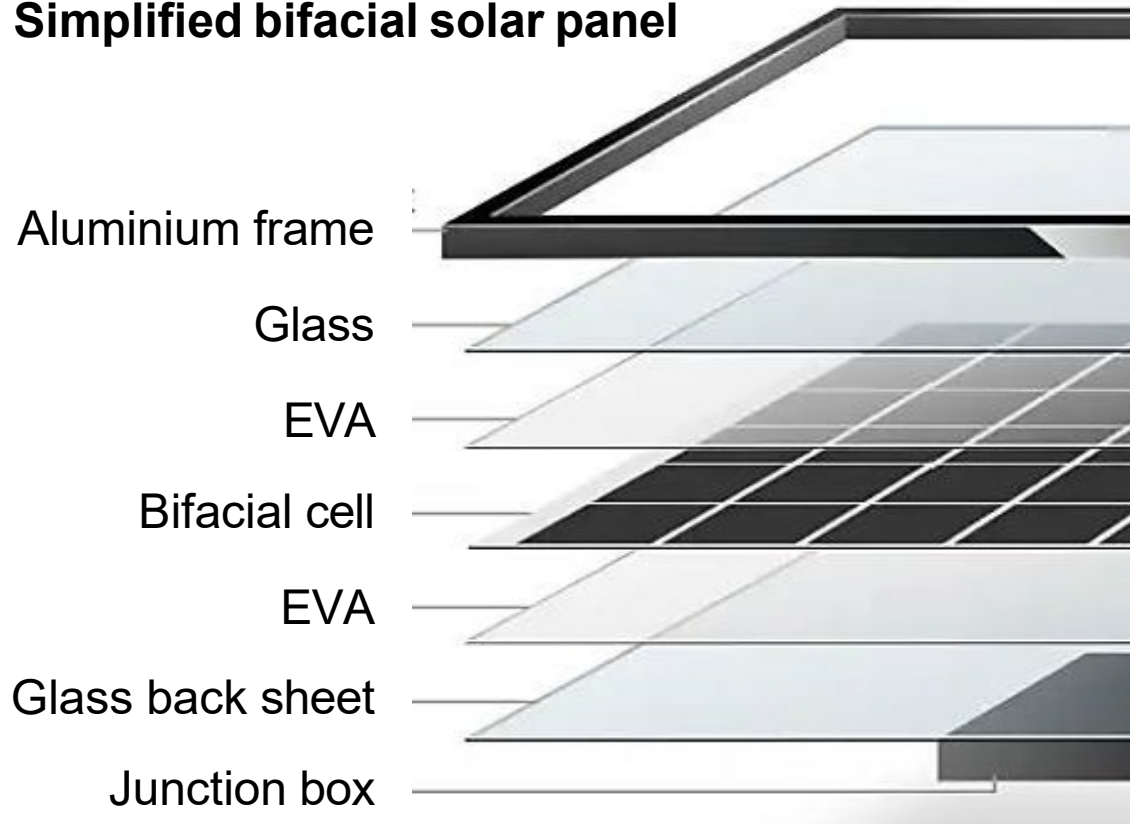
BESS = battery energy storage systems; Other renewables: biomass, geothermal, ocean and concentrating solar power.

Capacity for Solar PV and electrolyzers in DC, all other technologies in AC. Utility-scale power generation includes projects that are bigger than 5 MW and front-of-the-meter energy storage. Distributed generation includes residential and commercial PV systems and behind-the-meter energy storage. Hydrogen production includes electrolyzers and dedicated renewables additions for green hydrogen production.

