Upstream Oil and Gas Investment Outlook

A Report by the International Energy Forum
and S&P Global Commodity Insights

June 2024

S&P Global
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INTERNATIONAL ENERGY FORUM

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Executive Summary

- **Annual upstream investment will need to increase by $135 billion to a total of $738 billion by 2030 to ensure adequate supplies**. This estimate for 2030 is 15% higher than we assessed a year ago and 41% higher than assessed two years ago due primarily to rising costs and a stronger demand outlook. A cumulative $4.3 trillion will be needed between 2025 and 2030, even as demand growth slows toward a plateau.
- **Oil and gas annual upstream capital expenditures rose by $63 billion year-on-year in 2023 and are expected to rise a further $26 billion in 2024, surpassing $600 billion for the first time in a decade.** Upstream investment in 2024 is expected to be more than double 2020's low of $300 billion and be well above 2015-2019 levels of ~$425 billion**.** More than a third of the spending will come from North America this year. However, Latin America is expected to be the largest source of incremental capex growth in 2024, surpassing North America for the first time since at least 2004.
- **More than 60% of the increase in upstream capex spent between now and 2030 will come from the Americas**. While North America is expected to be the largest driver of capex growth to 2030, Latin America will continue to play an increasingly significant role in non-OPEC supply growth, particularly for conventional crude, with expansions planned for Brazil and Guyana. Around 2.2 million barrels per day (mb/d) in new or expanded conventional projects have been approved and are expected to be producing in Latin America by 2030 – this is more than a third of the total 6 mb/d that have been sanctioned globally.
- **The risks of underinvestment and a supply shortage have receded over the past year, despite the upward revisions to the forecasted investment requirements, as:** (1) elevated prices have supported more investment, (2) capital constrains have eased, (3) production has remained resilient in Russia, Iran, and Venezuela despite sanctions, (4) non-OPEC supply has surprised to the upside, and (5) spare production capacity has been restored. However, the risk of underinvestment and undersupply could rise again if there are changes to the commodity price environment, geopolitical landscape, or to a lesser degree, changes to environmental, foreign, and monetary policies, and ESG regulations. Continued upstream investment is still needed to both offset expected production declines and to meet future demand growth.
- **The investment and fundamentals outlook has improved primarily due to supply-side factors, but looking ahead demand uncertainty will play a more prominent role**. This investment outlook assumes demand for total liquids rises to nearly 110 mb/d by 2030 and then plateaus and slowly declines to ~100 mb/d in 2050, requiring a significant capex tail. However, there is a lot of uncertainty around the demand trajectory and the pace of the energy transition. This creates a difficult environment for making investment decisions. Base case forecasts from consensus-leading organizations diverge by as much as 7 mb/d for 2030 and this gap widens to 27 mb/d when more ambitious climate scenarios are included.
- **Increased investment supports energy security and the energy transition.** A just, orderly, and equitable energy transition requires a foundation of energy security. The past

two years have demonstrated the consequences of "disorderly" transitions: price shocks, shortages, disruptions, political backlash, bitter divisions, and conflict. Ensuring adequate investment levels can help provide stability and enable a just transition. But it will require the market to remain nimble and flexible to overcome potential hurdles and adapt to new realities.

Introduction: An Era of (Relative) Stability or Calm Between Storms?

Global oil liquids demand reached a new record in 2023 and is expected to continue setting fresh highs in each successive year this decade, albeit at a decelerating pace of growth. Yet, the primary story in the oil market in the past two years has been on the supply side.

Over the past year, geopolitical risk has risen with the escalation of the Israel-Hamas war, continued military conflict in Ukraine, and a growing number of attacks on shipping in the Red Sea. Yet, amid the tumult, physical oil production has remained relatively unscathed. Oil trade has adjusted and rerouted, mitigating the impact of increasingly dangerous transit routes and sanctions.

At the same time, output in the US, Canada, Brazil, and Guyana is surging to all-time highs, there is record total non-OPEC supply, historically high OPEC spare production capacity, and decade-high upstream investment.

In the past two editions of our annual upstream investment report, we warned of a rising risk of underinvestment in the upstream sector this decade if upstream investment did not rebound sustainably from COVID-induced lows. As things stand today, that risk has receded for this decade, though it has not completely disappeared. A higher commodity price environment has eased capital constraints for upstream oil and gas companies and producers have responded by repairing their pandemic-hit balance sheets and increasing investment. Upstream capex in 2024 is expected to be nearly 40% higher than 2019 levels. At the same time, and despite sanctions, production has remained resilient in Russia, Iran, and Venezuela. Additionally, consolidation in the US shale sector, higher commodity prices, private operators, and increased efficiencies have caused US production to surprise to the upside, yet again.

While the outlook for global supplies is more positive than one or two years ago, there remains significant uncertainty on the demand-side and the pace of the energy transition over the next decade and beyond. The energy transition entails moving towards lower carbon-intensive energy sources, while also catering to growing demand needs. While the electrification of mobility is accelerating, particularly in China, the scale of energy demand growth from demographic and economic factors remains formidable in the developing world.

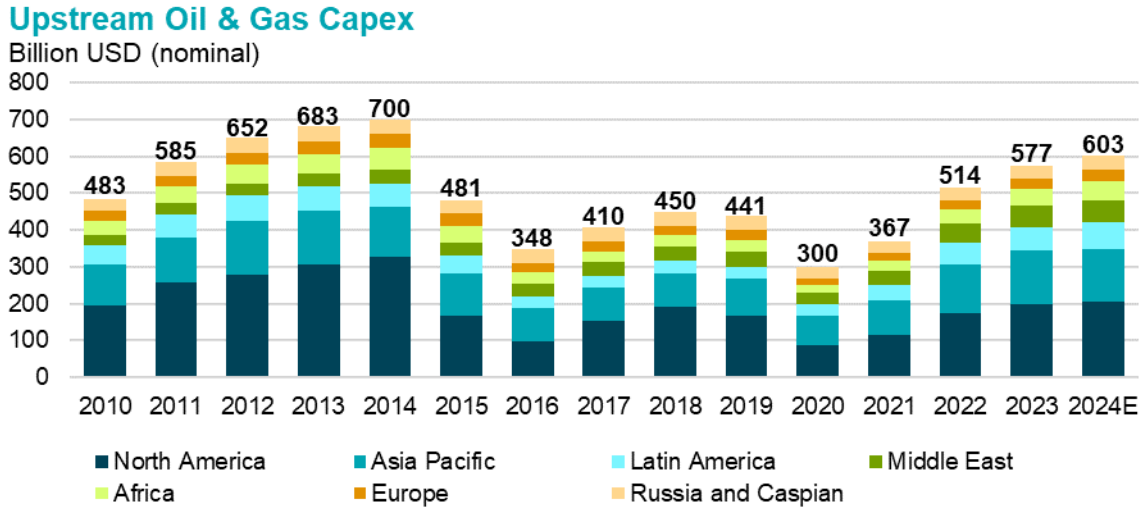
Just as oil markets have displayed resiliency and flexibility in the past four years, they will need to remain agile through the energy transition and adapt to the evolution of demand and policy changes to ensure the current period is not just a relative calm between storms.

