Global Energy Weekly

Life in plastic, it's fantastic

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Commodities
Global

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See Team Page for List of Analysts

See Exhibit 51 for list of acronyms

Energy demand and GDP are linked, but substitution is key

As a key driver of productivity, global energy usage remains very tightly intertwined with economic activity, exhibiting an R^2 of 80% and a beta to GDP of ~1. Put differently, the global economy needs about 3% more energy to meet a 3% growth expectation. Still, energy input sources keep changing as substitution and efficiency continue to displace thermal fuels with cleaner and/or electrified alternatives. While recent shocks have altered historical energy demand trends, global oil demand hit a record of ~103mn b/d in 3Q23. The 2020 COVID-19 demand contraction to 92mn b/d in 2020 was offset by three recovery years where demand grew 3.3mn b/d YoY on average. Looking forward, we expect total oil consumption levels to reach 107mn b/d by 2029, adding net growth of about 3.7mn b/d over the next six-year period. Still, at 600k b/d YoY on average, oil demand growth into the end of the decade should be a fraction of the rate observed in the past three years. What will drive incremental oil consumption?

Plastics and airline oil demand keeps growing into 2040s

While we see a decelerating trend, we now believe that oil demand will likely continue to grow modestly to 2030 as gasoline lingers on and substitution trends ease. A mild slowdown in EV sales growth points to modestly better prospects for light ends. Global oil demand growth into 2029 will be most pronounced in segments that are hard to decarbonize such as airlines and chemical companies. The aviation sector will try to shift to more renewables such as SAF, but these alternatives are very expensive and jet fuel demand will remain a key petroleum driver supporting distillates. Marine transportation will also expand into the next decade, in our view, although alternative shipping fuels like LNG and methanol will make a small dent. Petrochemical feedstock consumption will likely remain the thickest oil market pillar as demand will likely expand into 2050. Life in plastic, it's fantastic, it seems.

Demand expands til 2030, but growth rates have peaked

When breaking down demand region by region, OECD consumption will likely contract by 1.5mn b/d to 44mn b/d by 2029 on aging populations, increased efficiencies, and substitution. Sluggish income growth could play a role too. Instead, emerging markets will keep oil demand on a growth path, although Chinese oil consumption should peak around 2030 as surging EV sales trigger a big slowdown in domestic fuel demand. Meanwhile, India will remain the fastest growing major petroleum market as income per capita catches up. At any rate, the final destination towards net zero emissions does not change, as renewable energy prices drop to become competitive with thermal fuel alternatives. Following a 2.3mn b/d or 2.3% expansion in 2023, oil consumption will likely continue to grow into 2030, but the rate of oil demand growth has likely peaked for good.

Exhibit 1: BofA Commodity Research Themes and Outlook
Key takeaways

	View	Recent reports
Macro outlook	■ Our economists see world GDP rising 3% in 2023 and expanding by 2.8% in 2024.	
WTI and Brent crude oil	■ We project Brent and WTI to average \$80/bbl and \$75/bbl, respectively, in 2024. ■ The global oil balance should remain in a mild surplus during 2024, as OPEC+ withholds more supply from the market to counteract slowing demand growth ■ We forecast global demand growth of 2.3mn b/d YoY in 2023 and 1.2mn b/d in 2024. ■ Non-OPEC supply should grow roughly 2.24mn b/d YoY in 2023 and 1.35mn b/d in 2024. ■ We project total US crude and NGL supply to rise 1.5mn b/d in 2023 and 700k b/d in 2024. ■ OPEC crude oil supplies are set to fall 470k b/d in 2023 and 260k b/d in 2024 as OPEC+ actively manages balances	• Can (geo)politics Trump fundamentals? 04 January 2024 • The grind of the oil bulls 26 September 2023 • Money breaks oil's back 08 May 2023 • OPEC+'s whatever it takes moment 05 April 2023 • Global Energy Paper: Medium-term oil outlook 26 February 2023
Atlantic Basin oil products	■ Refined product markets face risks from OPEC+ cuts, a looming recession, and the pace of global refining capacity growth. ■ We forecast RBOB-Brent to average \$13/bbl in 2024, and we see ULSD-Brent cracks averaging \$26/bbl over the same period. ■ OPEC+ cuts, rising complex refining capacity, lower gasoline and diesel cracks create upside for 3.5% fuel oil cracks, which we see averaging -\$12/bbl in 2024.	• Waiting for Dangot(e) 31 October 2023 • Diesel weasels out of a cyclical downturn 29 August 2023 • In the fuel oil market, high sulfur is king 31 July 2023
US natural gas	■ US gas supply and demand growth should hit 1.6Bcf/d and 2.6Bcf/d YoY in 2024, pushing stocks to 3.95Tcf by October. ■ We forecast US Henry Hub natural gas prices will average \$3/mmbtu in 2024	• US nat gas rollercoaster nears the bottom 17 February 2023
LNG	■ LNG supply growth is manageable from historical view at 10MMT in 24 and 16MMT in 25, leaving demand to dictate future price path ■ JKM and TTF should average \$15/MMBtu and €50/MWh in 2024, but they could easily hit \$25/mmbtu or €100/MWh on cold weather	• Liquid gas can float and fly. So can oil 17 October 2023 • LNG is now a buyer's market 17 April 2023
Thermal coal	■ Seaborne coal prices pulled back on softer balances. Yet, China has come back in earnest, more than doubling thermal coal imports ■ We are constructive in 2024 on strong Asian demand and declining Russian supply	• China coal floors global gas 05 September 2023 • King coal loses its crown 31 March 2023

Source: BofA Global Research estimates

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Exhibit 2: BofA Global Research Commodity Price Forecasts
(period averages)

	units	1Q23F	2Q23F	3Q23F	4Q23F	2023F	1Q24F	2Q24F	3Q24F	4Q24F	2024F
WTI Crude Oil	(\$/bbl)	76	74	82	82	**78**	73	75	77	75	**75**
Brent Crude Oil	(\$/bbl)	82	78	86	86	**83**	78	80	82	80	**80**
US NY Harbor ULSD (HO) Cracks to Brent Crude Oil	(\$/bbl)	41	25	40	37	**36**	30	25	25	25	**26**
US RBOB Cracks to Brent Crude Oil	(\$/bbl)	23	31	29	7	**22**	11	21	14	7	**13**
NWE Low Sulphur Gasoil Cracks to Brent Crude Oil	(\$/bbl)	31	17	32	29	**27**	23	20	20	19	**21**
NWE Eurobob Cracks to Brent Crude Oil	(\$/bbl)	15	22	27	7	**18**	5	14	10	3	**8**
NWE 1% Residual Cracks to Brent Crude Oil	(\$/bbl)	-13	-8	-3	-7	**-8**	-6	-5	-5	-5	**-5**
NWE 0.5% Residual Cracks to Brent Crude Oil	(\$/bbl)	2	2	4	3	**3**	2	2	2	2	**2**
NWE 3.5% Residual Cracks to Brent Crude Oil	(\$/bbl)	-23	-11	-4	-14	**-13**	-13	-12	-12	-12	**-12**
US Natural Gas	(\$/MMBtu)	2.74	2.32	2.66	3.15	**2.72**	2.90	2.50	3.00	3.60	**3.00**
Thermal coal, Newcastle FOB	(\$/t)	253	160	147	145	**176**	148	148	151	153	**150**
Aluminium	\$/t	2,401	2,260	2,160	2,250	**2,268**	2,250	2,500	2,750	2,750	**2,563**
Copper	\$/t	8,941	8,461	8,367	8,000	**8,442**	8,000	8,500	8,750	9,250	**8,625**
Lead	\$/t	2,137	2,118	2,171	2,200	**2,156**	2,000	2,000	2,000	2,000	**2,000**
Nickel	\$/t	25,973	22,277	20,392	18,500	**21,786**	18,500	18,500	19,000	19,000	**18,750**
Zinc	\$/t	3,132	2,527	2,435	2,500	**2,648**	2,500	2,500	2,250	2,250	**2,375**
Gold	\$/oz	1892	1977	1927	1900	**1924**	1950	1950	2000	2000	**1975**
Silver	\$/oz	23	24	24	23	**23**	23	23	24	24	**23**
Platinum	\$/oz	995	1,027	932	950	**976**	1,000	1,000	1,100	1,100	**750**
Palladium	\$/oz	1,568	1,445	1,254	1,250	**1,379**	900	800	700	600	**750**

Source: BofA Global Research estimates

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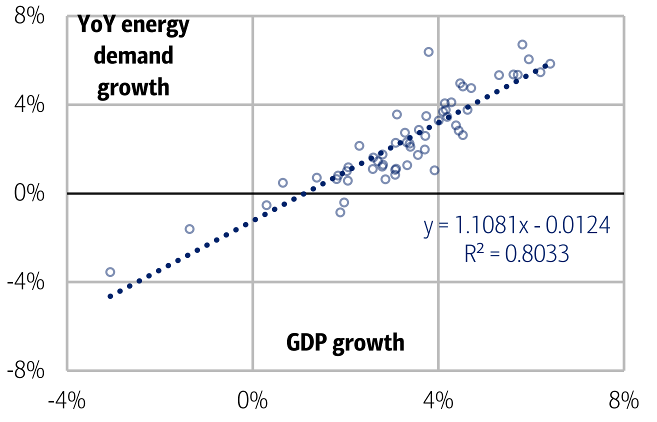
Energy demand and GDP remain closely interlinked…

As a key driver of productivity, global energy consumption remains very tightly intertwined with economic activity (Exhibit 3), exhibiting an R^2 of around 80% and a beta to GDP of ~1. Energy is often defined as "the ability to do work", so it should not be surprising that energy and GDP go hand-in-hand, with other key components of economic activity being labor, capital and technology. Still, not every energy source has a tight relationship with economic activity due to rigid prices structures, substitution effects, and efficiency dynamics (Exhibit 4). Being the most flexible energy source, oil has the tightest relationship to GDP followed by gas, while renewables have the loosest.