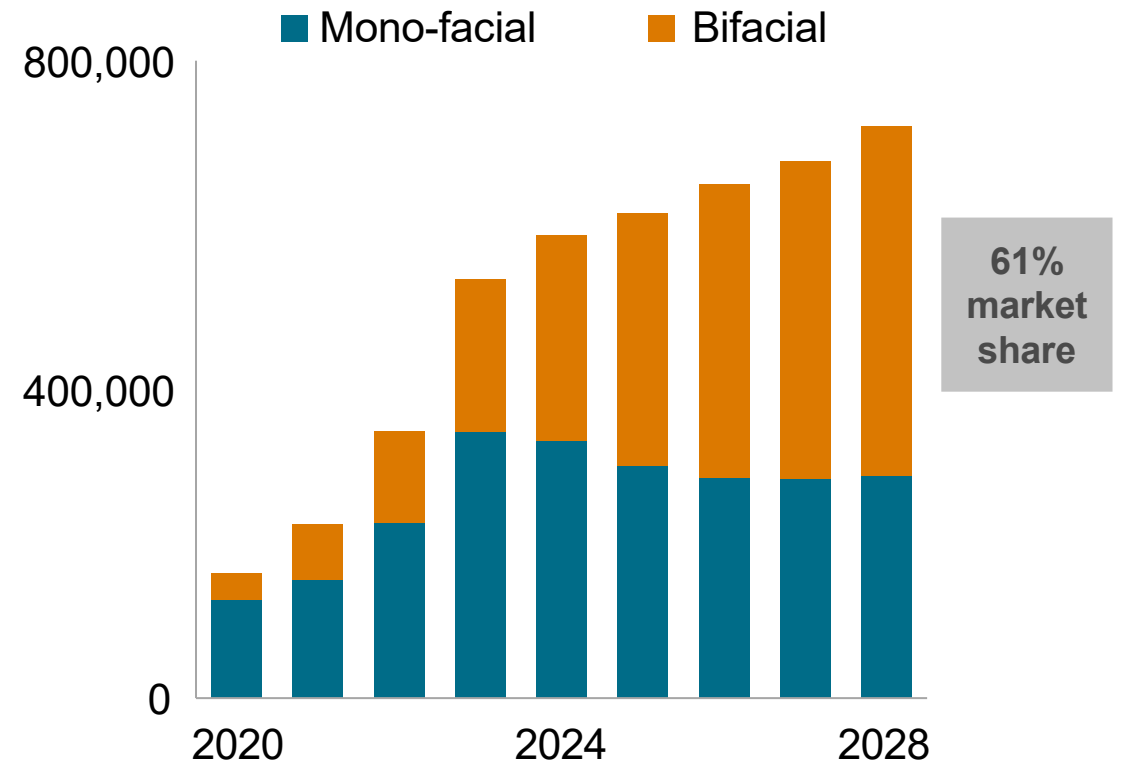


Boost in chlor-alkali consumption from more bifacial solar panels

Simplified bifacial solar panel



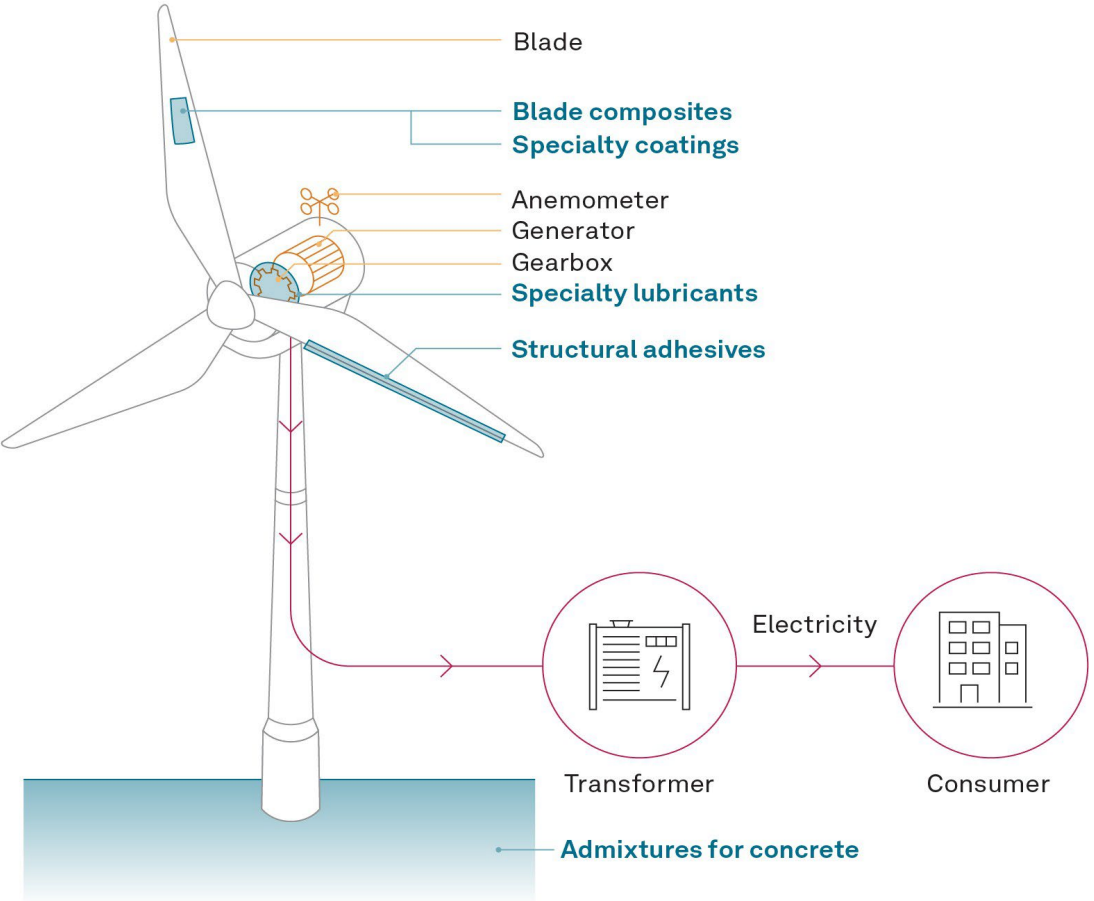
Module production by bifaciality (MW)



