

Oil and Gas Investment Outlook

IEF

Investment Crisis Threatens Energy Security

A Report by the **International Energy Forum**
and IHS Markit

December 2021



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About the International Energy Forum

The International Energy Forum (IEF) is the world's largest international organization of energy ministers from 71 countries and includes both producing and consuming nations. The IEF has a broad mandate to examine all energy issues including oil and gas, clean and renewable energy, sustainability, energy transitions and new technologies, data transparency, and energy access. Through the Forum and its associated events, officials, industry executives, and other experts engage in a dialogue of increasing importance to global energy security and sustainability.

About IHS Markit

IHS Markit is a global leader in information, analytics and solutions for the major industries and markets that drive economies worldwide. IHS Markit partners with clients in business, finance and government to help them see the big picture with unrivaled insights that lead to well-informed, confident decisions. IHS Markit serves more than 50,000 key customers in over 140 countries, including 85 percent of the Fortune Global 500.

Executive Summary

- **Oil and gas upstream investment will need to increase and be sustained at near pre-COVID levels of \$525 billion through 2030 to ensure market balance despite slowing demand growth.** Upstream investment in the oil and gas sector in 2021 was depressed for a second consecutive year at \$341 billion – nearly 25% below 2019 levels. Meanwhile, oil and gas demand is now near pre-pandemic highs and will continue to rise for the next several years, particularly in developing countries.
- **The investment environment for the oil and gas sector is becoming more challenging in the face of unprecedented uncertainty and risks,** including record price volatility, evolving government regulations, increasingly diverging long-term demand narratives, and non-standardized ESG criteria. The lower-price cycle of the past six years and long-term demand debates have driven up investment hurdles and the cost of capital for long-cycle oil projects. This is fostering an environment of “pre-emptive underinvestment” for oil and gas supply, where investments are lagging robust demand.
- **The next two years (2022-2023) are critical for sanctioning and allocating capital toward new projects** to ensure adequate oil and gas supply comes online within the next 5-6 years. Operators will continue to favor projects with access to existing infrastructure as these require less capital, have shorter payback periods, and are more insulated from long-term demand risks. Fear of a mismatch between demand and future supply could start to materialize in this time frame.
- **The role of US unconventional production (shale) in the global supply mix is evolving, bringing conventional investment trends back to the fore.** The swift growth in US production both masked the impact of pre-2020 lower investment in conventional production and amplified it post-2020. While the unconventional resource will remain an important component of new oil and gas supply through the next decade, consolidation of the industry and more balanced spending behavior will structurally limit US’ supply response, compared to the tremendous growth over the past decade.
- **Transparent and standardized greenhouse gas emissions data is essential** as sustainability plays an increasingly important role in strategic planning and financing. Emissions data could be key for future investment during the energy transition. Projects with low breakeven prices, carbon, and methane intensities will be preferred over projects with less favorable attributes.
- **Insufficient upstream investment would result in more price volatility and spur adverse economic consequences.** Increased price volatility would weaken the prospects for the inclusive and sustainable economic recovery that producers, consumers, and governments all want. It would also complicate policy choices during the energy transition.
- **Concerns about lower future investment can inflate prices.** Delayed investment decisions and the increased reliance on short-cycle production increase the uncertainty surrounding the source of the future output. Increased uncertainty around future security of supply can add a premium to prices.

Introduction: Investing Towards Just and Orderly Transitions

Momentum towards energy transitions clashes with rebounding energy demand

The momentum surrounding decarbonization continues to increase. Economies are recovering from the COVID-19 recession and governments have pledged to “build back better,” accelerating a pivot toward clean green energy and a lower-carbon economy.

At the same time, stimulus spending, relaxed travel restrictions, and the global recovery in mobility and economies since 2020 have sparked a bounce back in hydrocarbon demand. Between 2Q 2020 and 3Q 2021, global oil consumption rose by nearly 15 million barrels per day, an extraordinary surge.

While progress has been made in advancing alternatives to fossil fuels in power generation, transportation, and industrial use, these are long-term solutions, and hydrocarbons are expected to remain an essential part of the energy mix for the reasonably foreseeable future. Most base or business as usual scenarios forecast oil demand to be higher than or near current levels by 2030. Therefore, adequate investment in oil and gas remains vital to ensuring energy security and market stability through the energy transition.

The long road to transition: Oil and gas will remain a significant part of the energy mix for the reasonably foreseeable future

History has shown that energy transitions are slow, and technology breakthroughs are difficult to achieve¹. Even with countries actively pursuing de-carbonization, the world will still need oil and gas to ensure a reliable supply of energy during the transitioning period. IHS Markit’s base case long-term demand outlook calls for oil and gas to account for 55% of the primary energy demand in 2030, slightly above 2020 levels. Even under the more ambitious energy scenarios, such as IHS Markit’s *Green Rules* scenario, which reflects a fast-tracked transformation towards a sustainable low-carbon economy, oil and gas still account for 52% of the primary energy mix in 2030, with greater demand erosion in subsequent decades. Regardless of policy uncertainties and despite some variance across scenarios, there will be a clear call on upstream investment to meet market needs.

