

Plugging Holes In A Sinking Ship? An Example Of Terrible Sell-Side Research, and Other Issues

Key Findings:



General Thoughts: Since 2021, many companies have expanded rapidly to only see expected demand fail to materialize as projected, lifting industry financial challenges amid falling expected returns and rising cash burn.



Supply Chain/Commodities: We discuss recent corporate actions at Albemarle to restructure and cut growth capex following the decline in lithium prices. We also discuss recent movements in propylene and polypropylene.



Energy/Upstream: We discuss recent IEA and OPEC commentary on oil markets, flag the shrinking arbitrage between US and Asia and Europe LNG markets, and estimated China GDP growth impacts on energy markets.

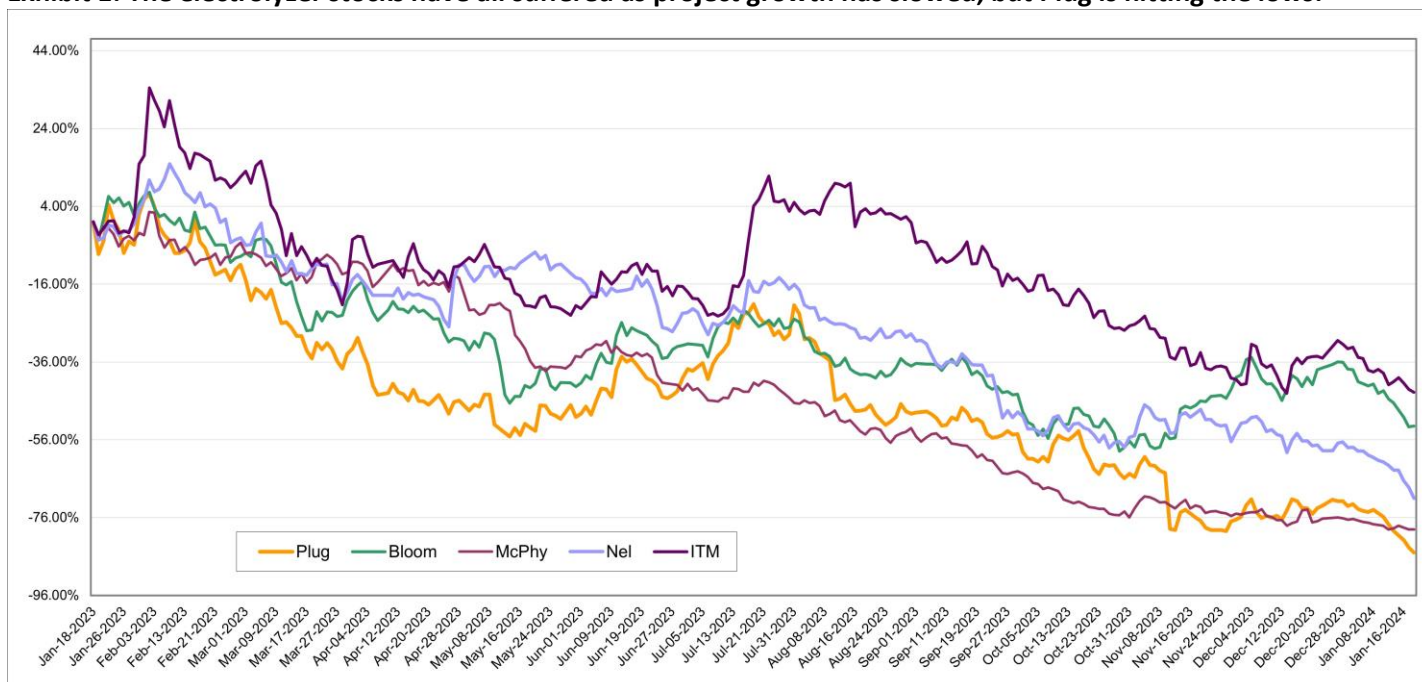


Sustainability/Energy Transition: We discuss the Plug Power announced US\$1bn share offering, following its significant recent share price decline that highlights mounting challenges among electrolyzer producers.



Downstream/Other Chemicals: We highlight global freight rates surging prices between China and the US East Coast and Europe, and we flag a German credit availability indicator and numerous US housing market statistics.

Exhibit 1: The electrolyzer stocks have all suffered as project growth has slowed, but Plug is hitting the lows.



Source: Capital IQ, January 2024

General thoughts: In November 2023, we published research, [Un-Plugged: The Worst of The Drunken Sailors – Making Life Harder](#), following early November [news of hydrogen fuel cell maker Plug Power management raising going concern](#), and our late October research [Déjà Vu – Are Electrolyzers Heading The Way of EVs – Too Many Players](#). This research focused on the challenges at Plug Power rippling through the hydrogen and other emerging clean energy technology markets, making already hard-to-find public market funding more scarce/negative, as it discussed the growing wave of

negative results and expectations coming from Europe that confirmed the industry is facing challenges. While industry and company warning signs continue to flash, we highlight that most sell-side analysts covering Plug Power continue to have buy ratings on its equity, following the equity notably lower since the start of 2023, as shown above. In 2021, Plug Power and other companies capitalized on favorable conditions to raise substantial funds, which were primarily invested in building inventory and expanding operations to meet anticipated demand in the electrolyzer industry. However, the expected demand failed to materialize as projected, leading to significant cash consumption and financial challenges for Plug Power. This situation, not unique to Plug Power, has put the company in a precarious position with a need to achieve positive cash flow while facing competition from players with stronger balance sheets. We think mounting market headwinds and low stock prices will pose incremental difficulties in raising additional capital, and potential buyers in this space may be deterred by those with outsized liabilities. Looking more broadly, we find low prices impacting multiple industries, such as low lithium prices prompting corporate cost-cutting actions at Albemarle to a price war occurring downstream in the EV market that is occurring alongside slower-than-expected demand, moving in favor of slower growth capex across the value chain given shrinking returns. In commodity petrochemicals, we continue to find a setting of oversupply beyond a few selective markets, and flag notable disruptions lingering in US propylene from outages and the recent strength in crude oil values working in favor of tighter cracker co-products globally. See our recent research, [Feedstock Shifts In Focus, As North American Costs Broadly Inflate YTD](#). We also discuss demand headwinds facing recycled polymers due to the low relative price of virgin polymers among other items in sustainability. In the downstream demand section of the report, we focus on global freight rates, German lending activity, and recent movements in US home indicators. Overall, the impact of recent interest rate hikes, low prices for most chemical products due to oversupply, energy movements, and logistic and outage issues being the major drivers of early 2024 commodity markets.

Supply Chain, Commodity Chemicals, & Chemical Sector News:

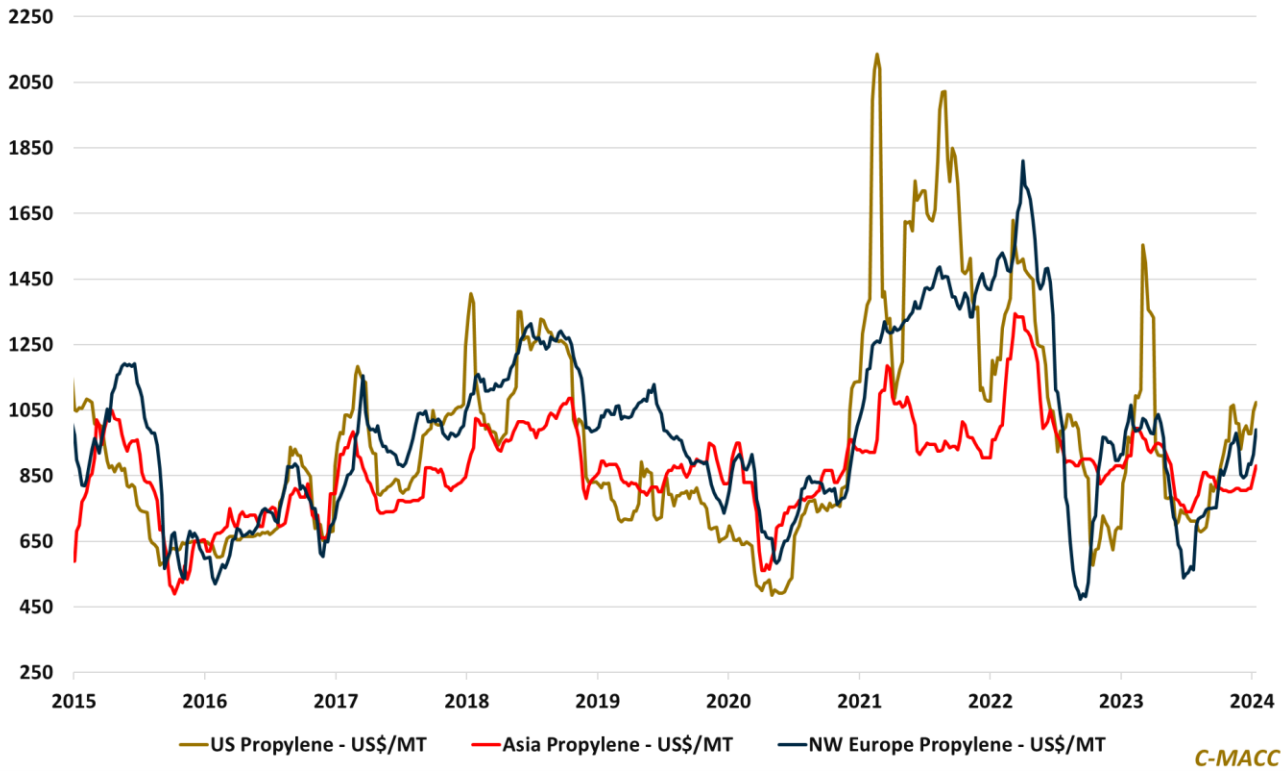
Facing The New Reality: While much of this commentary applies to companies in the energy transition space, it is good to see Albemarle recognize the “new normal” we face in many industries and start right-sizing the company and capital spending – see comments on Plug Power below. Global growth rates were revised downwards for 2023 during the year and the consensus view of 2024 is quite poor – albeit with some growth. One of the realities of the materials sectors that we have not spent much time talking about is that in general, if you had no end demand growth and no inventory moves throughout the chain, demand for materials would fall each year. This is because customers are always looking for efficiencies and ways to use less material. The best example is in polyethylene, which if you look at overall growth in demand in volume has had a reasonable correlation close to GDP, whereas demand measured in surface area has grown far faster – films and other packaging structures have become stronger and thinner. In a no-growth world, the chemical industry does not see flat demand – it sees declining demand – same for metals, wood products, etc. In the sustainability section below, we talk about EV pricing and EV demand, and this is likely top of mind for Albemarle. We have advocates of how overhyped the lithium market has been for a long time and that the lithium producers have played into the hands of the auto buyers by believing the thesis that lithium will be very short, and overbuilding. When you combine this with a possible stall in EV sales and market penetration you expose the surplus quickly. We have noted in other research that direct lithium extraction could prove to be a game changer for the industry as it would likely sit at the lower end of the cost curve.

