EDISON

Decarbonisation

Options for independent oil & gas companies

Edison themes

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Efforts to address climate change by governments, investors and corporates appear to be accelerating, and many of these bodies are now setting net zero targets. Essentially, these targets aim to reduce greenhouse gas (GHG) emissions to net zero by 2050, consistent with restricting the temperature increase to 1.5˚C.[1] A key feature of being able to achieve this is the need for early action this decade, and there remains substantial uncertainty whether this can be delivered by all parties.

In response, oil and gas companies have accelerated their strategies to tackle GHG emissions. The European majors have led the way, setting out plans that include strategies to pivot away from fossil fuel sales to become broader energy companies. Many companies are forecasting that oil demand and price will drop over this period and they will need to ensure that their portfolios remain resilient to meet this challenge. At Edison, we have been assuming a low/mid/high Brent oil price range of $40/$50/$60/bbl for the last 18 months, but recognise the longer-term uncertainty and will be looking to update this. Carbon Tracker, the energy transition financial think tank, believes that a marginal break-even price of $46/bbl longer term is consistent with limiting global warming to below 2ºC.[2]

Against this backdrop, we look at how the independents are responding to this challenge.

From the street

'No oil and gas company will be unaffected by clean energy transitions. If not today, it is tomorrow. And I have all the confidence that the oil and gas industry, looking at the past recourse, will respond rightly and positively.'

Fatih Birol, executive director, International Energy Agency

Edison themes

As one of the largest issuer-sponsored research firms, we are known for our bottom-up work on individual stocks. However, our thinking does not stop at the company level. Through our regular dialogue with management teams and investors, we consider the broad themes related to the companies we follow. Edison themes aims to identify the big issues likely to shape company strategy and portfolios in the years ahead.

Companies named in this report

Cairn Energy

Canacol Energy*

Genel Energy

IGas Energy

Jersey Oil and Gas

Lundin Energy

Parkmead Group

Pharos Energy

Plexus Holdings

Predator Oil and Gas

Serica Energy

Storegga Geotechnologies

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[1] As set out by the Intergovernmental Panel on Climate Change (IPCC) 1.5˚C Special Report 2018.

[2] Based on the IEA's Sustainable Development Scenario, which equates to roughly a 1.65˚C temperature rise.

What is the industry's share of global emissions?

The International Energy Agency (IEA) estimates that 5.3 gigatonnes of carbon dioxide equivalent ($GtCO_2$), or around 15% of global energy GHG emissions are due to Scope 1 and Scope 2 emissions from the oil and gas sector (see box below), with methane contributing c 2.1$GtCO_2e$. This is a major source of emissions, however the majority of emissions from fossil fuels are not caused by oil and gas operations, but by the combustion of oil and gas by end-users. These emissions are known as Scope 3 emissions (and specifically as category 11 of Scope 3) and are estimated by the IEA to be three times the level of Scope 1 and 2 emissions at around 16bn tonnes of CO_2 equivalent.

Scope 3 emissions are largely driven by demand, making it harder for companies to address. Nevertheless, a number of majors have announced planned targets to reduce emissions across Scope 1, 2 and 3. To date, Shell, BP, Total, Equinor, ENI, Repsol and Occidental have targets that include Scope 3 emissions. While we recognise that Scope 3 emissions are a significant issue in addressing climate change, this note looks at the efforts to reduce Scope 1 and Scope 2 emissions, which have to date been the focus for independent oil and gas companies.

What are Scope 1, 2 and 3 emissions?

The industry has adopted the standards put forward by the Greenhouse Gas Protocol (GHGP), a partnership between the World Resources Institute and the World Business Council for Sustainable Development. The GHGP divides emissions into three scopes:

Scope 1 covers all direct GHG emissions from the oil and gas production process.

Scope 2 covers indirect emissions from energy purchased by the producer.

Scope 3 covers indirect emissions, ie those produced in the supply chain and from the final consumption of the operator's products by customers.

What are the additional pressures to reduce emissions?

Pressure on companies to reduce emissions is manifesting in a number of ways. These key pressures include maintaining a licence to operate and access to investment.

Licence to operate

Companies will increasingly need to demonstrate that their operations are compatible with the climate change ambitions and commitments of the countries in which they operate. For example, in the UK, the government's Energy White Paper, published in December 2020, sets out plans for the UK continental shelf to become a net zero basin by 2050, with zero routine flaring (that is flaring during normal production operations) by 2030. Every licence application and field development plan (FDP) will need to demonstrate alignment with these goals.