IEF and IHS Markit analysis shows oil and gas upstream capex needs to recover to nearly \$525 billion per year by 2030 – more than a 50% increase over 2021 levels – simply to meet expected demand. While there are enough known low-cost oil and gas reserves and projects to meet demand over the next decade, the primary uncertainty remains whether companies will or can commit sufficient investment to sanction the necessary projects.

Committed annual upstream capex levels need to increase, but the investment environment for the oil and gas sector is becoming more challenging

Unlike the resource challenge in the face of surging demand in the mid-2000s, the primary obstacles ahead for global upstream investment are predominantly above-ground. Record price volatility and increasingly divergent long-term demand narratives are being amplified by a changing regulatory and capital market environment and ESG pressures. Combined, these forces are fostering an environment of structural underinvestment for oil and gas supply.

The unprecedented level of uncertainty increases the risk profile of oil and gas investments, owing to the questions about the future path of the energy system, the energy transitions, and capital markets

still in search of standardized ESG criteria. This landscape is reshaping investment decisions and making it more challenging to meet adequate investment levels this decade compared to decades past.

This accentuates the risks of multiple energy crises during the energy transitions. The world may face recurrent price shocks across commodities emanating from the disparity between the slower-moving demand transition and the rapidly thinning supply buffer from insufficient investment. This will result in increased price volatility across the energy complex and adverse economic consequences.

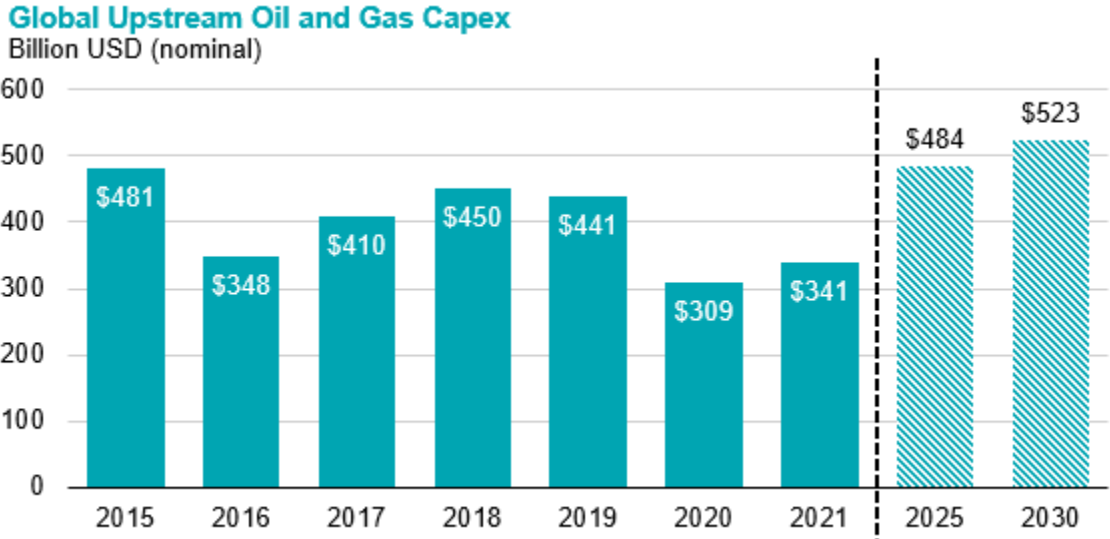
Oil and Gas Upstream Investment Required in a Transitioning World

Upstream oil and gas investment levels will need to exceed pre-COVID levels over this decade to meet future demand and offset declining production

Upstream investment for oil and gas collapsed by 30% in 2020 to \$309 billion. It recovered marginally in 2021, as energy prices increased, pandemic fears waned, and energy demand recovered. However, the recovery of investment in 2021 fell short of pre-COVID levels by a gap of more than \$100 billion or by nearly 25%.

Our analysis shows that annual upstream capex levels will need to return to near \$525 billion by 2030. Cumulatively, we see the need for \$4.7 trillion of upstream capex over 2021-2030 to meet market needs and prevent a supply shortfall, even if demand growth slows toward a plateau. Although this remains below 2011-2020 cumulative capex of \$5.5 trillion, it remains a significant ask of investors and operators in the face of more challenging market conditions.

Figure 1: Upstream investment needs to increase despite plateauing demand



Source: IEF, IHS Markit

While many oil demand forecast scenarios show a potential peak in demand across some OECD regions by 2030, nearly all forecasts show continued robust demand growth across non-OECD Asia, Africa, and the Middle East. The increase in upstream capex is needed to meet this incremental demand growth and despite the sector becoming more efficient. Widespread upstream cost deflation,

operators streamlining project designs and the maturation of the US shale sector mean that the global industry’s capital efficiency (i.e., how far each dollar of capex goes in terms of production) has increased materially over the past decade. The industry can undoubtedly “do more with less” today (inflation, aside). While this provides an important tailwind, we still see a requirement for average annual upstream spending through the end of the decade roughly 15% above 2015-2019 average capex levels.

