

December 2022

# **Paris Maligned: Why investors should assess the climate alignment of oil & gas companies.**

## About Carbon Tracker

The Carbon Tracker Initiative is a team of financial specialists making climate risk real in today's capital markets. Our research to date on unburnable carbon and stranded assets has started a new debate on how to align the financial system in the transition to a low carbon economy.

[www.carbontracker.org](http://www.carbontracker.org) | [hello@carbontracker.org](mailto:hello@carbontracker.org)

## About the Authors

### Thom Allen – Oil and Gas Analyst

Thom joined Carbon Tracker in 2021 and focuses on the oil & gas industry and the implications of the energy transition. He has published work on emission targets, tackling the industry's methane problem, carbon capture and storage, and recently authored the *Unburnable Carbon: Ten Years On* report, which exposed the concentration of embedded emissions and stranded asset risk in financial markets.

Prior to joining Carbon Tracker, Thom worked as an exploration geologist at INEOS, and as an analyst at Deloitte.

Thom has an MSci in Geology from University College London and an MSc in Petroleum Geoscience from Royal Holloway, University of London.

### Mike Coffin – Head of Oil, Gas and Mining

Mike joined Carbon Tracker in 2019, and now leads the oil, gas and mining research team, focussing on identifying transition risk within the oil and gas industry and developing metrics and tools to assess company climate-alignment. He has authored reports on transition risk at the company level, alongside writing on company climate ambitions in *Balancing the Budget* and the *Absolute Impact* series. Other research themes include country risk and executive remuneration.

Prior to joining Carbon Tracker, Mike worked as a geologist for BP for 10 years on projects across the upstream value chain, from early access to development. Mike has experience working in petroleum basins across the world, including time spent working in Norway, with expertise in unconventional exploration and in leading technical project teams.

Mike has an MA and MSci in Natural Sciences from the University of Cambridge and is a Chartered Geologist (CGeol).

With thanks to the wider team at Carbon Tracker for helpful comments and review.

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A large, bold, red letter 'O' is the central focus, set against a blurred background of an industrial facility with smokestacks and cranes. The scene is reflected in a body of water in the foreground. The top of the page features a horizontal bar with segments of red, dark blue, and light green. To the right, a red rectangular shape is partially visible, overlapping the 'O'.

**Key  
Findings**

- ✓ **Asset owners seeking 1.5°C-aligned portfolios cannot credibly own financial interests in companies that continue to invest in new conventional oil and gas projects.**
- ✓ **Alignment with Paris – whether 1.5°C or ‘well below 2°C’ – implies production declines by 2030, yet most oil & gas companies are planning production increases.**
- ✓ **With Russia’s invasion of Ukraine pushing commodity prices higher and incentivising new investment, investors looking to be Paris-aligned must continue to scrutinise company plans,** as investment in new oil & gas projects that lock-in future emissions are incompatible with Paris.
- ✓ **62% of investments approved in 2021/Q1 2022 (or \$103bn) were inconsistent with a Paris-aligned pathway (the IEA’s 1.7°C Announced Pledges Scenario), including \$58bn that was outside even a 2.5°C outcome.**
- ✓ **Many future oil & gas investment opportunities approaching final investment decisions are inconsistent with a Paris-aligned outcome,** with the portfolios of Occidental Petroleum, ConocoPhillips and EOG found to be the least aligned.
- ✓ **Despite ever-growing investor concerns about climate-alignment, collectively companies are not becoming significantly more aligned.**
- ✓ **Those investors without a climate-alignment, sustainability or ESG mandate can use these results to assess transition risk exposure for investee companies.**
  - Energy security concerns and the cost-of-living crisis are accelerating the energy transition and highlight the additional benefits of phasing out fossil fuels to policymakers.
  - The new energy system provides a cheaper, more abundant energy supply less prone to volatility and geopolitical disruption.



# Q2

## Financial Report

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## Executive Summary

Energy markets in 2022 have been dominated by the terrible events unfolding in Ukraine, yet global average temperatures continue to rise alongside increased instances of extreme weather events. Most are agreed that limiting global temperature to goals of the Paris agreement is in the interest of all, and while there is much less agreement on how to achieve this, it is increasingly recognised that the global financial community has a significant role to play.