Exhibit 3: World GDP and energy demand growth (1966-2022)
As a key driver of productivity, global energy consumption remains very tightly intertwined with economic activity



Source: Energy Institute, Bloomberg

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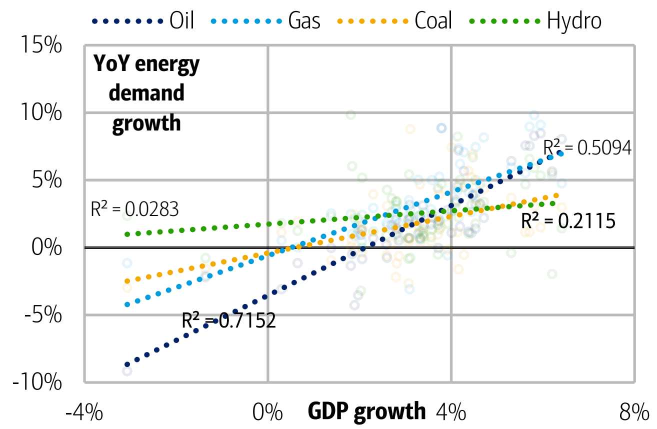
Exhibit 4: World GDP and energy demand growth by fuel (1966-2022)
Still, not every energy source has a tight relationship with economic activity due to substitution and efficiency dynamics



Source: Energy Institute, Bloomberg

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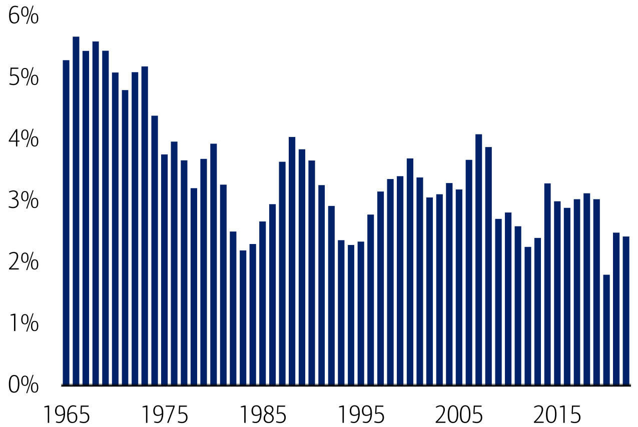
… and slower economic trends point to softer use ahead

What does this mean in the context of the current economic situation around the world? Looking back and looking forward, we note that global GDP trends should materially slow down over the coming decade. World income growth averaged 5% in 1965-75 and more recently approached 3% since 2015 (Exhibit 5). As global growth continues to ease, we expect energy demand trends to slow down too. Note that the slowing rate of growth in world GDP is mostly due to weaker China and Emerging Asia trend growth of around 5% after almost three decades averaging 8-10% (Exhibit 6), while the rest of the world has converged towards steady state growth.

Exhibit 5: 5-year moving average of real global GDP growth
Looking back and looking forward, we note that global GDP trends should materially slow down over the coming decade...



Source: World Bank

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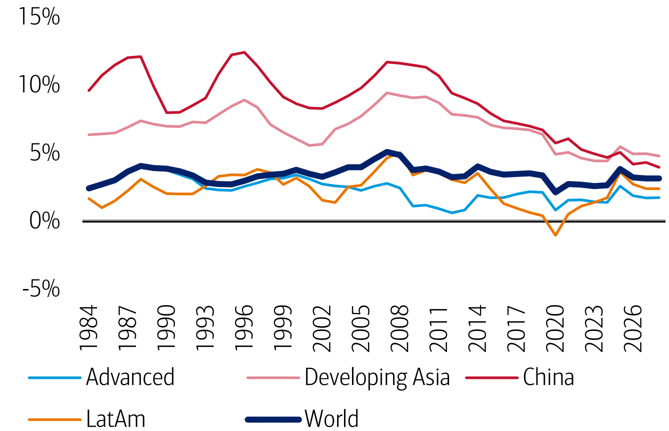
Exhibit 6: 5-year moving average of real GDP growth and IMF projections by aggregate
... due to slower China trend growth of 5% after almost three decades averaging 10%, while the rest of the world including emerging economies converge towards steady state growth



Source: IMF

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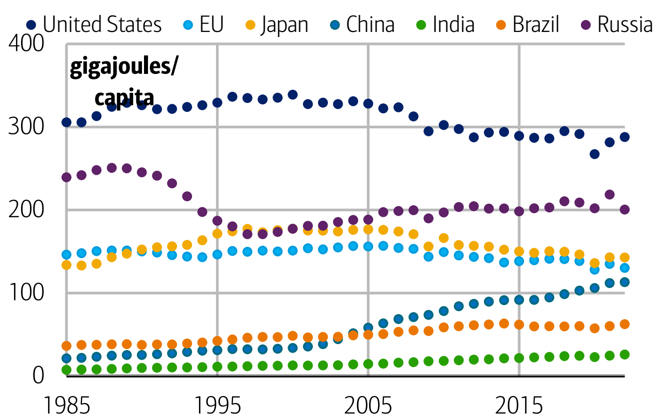
Importantly, energy input sources are also changing as...

On a country-by-country basis, we note that the US remains one of the largest per capita consumers of energy in the world (Exhibit 7). Although demand has fallen roughly 15% from the peak, consumption has been averaging 300GJ per capita in the past year or so. The EU and Japan have experienced similar trends, with energy consumption per head being roughly flat for decades. In contrast, China and India have seen a very strong pick up in energy consumption per head in recent decades. The average American is also a large, albeit declining, consumer of oil in aggregate, but China has ramped up consumption as Japan pulled back (Exhibit 8).

Exhibit 7: Primary energy consumption per capita
On a country-by-country basis, we note that the US remains one of the largest per capita consumers of energy...



Note: EU consumption excludes Slovenia prior to 1990
Source: Energy Institute, World Bank, BofA Global Research

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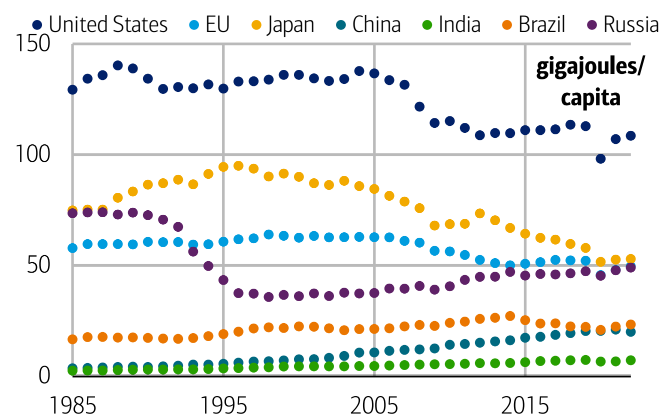
Exhibit 8: Oil consumption per capita
... as well as one of the biggest consumers of oil in aggregate, but China has increased very quickly to approach Japan



Note: EU consumption excludes Slovenia prior to 1990
Source: Energy Institute, World Bank, BofA Global Research

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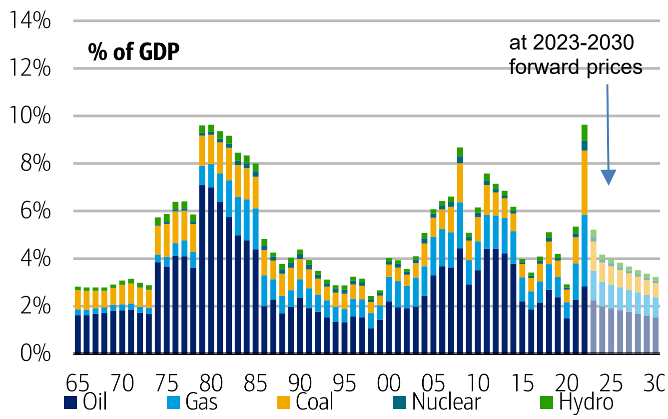
... substitution and efficiency will keep displacing oil burn

Given the strong relationship between energy consumption and GDP, as well as the tight relationship between GDP and demographics, it is safe to say that economic activity and population growth into 2050 will likely keep tilting global energy consumption higher for the next two and a half decades. The two big questions are how much energy demand will grow and how the energy mix will look like in the context of the transition. One crucial input is the energy consumption expenditure as a share of GDP. We note that costs have normalized from the exceptional levels seen in 2022 (Exhibit 9), with thermal fuel demand poised to see a shrinking share due to the very high prices and the push into renewables. In fact, we have already seen a major rotation in energy inputs into GDP in the past five years as a result of COVID-19 and the Ukraine war (Exhibit 10).