Short term shortage rally: With the freeze in the US Gulf and the shipping challenges in the Middle East we are seeing some near-term price support for a handful of chemical products that are either directly impacted or levered to any potential escalation in the Middle East. However, absent any escalation, we still expect 2024 to be a year of significant oversupply for most chemicals and we would bet against any medium-term margin recovery.

- **Supply Chain & General Thoughts Companies Discussed:** Albemarle, Plug Power, Bayer, Lummus Global, Formosa Plastics, Asian Paints, H.B. Fuller, LyondellBasell, Ineos, Westlake, Elementis, Insteel Industries, Nan Ya Plastics
- **Commodities:** Polyethylene, Metals, Wood Products, EVs, Lithium, Propylene, Polypropylene, Polycarbonate
- [Albemarle to cut capex, overall costs in 2024](#)
- [Bayer to implement job cuts in 2025, reaffirms strategic commitment in Germany](#)
- [European Benzene Prices Rise Amidst Geopolitical Tensions, Supply Disruptions, and Rising Production Costs](#)
- [Ineos Cuts Olefins Production in Texas Amid Frost Conditions](#)

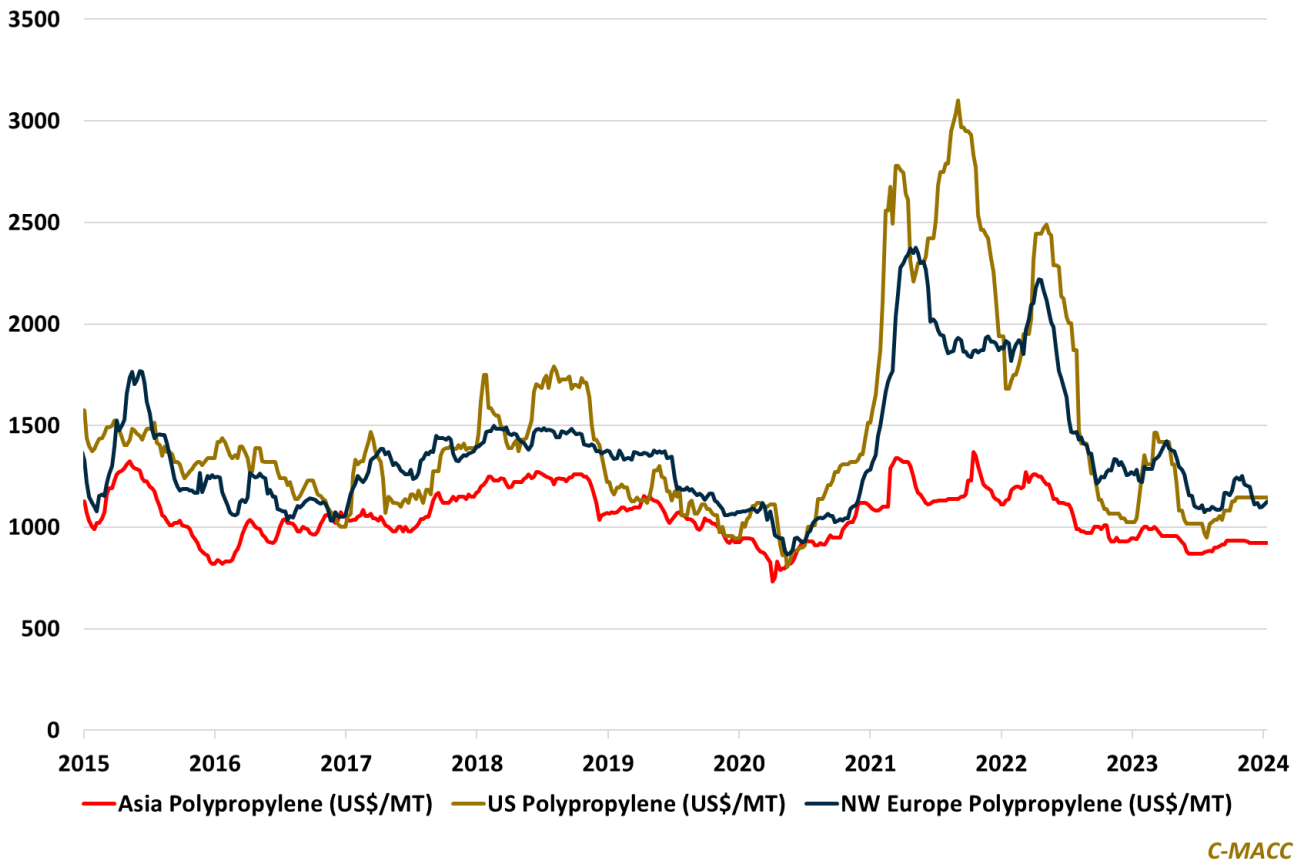
- [LyondellBasell, Covestro idle POSM JV plant in Netherlands](#)
- [Westlake seeks to minimize impact on PVC deliveries from Red Sea freight chaos](#)

Exhibit 2: [European propylene spot prices start the year strong on tight supply](#)



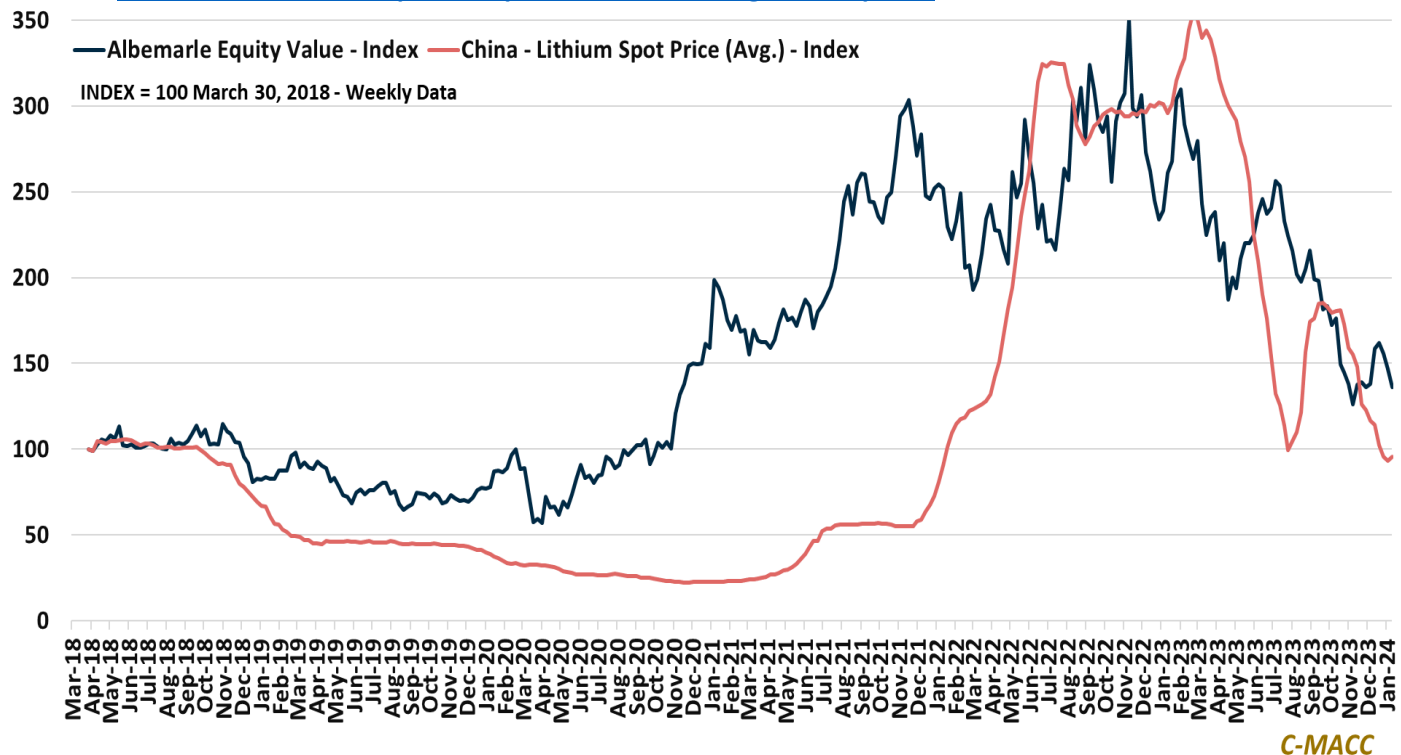
Source: Bloomberg, C-MACC Analysis, January 2024

Exhibit 3: [Asia PP to continue being weighed by oversupply in 2024](#)



Source: Bloomberg, ICIS, C-MACC Analysis, January 2024

Exhibit 4: [Albemarle to cut staff, pause expansions amid falling lithium prices](#)



Source: Bloomberg, C-MACC Analysis, January 2024

Energy/Upstream:

