Energy Transition 2025

The evolving role of oil & gas companies in the energy transition

June 2025

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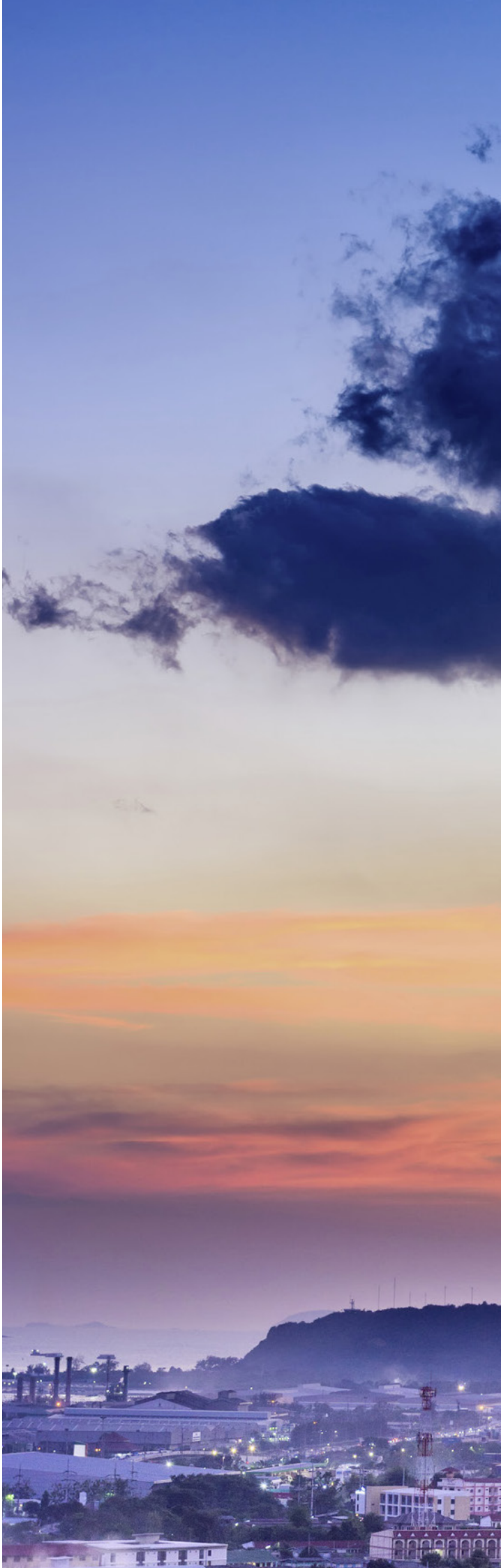


Introduction

The past 10 years of energy transition have challenged oil & gas majors to remain true to their core purpose – the discovery, extraction and commercialisation of fossil fuels – while advancing the priorities of a net zero future. In this report we analyse how a shift back towards that core purpose is influencing the majors' evolving role in the energy transition.

The report is the fourth in a series dating back to 2019 that has been examining how major oil & gas companies are approaching the energy transition. It includes information on 16 oil & gas companies that encompass independent, integrated and national oil & gas companies from around the globe.

Since our first report was published, the world has made great strides towards a global consensus on the objective of achieving net zero by 2050. Furthermore, the oil & gas majors are also part of this consensus and have largely embraced this societal goal. They are committed to it as a political objective and are largely maintaining their stance on the emissions reduction targets they have set for themselves and their suppliers.

Where consensus remains elusive, however, for both nation states and oil & gas companies, is on how (and in some cases, whether) they should each contribute towards the broader net zero goal. To date, Europe has been a leader in the transition but there are some indicators that it may be backtracking on its commitments due to several factors, including weaker economic growth, a lack of policy development and concerns about the security of supply. In the US, the 2025 Trump Administration does not endorse the concept of mitigating against the adverse impacts of climate change and has dropped out of the Paris Agreement once again.

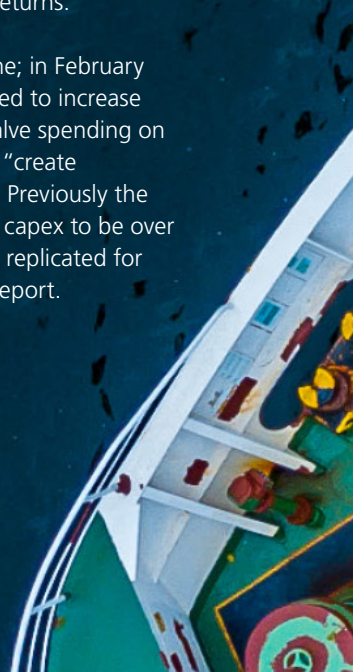
The energy transition is a fast-paced, exciting and growing part of the global economy. As a consequence - in both advanced and emerging economies - national priorities, regulatory regimes and fiscal frameworks to promote the energy transition continue to evolve, sometimes rewarding oil & gas companies but often, it seems, creating difficult pathways or challenges for them.

Alongside the energy transition, the environment for the core oil & gas business remains in flux. Increased concerns about security of supply and affordability have continued to drive demand for oil & gas, and some have argued that this is both slowing the pace of the energy transition and diverting oil & gas companies away from it. Given still strong demand for fossil fuels, the majors have continued to invest largely in their oil & gas operations and ancillary operations such as LNG infrastructure to maintain their routes into markets.

This report provides an outlook on likely capital expenditure (capex) on energy transition technologies to 2030, and the drivers behind that commitment. The oil majors' energy transition capex in 2024 is estimated at USD19.6 billion, representing roughly 7.7% of the surveyed companies' total capex. This is about three times the level of capex they spent in 2018.

There are headwinds, however, and capital discipline has now been applied more rigorously to energy transition investments. This means that some companies that were previously leading in terms of renewables commitments are now formally "resetting" their approach. As a result, divestments and acquisitions are being targeted at areas where the companies see their particular strengths, rather than simply meeting the goals of the energy transition. This is in part due to a shift in the attitude of shareholders, who are more focused on the need for returns.

There are many examples, but to pick one; in February 2025 it was reported that Equinor planned to increase production of fossil fuels by 10% and halve spending on renewables from $10bn/year in order to "create shareholder value for decades to come". Previously the company had set a target for renewable capex to be over 50% of total capex by 2020. This shift is replicated for most of the oil & gas companies in this report.



The result of these resets across the sector has been a more focused approach on the optimal energy transition investments by the majors. In that context, the development of hydrogen and carbon capture are important to nearly all the companies. Key projects to prove these technologies are coming onstream in the next few years. Whether this investment expands or tails off will principally depend on demand for hydrogen and carbon storage respectively, and in cases where demand is not sufficient, government support. Demand is not within the control of the oil & gas companies and so will depend on political and consumer responses to the energy transition. By contrast, offshore wind and solar are heavily invested in already by many of the companies surveyed but are likely to see less focus and growth than in previous years.

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Methodology

Capital Economics has been commissioned by CMS to assess the strategies and activities that 16 major oil & gas companies have undertaken related to the energy transition. The focus of the report is the companies' own messaging related to these activities.

This report is an update of analysis last produced in 2023, and the fourth report in a series dating back to 2019.

Our report and findings are based on an extensive review of the stated strategies of the companies as presented in reporting channels, primarily annual reports, sustainability reports, investor presentations and websites.

In addition, we drew on respected public sources to inform our views on the current state of, and future longer-term trends in, the global energy mix. These include the International Energy Agency (IEA), the International Renewable Energy Agency (IRENA), the Energy Institute and US Department of Energy.

Overview and key findings

Despite recent political developments, there is much more consensus globally on the need to achieve net zero and a (partial, if not total) shift away from fossil fuels by 2050.

How to do this remains elusive and there is currently less consensus on the role of oil & gas companies in the energy transition.

Oil & gas majors have delivered significant capex into renewables and energy transition, with the amount of investment having tripled since our first report in 2019. Recent shifts may lead to a plateauing of investment at this increased level. While there is a clear need for front-loading such investment globally to reach net zero by 2050, the amount of investment from oil & gas companies may be driven less by a desire to simply diversify across the energy spectrum and more by shifts in demand for their fossil fuels and in seeking greener pathways to market for fossil fuel products (such as through hydrogen or carbon capture).

This shift is also due to shareholder pressures on the majors to refocus on core and related activities amid profitability concerns from what are still seen by many as ancillary activities.

Overall, the outlook for oil & gas companies' investment in the energy transition is both higher than two years ago but more nuanced, as it plateaus at current levels, but with prospects for growth in investment considered to be lower.

Global context for the energy transition

Greenhouse gas emissions (GHGs) are now 4.7% higher than in 2016, despite pledges to reduce GHGs around the world.

Around 55% of all emissions in 2023 were generated by the major economies of China, US, EU and India.

Rising electricity consumption is driving new energy demand due to a combination of economic growth, expanded energy-intensive use of data and digital technologies, and the switch to electric vehicles. There is a desire for this new demand to be met by renewable generation, but there will be continuing demand for oil & gas for decades to come.

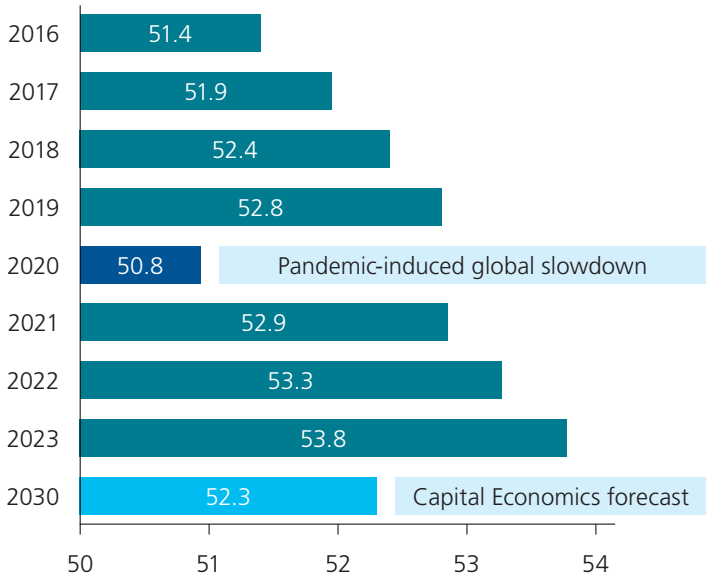
Security of supply concerns, along with a slower transition to renewable and low-carbon energy than perhaps forecast at the time of our first report in 2019, has seen a refocussing on oil & gas activity. The high gas price has perhaps also been a driver in terms of ensuring the best return for shareholders.

Global emissions continue to rise as economies like India and China grow

The main components of GHGs are carbon dioxide (CO2), methane, nitrous oxide and three groups of fluorinated gases – sulphur hexafluoride, hydrofluorocarbons and perfluorocarbons.

The Paris Agreement (2015) accelerated moves in the energy transition, with 196 countries pledging to reduce their GHGs and prevent the global temperature from rising more than 1.5˚ C by the end of this century. In 2025, some scientists have reported that the world is already surpassing that 1.5˚ C temperature change. GHGs in 2023 were 4.7% higher than in 2016 and rose in every year except 2020, when the COVID-19 pandemic caused a large but temporary reduction in global mobility and economic activity.