Oil and Gas Upstream Capex Rises to Decade High in 2024

Upstream investment expanded by 12% in 2023 and is expected to grow by 5% in 2024

Annual oil and gas upstream capital expenditures grew by $63 billion year-on-year in 2023 and are expected to grow by a further $26 billion this year. This will put total annual upstream capex at

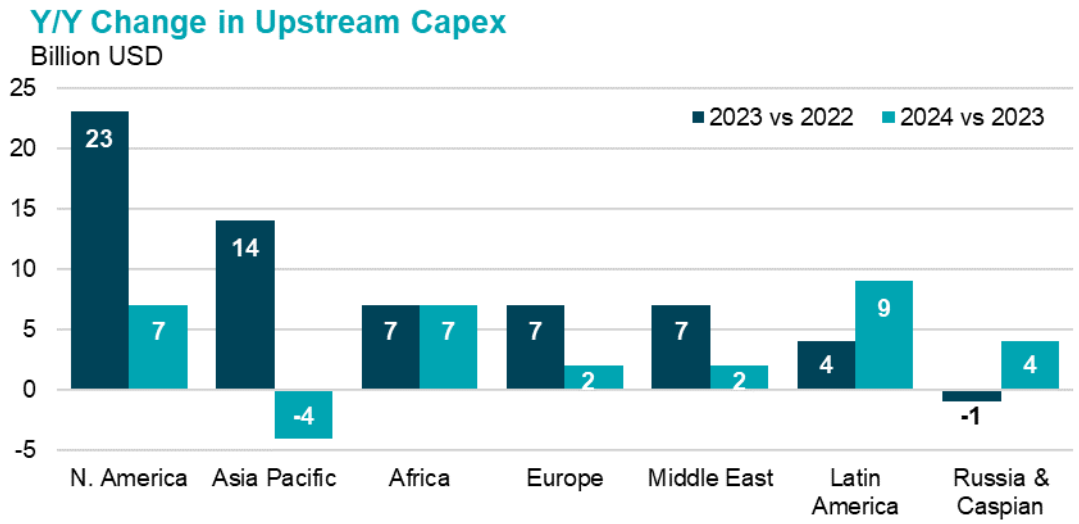
$603 billion in 2024, the highest level since 2014 and more than double the levels spent in 2020. Spending is ~40% higher than the 5 years leading up to COVID but is still below the peak of $700 billion seen in 2014. However, the period leading up to and including 2014 was associated with a significantly lower capital efficiency, particularly in the US. Increased efficiency has helped global oil production reach record highs despite investment levels being lower than past periods.



Source: IEF, S&P Global Commodity Insights

North and South America account for half of the increase in capex since 2022

Upstream capex spending in the Americas is expected to increase by $43 billion between 2022 and 2024, accounting for more than half of the total increase across the globe. Latin America is set to be the largest driver of capex growth in 2024, surpassing North American year-on-year capex growth for the first time since at least 2004. Following a lull in global offshore spending, a new wave of large deepwater projects in Brazil and Guyana are driving growth in Latin America. Meanwhile, the pace of rising capex spending in the US is expected to slow this year due to consolidation in the sector and continued prioritization of returns to shareholders.

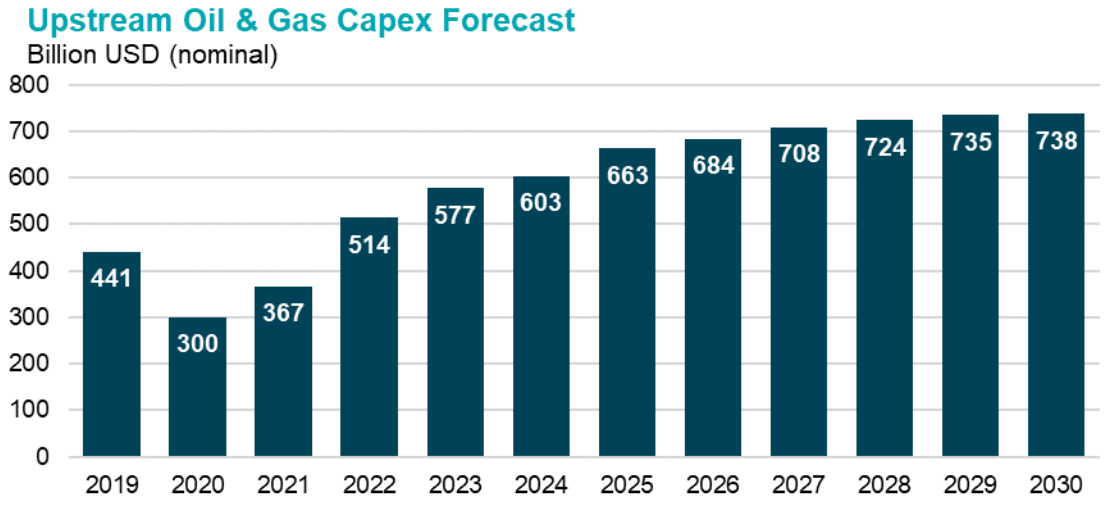


Source: IEF, S&P Global Commodity Insights

Annual Upstream Capex Needs to Rise by an Additional ~$135 Bn by 2030

Upstream investment will need to increase to $738 billion annually by 2030 to ensure adequate supplies

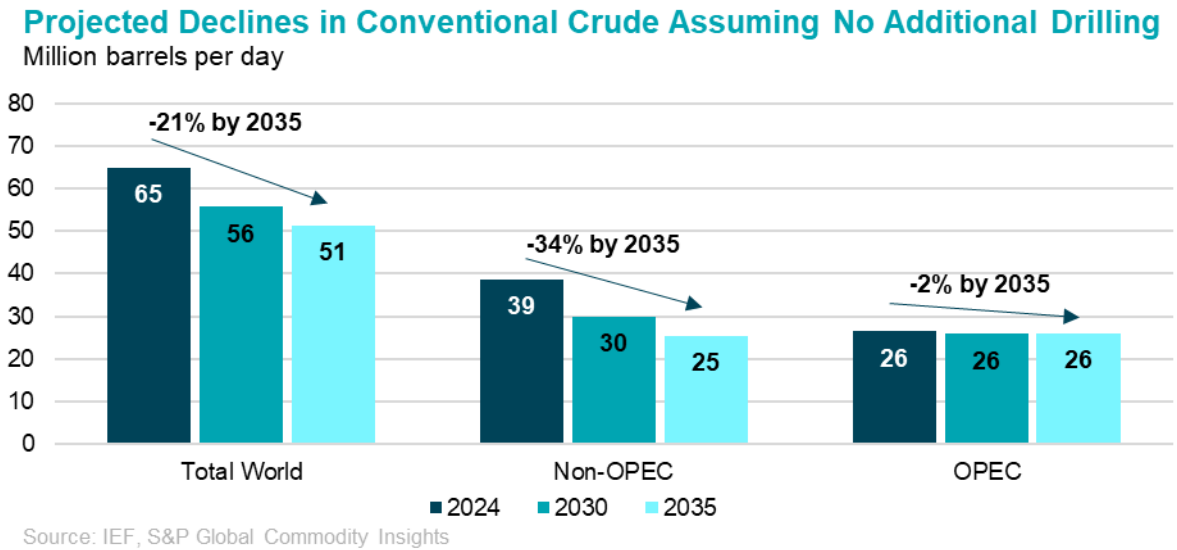
While upstream investment is set to reach a decade high in 2024 at $603 billion, it will need to rise to $738 billion by 2030. A cumulative $4.3 trillion needs to be invested in the upstream sector between 2025 and 2030 to meet market needs, even as demand growth slows toward a plateau. This is a significant ask from investors and companies, but one that has become more manageable considering the increase in cash availability for producers and the increased prioritization of energy security for policymakers. However, the continued availability of organic free cash, enabled by higher prices, is increasingly critical as a baseload source of capex funding. If commodity prices were to fall, this could add pressure on external funding to fill the gap.