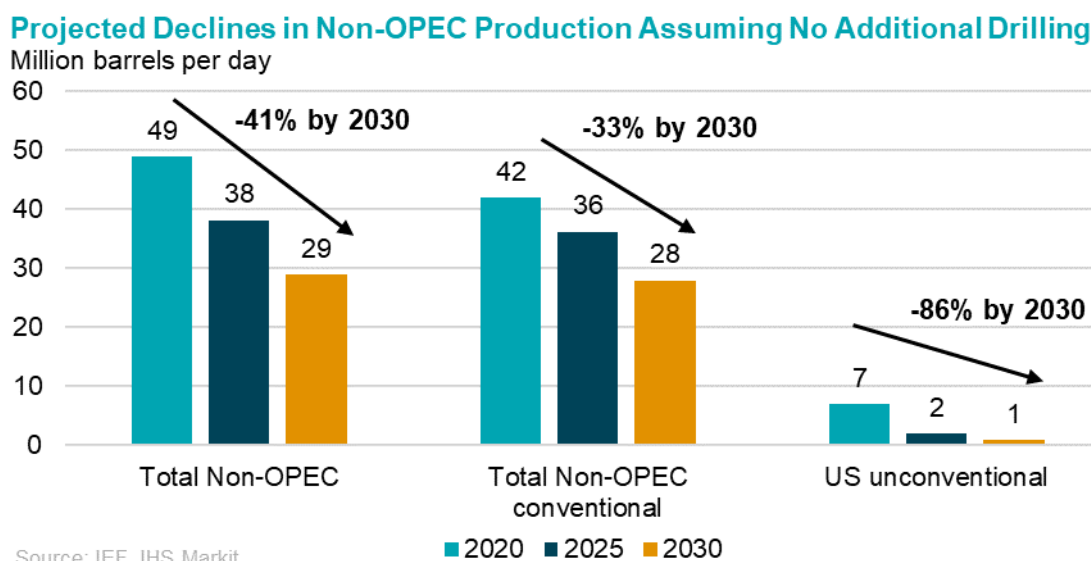
Beyond demand, global supply still requires significant investment to offset normal declines

The need for continued investment is not driven by the demand side alone. A steady stream of investment is needed to offset declines in existing oil and gas fields. Without additional drilling, we estimate that non-OPEC production would decline by 9 million barrels per day by 2025 and 20 million barrels per day (or 41%) by 2030.

In the past two decades, as short-cycle production sources became a greater share of global production, global average annual decline rates have increased. Without additional drilling, US unconventional supply would decline by an estimated 6 million barrels per day (or 86%) by 2030.

Continued upstream investment is needed just as much, if not more, for offsetting normal production declines than meeting future demand growth.

Figure 2: Current non-OPEC production would fall by 20 million barrels per day by 2030 without further upstream capex investment



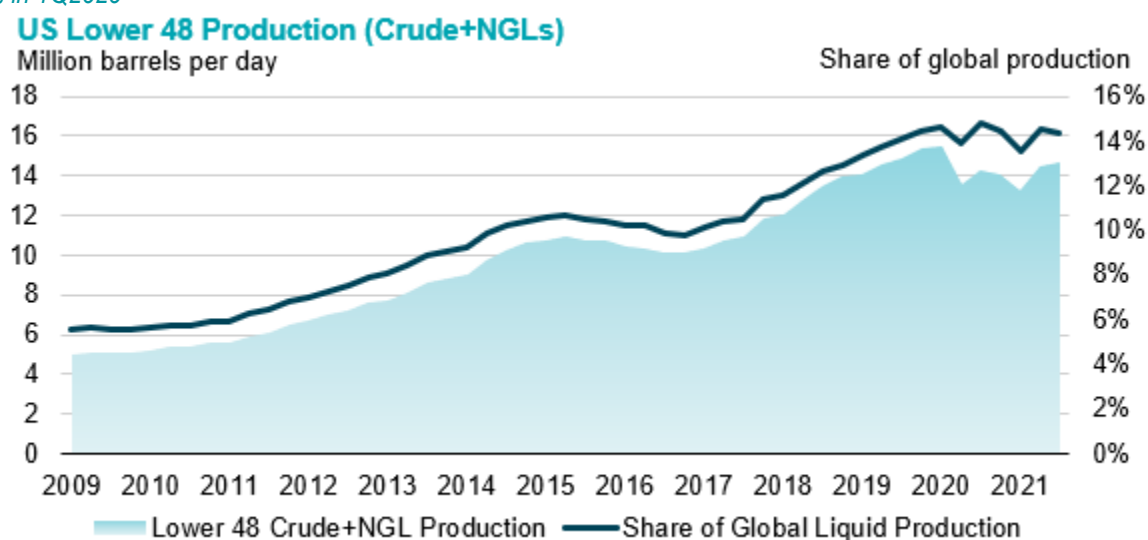
The promises and perils of short-cycle barrels: the shale double-edged sword

In previous decades, low investment would signal a higher risk of undersupply several years in the future. However, the effects of COVID-driven low investment in supply are playing out more quickly due to the global system’s increased reliance on short-cycle production, particularly US shale. The swift growth in US production both masked the impact of pre-2020 lower investment in conventional production and amplified it post-2020. By repeatedly responding to modest upward price signals with

outsized production growth, short-cycle barrels added tremendous volumes to the market, often exceeding demand.