Global GHG emissions (billion tonnes CO2)



Sources: Capital Economics and IEA

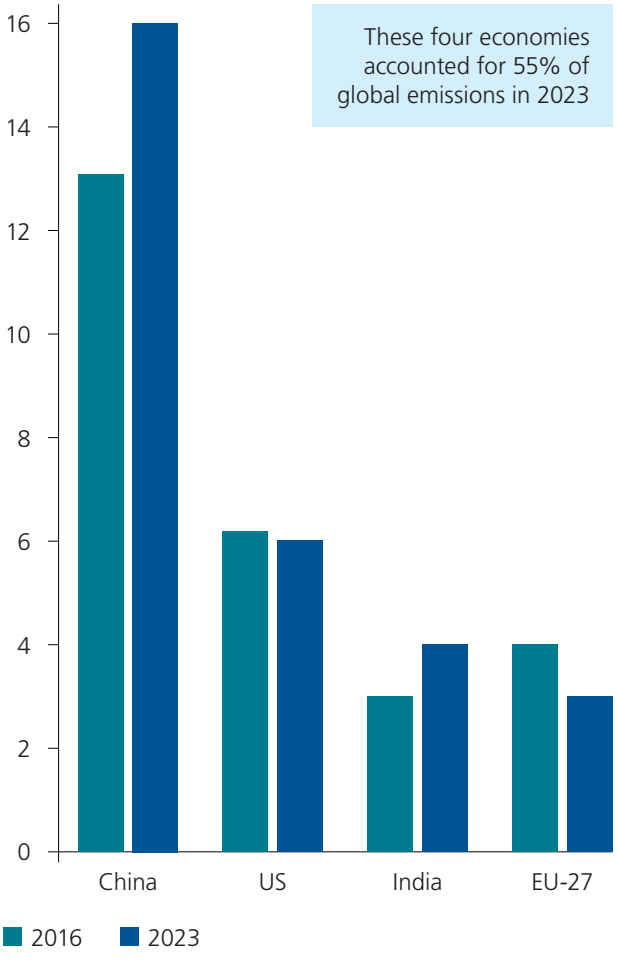
Although global emissions have been rising, performance between countries has varied.

China, the US, India and the EU together account for 55% of global emissions (2023). Much of the increase in global emissions since 2016 can be attributed to heavily populated, developing economies, mainly China and India, where significant economic growth has resulted in increased demand for energy and outpaced the ability of cleaner energy investment to keep up.

The EU and US, by contrast, reduced their emissions over the same period, driven by national policy as well as the shift of some global industrial and manufacturing processes to places like China. Nevertheless, the EU has not made as much progress as expected given the challenges of new technologies and some consumer resistance to renewable energy. The wish to become independent of Russian fossil fuels by 2030 continues to be a significant factor in the development of LNG supply.

The US reduced emissions due to legislation enacted during the Biden administration (2021-2024), as noted in our 2023 report. However, a lack of national commitment to reducing GHGs under the second Trump administration presents additional obstacles to progress in future.

GHGs by country

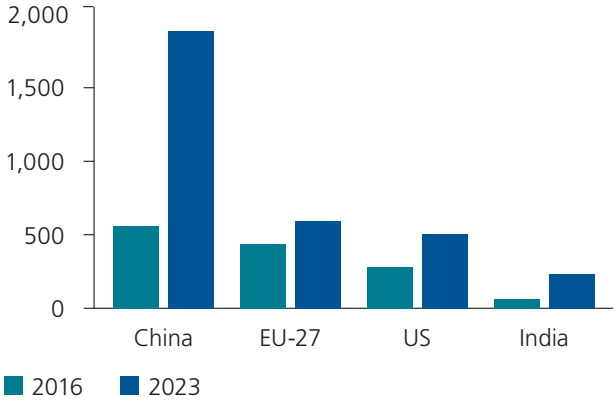


Sources: Capital Economics and IEA

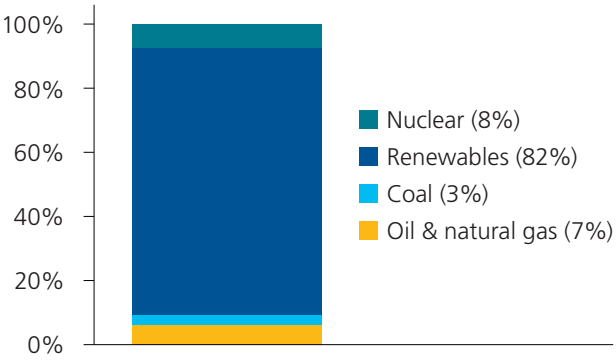
New energy demand is increasingly met by electricity from renewable generation

Failure to reduce GHGs globally since 2016 is reflected in the continuing role of oil, gas and electricity generated by fossil fuels over that period. However, additional electricity demand has been increasingly met by renewables, as in the case of China and India, while in advanced economies like the US and EU, renewables are both replacing existing generation and meeting new electricity requirements. Worldwide, 82% of investment in power generation is now in renewables, up from 74% in the 2023 report, while investment in oil & gas generation has fallen from 11% to 7% since 2023.

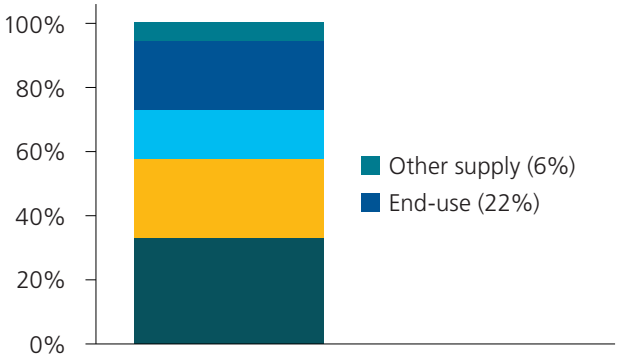
Installed renewable generation capacity GW



Power Generation IEA energy investment 2023-24 USD bn



Power Supply IEA energy investment 2023-24 USD billion



Sources: Capital Economics and IEA

Varied picture in LATAM

Growing, though uneven, momentum towards energy transition in Latin America has been shaped in the past decade by national policy agendas, international climate commitments, and increasing interest in renewable energy deployment. Nevertheless, oil & gas will remain a fundamental component of Latin America's energy landscape in the near to medium term, underpinned by the region's ongoing efforts to meet domestic energy needs, bolster economic development, and ensure security of supply.

Countries such as Brazil, Guyana and Argentina continue to drive upstream momentum, supported by strong resource potential and foreign investment interest. On the other hand, Uruguay stands out for its near-complete reliance on renewables for electricity generation, while Chile has made significant strides in expanding solar and wind capacity. Other countries are at varying stages of exploring diversification strategies.

Natural gas remains prominent as a key transitional fuel. Argentina's Vaca Muerta shale and related LNG developments, along with regional gas trade from Bolivia, play an important role in supporting supply reliability and reducing emissions intensity. Peru continues to rely on natural gas from the Camisea fields and a vast network of hydro-power facilities to support both domestic consumption and power generation at low prices.

Venezuela, despite holding the world's largest proven oil reserves, remains largely sidelined from the regional energy resurgence due to longstanding political instability, underinvestment, and international sanctions. However, any potential recovery in that country could have far-reaching implications for regional supply dynamics and energy markets.

Overall, Latin America continues to face the broader challenge of balancing energy security and affordability with the need to decarbonise. Issues such as access to finance, infrastructure investment, and social equity will remain critical to ensuring a just and sustainable transition.

ASEAN countries balance conflicting demands

Oil & gas demand in Southeast Asia will remain a pivotal energy source in the near to medium term, driven by the need for underdeveloped countries to meet the demands of rapid urbanisation, industrialisation, security of supply and rising energy needs. That said, there have been varying degrees of appetite for developing transition and greener energy sources, largely driven by national policies, international commitments, and increasing investment in renewables.

While oil & gas continue to play a significant role in meeting ASEAN's energy security and economic development goals, the region is progressively integrating into its energy mix transitional fuels such as LNG, natural gas and hydrogen. While the hydrogen economy has not progressed as rapidly as expected, in countries such as Japan and South Korea hydrogen is playing an important role in reaching net zero. In conjunction with this, there has been acceleration of the deployment of solar, wind, CCUS and other low-carbon technologies. For instance, recently Malaysia issued a yet to be gazetted law dealing with CCUS, and companies such as JOGMEC (the Japan Organization for Metals and Energy Security) are exploring CCUS projects in Asia (on a contract for difference basis) to assist Japan to reach net zero targets.

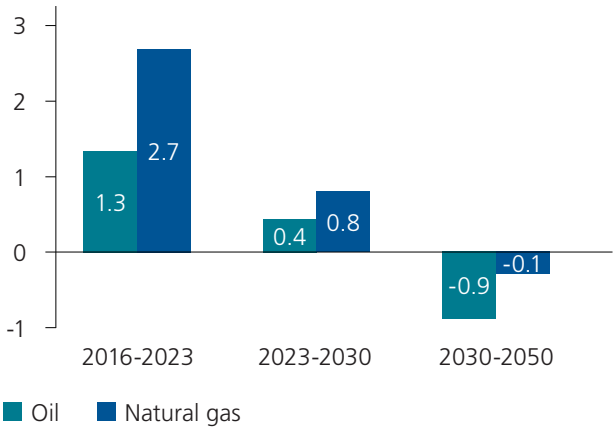
ASEAN has always had to balance energy security (i.e. ensuring reliable, affordable energy supply) with the global push for decarbonisation and the need to meet global climate targets. This has produced several complex challenges such as the need for financing, strategic investments, regional cooperation, and policy innovation, which will need to be overcome to ensure that the energy transition remains on-track in this region.

The International Energy Agency (IEA) has several scenarios for energy demand and, by extension, GHG emissions. The "stated policies scenario" is based on a continuation of the currently known policies and does not account for progress on future adoption. Under this scenario, electricity demand will accelerate and nearly double between 2023 and 2050.

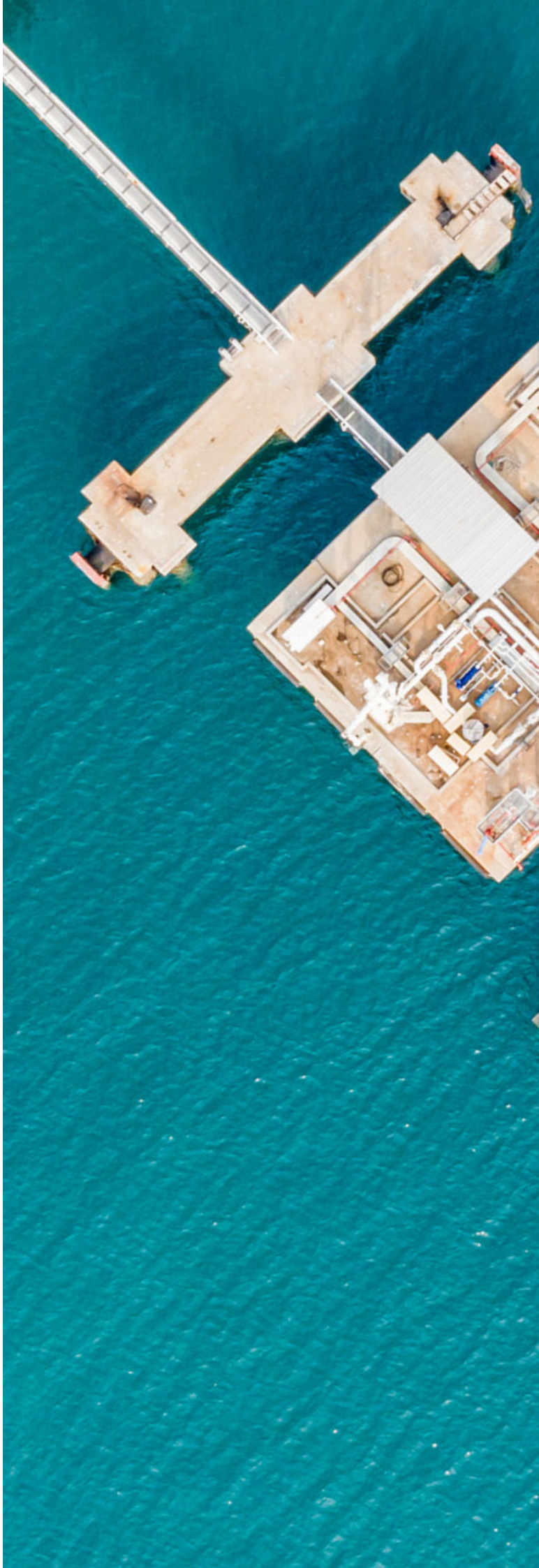
Already we are seeing this trend accelerate, for example driven by the huge energy requirements of data centres. As the demands of the IT industry (especially with wider adoption of AI tools) grow, the need for clean power continues to rise. Furthermore, as consumers adopt hybrid and EV vehicles, demand is shifting further towards electricity and away from fossil fuels. In addition, the rise in global temperatures means even greater demand for electricity-fuelled domestic cooling around the globe.