Exhibit 9: Primary energy to nominal GDP ratio - World
Global energy consumption expenditures as a share of GDP have normalized from the exceptional levels seen in 2022



Source: Bloomberg, IMF, BP, IEA, Energy Institute, BofA Global Research estimates

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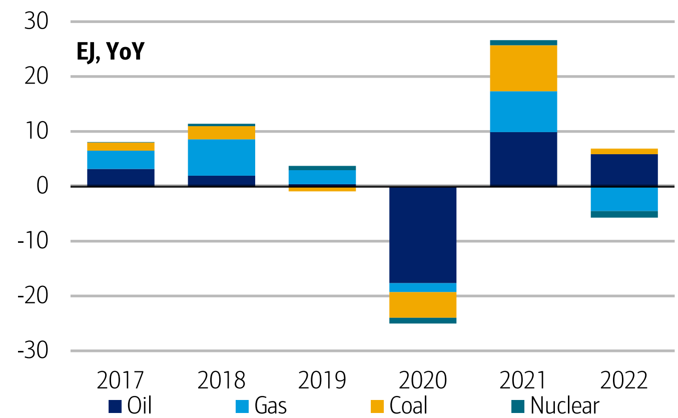
Exhibit 10: Primary energy consumption by fuel
Still, we have seen a major rotation in energy inputs into GDP in the past five years as a result of Covid-19 and the Ukraine war



Source: Energy Institute

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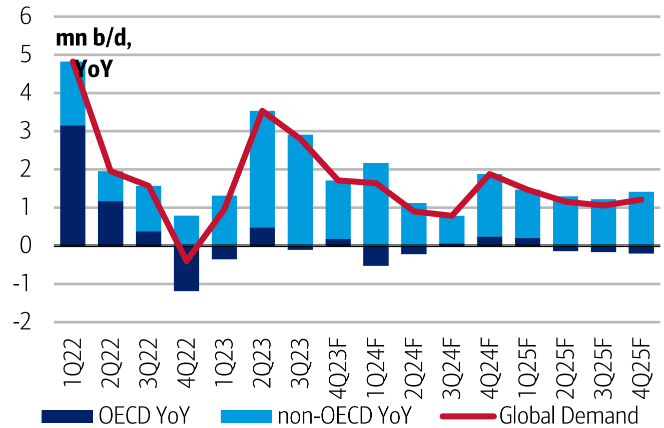
Still, oil demand is back to record levels after COVID-19…

While prior energy demand trends have shifted as a result of recent shocks, we note that global oil demand reached a record of 103mn b/d in 3Q23 as the 2020 COVID-19 contraction to 92mn b/d was offset by three years of break-neck oil demand growth in a post-pandemic recovery that has averaged 100mn b/d in 2021-23. Looking forward, we expect growth to continue in the medium term (Exhibit 11) with total oil consumption reaching 107mn b/d by 2029, adding net growth of about 3.7mn b/d over the next six-year period on average vs 2023 levels (Exhibit 12). This means that, at 600k b/d YoY, the average demand growth rate into the end of the decade will be a fraction of the past three years.

Exhibit 11: Quarterly oil demand growth
Global oil demand reached a record of 103 mn b/d by 3Q23 and we expect growth to continue into the coming years...



Source: IEA, BofA Global Research Estimates

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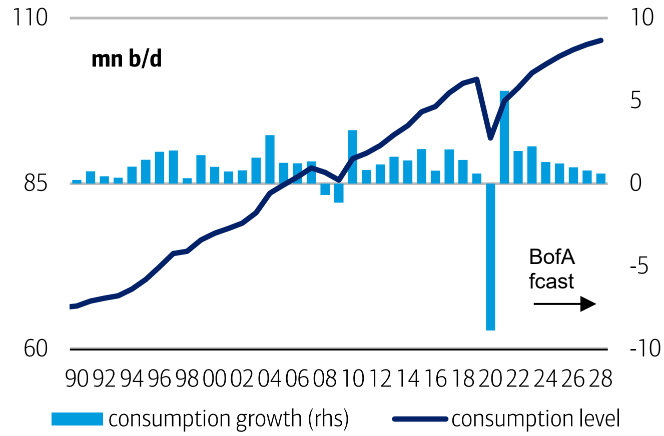
Exhibit 12: Oil consumption
... with total oil consumption levels reaching ~107mn b/d by 2029, an increase of roughly 5mn b/d versus 2023 levels



Source: IEA, BofA Global Research Estimates

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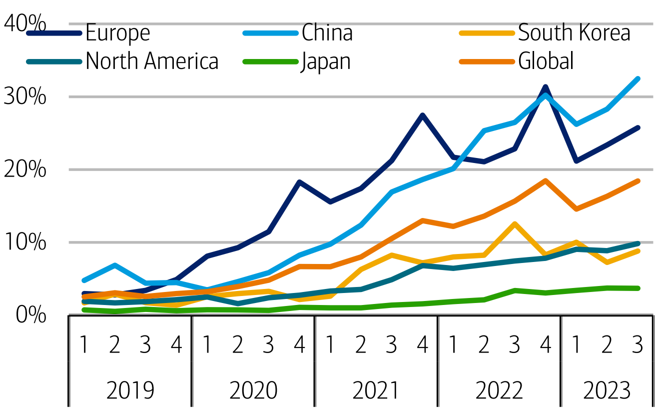
... and slower EV sales point to less substitution near term...

While EV sales have surged in recent years and now make up an average of 18% of total vehicle sales around the world as of 3Q23 (Exhibit 13), a number of factors have played into a modest slowdown in the rate of growth of new EVs entering the global market (Exhibit 14). Still, EVs as a share of total vehicles sold is now at around 26% in Europe and 33% in China, while laggards Korea and Japan have seen a very large increase in the sales of ultra-fuel-efficient hybrids in recent decades. At any rate, we believe the reported deceleration in EV sales does not signal a major change in trend but rather a "speed bump" in the transition towards electric transportation.

Exhibit 13: EV share of new passenger vehicles sales
While EV sales have surged in recent years and now make up an average of 18% of total vehicle sales around the world...



Source: BloombergNEF

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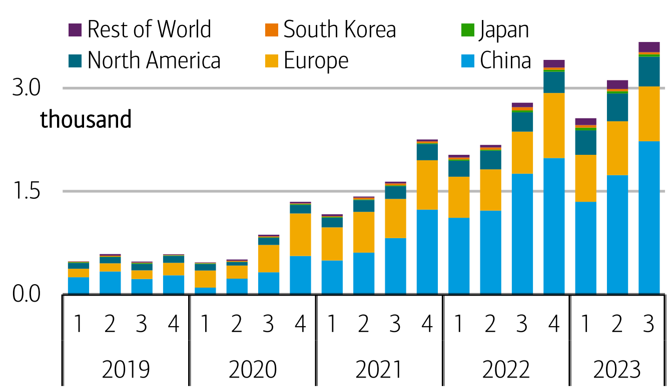
Exhibit 14: Global passenger EV sales by region
... a number of factors have played into a modest slowdown in the rate of growth of new EVs entering the global market



Source: BloombergNEF

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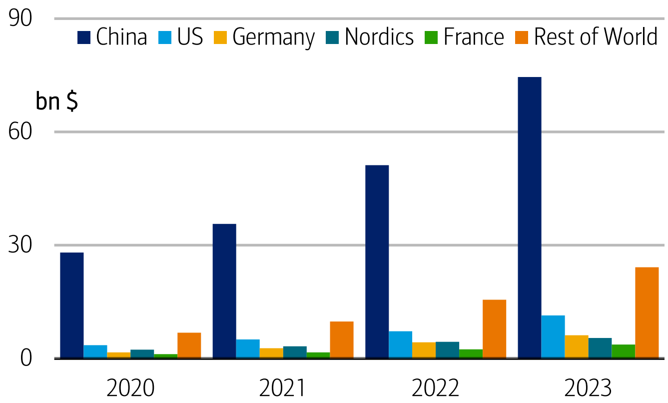
... as EV charging infrastructure and grid spending lags

A major factor that could be holding back EV adoption is the fact that charging infrastructure for electric vehicles has been lagging quite a bit across many markets, although not in China (Exhibit 15) where car sales have continued to grow. Similarly, grid spending remains a major bottleneck in the adoption of renewable technologies to electrify the economy away from fossil fuels (Exhibit 16). The good news for both electrification trends and EVs is that the price of many key energy-transition minerals for batteries has collapsed, with lithium hydroxide prices rolling off 84% from a high of $85k/MT just over a year ago to just $13k/MT today (see Geopolitics blows up lithium).

Exhibit 15: EV charging infrastructure investment
Charging infrastructure for electric vehicles has been lagging quite a bit across many markets, although not in China



Source: BloombergNEF

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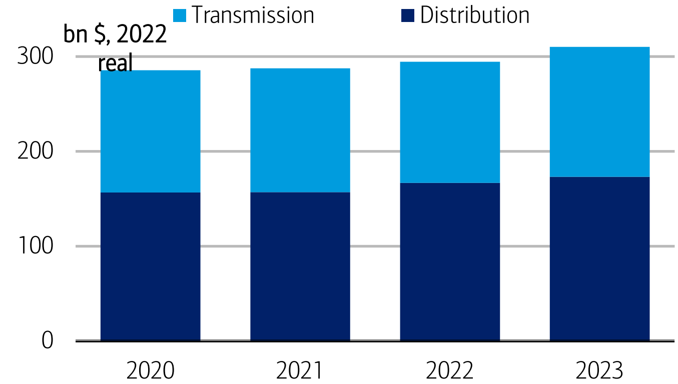
Exhibit 16: Global expenditure in power grids by category
Similarly, grid spending remains a major bottleneck in the adoption of renewable technologies to electrify the economy away from fossil fuels



Source: BloombergNEF

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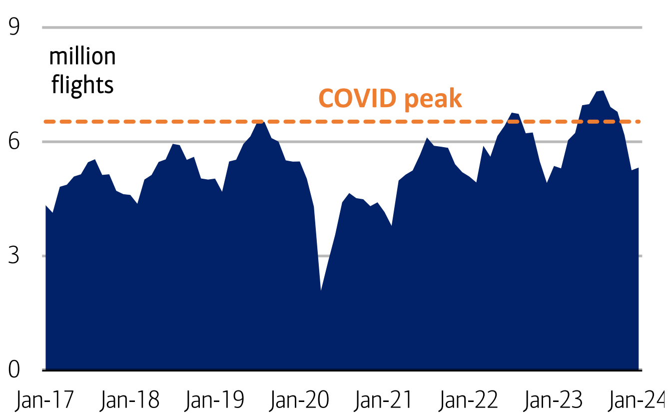
The aviation sector tries to shift to more renewables…

With falling raw materials prices key to the electrification of transport, the costs of batteries should follow through and make EVs more affordable. Still, some segments of mobility will be quite hard to decarbonize and the air transportation sector stands out in that regard. While COVID-19 put a major dent in global aviation demand growth, air travel continues to recover globally (Exhibit 17) with international air travel in China being perhaps the biggest laggard across all major airline segments (Exhibit 18). The robust services PMIs and a strong consumer backdrop, coupled with lower rates in EMs and soon in DMs, should further boost air travel.