What is clear, is that for there to be any credible chance of achieving the goal of limiting global temperature rise in 2100 to 1.5°C vs pre-industrial, then the burning of fossil-hydrocarbons must fall rapidly. Limiting warming to “well below 2°C” similarly requires fossil fuel usage to plateau now, and then start to decline well before the end of this decade.

For investors seeking climate-alignment within investment portfolios – whether they do so from an ethical, universal-owner or risk perspective – then oil and gas producers are a key area of focus. In this report we assess the production and investment plans of such companies as to whether they can be considered climate-aligned, or not.

In response to the challenge, and perhaps to frame themselves as “part of the solution”, oil and gas companies are investing some of their earnings – which historically would have been re-invested into oil and gas – into renewable energy. While this may have some positive impact in shifting the energy system – and may be a sound financial investment – it doesn’t somehow “offset” the continued legacy businesses and create a “climate-aligned” company. Equally, there are other potential strategies, including allowing existing production to wind-down over time, without any re-investment.

Accordingly, our assessments are designed to be strategy agnostic, and focus on the extent to which companies are planning for their oil and gas production volumes – to first order a direct read across to the full lifecycle CO<sub>2</sub> emissions that result from company activities – to fall over the coming decades. Plans for investment in new developments is a key component of this.

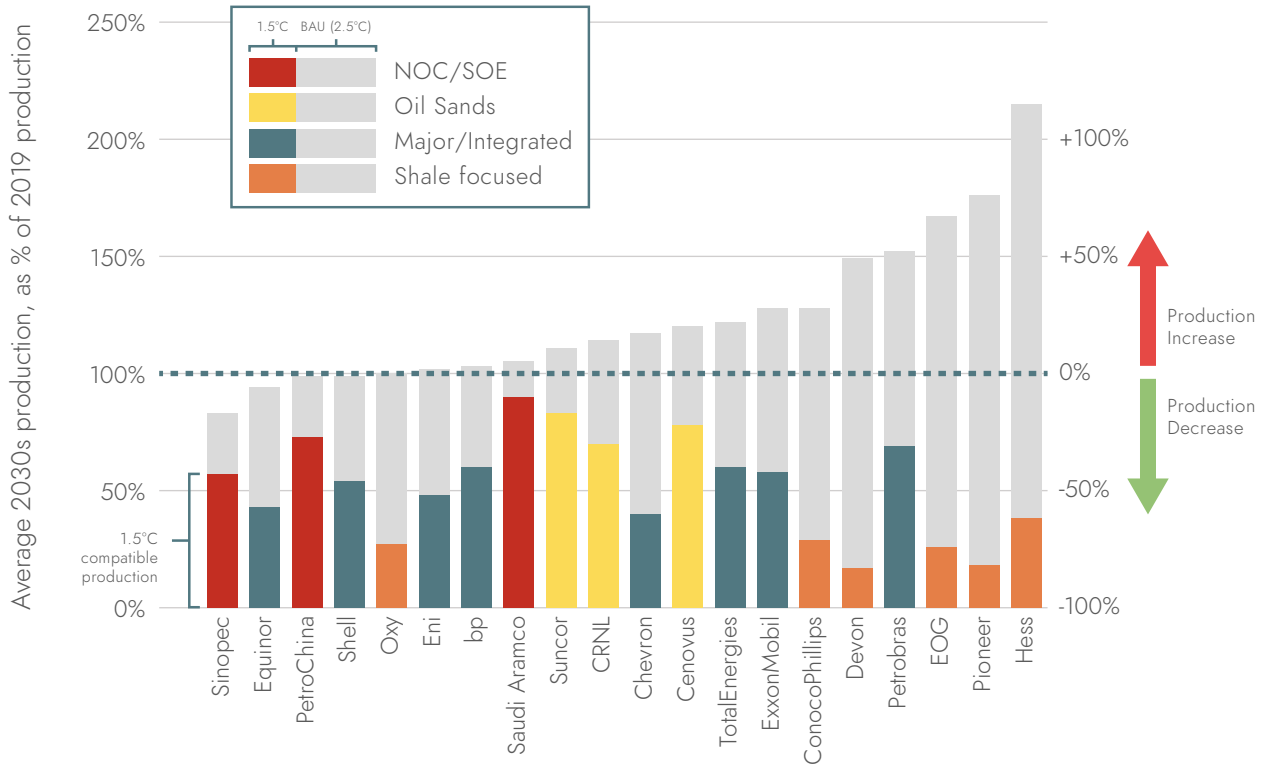
In this report, we look beyond targets to evaluate companies’ actions by considering the alignment of project approvals and future production plans. We have modelled current and future oil and gas projects globally to assess compatibility with the different International Energy Agency (IEA) scenarios. This work complements our assessments of the Paris-compliance of companies’ emissions goals in our Absolute Impact series, alongside assessment of the degree to which executive remuneration policies are supportive of companies transitioning away from fossil fuel growth.

