

Energy Transition: The evolving role of oil & gas companies in a net-zero future

Table of Contents

Introduction	3
Overview and key findings	5
Recent developments and trends in energy transition	7
The route to decarbonisation	17
Interview: Bob Henderson – Shell	20
Energy transition in the Middle East region	24
Overview of the strategies of O&G majors	26
Interview: Pierre Girard – Neptune Energy	30
Eight O&G majors agree Energy Transition principles	33
New UK agreement could be a model for others	34
Interview: Will Webster – Oil and Gas UK	36
Technologies being used	38
Energy transition in the APAC region	40
How well are they doing?	42
Energy transition in the CEE region	44
Why are European majors taking the lead?	47
Interview: Christina Verchere – OMV Petrom	48
Outlook for investment	50
Energy transition in South Africa	54
Challenges to the transition	56
Methodology	59
About CMS	60

Introduction

After an extraordinary year of health and economic challenges, the global oil and gas sector has an essential role to play in the economic recovery. The same could however be said of any economic recovery and expansion over the past 100 years – during this time oil and gas companies have provided most of the primary energy that has fuelled huge economic growth.

But this time does look different. The oil and gas sector will power economic recovery not just through oil and gas exploration and production, but also (and perhaps counter-intuitively to some) through facilitating the transition to a lower-carbon economy and eventually a net zero future. This report presents a wide-ranging review of the role of oil and gas companies in that future.

The term “energy transition” is generally understood as covering the move from a fossil fuels to a more clean energy economy, from high carbon intensity to lower carbon intensity, and from a fragmented energy sector to one in which the multiple elements (oil and gas, renewables, transport, heating and others) are interconnected and increasingly integrated.

This multi-faceted transition has been going on for the past decade, but in the 18 months since we published CMS’s energy transition report (‘Energy Transition: Evolution or Revolution? The role of oil and gas companies in a net zero future’) much has changed, and the pressure for a faster pace of change continues to increase. This makes the energy transition of crucial and central importance to the companies involved, but also to policy makers and

to all of us as consumers, taxpayers, and responsible citizens.

The roll-out of vaccination programmes offers the prospect of a super-heated economic recovery driving us out of the economic doldrums of 2020, but there are many demands for that recovery to rely on more sustainable energy sources and also pressure on policy makers to use the opportunity to accelerate the pre-COVID-19 trend toward a lower-carbon economy.

There is recognition from many quarters that the trend is away from fossil fuels. The International Energy Agency (IEA) forecasts in its May 2021 report ‘Net Zero by 2050 – A Roadmap for the Global Energy Sector’ that investment in upstream oil and gas will, after 2030, decline to roughly 50%

of levels projected over the next decade, driven by a long-term downward trend in demand for oil in particular. For the 15 oil and gas companies sampled in this report, this conclusion brings into question where their future capital should be invested. This report therefore looks in detail at their investment plans and, by doing so, presents a holistic picture of their intended role in a net zero future.

Contrary to many accounts, we report that the oil and gas sector is responding to that challenge. Investment in the energy transition increased by 34% across the sample of 15 companies analysed in this report. Furthermore, 10 out of those 15 O&G majors had announced net-zero emissions pledges by the end of 2020, compared with just one a year earlier. While the majors’ capex investment in absolute terms was down overall in 2020, the decline was smallest in renewable power. It must be acknowledged that in most cases the capex amounts committed to clean energy sources represent a small fraction of the company’s total capex, and there remains in some cases a gap between rhetoric and action, but the trends and direction of travel are clear.

Anecdotally we can also report from our advisory work that the oil and gas companies are now central players in the clean energy and transport markets searching for investment opportunities across the globe to help diversify their portfolios. There are naturally challenges in making the diverse risks and revenues of such opportunities fit the investment criteria of oil and gas companies and their shareholders, but there is significant impetus to stretch internal requirements and expectations to make new propositions fit. Indeed, a number of the players in the sector have reshaped their businesses to reflect their anticipated future, along lines that bring renewables and sustainable energy away from the fringe and to the centre of their business organisation: embracing their future as integrated energy, rather than pure oil and gas, companies.

But there is much still to do. While five of the 15 O&G majors are on track with their emissions pledges made to support the goals of the Paris Agreement, all of them are at the date of writing struggling to commit to actions that would be consistent with the 2 degrees Celsius limit. Nevertheless, due to internal pressures, external economic pressures, and perhaps also increasing shareholder activism and the wave of formal climate change litigation, the need for greater action is not lost on the companies or their senior management.

For now though, the oil and gas companies in our sample do remain exactly that. And for many of them, their ability to finance an expansion into energy transition opportunities come from the strong backbone of returns from oil and gas projects. So, despite impassioned calls to immediately transition to net zero, the reality is more nuanced and, we believe, justified.

This edition of our energy transition report is a record of a step on a journey. We expect to see further acceleration of the trends we highlight here, and as the influence of big players in the sector is felt through their supply chains and to all of us as energy consumers, the implications for the next phase of the energy transition will be far-reaching.



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Overview and key findings



10 out of the 15 O&G majors analysed had announced **net-zero emissions pledges** by end of 2020.



The **jump in investment in the energy transition by O&G majors is also striking** – 3.6% of capex in 2020 vs 2.9% in 2019, a solid 34% increase across the sample as a whole.



Capex investment in O&G has been hit hard during the pandemic; **renewable power has been the segment least affected.**



But while five of the 15 O&G majors are on track with their emissions pledges made as part of the Paris Agreement, **all fall short in limiting the adverse impact of climate change to 2 degrees Celsius.** This shows the urgent need for change and a strong call to action.



In one scenario, investment could rise more than threefold over the next decade – reaching USD 28bn a year by 2030. But on a less bullish scenario, investment could reach just USD 10.4bn by 2030, so there is a lot at stake.



The recovery from the COVID-19 pandemic will see demand for oil rebound from the levels of 2020, but, among other things, given the likely long-term impact of COVID-19 on many areas of life it now seems reasonable to bring the forecast date for peak oil forward to 2030.

*Norman Wisely,
Partner in the Oil and Gas Team at CMS*

Recent developments and trends in energy transition

The term “energy transition” refers to a long-term, structural change in all components related to the production, conversion, delivery and use of energy.



Over decades the global energy system has repeatedly been transformed as innovation and scientific discovery have led to significant changes in the use of primary energy sources. The current energy transition is not a simple shift from oil & gas (O&G) to renewables, but rather a case of an increasing number of O&G majors looking to expand their current energy mix and contribute towards lower emissions.

The COVID-19 pandemic is likely to permanently modify behaviour in many ways that directly affect the prospects of energy transition, for example, many commentators predict less commuting and business air travel. The pandemic led to a 6% fall in energy demand globally in 2020, the largest fall in more than 70 years (source: *International Energy Agency*). There was a still larger fall in CO₂ emissions, down 8% (or 2.1Gt) in 2020 on an annualised basis (source: *IEA*). Both demand and emissions have since rebounded, but around the world many governments are putting climate change at the centre of their pandemic recovery plans.

Against this changing backdrop there are many long-term pressures and complex issues forcing the traditional O&G majors to rethink their strategies and expand their energy mix. Our research has identified the following eight key drivers:

— **Peak oil demand brought forward** – we believe that ongoing measures to contain the virus will accelerate the move towards less oil-intensive GDP growth. So although we expect non-OECD oil demand to grow until the early 2030s, we now forecast peak oil globally to occur around 2030. That implies a scenario of falling demand, an ample supply of oil and gas, and lower marginal costs.

“The recovery from the COVID-19 pandemic will see demand for oil rebound from the levels of 2020, but, among other things, given the likely long-term impact of COVID-19 on many areas of life it now seems reasonable to bring the forecast date for peak oil forward to 2030,” says Norman Wisely, Partner in the Oil and Gas Team at CMS.

“It looks as if there will continue to be less business travel, more working from home, and other trends that will diminish demand for oil in the long term. The issue is no longer one of when oil will run out, but rather of when will the transition to other forms of energy take over,” mentions Charlie Denham, an Associate in the Oil and Gas team at CMS.

— **Lower O&G capex in the short term** – the oil majors reacted to the impact of COVID-19 and falling oil prices by announcing cuts in spending and new production of between 10% and 30% compared with their original plans for 2020. Overall, that represented a fall of 25%, or USD 66bn. Those cuts seem to have fallen mostly on O&G (with cuts of 36.5% to upstream activities and 30.8% to mid-/downstream activities, respectively – source: IEA). Renewables by contrast have been largely spared, with a cut of just 3.2%.

“The O&G majors’ capital expenditure is unlikely to recover to pre-COVID-19 levels. Under the influence of the pandemic, companies cut back their expenditure and that will continue. So even though we expect oil to continue to play a big part in the energy mix for years to come, very large new projects may no longer be attractive when these represent decades of future commitment,” said CMS’s Wisely.

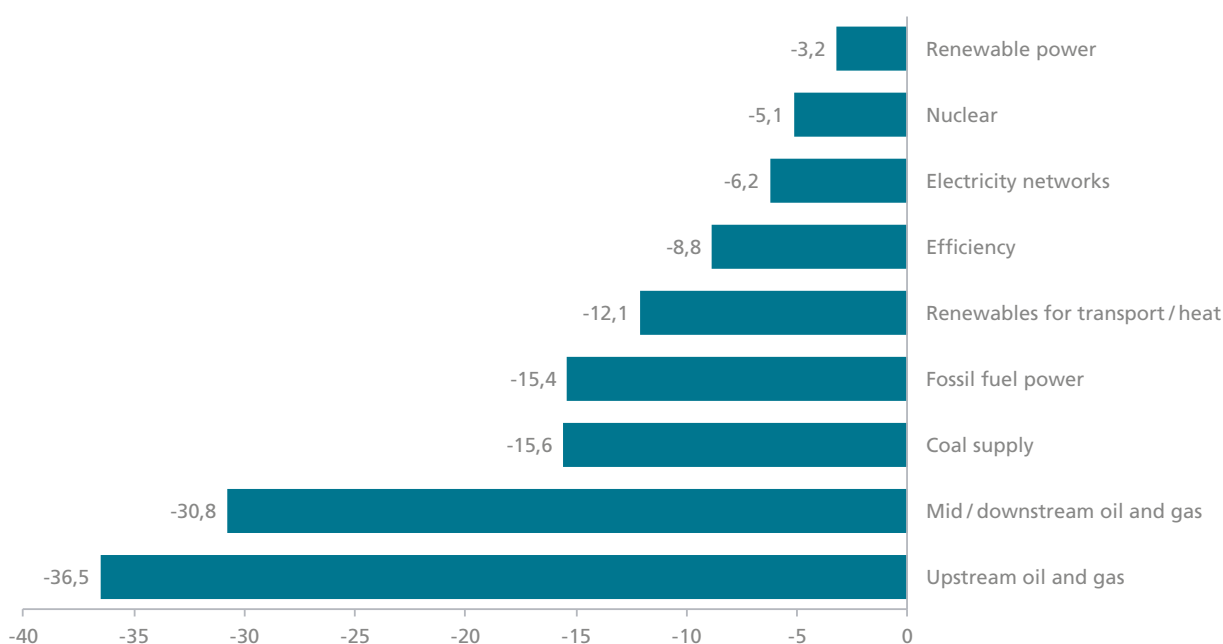
“Oil and gas is going to continue to play a big role in the energy mix. In many areas there are still no substitutes, and as the majors divest, we will continue to see independent companies, many of them privately-backed, buying up the assets that the majors want to sell. This is only to be expected. When the cost of North Sea production is roughly USD 20/barrel and oil sells for USD 65/barrel, companies can still make money out of oil and gas production.”

But the prospect of an earlier date for peak oil is certainly being seen in asset disposals and balance sheet write-downs. In the UK the majors continue to divest non-core oil and gas assets, have sold and are selling their pipelines and terminals to groups like Ineos and Kellas, then paying to use those facilities. And the majors are writing down the value of their assets to reflect the fact that they are now worth less.

“Those write-downs will have an impact on their balance sheets and their ability to raise new funding,” said CMS’s Denham.

Investment in oil and gas has been hardest hit and renewable power generation least impacted

Annual change in global energy investment by sector between 2019 and 2020 (per cent)



Sources: Capital Economics and International Energy Agency.