Exhibit 17: Total global flights each month
COVID-19 put a major dent in global aviation demand growth, but air travel continues to recover across all regions…



Source: Bloomberg

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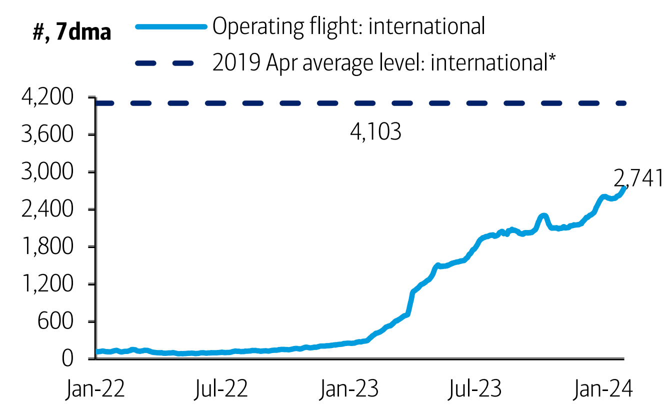
Exhibit 18: China's operating flights: international
… with international air travel in China being perhaps the biggest laggard across all major airline segments



Source: Wind, BofA Global Research GEM Economics Asia | China, Note: * benchmark of pre-COVID level reset based on the Apr's press conference by CAAC, data as of Jan 30

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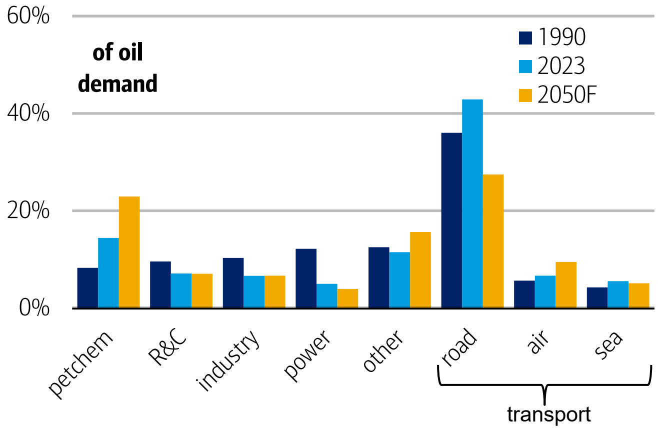
… but jet fuel demand will remain a key petroleum driver…

While we have argued that air travel trends will improve in the short-run, the long-term outlook for the industry is also strong and substitution and efficiency do not play as much of a role here. Across the various oil demand sectors that will continue to grow into 2050, we would highlight aviation and the petrochemical sector (Exhibit 19), with other uses in transportation and industry falling by the wayside as new technology leads to reductions in thermal fuel usage to achieve Net Zero emissions targets. Still, the middle distillate complex still has plenty of room to grow, as we believe SAF and other bio/renewable fuels will grow relatively slowly (Exhibit 20) and batteries are not very effective for airlines or large industrial equipment.

Exhibit 19: Evolution of global oil demand
Across the various oil demand sectors that will continue to grow into 2050, we would highlight aviation and petchems



Source: IEA, BofA Global Research estimates

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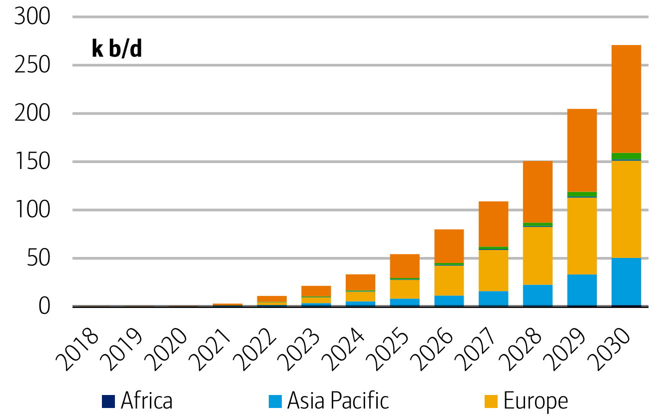
Exhibit 20: SAF consumption by region
The middle distillate complex still has plenty of room to grow, as we believe SAF and other bio/renewable fuels will grow relatively slowly



Source: BNEF

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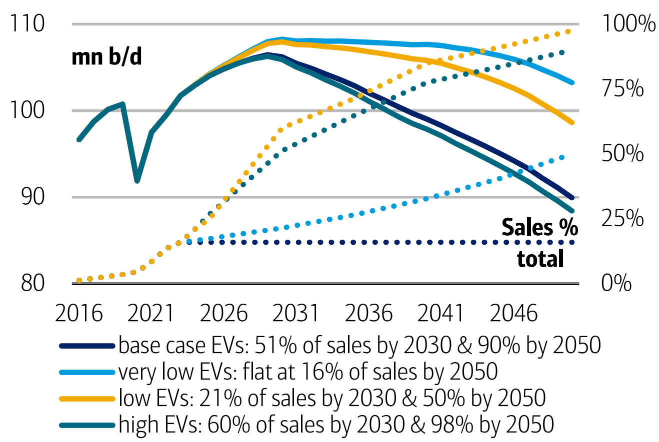
... supporting distillates, as gasoline lingers on a bit longer

In this regard, the storyline for petroleum product fuels has not changed much in recent years. Petrochemical feedstock demand stays robust, together with distillates, as gasoline and residual fuels at the bottom of the barrel suffer. As it relates to light-ends (NGLs, naphtha, gasoline) representing 47% of the oil market today, we expect a shift away from ICE vehicles into EVs to start biting into global gasoline demand by the end of the decade (Exhibit 21) and eventually pick up speed into 2050 when the majority of the stock of vehicles in circulation becomes electric. For the next two or three years, however, we see some support. In Europe, demand for gasoline has picked up as a result of a shift away from diesel passenger vehicles (Exhibit 22), a trend that has some room to run.

Exhibit 21: Oil demand under EV scenarios
We expect the shift away from ICE vehicles into EVs to start biting into global gasoline demand by the end of the decade



Source: IEA, BofA Global Research estimates

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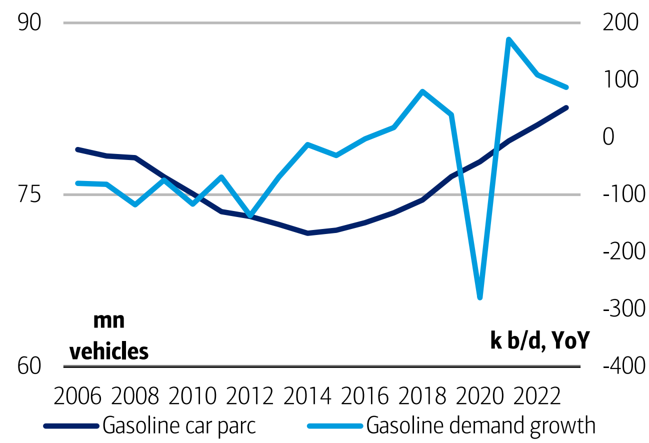
Exhibit 22: Gasoline demand growth in Europe
In Europe, demand for gasoline has picked up in recent years as a result of a shift away from diesel passenger vehicles



Source: IEA, Woodmac

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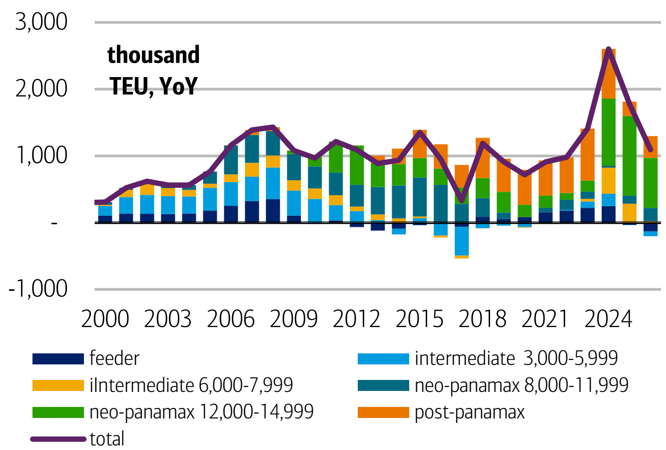
Marine transportation will still expand in the next decade

The marine transportation sector sits right in between the airline sector and the passenger road vehicle sector in terms of the difficulty associated with decarbonization. There are alternative fuels that will come in to displace IMO compliant very low sulfur fuel (VLSFO), but the shift to other fuels like LNG or methanol will be gradual. Looking at the order book, we note a continued expansion in the global container fleet supporting fuel demand in the years ahead (Exhibit 23) and we expect oil bunker fuel demand to start flatlining sometime in the 2030s (Exhibit 24). Another factor that could push marine fuel demand lower would be a reduction in fossil fuel exports, as wet tankers remain a large part of the marine transport feel.