Oil demand growth will drop significantly between 2023 and 2030 and will then contract through to 2050. But with gas partly displacing oil demand, natural gas demand will rise during the period 2023 to 2030. As renewable generation ramps up to meet new electricity needs, growth in natural gas demand will then slow beyond 2030 and towards 2050.

Demand for oil, natural gas and electricity to 2050



Sources: Capital Economics and IEA



Huge potential in Africa, but the usual challenges

Africa finds itself at a crossroads between focusing on industrial and economic development based on fossil fuels and promoting the transition to renewable energy (to reflect global goals in relation to climate change and use the continent's huge renewable energy potential). It has some of the world's biggest reserves of oil & gas and an increasing position as a producer, especially in Nigeria, Angola, and North Africa. But Africa also has fast-growing energy demands, driven by industrialisation and a population often lacking access to electricity. The chosen path will be an attempt to find a balance in the energy mix, seeking to reconcile both approaches.

Natural gas, particularly the LNG sector, is widely seen as a short- and medium-term energy transition solution to sustain industrial growth on the continent. African LNG projects aim to use advanced technologies to reduce emissions. One of the key projects being developed is Mozambique LNG, in the Mozambique Rovuma Basin, which involves plans to extract approximately 65 trillion cubic feet of recoverable natural gas, including a two-unit liquefaction project with expansion capacity of up to 43 million tons per annum.

There are many other examples. Tanzania LNG is a project for an LNG terminal in the Lindi Region, with a pre-FID slated for 2025. Greater Tortue Ahmeyim (GTA) LNG is located on the maritime border of Mauritania and Senegal and one of the deepest, most complex gas developments in Africa, expected to produce around 2.3 million tons of LNG per year. The Yakaar-Teranga Conventional Gas Field, located in ultra-deepwater off Senegal is expected to start commercial production in 2026 and will use gas for domestic electrification and export via a floating LNG vessel.

The energy transition should be a great opportunity for Africa to invest in its many renewable resources – sun, wind and hydro. The Democratic Republic of Congo, Ethiopia, Malawi, Mozambique, Uganda, and Zambia all have strong potential for hydropower development. In fact, some of the countries - Mozambique, for example - already rely heavily on hydropower, with over 80% of their electricity coming from this source. The increasing interest in green hydrogen also represents a significant market for the African countries, and several projects are already being developed for example in Angola, where there is a 600MW green hydrogen project. Other examples include South African plans to support a pipeline of green hydrogen projects worth about $17.8bn over the next decade, including initiatives like the Hydrogen Valley project. Meanwhile the Namibian government, in partnership with Germany, is aiming to develop a large-scale green hydrogen hub with a target of producing over 300,000 tons of hydrogen annually for export to Europe.

The challenges to realising Africa's climate and development objectives include the need for strong energy transition strategies that will not only focus on the environment and economics, but also on a just transition in terms of the social impact on poor and vulnerable populations. Finding adequate and affordable funding - capital costs for projects in Africa are far higher than elsewhere - and investing in infrastructure development will be key to the success of these goals.

Drivers, trends and challenges in the energy transition

Although the direction of travel towards net zero is now clear, international consensus on the "how" remains elusive. National regulatory regimes are still evolving and, in some cases, governments are stalling and even backtracking on previously stated priorities. This is made more acute against the rising pressure on the costs of energy and the desire to safeguard domestic energy security, especially in Europe.

Some renewable investments are in distress with cost pressures increasing and IRR returns depressed. In addition, some newer technologies are unproven at scale, expensive to develop, and/or present challenges in securing and developing end-user demand.

Within the oil & gas industry globally there is broad acceptance that GHG emissions need drastic reduction. The majors have embraced the goal of net zero by 2050, which is a significant development in mindset since 2018. This includes investment in renewables and other energy transition technologies and in reducing their own GHGs.

Oil & gas companies need to continue to provide a secure and affordable source of fuel, while still expecting demand to fall in coming decades. In the last couple of years there has also been a perceptible shift in investor attitudes towards the majors investing in renewables outside their area of expertise. This has led to a focus on other energy transition technologies such as hydrogen and CCUS.

Evolving trends

Many of the trends in the energy transition that existed in 2019 are still trends today, although they have evolved in different ways.

Of the key drivers behind the energy transition, many remain in place:

— Concerns about reputation have led more oil & gas majors to adopt third-party monitoring and increased use of insights gleaned from data collection and artificial intelligence to identify opportunities for emissions reduction.

— In some demographic groups and geographies, consumers and investors alike are clearly expressing a preference for products with a smaller carbon footprint.

— There is now an overall acceptance by the majors of the societal need to move towards net zero by 2050.

However, the picture is uneven, with implications for the corporate strategies of oil & gas companies:

— Regulatory and disclosure requirements are uneven and still evolving.

— Pressure from consumers for oil & gas companies' commitment to energy transition is varied by sector and geography, and consumer attitudes to the balance between costs of energy and net zero commitments can be volatile.

— The environmental impact considerations for oil & gas developments in the UK remains in a period of some uncertainty with updated guidance having just been published (19 June 2025) in response to a government consultation following the landmark ruling of the UK's Supreme Court in June 2024, which concluded that a local authority had erred in failing to consider scope 3 emissions. On the other hand, in the US a recent case (Seven Country Infrastructure Coalition v. Eagle County) concluded that there was no requirement for the Transportation Board to consider the environmental effects of upstream and downstream projects separate in time from a proposed railway line.

— The cost of established renewable energy has plateaued, but newer renewable energy technologies are costly. In the UK, one example is Ørsted discontinuing its Hornsea 4 offshore wind project due, in part, to increased supply chain costs. When even offshore wind companies are cancelling projects due to high costs it is understandable that oil & gas companies will choose to stay away and put their capital into lower-cost oil & gas projects relating to their core business.

— Pressure on the profitability of renewables (and the potential timeline to see a return on investment), and resulting shareholder pressure, has led some companies to rein in their renewable capex and renew their focus on exploration. As bp retreats from some of its green targets, the company is scaling back or even cancelling hydrogen projects which are not demonstrably justifiable economically. This is against a backdrop of demands by activist investors such as Elliott Management for bp to better manage costs after perceived poor stock market performance over the past five years.

— In the Netherlands, The Hague Court of Appeal recently overturned a prior order requiring Shell to reduce its greenhouse gas emissions by 45% by 2030, reversing a ruling by the Hague District Court. However, in February 2025, Milieudefensie (the Dutch environmental activist group) announced that it would appeal the decision to the Supreme Court of the Netherlands.

Furthermore, some important new trends have emerged since our last report in 2023:

— The move to electrification has been faster than expected;

— The consensus on how to achieve global climate targets is breaking down, with a new reversal in US policy under the current Trump administration;

— AI is emerging and many consider that it will transform the pathway to emissions reductions by optimising processes, improving efficiency, and enabling new solutions across various sectors, while potentially adding to the pressures due to the power demand from data centres.

The broader context for oil & gas

Factors largely outside the control of the oil & gas majors continue to present risks and challenges that affect their strategies and levels of investment towards the transition. Shareholders of public companies expect profits regardless of production decisions that affect market balance and prices.

— The need for reliable, affordable fuel supplies given geopolitical volatility:

  - Demand for oil & gas could fall due to the transition, and shifts could be abrupt.
  - Use of oil & gas will not wholly disappear, and certainly not in the short term, so capex is needed to ensure availability of future fuel supply.
  - Global inflationary pressures and the impact of Russia's invasion of Ukraine shows that consumers and investors will demand an affordable and reliable supply of oil & gas during the transition.

— Changing regulations and inconsistent reporting requirements:

  - There are still few global standards, although the UN's Sustainable Development Goals (SDGs) are used most often. Enforcement and monitoring of these

falls short of the desired global outcomes. There is some limited progress being made in respect of international shipping and cross-border movement of CO2 but limited mutual recognition in areas such as hydrogen certification.

- The US reporting regime is standalone. Some national oil companies do not report at all, partly to avoid falling foul of greenwashing regulations.
- Advanced economies are changing incentives and tax treatment to discourage oil & gas investment. An example is the increase and extension of the UK Energy Profits Levy and removal of the investment allowance uplift.
- However with such a widescale change to the energy make-up, the rate of policy development is struggling to keep up with potential investment, which is impacting investor confidence.
- Permitting processes are not consistent across countries, a particular problem in Europe.

— Unproven lower carbon and renewables technologies:

- Companies are investing in various forms of carbon capture (in addition to investments for enhanced oil recovery purposes), but these are not yet to a scale that can be counted on to generate reliable returns. Geological storage of CO2 on a commercial scale is yet to be developed.
- Carbon offsetting and carbon removals (such as direct air capture) are mainly done on a voluntary basis and, as such, require companies to be certain that there is sufficient evidence about the carbon emissions reductions that such projects deliver.
- Although a proven technology, the offshore wind industry is experiencing rising costs, supply chain issues and grid delays. Floating offshore wind technologies are not yet commercially deployed and are significantly more costly.
- Hydrogen development is ongoing and increasing for own consumption in the petrochemical and refining sectors but beyond this is held back by lack of demand stimuli for hydrogen consumers and lack of enabling infrastructure, which is affecting future investment plans. Delays in the roll out of hydrogen policies across various jurisdictions mean that even those willing to invest must wait until these are r olled out.

— Policy uncertainty on targets:

- Despite near global consensus on reaching net zero by 2050, there is great variation among countries in terms of the nature and adoption of targets.
- US climate policy is antagonistic and inconsistent under the 2025 Trump administration.
- Energy affordability and economic growth concerns are leading to some backtracking on national climate commitments. An example is Europe's "re-industrialisation" policy.
- There has been flip-flopping by some governments making long-term decision-taking hard, for example, successive UK governments' approach to new exploration licenses. In the same vein, Harbour Energy is reviewing its commitment to the Viking CCUS scheme planned for Humberside, citing repeated delays by the UK government in respect of its commitment to the Track 2 of CCUS development in the UK – albeit since then the UK Government Spending review announced on 11 June 2025 included funding commitment for the Track 2 projects.
- There is not enough clarity on how to make the energy transition affordable for both the most vulnerable and least wealthy countries, where demand for energy is forecast to rise significantly but which cannot easily afford the higher costs of EVs or green hydrogen.
- The London Protocol, and its impact on cross-border transportation of CO2, remains an important factor in future scalability of CCUS projects.
- Oil & gas are used for a wide range of non-energy uses, including cement, feedstock and plastics. The future of hydrocarbons is not just about energy.

Rosebank highlights regulatory challenges

The regulatory environment for oil & gas companies has become less stable in recent years, making it harder for them to take the sort of long-term decisions that are necessary in the industry. The experience of the Rosebank field illustrates the challenges.

Rosebank, owned by Equinor and Ithaca, is the largest known, undeveloped oil & gas field in the UK. The NSTA granted consent to develop Rosebank in September 2023, however a decision by the UK's Supreme Court in June 2024 cast doubt on its future. That decision held that downstream, end-use combustion emissions should be considered in the granting of consent for development, which had not been accounted for in the initial application for the Rosebank field. That meant the consent was challenged by judicial review as unlawful.

The owners won a judgement in January 2025 granting them permission to continue with the project while the situation was reassessed in the light of new guidance from the UK government that was expected in Spring 2025. Over its life, Rosebank represents an investment of over £6bn in the UK economy, so the impact of the ultimate decision is important for the wider economy. In the meantime, investors in UK offshore projects like Rosebank face uncertainty in the approach and timing for regulatory decision-making.

More generally, this illustrates the kinds of challenges facing the oil & gas sector in an increasingly litigious space that the majors will have to navigate, and companies face similar climate or environmental-based regulatory challenges in other developed economies.

Oil & gas majors' investment in renewables

Against this complex backdrop, oil & gas companies have diversified into multiple renewables and energy transition solutions over the last 10 years, although their level and focus of investment varies.

When it comes to diversity of approach, most are present across almost all of the range of activities, with Chevron and Shell present across all of them. Of course, diversity does not equate to equal depth of engagement in each area and some companies may be more focused on ensuring external PR on their activities in this space than others.