Source: S&P Global Commodity Insights.

Boost in chlor-alkali demand from the growth in coatings for wind turbines

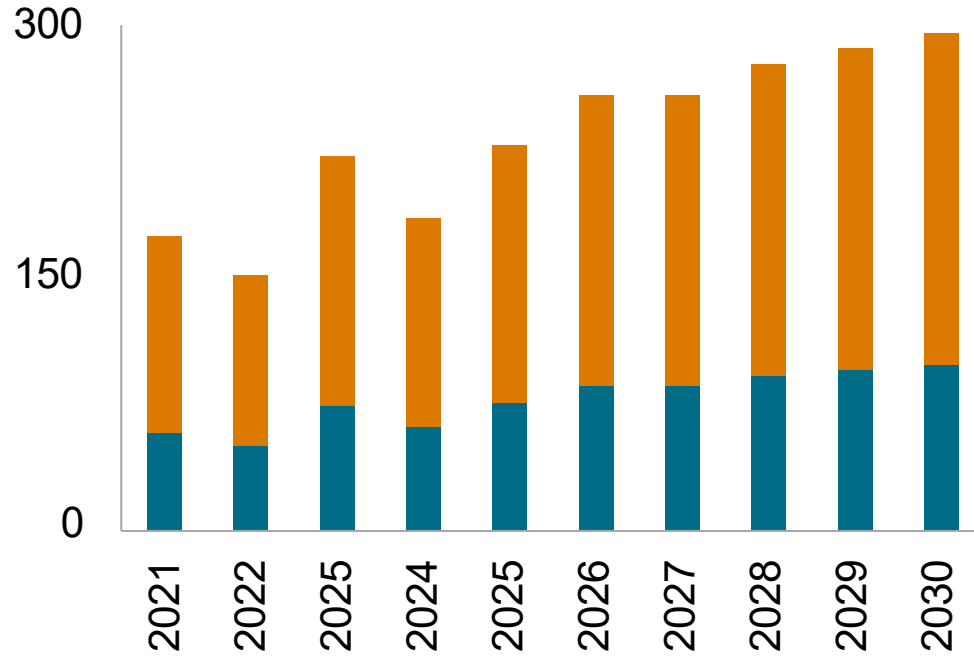
Wind turbine structure



Basic coating and surface coating

Worldwide specialty coatings consumption for wind turbines (Thousands of metric tons)