Access to investment

Investors are challenging companies on their emission reduction plans and companies will need to show that they are well placed to manage the risks of the energy transition. Climate Action 100+, a global initiative involving over 500 signatories responsible for more than US$47tn in assets, is engaging with companies to deliver Paris Agreement-aligned emissions cuts. In February 2021, the world's largest investment fund, BlackRock, called for companies to disclose the full scope of their GHG emissions including in Scope 3, while asset manager Aviva Investors, a top 30 holder in BP and Shell, announced that it now requires its oil and gas holdings to deliver net zero Scope 3

emissions by 2050, and to establish robust transition roadmaps to demonstrate commitment to immediate action, or risk divestment.

How are independents tackling their emissions?

Exhibit 1: Options to reduce emissions

Reduce operational emissions	Reduce emissions from fossil fuels	Neutralising measures
Scope 1 & 2	**Scope 3**	**Any/all emissions**
Minimise flaring and venting	Reduce oil/gas production	Carbon capture utilisation and storage
Change/reduce fossil fuel consumption	Reduce oil/gas sales	Offset
Shift to gas	Divest	
High-grade portfolio	Diversify into renewables	

Source: Edison Investment Research

Minimise flaring and venting

In 2018, 29% of emissions from the offshore UK sector was from flaring and venting, according to Oil & Gas UK (OGUK). Reductions here can be achieved through operational changes, so it is possible to make improvements over the short term and at reasonable cost. In a mature region with established infrastructure and regulation such as the UK North Sea, 3% of produced gas was flared or vented in 2019, of which 98% was flared and the remaining 2% was vented. Although the vast majority of released gas is flared, monitoring vented gas is critical as the predominant GHG emission here is methane, which has a much higher Global Warming Potential (GWP) of 28–36, compared to a GWP of 1 for CO_2. Although methane emissions are emission intensive, they are short lived in the atmosphere, so that cutting methane can affect near-term warming. Vented methane can be addressed through the use of vapour recovery units. Gas leakage in the system is also a problem and companies such as **Plexus Holdings** (a provider of gas tight wellhead systems) should benefit as pressure increases for these leakages to be addressed.

In contrast, in the United States, the rapid growth of shale production resulted in a 23% rise in gas flaring and venting in 2019, with 51% of the flaring volume coming from Texas. Current regulations in Texas allow flaring for up to 180 days, while the build-out of pipeline infrastructure has been unable to catch up with the rapid growth in production from the Permian. With the Biden administration committed to tackling climate change, such regulations may be subject to change in the near term.

Examples of companies successfully reducing flaring include **Serica Energy**, with operations centred on the UK North Sea. Its key assets are the Bruce, Keith and Rhum (BKR) fields, acquired in 2018. Average production from the company's portfolio is more than 30,000boe/d, with over 80% being gas. Since taking over operatorship of BKR, Serica has focused on reducing flaring on Bruce. Daily flaring has been reduced, but a larger reduction has been seen in 'start-up' flaring through changes to operating procedures, together with improvements in metering and sampling and setting daily targets on flare. This has resulted in a 62% reduction in flaring from the field in the first two years since Serica acquired Bruce The company has reported a carbon intensity of less than 18kg CO_2e/boe compared to the North Sea average of 22kg CO_2e/boe. Meanwhile in Kurdistan, **Genel Energy** has cut flaring from its Peshkabir field by half, working together with the field operator DNO. Since mid-2020, associated gas produced at Peshkabir has been transported to the Tawke field for injection into the Cretaceous reservoir, thereby also reducing GHG emissions by 50%. Peshkabir had been producing and flaring 20mmscfd, which contributed to 85% of Genel's 2019 emissions profile. The company has assessed its carbon intensity across all assets to now be 7kg CO_2e/bbl.

Change/reduce fossil fuel consumption

A step change in emissions reduction can be achieved by tackling the largest sources of upstream emissions: power generation, process heat generation and gas compression. According to OGUK, 70% of offshore emissions in 2018 were from power or heat generation. Norway leads the industry

in reducing these emissions, having eight part or fully electrified developments that are powered by electricity from shore. The Norwegian sector is going further still: **Lundin Energy** aims to replace 100% of the electricity supply at its giant Johan Sverdrup field and then in Edvard Grieg through renewable energy (wind power), and is targeting 60% of the company's net electricity usage to be replaced in this way from 2023. Moreover, in 2020, Lundin's carbon intensity was less than 3kg CO_2/boe and the company is on track to achieve carbon neutrality by 2025. By contrast, the infrastructure in the UK Continental Shelf is older than that seen in Norway, so that closing in and decommissioning fields in this mature basin will help to reduce the carbon intensity of the region. New developments will need to become more innovative, and **Jersey Oil and Gas (JOG)** is planning to redevelop the Buchan field incorporating platform electrification via subsea cable from the UK power grid. JOG estimates that carbon emissions from the Greater Buchan Area (GBA) will be <1kg CO_2/boe with electrification. If successful, it will be the first UK North Sea installation to be electrified and has the potential to act as an enabler for regional electrification. Further afield, in Egypt, **Pharos Energy** reduced flaring by using associated gas production to power electricity generators that were previously diesel powered. In 2019, this resulted in a 30% reduction in flared gas at the North Silah Deep field, but also eliminated the use of 730,000 litres of diesel. The company is now planning to implement a second phase of associated gas generators in the country.