## **1.5°C-alignment requires production declines, but most oil & gas companies are planning to expand**

Under the IEA’s Net Zero Emissions by 2050 scenario (NZE), the most widely cited pathway to limit warming to 1.5°C, there is no need for new conventional oil & gas development – production falls by 22% by 2030 and 44% by 2035 compared to 2019.

The implication of this is that for all of the largest listed companies, to be aligned with 1.5°C, production needs to fall over the coming decades. Figure 1 shows the future production from existing and already-sanctioned developments in the 2030s compared to that which might be expected under business-as-usual company plans. The differences in companies’ future production without the development of new projects is primarily a result of the differing decline rates of projects within company portfolios – shale wells decline at a faster rate than conventional fields, while oil sands tend to decline more slowly.

**Figure 1: Oil and gas production in the 2030s from already-sanctioned developments vs business-as-usual plans**



Source: Rystad Energy, IEA, CTI analysis

Notes: 2030-2039 average production as a % of 2019 production in barrels of oil equivalent. Coloured portion of bars show future production from already-sanctioned projects that is potentially aligned with the IEA’s 1.5°C Net Zero Emissions by 2050 Scenario (NZE) – bar colour indicates the company classification. Grey bars show production modelled under the IEA’s 2.5°C Stated Policies Scenario (STEPS). Top 20 producers by market capitalisation from the S&P global oil index.

We also review the stated production plans of these companies, finding that only three have stated they are planning for oil production declines, while only one, bp, has stated that it plans to reduce oil and gas production by 2030.

### Alignment with “well below 2°C” requires many proposed investments to not go ahead

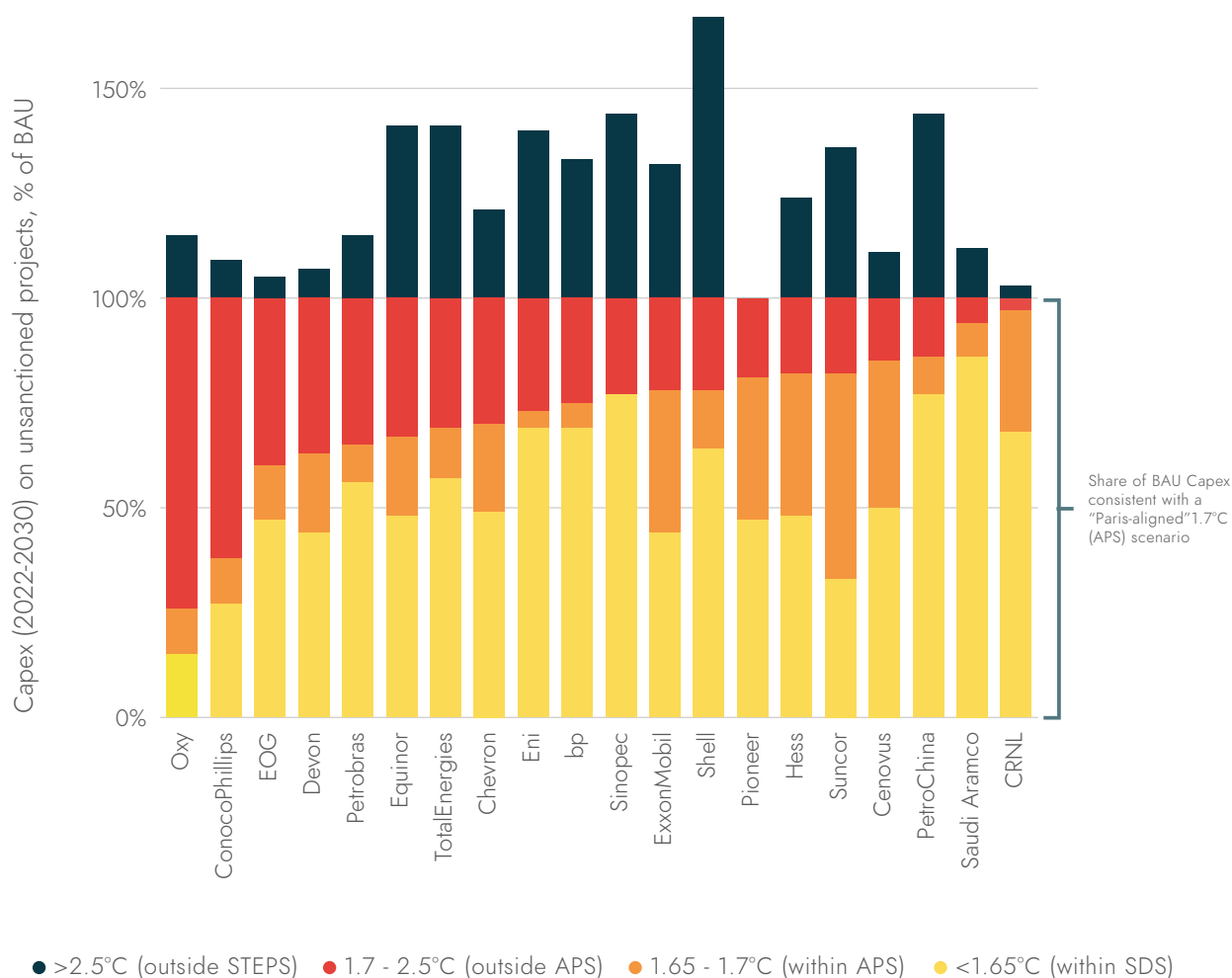
Even alignment with a *well below 2°C* scenario requires production declines of at least 14% by 2035, with our modelling indicating that a significant proportion of proposed oil and gas developments need not see the light of day. We now use the IEA’s 1.7°C Announced Pledges Scenario (APS) as this less ambitious interpretation of Paris goals, as a result of the IEA updating its scenario set.