Source: IEF, S&P Global Commodity Insights

Global conventional crude production would fall by >20% by 2035 without additional drilling

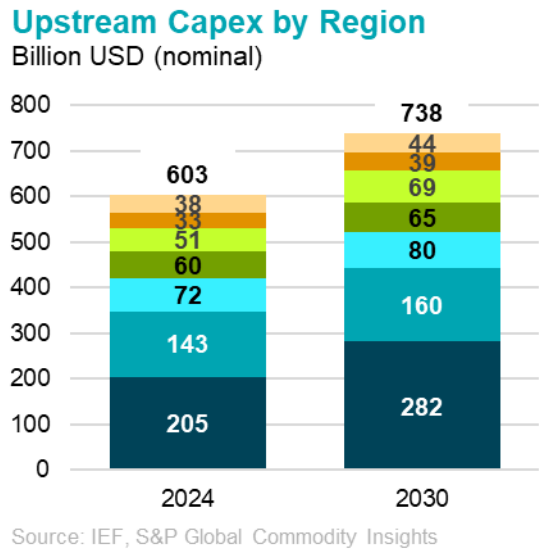
Investments made this decade will impact production levels well into the next decade and beyond. Continued upstream investment is needed first to offset expected production declines and then to meet future demand growth. Without additional drilling, we estimate that conventional non-OPEC production would decline by 9 mb/d by 2030 and 14 mb/d (or 31%) by 2035. The decline rates for non-conventional crude, including US shale, are significantly steeper and would see more than 80% decline in the next decade.

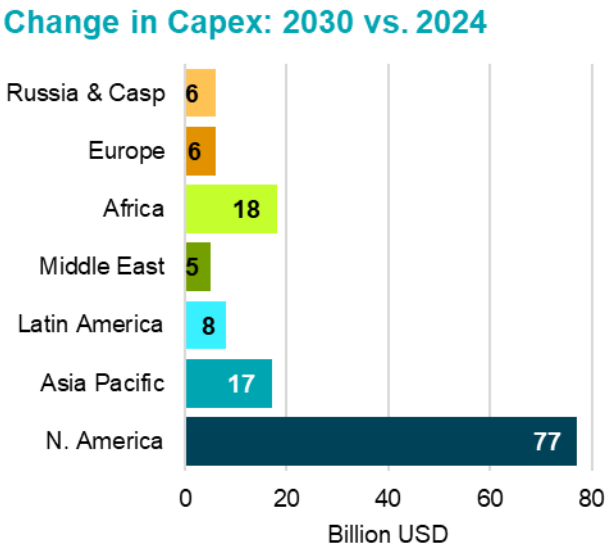


Source: IEF, S&P Global Commodity Insights

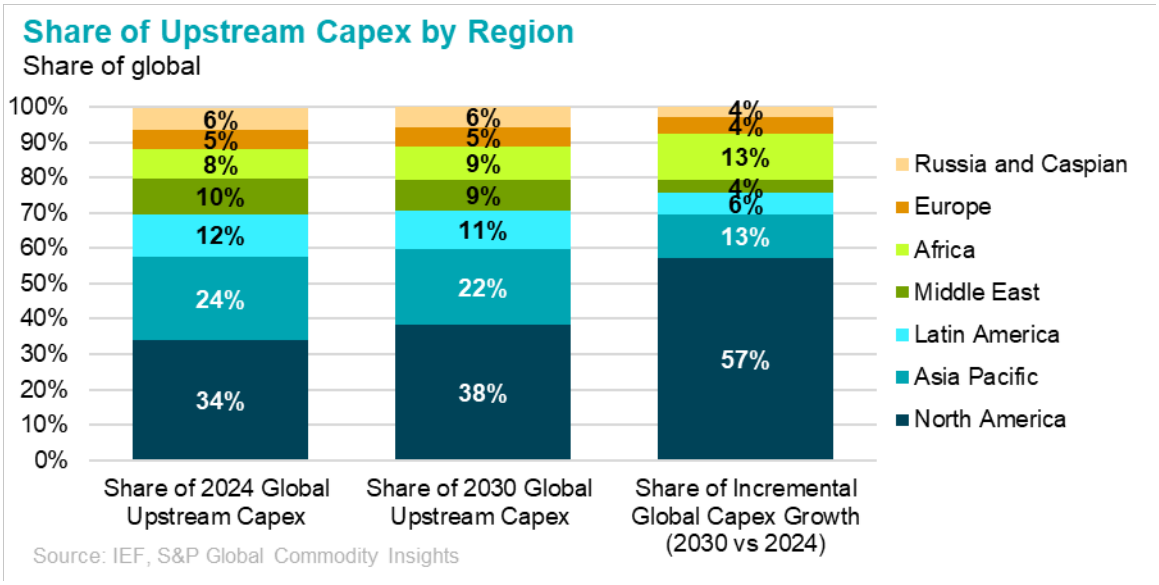
North America will lead in the incremental capex increase to 2030

North America upstream capex is expected to rise by $77 billion between 2024 and 2030, which is more than all other regions in the world combined. This will be driven by US shale, particularly the Permian Basin, but US Gulf of Mexico and Canada will contribute marginal growth.