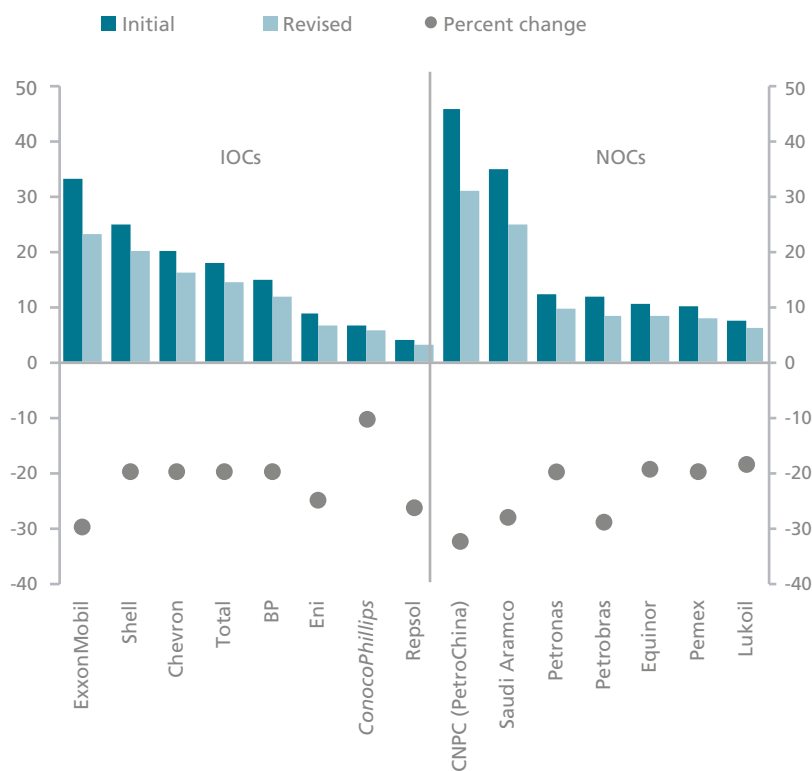


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*Charlie Denham,
Associate in the Oil and Gas team at CMS*

Capex cuts announced by 15 majors amount to USD 66bn – a 25% drop from initial plans

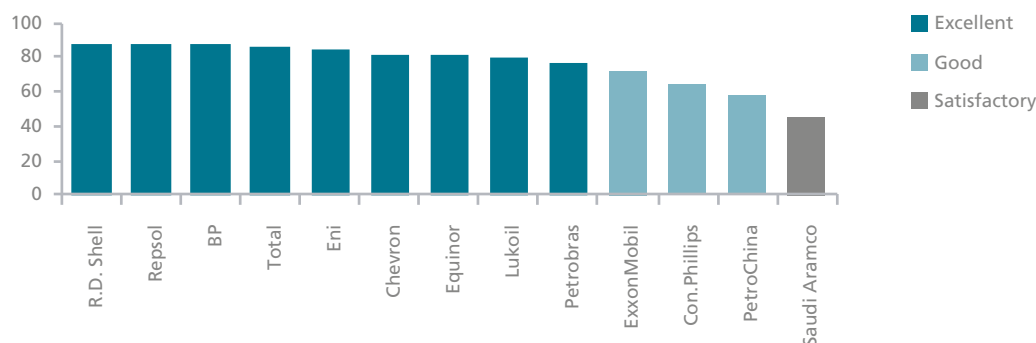
Announced revisions to 2020 capital expenditure by sample of 15 oil and gas companies (USD billion above zero, and % below zero)



Sources: Capital Economics, International Energy Agency and individual company announcements. Note: Initial capex figure for PetroChina refers to the company's official 2019 capex as no initial spending figures had been publicly released for 2020.



**Refinitiv ESG Score for a sample of 15 oil and gas companies
(Index, 100=best, 0=worst), as of 22 February 2021**



Sources: Capital Economics, Refinitiv and BP.

- **Increased interest in ESG funds** – sustainable investing has been a long-term trend for several years and around USD 3trn of institutional assets now have an ESG rating. As well as investors' growing wish to support moves to limit adverse impacts of climate change, this trend has been helped by the relative outperformance of ESG funds, including during the sharp, COVID-19-driven market sell-off in March 2020.

There is scope here for companies to gain an advantage over competitors. Several O&G majors have good ESG scores, led by Royal Dutch Shell with 87.9, indicating excellent relative ESG performance and a high degree of transparency in reporting material ESG data publicly (*source: Refinitiv*). Other majors that currently score well on this measure are Repsol, bp, Total and Eni.

"Of the three elements in ESG, the most important for the oil majors is the "E" – environmental issues," said CMS's Wisely. "Companies are increasingly analysed according to their compliance with ESG concerns, and to some extent they compete with each other on those criteria," adds CMS's Denham.

However, the O&G industry's perceived, long-term structural decline continues to be a driver for divestment by some institutional investors.

- **Large-scale joint action by Europe** – globally many governments have chosen to use COVID-19-related stimulus packages (already totalling USD 15trn) to promote clean energy as well as economic recovery. The EU has dedicated 30% (EUR 550bn) of its support to green initiatives over seven years. This includes a target of a 50–55% cut in emissions by 2030 compared with 1990 levels. The fact that low-carbon stimulus programmes create relatively more jobs helps to support this approach.

- **Shift in US policy on climate change** – US President Biden's administration has adopted a far more pro-active approach to the environment and climate change, including bans on new O&G leases and the ambitious aim of the US power sector being carbon pollution-free by 2035.

A package of measures is aimed to cut greenhouse emissions from transport and encourage a move to electric-only vehicles, although there is no deadline for this as yet. The Biden administration has committed to historic investments of USD 400bn in the next 10 years for renewables investment and innovation in the sector. The recent Leaders Summit on Climate initiated by the US has emphasized a call for action and raised the expectations of a joint ambitious approach at the Glasgow UN Climate Change Conference later this year.



Using hydrogen is not new. The Olympic torch for the Tokyo Olympics is powered by hydrogen. So use of hydrogen has been proven. What's new is making use of low-carbon hydrogen mainstream. It is a long journey for a new process like this to become established – it took 10 years for solar PV to make inroads into the electricity markets. However, over the last 12 months the policy space around low-carbon hydrogen has certainly woken up. The EU published a hydrogen strategy in 2020, and Hydrogen Europe has been set up as a new trade association to represent the European industry and R&D players looking to support the roll-out of hydrogen and fuel cells technologies.

*Dalia Majumder-Russell,
Partner specialising in renewables and
energy transition projects at CMS*

"The Biden administration represents a radical shift towards taking global action on climate change that will affect the international climate policy agenda," says Varinia Radu, Head of Oil & Gas for the CEE region at CMS.

"This is seconded by the EU's recent resolution backing the implementation of a Carbon Border Adjustment Mechanism and a bold 'Fit for 55' by 2030 set of policies that are likely to put an expensive carbon penalty on the carbon-intensive industries and will likely influence existing trade schemes."

- **Acceleration of hydrogen technology** – there is growing recognition of the potential for hydrogen as a clean energy source for transport, heating and industry. The fact that it can be transported by a variety of methods and is relatively easy to store makes hydrogen an attractive alternative to fossil fuels.

"Using hydrogen is not new," says Dalia Majumder-Russell, Partner specialising in renewables and energy transition projects at CMS. "The Olympic torch for the Tokyo Olympics is powered by hydrogen. So use of hydrogen has been proven. What's new is making use of low-carbon hydrogen mainstream. It is a long journey for a new process like this to become established – it took 10 years for solar PV to make inroads into the electricity markets. However, over the last 12 months the policy space around low-carbon hydrogen has certainly woken up. The EU published a hydrogen strategy in 2020, and Hydrogen Europe has been set up as a new trade association to represent the European industry and R&D players looking to support the roll-out of hydrogen and fuel cells technologies."

"The key challenge now is to create an interface between the impressive development of renewables and a storage system that can solve the problems involved in using such energy for vehicles and aircraft," says Holger Kraft, a CMS partner specialising in corporate M&A and energy infrastructure.

The majors are already investing in this sector. For example, bp is working with Orsted to build a 50MW electrolyser and associated infrastructure at bp's Lingen Refinery in Germany, and Repsol is developing new technology, photoelectrocatalysis using electricity to convert solar power and water into renewable green hydrogen.

Germany is taking a lead with hydrogen just as a generation earlier it built out its solar generating capacity. The country has opportunities to connect hydrogen with clean energy, and energy companies are keen to build out their hydrogen footprint.

"It is impressive how solar power has changed in Germany over the past 15–20 years," explains CMS's Kraft. "It started with a high tariff that encouraged investment and also stimulated the development in China of manufacturing to meet that demand. Hydrogen needs something similar over the next decade, with developments in both cost and efficiency. Based on what happened with solar, there are reasons for optimism."

The growing interest in hydrogen is not limited to Europe. In Asia-Pac, Australia has a huge capacity to produce hydrogen (both blue and green) and Japan, which is more advanced in the application of hydrogen technology, is keen to buy it. As with solar power, China is expected to become a manufacturer of cheap and fast hydrogen-related technology. Perhaps unsurprisingly, there is even interest in hydrogen in the Middle East where – although there is no shortage of oil – solar power can offer ways of producing green hydrogen and managing its intermittency.

- **Further cost declines in renewables** – the significant decline in the cost of alternative energy generation technologies continues to boost the take-up of renewable energy. Wind and solar are now cheaper than more traditional electricity sources thanks to a combination of decreasing capital costs, improving technologies and increased competition. This has underpinned many O&G majors' strategy of integrating renewables into their own operations as well as investing outside their traditional business.

The majors' experience is already very varied across the range of renewable technologies. Shell has a carbon capture venture in Canada and is buying suppliers for electric vehicles. Repsol and Total have experience in operating windfarms and Repsol has a 335MW wind power project in Aragon.

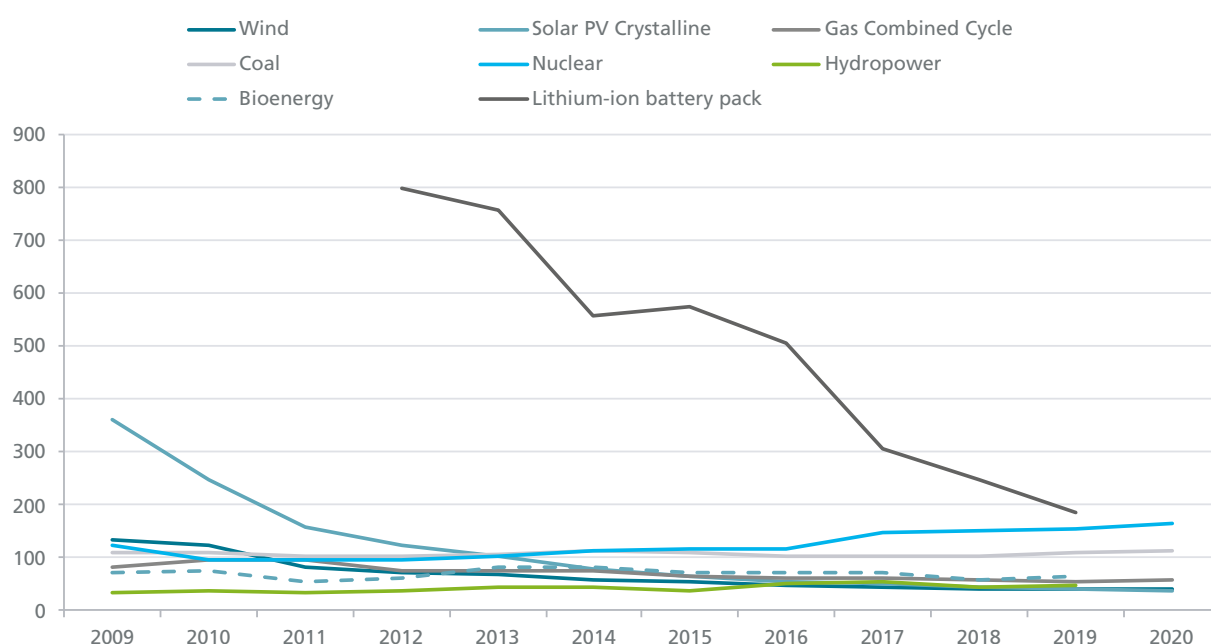
"There have been several days in the UK now with no electricity generated from coal," said CMS's Majumder-Russell. "Solar and onshore wind are at times the cheapest source of energy in the UK and several other European jurisdictions, and on occasion electricity prices in the UK have actually turned negative i.e. producers have to pay to have their power taken by the grid! The O&G majors are very keen to get involved in offshore wind. In the latest offshore wind leasing round some areas were keenly contested, for example in the Irish Sea off Liverpool. Consortia led by bp and Total secured more than half of the 8GW that was being auctioned. But the majors are paying high prices to access those opportunities and the less experienced are partnering with more experienced players. An example of that is bp's purchase of a stake in Equinor's offshore wind projects on the East coast of the USA, generating enough power for 2m homes."

— **Use of oil & gas industry template contracts for energy transition projects** – With the entry of the oil & gas industry into energy transitions projects (wind, solar, hydrogen, CCUS, battery, etc.) there has been a marked increase in questions relating to what terms are “market” for these types of projects. The oil & gas industry is largely unfamiliar with the more typical renewables industry template agreements such as FIDIC and NEC, and instead, and especially in relation to the oil & gas supermajors and majors, has developed its own suite of templates which has been used in the last 70 years for the largest projects on the planet, both onshore and offshore.