Almost all the companies surveyed for this report are now involved in some form of carbon removal and reduction projects, whether nature-based, carbon capture, utilisation and storage (CCUS), or third-party credits/offsets. The picture is much more complete since the 2023 report, and all but one company (Pemex) now invests in third-party credits/offsets.

An interesting new development is involvement in direct air capture. The Climeworks projects – such as Orca and Mammoth in Iceland, Norse Pine in Norway and Cypress Southwest in Louisiana, USA – are seen as the current frontrunners for DACs. Though nascent and currently the most expensive way to remove CO2 from the atmosphere, this technology has been included in a number of proposed legislative policies that could encourage oil & gas majors to support it. For example, the European Commission included DACs as one of the possible technologies to help with its aims to store up to 50 Mt CO2 a year by 2030 as part of the Carbon Removals Certification Framework. However, the shift in US government attitude to supporting low carbon projects makes DACs less certain there. For example in May 2025, the US Department of Energy announced the cancellation of $3.7bn worth of clean energy grants including for these sorts of projects.

Despite the limited end demand to date, delays to development of necessary infrastructure for the transportation or storage of hydrogen or the barrier of costs of these projects compared to traditional activities, hydrogen is still a focus for most majors, the only exceptions being Harbour Energy and Pemex. In contrast, TotalEnergies is actively involved in several hydrogen projects, such as the Masshylia Project at the La Mède biorefinery in France, in collaboration with Engie, which aims to produce green hydrogen for the biorefinery's needs. Similarly, ExxonMobil's Baytown facility in Texas, US, is aiming to produce 1 billion cubic feet of hydrogen per day while capturing over 98% of associated CO2 emissions.

Involvement in low-carbon solutions covers renewable fuels and EV charging points, while renewable generation can be both for their own operations or for external generation. Again, the picture is more complete than in 2023, with most majors now investing in EV charging points, for example. This is driven in part by domestic forces such as requirements in France that car parks over a certain size have both solar PV and EV charging (plus bicycle parking) as well as an appreciation that existing refuelling stations will start to lose customers as the transport sector includes more EVs.

Companies' renewable investments by sector

Company	Carbon removal and reduction				Hydrogen	Low carbon solutions		Renewable generation	
	Nature-based	Carbon capture & storage	Direct air capture	Third party credits / offsets		Renewable fuels	EV charging points	For own O&G operations	For external generation
ADNOC	●	●	●		●	●	●	●	●
Aramco	●	●	●	●	●	●		●	
bp	●	●		●	●	●	●	●	●
Chevron	●	●	●	●	●	●	●	●	●
ConocoPhillips	●	●		●	●	●		●	
Eni	●	●		●	●	●	●	●	●
Equinor	●	●		●	●	●		●	●
ExxonMobil	●	●	●	●	●	●		●	
Harbour Energy	●	●		●					
PEMEX	●								
PETROBRAS	●	●		●	●	●	●	●	●
PetroChina	●	●		●	●				●
PETRONAS	●	●		●	●	●	●	●	●
Repsol	●	●		●	●	●	●	●	●
Shell	●	●	●	●	●	●	●	●	●
TotalEnergies	●	●		●	●	●	●	●	●

Sources: Capital Economics and company reporting

Focus where engineering-led expertise is most relevant

The oil & gas majors are by nature engineering-led businesses and, supported by the global supply chain, they have particular expertise from their experience of oil & gas extraction that they can employ in the energy transition. A shift in thinking is that to some, it makes more sense for them to concentrate on areas such as hydrogen and CCUS, where they are using those skills, rather than onshore solar, carbon offset or carbon removal.

— They are using AI to explore for oil & gas – reducing time, cost and environmental damage. It is also used in ongoing operations to detect emissions leaks and to make service routes more efficient.

— These companies are becoming pioneers in terms of carbon capture to both utilise and store emissions. This helps to make progress on decarbonisiation in transportation and industry. A key challenge with regard to CCUS has been government policy in some jurisdictions. For example the UK has been holding back on the Track 2 and merchant models, which is hindering progress on CCUS development.

— Direct air capture is another cutting-edge technology that several of the companies are advancing.

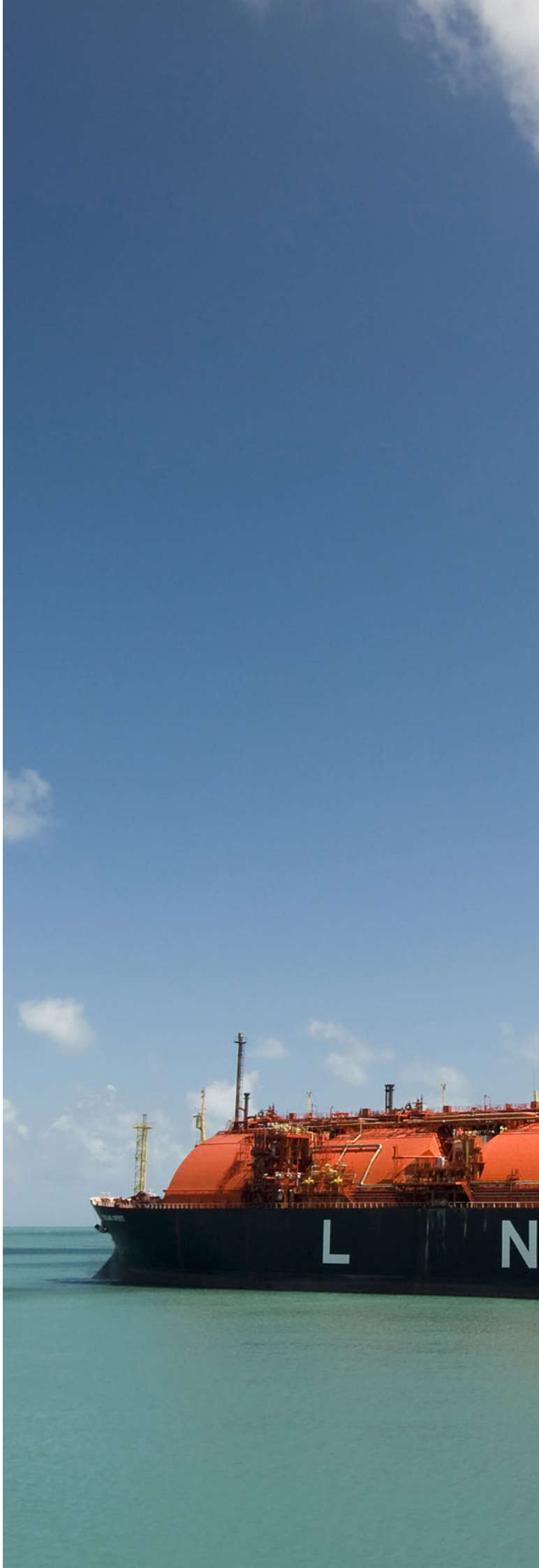
— With solar and wind generation on the rise, battery storage is critical to balancing electricity grids. Companies with renewable operations, in particular, are investing in developing battery storage capacity to support electricity distribution.

— Proven expertise in oil & gas extraction is being used:

  - to exploit critical minerals, whether in traditional mines or on the sea floor;
  - in subsurface understanding of carbon storage sites; and
  - in the transportation of hydrogen and carbon, as well as offshore construction and operations generally.

— In the future mobility will still require fuels, and these companies are at the forefront of developing lower-carbon fuels from both renewable sources and waste streams that will support a lower carbon economy in the future.

— Experience in offshore drilling has enabled several of the majors to transfer their expertise to furthering offshore wind generation projects. However, a combination of rising costs, supply chain issues and rising interest rates has led some, including Shell, to pull back from leading new offshore wind developments. In Shell's case this followed a company-wide review in 2023. One example is the company's exit of the Atlantic Shores offshore wind project off New Jersey in the US.



Shifting sustainability requirements demand agility

Sustainability reporting has evolved significantly in recent years, particularly around the energy transition. Investors, regulators, and other stakeholders demand greater transparency and consistency in disclosures related to environmental, social, and governance (ESG) performance. However, the global regulatory landscape remains uncertain, with significant disparities in reporting requirements and timelines between major economies (including the European Union, the United States, and China) posing considerable challenges for multinational oil & gas firms. Additionally, current geopolitical pressures complicate sustainability strategies and reporting.

In the United States, the regulatory landscape for sustainability reporting has become increasingly uncertain since the beginning of the current administration. At the federal level, the Securities and Exchange Commission (SEC) is no longer pursuing its climate disclosure rules, while state-level initiatives take stridently different views on climate issues. This divergence between federal and state regulations creates a complex compliance environment for companies operating across multiple US jurisdictions.

Meanwhile, in the EU, recent amendments and ongoing revisions to the Corporate Sustainability Reporting Directive (CSRD) and the Corporate Sustainability Due Diligence Directive (CSDDD) have created confusion and uncertainty, complicating compliance strategies for multinational firms. Taken together, the global regulatory picture is fraught with risk. Multinational companies must therefore remain agile and proactive, continually adapting and reviewing their sustainability frameworks and regulatory obligations to effectively manage these evolving risks.

But maybe the US and the EU will be left behind to fight it out. Following the disbandment of the Task Force on Climate-related Financial Disclosures (TCFD) at COP28 in 2023, the International Sustainability Standards Board (ISSB) standards have emerged as the leading global framework, guiding companies – initially on a voluntary basis – in effectively communicating their climate strategies, risks, and impacts. As of May 2025, over 20 jurisdictions representing more than 60% of global GDP, had adopted ISSB standards with additional jurisdictions in the process of consultation or adoption. While many of these countries – including China – are adapting the ISSB standards to their national context, this seems to be the clearest indication yet of a streamlined global standard and one we would encourage multinationals to support.

Different company strategies in the energy transition

In our previous reports we noted that the companies surveyed had three main strategic trajectories, a key differentiator being their focus on how to compete in the net zero future. In this report we have maintained that fundamental division in our analysis:

- Diverse portfolio - have expanded beyond traditional oil & gas activities and are more committed to renewable generation as a future revenue producer;
- Core focus companies - may use renewables in their own operations but their capex priorities lean towards current operations and lower carbon commercial solutions; and
- National champions - are generally state-owned entities mandated to carry out national energy transition commitments.

Oil & gas majors are often clearer about their emissions targets and commitments than companies in other industrial sectors. They participate in a variety of industry forums to maintain a voice in the evolution of the energy transition, and, along with ongoing emissions monitoring, it is important to ensure they maintain their social licence to operate.

Though not all companies can or want to be electricity generators, most see the benefit of renewables in their own operations to help them reach their emissions targets. Fuel exploitation – i.e. oil, gas and coal – is the fifth largest sectoral emitter globally. Until that is significantly reduced, progress by the majors towards reducing emissions will remain a public concern.

The majors are technology innovators and lead on hydrogen and carbon capture.

Energy transition activities are more integrated into corporate strategies

Nearly 10 years after the Paris Agreement, energy transition activities are certainly more integrated into oil & gas company strategies.

The companies moved first to embrace the energy transition, then to integrate it into their strategies. Now they maintain a public commitment to reducing carbon emissions in their own operations and have invested in downstream technologies to produce lower-carbon products for the future. At the same time, however, they are re-evaluating and in some cases reducing their capex into renewables, in part thanks to shareholder pressure to generate profits in the face of forecast declining demand for their core product.

Timeline

	Evolving views on emissions	Evolution of views on investments in the energy transition	Views on the core oil & gas business
2019	Emissions reduction targets emerge for O&G companies. Integration of renewables in own operations as a way to achieve emissions targets.	Portfolio diversification into renewables operations as a way to survive when transition complete.	Continued focus on oil & gas but at lower cost and improved efficiency.
2021	Acting on supply and operations emissions. Acting on demand emissions. Leveraging digitalization to lower emissions.	Adopting climate-focused ESG considerations as a fundamental aspect of future business models. Taking major actions to diversify business portfolio. Focus also on nature-based solutions to offset hard to abate elements.	
2023	Further and stronger commitment to own carbon reduction.	Continue to expand renewables, but only where it fits strategy.	An increased focus on a low-carbon future with new downstream products – increased R&D to that objective. Continue to fund oil & gas investment, with focus now also on ensuring a secure supply.
2025	Commitment to reducing carbon in own operations affirmed with clear public communications. A commitment to net zero by 2050 as a societal ambition in which they play a part.	Re-evaluating and reducing the level of capex for renewables given the pressure to generate profits amid a landscape of declining demand.	Investing in downstream technologies to produce lower carbon products of future, company specific strategies with R&D in proprietary products.