■ Polyurethane surface coating ■ Epoxy based coating



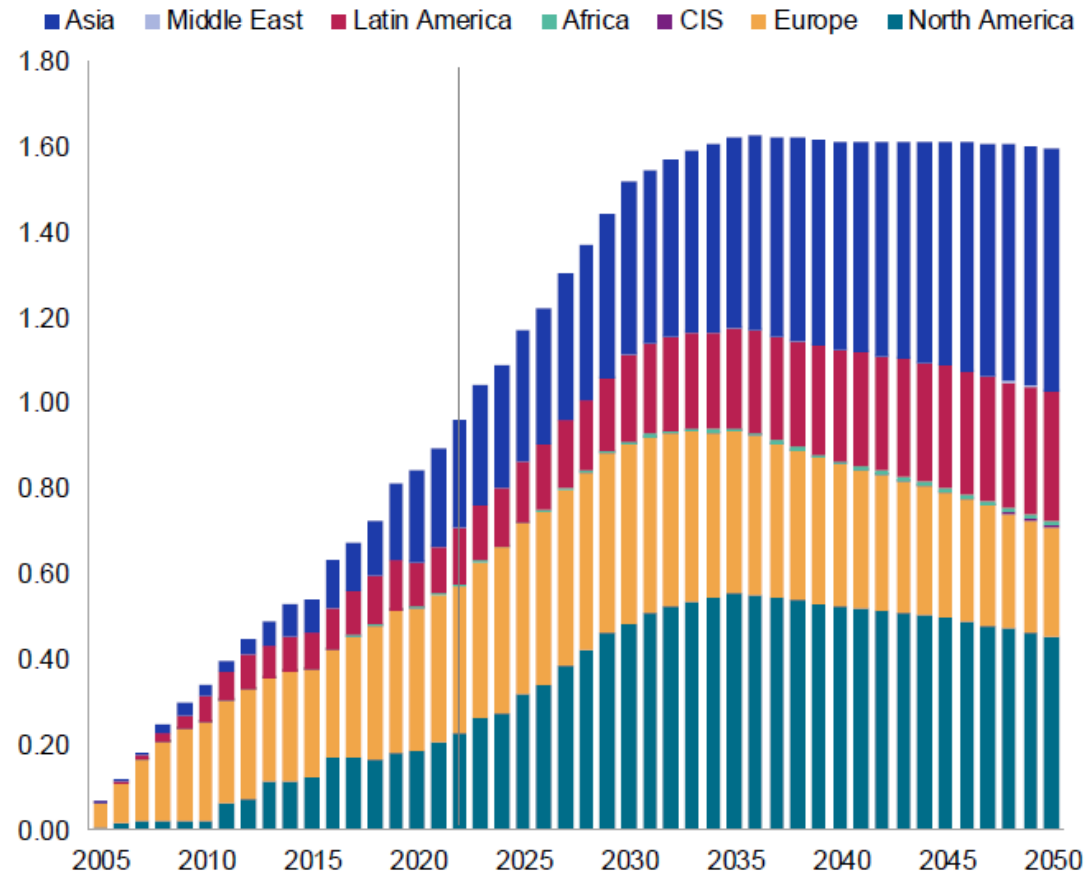
Source: S&P Global Commodity Insights.

As of Jan. 12, 2025.
Source: S&P Global Commodity Insights.

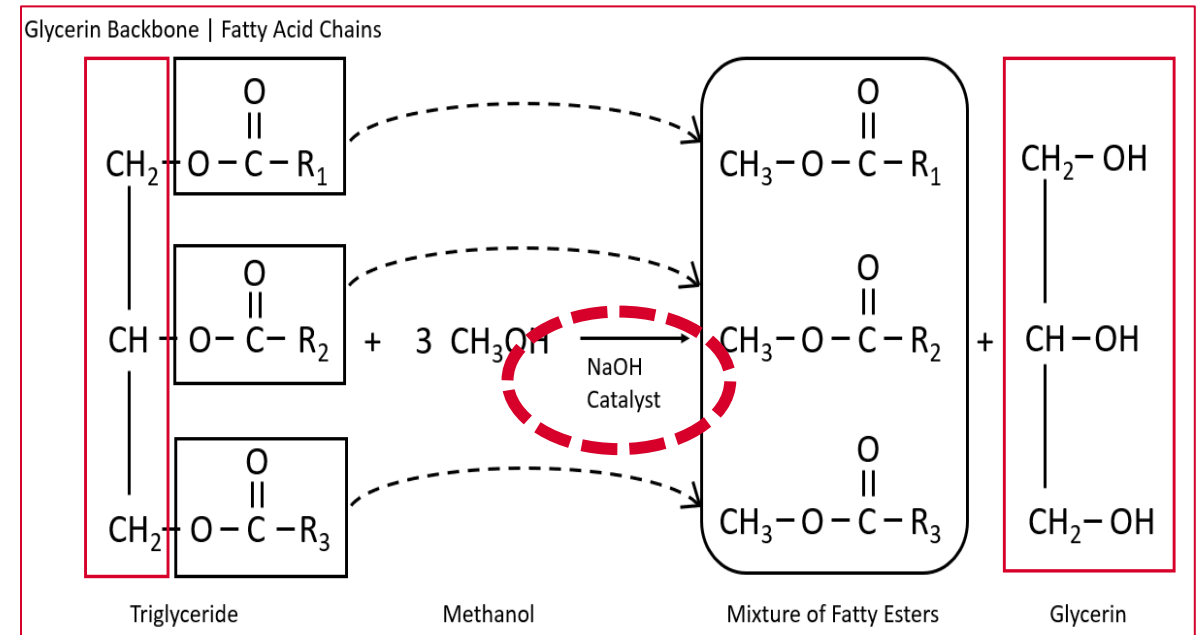
Boost in caustic soda demand from rapid growth in biodiesel production

In any biodiesel routes, the waste treatment would also require caustic soda...