Exhibit 23: Containership fleet growth by ship type
Looking at the order book, we note a continued expansion in the global container fleet supporting fuel demand in the years ahead



Source: Clarksons, BofA Global Research estimates

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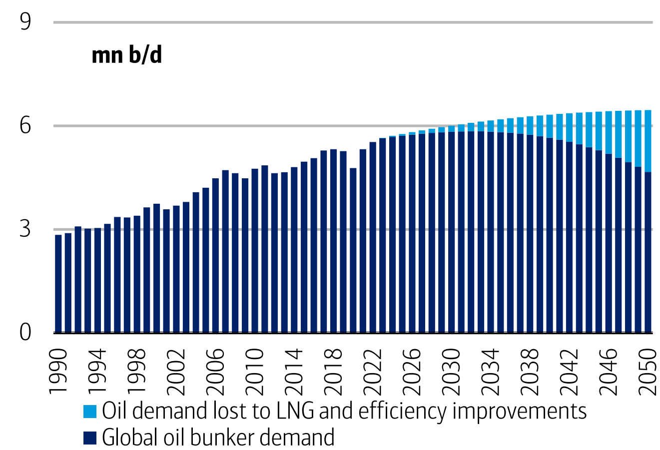
Exhibit 24: Global oil bunker demand
... but we still expect oil bunker fuel demand to start flatlining sometime in the 2030s as other fuels like LNG become increasingly prominent



Source: IEA, BofA Global Research estimates

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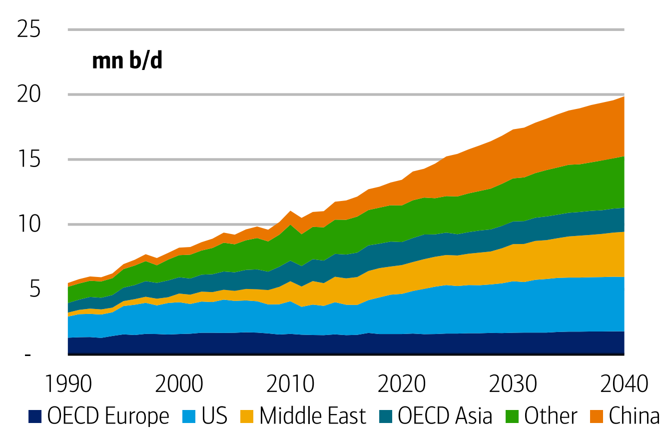
Petrochemical consumption remains an oil market pillar…

Perhaps the sector with the most positive oil demand trajectory into 2050 is petrochemicals. Decarbonizing steel and cement is very hard, but decarbonizing plastics is possibly even harder. Reutilizing old plastics to create new is probably the best way to reduce the sector's high carbon footprint. But without a material change to plastics recycling, petrochemical sector oil demand is likely to continue to rise into 2040 (Exhibit 25). Part of the challenge associated with decarbonizing this sector is also that the growth in petrochemical capacity has been very strong in recent years and continues to expand in line with GDP (Exhibit 26), with little efficiencies.

Exhibit 25: Petrochemical sector oil demand
Without a material change to plastics recycling, petrochemical sector oil demand is likely to continue to rise



Source: IEA, Woodmac, BofA Global Research estimates

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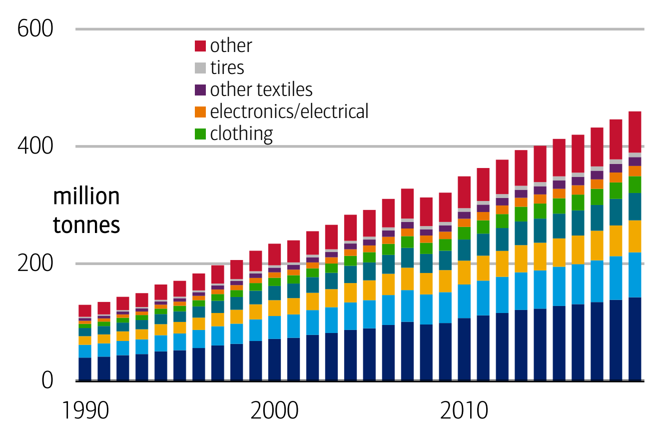
Exhibit 26: Historical plastic use by application
Global plastics demand has risen relentlessly, save for the GFC, clocking an annual growth rate of roughly 3.5% YoY during 2000-19 timeframe



Source: OECD

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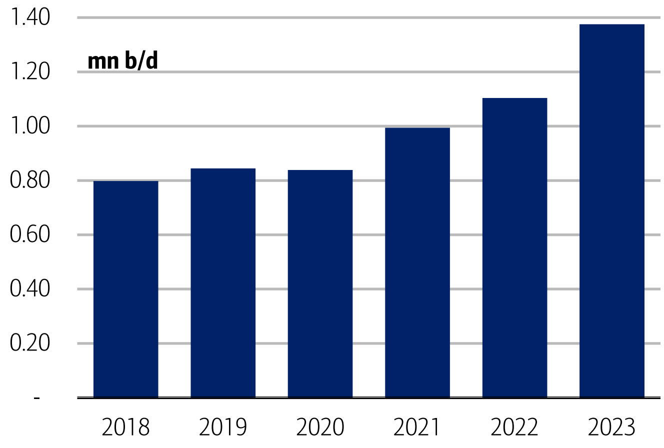
… and we see a continued expansion of demand into 2050…

A great driver of demand for petrochemical inputs including naphthas and liquid petroleum gases such as ethane, propane, and butane is China. In fact, Chinese imports of key petrochemical feedstocks are up 72% since 2018 and reflect the growing plastics demand domestically (Exhibit 27) as well as China's robust manufacturing export industry. On a per capita basis, China already consumes a lot of plastic considering its level of income, while we would also note that India has a long way to go from a demand perspective to converge with wealthier countries (Exhibit 28). Life in plastic, it's fantastic, it seems.

Exhibit 27: China imports of LPGs and naphtha

Chinese imports of LPG and naphtha, key petrochemical feedstocks, are up 72% since 2018 and reflect growing plastics demand



Source: Bloomberg, BofA Global Research

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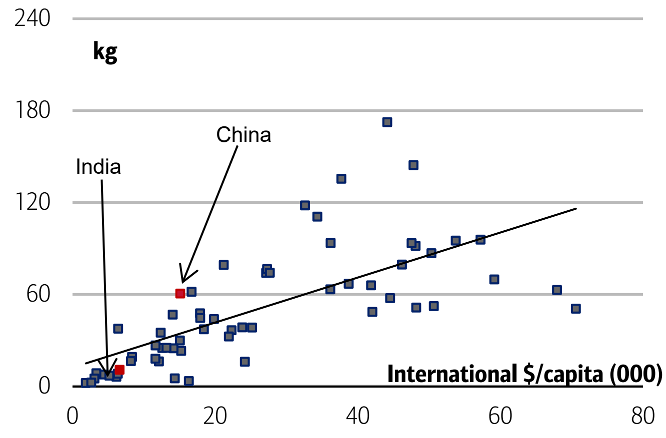
Exhibit 28: Income and plastics demand per capita (2015)

Looking at plastics, we note that India has a long way to go from a demand perspective to converge with wealthier countries



Source: Euromap, BofA Global Research

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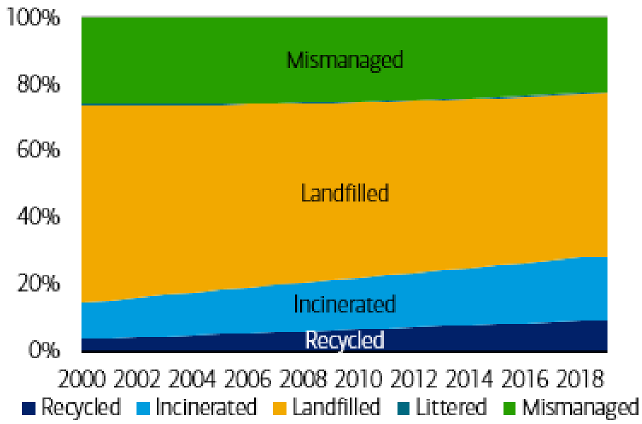
… but future growth faces headwinds from plastic recycling

It is hard to construct a bearish argument for plastics and thus petrochemical demand for oil feedstocks based on a somewhat tamer GDP outlook, but just like in steel, aluminum, and other hard to decarbonize industries, recycling could offer a window for decarbonization. In that regard, we note that plastic waste recycling rates remain exceptionally low at about 10% today according to OECD data (Exhibit 29) and thus oil demand could take a hit if the recycling ration was to climb considerably. In any case, demand for oil is unlikely to take a hit on plastics before 2030. While growth is expected to slow for ethylene and PE, propylene and PP capacity growth is set to remain firm for the next few years (Exhibit 30).

Exhibit 29: Global plastic waste by end-of-life fate
Plastic waste recycling rates remain exceptionally low at about 10% today according to OECD data



Source: OECD

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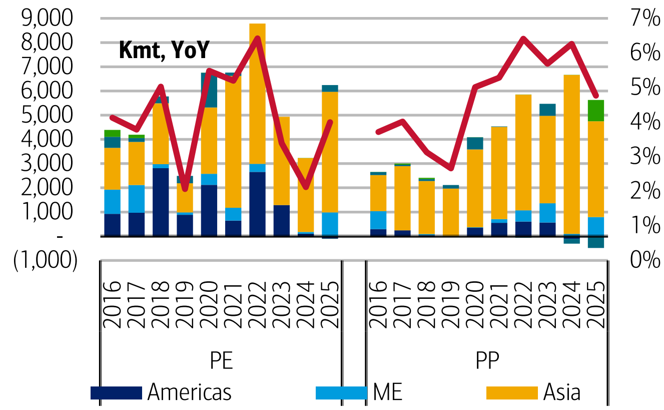
Exhibit 30: Global PE and PP capacity expansions
While growth is expected to slow for ethylene and PE, propylene and PP capacity growth is set to remain firm next year



Source: Platts

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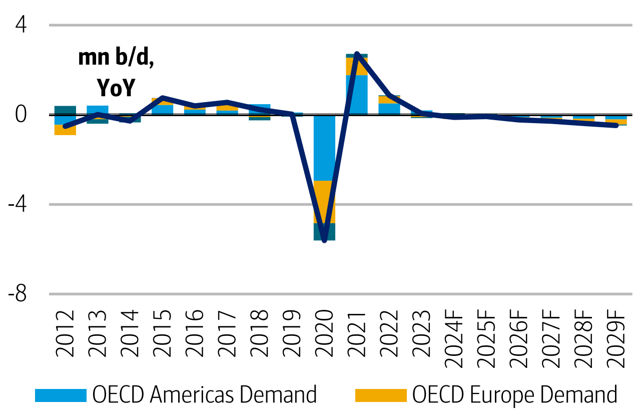
Regionally, OECD oil demand has peaked and will fall next

Moving on from our sector discussion to a geographic one, we would highlight the stark contrast in expectations between oil demand in developed and emerging economies. When breaking down demand region by region, we note that OECD consumption will likely contract into the end of the decade to 44mn b/d by 2029 (Exhibit 31). OPEC, Europe, and Asia are more likely to take a bigger hit on aging populations and increased efficiencies and substitution. Sluggish income growth is also likely to play a role here too. In short, oil demand across developed economies is a shrinking piece of a growing pie, with demand falling from a peak of 76% in the late 1960s to just 41% in 2029 (Exhibit 32).