The surge in US production contributed to the deceleration in conventional investment by providing the market with a perceived buffer of supply safety that was seen to endure well into the next decade. However, that vision of a perceived safety net has changed. US production collapsed by nearly 2 million barrels per day in 2020 as the flipside of short-cycle growth, steep declines, became apparent. The shale industry’s muted production response to the 2021 recovery reflects new priorities of increasing shareholder returns and the commitment to “capital discipline”. With the US entering the coming decade with a lower production base and dampened capex responsiveness, the market faces a need for conventional investment to fill the eventual gap left in its wake.

Figure 3: Short-cycle production is responsible for driving up US Lower-48’s market share from 5% in 2009 to nearly 15% in 1Q2020



Source: IEF, EIA

An immediate challenge: 2022 and 2023 will be crucial years for sanctioning projects

Unlike cycles past, the primary obstacle facing global supply in the next decade is not the lack of resource, but rather the increased above-ground risks that could stymie investment and result in an undersupplied market. This is a unique and unfamiliar challenge for an industry where the price has always ultimately justified the means.

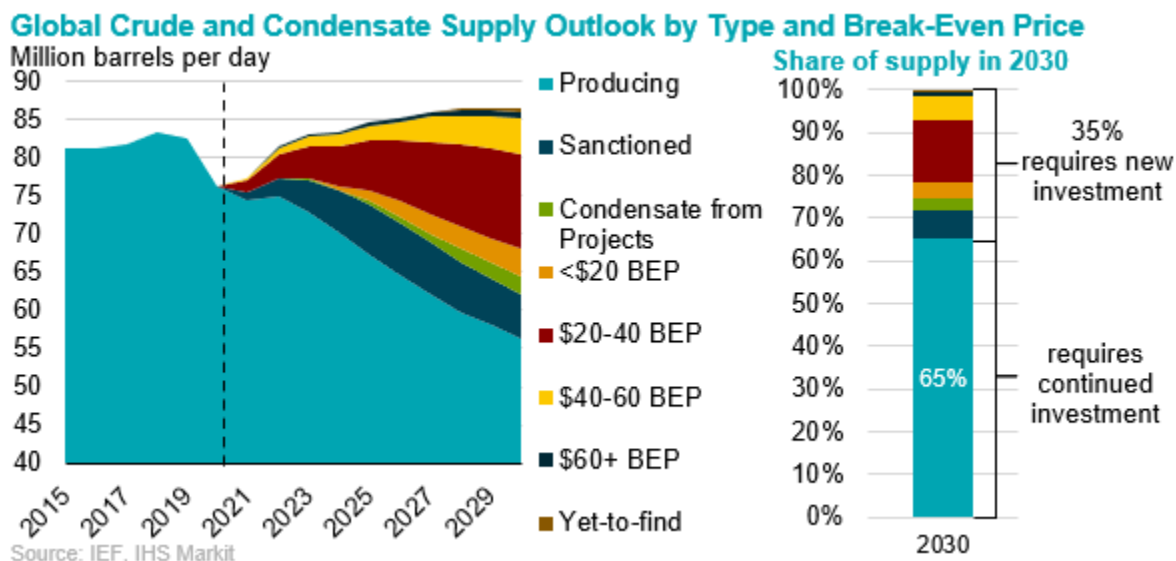
If upstream capex fails to accelerate, the risk of markets facing a period of substantive supply shortfalls in the medium-term rises significantly.

Caution favors the safe(r) investments: a shift towards smaller scale, infrastructure integration and greater concentration in key producing basins

The list of sanctioned projects provides a picture of an industry shifting from expensive, large-scale, single-project investments to small- or medium-scale onshore and subsea tieback projects. Those projects with multiphase expansion opportunities and economical breakeven prices are expected to fill in the majority of new conventional crude oil production over the next decade.

Remarkably, there are currently no new greenfield megaprojects planned (a single large-scale project with peak production of >500 thousand b/d with new infrastructure) in the next five years. In contrast, almost 250 small- to medium-scale projects are expected to begin by 2030, assuming investment materializes. These projects require less capital, have shorter payback periods, and are more insulated from long-term risks.

Figure 4: More than 70% of new production in 2030 will have a breakeven at or below \$40/bbl



The New Investment Environment: Increased Risk and Competing Demand for Capital

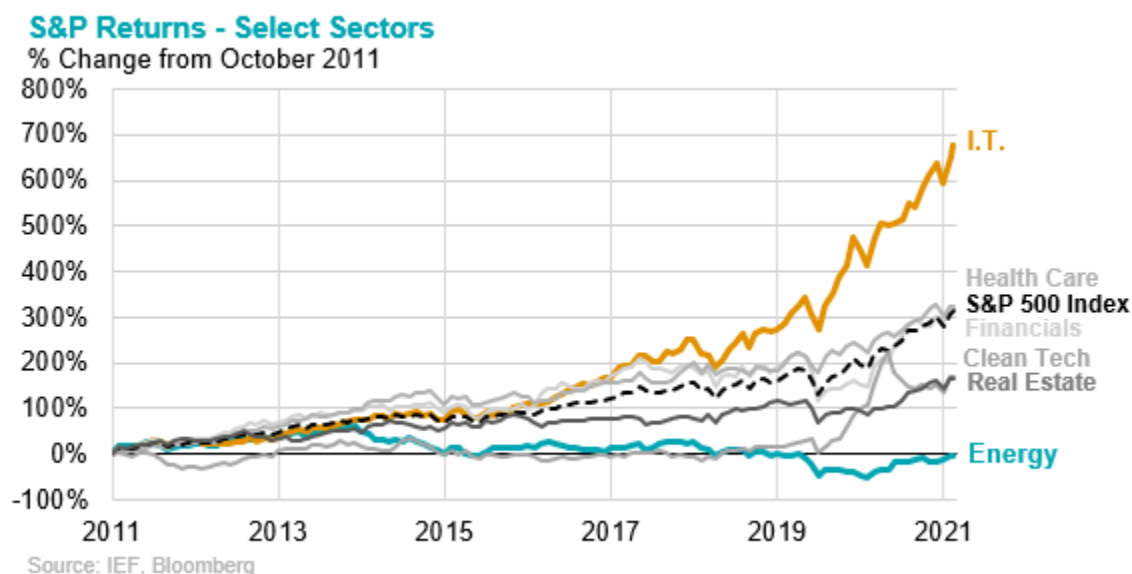
Unprecedented risks and uncertainties challenge investment goals