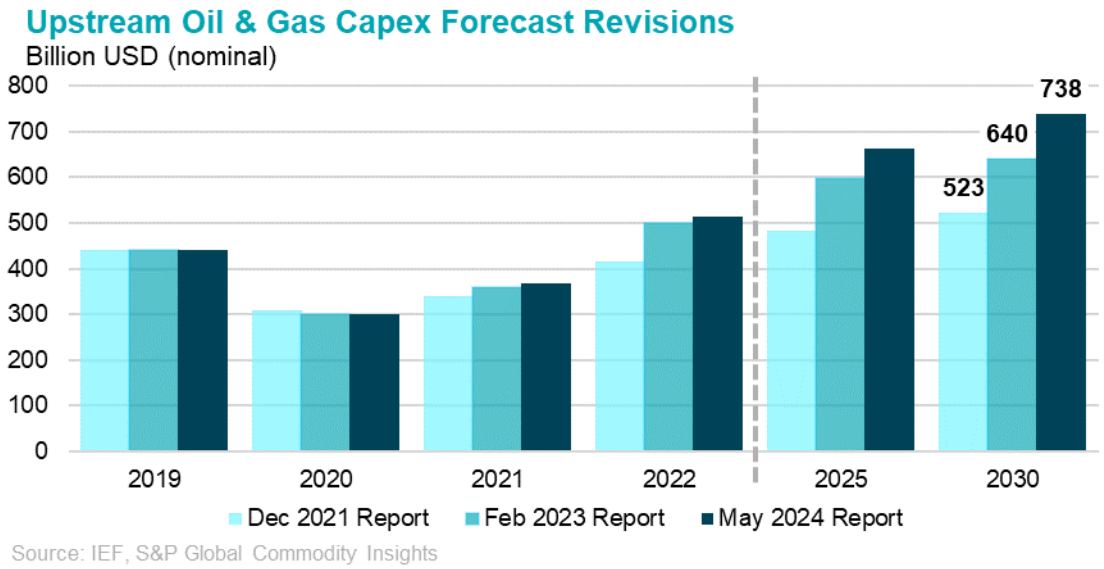


While North America's share of global upstream capex will rise from 34% in 2024 to 38% in 2030, it will be below 2014's high of 47% of global capex. North America will account for 57% of incremental growth to 2030, followed by Asia and Africa at 13% each.



Our 2030 forecast is >$200 billion higher than estimated in 2021

Our 2030 capex forecast is 15% higher than we published in our February 2023 investment outlook report and 41% higher than we published in December 2021. These revisions reflect a relatively stronger demand outlook, including a higher demand baseline, and an increased cost environment. The base case liquids demand forecast for 2030 has been revised up by nearly 4 mb/d since 2021. Meanwhile, persistent inflation, a higher cost of capital, and supply chain issues have increased the cost of operations and financing.



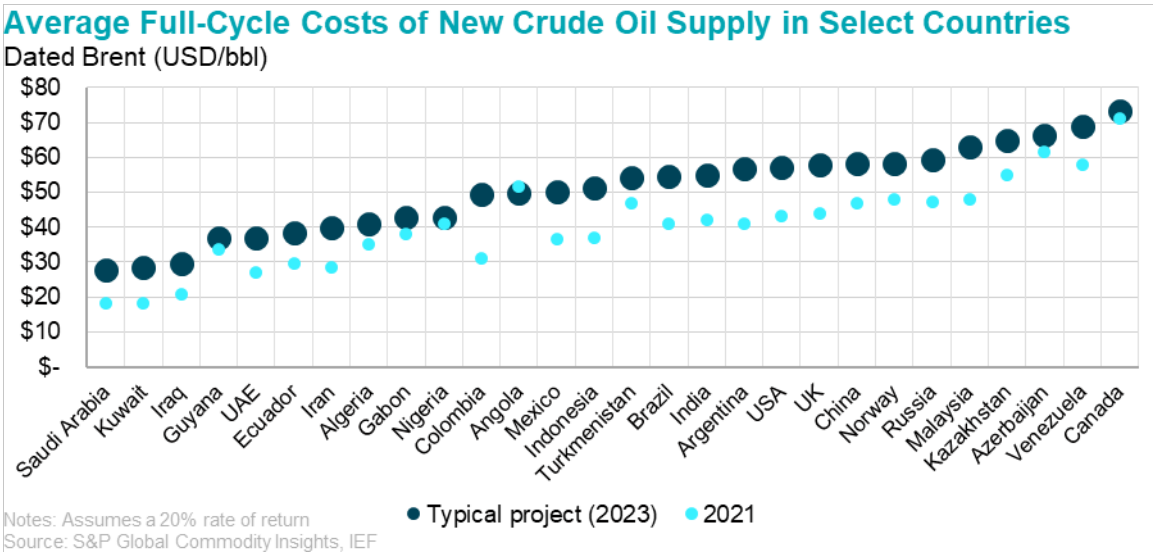
Oil and gas companies are also allocating a higher portion of spending towards decarbonizing operations. The upstream sector accounts for around 60% of the oil and gas industry's greenhouse gas emissions. Companies are increasingly focused on reducing Scope 1 and 2 emissions in their upstream operations to meet regulatory requirements, investor expectations, and environmental goals. This frequently entails increasing spending on methane abatement, flaring reduction, operational and energy efficiency, and CCUS. The increased focus on upstream decarbonization has also contributed to the upwardly revised capex forecast.

Cost of production has risen, but majority of new supplies can be produced at under $60/bbl Brent

Most new supply can be produced at an average of $60/bbl Brent or less. This is $10/bbl higher than assessed in 2021.

The lowest cost supplies are from the Middle East, Guyana, and West Africa. The average weighted Middle East breakeven price is about $30/bbl Brent, whereas Guyana is $36/bbl and the average new well in the US requires about $57/bbl. The highest end of the cost curve includes heavy crudes in Canada and Venezuela.

The overall global supply stack is relatively flat, with the majority of supply expected to break even between $50/bbl and $60/bbl. Both conventional and tight oil projects, including some of those at the higher end of the cost curve, will be needed to meet demand and offset base declines in the upcoming 10-15 years.



Risks of Underinvestment in this Decade Has Receded, but Not Disappeared

While the outlook for required investment to 2030 has risen over the past couple of years, the risk of underinvestment and a supply shortage during this decade have subsided as:

1. Higher crude prices have driven an increase in investment levels and in projects being sanctioned;
2. Capital constrains have eased;
3. Production has remained resilient in Russia, Iran, and Venezuela despite sanctions;
4. Non-OPEC supply has surprised to the upside as efficiency has improved; and
5. Spare production capacity has increased.

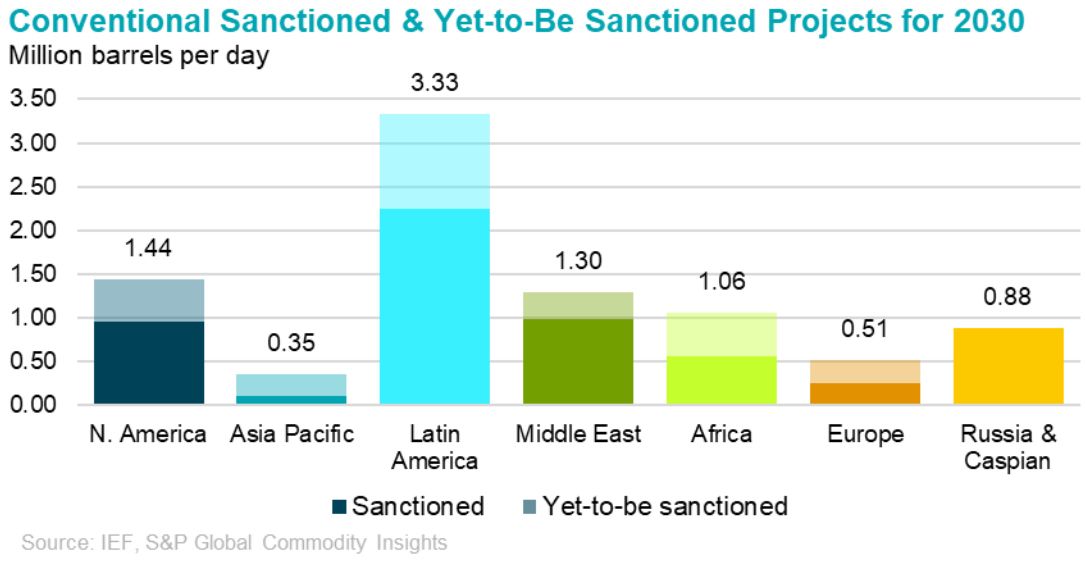
Nearly 70% of new conventional production needed for 2030 have been approved