Exhibit 31: OECD oil demand growth
When breaking down demand by region, we note that OECD consumption will likely contract into the end of the decade to 44mn b/d by 2029



Source: IEA, BofA Global Research estimates

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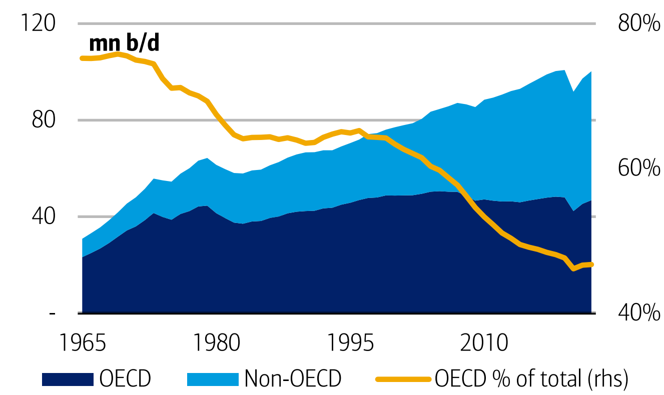
Exhibit 32: Global oil demand and OECD share
Oil demand across developed economies is a shrinking piece of a growing pie, with demand falling from a peak of 51 mn b/d in 2005



Source: Energy Institute

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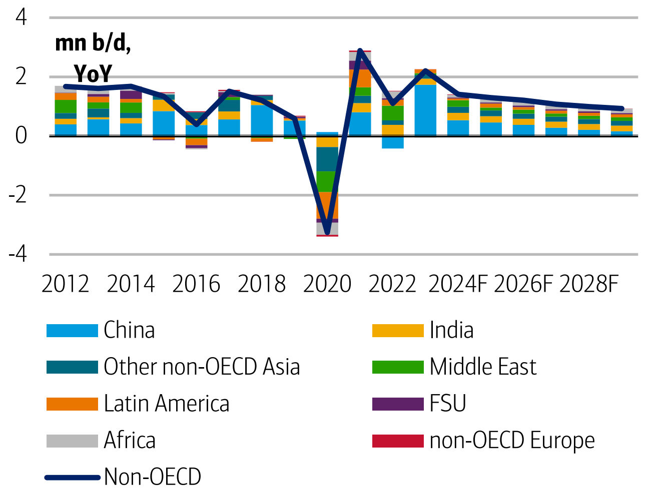
Emerging markets will keep oil demand on a growth path

In contrast to the gloomier outlook for developed markets, Emerging economies, led by China, have remained the main drivers of the global oil market for two decades. But even there we see a deceleration ahead (Exhibit 33) due to demographic and structural issues. In part, a falling rate of EM oil demand growth has to do with reduced demand growth from China, as well as rising clean energy investments (Exhibit 34). But a shrinking population, a push for electrification, and a stagnating economy do not make a strong cocktail for a roaring fuel demand picture in China beyond the post COVID-19 demand impulse.

Exhibit 33: Non-OECD demand growth

Emerging economies, led by China, have remained the main drivers of the global oil market for two decades, but we see a deceleration ahead



Source: IEA, BofA Global Research estimates

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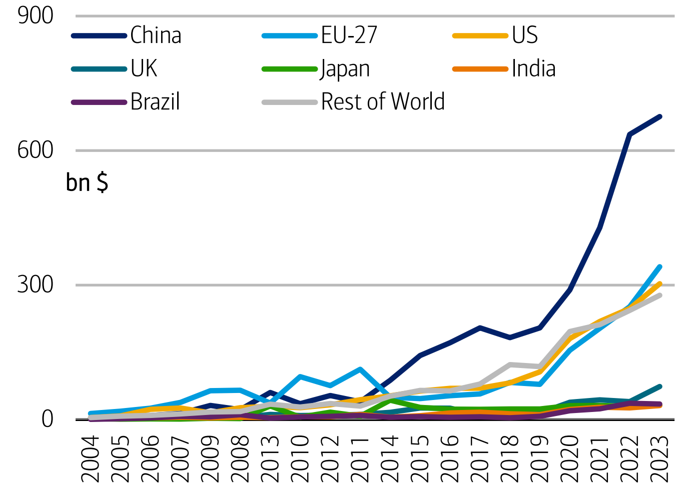
Exhibit 34: Energy transition investment by economy

In part, a falling rate of EM oil demand growth has to do with reduced demand growth from China, as well as rising clean energy investments



Source: BloombergNEF

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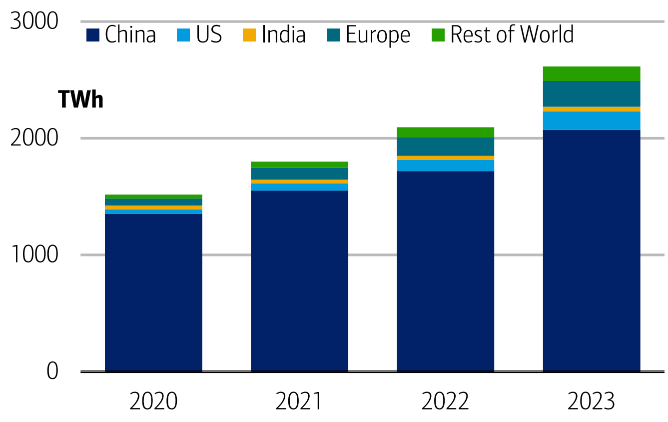
Even then, we see Chinese oil consumption to peaking too…

Exceeding 2000 TWh last year, China represented most of the electricity demanded by electric vehicles around the world (Exhibit 35), suggesting that the Asian nation is by far the most advanced across various regions when it comes to creating fuel substitution effects in the oil sector. More importantly, much of China's car industry is gearing up for export and volumes have grown 11 fold since July 2020 through the recent period (Exhibit 36), with the share of EVs in the export mix rising from 7% in March 2021 to a high of 32% in October 2022. In the past quarter, China exported 111 thousand EVs every month!

Exhibit 35: Estimate electricity demand by electric vehicles

Exceeding 2000 TWh last year, China represents most of the electricity demanded by electric vehicles around the world



Source: BNEF

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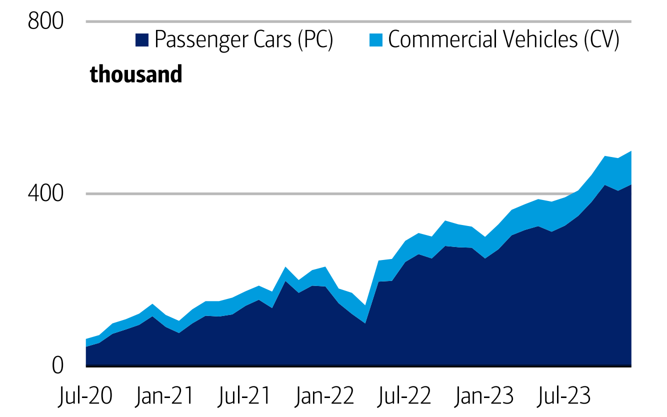
Exhibit 36: Total automobile exports from China

Much of China's car industry is gearing up for export and volumes have grown 11-fold since July 2020 through the recent period



Source: China Association of Automobile Manufacturers

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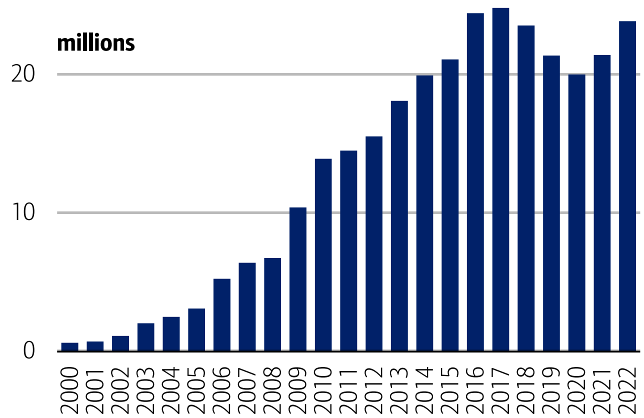
… as surging EV sales trigger a big slowdown in fuel demand

While total auto sales and production in China have been roughly flat for the last three years and have yet to speed up (Exhibit 37), the industry is clearly gearing up for the domestic substitution of ~3.7mn b/d of gasoline and also plans to export its units aggressively over the coming years. In effect, electric vehicle auto sales domestically have sped up pretty significantly during the past three years, gaining tremendous market share (Exhibit 38), and are poised to continue to grow into 2030, eventually denting the strong trajectory of China's oil demand in recent decades.