Figure 2 shows the potential future capex on new upstream oil & gas projects coloured to show the compatibility of projects with different temperature outcomes based on our modelling. The larger the yellow + orange bars, the more of a company’s future project options that are potentially aligned with a *well below 2°C* scenario. The yellow bars indicate projects aligned with the IEA’s Sustainable Development Scenario (SDS), a tighter *well below 2°C* scenario not dependent on “net negative emissions” and ones which keeps the *door open* to 1.5°C.



Compared to our previous assessments – which used the SDS (1.65°C) – companies appear more aligned under the new APS (1.7°C). This is primarily a result of the disproportionately higher oil production under APS, in part facilitated by APS's greater reliance on net negative emissions, which are as yet unproved at scale. However, seeking alignment with the current APS, rather than SDS, may close the door on achieving 1.5°C.

**Figure 2: Degree of paris-alignment of companies' business-as-usual investments**



Source: Rystad Energy, IEA, CTI analysis

Notes: Upstream oil & gas capex (2022-2030) on unsanctioned projects compatible with different scenarios, as a % of business-as-usual (BAU) plans (2.5°C, STEPS). Top 20 producers by market capitalisation from the S&P global oil index sorted by % capex aligned with a 1.7°C (APS) scenario.

Our analysis also shows that in 2021, companies greenlighted some \$136bn USD of investments in new upstream oil & gas assets over the next decade, with a further \$30bn approved in the first quarter of 2022. Almost all of this capex is unaligned with a 1.5°C (NZE) pathway, with 62%, or \$103bn, inconsistent with a *well below 2°C* (APS) pathway. This includes \$58bn USD that was outside even a 2.5°C outcome. In total, 62% of our universe of 52 companies had sanctioned new projects in 2021/ Q1 2022, with 40% approving assets we assess as being inconsistent with a *well below 2°C* scenario (APS).

## Climate-aligned companies are likely to have reduced transition risk exposure

Investors must press company management as to why they believe that companies can be climate-aligned despite not planning for production reductions. Even for those companies that are planning on reduced production, this must be done in a credible way, without simply selling assets to “create space” vs emissions or production targets.

For those investors without a climate-alignment mandate, the degree to which company plans are aligned with a given climate scenario can give an indication of energy transition risk exposure. The results in this report can support assessments of transition risk, supporting previous publications on this topic including *Adapt to Survive* and *Managing Peak Oil*.

A side-effect of the war in Ukraine is an ever-growing recognition that renewables – combined with enablers such as battery storage – have the solution to the energy trilemma of clean, affordable and secure energies. For citizens – the ultimate beneficiaries of investment decisions – shifting the energy system away from fossil fuels provides many long-term benefits.