Weighing on the industry today are the uncertainties that are more significant than ever. Some challenges are age-old, such as geologic and economic considerations and the ability to generate attractive returns. Other challenges are emerging, such as diverging long-term demand outlooks and external pressures on investment, be they from policymakers or shareholders. This new environment and the growing weight of pressures are impacting decision-making and increasing risk, leading to structural underinvestment as companies look across an obstacle-ridden landscape.

Old but continued risk: Poor performance and lackluster returns

The present investment challenge comes after a decade of poor financial performance by energy companies, and historic low returns for oil and gas companies. From October 2011 to November 2021, the S&P 500 energy sector index performance was essentially flat, compared with the overall index which increased 300%.

Figure 5: Energy sector returns lag other sectors in S&P 500



US capex reckoning: After years of outspending cash flows, the end of shale hyperactivity

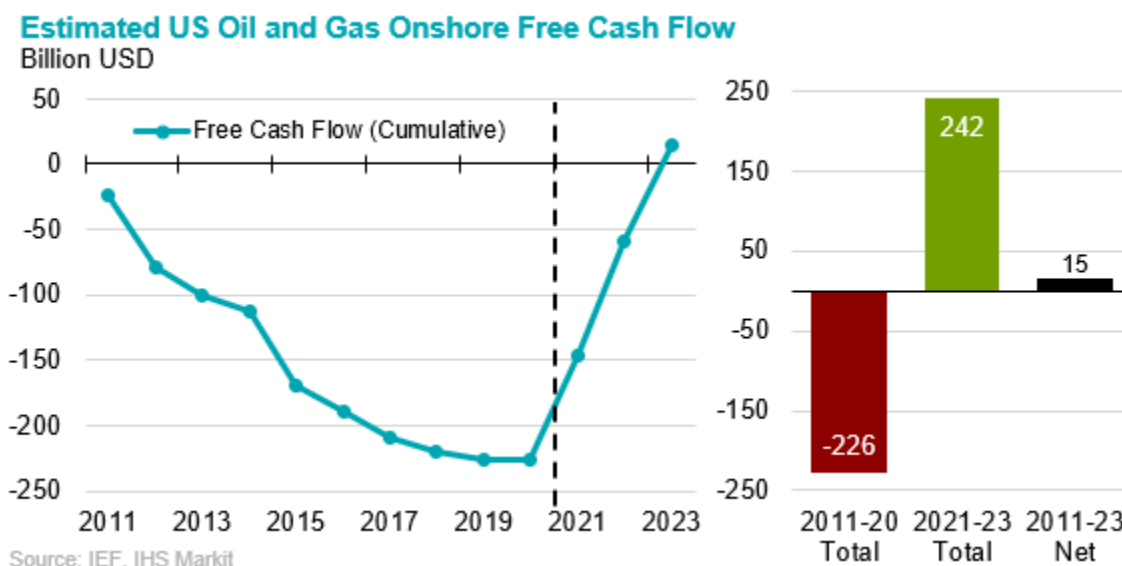
Understanding the role and transformation of the US shale sector is essential to appreciate the challenge ahead. The market can no longer depend on shale to quickly respond to prices due to a transformation of the sector that was accelerated by the COVID-19 crisis.

Unprecedented US supply growth had an immediate and ultimately deflationary impact on both prices and long-cycle investments between 2015-2019. However, while production boomed, free cash flow remained negative. Between 2011 and 2020, we estimate that the US onshore sector outspent cash flows from operations for 10 consecutive years by a cumulative \$225 billion. Spending in excess of cash flows was funded primarily by the combination of debt and equity markets, both public and private.

Even prior to the COVID-19 crisis, shale investors were beginning to demand the prioritization of fiscal discipline and returns over production growth. As a result, overspending and production growth slowed before 2020. Yet, it was the COVID-led demand and price collapse that really accelerated consolidation and cemented the sector's move towards capital discipline. Fewer, larger, operators are now responsible for a larger share of production and growth. Larger public companies must respond to shareholders and attract investors and now tend to be more restrained compared to the shale boom era.