Global biodiesel demand (Million b/d)

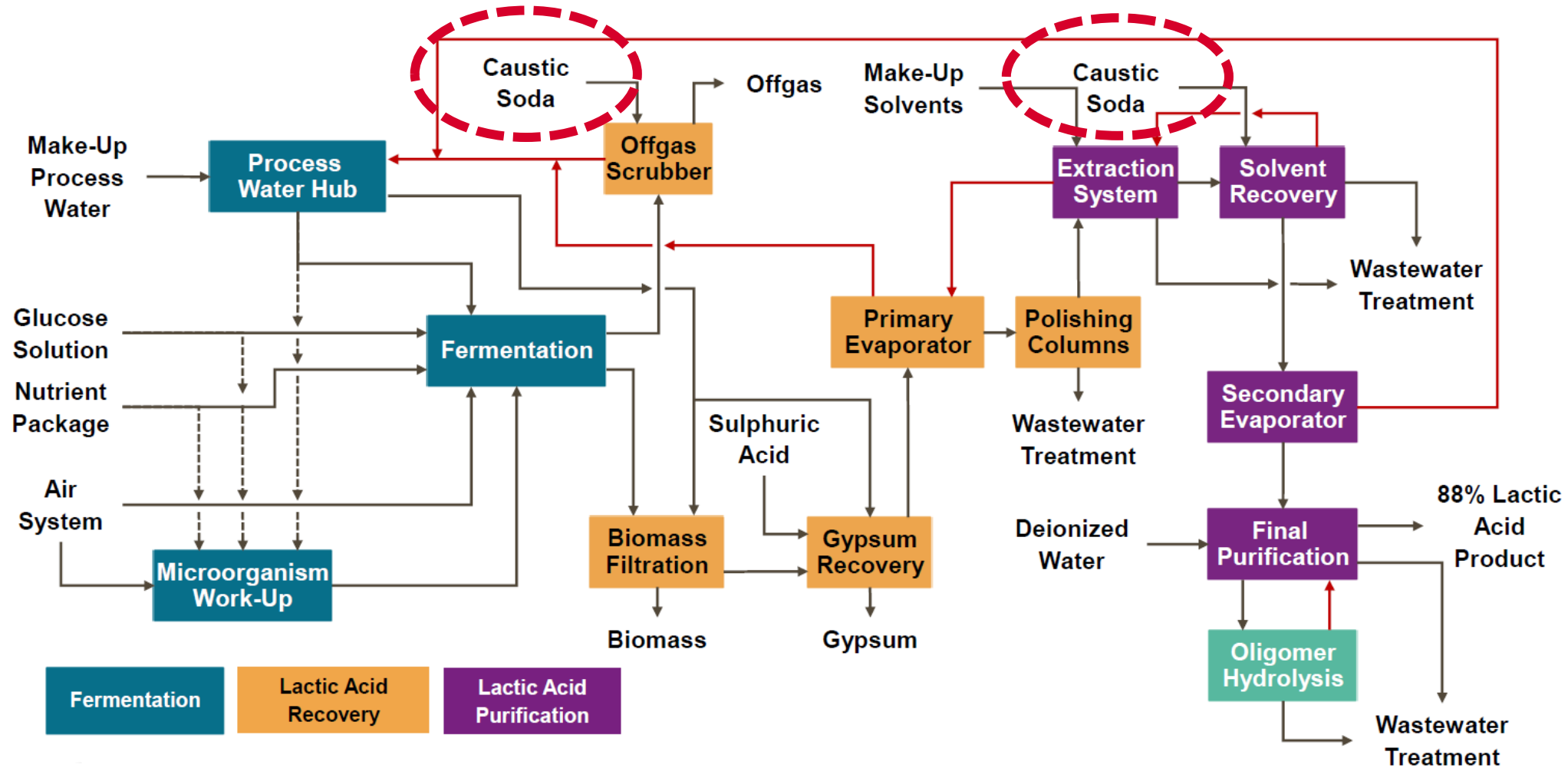


Source: S&P Global Commodity Insights.