Alongside actions from investors, it is crucial that policymakers create the right commercial and regulatory environment to further attract capital and accelerate the deployment of the new technologies needed and reduce society’s reliance on fossil energy sources.



# Introduction

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The impacts of global warming are becoming increasingly clear. In 2022 temperatures set new highs simultaneously across all continents, resulting in heat-related deaths, wildfires and poor harvests. Perhaps the hardest hit was the city of Jacobabad in Pakistan where the mercury pushed 51°C, and the country has since experienced its worst flooding this century, with some 33 million people displaced. These are the kind of extreme weather events and social impacts predicted to become more common as the climate continues to change.

The science is clear: to reduce the rate of global warming, greenhouse gas emissions must fall rapidly, necessitating a fundamental shift in our energy system. If all the world's discovered fossil hydrocarbons were produced and combusted, this would lead to a devastating temperature rise far above 3°C. Limiting warming to well-below 2°C, and ideally to 1.5°C, will necessitate leaving much of these discovered fossil fuels in the ground as *unburnable carbon*.<sup>1</sup>; there is no need to explore for new hydrocarbons or award new exploration licences.

In 2021 the International Energy Agency (IEA) sent shockwaves through the industry with a clear statement: under the IEA's Net Zero by 2050 Roadmap – a descriptive pathway to achieve a 1.5°C goal – no new oil or gas fields were required beyond those already approved for development.

Yet, as a result of Putin's invasion of Ukraine, 2022 has been a bumper year for the oil & gas industry. Majors such as ExxonMobil, Shell and Chevron are reporting consecutive record quarterly profits, and the current high-price environment is tempting investment in new developments and exploration. Whilst oil and gas companies may claim credible climate targets, it's clear that continued investment at scale is incompatible with keeping global temperatures below 1.5°C, with only limited investment possible under the looser "well-below 2°C" interpretation of Paris goals.

## Keeping Paris alive in the midst of a cost of living and energy crisis is challenging policymakers

With global temperatures already more than 1.1°C above pre-industrial levels and new investments growing, keeping temperatures below 1.5°C is increasingly challenging. Yet policymakers face increasing pressure to roll back climate commitments and facilitate new fossil investment as inflation hits 40-year highs, fuelled by high commodity prices and soaring energy bills.

Incentivising new fossil fuel exploration and development is, however, misguided - there is little evidence this will lower prices for consumers or alleviate short-term supply problems.<sup>2</sup> Oil & gas projects have long lead times - typically 5-10 years - and once out of the ground domestic production is sold to global markets. As consumers are experiencing, these markets are extremely volatile for reasons often outside the control of individual governments (e.g., market liquidity and geopolitics).

Instead, high-prices and energy security concerns highlight the benefits, beyond tackling climate change, of accelerating the transition to a more reliable<sup>3</sup> and affordable energy system based on renewable energy. A better response to the cost-of-living crisis would be public policies that improve energy efficiency and reduce demand – such as home insulation grants – whilst focusing on the necessary grid upgrades and storage to support the continued build-out of renewables.

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<sup>1</sup> Carbon Tracker report: Unburnable Carbon: Ten Years On (2022), available at: <https://carbontracker.org/reports/unburnable-carbon-ten-years-on/>

<sup>2</sup> Carbon Tracker blog: Why drilling for more fossil fuels won't bring UK energy security or cut prices, available at: <https://carbontracker.org/why-drilling-for-more-fossil-fuels-wont-bring-uk-energy-security-or-cut-prices/>

<sup>3</sup> Less intermittency of supply resulting from the actions of dictators and cartels. Intermittency of renewables can be addressed through investment in energy storage – an eminently solvable engineering challenge – rather than an intractable geopolitical one.

### 3.1 Why climate-alignment matters to investors

The motivation to pursue climate-alignment stems not only from the wishes of individuals, but increasingly from asset owners themselves, with the levels of “sustainable” investment growing.

Beneficiaries – for example individuals in a defined-benefit pension scheme, or students at universities funded by sizeable endowments – are increasingly interested in the potential negative impacts of the investee companies. Many are prepared to forego potential profits by excluding sectors which negatively impact society, both now and for future generations; as a result, pressure on owners to exclude certain sectors is rising.