As investors reward companies for reducing debt and increasing returns, production increases from public companies will remain modest and financed from cash flow. The US industry could generate more than \$240 bn of free cash flows over 2021-2023 at prices above \$70 WTI. However, this would only offset the cumulative outspend of the prior decade and give a \$15 bn net free cash flow for 2011-2023. However, the trade-off of this new dynamic will be the US supply shifting into lower gear just as markets enter a more challenging period.

Figure 6: US onshore had negative cash flow every year between 2011 and 2020, burning a cumulative \$225 bn



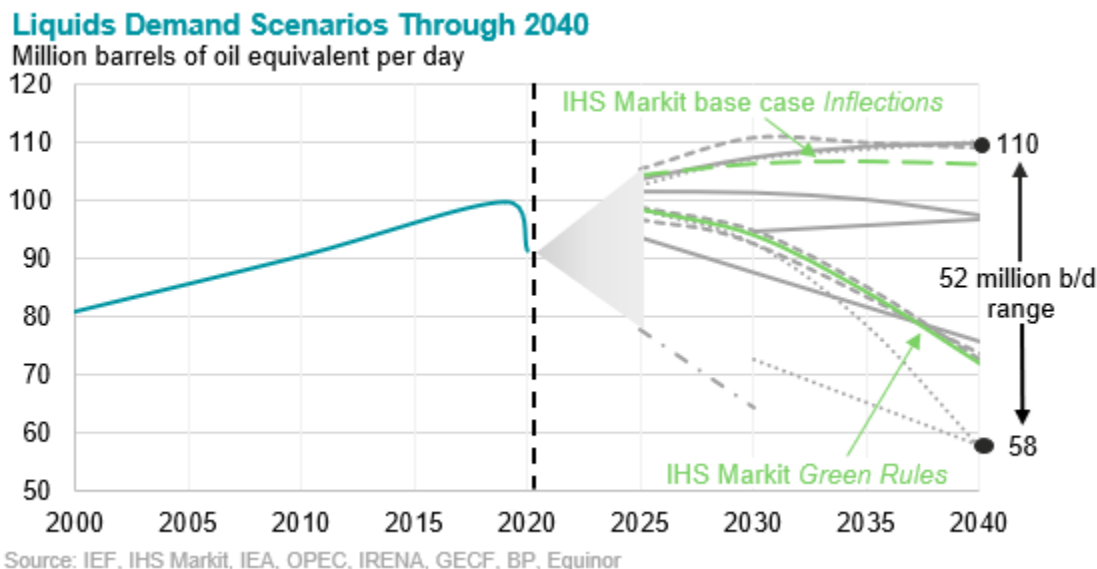
New risk: Widening divergences in demand forecasts adds a fundamental challenge to long-cycle investments

Traditionally, decisions to invest in long-cycle upstream projects consisted of balancing economic considerations such as full-cycle breakeven prices and above-ground risk affecting developments. Now, investment decision-makers must also consider if demand will still be there over the lifetime of a specific project and the impact of government policy changes. The speed of change in long-term demand assumptions over the past few years and widening differences between long-term demand outlooks have brought this consideration to the fore.

There is more than one pathway and pace for the energy transitions, which is evident in the wide range of forecasts and scenarios. Of the various long-term forecasts and their varying scenarios, the difference between oil demand in the highest and lowest case for the following 20 years is 52 million barrels per day, or half of today’s market. Conversely, ten years ago, the gap between forecasts did not exceed 30 million barrels per day – less than a third of the market.

Long-cycle projects that would come online in the mid-2020s are meant to produce well into the 2030s and often beyond into the 2040’s. These projects now face a wide range of long-term price scenarios and growing uncertainties. This means what may be profitable in today’s environment may no longer be economic tomorrow. Or, on the contrary, may well be – and necessary to meet demand. Operators will seek to mitigate this risk by accelerating the payback periods for new investments and raising the return thresholds to account for additional risks. The current focus on smaller, incremental, and more modular projects, with access to infrastructure and the ability to be brought on faster, reflects this trend.

Figure 7: Oil demand forecasts diverge by 52 million barrels per day in 2040



Evolving risk: Changing government regulations contribute to higher cost of capital

In many parts of the world, environmental policies and regulatory frameworks related to the energy transition are in flux. As a result, companies must consider the impact that future regulatory changes may have on costs of compliance and returns over time. Unforeseen or newly introduced regulations can lead to higher costs and reduced revenues.