Caustic soda used in offgas scrubbing and solvent recovery of LA production

Non-food biomass for PLA production can drive investment in 2G/3G biofuels

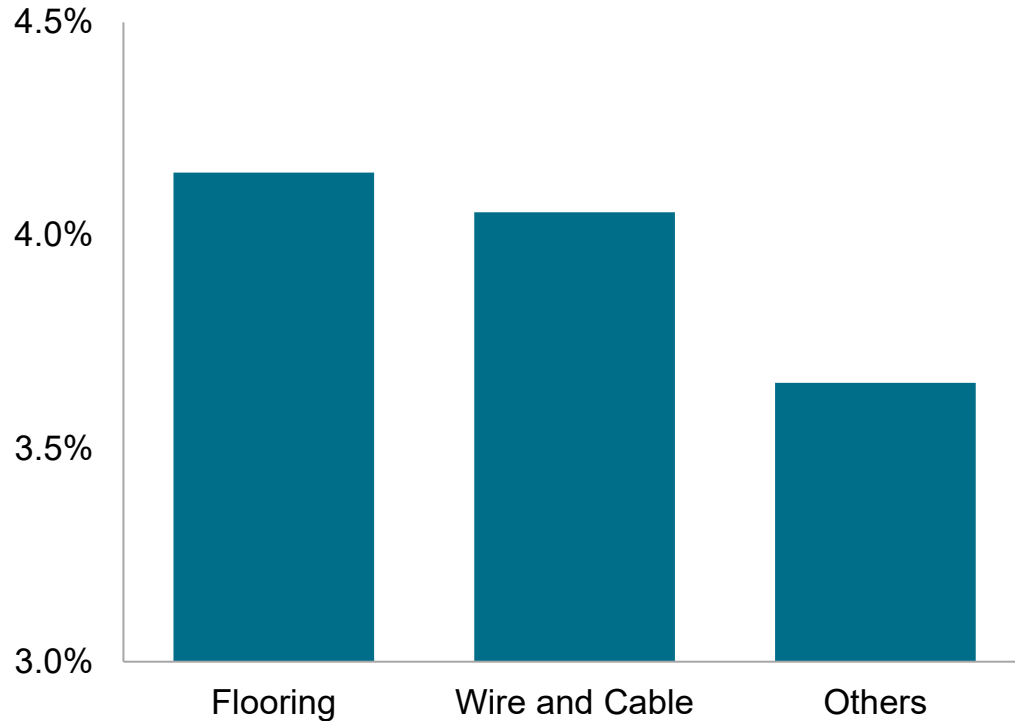


PVC benefits from Energy Transition too

PVC flooring is durable and suits in-floor heating; cost-effective PVC rides on the electrification trend

Flooring and W&C to enjoy superior growth rates

Asia PVC demand by application, CAGR 2024-2029



Source: S&P Global Commodity Insights.