Diverse portfolio	Core focus	National champions
— bp	— Chevron	— ADNOC
— Eni	— ConocoPhillips	— Aramco
— Equinor	— ExxonMobil	— PEMEX
— Repsol	— Harbour Energy	— PETROBRAS
— Shell		— PetroChina
— TotalEnergies		— PETRONAS

Source: Capital Economics

Three-way division reflects different trajectories and priorities

The companies surveyed for this report fall broadly into three groups based on how they approach energy transition – **Diverse portfolio, Core focus and National champions**. The composition of these three groups has not changed since the 2023 report, but we have added Harbour Energy to the **Core focus** group.

— The **Diverse portfolio** strategy is employed by the six European majors in this analysis. The key differentiator of this strategy is a strong commitment to renewable power generation beyond their own oil & gas operations, although the level of that commitment varies across the group. These companies actively support their home countries' national energy strategies, which are relatively well articulated compared to their non-European peers. In some cases, the companies are also state-owned utilities, which explains the high commitment to renewable electricity as a way of generating profits in the future.

— The **Core focus** group includes the three US-domiciled firms and the UK's independent Harbour Energy. None of these companies has ambitions to become an electric utility, so investments in renewable power generation support existing operations. Their activities focus on developing lower-carbon energy and industrial solutions that will be prominent for their customers in the future, thereby allowing them to survive the transition. These companies are also primarily driven by the demands of their shareholders and, partly for that reason, they have taken significant steps in recent years to develop clear messaging on climate and to be perceived as responsive towards emissions reduction.

— The strategy and activities of the six in the **National champions** group largely reflect how their home countries are evolving along the net zero pathway. These companies are all key drivers of national economic growth and their mandate is to champion their countries' climate commitments.

Corporate messaging reflects declared strategies

In their corporate messaging, the oil & gas majors strike a balance between their core activities and support for the energy transition. Even those companies with limited investment in renewables clearly feel the need to address the issue publicly, for example with ExxonMobil's "Advancing climate solutions" or Aramco's "Investing in growth. Innovating in sustainability". Similarly, although companies like bp and Equinor are scaling back on some renewable investments, they are heavily investing and invested in the sector and therefore, of course, continue to reference it in their messaging.

High profile statements seek to strike a balance between core activities and supporting the energy transition

Company	Statement
ADNOC	Maximum energy. Minimum emissions.
Aramco	Investing in growth. Innovating in sustainability.
bp	Reimagining energy for people and the planet.
Chevron	Energy that fuels the world.
ConocoPhillips	Energy for tomorrow, and today.
Eni	A just transition.
Equinor	Energy for people. Progress for society. Searching for better.
ExxonMobil	Advancing climate solutions.
Harbour Energy	Our purpose is to play a significant role in meeting the world's energy needs through the safe, efficient and responsible production of hydrocarbons, while creating value for our stakeholders.
PEMEX	To contribute to energy security through the production, processing, distribution, marketing and sale of hydrocarbons and hydrocarbon derivatives, while ensuring profitability and sustainability for the benefit of national development.
PETROBRAS	To provide energy that ensures prosperity in an ethical, just, safe, and competitive way.
PetroChina	Pursuing green development and supplying reliable energy to fuel the growth of our customers and power people's happy life.
PETRONAS	Passionate about progress. Our passion for progress drives us to create better solutions that benefit people, our partners and the planet.
Repsol	Committed to a just energy transition.
Shell	Powering progress: More value, less emissions.
TotalEnergies	More energy, less emissions.

Sources: Capital Economics and company reporting

Different renewable investment strategies

The oil & gas majors surveyed for this report are employing multiple strategies to address the energy transition. They do this with an eye to disciplined capital allocation as well as alignment with their own long-term strategies. Naturally enough, they – and their shareholders – compare investment in renewables and energy transition with opportunities in their core oil & gas activities.

Reduce emissions to meet stated targets
- Operational efficiency utilising AI, digitalisation
- Integrate renewables into own operations
- Decommission and/or divest high-emission assets often to non-industry players

Develop renewables as a future revenue center
- Acquisition or new development of wind, solar generation
- Leverage own offshore drilling expertise in offshore wind projects

Invest in new natural gas projects…and oil too
- LNG expansion promotes security of supply and reduces portfolio emissions
- Partnerships in countries where oil & gas is an avenue for economic development

Continue hydrogen development
- May be combined with offshore wind or other renewable generation
- Use in shipping, fuel-intensive industries
- Often a partnership where existing expertise is leveraged

Promote carbon removal technologies
- Carbon capture, sequestration and storage
- Direct air capture
- Reforestation, carbon sinks

Support transition downstream
- Develop lower carbon products for future
- Add EV charging points to their own service station assets

Clear industry messaging
- Participate in industry organisations and global initiatives
- Engage with third-party monitors

Sources: Capital Economics and company reporting

Working to reduce their own emissions

One direct way in which oil & gas majors can reduce GHG emissions is by cutting the emissions generated during their own extraction and processing of fossil fuels. This activity (including coal extraction) accounted for 11% of global emissions in 2023, making it the fifth highest source of GHGs, so progress in this area is very material in the advance towards net zero overall.

In Scotland, one way this has been supported is via an innovative leasing round for offshore wind projects: Innovation and Targeted Oil & gas (INTOG). Developers were able to apply for seabed rights to build two types of offshore wind project:

- **IN** – Small-scale, innovative projects of less than 100MW
- **TOG** – Projects connected directly to oil & gas infrastructure, to provide electricity and reduce the carbon emissions associated with production

Most of these companies now have a stated net zero ambition for their own operations by 2050, supported by four main approaches to pursuing and monitoring these ambitions:

Culzean shows the way

One example of a TOG project is the Culzean Floating Wind Pilot Project, carried out by a joint venture comprising TotalEnergies, bp and NEO Energy). The project included the acquisition of an INTOG (Innovation and Targeted Oil & gas) offshore wind licence leading to the grant of an Option Agreement from Crown Estate Scotland for the project. The project aims to reduce emissions from offshore oil & gas operations through the provision of renewable electricity from a 3MW floating wind turbine directly connected to the Culzean platform (also jointly owned by TotalEnergies, bp and NEO Energy). The project is expected to be fully operational by the end of 2025, supplying around 20% of Culzean's power requirement, thereby reducing its GHG emissions.

The project is seen as an opportunity to demonstrate the potential of decarbonising offshore oil & gas operations in the UK by integrating renewable electricity generation. It represents an important initial step towards larger-scale reduction in offshore emissions trough the electrification of oil & gas assets, consistent with the targets of the North Sea Transition Deal and the UK's net zero targets.

How companies are reducing their own emissions.

Accountability for targets

- Strong, consistent company messaging on clear and measurable targets indirectly supports transition by holding companies accountable to a variety of stakeholders.
- Use of third-party engagement in setting targets and driving improvements identifies areas of change.
- Standardardised reporting (against UN SDGs or ISSB) provides measurability and is increasingly used in Europe - separately from regulatory requirements.

Operational efficiency

- Improving efficiency was an early focus for reducing scope 1 and 2 emissions.
- Price volatility over the last few years has brought cost control into focus, supporting efficiency gains.
- Success in this area has been achieved by companies that have embraced technology.
- Artificial intelligence (AI) tools are being employed to notify about emissions releases and this has speeded up the process of mitigation.

Renewables as a reduction tool

- Not all companies in our survey are willing or able to become providers of clean energy to consumers.
- However, nearly all these companies are utilising solar and wind energy to power their own operations, so reducing their own emissions output.

Divesting assets that are high emitters

- Companies are keenly aware that their reputation is tied to following through on meeting their emissions targets.
- Divesting assets that are heavy emitters is another way of reducing the company's own emissions.
- This practice has been criticised by activists as the disposals are often to less regulated entities and while the selling company's emissions may look better, this method is not helping the overall transition.

Sources: Capital Economics and company reporting

In an interesting example of the use of renewables to reduce emissions, bp has announced the expansion of oil & gas production in Azerbaijan, coupled with decarbonisation through solar energy and electrification of its oil & gas processing terminal. Renewable electricity generated by the new 240MW Shafag solar project in Azerbaijan's Jabrayil district will be supplied to grid operator AzerEnerji, which will in turn provide equivalent power to the Sangachal oil & gas terminal (operated by bp) near Baku. This will support reduction of operational emissions in Azerbaijan, enabled by the electrification of the terminal, which will also free for export the gas currently used to fuel the turbines generating power for the terminal.

In the Middle East, Aramco has commissioned a megawatt-scale renewable storage battery system to power its gas production facilities and as an alternative to solar energy solutions. More generally, ADNOC has deployed over 30 AI solutions across its operations, in part to reduce emissions.

The table below captures the stated commitments of the majors to specific targets. Since the 2023 report, PEMEX has added an emissions reduction target, but Chevon has dropped the one it previously had. Compared to previous years, almost all oil majors have accepted targets for most aspects of their business.

In most other areas there is no change as the majors had already committed to these objectives two years ago. One additional target surveyed this time is a commitment to net zero their own operations by 2025, and all but two companies have signed up to that, the exceptions being PEMEX and PetroChina.

Investment in renewable generation capacity is part of all these companies' strategies but is significantly higher for the Diversified Portfolio Group.

Commitment to emissions targets

Company	Emissions reduction target	Carbon intensity reduction target	Methane reduction target	Net Zero own operations by 2050
ADNOC	●	●	●	●
Aramco	●	●	●	●
bp	●	●	●	●
Chevron		●	●	●
ConocoPhillips	●	●	●	●
Eni	●	●	●	●
Equinor	●	●	●	●
ExxonMobil	●	●	●	●
Harbour Energy	●	●	●	●
PEMEX	●	●	●	
PETROBRAS	●	●	●	●
PetroChina	●	●	●	
PETRONAS	●		●	●
Repsol	●	●	●	●
Shell	●	●	●	●
TotalEnergies	●	●	●	●

● A dot indicates a stated commitment

Sources: Capital Economics and company reporting

Investment in renewable generation capacity by company with examples

Company	Own operations	External generation	Renewables activities
ADNOC		●	Plans to deploy 100 GW of renewables generation capacity through Masdar by 2030
Aramco	●	●	Solar in own operations / Plans to generate 12 GW of renewable energy by 2030
bp	●	●	Solar and wind projects / Will scale back future projects to be "capital light"
Chevron	●	●	Solar fields power some operations
ConocoPhillips	●	●	Wind and solar for own operations / Investment in Chinese wind project
Eni	●	●	Plenitude business unit generates electricity from both wind and solar for consumers
Equinor	●	●	Invested in onshore renewables in Europe/Americas and also offshore wind
ExxonMobil	●		Does not see renewables as a core competence of the company
Harbour Energy			Presents itself as an independent producer of oil and natural gas
PEMEX			Intends to investigate renewable clean energy post-2035
PETROBRAS	●	●	Plans to invest in onshore solar and wind in Brazil between now and 2028
PetroChina		●	Solar and wind investments are part of its strategic plan through 2025
PETRONAS	●	●	Actively investing in solar and wind via its Gentari business unit
Repsol	●	●	Actively investing in renewable generation in Spain and elsewhere
Shell	●	●	Actively investing in solar, wind generation globally but is scaling back efforts
TotalEnergies	●	●	Plans 100GW renewable energy generation by 2030 / actively pursuing new projects

● A dot indicates a stated commitment
Sources: Capital Economics and company reporting

The outlook for oil & gas production to 2050

For all the focus on the transition to net zero, there appears to be a re-emphasis and re-focus on oil & gas production, with acceptance that demand for fossil fuels will remain a part of the global fuel mix for many years to come. This is seen as being due to a combination of a lack of suitable alternatives for high energy-intensity fossil fuels; natural gas increasingly being accepted as a transition fuel; and concerns about energy security – although this cuts both ways, with some arguing that renewables increase security but others arguing that over-reliance on certain renewables technologies decreases security.