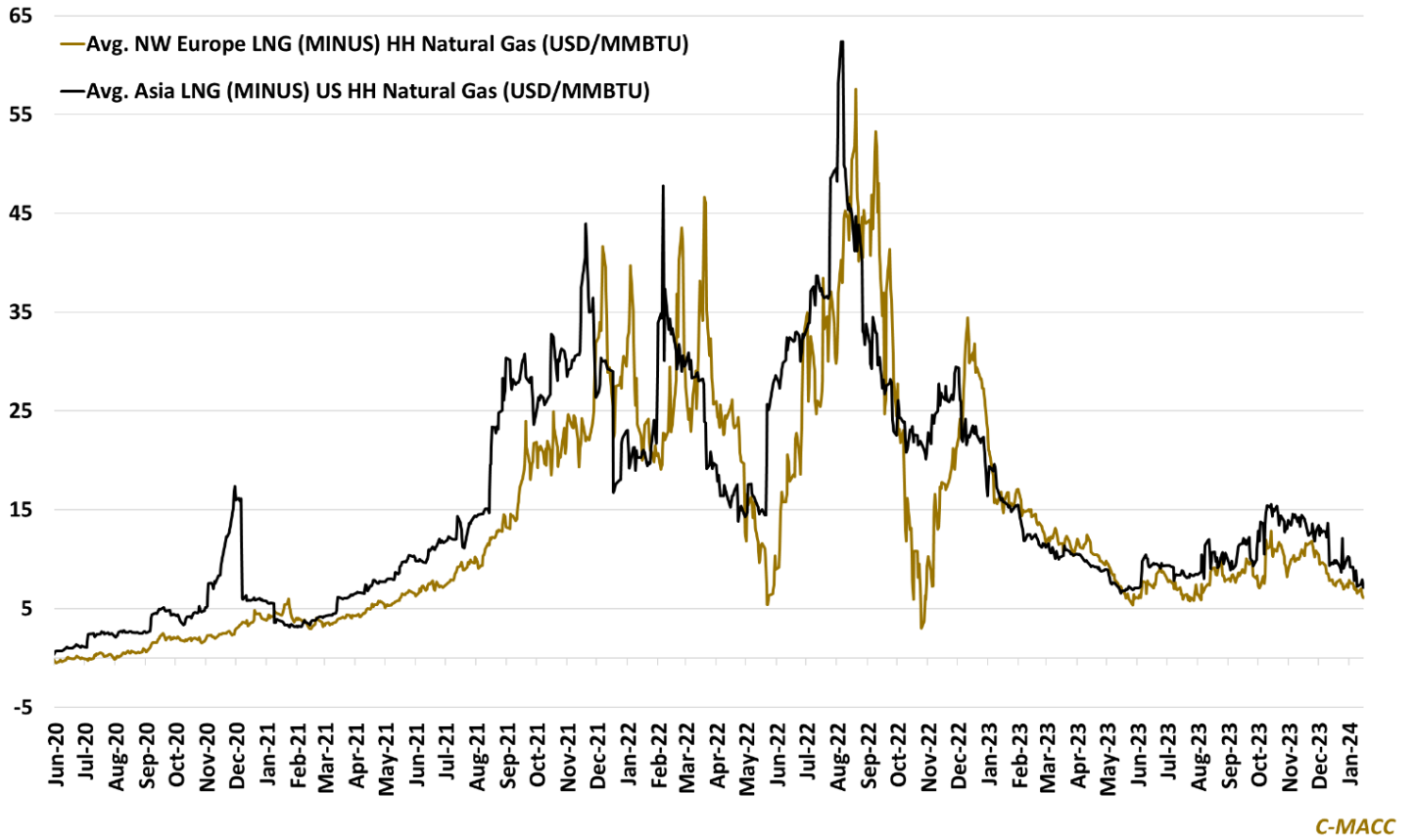
The two oil camps – short-term surplus versus long-term shortage: Can the IEA and OPEC both be correct? The answer is probably yes, depending on the time frame that you are looking at. With slower growth in 2024, the addition of renewable power capacity and power consumers that would otherwise rely on oil, we could see a dip in oil demand at a time when non-OPEC production – especially in the US – is growing. OPEC is likely banking on a return to better global growth but may not be adjusting for the still very profitable US business and some of the production efficiencies which will accrue from the M&A we are seeing – especially from the Permian. By talking up demand, OPEC is effectively encouraging non-OPEC members to keep producing, while at the same time trying to reassure its members. We see a need for more OPEC cuts this year to maintain pricing and we think they will happen as the Middle East likely cannot afford an oil price war with everything else that is going on – this will heap pressure on Saudi Arabia and a couple of its near neighbors to make the largest cuts as several other members are unlikely to fall in line.

➤ **Key Companies:** BP, ExxonMobil

➤ **Commodities:** Oil, Natural Gas

- [IEA signals 'substantial surplus' as oil demand growth slows](#)
- [Oil Prices Rise Following Upbeat Demand Forecasts from IEA and OPEC](#)
- [OPEC Expects Global Oil Demand to Slow in 2025](#)
- [OPEC optimistic on global oil demand growth in 2024, 2025 on strong economic forecasts](#)
- [Oil supply disruption risk from Middle East conflict remains elevated – IEA](#)
- [Energy giant BP appointed interim boss Murray Auchincloss as permanent CEO](#)
- [EU agrees timetable to cut diesel truck emissions](#)
- [ExxonMobil Agrees to Purchase More LNG From Saguaro Energia Export Project in Mexico](#)
- [European oil product imports fall 20% in Jan on Red Sea turmoil: CAS](#)

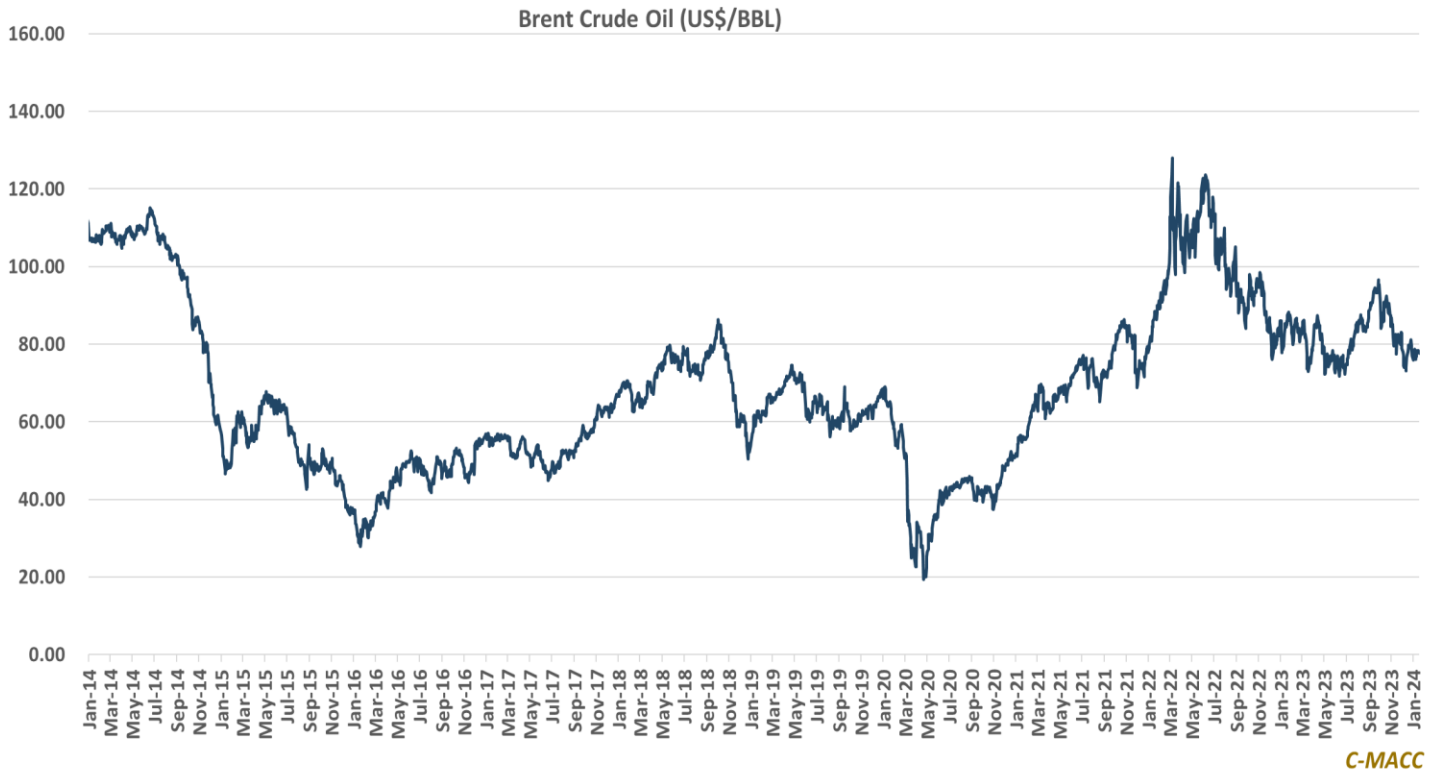
Exhibit 5: [US LNG, LPG arb economics narrow on ample supply, export delays](#)



C-MACC

Source: Bloomberg, C-MACC Analysis, January 2024

Exhibit 6: [IEA sees 500,000 b/d oil supply surplus in 2024](#)



C-MACC

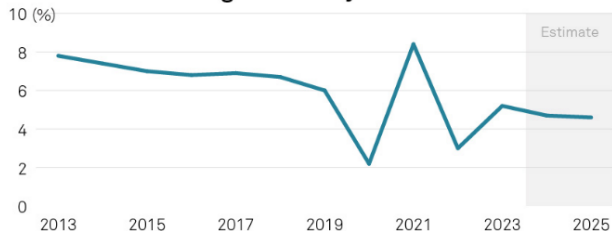
Source: Bloomberg, C-MACC Analysis, January 2024

Exhibit 7: [Infographic: What China's lower GDP growth means for 2024 commodity demand](#). We highlight this infographic in the energy section of our report due to its focus on Chinese oil, natural gas, and coal demand.