Shift to gas

Shifting the hydrocarbon mix to include a greater proportion of gas can also be used to reduce the carbon intensity of production, given that natural gas produces c 30% less CO_2 than oil and c 50% less than coal when burned. Demand for gas is expected to be more resilient than that for oil over the next 30 years and remains a key transition fuel, as it will be required to reduce reliance on coal in fast growing developing economies.

For example, energy supply in Colombia has historically been dominated by coal and oil, and the country believes natural gas will play a key role in its energy transition as it looks to reduce emissions by 20–30% by 2030. Natural gas is expected to contribute c 20% of energy by 2050 (up from 9% in 2020) in line with Colombia's Paris Agreement targets. At the same time, the supply-demand balance points to a national-level deficit of natural gas in 2024. As Colombia's largest independent natural gas producer, Edison client **Canacol Energy** should benefit from these developments. The company currently holds a c 20% market share of national demand and holds a large resource base of 4.7tcf prospective resources that supports growth. Alternatively, **Vermilion Energy** produces a mix of light oil and liquids-rich natural gas in Canada and the US, together with natural gas across its European assets. Between 2012 and 2018, the company has shifted its production mix from a 67% weighting of oil compared to natural gas and natural gas liquids to 44%. This is only one of a number of ESG strategies (see Diversify into renewable energy solutions section below) that have contributed to the company being awarded a Leadership Level rating of A- by the CDP (formerly known as the Carbon Disclosure Project) every year since 2017. Vermilion also received a rating of 'AA' on a scale of AAA (leader) to CCC (laggard) in the June 2020 MSCI ESG Ratings assessment.

High grade the portfolio

As oil demand falls, the most expensive barrels to produce will be dropped first and companies will need to be able to lower production costs to ensure they can still sell profitably in a potentially lower oil price environment. For example, in March 2020, **Cairn Energy** announced that it was selling its interests in the Catcher and Kraken fields in the UK North Sea and acquiring a portfolio of assets in the Egyptian Western Desert. The new assets will adjust the company's hydrocarbon split towards gas but will also provide low-cost production with near-term development, exploration potential and immediate cash flow. However, at c 30kg CO_2/boe, the carbon footprint of the Egyptian assets is

higher than seen in Catcher and Kraken, since these North Sea fields are more modern developments than those in the mature Egyptian fields. The company plans to reduce this by converting the c 100 diesel generators to gas, together with reducing flaring, and in the longer term will look at using produced CO_2 for enhanced oil recovery (EOR) and/or sequestration.

Diversify into renewable energy solutions

Diversifying to include renewable energy as part of a portfolio will reduce carbon intensity and add resilience to meet the energy transition. Independent companies' shifts into wind and/or solar power are not common at this point and tend to be at an early stage, such as **Parkmead Group's** acquisition of a site to the west of Aberdeen with identified wind energy potential, where technical studies are underway.

Geothermal energy, in particular, provides a skill set overlap with the oil and gas industry, since it requires subsurface expertise together with the design and drilling of wells. Geothermal energy is a proven technology that already exists in 327 sites across Europe, with 57 in Paris alone. Hot water is pumped from a well drilled into a deep aquifer and passed through a heat exchanger to provide heat for a network or customer. The cooled fluid is then injected back into the aquifer via an injection well.

IGas Energy (see also under CCUS) acquired the geothermal energy business GT Energy in September 2020. GT Energy is developing a near-term deep geothermal project to provide 45 gigawatt thermal (GWhth) of heat annually to Stoke-on-Trent City Council (SoTCC) for a district heating network. All geophysical work has been completed, but the build-out of the heat network has been delayed due to the impact of COVID-19. Further projects are under assessment, with c 50–100 potential projects across the UK at an average size of 10MWhth.

It is also possible to utilise geothermal energy as a by-product of conventional oil and gas production. **Vermilion Energy** (see also under Shift to gas) has been producing heated water free of charge from its Parentis field in France since 2012 to heat greenhouses run by the Tom d'Aqui tomato growing operative. The project has resulted in a reduction in CO_2 emissions of 10,000 tonnes a year and its success has led to three new similar projects independent of the company. Vermilion is also using a similar geothermal concept to heat 550 apartments in the La-Teste eco-neighbourhood using geothermal energy from three producing oil fields in the Arcachon Basin in France, saving 500 tonnes per year of CO_2 and 50% of the heating bills for residents. The company is now expanding this concept to provide geothermal heat to 900 social housing apartments until 2040.