To give a few examples of the changing mood, the Netherlands recently signed an energy sector deal that specifically looked to increase the role of a state-owned company in natural gas projects to remove reliance on imports. Meanwhile in New Zealand the government is looking at restarting natural gas production after several years. Significant dealmaking, particularly in the US, also indicates confidence in long-term gas demand, as does QatarGas's expansion of its LNG tanker fleet. By contrast, in the US the partial roll-back of the Inflation Reduction Act has reduced fiscal incentives for lower carbon investment.

Oil production is forecast to be lower in 2050 than in 2023, but even then it will still be an important element in energy production globally. Natural gas is seen by many countries as a transition fuel, and here production is forecast to remain stronger than that for oil, and some trajectories even show an increase in 2050 when compared to 2023.

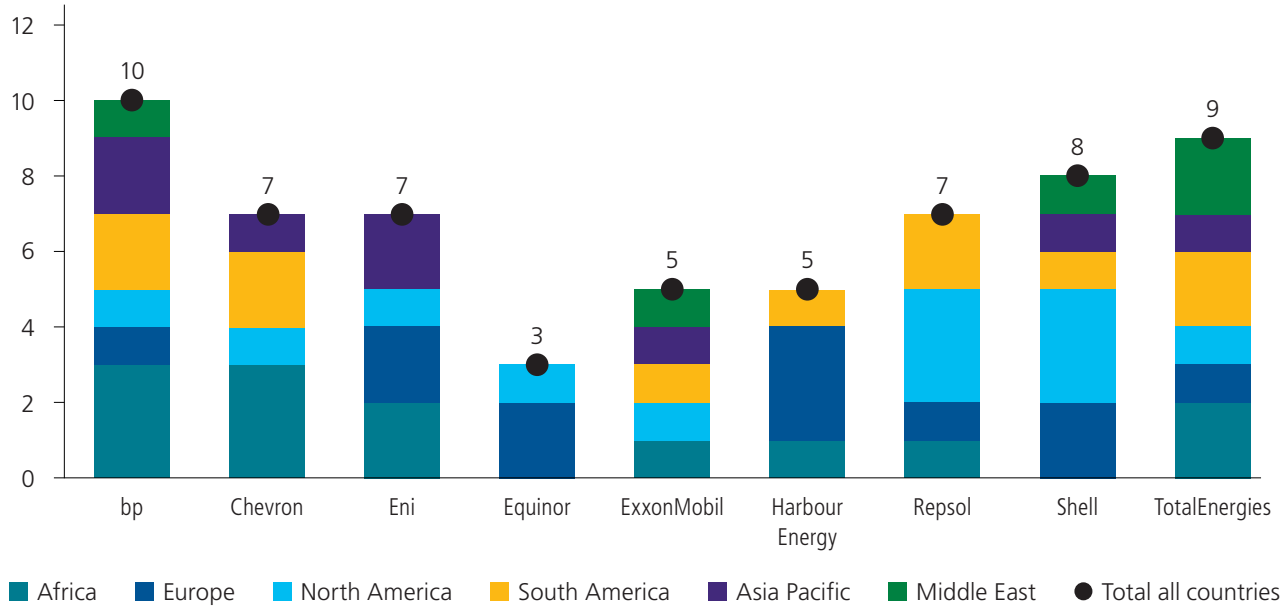
Based on the IEA's "stated policies scenario", oil output will continue rising through to 2030 with North America leading, primarily due to higher US production. There will also be increases in the Middle East. Eurasia will hold steady while the other regions will see a decline. Other analysts support a similar view. Vitol, a large, independent energy trader, expects global demand for oil not to fall until at least 2040. By 2050, however, the IEA expects oil output to fall and be 6.7% below the 2023 level – still a substantial element in global energy supply.

We see evidence of continued investment in oil & gas production in company reporting for 2024. As national oil companies, Aramco and ADNOC have plans to invest more in their own countries' output. US production comes from independent oil producers, with the US majors likely to invest overseas to increase production, particularly in Africa and the Americas.

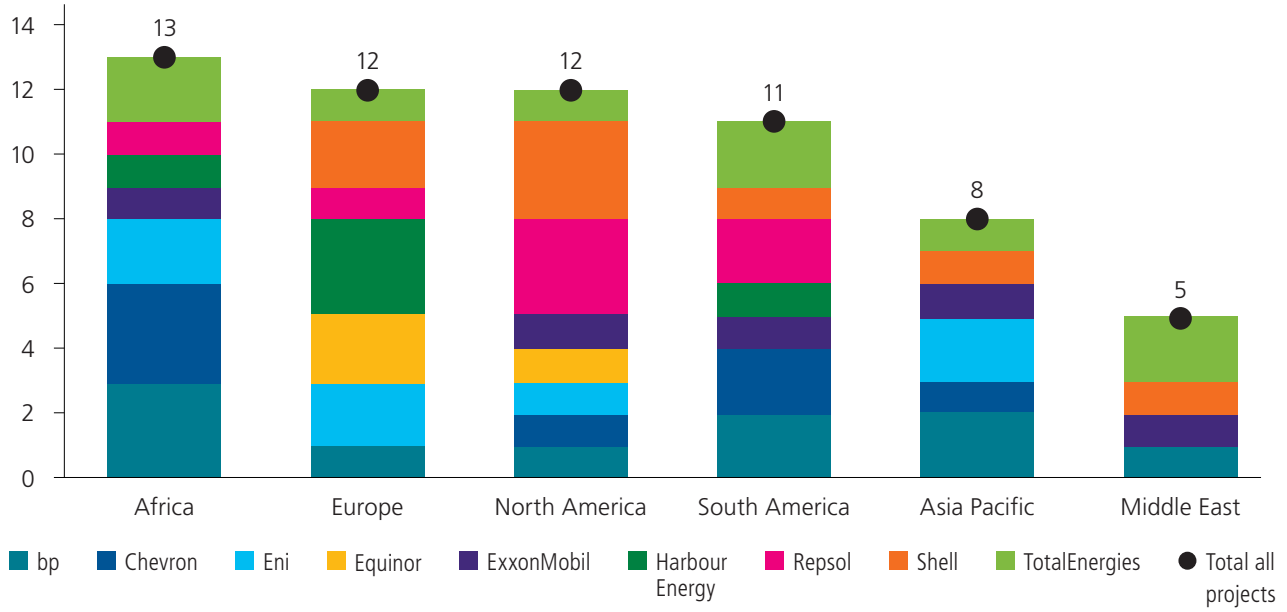
The production outlook for natural gas is greater than that for oil, with global volume expected to be 3.7% higher by 2050 than in the last reported data (2023). While production in the Americas, again primarily from the US, will be the highest of all the regions in 2030, by 2050 Middle East producers are expected to be on par with them. Across the rest of the world, regional gas volumes will be relatively steady, except in Europe where they will decline from what are already relatively lower levels.

From an energy transition standpoint, higher investment in natural gas is a way to displace oil in the short term. From an energy security perspective, gas investments are also being used to help shift buyers away from relying on Russian supply via the expansion of LNG terminals and delivery. As the areas with the largest known reserves of natural gas, the Americas and the Middle East will remain the prominent, lowest-cost suppliers through this period.

Number of countries in each region where companies indicate investments in 2024 annual reports*



Number of countries in each region where companies indicate investments in 2024 annual reports*



Sources: Capital Economics and company reporting

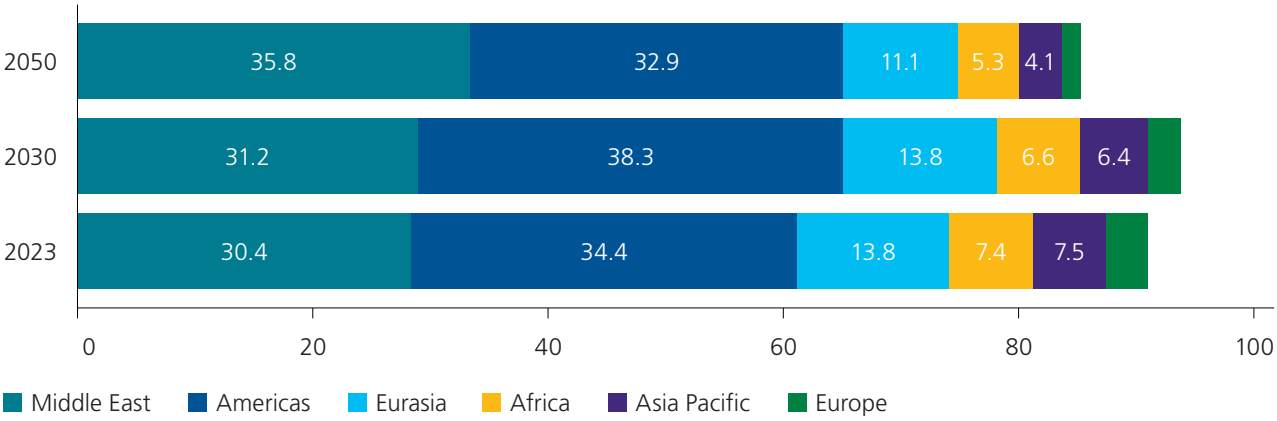
*Note: Selected projects that are coming into production or where decision has been taken

Significant investments are being made to expand LNG infrastructure in the German market, such as projects implementing (hydrogen ready) LNG-terminals in Wilhelmshaven and Stade. The latter project has recently met all the requirements for bank financing (financial close). Further projects are currently in progress in Brunsbüttel and Sassnitz. It is also important to note that the German market is increasingly focusing on dual-purpose LNG terminals, and some of these will also be capable of processing green hydrogen and its derivatives.

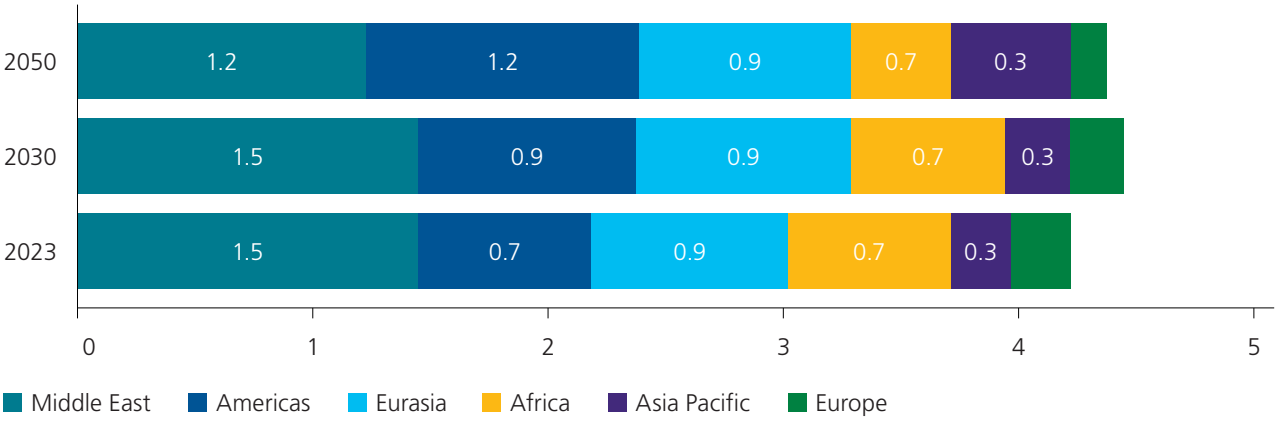
The key players in the LNG market are a mix of the main oil & gas companies but also many other companies that specialise in this lucrative subsector. The role of oil & gas companies in the LNG sector is key, as experienced project developers, traders or as providing a route to market for one of their key products. Almost all of the main oil & gas companies have expanded their portfolio of LNG projects significantly over the past years in response to the shift in the market towards more LNG terminals and demand.