What China's lower GDP growth means for 2024 commodity demand



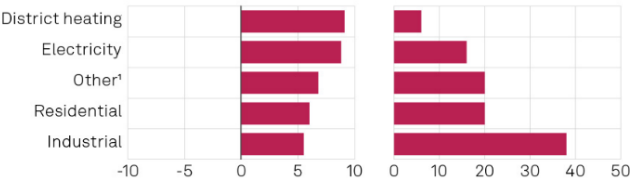
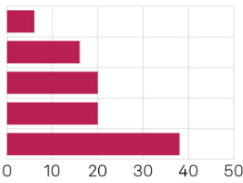
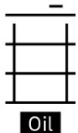

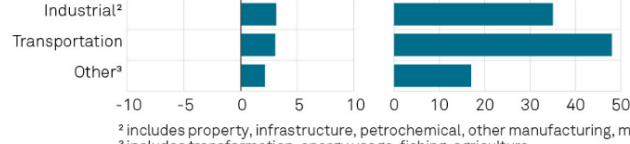
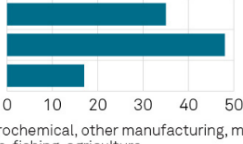


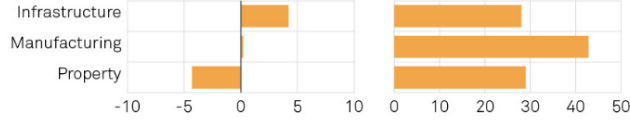
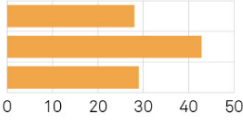


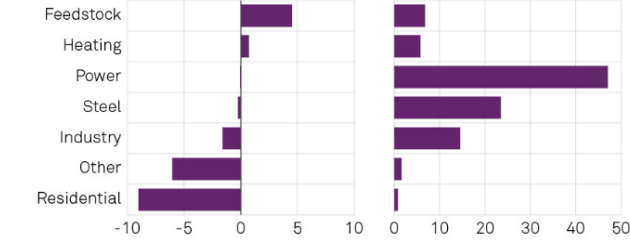
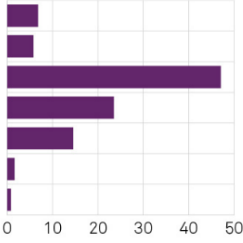
China on Jan. 17 released its 2023 GDP growth at 5.2%, meeting its target set in March last year. S&P Global projects China's 2024 GDP growth to slow to 4.7% after the country's annual economic conference held in December signaled that any fiscal and monetary measures taken in 2024 were unlikely to be more aggressive than in 2023. This sets a weak tone for commodity markets in terms of end-user demand.

China's 2024 GDP growth likely to fall below 5%



*Note. 2024, 2025 GDP are estimates.

China's commodities demand outlook for 2024 vs 2023

Commodity	Outlook	Impacts from China's 2024 targets	End-user demand Y/Y change (%)	Proportion of total 2024 (%)
 Natural gas	 6.6% 25.7 Bcm	China's 2024 gas demand is expected to rise 6.6% on the year, stepping back from the 7.4% projected in 2023 due to a lower GDP growth target. The growth is underpinned by continuing coal-to-gas switching in the industrial sector and an addition of 13.7 GW of gas-fired power generation capacity.		
 Oil	 2.9% 470,000 b/d	China's oil demand growth is seen at 2.9% in 2024, slower than the 6% in 2023. Jet fuel continues to drive growth amid a travel boom, but in 2024 slows to 17% from 73% in 2023. Gasoline demand growth would be also capped at 3% from 10% in 2023 with further EV penetration. However, the government's infrastructure investment will help gasoil demand grow 1.8% in the year compared to 1% growth in 2023.		
 Steel	 -0.1% 1.2 million mt	China's property crisis, sluggish consumer spending, and growing steel overcapacity are expected to remain the biggest hurdles for the Chinese steel markets in 2024. But major infrastructure projects and manufacturing sectors are expected to provide a buffer, leaving China's domestic steel demand in 2024 down only 0.1%.		
 Coal	 -0.2% 5 million mt standard coal equiv.	China's coal demand will likely be under pressure in 2024 from flat coal-fired power generation, weak industrial demand, and continuing reduction of coal use for heating as a pollution control measure. The drop in coal consumption comes despite expectations of a 5.2% growth in power demand in 2024. Power accounts for 47% of coal demand in China.		

S&P Global

Commodity Insights

Source: S&P Global Commodity Insights, Chinese government

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Source: [S&P Global](#), January 2024

Sustainability, Clean Energy, Recycling & ESG:

Unplugged Again: We remain stunned by the incompetence or simple lack of interest from the sell-side with many of the energy transition stocks today, and Plug Power is one of the better examples. Twenty-five analysts cover the stock, and

while the average rating has moved from a strong buy since the company included the phrase “going concern” in a regulatory release in November, the average rating remains a buy! Five minutes of cash flow analysis could have predicted the equity raise that we saw last night, as company cash flows are so negative that fresh cash was needed and it is unclear that the company got a better deal or a better stock reaction if it had borrowed the money, as no one would lend without collateral and this would need to be the IP and the assets. We still believe that Plug could fail, in part because of its terrible cash flows and in part because demand for its equipment is likely to disappoint – see - [If You Can't Beat Them – C-MACC Enters the Mythical Hydrogen Pricing Game!](#) – and - [Déjà Vu – Are Electrolyzers Heading The Way of EVs – Too Many Players](#). In the supply section of the report, we talk about the cost moves that Albemarle is making – which we applaud. Plug management clearly has not woken up to the reality of the business environment it faces, as if it had, we would see some aggressive cost cutting – SG&A and R&D were 59% of revenue in the 12 months through September and rising, while the company posted a negative almost \$300 million gross margin. We would have less confidence in our failure conclusion if we saw some significant cost restructuring.

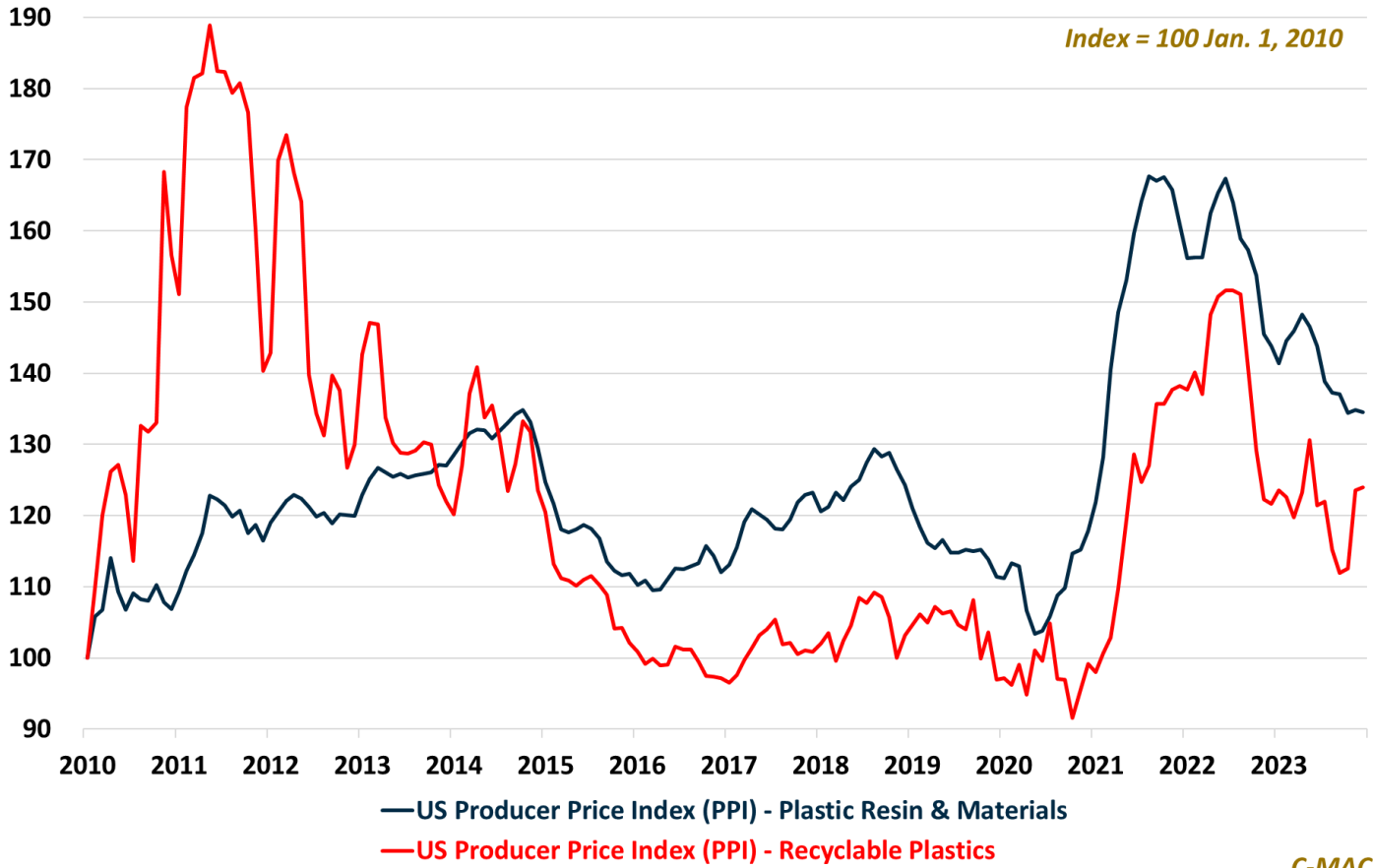
EV Fatigue: The Hertz news that it is selling much of its EV fleet has brought the issue of EV demand growth to the front burner again and we see more headlines around price cuts and slowing demand growth. As an interesting anecdote, faced with the choice of renting a Tesla at Heathrow airport last year half the daily rental rate of an ICE vehicle (because of UK subsidies for EVs), we chose to pay more because we had no idea whether we would be able to charge the Tesla at our overnight stop. These range and charging concerns are keeping many out of the market and when you then hear about cold weather battery life issues, it just adds to the list of reasons to wait until your next purchase cycle. The net effect is likely to be lower prices for EVs, affordable but painful for Tesla and for the large automakers, but possibly fatal for some of the smaller names. It may also mean reduced demand growth for a while and this will have a knock-on impact for lithium, as noted above.