PVC substituting TPE for EV charging cables



Agenda

1. Chlor-alkali market recovery on steady demand growth amid moderating supply expansion over the next decade

2. Chlor-alkali consumption basking in the (sun)light of energy transition trends

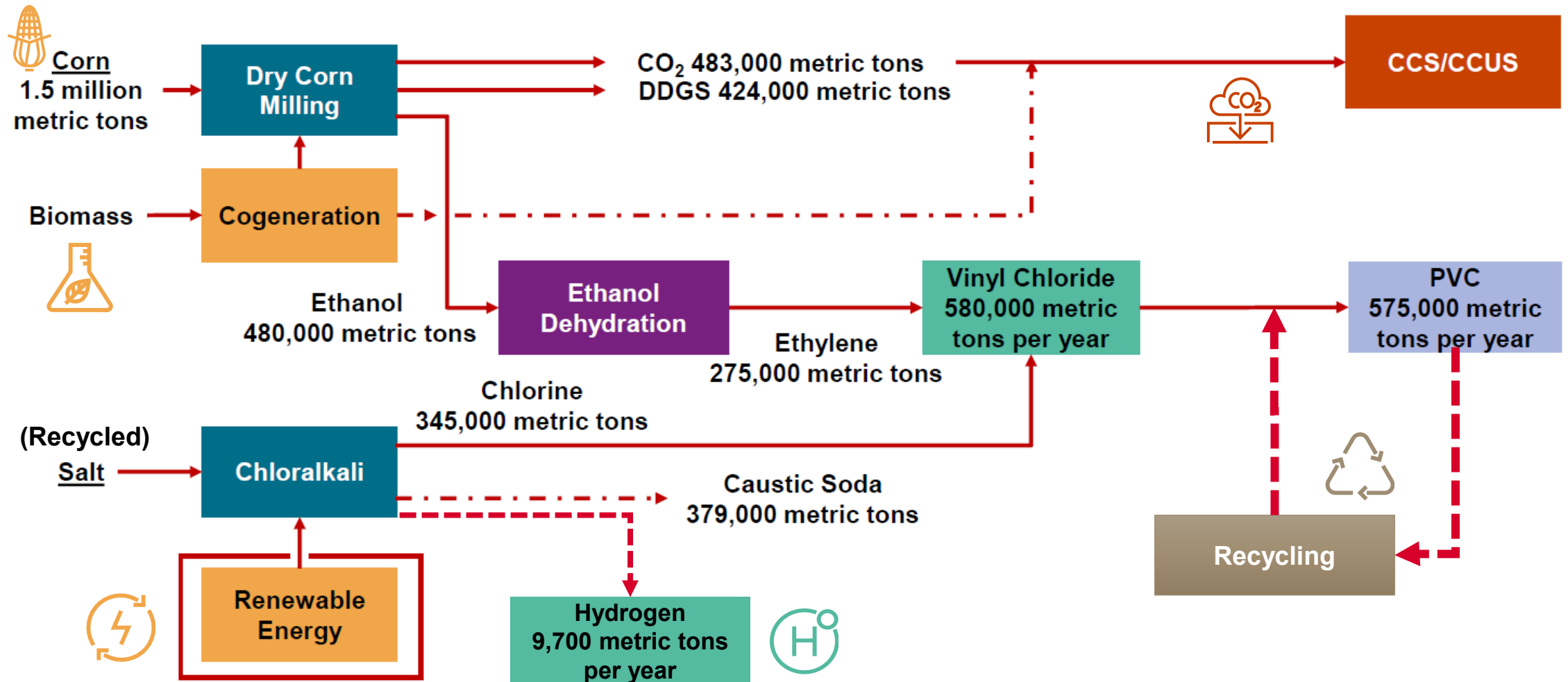
3. Turbocharging chlor-alkali and PVC through sustainable integrated production

For discussion purpose only - generated using Microsoft Copilot with the prompt: A house interior with PVC window profiles, luxury vinyl tiles, a PVC pipe, PVC wall cladding, PVC cables, a vinyl mat, and a PVC synthetic leather sofa.