Similar shifts in the LNG markets are being seen in other European jurisdictions too. However, there are suggestions that investments by the oil & gas majors in LNG to target the Chinese market may be rendered redundant by China's investment in domestic gas production.

Oil production by region in 2023 and forecasted in the IEA "stated policies" scenario (million barrels per day)



Natural gas production by region in 2023 and forecasted in the IEA "stated policies" scenario (trillion cubic metres)



Sources: Capital Economics and IEA

Hydrogen and CCUS are centre stage

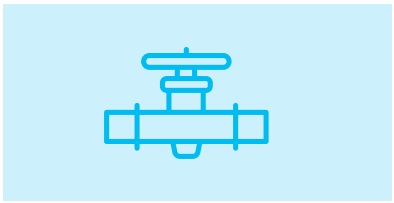
Key target areas for the majors' renewables capex investments in future are likely to be more concentrated on activities ancillary to their core business. That means hydrogen development and carbon capture and storage, rather than wind and solar, although TotalEnergies recently inaugurated its largest solar power plant cluster in Europe, 263MW of installed capacity near Seville, Spain.

Most of the companies analysed pursue investing in hydrogen as a clean fuel. "Blue hydrogen" (made from natural gas) is often a partner to the investments being made in carbon capture projects, while "green hydrogen" projects (produced by water electrolysis) rely on renewable electricity for their power. For example, Aramco bought 50% stake in a subsidiary of Air Products (Blue Hydrogen Industrial Gases Company (BHIG)) as part of its ongoing efforts to develop a hydrogen network and support a carbon capture and storage (CCUS) hub that it is building in Jubail. Chinese companies lead on hydrogen projects globally with PetroChina being a key part of these developments. PetroChina's solar powered Yumen Oilfield Renewable Energy Hydrogen Production Demonstration Project began operations in March 2024 and PetroChina has plans for another three green hydrogen projects totalling 4.5GW.

A key challenge of investing in hydrogen is that demand remains modest, which in turn has limited the amount of hydrogen (and its derivatives) that have come onto the market. To date, electric vehicles have essentially bypassed the potential for the development of a hydrogen-based fleet, although there has been some uptake from trucking and rail. Marine transport remains one of the most promising potential uses for hydrogen, especially for ocean-going shipping powered by ammonia.

Some recent examples of hydrogen initiatives by companies surveyed for this report include investments by bp, ExxonMobil, Repsol and Shell.

The oil & gas majors continue to lead on developing hydrogen as a fuel for the future, despite slow uptake on the demand side and an unclear policy environment

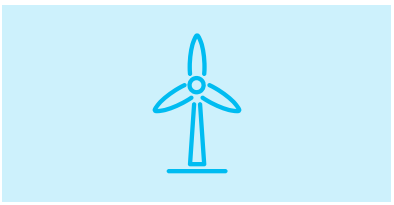


bp – Castellón, Spain
Partnering with Iberdrola to transform bp's refinery into a hydrogen hub got underway in early 2025 and is slated to be operational by mid-2026.

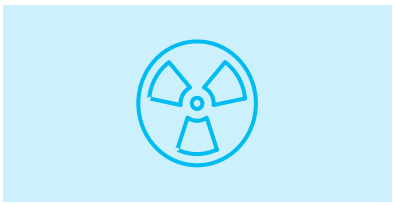
bp – Lingen, Germany
Project to be built next to bp's Lingen refinery to support industrial customers and furthering decarbonization in the Lower Saxony region.

ExxonMobil – Baytown, TX
Expected to be operational in 2028 with 98% of emissions avoided through carbon capture and storage.

Repsol – Spain
The company previously halted several green hydrogen projects in Spain but may now revive them given a change in government tax policy.



Shell – Netherlands
Hydrogen plant to be powered by offshore wind from the North Sea with operations expected to commence before 2030.



PetroChina – China
The company has plans for another three green hydrogen projects totalling 4.5GW.

Source: Capital Economics

Carbon capture remains significant in helping the majors to reduce both their own emissions and those of their customers. Oil & gas companies appreciate the scale and versatility that is offered by CCUS projects - be it in capturing emissions from gas power plant or in the production of blue hydrogen. A flagship project for bp is its Net Zero Teesside Power project, a first-of-a-kind fully integrated gas-fired power and carbon capture project that flows its captured carbon dioxide offshore for geological storage. On shipping and storage of carbon dioxide from CCUS projects the oil & gas companies have been behind the pioneering Northern Lights project. This collaborative effort involved several major players such as Equinor, Shell and TotalEnergies. As part of the Norwegian broader Longship initiative, this project aims to capture CO2 from industrial sources, transport it to an onshore terminal, and then store it permanently under the North Sea.

On a smaller scale, carbon offsetting and carbon removals also feature in oil & gas majors' strategies. Shell was one of the largest buyers of carbon credits in 2024 (buying 14.5 million carbon credits) as part of strategy to offset its emissions. Of these, 9.4 million credits came from forestry and land-use initiatives.

Lower-carbon downstream products and services include renewable diesel, sustainable aviation fuel, renewable natural gas, biofuels from agricultural waste, synthetic fuels and hosting EV-charging stations on their properties. In the face of Saudi Arabia's plans to increase EV adoption from 1% to 30% by 2023, Aramco announced a deal with China's BYD to co-develop advanced technologies for electric vehicles including charging.

Aviation is a new frontier for many in the energy transition space but many of the companies surveyed for this report have planned SAF (sustainable aviation fuel) projects. They include bp, which is planning five biofuel projects focused on SAF in Kwinana in Australia, Rotterdam in the Netherlands, Castellón in Spain, Lingen in Germany and Cherry Point in the US.

Oil & gas sector consolidation

The oil & gas industry is currently experiencing a significant wave of consolidation, driven by mergers and acquisitions (M&A) activity. Examples include ExxonMobil's acquisition of Pioneer Natural Resources; Chevron's acquisitions of Hess and PDC Energy; and other more geographically focussed business combinations such as Equinor and Shell's combination in the UK, and bp and Eni's in Angola as examples.

This trend has seen record-breaking deal values in recent years, with companies focused on building larger, more efficient entities, better placed to deal with market volatility.

While the rationale for such consolidations varies, an energy transition-related element of some of those mergers and consolidations is accounting deconsolidation, potentially allowing oil & gas companies to remove carbon emissions reporting from their balance sheets for <50% holdings in any merged entities. In addition, a "perceived" exit from oil & gas through taking less equity in a larger nationally focussed entity in some jurisdictions can play well to the market.

Oil & gas majors want a voice in the transition

On current estimates, fossil fuels will still be used even when the world achieves net zero emissions. To allow themselves a say in how the energy transition evolves, oil & gas companies participate in multiple forums dedicated to the transition. Industry organisations related to decarbonisation have been evolving over the last decade, but it seems that the industry is becoming more effective at messaging its activities and intent.

Key industry forums with O&G company participation:

- Global CCUS Institute: 2009
- OGCI - Oil & gas Climate Initiative: 2014
- OGMP - Oil & gas Methane Partnership: 1.0 in 2014, 2.0 in 2020
- ETC - Energy Transitions Commission: 2016
- Methane Guiding Principles: 2017
- Hydrogen Council: 2017
- Net Zero Producers Forum: 2021
- OGDC – Oil & gas Decarbonization Charter: 2023 at COP28

Interestingly, it seems that these companies have increased engagement with third-party monitors and reference them in their reporting. In addition, there are more companies using scenarios for the path to net zero from research organisations such as the IEA. Some companies are also doing their own internal work on these scenarios, with bp and ExxonMobil notable examples.

Third party monitors mentioned in company reporting:

- Climate Action 100+
- ISS ESG
- Sustainalytics
- Transition Pathways

Renewables investment and the outlook to 2030

All projections, including those of Capital Economics, forecast that investments in clean energy need to rise dramatically by the end of the decade for the world to stay on track to reach net zero by 2050. Furthermore, these investments need to expand significantly by the end of this decade.

In 2024, oil & gas majors' capex on renewables is estimated at USD19.6 billion, representing about 7.7% of the companies' total capex. These outlays are roughly three times the level of capex they spent on renewables in 2018, which was equivalent to just 3% of total capex.

However, renewables spending in current US dollar terms may have plateaued. Several companies that had higher targets for renewables capex have now pivoted to be less ambitious, and the reduction in their planned outlays has not been offset by new commitments by other companies in the surveyed group.

Given some banks' reticence to finance many oil & gas-related activities, the majors are turning to a wider range of financing sources, a trend that is likely to continue.

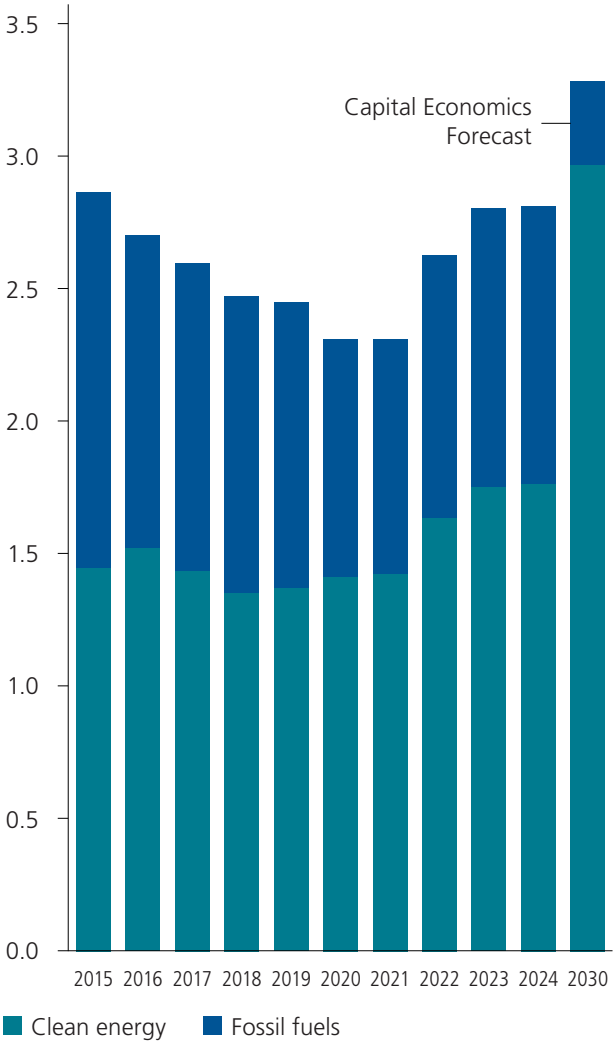
Looking back to our first report in 2019, we can see that the sample of major oil & gas companies have, in aggregate, spent more by 2024 on renewables capex than was expected six years ago, even under the IEA's "rapid energy transformation" scenario. However, the outlook to 2030 is one of reduced investment into renewables compared with the 2019 forecast for that scenario.

Global investment in clean energy needs to be front-loaded

All projections, including those from Capital Economics, forecast that investments in clean energy need to rise dramatically by the end of the decade for the world to stay on track to reach net zero by 2050. Having been stable at around 1.4% of global GDP from 2015 to 2021, clean energy investment had risen to 1.8% of global GDP by 2024. It will need to expand exponentially by the end of this decade in order to produce the decarbonization benefits needed to achieve net zero by mid-century. However, capex on renewables by the oil & gas majors may not play such a big role in that process.