Recycling challenges – price is important: As we have noted in plenty of prior research, everyone wants to do the right thing – have a cleaner footprint, do right by the environment, etc., but no one wants to pay for it. This is a major challenge in the recycled plastics industry today as we are at the low of a petrochemical and polymers cycle and virgin polymers are much cheaper than recycled polymers as a result. While many retailers and packagers have recycled or renewable targets which they have shared with stakeholders, none of these targets are for January 2024, and few are for any point this year – so why pay up when you do not need to. Meanwhile the recyclers run the risk of financial failure before they have the pricing power that would come with meeting mandates. This is not just a problem for recycled polymers but also those made from renewable resources and biodegradable polymers. We expect the virgin polymer glut to be around for a while and this will maintain the negative pressure on the alternatives.

- **Key Companies:** Plug Power, Albemarle, Hertz, Tesla, BASF, Heraeus, BlackRock, BMW, Bunge, Iberdrola, Enel, Drax, Braskem, Shell, Avangrid, Ceres, BYD, Covestro, Avangrid, Delta, Air Products, Brenmiller, Novolooop
- **Commodities:** Hydrogen, EVs, Lithium, Polymers

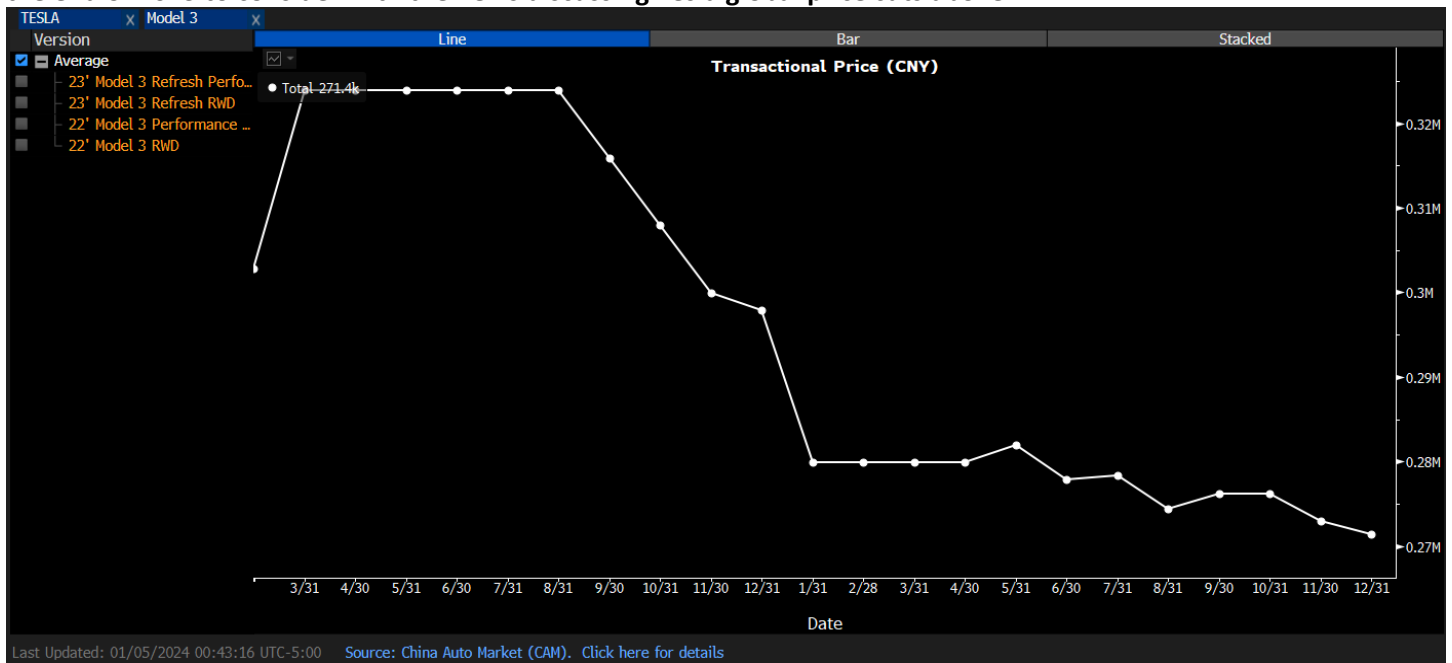
- [Cold weather creates Tesla graveyard in Chicago. One EV owner speaks out: ‘This ain’t my fault!’](#)
- [Tesla Price Cuts, Used Cars Flood Market With Affordable Model 3, Model Y](#)
- [Chinese EV Shares Slump, Pressured by Tesla Price Cuts, Weak Sales](#)
- [China's EV stocks start 2024 in reverse gear as price wars pressure profitability](#)
- [Tesla Drivers in Chicago Confront a Harsh Foe: Cold Weather](#)
- [Plug Power US\\$1bn Equity Offering – 8-K](#)
- [Plug Power stock plunges on potential \\$1B share offering](#)
- [Plug Power January 23, 2024 Webcast To Provide Business Update](#)
- [Tesla Price Cuts Send European, Chinese Auto Stocks Lower](#)
- [Tesla slashes prices on Germany cars after similar cuts in China](#)
- [Tesla slashes Model Y prices in Europe after China price cuts](#)
- [Tesla Stock: EV Giant Keeps Cutting Vehicle Prices In 2024. Wall Street Is Worried](#)
- [Tesla Stock: EV Giant's Vehicle Prices Are Inverting. Why That's A Bad Sign](#)
- [Tesla Prices Now Rival Average US Cars After Billions in Cuts - Bloomberg](#)

Exhibit 8: [Petrochemical glut makes new plastic cheaper than recycled](#). We also highlight the US PPI trend for Plastics & Resins and Recycled Plastics as estimated by the St. Louis Fed from 2010 to show the recent drop in virgin plastic prices but support in recycled plastic values in 2023.



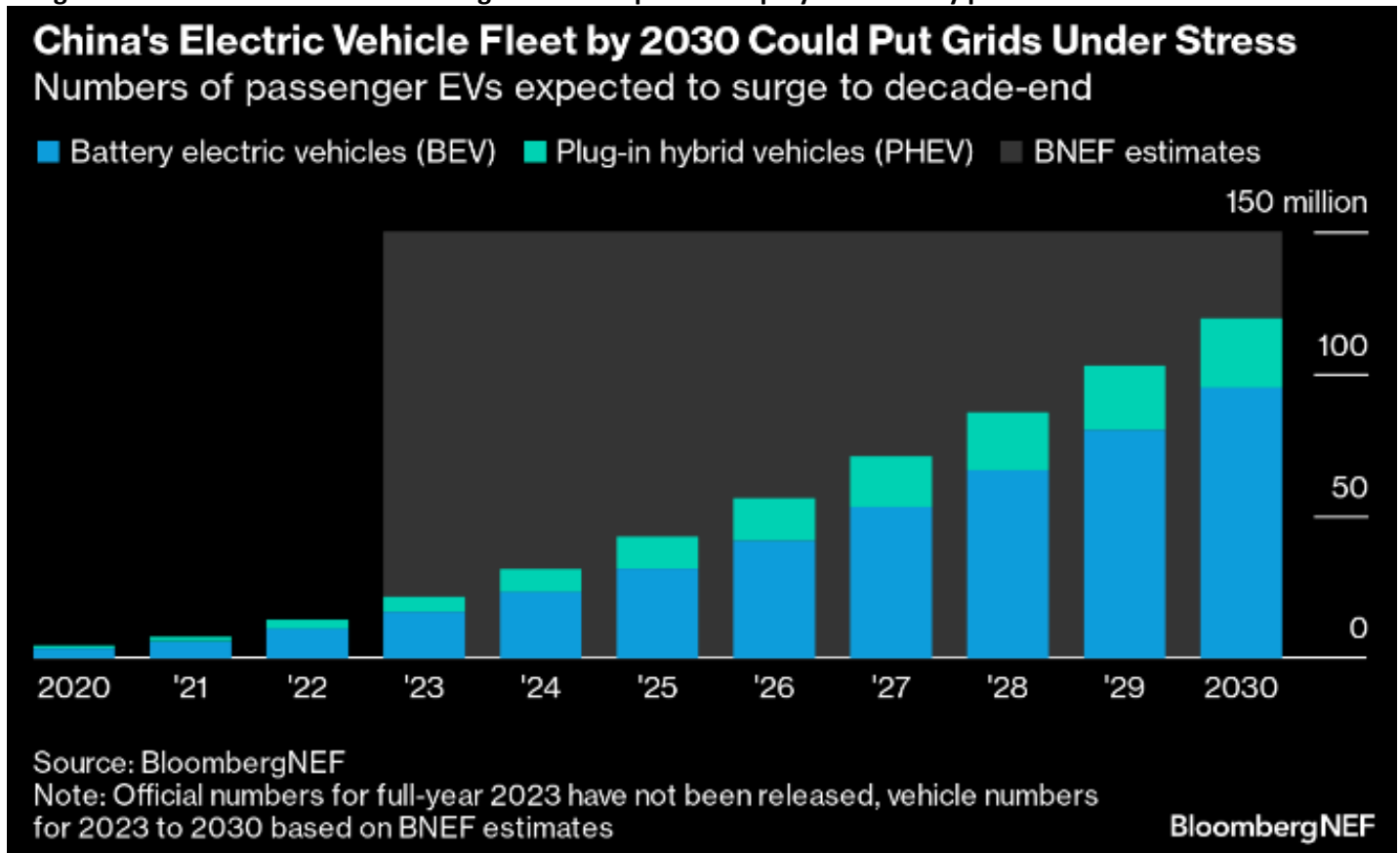
Source: Bloomberg, C-MACC Analysis, January 2024

Exhibit 9: [Tesla, China Worries Crush EV Stocks. Car Maker Forecasts Could Deliver Final Blow.](#) We highlight the transactional price trend for the Tesla Model 3 as estimated by China Auto Market (CAM) from the start of 2022 through the end of 2023 to consider with the news discussing Tesla global price cuts above.