Our previous upstream investment reports highlighted how 2022-2023 would be crucial years for financing projects. In 2022, nearly 2.6 mb/d of new capacity was approved or sanctioned, while 1.9 mb/d were greenlit in 2023. Guyana is a prime example of where project development is accelerating. New projects are currently scheduled to start up every year between 2026 and 2030, doubling production capacity from 600 kb/d today to more than 1.2 mb/d by the end of the decade.

Similar to past years, companies are still favoring small, modular, or phased projects over megaprojects. These projects require less capital, have shorter payback periods, and are more insulated from long-term demand risks.

Conventional crude accounts for ~85% of global crude production and typically requires longer lead times for first production. Producers commonly make investment decisions years in advance of first production. Meanwhile, unconventional crude is short-cycle production and is more flexible to respond to crude price signals. US shale is the largest source of unconventional crude production in the world. Capex and drilling plans are generally made a year in advance but can be modified and are reactive to commodity price movements in a matter of months (or even quicker).

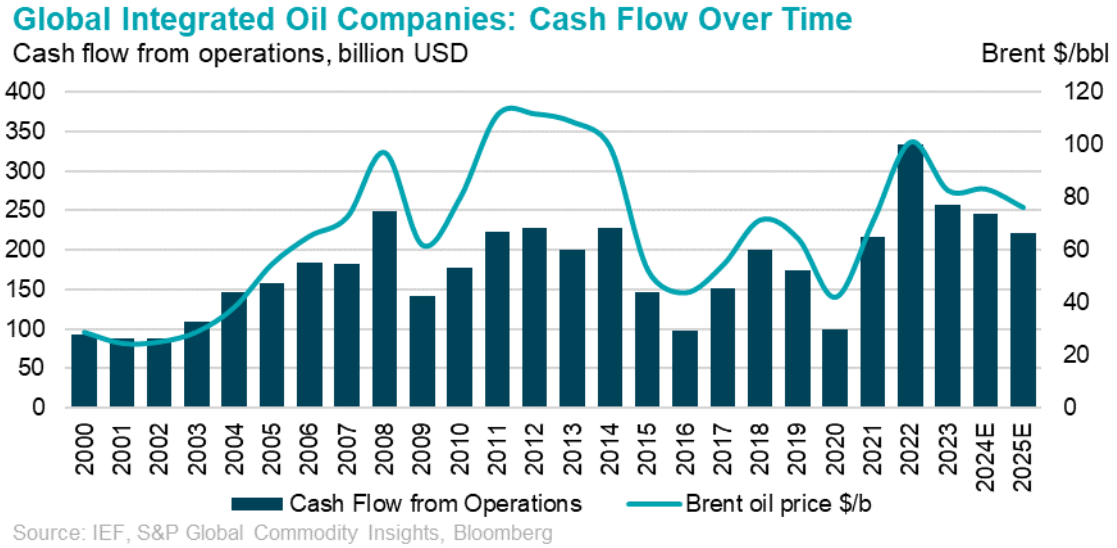
Focusing on conventional crude, new projects and expansions that have already been sanctioned will add more than 6 mb/d of conventional crude by 2030 with more than 2.2 mb/d coming from Latin America. This leaves only ~2.8 mb/d of conventional crude that still need to be sanctioned in the next 2-3 years to meet market needs by 2030, given demand growth and production base declines. Given the recent trend in approvals and access to capital, these projects are expected to be greenlit in the next couple of years in regions that are currently seeing growth in conventional crude such as Brazil, Guyana, and Canada.



Record profits helped ease capital constraints

Strong profits in the past couple of years have helped companies invest in capex directly from operating cash flow, reducing reliance on debt financing. This is a notable change from COVID and pre-COVID years when the primary constraint on investment was capital availability due to weak cash flow, reliance on external capital, and depressed investor appetite.

A group of seven of the largest global IOC's reported cash flow from operations of nearly $350 billion in 2022 and nearly $250 billion in 2023 and $250 billion expected in 2024. Cash flow from these three years is more than the total cash flow of the five years leading up to the pandemic.



Whereas the challenge through most of the 2015-2021 period consisted of prioritizing limited capital in a low commodity price environment, the challenge for investment is now focused on how to allocate available capital in a higher commodity price environment.

This year, the largest IOCs are expected to put on average ~50% of their cash flow from operations toward capex, 27% towards share buybacks, and 23% towards cash dividends. The proportion of cash flow going to capex is significantly lower than historical levels. The surge in cashflow is offsetting the lower "reinvestment rate."

Low carbon business segments are also competing against the upstream for capex allocation. In 2024, the largest IOCs will spend 11-26% of their total capex in low carbon business segments such as renewables, hydrogen, and CCUS.

If cash flows decline due to lower prices or higher costs, then IOCs would need to increase their reinvestment rate to maintain capex and production levels while also making decisions about allocating capex to the upstream or to other business segments.

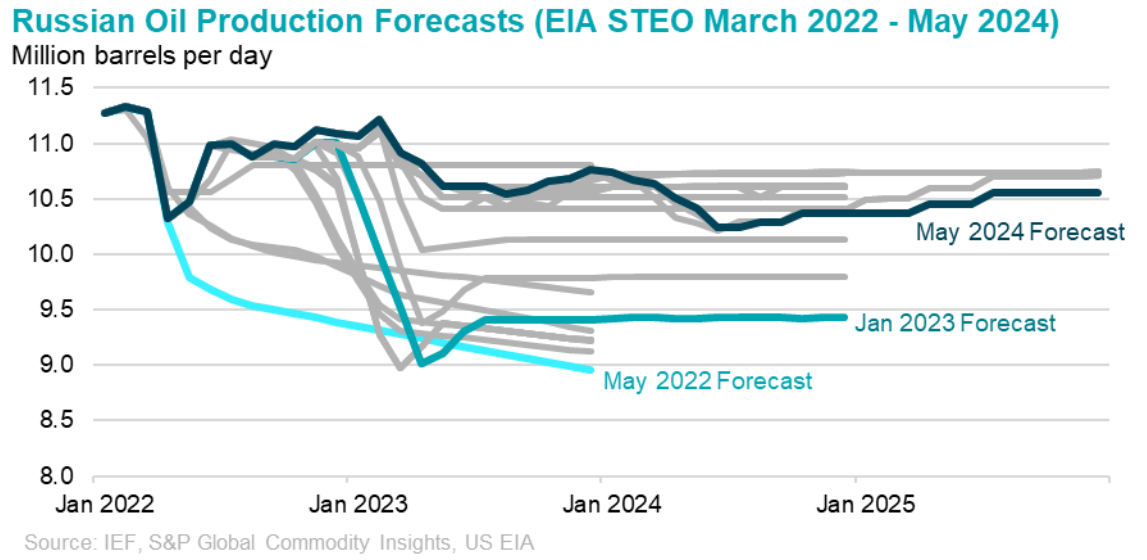
Production in Russia, Iran, and Venezuela has remained resilient despite sanctions