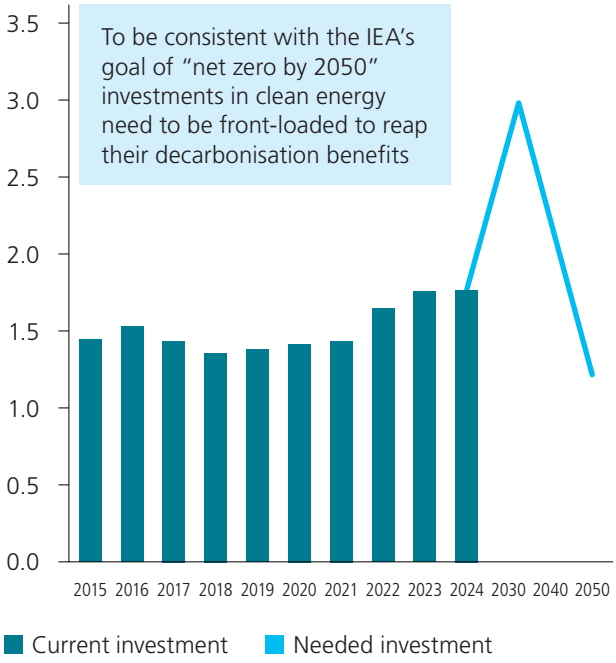
Achieving the IEA's goal of net zero by 2050 means front-loading investment over the next few years. Capital Economics forecasts an increase in clean energy investment to 3.0% of global GDP by 2030, a huge increase. At the same time investment in fossil fuels, having been stable around 0.9% to 1.1% of global GDP from 2018 to 2024 is forecast to fall dramatically, to 0.3% by 2030.

Energy investment as a share of global GDP (%)



Sources: Capital Economics and IEA

Current energy and future needs as a share of global GDP (%)



Sources: Capital Economics and IEA

Oil & gas majors' capex has increased 3x since 2018

In 2024, the majors' capex on renewables is estimated at USD19.6 billion, representing about 7.7% of the surveyed companies' total capex. These outlays are roughly three times the level of capex spent on renewables in 2018, which was equivalent to 3% of total capex. But Capital Economics' analysis suggests that renewables spending in current US dollar terms may have plateaued, as several companies that previously had higher targets for renewables capex have now pivoted to be less ambitious.

The biggest relative fall has been at Petronas, where renewables capex as a percentage of total capex has fallen from 25.0% in 2022 to 7.0% in 2024. But companies in the Diversified Portfolio group are also seeing reductions. At Equinor, renewables capex as a percentage of total capex has fallen from 14.0% in 2022 to 7.5% in 2024. Similarly, Shell has seen renewables capex fall from 11.7% of capex to 7.6%.

By contrast, companies showing an increase in renewables capex include bp (up from 8.7% to 10.6%), Chevron (8.4% to 12.2%) and Repsol (24.0% to 34.9%).

Majors' capex spending (USD bn)

	Total capital investment (USD bn)				Capex for renewables (USD bn)			Renewables as % of total capex (USD bn)		
Company	**2018**	**2022**	**2024**	**AGR 2018-2024**	**2018**	**2022**	**2024**	**2018**	**2022**	**2024**
Aramco	35.1	37.6	50.4	6.2	0.2	0.0	5.0	0.4	0.0	10.0
bp	16.0	11.8	15.0	-1.1	0.9	1.0	1.6	5.6	8.7	10.6
Chevron	13.8	12.0	16.4	3.0	0.2	1.0	2.0	1.5	8.4	12.2
ConocoPhillips	6.8	10.2	12.1	10.2	0.0	0.0	0.0	0.0	0.0	0.0
Eni	10.0	8.2	8.3	-3.1	0.4	0.	1.0	4.0	8.2	11.9
Equinor	10.7	8.4	11.6	1.3	0.5	1.2	1.4	5.0	14.0	7.5
ExxonMobil	19.6	18.4	24.3	3.7	0.1	0.0	0.0	0.5	0.0	0.0
Harbour Energy	0.3	0.6	1.2	28.7	0.0	0.0	0.0	0.0	0.0	0.0
PEMEX	4.9	10.6	9.5	11.6	0.1	0.1	0.0	0.0	0.7	0.0
PETROBRAS	11.4	9.8	16.6	6.5	0.1	0.4	0.5	0.8	3.6	2.9
PetroChina	37.3	39.8	35.3	-0.9	0.1	1.1	0.0	0.3	2.8	0.0
PETRONAS	11.3	11.4	12.2	1.3	0.4	2.9	0.9	3.3	25.0	7.0
Repsol	3.0	3.8	4.9	8.2	1.0	0.9	1.7	16.7	24.0	34.9
Shell	22.3	24.8	21.1	-0.9	2.0	2.9	1.6	9.0	11.7	7.6
TotalEnergies	16.6	15.9	14.3	-2.4	0.5	4.0	3.9	3.0	25.1	27.3
TOTAL	**219.1**	**223.3**	**253.3**	**2.4**	**6.5**	**16.1**	**19.6**	**3.0**	**7.2**	**7.7**

Sources: Capital Economics and company reporting

IEA predicts 6% drop in upstream oil investment in 2025

Investment in upstream oil production will drop by 6% in 2025 in the first year-on-year fall since the Covid pandemic, according to the International Energy Agency (IEA). Excluding the Covid pandemic, this marks the largest fall in oil production spending since 2016, when oil prices dropped to below $30 a barrel.

In its annual report on energy sector investment, the IEA said global energy investment is set to increase to a record $3.3 trillion this year "despite headwinds from elevated geopolitical tensions and economic uncertainty". The IEA said clean energy technologies will attract twice as much capital as fossil fuels, with spending on renewables, nuclear, grids, storage, low-emissions fuels, efficiency, and electrification on course to hit a record $2.2 trillion. This reflects "not only efforts to reduce emissions but also the growing influence of industrial policy, energy security concerns and the cost competitiveness of electricity-based solutions," the IEA report found.

Meanwhile, the IEA predicts investment in oil, natural gas and coal will reach $1.1 trillion. Spending on oil production in 2025 will be close to $535 billion, a fall from $599bn last year. Investment in natural gas production, however, will increase slightly from $361bn in 2024 to $365bn this year.

IEA Executive Director Fatih Birol said energy security is a "key driver of the growth in global investment" in 2025 as countries "seek to insulate themselves from a wide range of risks" . . . "The fast-evolving economic and trade picture means that some investors are adopting a wait-and-see approach to new energy project approvals, but in most areas we have yet to see significant implications for existing projects," Birol said. The report also showed China is "by far the largest energy investor globally", Birol said, spending twice as much on energy as the European Union.

But the majors' renewables capex could now plateau

Looking ahead - and based on the stated plans of the companies in their 2024 reporting - Capital Economics estimates that the oil & gas majors could allocate a total of roughly USD115 billion to renewables over the six-year period from 2025 to 2030. However, the level of overall spending in 2030 is expected to be slightly below that in 2024. This is due to a planned decrease in spending on renewables by companies which were among the highest spenders in 2024, including bp, Shell and TotalEnergies, for example with bp looking to further de-risk its wind investments by entering into a 50:50 global offshore wind joint venture with JERA, announced in December 2024.

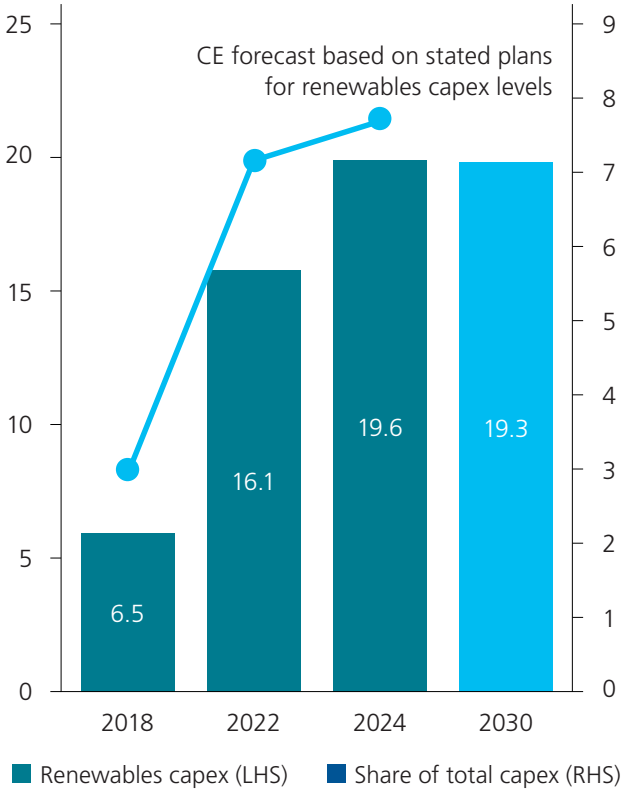
Company projections also indicate a relatively flat level of capex allocated to renewables during 2025 to 2028, a view that has been reflected through the remaining years of the forecast in this report. This means that capex allocated by the oil & gas majors to extraction and ongoing operations is likely to be maintained at current levels.

There is a wide range of approaches between the companies surveyed for this report. Repsol stands out for remaining committed to its previously stated target of 35% of capex to renewables. This is at a time when many European oil & gas companies are scaling back their renewables commitments. The Spanish group's strategy includes selling minority stakes in renewables to investment partners such as Schroders Greencoat, which took 49% of a 400MW Spanish wind and solar platform early in 2025.

Among the National champions, Aramco recently pledged 10% of its future capex to new energy projects. It is unclear whether all of that capex will go towards renewable energy, but Capital Economics has assumed a similar level of renewables capex as in 2024 through to 2030.

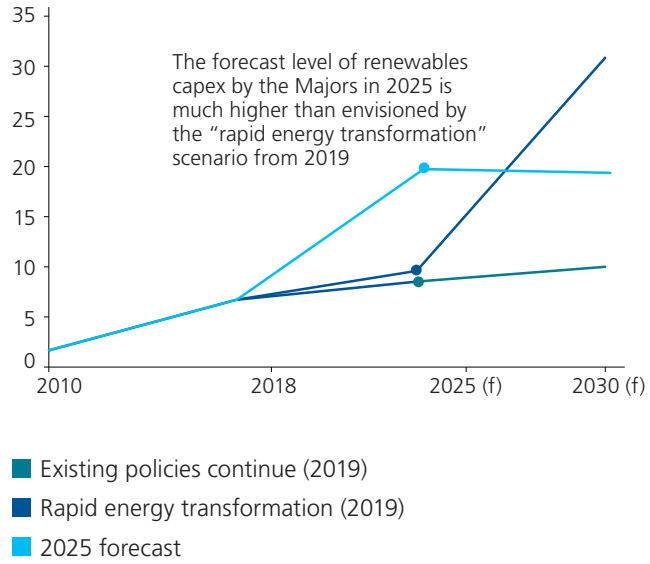
On the other hand, several companies surveyed for this report - ConocoPhillips, ExxonMobil, Harbour Energy and PEMEX - have no stated plans regarding renewables capex going forward. Capital Economics has therefore assumed their future renewables capex spend at zero for this report, which may be overly cautious.

Renewables capex spending levels (USD bn) and share of total capex



Sources: Capital Economics and company reporting

Capex spending on renewables under Capital Economics' two 2019 scenarios and 2025 projections (USD bn)



Sources: Capital Economics, IAE, and company reporting

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NB Company reporting is not uniform, and some companies do not report renewables spending on its own. Wherever possible, we have identified spending directed to renewables, but these figures will include broader categories such as "low carbon energy". Figures do not include ADNOC which does not disclose details of its capex through financial reporting.

How to fund it

There remain significant policy-based funding constraints for oil & gas projects resulting from some of the previously active Western lenders and European Export Credit Agencies (ECAs) withdrawing from the market. It will be interesting to see if that changes as a number of those traditional lenders and supporting ECAs reconsider their policy stances in light of the current geo-political environment, in particular in respect of LNG projects. In the meantime, the Asian ECAs (supporting their domestic manufacturing yards) and Asian banks have, to a degree, stepped up to fill the gap by making available project finance and working capital facilities.

However, non-traditional funding sources are also becoming an increasingly visible presence in the oil & gas debt markets. Those non-traditional funding sources include debt providers such as PE (debt) funds, equipment manufacturers, finance lessors, traders and the trading arms of oil & gas trading giants, in many cases filling funding gaps in exchange for their positions as vendors or off-takers to the underlying sponsors or projects.

This trend is driving new funding structures and structural innovation. For example, for large capex equipment, these sources are providing financing by way of JVs, "club-finance" leasing and, from field operators, the provision of secured mezz debt packages to oil & gas contractors. These alternative funders often have other interests in the underlying project beyond the debt being provided. Handling complex conflict issues that arise as a result of those different roles as well as with other credit providers to the project in question has therefore become a feature of the current financing landscape.

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