“The next year will be one to watch as we have seen a period of oil & gas companies contracting on more traditional renewables template contracts, transiting to hybrids of these templates, and very recently tendering on traditional oil & gas industry terms. This is a trend that we expect to continue, with traditional oil & gas industry terms set to become the dominant approach for oil & gas companies carrying out energy transition projects,” said Andrew Shaw, Partner specialising in Oil & Gas and energy transition projects at CMS.

There have been significant cost declines for alternative energy generation technologies, which has been both a driver for the industry as well as a challenge

Unsubsidised levelised cost of energy (USD/MWh)



Wind and solar have become cheaper than more traditional forms of electricity sources benefitting from, among other factors, decreasing capital costs, improving technologies and increased competition. This has underpinned many oil and gas major's strategies to integrate renewable technologies into their oil and gas operations

Sources: Capital Economics, BloombergNEF, IRENA and Lazards.



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*Andrew Shaw,
Partner specialising in Oil & Gas and
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O&G majors need to get closer to the electricity and clean energy markets. The challenge is to apply their deep O&G expertise to these new areas. The majors have been experts in energy price risk for decades, and that is very much applicable to contracts for offshore wind although it is a different regulatory framework. This is an opportunity for them to use their knowledge of energy pricing in new spheres.

*Holger Kraft,
CMS partner specialising in corporate M&A
and energy infrastructure*

The route to decarbonisation

During 2019 the 15 O&G majors in our sample invested roughly 3.6% of their total budget in energy transition.



That compares with 2.9% in 2018, and represents a striking 34% jump in clean investment in just one year. Much of that increase was driven by two European majors – Eni and Total – who recorded a rise in the percentage of their investments going to renewables to 17% and 10% from 4% and 3%, respectively.

Overall capital investment for the sample was USD 247.1bn in 2019, up 8.4% on 2018. Of that total, USD 8.8bn was invested in renewables, compared with the 2019 figure of USD 6.6bn. The largest single investor in renewables in absolute terms was Royal Dutch Shell with USD 2bn, followed by Total (USD 1.7bn) and Eni (USD 1.6bn).

These leading companies clearly intend to go further. Eni has pledged to raise its renewables investment to 21% of capex between 2021–2025, and Royal Dutch Shell is targeting 26% by 2030. In fact, of the 15 majors in the survey, 10 had announced net zero emissions pledges by the end of 2020, compared with just one (Repsol) at the end of 2019.

M&A can also be a route to transformational change. Some O&G majors have chosen to gradually build up an offshore wind portfolio through auctions, but another solution could be a major acquisition of an established company.

“O&G majors need to get closer to the electricity and clean energy markets,” says CMS’s Kraft. “The challenge is to apply their deep O&G expertise to these new areas. The majors have been experts in energy price risk for decades, and that is very much applicable to contracts

for offshore wind although it is a different regulatory framework. This is an opportunity for them to use their knowledge of energy pricing in new spheres.”

Venture capital-type investments and private fund-raising can also allow O&G majors to participate in new start-ups focusing on renewables. For example, in 2020 Petronas made a second venture capital investment in a solar energy company that strengthens its commitment to renewables.

But the potential impact of the O&G majors goes beyond investment and capex commitments. They can also work to create collective momentum and engage with interested stakeholders, as well as governments and consumers, on issues like carbon pricing. Partnerships with universities can support the move towards low-carbon technologies. Exxon Mobil has been spending over USD 1bn a year on R&D and has agreements with universities in the US, Singapore and India for research in areas including biofuels and low-emissions technology.

The O&G majors are using a variety of structures for their investments. One approach is to invest in SMEs whose business or technology is aligned to a major’s strategy, such as bp’s purchase of Chargemaster (now called bp Pulse). Another is to buy large stakes in particular renewables projects from renewables businesses, such as Total’s acquisition from SSE Renewables of a 51% interest in the Seagreen offshore wind farm project. We are yet to see an O&G major involved in the large-scale acquisition of an entire renewables business.

10 majors in our sample have made net zero pledges as of early 2021, up from one at end-2019

Company		Emissions, million tonnes CO ₂ eq / kboe (2019)	Emission targets					
			Scope			Inten- sity	Intermediate CO ₂ reduction and other targets	2050 CO ₂ reduction target
			1	2	3			
1	Eni	19.6					Upstream carbon intensity: 43% by 2025 vs 2014, zero process flaring by 2025 and methane intensity upstream below 0.25% Net carbon neutrality in upstream (scope 1 and 2) emissions by 2030. Net scope 1,2,3 emissions: 30% in 2035 vs 2018	100% in scope 1 and 2 80% in scope 1,2,3
2	Repsol	25.2					Carbon intensity indicator vs 2016: 10% by 2025, 20% by 2030 and 40% by 2040	Net zero emissions
3	BP	54.4					Emissions from bp’s operations: 30–35% by 2030 Emissions of carbon in upstream production: 35–40% by 2030, Carbon intensity of products sold: more than 15% by 2030	Net zero emissions
4	Shell	70.0					Products carbon intensity: 30% by 2035, 65% by 2050	Net zero emissions
5	Total	41.5					Carbon intensity of products: 15% by 2030, 35% by 2040 and 60% by 2050	Net zero emissions
6	Equinor	14.4					40% by 2030	Net zero emissions
7	Chevron	60.0					Oil emissions: 5–10% by 2023 Gas emissions: 2–5% by 2023 Flaring intensity: 25–30% by 2023 Methane emissions: 20–25% by 2023	Net zero emissions
8	Conoco Philips	20.5					Emission intensity by 35–40% by 2035, zero flaring by 2030	Net zero emissions
9	Exxon Mobil	120					Intensity of upstream emissions: 15–20% by 2025 vs 2016, 40–50% cut in methane intensity, and 35–45% cut in flaring intensity	
10	Pemex							
11	Saudi Aramco	57.9						
12	Petronas	47.9					Max annual emission of 49.5m tonnes of carbon dioxide equivalent by 2024	Net zero emissions
13	CNPC	174.08						Net zero emissions
14	Lukoil	37.2						Net zero emissions
15	Petrobras	59.0					Absolute operating emissions: 25% by 2030, Zero routine flaring by 2030, 32% reduction in carbon intensity in the upstream segment by 2025, 40% reduction in methane emission intensity of upstream by 2025, 16% reduction in carbon intensity in refining by 2025, 30% by 2030	

■ Existing target, while grey cells indicate no existing target or insufficient information.
■ Emissions above 50m tonnes CO₂eq/Kboe
■ Emissions below 50m tonnes CO₂eq/kboe.

Source: Capital Economics.



Interview:

Bob Henderson – *Shell*

Shell is an international energy company that aims to meet the global need for more and cleaner energy solutions in ways that are economically, environmentally and socially responsible. Bob Henderson is Associate General Counsel, Integrated Power and Renewables & Energy Solutions. He heads the Shell legal team for integrated power and renewables globally.

“By 2050, we envisage that all our cashflows will come from serving customers with net-zero energy solutions and sustainable materials. Our energy product mix would be dominated by low and no-carbon energy – renewable power, biofuels and hydrogen. Some products might still contain carbon but all fossil-based carbon would either be captured and stored, or balanced through nature.”

For Shell, getting to net zero by 2050 means cutting its carbon intensity by 100%, and by 45% by 2035. Those targets cover the

full range of its emissions from all the energy it sells, and not just the energy it produces.

The Shell legal team works closely with the business, providing leading and innovative expertise in all key activities to deliver on Shell’s Energy Transition agenda, in a safe, inclusive and ethical way.

“Tackling climate change is an urgent challenge. Shell has set a target to be a net-zero emissions business by 2050, in step with society and our customers. Our target supports the most ambitious goal of the UN Paris Agreement – to limit the rise in average global temperature to 1.5° Celsius above pre-industrial levels.”

In February 2021, Shell published its Powering Progress strategy to set out how it will accelerate its transformation to a net-zero emissions business, purposefully and profitably.

“The COVID-19 pandemic caused severe disruption, and along with this came a fall in energy demand and carbon dioxide emissions. This has led to a renewed focus across society about how it interacts with the natural world.”

“More than 90% of Shell’s emissions come from the use of all the energy products we sell. So we will help our customers cut their emissions where we can by selling them low and no-carbon solutions.”

Looking at the most interesting trends affecting energy transition over the past year, Henderson considers the impact of the COVID-19 pandemic.

“First, the pandemic may prove to be an action accelerator necessary to meet the Paris aspirations. To address the economic impact of the pandemic, lessons are being drawn that well-directed green investment is good for jobs and economic recovery. This adds to the momentum generated by governments and businesses that have already set ambitious net zero targets.”



"Second is the emergence of more integrated energy solutions. For example, Integrated Power continues to be core to our Powering Progress strategy, but there is huge growth potential from emerging integrated hydrogen opportunities. Hydrogen can be part of the solution to address intermittency of renewable energy production and meet growing customer appetite for matching renewable energy supply and demand."

Shell's current projects include the REFHYNE electrolyser in Germany that will produce green hydrogen using renewable energy. This 10 MW electrolyser, using advanced proton exchange membrane technology, will be one of the largest hydrogen electrolysers of its kind when completed in 2021. It will produce 1,300 tonnes of hydrogen per year and Shell's Rhineland refinery will be the anchor customer.

Shell is also working with partners to create a green hydrogen hub in the Port of Rotterdam.

"At its core is our 759 MW Hollandse Kust Noord offshore wind project in the North Sea. We plan to build a 200 MW electrolyser and the green hydrogen produced will initially be used at our Pernis refinery. A final investment decision on the electrolyser is yet to be taken."

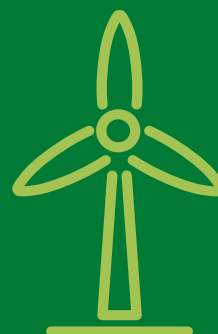
In terms of the strategies outlined in this report, Henderson highlights what Shell is doing in two key areas: acting on demand, and focusing on nature-based solutions.

"As most of our emissions come from the use of fuels and other energy products we sell, it makes sense to place our customers at the centre of our energy transition strategy. We will work with customers on a sector-by-sector basis to deliver low and no-carbon solutions. This includes customers in sectors that are difficult to decarbonise such

as aviation, shipping, road freight and industry. In aviation, Shell can work with customers and suppliers to develop a profitable market for sustainable aviation fuel. In 2020, we signed a deal with Amazon Air to supply up to six million gallons of sustainable aviation fuel."

"Mitigation through nature is necessary on top of transition of the energy system. Today many customers have no alternative to using carbon-based energy but they still want to be net zero. So we support the responsible use of high-quality, independently-verified, nature-based offsets as an integral part of the energy solution we sell to them."

"In 2020, we invested around USD 90m in the future development and purchase of nature-based offsets, and in 2021 we expect to invest around USD 100m. To be clear, the order of priority for us is: first, avoid emissions; second, reduce emissions. And then, turn to mitigation through methods like nature-based solutions, which include many additional environmental and sustainability benefits."



Total capital investment in renewables as a share of a sample of 15 oil and gas major's capital expenditure

		Total capital investment in renewables as share of CAPEX (%)	
		2018	2019
1	Eni	4.0%	17.0%
2	Total SA	3.0%	10.0%
3	Royal Dutch Shell	9.0%	8.7%
4	Equinor	5.0%	7.5%
5	Equinor	16.7%	5.3%
6	Petronas	3.3%	5.0%
7	BP	5.6%	2.6%
8	Chevron	1.5%	2.0%
9	Saudi Aramco	0.4%	1.5%
10	CNPC	0.3%	1.0%
11	Petrobras	0.8%	0.9%
12	Exxon Mobil	0.5%	0.4%
13	ConocoPhillips	0.4%	0.2%
14	Lukoil	2.4%	0.1%
15	Pemex	1.0%	0.0%
Total		2.9%	3.6%

Sources: Capital Economics and individual company reports and announcements.



Energy transition in the Middle East region

John Geddes, Head of Oil and Gas for the Middle East at CMS, looks at the situation in that region.

Oil and gas is synonymous with the Middle East and that is likely to remain so in the coming decades.

Some less stable economies such as Iran and Iraq, which have stewardship over the fourth and fifth highest oil reserves in the world, appear likely to focus on maximising government revenue by increasing oil and gas production at all costs. However, more advanced and stable regional economies, such as the United Arab Emirates and the Kingdom of Saudi Arabia, are eager to be seen as world leaders in the energy transition, promising the biggest-of-their-kind projects and use of the most contemporary technologies.

A combination of recent oil prices crashes (2014 and 2020) and the proliferation of various international agreements aimed at reducing reliance on fossil fuels and tackling climate change (principally the 2016 Paris Agreement on Climate Change and the United Nation's Sustainable Development Goals), has hastened a refocus of Middle Eastern governments on their energy mix, their continued reliance on conventional energy sources and power generation methods, and – more importantly – the environment.