Geopolitical risk is at one of the highest levels in recent history, yet despite the ongoing wars, the impact on physical oil supply has been marginal. Oil markets have proved to be flexible, and flows have been rerouted despite sanctions and threats to pivotal waterways.

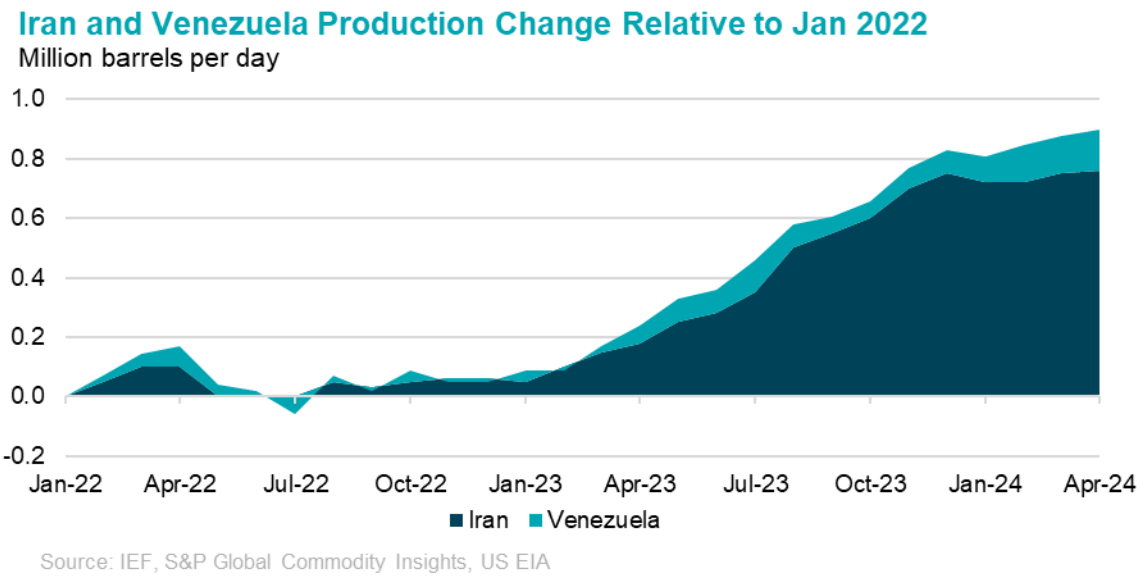
In 2022 and early 2023, many consensus-leading forecasts showed Russian production falling by >2 mb/d due to various sanctions on buying, trading, and insuring Russian crude and products, including the G7 price cap. However, production has remained relatively resilient.

Russia has increased its use of the dark fleet, tankers operating under the radar to circumvent sanctions. Over the past couple of years, the global dark fleet has expanded from around 70 vessels to more than 250 vessels. This substantial increase includes a rise in the number of older tankers which would typically be retired or recycled.

Russia is currently participating in OPEC+ production cuts and its production is currently ~0.7 mb/d below early-2022 levels. However, it is difficult to assess how much of the production cuts are voluntary measures that can be swiftly recovered if OPEC+ changes its production policies.



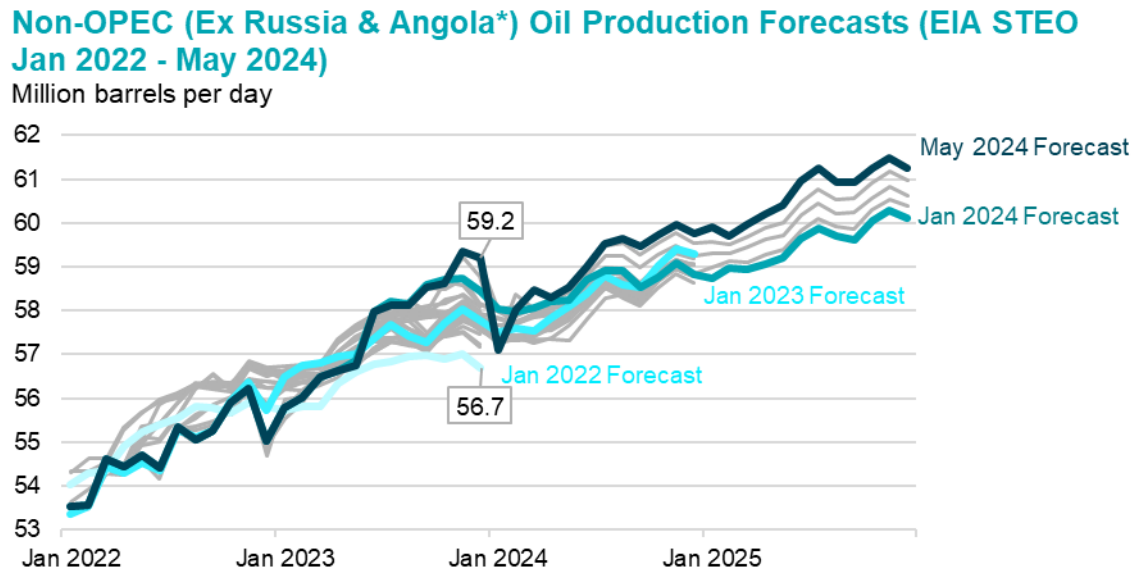
Iran and Venezuela have also seen their combined production rise by nearly 900 kb/d over the past 18 months as they have benefited from the expanded dark fleet, a pick-up in Asian demand, and softer enforcement of sanctions.



Together, Russia, Iran, and Venezuela produced nearly 2.5 mb/d more during 2023 than many analysts/forecasters expected in January 2023. Absent any policy changes, stricter sanctions enforcement, or disruptions, these flows could continue at their current rate.

Non-OPEC supplies have surprised to the upside

Non-OPEC production, excluding Russia, fell short of expectations for much of 2022, but this changed in mid-2023. By the end of 2023, production had risen to 59.2 mb/d – surpassing early forecasts by 2.5 mb/d. Production in the US, Canada, Brazil, China, Guyana all exceeded earlier forecasts.