Source: Bloomberg, China Auto Market, January 2024

Exhibit 10: This exhibit comes from a BloombergNEF article, highlighting that China’s recent rules on strengthening the integration of electric vehicles with the grid reflect a push to deploy EVs as a key power store.



Source: BloombergNEF, January 2024

Other Chemical Industry, Demand & Downstream News:

Leading indicators picking up: It is not surprising to see some optimism in a market early in the year and it is why we generally see better performance from materials stocks at the end of most calendar years in the hope that the new year sees an economic rebound. Compounding the ability to predict how much of any rebound is real in 2024 will be the inventory effect of 2023, and whether inventory decline stabilize and possibly reverse in 2024 or keep sliding. Unrest, such as that caused by the current issues in the Middle East, which are now extended to Iran and Pakistan, are having an impact on oil prices, although not as much as one might have expected, and any fear of escalating oil prices would cause an inventory rebuild at certain points in the supply chain, and this could drive demand for materials and chemicals higher. We have found January to be a poor predictor of annual performance over the many years that we have been covering the commodity world, with direction after the Chinese New Year generally a much better indicator of both underlying demand and sentiment. Meanwhile – Germany remains on the ropes.

➤ **Key Companies:** Apple, Bosch, Hyundai, Fastenal Company, Morgan Stanley

- [China's Economy Limpes Into 2024](#)
- [Consumers Start 2024 on Strong Footing After a Jolly Holiday](#)
- [Did China's Economy Really Grow 5.2% in 2023? Not All Agree](#)
- [For many in China, the economy feels like it is in recession](#)
- [Jobless Claims Plunge to 187,000, Lowest Since September 2022](#)
- [The Houthis, China and Other Dangers to Seaborne Commerce](#)
- [The Massive Economic Impact If China Invades Taiwan](#)
- [US Housing Starts Decline While Building Permits Pick Up](#)
- [US single-family housing starts plunge in December](#)
- [US weekly jobless claims fall to level last seen in Sept 2022](#)

Exhibit 11: [Activity Is Picking Up in 2024, But Severe Winter Weather Keeps Some Buyers and Sellers on the Sidelines](#)

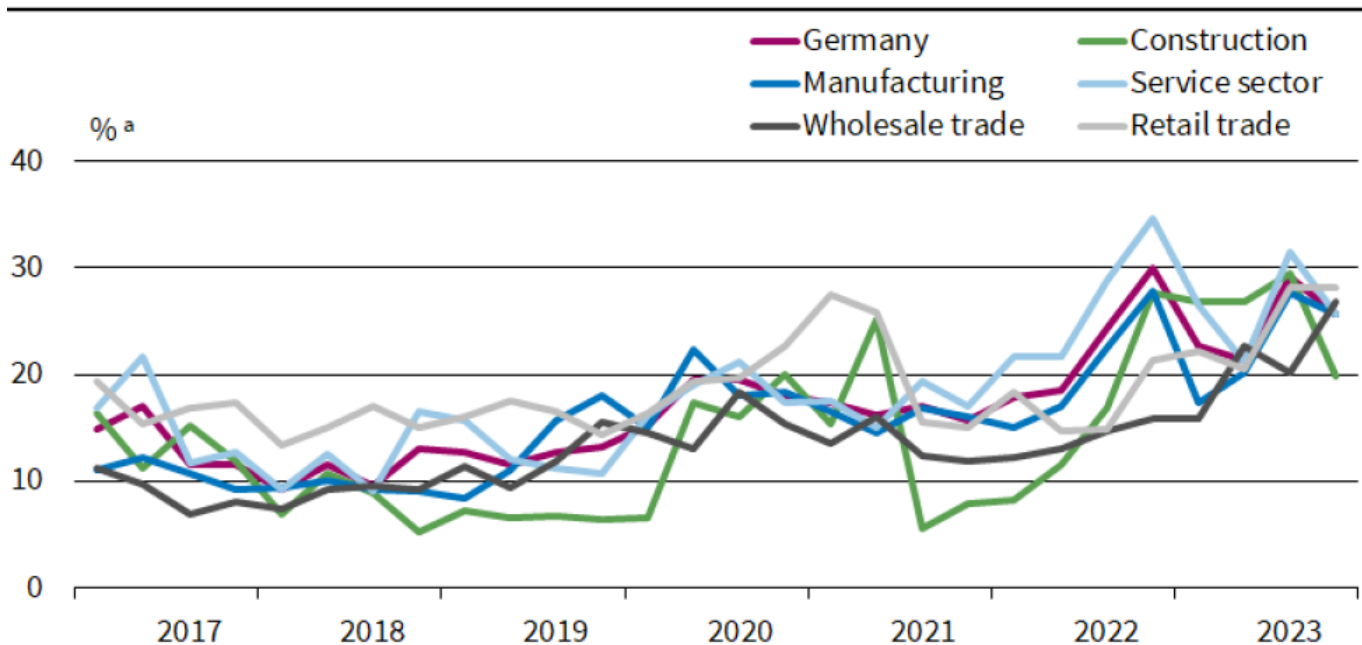
Leading indicators

Indicators of homebuying demand and activity				
	Value (if applicable)	Recent change	Year-over-year change	Source
Daily average 30-year fixed mortgage rate	6.88% (Jan. 17)	Up slightly from 6.78% a week earlier	Up from 6.07%	Mortgage News Daily
Weekly average 30-year fixed mortgage rate	6.66% (week ending Jan. 11)	Near lowest level since May	Up from 6.33%	Freddie Mac
Mortgage-purchase applications (seasonally adjusted)		Up 9% from a week earlier; up 8% from a month earlier (as of week ending Jan. 12)	Down 20%	Mortgage Bankers Association
Google searches for "home for sale"		Up 10% from a month earlier (as of Jan. 16)	Down 13%	Google Trends

Source: [Redfin](#), January 2024

Exhibit 12: [ifo Institute estimates it became "slightly easier" for German companies to obtain new lows in December 2023](#), though we flag that its constraint credit indicator remains toward the high end of its prior five-year range.

Credit Constraint Indicator



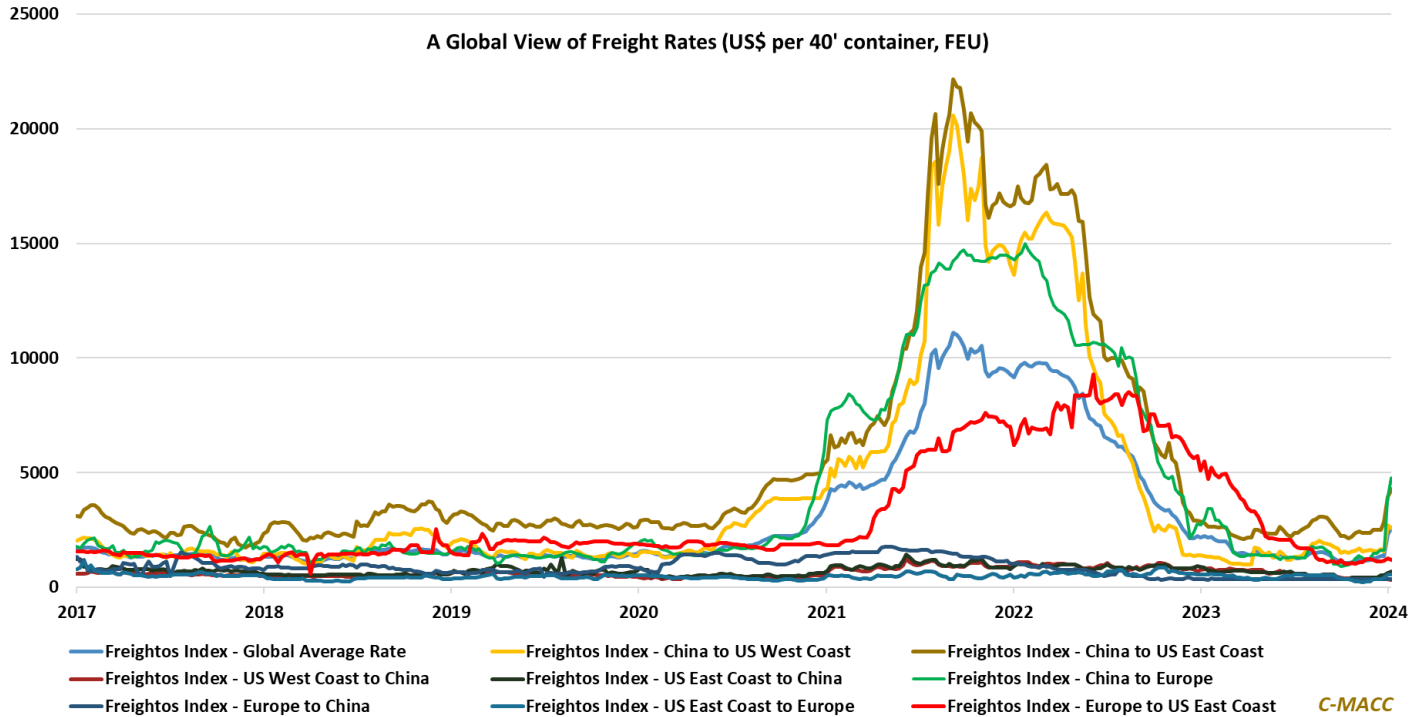
^a Proportion of companies surveyed that reported restrictive behavior by their banks.