Both Saudi Arabia and the UAE have pledged to deliver around 40–50% of their energy from renewable sources in 2030. However, governments find themselves in a somewhat paradoxical situation where in order to boost investment in renewable energy and other clean energy sources, hydrocarbon development has to be sustained – or even increased – to ensure government funding is available for the planned renewable mega- and giga-projects.

The UAE and Saudi are also pointing to the low-carbon intensity of their oil as they seek to increase oil and gas production rates. Vast economies of scale, as well as plans to reduce carbon inefficiencies and enhance carbon capture utilisation and storage facilities, mean this is no empty claim. Producing hydrocarbons with the world's smallest carbon footprint may provide Middle Eastern oil with an advantage in the race to be the *last show in oil and gas town*.

All that said, the UAE and Saudi have publicly committed to using their other abundant resources (in particular the sun) to develop renewable energy sources.



The UAE, for example, currently attracts the world's cheapest solar prices from the Al Dhafra plant and has finalised the funding for the world's largest solar project, using approximately 4m solar panels. Saudi's domestic pivot to solar power has been slower, but ACWA Power (partially owned by the state's sovereign wealth fund) is turning its attention from foreign projects to the massive Red Sea development in the Kingdom.

With green hydrogen remaining flavour of the month for transition fuel sources, it is no surprise that the UAE and Saudi have both committed to investing in that technology. Saudi, in particular, is eager to take a lead in this fledgling industry and has announced that ACWA Power has formed a joint venture with America's Air Products to build the largest green hydrogen project, at a cost of USD 5bn, with claims that by 2025 the plant will produce 1.2m mt per year of ammonia.



Overview of the strategies of O&G majors

We have examined the energy transition strategies of 15 of the world's largest O&G majors.



These companies have aggregate revenues of USD 2.4trn and account for 52% of global O&G production and 24% of proven reserves.

Here we summarise six ways in which these companies are looking to navigate the energy transition. These transition strategies cover themes focused on reducing the footprint of their own operations, nature-based solutions, digitalisation, ESG considerations and diversifying the business portfolio. Eight of the companies sampled have also agreed on a set of principles to create a more consistent set of metrics for reporting on climate-related performance (see page 27).

- **Acting on supply and operations** – O&G majors are working to reduce the footprint of their own operations by cutting the share of their production represented by O&G, while increasing the share of renewables. There are significant investments in low-carbon energy solutions and energy-efficient products. Companies are also reducing the carbon footprint of their own operations e.g. decreasing methane, emissions intensity and routine flaring, and increasing the integration of upstream facilities.

“Under pressure from investors, O&G majors have sought to reduce the impact of their own operations,” says CMS’s Majumder-Russell. “But they are now are extending their influence beyond their own operations to encourage their extended supply chain to adopt their own sustainability policies.”

The impact varies, but these increasingly include Scope 2 and 3 emissions. Given their potential to influence their own suppliers in this way, it is short-sighted to see the majors only as a problem in this area. They are also part of the solution.”

(Note: Scope 2 emissions cover indirect emissions from the generation of purchased electricity, steam, heating and cooling consumed by the reporting company. Scope 3 includes all other indirect emissions that occur in a company's value chain.)

The US majors have, somewhat belatedly, followed their European peers in this area.

“ExxonMobil’s big loss of stock market value over the past year has focused minds on the need to take action. The results are being seen in areas like carbon capture and fuel-cell technology,” says CMS’s Radu.

ConocoPhillips’s climate strategy is focused on limiting the carbon intensity and GHG emission intensity of its own business operations, rather than diversifying its portfolio into other renewable energy sources. The company has adjusted its portfolio to concentrate on lower-cost production and divested some higher-emissions-intensity natural gas and oil sands fields. It has also set a GHG emissions intensity reduction target for their scope 1 and scope 2 emissions.

In terms of new technologies, ConocoPhillips has focused primarily on CCUS, arguing that it invests in technologies that complement its processes and leverage on its experience and competencies.

More broadly, the carbon intensity of gas turbines typically used for power on offshore oil and gas installations is coming under increasing scrutiny, particularly in light of major emissions trading schemes setting higher benchmarks for the issuance of emissions allowances. This is the case across existing and new installations alike.

"In the UK, the Oil and Gas Authority is encouraging oil and gas companies to work together to potentially provide electrical power to clusters of existing offshore installations through a series of electrification workshops," said CMS's Denham.

A collaborative approach would likely be required for electrification projects to materialise, with significant CAPEX investment likely to be required in order to provide electric power from shore or nearby offshore windfarms. So modern approaches to the design of new installations allow more creative thinking on how to produce oil and gas in a way that is low-carbon by design.

"We expect to see a continued preference for normally unmanned installations and subsea tieback designs that can deliver additional production with significantly lower direct emissions," said CMS's Wisely.

- **Acting on demand** – the majors can help their customers through the energy transition by increasing demand for more low-carbon impact products, and scaling back offerings where competitive low-carbon products are available.

One example of this is Total's decision to no longer sell fuel oil for power generation after 2025. Here the aim is to encourage French customers to switch to electricity, natural gas or wood for home heating. Total also has a JV with Groupe PSA to develop electric battery manufacturing as well as a concession for 20,000 new electric vehicle charging points in Amsterdam.

In the same spirit, Shell is offering customers carbon-neutral lubricants for passenger cars, heavy-duty diesel engines and some industrial applications. It is also purchasing biomethane from Denmark's Nature Energy to provide lower-carbon choices for customers. Meanwhile bp has partnered with Qantas to reduce emissions in the aviation sector and contribute to a sustainable aviation fuel industry in Australia.

In addition, bp has a partnership with Neste, the world's largest producer of renewable diesel and sustainable aviation fuels, to offer more sustainable aviation fuel in Europe in 2020–2021. Total has been reducing the average carbon content of its mix of energy products, expanding algae gas and the renewable energy value chain, and Eni has been developing decarbonised products for mobility, household consumption and small businesses.

- **Focus on nature-based solutions** – the majors are also focusing on natural solutions to greenhouse emissions. These projects protect, transform or restore natural ecosystems, such as forests, grasslands or wetlands that can absorb CO₂. Such projects can also have environmental and social benefits. Examples include reforestation, creating biofuels from algae and cellulosic biomass for commercial transportation.

ExxonMobil has an algae biofuel research programme with Synthetic Genomics Inc. that is aiming to produce 10,000 b/d of algae biofuel by 2025. Elsewhere, bp is scaling up its bioenergy business, which focuses on biofuels, biogas and biopower. Here it aims to replicate the successful model of bp Bunge in Brazil, and of biogas in the US. Meanwhile Shell is planting more than 5 million trees in the Netherlands over 12 years through a project with the Dutch National Forestry Department.

- **Leveraging digitalisation** – companies are trying to digitise their operations and ensure that technology is used to improve the sector's connectivity, efficiency and sustainability. It links in with other strategies to decarbonise internal operations (see above).

Digitalisation can improve decision-making on renewable energy production and assets, reduce the carbon footprint of internal operations, and lower operating costs. Examples include robotic process automation, data-driven decisions supported by artificial intelligence, and blockchain technology.

"Digitalisation helps companies to track operations at every stage, and smart contracts allow contracting in real time, which helps risk management," says CMS's Majumder-Russell.

One example of this strategy is ExxonMobil joining the ABM Quantum Network to explore the potential for quantum computing to solve real-world energy problems more efficiently than classical computing. Applications could include the management of the global fleet of merchant ships. And in February 2020, Eni launched the HPC5 supercomputer at its Green Data Center. The computer is used to process

data on O&G reserves, saving time and money in the analysis of exploration prospects.

- **Adopting climate-focused ESG considerations into business models** – as investors look for sustainable investment products, the majors are feeling the impact of ESG-driven investment. This pressure encourages them to find lower-carbon solutions as a strategy that may help them to successfully attract new capital.

This pressure is now influencing US companies in new ways. ExxonMobil announced in December 2020 that it planned to reduce greenhouse emissions over the coming five years. This was a response to pressure from investors and climate-change campaigners. Previously shareholder proposals to improve ESG disclosure had been overturned, but things changed after ExxonMobil's second-largest shareholder, BlackRock, voted in May 2020 in favour of an independent chairman and against the re-election of two directors.

Another example of change is that at the time of its USD 9.7bn acquisition of drilling company Concho Resources, ConocoPhillips made specific reference to that company's ESG strategy, including commitments to cut emissions and phase out routine flaring.

- **Diversifying the business portfolio** – the O&G majors are continuing to acquire existing, non-core businesses, especially in the electricity sector, to hedge their traditional operations. These range from established power utility companies to electric-vehicle charging start-ups. The majors' continuing access to vast capital resources puts them in an excellent position to invest in a wide range of technologies at relatively low risk, and to take advantage of technological breakthroughs when these occur.

Electric vehicles are a good example. *"Consumers, especially the younger generation, have woken up to the appeal of electric (including, hydrogen fuel cell powered) vehicles, with all the benefits these can bring especially in terms of improving air pollution in urban settings,"* says CMS's Majumder-Russell. *"One problem remains the lack of charging point infrastructure, but this is an area where the O&G majors can play a big role. Petrol station forecourts offer ideal venues for hydrogen storage and sale, and O&G companies have the experience of working with local councils to understand and control the risks of energy storage."*

In this field Shell has agreed to buy Ubitricity, which operates the largest public electric vehicle-charging network in the UK. Chevron has made a Series C investment in Blue Planet Systems Corp, a start-up that manufactures and develops technology to reduce the carbon intensity of industrial operations. Total has acquired 20% of Adani Green Energy from India's Adani Group, the largest solar developer in the world, and Eni is working with Enel to produce green hydrogen through electrolyzers in Italy (10MW).

In the virtual power segment Shell has acquired Next Kraftwerke, a platform that remotely connects and manages over 10,000 decentralized energy units across eight countries in mainland Europe. These units, which include solar, bioenergy and hydropower plants, produce electricity that is traded on the wholesale electricity markets on behalf of Next Kraftwerke's customers. The acquisition will help Shell meet its aim to sell around 560TWh of electricity a year by 2030, twice as much as currently. Shell had previously bought two virtual power plants – sonnen GmbH in Germany in February 2019 and Limejump Ltd. in the UK in March 2019.



Interview:

Pierre Girard – Neptune Energy

Neptune Energy is a leading independent exploration and production company operating in Europe, Asia-Pac and North Africa. Founded in 2015, it aims to offer a differentiated portfolio that delivers strong returns for investors. Pierre Girard is Director of New Energy, reporting to the VP Business Development, Commercial and New Energy.

“At Neptune my role is focused on three areas: decarbonisation of our operations, supporting Neptune’s ESG targets; Carbon Capture Usage and Storage (CCUS), a way to dual-purpose or repurpose our facilities and to create new business lines; and energy systems convergence i.e. new forms of energies that build on our skills and infrastructure.”

Girard outlines a future in which gas continues to have an important role for some time.

“We need a mix of energy sources, and hydrocarbons will continue to play a key role for many years to come. Gas has played a key role in reducing emissions in countries like the UK, where coal-fired power stations have been phased out and replaced by gas-fired efficient power stations.”

“In Norway, we operate the Gjoa semi-submersible platform, which was electrified from the onset, saving 200,000 tonnes of CO₂, annually, and we are pleased to be progressing the electrification of the Gudrun facilities.”

So the outlook is one of continuing change, with a role for gas but also for new technologies.

“Increased investments in renewables by O&G majors may be required by shareholders and investors in order for these companies to maintain their

social licence to operate. In turn, this may put increased pressure on the supply chain, creating both opportunities and risks with possible associated cost increases. The intermittence of most renewable energy will also need to be addressed, with a continued role for gas and the possible growth of hydrogen as a solution, as well as further developments in battery technology.”

Of the various energy transition strategies outlined in this report, Neptune’s focus is on adopting climate-focused ESG considerations into its business models. For example, he sees a role for Neptune in carbon capture and storage.



“There is growing momentum to use CCS for hard-to-abate industries, and Neptune is well placed to play a key role, with studies to offer storage capacity at the L10 Hub in the Netherlands. We have applied for a CO₂ storage licence in the UK and are keen to bring our experience and agile ways of working to offer value-for-money solutions and help the UK meet its goal on the journey to Net Zero.”

Neptune is also working on how to adapt its infrastructure for hydrogen.

“With our PosHYdon hydrogen project, we plan to progress feasibility studies to install an electrolyser on our operated Q13a-A platform and learn how to repurpose facilities to produce and transport hydrogen. We expect to see rapid changes in hydrogen technology. At this point we are technology agnostic and focus on bringing our expertise in safe offshore operations handling natural gas with the natural evolution to hydrogen.”