Exhibit 37: Annual Chinese automotive car production
While total auto sales and production in China have been roughly flat for the last three years and have yet to speed up…



Source: Bloomberg

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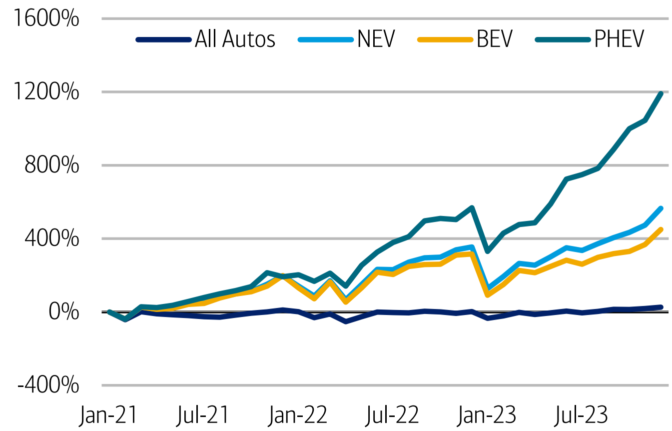
Exhibit 38: Automobile sales in China indexed to Jan 2021
… electric vehicle auto sales have sped up pretty significantly during the past three years, gaining tremendous market share



Source: China Association of Automobile Manufacturers

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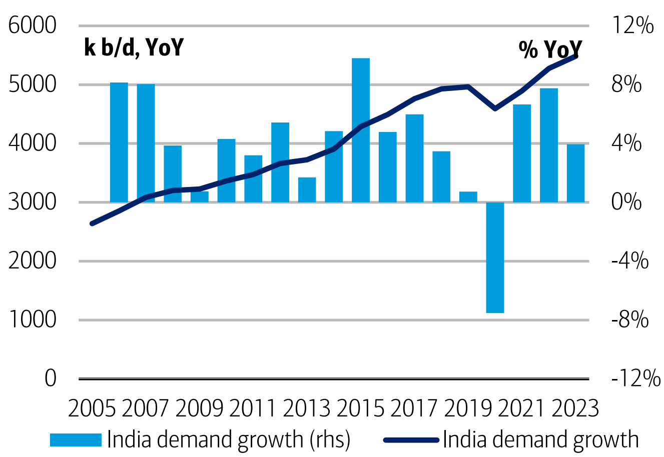
India will remain the fastest growing petroleum market…

China's oil demand has grown from 3mn b/d in 1993 to 16mn b/d in 2022, clocking in an average rate of growth of 6% per annum. During that same period, Indian oil demand expanded from 1.3mn b/d in 1993 at an average annual pace of around 5% to reach 5.5mn b/d in 2023 (Exhibit 39), also an impressive performance. Looking at a breakdown of the various components, we note that Indian fuel consumption has been led by diesel and gasoil (Exhibit 40). On a per head basis, however, China consumes nearly three times more oil than India, a metric that will likely contract over the coming years as India leads global EMs in terms of growth.

Exhibit 39: India demand
Indian oil demand has expanded at a pace of around 6% on average during 2021-23 to reach 5.5mn b/d in 2023



Source: IEA

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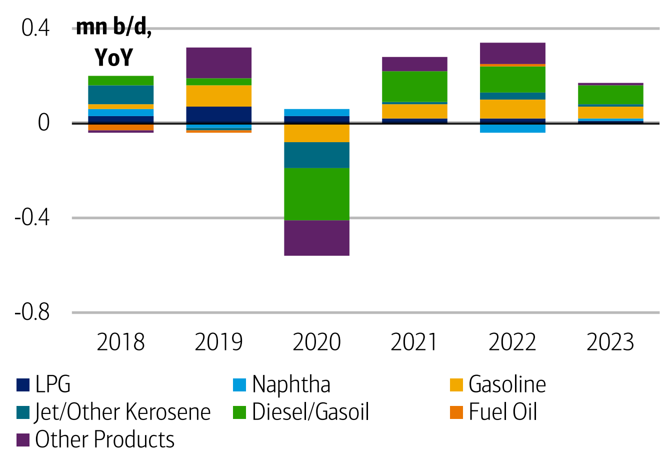
Exhibit 40: India demand growth
Looking at a breakdown of the various components, we note that Indian fuel consumption has been led by diesel and gasoil



Source: Woodmac

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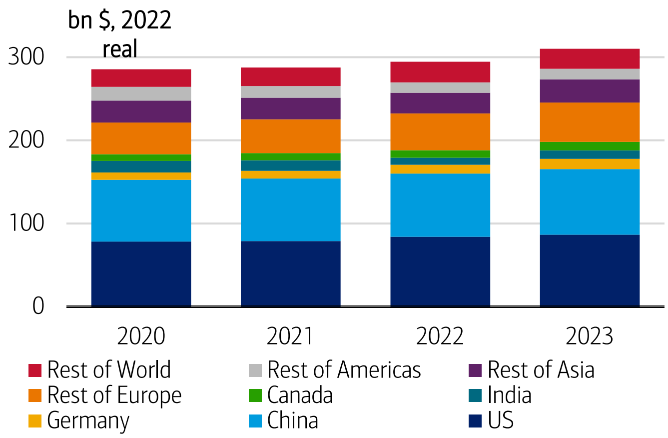
... but at a decelerating rate, as substitution bites there too

We also believe India will become an increasingly important region for global oil suppliers given its reduced ability to substitute away from oil to electrify the economy. Looking at different regions around the world, we note that India has lagged other parts of the world in grid investments (Exhibit 41) and has yet to represent a meaningful portion of global energy transition spending, where China, the EU, the US, and the UK lead (Exhibit 42). As such, we expect Indian oil consumption to grow from 5.5mn b/d last year to 6.7mn b/d in 2029. Note that our expectation is that China's oil demand will grow by nearly 2mn over the same period.

Exhibit 41: Global power grids investment by region

Looking at different regions around the world, we note that India has lagged other parts of the world in grid investments...



Source: BloombergNEF

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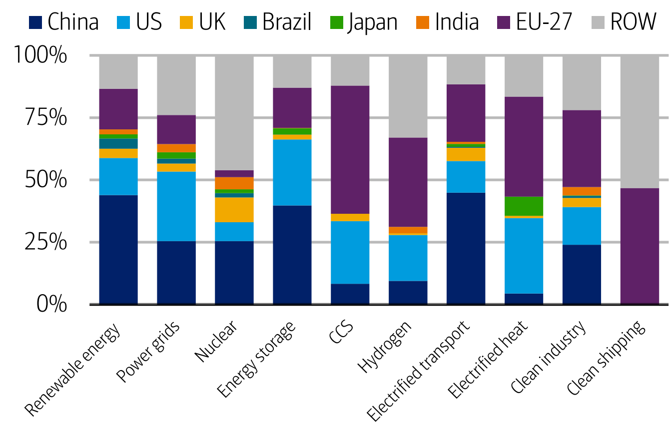
Exhibit 42: Share of 2023 energy transition investment by country and sector

... and has yet to represent a meaningful portion of global energy transition spending, where China, the EU, the US and the UK lead



Source: BloombergNEF

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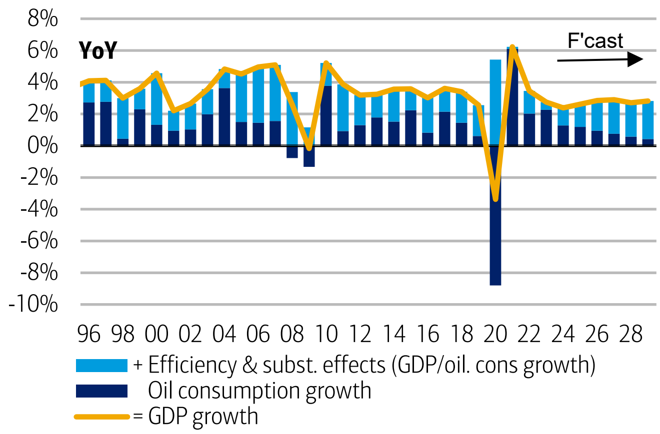
Net, oil burn peaks at a higher level, later than expected...

The themes across regions and segments of the economy vary but also rhyme when it comes to oil demand. To be clear, we see a decelerating trend for global oil consumption growth on the back of efficiency and substitution advances over the coming years (Exhibit 43), although we now believe that oil demand will likely continue to grow, albeit modestly, into 2030. Dislodging oil from the energy sector is not easy because this fuel has an exceptional energy density compared to other alternatives (Exhibit 44). So peak oil demand comes a bit later, and at a higher level than previously expected.

Exhibit 43: Global oil demand and GDP growth
We see a decelerating trend for global oil demand growth on the back of efficiency and substitution advances over the coming years



Source: IEA, BofA Global Research estimates

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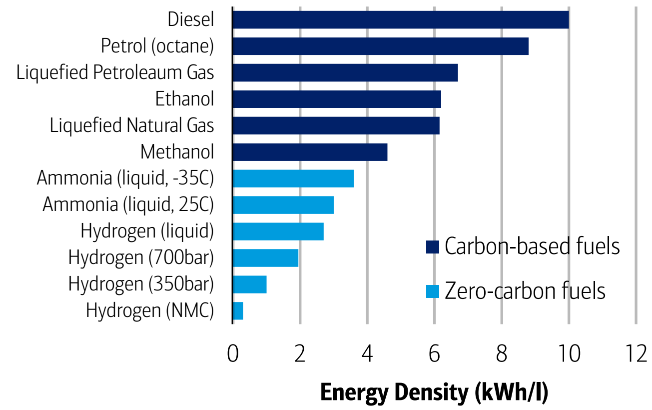
Exhibit 44: Energy density by source
Dislodging oil from the energy sector is not easy because this fuel has an exceptional energy density compared to other alternatives



Source: Green Ammonia, Royal Society Policy Briefing (David et al. 2020)

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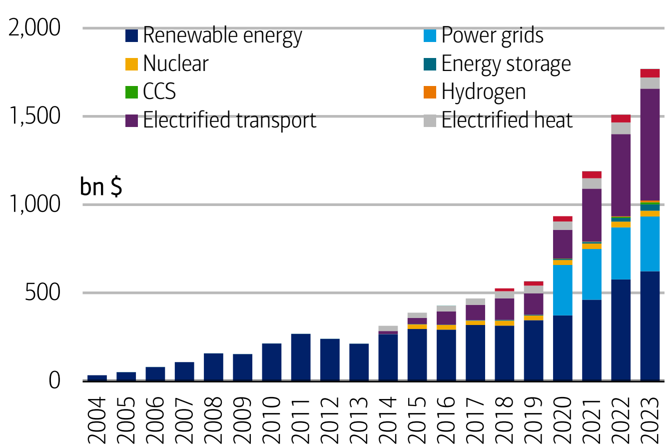
… although transition spending is still expanding quickly…

While recent weeks have seen a slew of news about reduced demand for EVs and missed sales targets, we note that a few datapoints do not make a trend. Global energy transition spending has accelerated quite a bit driven by electric transport, grid, and renewable power generation (Exhibit 45). Regionally, China maintains a strong lead in transition spending over both EMEA and the Americas due to its industrial gearing (Exhibit 46). And crucially, research and development spending has passed beyond internal combustion engines. Better batteries will arrive, and consumers will choose EVs because they are better products, just like we have seen in the case of Tesla.