Source: ifo Business Surveys, December 2023.

Source: [ifo Institute](#), January 2024

© ifo Institute

Exhibit 13: Freight rate movements show surging value from China to Europe and US East coast rates, while China to West Coast rates have fallen from recent highs. We also note appreciation in US East Coast to Europe rates, but this rate is ~20% of the China to Europe rate, as we link it partly to rising demand for US goods (chemicals, etc.).



Source: Bloomberg, C-MACC Analysis, January 2024

Other Relevant Headlines

Supply Chain, Commodity Chemicals, & Chemical Sector News:

- [China unearths million-tonne lithium deposit, heating up global resource race as Thailand also boasts big find](#)
- [Asian Paints' income rises on higher sales](#)
- [Bayer holds off on break-up to focus on management revamp for now -sources](#)
- [Chemical M&A sets up for rebound in 2024 as deal backlog bursts at seams](#)
- [Chevron Lummus Global awarded new licensing contract for HPCL's integrated hydrocracker and catalytic dewaxing unit](#)
- [Challenges for High-Cost Australian Miners Put BHP in Spotlight for Nickel Decision](#)
- [China's demographic crisis and the impact on global PP](#)
- [Elementis projects earnings growth in 2023, profit to beat estimates](#)
- [Extreme cold weather forces Enterprise to cease propylene production in Texas](#)
- [Formosa Plastics halts exports to Europe, Turkey due to Red Sea attacks](#)
- [Global PC and PP markets navigate turbulent waters amidst supply chain disruptions](#)
- [LyondellBasell Set to Invest \\$500 Million in Acquiring Stake in Saudi's NATPET](#)
- [Growing losses at Petro Rabigh trigger new Saudi stock exchange alert](#)
- [H.B. Fuller Reports Fourth Quarter and Fiscal Year 2023 Results](#)
- [Insteel Industries Reports First Quarter 2024 Results](#)
- [Invista Propylene Suspends Propylene Production in Texas](#)
- [Japan's December PVC output up on month, highest since January 2022](#)
- [Krahn Chemie acquires stake in Italian specialty chemicals distributor](#)
- [Nan Ya Plastics restarts BPA manufacturing operations in Mailiao](#)
- [MEGlobal increased February MEG ACP price by USD10/tonne](#)
- [Moda Midstream completes sale of Houston terminal stake to Exolum](#)
- [PentaCarbon Prepares for EU Sanctions by Investigating Alternatives to Russian Carbon Black](#)
- [Saudi Aramco beefs up venture capital arm to diversify from oil](#)

- [UK launches new strategy to protect, support supply of critical goods](#)
- [ZC Rubber Set to Construct Tire Manufacturing Facility in Indonesia](#)

Energy/Upstream:

- [Asia, Europe LNG Imports Likely To Survive Red Sea Chaos](#)
- [Austrian regulator plans to hike gas entry tariffs](#)
- [China Sets New Record for Coal Output in 2023](#)
- [German 2023 coal imports plunge 40% to record-low ahead of 2024 closures](#)
- [Lower NE Asian LNG spot prices spur winter activity](#)
- [Mild Late January Pattern Keeps Pressure on Natural Gas Futures Ahead of EIA Print](#)
- [Russia's Oil Freight Costs Decline Amid Sanctions, Weather Challenges, and Red Sea Incidents](#)
- [Thailand orders traders to suspend diesel exports](#)
- [The Great Recession's Impact on Spain's Natural Gas Market Still Ripples Through Global LNG Trade](#)
- [Red Sea ship diversions boost bunker demand, prices in Africa, Mediterranean](#)
- [Red Sea crisis prompts Asia to rethink oil policy, but near-term supplies intact](#)
- [The World's Coal-Fired Power Generation Hit a Record High in 2023](#)
- [Ukraine, EU must clarify position on future of Russian gas transit – former GTSOU CEO](#)
- [US LNG exports round the Cape of Good Hope remain elevated in Jan: S&P Global data](#)

Sustainability, Clean Energy, Recycling & ESG:

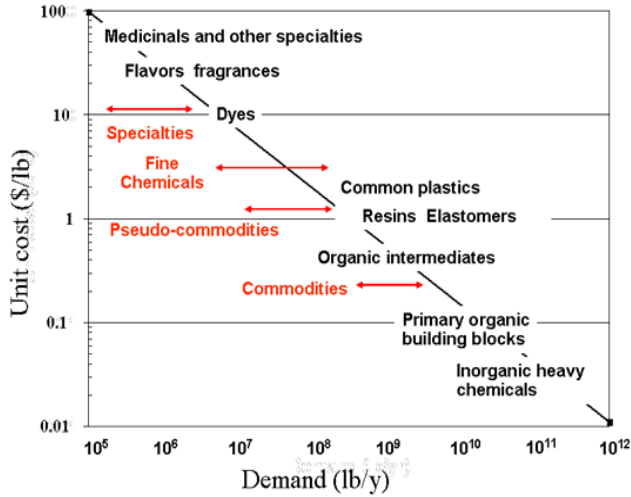
- [BASF, Heraeus start operations of precious metals recycling JV in China](#)
- [Australia pledges \\$46mn for Bell Bay hydrogen hub](#)
- [BlackRock stresses financial strength over ESG in company calls](#)
- [BMW taps humanoid startup Figure to take on Tesla's robot](#)
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Ex. 14: Specialty versus commodity



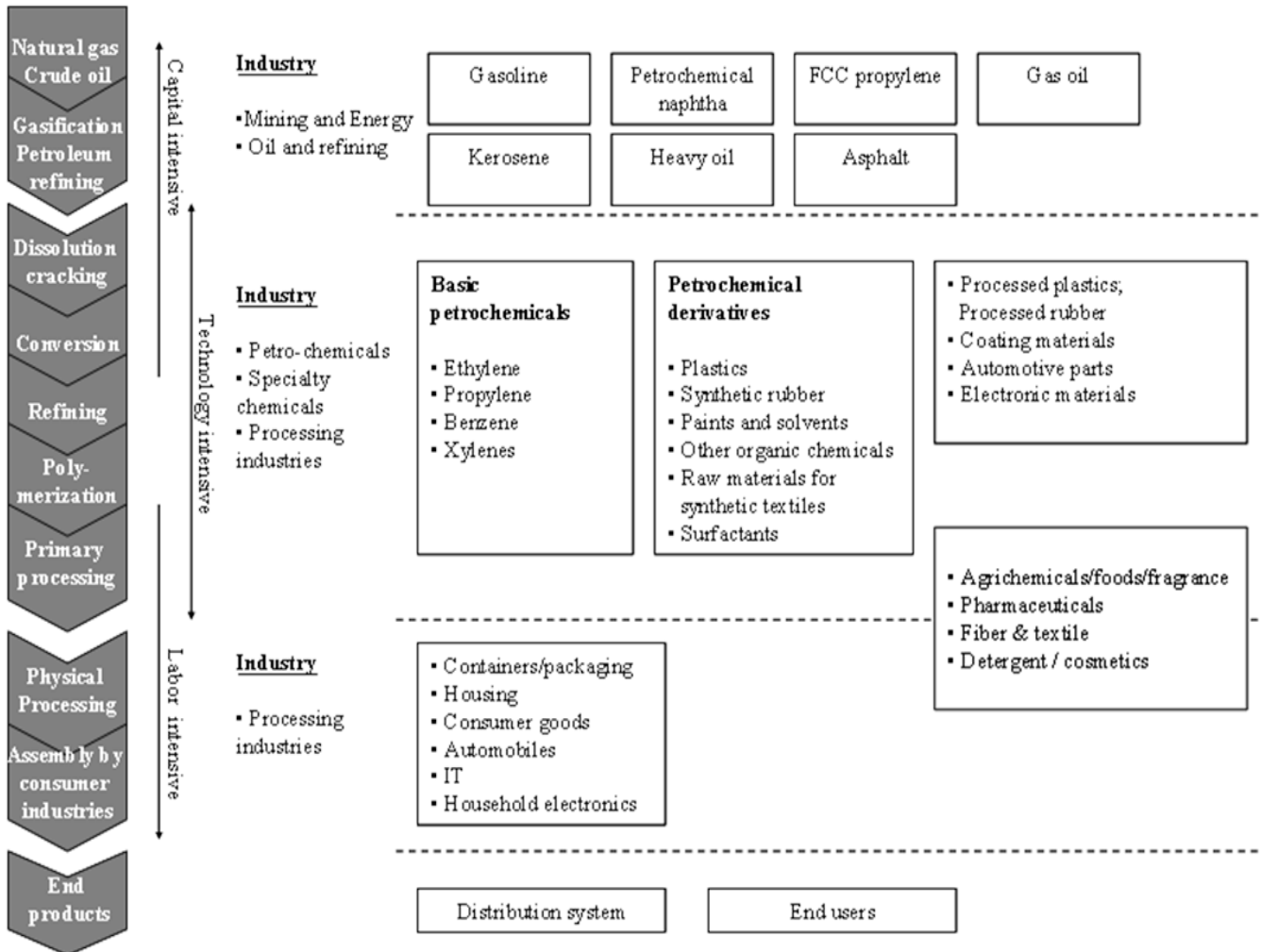
Source: SRI consulting, C-MACC, January 2024

Ex. 15: Chemical industry characteristics

	BULK CHEMICALS	FINE CHEMICALS	SPECIALTY CHEMICALS
Product life cycle	Long	Moderate	Short/moderate
# of products	00's	000's	0000's
Product volumes	>10,000t/y	<10,000t/y	highly variable
Product prices	<5US\$/kg	>5US\$/kg	>10US\$/kg
Product differentiation	none	very low	high
Value added	low	high	high
Capital intensity	high	moderate	moderate/low
R&D focus	process improvement	process development	application/product
KEY SUCCESS FACTORS			
• cost	✓ ✓ ✓	✓ ✓	✓
• technical service	-	✓ ✓ ✓	✓ ✓ ✓
• links with customer	-	✓ ✓	✓ ✓ ✓