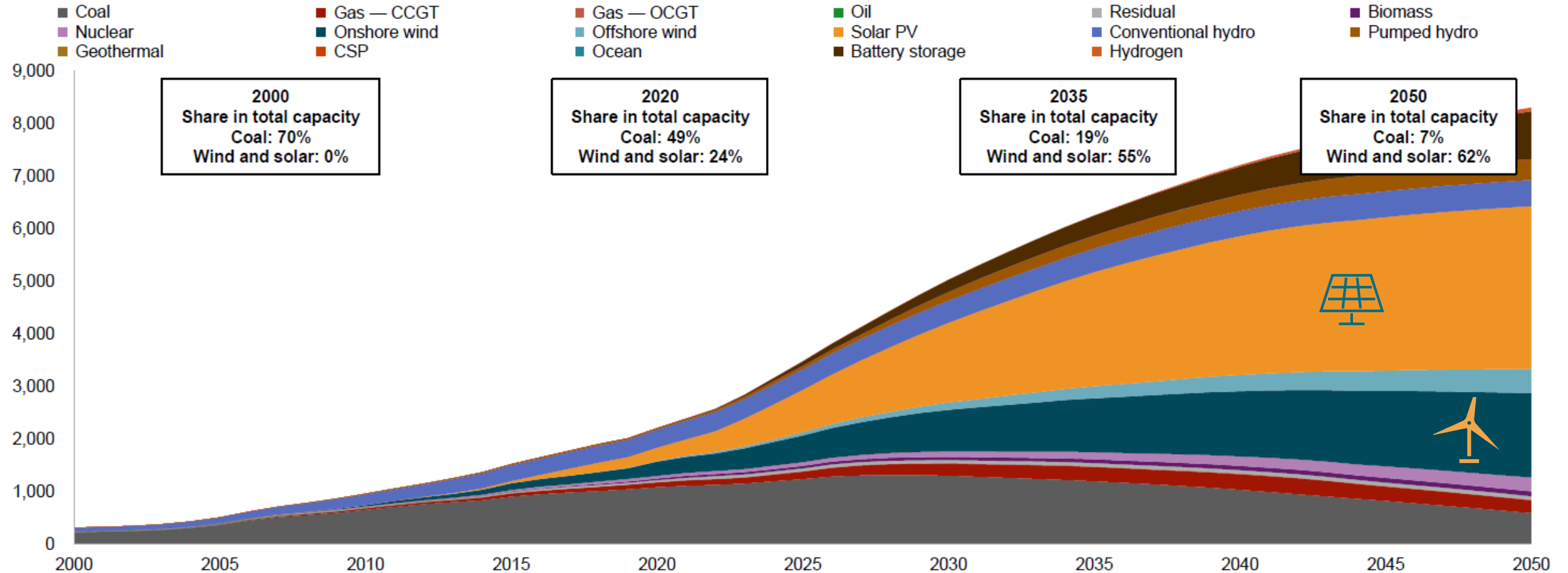
Green PVC is not a myth

Integrated Chlor-alkali to PVC production can be constructed with sustainability in mind



Chinese Chlor-alkali/PVC plants are increasingly powered by renewable energy

Power installed capacity by fuel type (GW)



Source: S&P Global Commodity Insights.

Restrictions on Use: You may use the analyses, prices, indexes, assessments and other related information (collectively, “Data”) in this presentation only for your personal use. You may not publish, photocopy, reproduce, distribute, retransmit, resell, create any derivative work from, put into a computer system and/or otherwise provide access to Data or any portion thereof to any person (either within or outside your company including, but not limited to, via or as part of any internal electronic system or Internet site), firm or entity.

Disclaimer: S&P GLOBAL COMMODITY INSIGHTS, ITS AFFILIATES AND ALL OF THEIR THIRD-PARTY LICENSORS DISCLAIM ANY AND ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO, ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE AS TO THE DATA, OR THE RESULTS TO BE OBTAINED BY ITS USE OR AS TO THE PERFORMANCE THEREOF. A REFERENCE TO A PARTICULAR INVESTMENT, SECURITY, RATING OR ANY OBSERVATION CONCERNING A SECURITY OR INVESTMENT PROVIDED IN THE COMMODITY INSIGHTS INFORMATION IS NOT A RECOMMENDATION TO BUY, SELL OR HOLD SUCH INVESTMENT OR SECURITY OR MAKE ANY OTHER INVESTMENT DECISIONS AND DOES NOT ADDRESS THE SUITABILITY OF ANY INVESTMENT OR SECURITY. NO USER OF THE COMMODITY INSIGHTS INFORMATION SHOULD RELY ON ANY INDEX, BENCHMARK, PRICE ASSESSMENT, OBSERVATION, OPINION OR OTHER INFORMATION CONTAINED IN THE COMMODITY INSIGHTS INFORMATION IN MAKING ANY INVESTMENT OR OTHER DECISION. COMMODITY INSIGHTS DOES NOT SPONSOR, ENDORSE, SELL OR PROMOTE ANY SECURITIES, OTHER FINANCIAL OR INVESTMENT PRODUCTS OR SERVICES. THE COMMODITY INSIGHTS INFORMATION IS NOT A SUBSTITUTE FOR THE SKILL, JUDGMENT AND EXPERIENCE OF SUBSCRIBER, ITS MANAGEMENT, EMPLOYEES, ADVISORS AND/OR CLIENTS IN MAKING INVESTMENT AND OTHER BUSINESS DECISIONS.

Limitation of Liability: In no event whatsoever shall S&P Global Commodity Insights, its affiliates or their third-party licensors be liable for any indirect, special, incidental, punitive or consequential damages, including but not limited to loss of profits, trading losses, or lost time or goodwill, even if they have been advised of the possibility of such damages, whether in contract, tort, strict liability or otherwise. The Data is provided on an “as is” basis and your use of the Data is at your own risk.

The names “S&P Global Commodity Insights” and “Commodity Insights” and the Commodity Insights logo are trademarks of S&P Global Inc. Any commercial use of the S&P Global Commodity Insights logo must be granted in writing by S&P Global Commodity Insights.