Based on the actions described above, Girard foresees an expansion in energy systems convergence, with increasing opportunities to combine hydrocarbon production with hydrogen from wind energy or with other forms of renewable such as geothermal.

“In 2020, Neptune Energy was in the top two in the industry for low CO₂ intensity, according to Rystad [an energy consultancy], and we aim to maintain our low carbon intensity for operated assets at 6kg/boe in 2030. This will require significant investments that are likely to be facilitated by the introduction of new business lines for these assets.”

Neptune’s strategy has implications across the markets in which it operates. “We will continue to bring affordable gas to the Asian market, helping replace coal-fired power plants with gas-fired power plants.”

Finally, in terms of the challenges that the industry faces as the energy transition advances, Girard particularly highlights the need for clarity on CO₂ pricing and how this will evolve over time, in order for companies to plan their investments accordingly.





Eight O&G majors agree energy transition principles



In December 2020, bp, Eni, Equinor, Galp, Occidental, Repsol, Royal Dutch Shell and Total announced that they had agreed on six principles to apply to their energy transition strategies. The aim is to create more consistency and transparency on the metrics used to report on climate-related performance.

Public support for Paris Agreement goals – including international cooperation as a vehicle to ensure that those goals can be achieved at the lowest overall cost to the economy.

Industry decarbonisation – reduce emissions from their own operations and strive to reduce emissions from the use of energy, together with customers and society. Measure firms' contributions using carbon intensity and/or absolute metrics at different points in the value chain.

Energy system collaboration – collaborate with stakeholders, including energy users, investors and governments, to develop and promote approaches to reduce emissions from the use of energy in support of countries delivering their Nationally Determined Contributions towards achieving the goals of the Paris Agreement.

Development of carbon sinks – continue to support and promote the development of emissions sinks such as CCUS technology and natural sinks

Transparency – provide disclosure related to climate change risks and opportunities consistent with the aims of the recommendations of the Taskforce on Climate-related Financial Disclosures (TCFD).

Industry and trade associations – report information about their memberships of main industry and trade associations and their alignment with the companies' key climate advocacy and policy positions.

New UK agreement could be a model for others



In the UK, the role of oil and gas companies in a net-zero future will be influenced by a unique agreement between the Government and the oil and gas sector, set to spur investment in decarbonisation and lower carbon technologies, and ensure that the sector is well prepared for the wider effects of the energy transition.

This highly anticipated agreement, the North Sea Transition Deal (NSTD) was published on 24 March 2021 and sets out a plan for the Government and UK offshore oil and gas sector to work together to accelerate the energy transition while protecting jobs and the economy.

The NSTD contains proposed industry and corresponding government actions, along with a joint commitment to invest up to GBP 14–16bn by 2030 to reduce carbon emissions. The UK is the first G7 country to agree to form a unique partnership of this kind, offering an opportunity to lead the way in the energy transition.

The key actions and outcomes of the NSTD relate to five areas of development:

- **Supply decarbonisation:** the NSTD focuses on cutting industry emissions with an ambitious sector target to reduce emissions by 10% by 2025, 25% by 2027, and 50% by 2030 compared with 2018 levels;
- **Carbon Capture Utilisation and Storage (CCUS):** in order to develop CCUS technology, the industry has committed to leveraging existing infrastructure to provide transport and storage facilities;
- **Hydrogen:** the Government will create a Net Zero Hydrogen Fund to boost production capacity and encourage private investment;
- **Supply Chain transformation:** to support the diversification of the UK supply chain, industry has committed to ensure that by 2030 50% of decommissioning and new energy technology projects being developed are provided by local companies. Underpinning this is the appointment of an Industry Supply Chain Champion to coordinate growth and job opportunities with other sectors;

- **People and Skills:** a key aim of the NSTD is to decarbonise the economy while using existing skills to protect jobs and offer opportunities for job creation. This includes a commitment to support up to 40,000 new jobs and retain the transferable skills of industry workers, allowing them to work across the energy sector.

The key challenge to the success of the NSTD will be turning sector-wide intentions into actions taken by individual companies to deliver on those intentions. The NSTD has been broadly supported by the sector and, as this report demonstrates, the major oil and gas companies in our survey have made and intend to continue with significant investment in lower carbon projects. However, there remains the risk of an inertia effect, resulting in the sector as a whole not delivering as the NSTD projects.

The governance structure of the NSTD should help in this respect, with implementation led by a delivery group that includes an industry representative. We expect that other countries with similar regulatory structures to the UK will consider similar approaches to the NSTD, and will closely review the early stages of its implementation as an indicator of its potential long-term success.

Interview:

Will Webster – Oil and Gas UK

Oil and Gas UK (OGUK) is the leading representative body for the UK oil and gas industry. Its aim is to strengthen the long-term health of the industry and speak on behalf of its members, which are all companies active in the UK continental shelf. Will Webster is OGUK's Energy Policy Manager.

"In this context, the industry was pleased to see a supportive outcome from the recent licensing review, which continues to offer the prospect of new drilling so long as projects meet the requirements of 'climate compatibility'."

This principle requires an assessment of whether government and regulatory decisions on future rounds are compatible with the UK's climate change objectives before a project is allowed to go ahead.

As for so many other industries, 2020–21 has been a very difficult time for the oil and gas industry. Demand for oil and gas has fallen, affecting price levels, as has capex, especially new investment in exploration and production.

"In the UK we are hoping for a bounce-back in exploration and development capex after COVID-19 and into 2022. This is important as oil and gas still supply 70% of the UK's primary energy. That percentage is going to fall, but over the next 30 years there is still an [approx.] 15bn barrel energy gap to fill in terms of O&G supply, and it will require some new exploration to fill it."

"It would be a mistake to think that we won't continue to need oil and gas, for example for aviation fuel, for years to come. Electricity cannot do everything that oil and gas currently do, and some of the emerging new technologies will not be available at scale in the short term."

As highlighted in this report on page 5 the likely date for global peak oil production is getting closer – some commentators even think that it might have been 2019 – and the consensus view is that peak oil is going to come sooner than previously forecast. However, peak oil is not the same as peak gas.

"We are in the middle of an energy transition and that transition includes decarbonised gas."

As part of the recent deal with the UK government, the O&G sector has committed to halve emissions from its own exploration and production from 18m tonnes to 9m tonnes by 2030.

"Some of this reduction will come from the use of produced gas for power generation offshore. And as the offshore electricity network is extended for the development of offshore wind, O&G assets can also be included and provide important synergies."



The majors are investing heavily in offshore wind themselves. In the recent Crown Estate auction for offshore windfarm acreages bp, Equinor and Total were all successful bidders.

“That seems to surprise some people, but it really shouldn’t. These are big companies with huge experience of working offshore with complex infrastructure. But if you want to really speed up decarbonisation, you are also going to need carbon capture and hydrogen. And moves to accelerate the timetable for carbon-reduction targets only increase the importance of those two technologies.”

There is potential to re-use existing O&G infrastructure for CCUS projects, and there is scope to re-use some gas infrastructure for hydrogen, for example the UPVC piping that is steadily replacing the old, iron mains. But arguably it is the experience, and more specifically, supply-chain experience, of the UK’s O&G sector that will be more valuable to these new technologies than their repurposed infrastructure.

Meanwhile, there continues to be helpful regulatory progress in many relevant areas.

“The CCUS market is moving ahead and we will see government-backed projects on the model of offshore wind. There has also been progress on how to remunerate pipeline infrastructure. We are still waiting for a business model for hydrogen, but that should happen later this year.”

In terms of ESG, the UK government’s reporting requirements continue to grow, as do institutional investors’ expectations of transparency so they can make informed investment decisions.

“The EU has already done a lot of work around the taxonomy of sustainability i.e. how to define a ‘sustainable fund’ and the UK government has now initiated work in this area.”

The Cop 26 climate conference to be held in Glasgow during 2021 will see the UK government ask companies about their contribution to achieving increasingly ambitious goals. Looking five years ahead, OGUK’s Webster expects this already fast-moving situation to have evolved even further.

“Companies are looking to develop new technologies at sufficient scale to play a role in the energy transition, just as offshore wind now does. In fact, the development of offshore wind over the past decade provides a good model for CCUS and hydrogen to follow. First, they need the infrastructure and a business model; then they learn through smaller projects; only after that can the technology be rolled out at scale.”



Technologies being used

The 15 companies in our sample invest in a large and growing range of renewable and clean energy technologies.



Wind and solar are the most common, with 14 out of 15 invested in both – only ConocoPhillips does neither. All 15 invest in carbon capture and storage (CCUS), often in projects linked to enhanced oil recovery, and all but ConocoPhillips are also investing in hydrogen, generally “green” hydrogen projects. Biofuels have attracted the majority of the companies – 12 out of 15 – but the take-up of hydroelectric and geothermal is less developed, and the majority of our sample are not invested in either of those two segments.

An interesting example of carbon capture is the Net Zero Teesside project in the UK. This involves five companies led by CCUS and links technologies from the O&G sector and renewables to capture, transport and store carbon.

“The Teesside project draws on legal expertise about renewables that is new to the O&G majors, who are bridging the gap between traditional O&G and the electricity sectors,” explains CMS’s Majumder-Russell.

In addition to classic renewable energies such as solar and wind power, LNG is also considered by some – but not all – commentators as a transition fuel. It is certainly commercially viable and the model provides a good future structure for the development of hydrogen. The O&G majors could be big players in that process due to their deep knowledge of gas. Project Cavendish is a hydrogen project on the Isle of Grain, on the edge of London. It will use existing infrastructure to import LNG for use in London and the South-East. It includes generation, storage, transport and CCUS.

“LNG can play a big role in the energy transition away from oil and coal,” says CMS’s Kraft. *“So could nuclear, although in countries including Germany that route has been comprehensively rejected by governments following the Japanese Fukushima nuclear plant accident.”*

Hydrogen and CCUS technologies popularity is increasing among oil and gas majors

			Investment in a range of renewable technologies						
	Company	Country	Wind	Solar	Hydro-electric	Geo-thermal	Biofuels	Carbon Capture and storage	Hydrogen
1	Repsol	Spain	✓	✓	✓		✓	✓	✓
2	Shell	Netherlands/ UK	✓	✓		✓	✓	✓	✓
3	BP	United Kingdom	✓	✓			✓	✓	✓
4	Equinor	Norway	✓	✓			✓	✓	✓
5	Eni	Italy	✓	✓			✓	✓	✓
6	Petronas	Malaysia		✓				✓	✓
7	Total SA	France	✓	✓			✓	✓	✓
8	Lukoil	Russia	✓	✓	✓			✓	✓
9	Chevron	United States	✓	✓		✓	✓	✓	✓
10	Pemex	Mexico	✓	✓		✓	✓	✓	✓
11	Petrobras	Brazil	✓	✓				✓	✓
12	ExxonMobil	United States	✓	✓			✓	✓	✓
13	Saudi Aramco	Saudi Arabia	✓	✓				✓	✓
14	ConocoPhillips	United States						✓	
15	CNPC	China	✓	✓		✓	✓	✓	✓
Total			13	14	2	4	10	13	14

Source: Capital Economics

✓ Enhanced Oil Recovery

✓ Green

Energy transition in the Asian region

Marc Rathbone, Head of Oil & Gas for Asia at CMS, looks at the prospects in the Asia-Pacific (APAC) region

The drive towards energy transition in Asia has been at a more conservative pace than in Europe.

There are many reasons for this, including the less-developed nature of some Asian economies prioritisation of gas/LNG infrastructure as opposed to wholesale renewable infrastructure; readily available and abundant base load energy sources (such as oil and coal); and the continued production of coal in the APAC region.

That said, statistically some of the largest contributing countries to global renewable energy are the larger emerging and developed Asian economies.

The drive to transition away from more traditional forms of energy – and reduce carbon emissions – is being led by some of the national oil companies and state-owned entities with underlying governmental influence that cannot be understated.

For example, Petronas is starting to introduce solar and wind development, clean hybrid and storage solutions and CCUS into its portfolio. It has installed solar panels in some of its upstream and downstream assets to supplement their electricity usage and invested in SOLS a solar photovoltaic start-up (sustainable energy for SME/residential).

CNPC is going through a rebranding process to expand its portfolio to include wind, solar, geothermal and hydrogen offerings. It is trying to reposition itself as an Asian energy transition pioneer in a move that will include a zero-carbon emission target. To date it has invested in domestic offshore wind farms, a small geothermal plant and localised solar arrays for petrol stations.

There are many factors at play that could influence the pace of energy transition in the Asian market over time. These include European companies (already in transition) influencing their operations in Asia; leaps in technological development (hydrogen and battery tech); reduced availability of financing for coal/oil (as is already happening with some Asian banks); and a correlative rise in financial liquidity for renewable projects.



But as is the case in CEE (and other areas of the world) the greatest influencer will be the attitude and motivation of national governments towards transitioning away from coal and oil to cleaner sources of fuel (which would include gas and nuclear). Without the right incentives and underlying legal frameworks the energy transition will not gain the needed momentum.