Carbon capture utilisation and storage (CCUS)

With CCUS, natural gas is split into hydrogen and CO_2, with the latter captured and stored securely in a geological formation deep underground (which can be old, depleted oil or gas reservoirs). The resulting hydrogen can be used to provide energy in areas that are difficult to electrify, thereby ensuring the availability of constant power (given the intermittent nature of wind and solar power). For more detail, see our report, The hydrogen economy – decarbonising the final 20%. The implementation of successful CCUS projects will be vital to removing CO_2 emissions that cannot be avoided. However, despite this being recognised for decades, progress has been slow and to date there are only c 20 large CCUS projects in operation across the world. Such projects are attractive to the oil and gas industry since they provide a way to address Scope 3 emissions while continuing to produce fossil fuels.

The IEA sees CCUS as a key pillar of efforts to reach net zero targets and estimates that it needs to account for c 15% of the cumulative reduction in emissions in its sustainable development scenario. Current participation in such projects in Europe is dominated by the majors, particularly Equinor, Shell and Total. These companies are all involved in Northern Lights, expected to be Europe's first

commercial-scale CCUS project off Norway, which could be operational by 2024. The project's first phase has the potential to see up to 1.5m tonnes of CO_2 stored per year and up to 5m tonnes per year in phase two. Meanwhile, **Storegga Geotechnologies**, the lead developer of the Acorn CCS and Hydrogen project through its subsidiary Pale Blue Dot, hopes to reach a final investment decision in 2021 and be onstream by 2024. The project will initially capture 300,000–400,000 tonnes of CO_2 pa from the St Fergus gas complex in North East Scotland, which will then be sent to the Goldeneye field in the UK North Sea. In the next phase, Acorn Hydrogen will focus on blending the resulting blue hydrogen with the natural gas piped through the National Transmission System to transport fuel into homes, offices and factories. Replacing just 2% gas with hydrogen is expected to reduce carbon emissions by 400,000 tonnes/year, and the project can grow to replace 20% over time. The project has been supported through its evolution by Shell, Total and Chrysaor. Storegga is now evaluating further opportunities for CCS projects in Europe and the Asia-Pacific region together with company shareholder Mitsui.

Other independents looking at CCUS projects include **IGas Energy.** The company is the largest operator of onshore oil and gas fields in Britain and has entered into a heads of terms with BayoTech, a hydrogen generation company that produces on-site hydrogen generators. IGas believes that its existing assets have the potential for carbon storage, and it has identified two sites in the South East of England where the produced gas can be reformed into hydrogen and sold to local or national customers. In addition, **Cairn Energy** is a strong advocate of CCUS and is at the evaluation phase of looking for a suitable project. It has also joined NECCUS, an alliance of industry, government and experts looking to support programmes needed to reduce carbon emissions from industrial sources in Scotland and beyond, with Acorn being a key project for the group.

Companies can also utilise recovered CO_2 for Enhanced Oil Recovery (EOR), a process which improves oil and gas recovery by injecting CO_2 into the reservoir. The CO_2 releases trapped oil and causes it to flow more easily. **Predator Oil & Gas Holdings** owns and operates a CO_2 EOR delivery system in Trinidad. The company has successfully carried out a pilot project that utilises CO_2 sourced from a local ammonia plant and injects it into the Inniss-Trinity field, operated by Bahamas Petroleum Company. Production from the two monitored production wells averaged 20bopd with a maximum of 51bopd, compared to a forecast of just under 16bopd following the injection of c 444 metric tonnes of CO_2 (representing 2% of estimated volume required to recover 459,000bbls of oil for a full-scale five-year project). Having de-risked the viability of the process, Predator has been approached by other in-country operators to assess the suitability of their fields for CO_2 EOR.

Occidental Petroleum, which already employs CO_2 EOR in the Permian Basin in the US, is developing the world's largest direct air capture (DAC) and sequestration facility to capture 500 kilotonnes of CO_2 directly from the atmosphere each year to be used in its EOR operations. **Storegga Geotechnologies** has partnered with Carbon Engineering to develop a UK based DAC facility.

Carbon offset

Carbon offset, together with CCUS, will be a key strategy for companies to mitigate Scope 3 emissions. Projects utilising natural carbon sinks such as forests, plants and oceans provide nature-based solutions for offsetting unavoidable industry emissions. Shell sees such schemes capturing up to 120m tonnes per year by 2030 as part of its transition to net zero. Carbon offset projects have a history of overpromising and underdelivering and have been seen as allowing industry to continue operating as usual without making real changes. A good carbon offset needs to have additionality, ie lead to GHG emissions reductions that would not have happened otherwise, be permanent, not lead to emissions occurring elsewhere (known as leakage) and to not be double

counted. While the sector has a history of involvement in such mitigation projects, this seems to be largely limited to the majors, with few examples from independent companies.

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