Many long-term investors – such as University endowments – are increasingly recognising their status as universal owners; they should consider the financial costs to their portfolios from inaction on climate change. In pursuing the remaining profits from the fossil fuel industry they may reduce returns in other parts of the portfolio.

For defined-contribution schemes, then individual investors should ensure their retirement savings are invested in funds that align with their wishes.

#### **Asset managers have a fiduciary duty to act in asset owners’ interests on climate**

Managers delegated to make investment decisions must take these preferences into account – it is their fiduciary duty to do so, even if they believe that profits could be greater within excluded sectors.

Of course, we expect that managers do invest according to beneficiaries’ wishes, but individuals seeking climate-aligned investments must scrutinise any “low-carbon” or “sustainability” funds to ensure that investment criteria are sufficient and that companies clearly contrary to achieving global climate goals are not included.

Given limiting warming to 1.5°C will require 90% of discovered fossil fuel reserves and resources<sup>4</sup> around the world, including those listed on stock exchanges, to remain in the ground as *Unburnable Carbon*, the degree to which investee companies are planning to move away from oil and gas is key to whether they can be considered climate-aligned.

#### **Assessment of climate-alignment can be used to inform transition risk exposure**

Even those asset owners that do not prioritise the societal impacts of climate change should care about the financial risks the energy transition poses via their investee companies. Companies that invest in new fossil extraction projects face substitution risk from new technologies such as renewables and electric vehicles, as well as an ever-increasing risk of policy action, both of which could lead to lower-than-expected returns.<sup>5</sup>

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<sup>4</sup> Carbon Tracker report: *Unburnable Carbon: Ten Years On* (2022), available at: <https://carbontracker.org/reports/unburnable-carbon-ten-years-on/>

<sup>5</sup> Carbon Tracker reports: *Managing Peak Oil* (2022), available at: <https://carbontracker.org/reports/managing-peak-oil/> and *Adapt to Survive* (2021), available at: <https://carbontracker.org/reports/adapt-to-survive/>

Shareholders in these companies could see valuations fall rapidly once the market reaches consensus that the writing is on the wall for these companies. Asset managers have a fiduciary duty to factor these risks into their asset allocation decisions. Considering the degree to which companies' plans are aligned with different climate scenarios provides a way to assess these risks.

### 3.2 How to assess climate-alignment of oil and gas companies

To allocate capital accordingly, investors need to be able to assess the climate alignment of companies in which they seek to invest, and for oil and gas, we see that multiple different metrics can be used to assess this.

In our *Absolute Impact* series of reports, we assess the climate targets of the largest publicly traded oil & gas companies and establish our *Hallmarks of Paris Compliance*, a set of minimum criteria required for a company's emissions targets to be considered 'Paris-compliant'. We believe that the robustness of a company's emissions targets is a good proxy for the sincerity of its climate strategy. However, targets, ambitions and aspirations are one thing and implementation is another.

We have also considered executive pay, and in our *Crude Intentions* report, we highlight many oil and gas companies with executive remuneration policies that are at odds with their stated emissions targets. Whilst in *Still Flying Blind* we review climate related disclosures in the financial statements of carbon-intensive companies. The transparent disclosure of climate-related assumptions and estimates used by companies in their reporting is essential to allow stakeholders to fully assess climate alignment.

In this report, we consider the alignment of both companies' future production and investment plans, building on our *Two Degrees of Separation* series of reports, considering alignment with both a limited/no-overshoot 1.5°C scenario and the less ambitious "well below 2°C" goal of the Paris Agreement. We believe that these two criteria – alongside our other assessments of climate alignment – are crucial for asset managers to allocate capital appropriately.

The oil & gas industry is distinct from most other industries in that the majority of its emissions come from the consumption of its products (Scope 3) rather than direct emissions from its operations or energy consumption (Scopes 1 & 2). While companies must decarbonise their operations (and in the case of the industry's methane leaks and discharges<sup>6</sup>, urgently so), these operational emissions typically account for less than 15% of total life cycle emissions resulting from oil & gas products.

The inescapable truth is that oil and gas consumption must fall rapidly, with the energy system shifting to low-carbon sources. Even large carbon capture projects or 'nature-based' negative emissions amount to little more than decarbonising operational emissions rather than those from production, given the scales involved (see box on following page).