Exhibit 45: Global energy transition investment by sector
Global energy transition spending has accelerated quite a bit driven by electric transport, grid, and renewable power generation



Source: BloombergNEF

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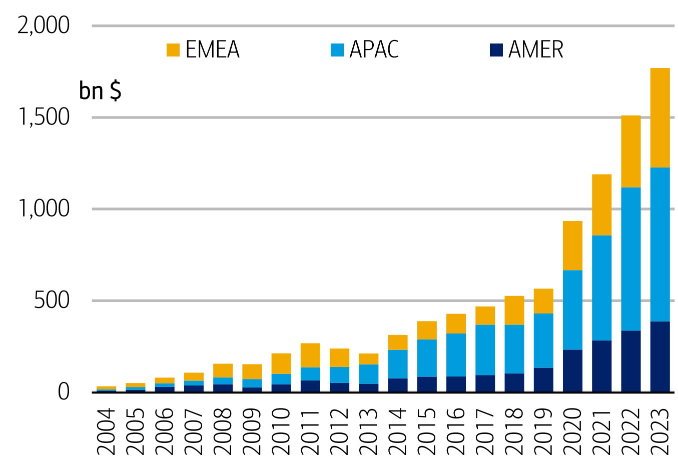
Exhibit 46: Global energy transition investment by region
Regionally, China maintains a strong lead in transition spending over both EMEA and the Americas due to its industrial gearing



Source: BloombergNEF

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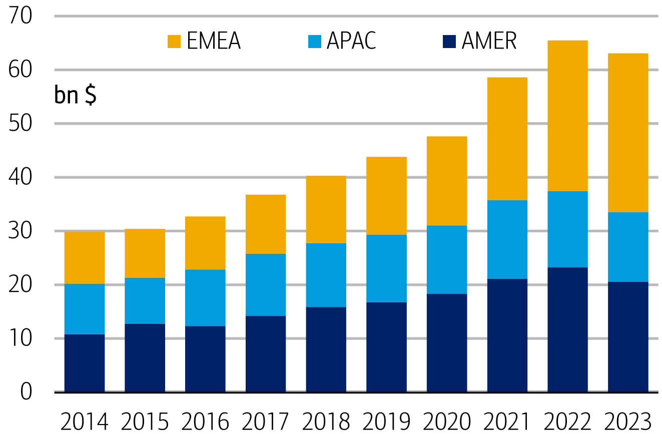
… across many different areas such as heating and industry

Other segments like heating oil will also get hurt over the coming years, in our view. The shift towards electrified heating has continued to grow at a strong pace around the world, helped by distributed energy installations (Exhibit 47). For consumers with access to a reliable grid and ample solar roof-top power, an electric solution is often cheaper, cleaner and more efficient. Plus, investment into green steel and other decarbonizing industrial processes continues to expand around the world (Exhibit 48).

Exhibit 47: Global electrified heat investment by region

Electrified heating has continued to grow at a strong pace around the world, helped by distributed energy installations (i.e. solar panels)



Source: BloombergNEF

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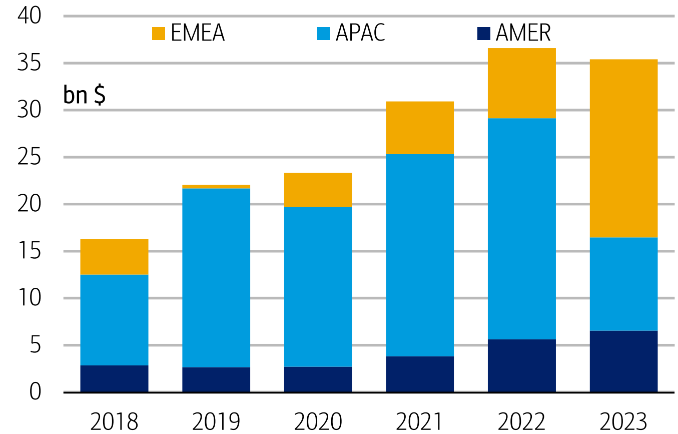
Exhibit 48: Global investment in clean steel by region

Investment into green steel and other decarbonizing industrial processes continues to expand around the world



Source: BloombergNEF

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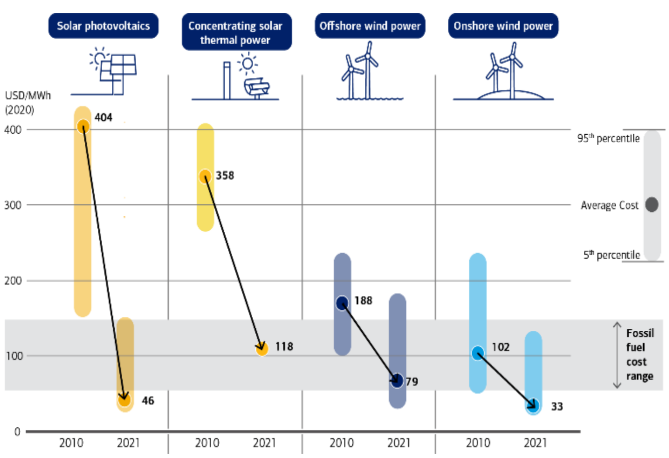
With renewable costs falling, fuel phase outs are a matter of time

Ultimately, the energy transition is about renewable energy prices falling to become competitive with thermal fuel alternatives (Exhibit 49). It is about making better and cleaner products that consumers want to buy. And most analyses point to the fact that the levelized cost of energy keeps falling across the board for renewables (Exhibit 50). It does not mean that oil demand will collapse imminently, but it does suggest that decarbonization and electrification trends will have a major impact on fossil fuel consumption in the decades ahead. Following a 2.4mn b/d expansion in 2023, we can conclude that oil demand has not peaked but it is relatively safe to assume that oil demand growth rates have indeed peaked.

Exhibit 49: Renewable Energy price declines led by wind & solar

Ultimately, the energy transition is about renewable energy prices falling to become competitive with thermal fuel alternatives...



Source: REN21 Renewables 2022 Global Status Report

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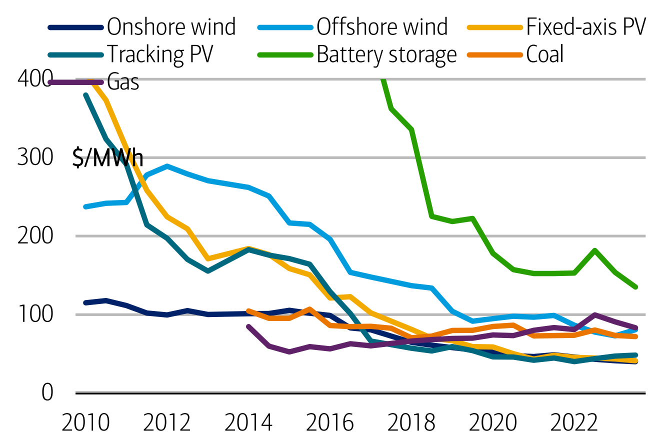
Exhibit 50: Global LCOE

... and most analyses point to the fact that the levelized cost of energy keeps falling across the board for renewables



Source: BloombergNEF

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Exhibit 51: Acronyms List

Acronym	Definition
$/bbl	dollars per barrel
2H2023	Second half of 2023
avg	average
b/d	barrels per day
bbl	barrel
bn	billion
boe	barrel of oil equivalent
Btu	British thermal unit
CB	central bank
CPI	consumer price index
D&C	Drilling and completion
DM	developed market
E&P	Exploration and production
ECB	European Central Bank
EM	European market
EM	emerging market
EUAs	European Union Allowances
EUR	Euro
EV	electric vehicle
FID	Final Investment Decision
FPSO	Floating production storage and offloading
GoM	Gulf of Mexico
GWh	gigawatt hours
Hz	Horiztontal
ICE	Internal Combustion Engine
IEA	International Energy Agency
IMO	International Maritime Organization
JKM	Japan Korea Marker
JPY	Japanese Yen
LNG	liquified natural gas
MA	moving average
mcm	million cubic meters
ME	Middle East
Mfg	manufacturing
MMBtu	million British thermal unit
mn	million
mt	metric ton
MWh	Megawatt hours
NBS	National Bureau of Statistics of China
NEV	New Electric Vehicle
ngl	natural gas liquids
NWE	North west Europe
OECD	Organisation for Economic Co-operation and Development
OPEC	Organization of the Petroleum Exporting Countries
OPEC+	OPEC countries plus ten additional countries
PE	Polyethylene
PP	Polypropylene
PMI	purchasing managers index
rhs	righthand side
SAF	Sustainable Aviation Fuel
SPR	Strategic Petroleum Reserve
TMX	Trans Mountain Expansion
TTF	Dutch TTF
TWh	terawatt hours
VLSFO	very low sulfur fuel oil
WCS	Western Canadian Select
WTI	West Texas Intermediate
YoY	year over year
yr	year

Source: BofA Global Research

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