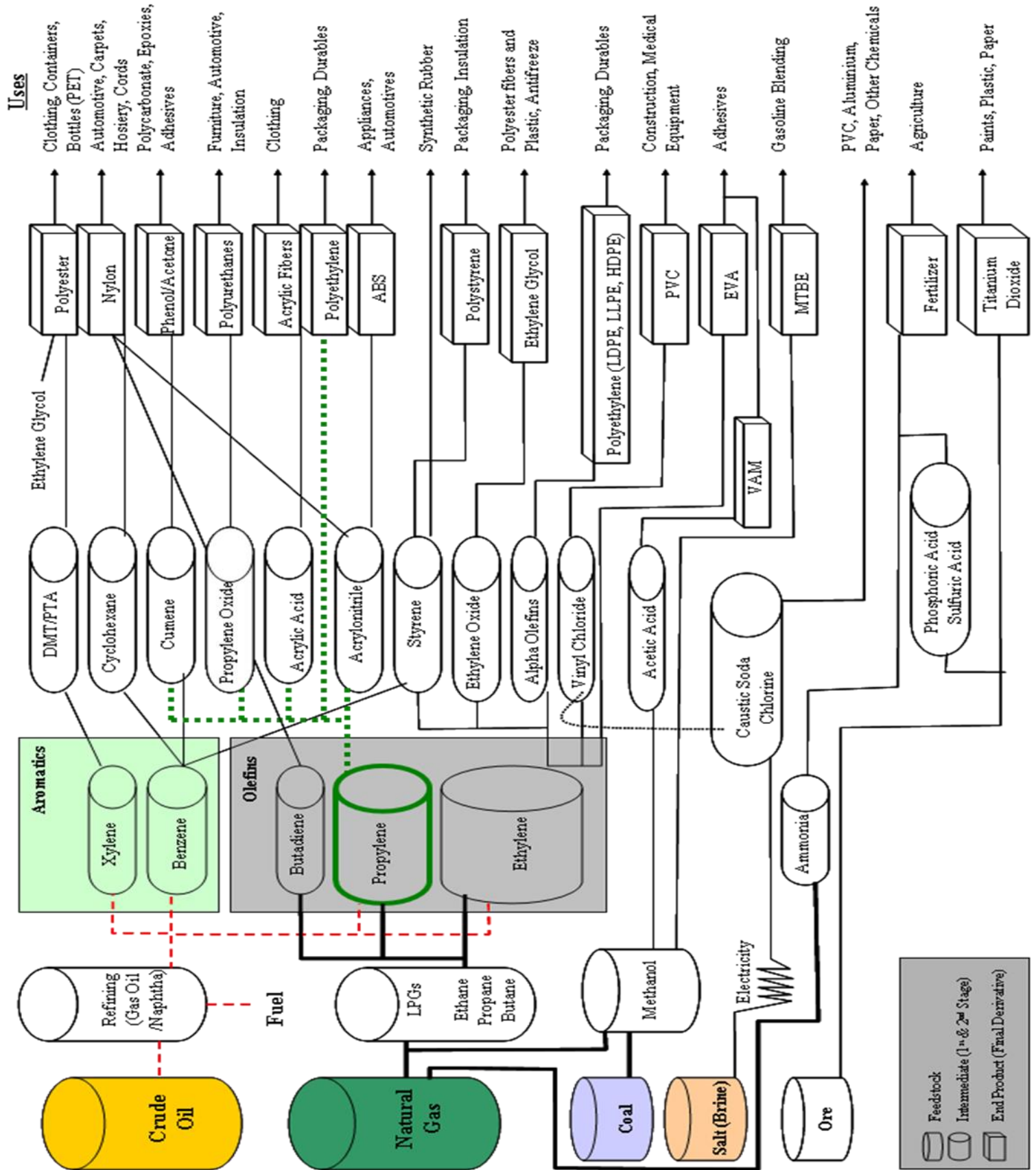
Source: C-MACC, January 2024

Ex. 16: Chemical industry and its upstream and downstream industries



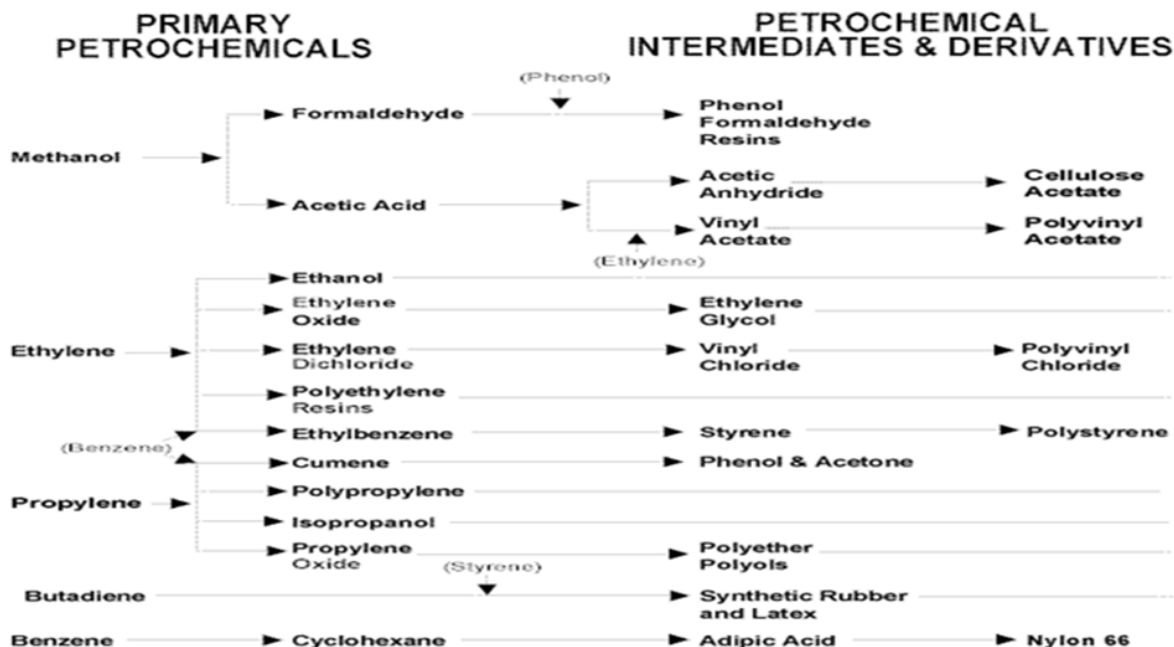
Source: C-MACC, January 2024

Ex. 17: Petrochemical Industry Production Flow – a look at the commodities and their end use



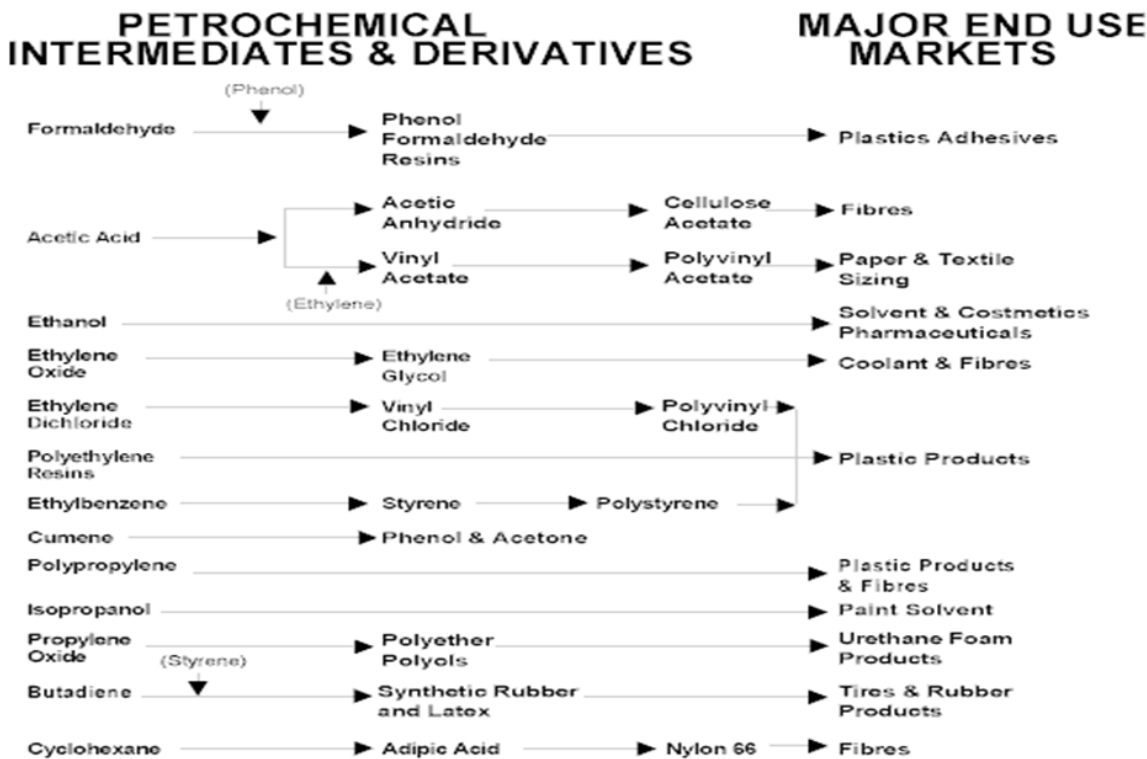
Source: C-MACC, January 2024

Ex. 18: The conversion of petrochemicals to primary intermediates/derivatives



Source: C-MACC, January 2024

Ex. 19: Intermediates & derivative conversion to end markets



Source: C-MACC, January 2024

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