*Angola left OPEC in December 2023. This chart excludes Angola from the Non-OPEC forecasts made after its departure to enable comparison.
Source: IEF, S&P Global Commodity Insights, US EIA

US total liquids accounted for ~1.4 mb/d of the 2.5 mb/d upside surprise for non-OPEC with crude accounting for nearly 0.6 mb/d, NGLs ~0.5 mb/d, and biofuels ~0.3 mb/d.

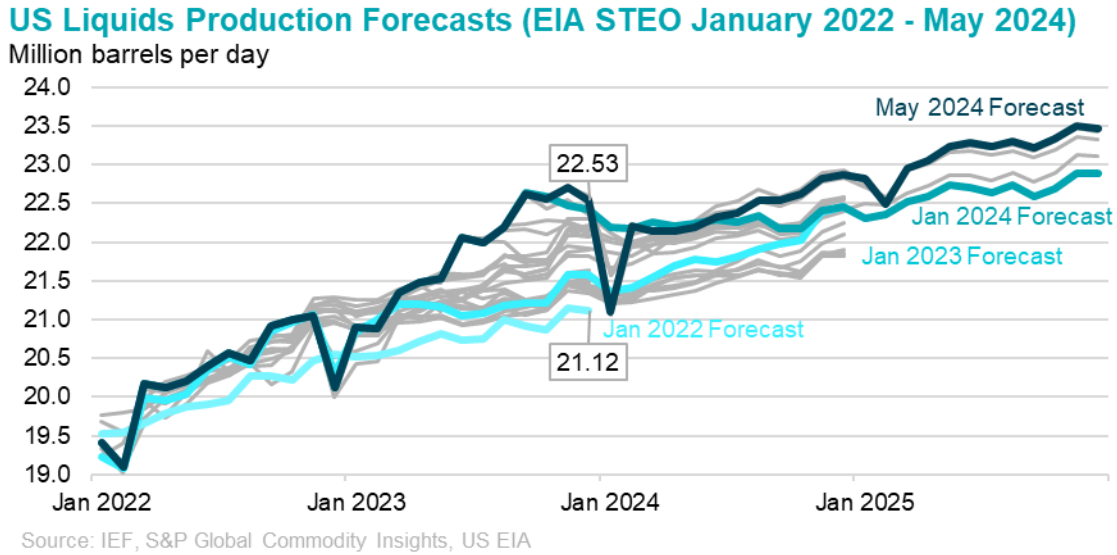
Private operators were key to driving US shale growth last year. However, it will be difficult for these companies to replicate the same level of growth this year given recent M&A trends, exhaustion of core (higher quality) resources, cost inflation, accelerating declines in wells in their first year (up to 50%). Non-public companies shed 50 rigs through the first quarter of 2024, which will also stifle production growth this year.

Additionally, consolidation in the sector will bring more restraint in drilling, but also increased efficiency. Large public companies have been acquiring more of the private firms. The public companies are prioritizing shareholder returns, share price performance, and debt reduction over production growth. However, the consolidation is leading to better efficiency by increasing contiguous shale acreage and improving access to advanced analytics. It also cuts overhead costs and helps reduce inflation as fewer companies compete for oilfield services and takeaway capacity.

The efficiency improvements are already evident as US Lower-48 production has already reached new record highs while the oil rig count remains nearly 40% below pre-COVID levels. The efficiency improvements are expected to continue as the impact of recent consolidation takes effect.

While US production growth is expected to slow this year and going forward, history has repeatedly shown that the risk for shale production is skewed to the upside and not the downside, particularly in a higher price environment. However, the oil price environment remains crucial for sustained

production growth in US shale. Independent producers and major companies are still able to generate cash surpluses of around 40%-45% for their shareholders while adding new wells to increase production at ~$80/bbl WTI. However, if prices were to weaken substantially, shale growth could quickly stall owing to the steepness of the system's base decline and the substantial capital spending required just to maintain production levels. Sustained WTI prices below $65/bbl would likely result in a pullback in US crude output.



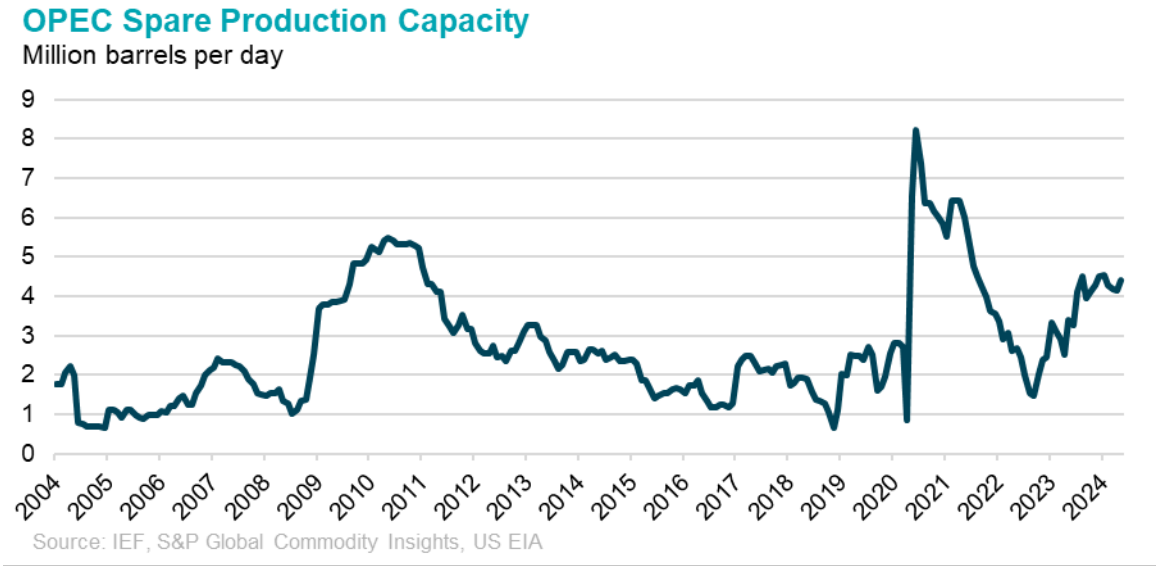
OPEC "unused" – or spare -- production capacity has returned

Due to uncertain economic conditions and resilient production in countries under oil sanctions and stronger-than-expected production growth in non-OPEC countries, OPEC+ has introduced several rounds of production cuts, including a coordinated group cut and individual voluntary cuts. Oil demand is back at record levels, yet OPEC spare production capacity is more than double the levels seen pre-COVID and in late-2022.

OPEC spare production capacity is currently at ~4 mb/d, alone exceeding the additional 2.8 mb/d of conventional crude that needs to be sanctioned in the next couple of years to meet demand in 2030. While markets will hope for some degree of spare capacity to remain, relatively elevated excess capacity levels provide a buffer against potential disappointments or delays in conventional sanctioning, protracted supply outages or an acceleration in base declines.

Spare production capacity helps stabilize markets and offsets some of the geopolitical risk premium in crude prices. Spare production capacity can act as a safety valve when the market overheats. Markets know that if there were a supply disruption, there is excess production capacity in Saudi Arabia, UAE, Kuwait, and others that could be brought online relatively quickly.