How well are they doing?

The Transition Pathway Initiative (TPI) is a global initiative to assess how far companies are prepared for the transition to a low-carbon economy.



It has assessed the management quality of 13 of the 15 companies in our sample, as well as the risks/opportunities relating to the low-carbon transition. That analysis covers a wide range of questions, from whether the company acknowledges climate change as a significant issue for the business to whether remuneration for senior executives incorporates climate change performance.

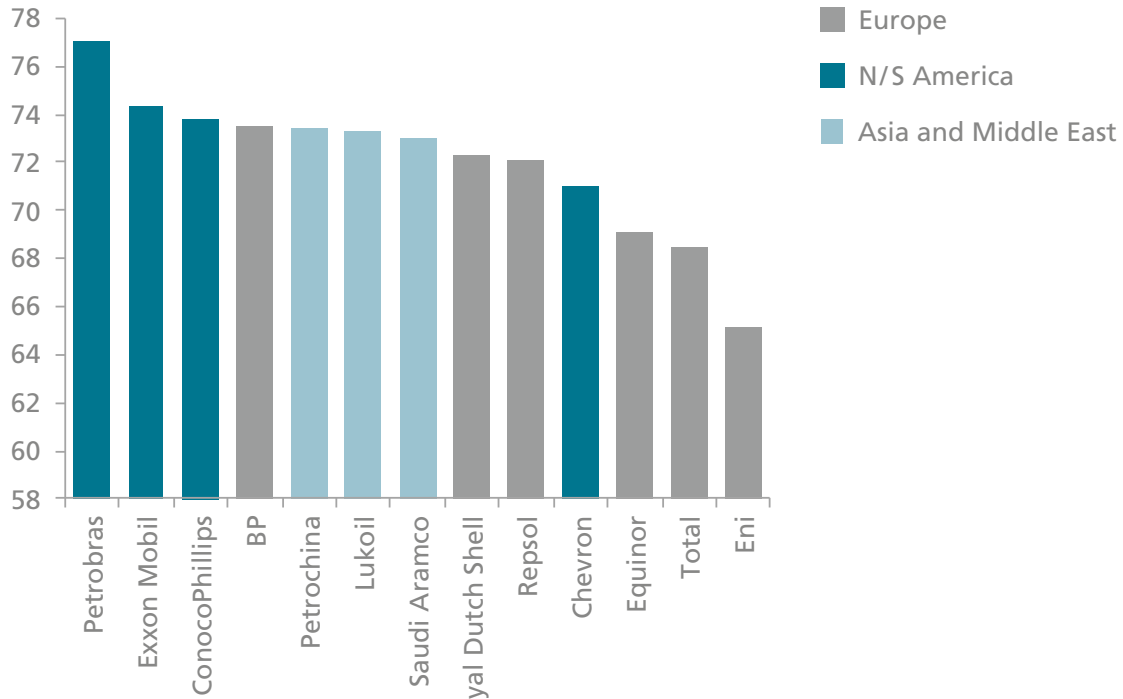
Overall, bp, Eni, Equinor and Total top the survey, able to answer “Yes” to all the questions posed, while Lukoil, Saudi Aramco and PetroChina bring up the rear. But the TPI analysis provides a nuanced picture. Of the 13 companies considered, just nine report on Scope 3 emissions and only five ensure consistency between their own climate change policy and the positions taken by the trade associations of which they are members.

Ten of the 15 have announced zero emissions targets by 2050. However, most of the targets set by the non-European companies focus primarily on cutting emissions from their own operations and decreasing their carbon intensity.

Overall, the European O&G majors are generally more ambitious thanks to a combination of comprehensive energy policies outlined by their own governments, fewer natural endowments of oil and natural gas, and greater concern by European publics about the impact of climate change. But in terms of stretch strategies, no major fossil fuel energy company has aligned its emissions pathway with limiting the global average temperature increase to 2 degrees C. Eni, Royal Dutch Shell and Total come close to reaching that target, but in aggregate the groups’ current pledges leave the world on target for a 3.2C rise.

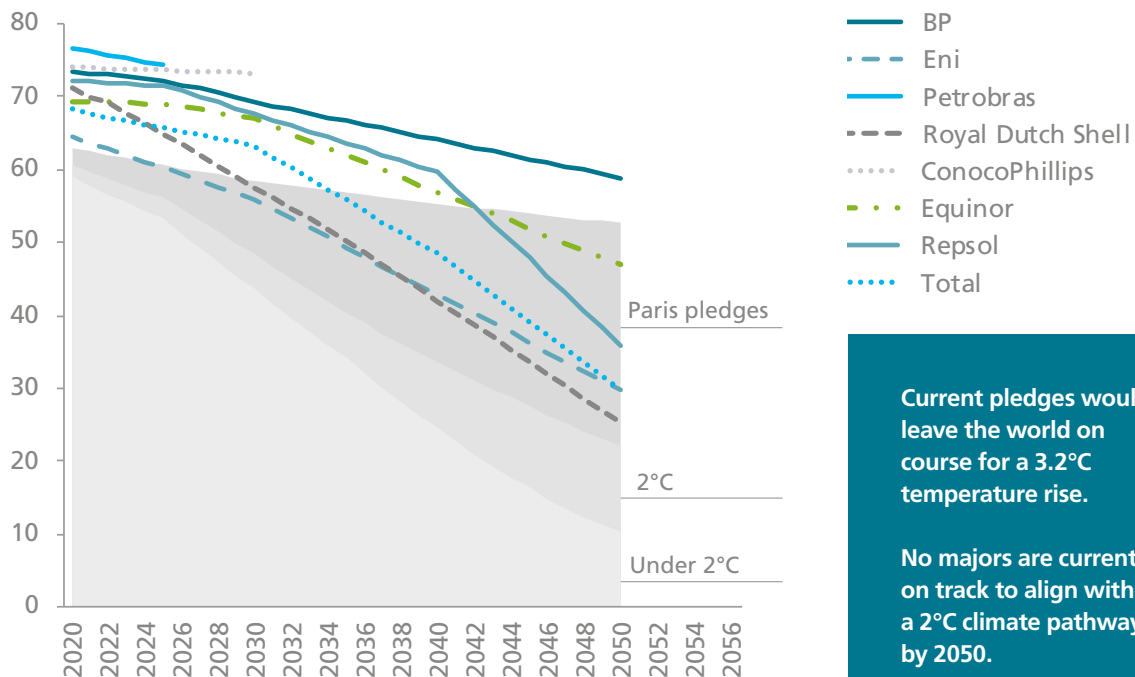
While five majors are on track to align with the emissions pledges made as part of the Paris Agreement, all fall short in limiting the rise in average global temperature to 2°C

Carbon emissions intensity for selected oil and gas majors (2019, gGO2e/MJ)



Sources: Capital Economics and Transition Pathway Initiative. Note: Data for ExxonMobil and Saudi Aramco are for 2018

Targeted carbon emissions intensity for selected oil and gas majors (gGO2e/MJ)



Current pledges would leave the world on course for a 3.2°C temperature rise.

No majors are currently on track to align with a 2°C climate pathway by 2050.

Sources: Capital Economics and Transition Pathway Initiative.

Energy transition in the CEE region

Varinia Radu, Head of Oil & Gas for CEE at CMS, looks at the prospects in that region

In Central and Eastern Europe the most powerful O&G companies are still controlled or influenced by their respective governments and so are less likely to enjoy freedom of action compared to bp or Shell.

The attitude of national governments in the region is important. While welcoming the EU's Green Agenda, CEE governments have lobbied the Commission to accept that the transition from traditional coal and oil will, at least for a period, involve a move to natural gas rather than a direct switch to renewables, especially to address the demand response in a more volatile mix of energy sources. Although politically unacceptable in some Western European countries,

They are, however, well aware of the many factors pushing them to take action and gain credibility with a range of stakeholders.

Their immediate response to the need for energy transition is seen in changes to their own operations through gains in efficiency and moves towards digitalisation, with the aim to decarbonise their production cycle and impose stricter standards on their supply chain. Diversifying their energy portfolios into renewables would help CEE companies to gain further transition credibility, but they face many challenges, including more limited financing sources for the hydrocarbon production and big workforce layoffs over the last year. We expect the energy transition in the region to be concentrated in the near term in those sectors where there are synergies with the core O&G business e.g. CCUS, geothermal and the production of blue hydrogen.

Exploration remains of interest and new licences have been on offer in several CEE countries in recent years. Interested parties include listed companies from Canada, Australia and the UK, as well as privately-held companies, often from the US such as Warburg Pincus, First Reserve and Carlyle.

nuclear power is also under consideration in several countries, including Bulgaria, Romania and the Czech Republic.

Meanwhile, some CEE companies have dipped their toes into renewables only to pull back.

Romania's OMV Petrom, the largest regional fully-integrated oil and gas player, sold its limited investments in wind generation a few years ago. However, it has consolidated its position in the power market with an investment in a 600MW gas plant. Recently Petrom announced that it could partner with Romanian state-owned gas producer Romgaz to develop a hydrogen production facility near a wind farm in south-east Romania (See interview with OMV Petrom on page 42).

Less-proven renewable technologies such as CCUS and hydrogen are considered, given that these technologies are also backed up by national energy and climate change plans. For example, Bulgaria is planning to develop a hydrogen roadmap targeting 1.1GW of green hydrogen production capacity by 2030, and Poland plans to have 2GW of hydrogen electrolysis capacity and 2,000 hydrogen fuel-cell buses on its roads by 2030.



Some smaller players have announced pilot projects producing blue hydrogen in Austria, such as ADX Energy. Also Unipetrol, the Czech company belonging to Orlen group, has announced the installation of hydrogen dispensers at its gas stations. Mazarine Energy Romania (which is owned by Carlyle) has concluded an association with CeraPhi from the UK to develop a pilot project producing geothermal energy by using existing wells from an oil field close to Bucharest.





Why are European majors taking the lead?

European O&G majors have set more ambitious targets and are further advanced in the energy transition than their non-European counterparts for several reasons.

First, in terms of the sample, the European companies are independent while the national oil companies are state-owned. As a result, the Europeans face much stronger pressure from their investors to diversify. They also have much greater freedom in setting their own agenda than national oil companies, many of whose governments/owners rely heavily on revenues from their fossil fuel business.

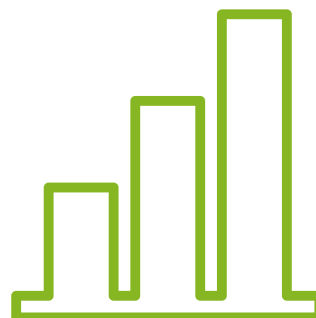
Secondly, much of Europe's progress reflects the results of national energy policies, which both require and incentivise the European majors to set stronger targets and diversify. National governments provide tax advantages and other subsidies to support the use and development of alternative energy technologies that impact demand for the majors' products.

The EU has also set out a clean energy policy with its Green Deal, laying out in broad terms how it intends to meet its objective of zero net emissions of greenhouse gases by 2050. No other advanced economy has taken such a sweeping step. While other national governments have policies in place that are meant to incentivize behaviour (e.g. the 45Q tax credit in the US that encourages the use of CCUS technology), the EU's policies are broader and more generous.

Thirdly, different circumstances necessitate different approaches. The US, for example, has an abundance of relatively cheap natural gas. It also has a preexisting and extensive pipeline infrastructure for carbon storage, transport and distribution. This creates different options for US oil and gas majors and partly explains why the US majors are more focused on deploying CCUS technologies rather than setting broader CO₂ reduction targets.

Furthermore, the US has the 10th largest proven oil reserves in the world. As such, US majors' portfolios are much more heavily invested in traditional fossil fuels than their European counterparts, making it easier for the latter to diversify.

Finally, evidence seems to suggest that attitudes towards climate change by European consumers are different from their peers elsewhere in the world. Surveys reveal that Europeans are simply more concerned about climate change, particularly compared to Americans and as consumer and investor sentiment are large forces in driving the energy transition, there is therefore more pressure on European oil and gas companies to diversity.



Interview:

Christina Verchere – OMV Petrom

OMV Petrom is one of the most important companies in Romania, responsible for providing fuels, natural gas and power for households, schools, hospitals, commerce and industry. Christina Verchere is the CEO of the company.

“We meet 40% of Romania’s demand for fuels and gas, and up to 10% of domestic electricity production, so we play a significant role in the energy landscape. As an energy company, we want to be part of the energy transition solution, and we strive to make this happen through all of our projects and operations.”

“Climate change is a strategic priority for OMV Petrom and we want to deliver on our promise to provide energy in a sustainable way, keeping our people, communities and the environment safe while transforming our business for a low-carbon future. We constantly make efforts to optimize processes and to improve our energy efficiency, and we look for solutions for cleaner energy to respond to the changing needs of our customers.”