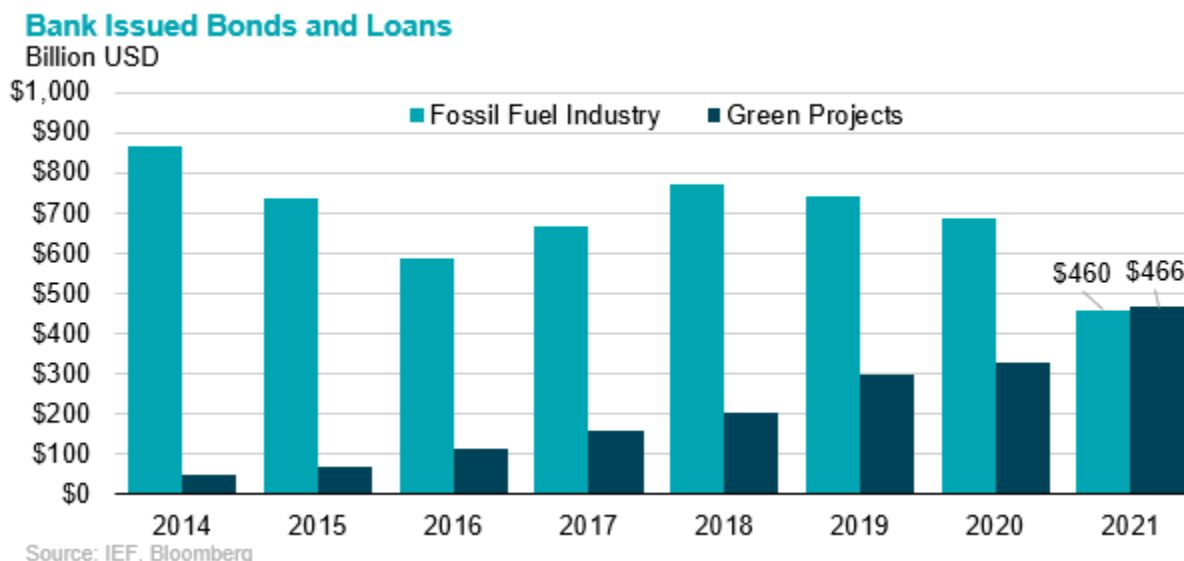
The energy industry needs more certainty from policymakers over penalties and incentives for future energy investments to ensure sufficient capital, for all technologies, is mobilized to meet the climate challenge. This requires government policies grounded in realistic assumptions about demand and the risks of disruption. In particular, governments need to ensure assumptions do not underestimate energy demand growth coming from the 80% of the global population in the developing world.

Operators need a certain level of assurance and regulatory certainty to invest in capital-intensive, long-cycle projects. They will be increasingly constrained in committing capital, or will require higher returns to do so, as risks evolve. Future supply must clear an acceptable hurdle rate that accounts for policy uncertainty, variable oil and gas prices, and, increasingly, carbon price assumptions.

Elevated long-term risk increases the cost of capital. Over the past six years, the cost of capital for long-cycle oil projects has been rising, meanwhile, the cost of capital for renewables has nearly halved, as costs have been coming down, and the demand for green bonds by investors have created a liquid market for the emergence of green finance.

Oil and gas projects must also compete for capital with renewables and other low-carbon investments. The hydrocarbon industry received fewer bank-issued bonds and loans than green projects (renewable and other climate-friendly ventures) for the first time in 2021. As sustainability issues increasingly shape strategic decisions, capital flows will be more likely require clear and transparent ESG strategies.

Figure 8: Bank issued bonds and loans for green projects exceed fossil fuels for the first time in 2021



ESG is increasingly important in investment and corporate decision-making, but still lacks standardization

Despite rising commodities prices, oil and gas companies remain under continued pressure from investors to redouble their focus and commitment to ESG standards.

However, investors use a range of ESG valuation metrics to assess companies. ESG ratings can vary significantly between rating agencies due to differences in methodology, subjective interpretation, market cap size, etc. Thus, standardizing industry ESG metrics could improve company reporting, transparency, and promote a more productive dialogue between producers and the investment community.

While ESG has transformed and added to investor expectations, it is not a barrier in itself to financing in many cases. Companies that are transparent and focus on low-carbon assets, carbon capture or offsets, and maintain capital discipline will likely continue to attract investors, albeit at a higher required hurdle rate than green projects.

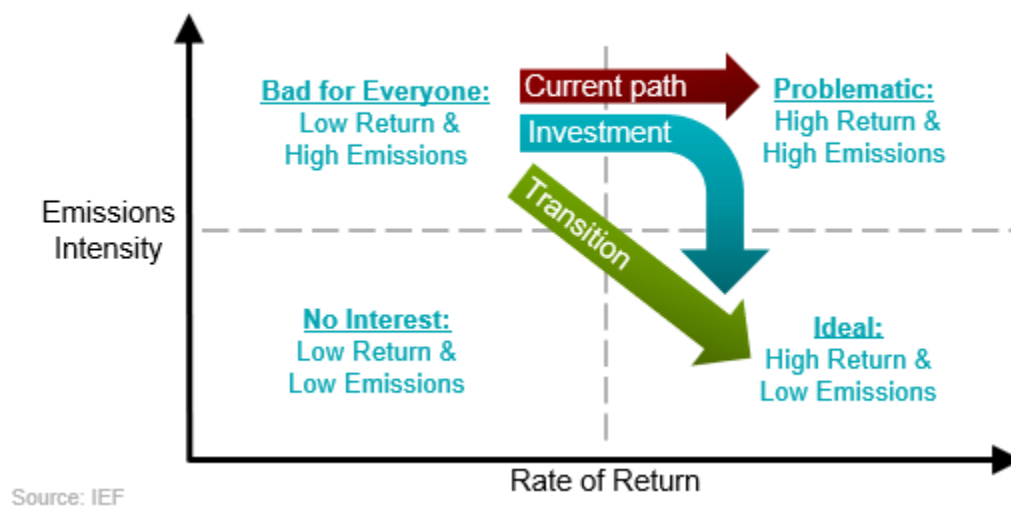
Transparent and standardized GHG data will play an essential role in determining financing

Emissions intensity is also becoming a critical metric alongside return on investment and breakeven prices. As sustainability becomes an increasingly important determinant in financing and risk assessment, transparent and standardized greenhouse gas emissions data is essential.