In previous years, when spare production capacity was limited, the risk of underinvestment was perceived as greater. Traditional, conventional oil supplies are relatively inelastic to short-run prices. No matter how far prices swing, there is a limit to how quickly new production can be brought to the market due to the long lead time for many new projects. However, when there is ample spare capacity, it can serve as a first-line defense (along with inventories) to buy more time until new additional supplies can come online.



Risk of underinvestment could rise again quickly if prices retreated for an extended period or geopolitical risks expanded to physical oil supplies

As of today, the outlook for the upstream is rosier than the past couple of years. However, changes to the commodity price environment, the geopolitical landscape, environmental, foreign, and monetary policies, or ESG regulations could increase the risk of underinvestment and undersupply once again.

Notably, more voters than ever in history are expected to participate in national elections this year. More than 50 countries—representing a combined population of about two billion people in the world—are holding high-level elections. The results of these could prove consequential for years to come, particularly for geopolitical and environmental policies.

While the upstream investment outlook is more optimistic than in years past, the market will need to remain flexible to overcome potential hurdles and adapt to new realities.

Energy Demand, Energy Security, and Energy Transitions

Energy security and energy transition policies will shape the future of demand, but uncertainties abound

The improved investment and fundamentals outlook has been driven primarily by the supply side – production in non-OPEC and sanctioned OPEC+ members have surprised to the upside and there has been an increase in project approvals and investment levels. A significant uncertainty going forward is the pace of the energy transition and the potential impact on energy demand.

Events in the last few years have demonstrated that the energy transition depends on energy security to really work and to proceed at a steady pace and at scale. Energy security entails providing reliable and affordable energy.

The task ahead is not just a transition away from carbon-intensive fuels, but to accommodate growing energy needs, particularly in the developing world where 80% of the world's population lives. More than three billion people in the developing world use less electricity, on an annual per

capita basis, than a standard refrigerator does in the United States. Without sufficient energy and investment, the economic gaps will only grow.

The world is also assessing the potential impact that increased AI use and data centers could have on energy demand. This could see an increase of natural gas and other fossil fuels in the power sector if renewables are unable to scale-up quick enough and depending on the existing energy mix in the regions where the data centers are located.

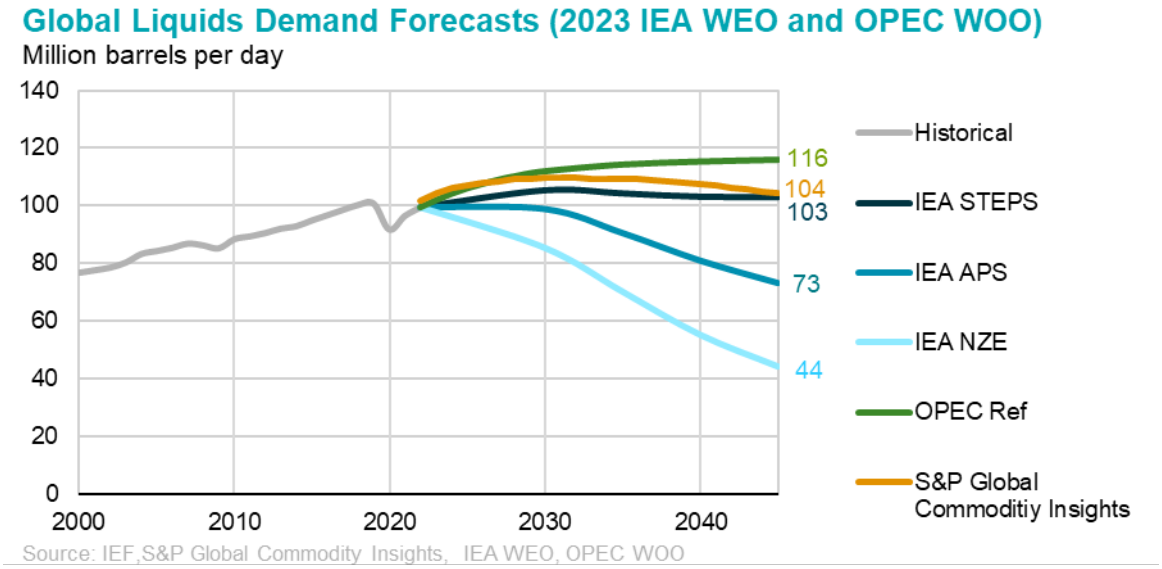
Medium-term and long-term demand outlooks continue to diverge more wildly rather than converge, posing a hurdle for long-term planning and investment

Accurately modeling oil demand during “normal” periods can be difficult. Accurately modeling oil demand for a time of historical market transformation is a herculean task.

Already, short-term oil demand forecasts are diverging by significant amounts. Despite seeing similar global economic outlooks, IEA and OPEC’s 2025 oil demand forecasts diverge by 2 mb/d.

While this may seem like a small divergence for a 100+ mb/d market, the relative inelasticity of supply to oil prices, means a relatively small (1-2%) divergence in global oil demand and supply levels, can cause significant price volatility.

When looking out to 2030, IEA and OPEC base case oil demand scenarios diverge by 7 mb/d and this divergence widens to 27 mb/d when including IEA’s Net Zero Scenario. By 2045, the divergence in base case scenarios widens to 13 mb/d and, including the more ambitious climate scenarios, the gap widens to 72 mb/d.



As short-term supply-side fundamentals stabilize, medium-term and long-term demand uncertainty has reemerged as a significant challenge for investment. Traditionally, investing in long-cycle upstream projects involved balancing economic considerations like full-cycle breakeven prices and above-ground risks. Now, decision-makers must also assess whether demand will persist over the project's lifespan and consider the impact of government policy changes.

Projects slated to come online within the next couple of years are expected to produce well into the 2030s and beyond into the 2040s. These projects now face a wide range of long-term price

scenarios and increasing uncertainties, meaning what is profitable today may not remain so in the future. To mitigate this risk, operators are accelerating the payback periods for new investments and raising return thresholds to account for additional uncertainties.

Long-term demand uncertainty remains a significant constraint and source of long-term investment risk.

Conclusion

The path forward for the oil and gas sector demands substantial and sustained investment to ensure energy security and meet future demand. Annual upstream investment must increase by $135 billion to reach $738 billion by 2030. This investment is vital for supporting energy security and enabling an orderly and equitable energy transition. The past two years have shown the negative impacts of disorderly transitions, such as price shocks, shortages, and a rise in geopolitical tensions.

Predicting market conditions in the coming years is challenging, but decisions made today will shape the availability and affordability of future supplies. Clear policies and increased dialogue can help reduce uncertainty and risks in this complex market. While low-cost resources and capital are available to meet oil demand this decade, the investment environment needs to be de-risked for the long-term. Oil demand will plateau, rather than peak and collapse, and could actually remain above 100 mb/d to 2050. Adequate investment will be needed to offset production declines and ensure market stability. While the near-term investment outlook has improved in the past year, markets cannot grow complacent, but need to remain agile and adaptable to changing conditions.

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