The company’s efforts in the energy transition are channelled towards reducing the carbon footprint of its operations and product portfolio, while responding to the increasing demand for energy. OMV Petrom leverages its integrated business model and the role of gas. Gas can contribute to lowering CO₂ emissions in various sectors (with applications in power production, heating, transportation), while ensuring spare capacity to cover for less predictable

renewable sources. In addition, the company assesses new business opportunities that complement existing business (such as photovoltaic, electric chargers) and looks into new technologies such as CCS, CCU and hydrogen.

OMV Petrom focuses efforts on value-added investment, using high-end technologies and innovations to reduce the carbon footprint of its operations. By 2020

it had managed to decrease the carbon intensity of its operations by 26% compared with 2010. The company is a pioneer in using suitable technologies and applications for the efficient use of energy and reduction of emissions. It has in operation 32 G2P and CHP power plants with a total installed capacity of 69 MW that contribute to reducing carbon intensity, especially in Upstream.

Natural gas accounts for over 50% of OMV Petrom’s hydrocarbon production and the company believes that gas has lots of potential for both the medium and long term.

“For the energy transition to be successful, we need to effectively use the competitive advantage provided by the availability of gas resources. Without natural gas, achieving the goals of the energy transition will be technically very challenging. It is the only resource that can ensure the flexibility of the energy system and it is critical for the sustainable transformation of coal-intensive regions in Central and Eastern Europe.”

OMV Petrom’s state-of-the-art gas-fired power plant can provide 10% of Romania’s power needs and ensures spare capacity when renewables are idle. Natural gas can also be blended with bio-methane and with hydrogen, and gas-fired power plants can be coupled with CCS or CCU.



The development of Black Sea gas can also contribute to Romania's post-pandemic economic recovery in terms of new revenue streams for the state budget. Deloitte has valued those revenues at USD 1.2bn/year during the production stage. In addition, Black Sea gas provides the opportunity to use a national resource to contribute to Romania's efforts to fulfil its carbon-reduction targets, and it underpins the country's energy security, helping to turn Romania from a net importer to ensuring that its own energy needs are met.

"The value chain of natural gas fits perfectly with the visions for 2030 and post-2050 because it will enable other technologies (i.e. battery storage, electrolysis, methane steam reforming, and pyrolysis), applications (i.e. power-to-X) and fuels (i.e. hydrogen, bio-methane, or ammonia) to scale up and generate multiple sustainable benefits for many strategic economic sectors." The COVID-19 pandemic has accelerated a number of trends that were already emerging in the energy sector, bringing into the spotlight the interaction between digitalization, environment, sustainability and energy.

OMV Petrom has continued to leverage digital technologies to drive business performance and value generation across business divisions, from digital signatures to online meeting tools. One interesting project has been the DigitUp program, when more than 170 OMV Petrom employees involved in exploration, development and production activities were able to access critical applications securely while working remotely.

The company wants to continue to invest in new gas production. ***"Unlocking Black Sea investment requires stable and predictable legislation. Romania has to compete in a global capital market at a time where oil and gas companies are reducing their investment levels worldwide. Investment also requires a competitive tax regime. Currently Romania's tax level is three times higher than the EU average for onshore, and five times higher***

for offshore production. There is also a need for a regulatory framework to access the financing lines that the EU makes available to member countries. A series of clean energy production projects could be developed in Romania, benefiting from the EU's financing mechanisms for the energy transition."

OMV Petrom has invested in various technologies to reduce its carbon footprint. Following investments of approximately EUR 21m since 2018, it has increased the annual bio-blending capacity at its Petrobrazi refinery from 200kt to around 350kt in order to supply fuels with increased quantities of bio-components in finished products. The use of fuels with increased bio-content contributes to achieving EU targets of reducing greenhouse gas emissions. OMV Petrom has also developed a new marine fuel oil to help the shipping industry reduce sulphur emissions.

"According to the International Marine Organisation (IMO), by limiting the sulphur content in marine fuel oil to 0.5%, an annual 77% drop in sulphur emissions could be achieved, with a cut of 8.5mmt of sulphur per year globally. This would have a very positive impact on the quality of life in port and coastal cities."

OMV Petrom has also been upgrading its filling stations. ***"We believe that the mobility offer at our filling stations should include a mix of fuels, both conventional and alternative. We have started developing an electric vehicle network and aim to have 80 electric rechargers in Romania and Bulgaria by the end of 2022, thanks to partnerships with Eldrive, Enel X and Renovatio. In addition, 82 of our filling stations in Romania are connected to green energy, thanks to the installation of photovoltaic panels, which reduce the carbon footprint of each filling station by 8.3t of carbon dioxide emissions per year."***



Outlook for investment

It is very clear that most O&G majors are moving in the same direction, investing more in renewables and planning to reduce emissions over the next decade.



For example, we would expect the majors to buy into renewables in East Asian markets and the US, which is now more attractive with the new administration. But how fast is that energy transition likely to be, and what are the wider implications of a faster or slower transition?

We have analysed the outlook to 2030 under two scenarios: 1) existing policies continue, and 2) a rapid energy transition. The overall direction of travel is the same in both, but the speed of transition varies considerably, as does the destination reached by 2030.

1) **Scenario 1: Existing policies continue** – the current levels of investment in renewables remain constant as a share of total energy demand across the forecast horizon.

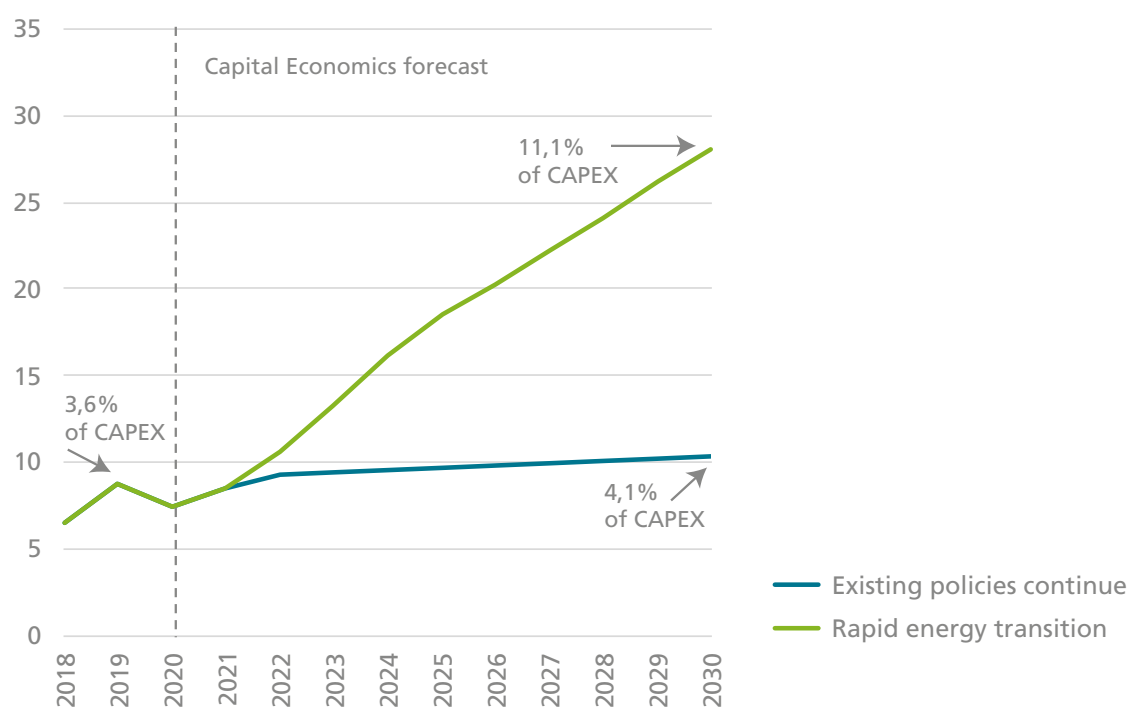
The forecasts for underlying energy demand are based on the Planned Energy Scenario of the International Renewable Energy Agency (IRENA). This incorporates national governments' current energy plans and other planned targets and policies as of 2019 including Nationally Determined Contributions under the Paris Agreement, unless the country has more recent climate and energy targets or plans.

Under this scenario, demand for renewable energy increases by 1.5% a year, and O&G majors' investment in renewables stays at 2.7% of global investment in renewables up to 2030.

2) **Scenario 2: Rapid energy transition** – the current levels of investment gradually increase over the same period. This describes an ambitious but realistic energy transformation pathway based largely on renewable energy sources and steadily improved energy efficiency. This scenario would set the energy system on the path needed to keep the rise in global temperatures to well below 2 degrees C and towards 1.5C during this century.

Under this scenario, demand for renewable energy increases by 5.0% a year, and the O&G majors' investment in renewables rises to 5.2% of the global total in 2030.

Total investment in renewable energy by sample of 15 major oil and gas companies, under Capital Economics' two scenarios (USD billion)



Sources: Capital Economics, IRENA and individual company reports.

Comparative table for our two scenarios

	Scenario 1 – Existing Policies Continue	Scenario 2 – Rapid Energy Transition
Forecast based on IRENA's	Planned Energy Scenario	Transforming Energy Scenario
Demand for renewable energy to increase by	1.5% a year	5.0% a year
O&G majors' annual investment in renewables in 2030	USD 10.4bn	USD 28.0bn
O&G majors' annual investment in renewables as % of their total investment	4.1%	11.1%
O&G majors' annual investment in renewables as a % of total investment in renewables to 2030	Remains constant at 2.7%	Rises from 2.7% to 5.2%

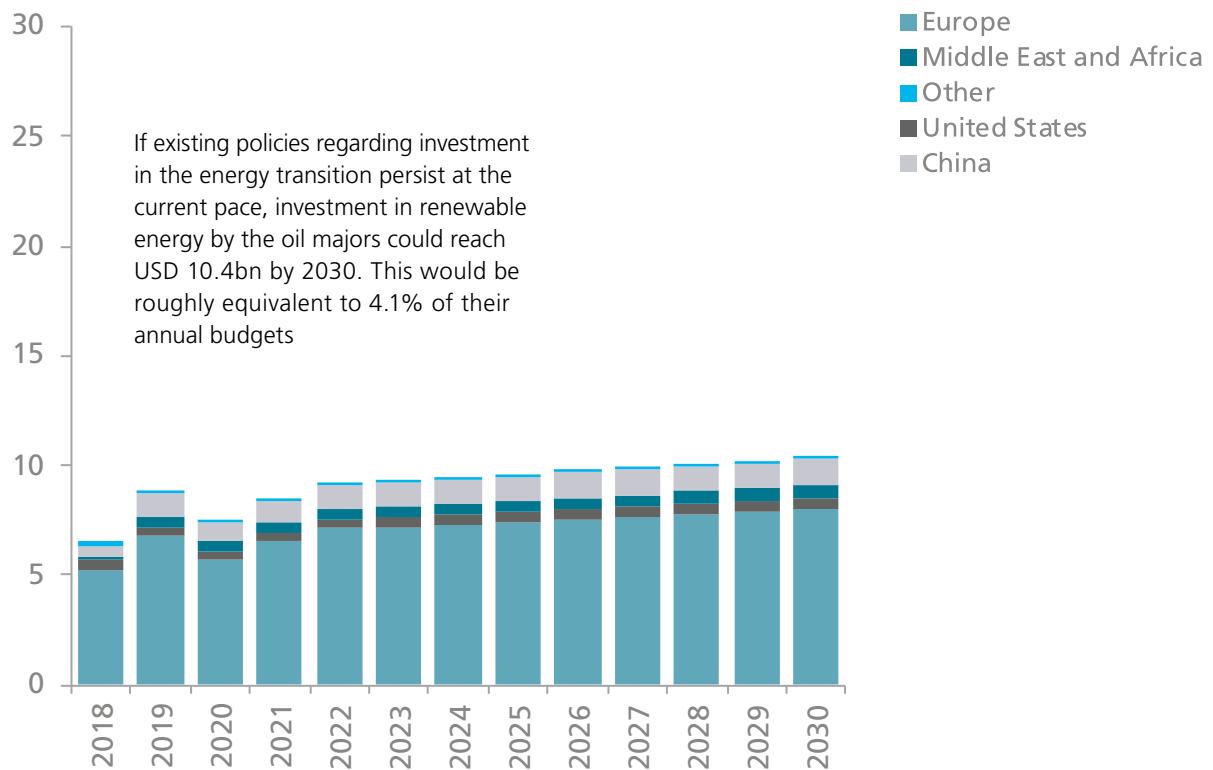
Under the second, more bullish scenario – Rapid Energy Transition – the O&G majors' investment could therefore rise to USD 28bn annually by 2030, which would account for 11.1% of their total combined capital expenditure.