Specific, standardized, and transparent emissions data could be key to unlocking future and continued investments in the oil and gas supplies the world will need during the energy transition.

Increasing investment and greenlighting new projects with a lower emissions intensity can also be used to lower the overall environmental impact of the sector. If older, less efficient fields with a higher emissions footprint are shut-in earlier than they might otherwise be, in an environment of underinvestment-induced higher energy prices, the industry’s overall emissions could decline.

Figure 9: Stricter investment criteria will favor new projects that can realize higher returns at lower emission rates



Underinvestment Would Threaten Energy Security and Increase Price Volatility

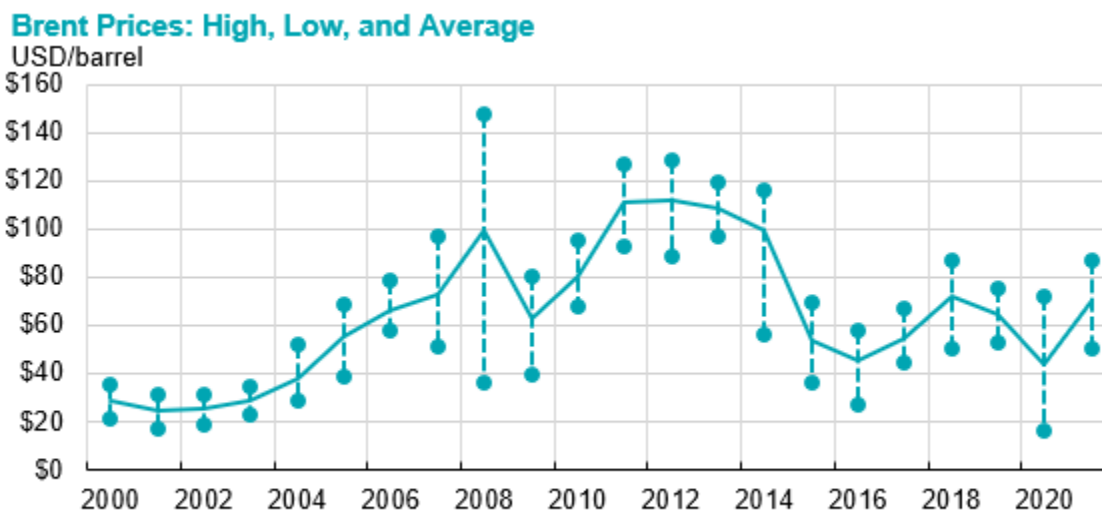
The difficulty of synchronizing slowdowns: Risk of curbing supply ahead of demand

Ultimately the key risk facing markets is a mismatch between the speed of energy transitions and the speed and scale of underinvestment. Pre-emptively reducing investment in the upstream without reduced demand will result in more market volatility at a higher price band and economic disruptions that will bring political turmoil. When there is too little or too much supply for demand, prices become volatile and can set off a wave of unwanted boom-bust prices. Therefore, for a just and orderly energy transition, a decline in the supply of oil and gas should not be reduced ahead of a similar decline in the demand of oil and gas. Additionally, generalizing trends from the developed world to the developing world can lead to misestimation of future demand.

Prolonged cycles of energy price volatility are detrimental to economic growth. On the micro-level, it can affect individuals' and companies' costs and revenue streams, making planning difficult. At the macroeconomic level, volatile oil prices fan inflation, hinder investment, delay consumption of durable goods, reduce total economic output, dent equity returns, and entrench energy poverty.

The uncertainty surrounding future supply/demand can impact prices before the market is under/oversupplied. Delayed investment decisions and the increased reliance on short-cycle production, increases the uncertainty of where or if future production will be sourced. Concerns about reduced FIDs and lower investment today can raise current prices even if the current market is well-supplied.

Figure 10: Market imbalances spur price volatility



Source: IEF, Bloomberg
Note: 2021 average through October

Conclusion: More Investment Needed, But Risks and Uncertainties Abound

The oil and gas industry faces a significant, double challenge. First, it needs to increase annual upstream investment to near \$525 billion by 2030 to meet continued or gradually decreasing demand. This alone would have been a challenge in previous decades. But it also must increase investment in an environment of unprecedented uncertainty and risk including evolving government policies and regulations, non-standardized ESG criteria and reporting, and diverging oil and gas demand forecasts. The elevated risks are resulting in higher costs of capital and transforming the sector.

Pre-emptive underinvestment can still be avoided, but the obstacles to achieving adequate investment are higher than ever, even if the consequences of underinvestment are severe.

In September 2021, energy prices increased dramatically in many regions across the world as a result of both short- and long-term issues on the supply and demand sides. However, the current energy crisis can serve as a warning of what could happen if there is structural underinvestment in the upstream oil and gas sector. High volatility and prices could hinder economic development and prevent a just and orderly energy transition for all.

ⁱ Daniel Yergin, *The New Map: Energy, Climate, and the Clash of Nations* (Penguin, new edition, 2021)