On the more conservative scenario of Existing Policies Continue, annual investment in renewables would still rise to USD 10.4bn by 2030, compared with USD 8bn currently.

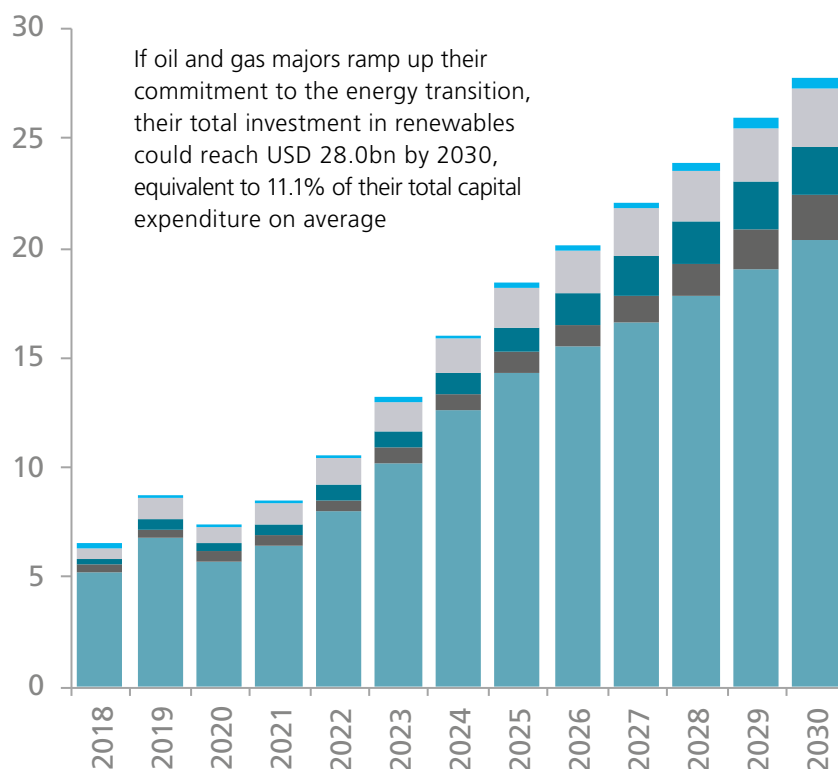


If oil and gas majors stick to their pledges, investment in renewables could account for over 11% of their total spending by 2030, compared to just 3.6% today

Total projected investment in renewable energy by sample of 15 major oil and gas companies, under Capital Economics' 'Existing Policies Continue' scenario by country/region (USDbn)



Total projected investment in renewable energy by sample of 15 major oil and gas companies, under Capital Economics' 'Rapid energy transition' scenario by country/region (USDbn)



Sources: Capital Economics, IRENA and individual company reports. Note that six companies out of our sample of fifteen oil and gas majors are European, and thus, Europe will account for a relatively large share of our total investment projections.

Energy transition in South Africa

Bridgett Majola, Director – Banking and Finance
at CMS South Africa, analyses the outlook in that country.

In the past decade South Africa has faced significant challenges in electricity generation as a result of an erratic and unstable power supply that has driven the country's heavy reliance on fossil fuels as a means of electricity generation and hindered its transition to a low-carbon economy.

South Africa's energy supply is dominated by coal, with renewables estimated to contribute to 11% of the total energy supply. However, despite these challenges, South Africa is still regarded as a potentially key emerging market for renewable energy development, given that it presently supplies approximately 40% of all the energy produced on the African continent.

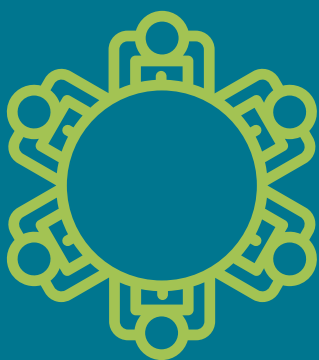
The South African energy sector has seen national developments including (i) nuclear technologies for new nuclear generation capacity; (ii) additional electricity generation through wind, solar and now battery storage as well as hybrid technologies; (iii) the abolition of licensing requirements for self-generation projects in certain instances; and (iv) the recent announcement during the 2021 Budget Speech of an injection of private sector investment in the region of R52.4bn (USD 3.7bn) to support the Renewable Energy Independent Power Producer Procurement Programme, the Small Independent Power Producer Programme and the Embedded Generation Investment Programme, in order to increase the country's generation capacity and address electricity supply constraints.

Local energy and chemicals companies have also been under notable pressure to achieve lower carbon emissions, which has led to an increased appetite for diversified energy sources. As an example, South African energy and chemicals group Sasol announced its three-pillar strategy for lowering its carbon emissions. This involves (i) the reduction of emissions through renewable energy; (ii) a transformation of coal-based operations through the introduction of green hydrogen operations; and (iii) a shift of Sasol's portfolio towards less carbon-intensive business operations through the use of renewable energy and electrolysis. In addition, Sasol has partnered with Toyota South Africa to establish a hydrogen mobility ecosystem for South Africa. This will involve installing hydrogen refuelling infrastructure between Johannesburg and Durban in the province of KwaZulu-Natal.



Despite South Africa's shifting outlook and development in relation to the renewable energy sector, various regulatory challenges still exist for prospective Independent Power Producers, which include licensing, permits and environmental requirements. These challenges, however, can be mitigated through strict compliance with the regulatory requirements relating to Independent Power Producers, legal due diligence, adequate anti-bribery and corruption measures, proper legal advice and sufficiently detailed contractual arrangements, and the implementation of skills development strategies that are aligned with the South African government's economic development imperatives.

Overall, while South Africa shows much promise in its readiness for a full transition to renewable energy development, such a transition will likely take time. The country's undoubted potential for development will likely need to be balanced with the need for a just transition that empowers vulnerable stakeholders.



Challenges to the transition

This new edition of our Energy Transition Report paints a generally positive picture of the prospects for energy transition and the expanding role of the O&G majors in that process.

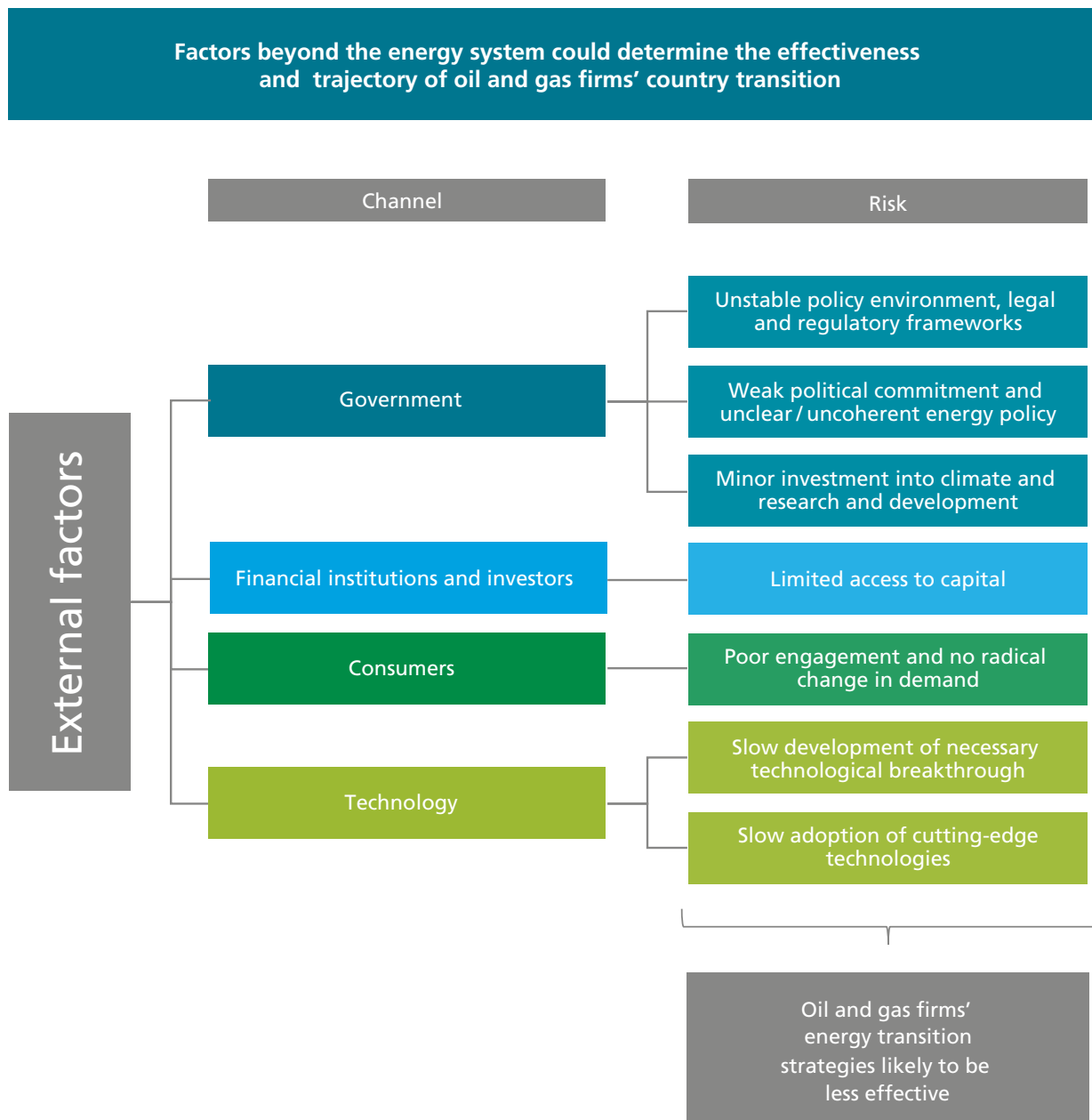


However, there are many challenges to future investment in the energy transition. Some are longstanding; others are a result of the impact of the pandemic on the O&G majors and the wider economy.

We highlight here some of the most important:

- **Changing regulation and higher standards** – O&G companies will need to be flexible and continue to adapt quickly to rapid change in the regulatory environment surrounding energy transition. Increasing pressure from wider society and the costs that results from more stringent expectations or compliance regulations could also put strain on companies' ability to remain competitive.
- **Financial weakness** – lower profitability for O&G majors and lower asset valuations of fossil fuel companies as they write down fossil fuel assets on balance sheets could hamper investment in renewables.
- **Competition from incumbents** – for example, electricity companies have more expertise in their own sector than O&G entrants, which have to adapt to a different energy model, invest in technology to lower consumer costs, and try to develop a competitive advantage.
- **Uncertainty around technology and returns** – the speed of technological change can create uncertainty about which technology to invest in, given questions on the attractiveness of returns. O&G companies need to be convinced that there will be a market for new technologies that are currently still expensive even when proven. But on past experience (for example with solar and offshore wind) there is often a tipping point at which the technology suddenly goes mainstream.
- **Energy utilities challenge** – there are challenges in investing in new energy utilities, including the need to deal with retail users, a skill-set that the classic O&G majors lack.
- **Oil and gas will still play a big role** – energy transition is a slow process, and oil and gas will continue to be the dominant energy source for some time. Furthermore, as economies recover from the COVID-19 pandemic, demand for oil and gas is likely to recover – at least in the short term – perhaps reducing the attractiveness of renewable energy projects.
- **Delays due to COVID-19** – sustained economic uncertainty due to a prolonged pandemic and (potentially) vaccine ineffectiveness could weigh on renewable energy investment, potentially delaying or stalling new investment in renewables by the O&G majors.
- **Balance sheet stress** – COVID-19 has left O&G majors with rising levels of debt, which could also put pressure on plans to invest more in clean energy.

Other external factors could also undermine the O&G majors' energy transition



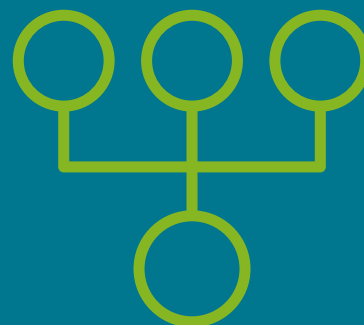


Methodology

CMS commissioned Capital Economics to assess the significance of the major oil and gas companies diversifying into renewables, and to provide economic analysis to assess the outlook for investment by these oil and gas companies in the energy transition globally.

Our report and findings are based in part on an extensive literature review, which includes a review of individual company reports, financial statements and stated strategies of our sample of fifteen oil and gas majors. 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 including the International Energy Agency (IEA), BP, and the International Renewable Energy Agency (IRENA). We also used data from the World Bank and the United Nations to help underpin our regional economic analysis.

Our forecasts for the outlook of investment in renewable energy are underpinned by two scenarios put forth by the International Renewable Energy Agency (IRENA). We used our analysis of the current levels of investment in renewable energy by our sample of fifteen major oil and gas companies, as well as assumptions regarding the speed of transition, to generate plausible projections for future diversification.



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