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<sup>6</sup> Carbon Tracker blog: Tackling the Methane problem: why investors should drive change at investee companies, available at: <https://carbontracker.org/tackling-the-methane-problem/>

### Why you can't just CCUS your way out of the problem

Many oil & gas companies are touting carbon capture, utilisation and/or storage (CCUS) as a solution to reduce their emissions. It sounds enticing – capture and store CO<sub>2</sub> deep underground – allowing companies to go on about their business whilst claiming to be part of the solution. Unfortunately, the reality is a little different. There are three main issues.

First, most CCUS does not necessarily reduce CO<sub>2</sub> emissions. This is because the majority of existing CCUS projects are for gas processing, which only reduces the carbon intensity of operations but in many cases results in a net increase in absolute emissions; much of the rest is linked to enhanced oil recovery (EOR). The IEA put annual carbon capture capacity in 2021 at around 40MtCO<sub>2</sub> – around a thousandth of the total energy-related greenhouse gas emissions. If this capture capacity was to disappear overnight, global emissions would go down (not up) as high CO<sub>2</sub> gas projects would have to be shut-in and less oil is produced through EOR. Genuinely negatively emission CCUS capacity is currently minuscule.

Second, the climate scenarios in Figure 1 already include CCUS expansion and yet still require rapid oil & gas production cuts. For example, the IEA's Net Zero by 2050 pathway assumes a CCUS capacity of 1,600 Mtpa by 2030 despite oil & gas production falling by 60% by 2040. A company deploying CCUS does not negate the need to also cut production.

Third, and the arguably biggest issue for the oil & gas industry, is that CCUS adds cost to fossil fuels projects that are already being out-competed by lower-cost renewable power generation.

Instead, CCUS should be reserved as a bridging technology for hard-to-abate sectors, such as cement and steel manufacturing, and not to justify the continued production of oil & gas. It may be that decarbonisation of industrial processes as a service might be a strategic option for some oil & gas companies. But this is a very different business model from that currently being put forward by the industry.

CCUS – and other negative emission technologies (NETs) will likely be needed to reverse temperature overshoot, but that doesn't mean that we should appeal to these technologies to justify investment in new oil and gas. Climate-alignment ultimately hinges on the pace at which existing fossil fuel business models – dependent on the release of greenhouse gas emissions– decline, rather than necessarily what new low-carbon investments, if any, a company is making.

### 3.3 Demand scenarios used to assess climate-alignment

Consistent with our previous reports in this series, we model future supply of oil and gas using a range of scenarios from the IEA, which provide sufficient regional breakdown of gas demand:

- **Net Zero Emissions by 2050 Scenario (NZE)** - a pathway consistent with limiting warming to 1.5°C (50% probability), with the global energy sector achieving net zero CO<sub>2</sub> emissions by 2050. **This is our 1.5°C-aligned (“net zero”) scenario.**
- **Sustainable Development Scenario (SDS)** - a pathway consistent with limiting warming to 1.65°C (50% probability), without any net-negative emissions, advanced economies reach net zero by 2050, China around 2060, and all other countries by 2070 at the latest. SDS was not updated in the 2022 World Energy Outlook (WEO), so the version used here is from 2021.
- **Announced Pledges Scenario (APS)** – a scenario consistent with a 1.7°C outcome (50% probability), assuming all national pledges are implemented in full, regardless of whether or not they are written into legislation. This shows the “ambition gap” between national pledges and that required to achieve 1.5°C. **This replaces SDS as the IEA’s “well below 2°C” scenario.**
- **Stated Policies Scenario (STEPS)** – a more conservative scenario consistent with a 2.5°C outcome, based on implemented and under development policies. **We use STEPS as a representation of business-as-usual investment decision-making by the industry.**

While we use reference IEA scenarios here, we note that there are other 1.5°C pathways and Paris-aligned scenarios, such as the UN Inevitable Policy Response (IPR) consortium’s 1.5°C Required Policy Scenario (RPS) and the 1.8°C Forecast Policy Scenario (FPS).<sup>7</sup>

RPS outlines the more ambitious policies that would be required to achieve a 1.5°C outcome. Under RPS, oil demand peaks in 2025 before declining more rapidly, whilst gas peaks in 2021. Under NZE both oil and gas demand decline from 2021, with the latest iteration of NZE now mirroring the rapid gas decline of RPS. In aggregate, however, demand is very similar between the two scenarios, given NZE is more widely referenced we accordingly use it as our reference case for assessing 1.5°C climate alignment.

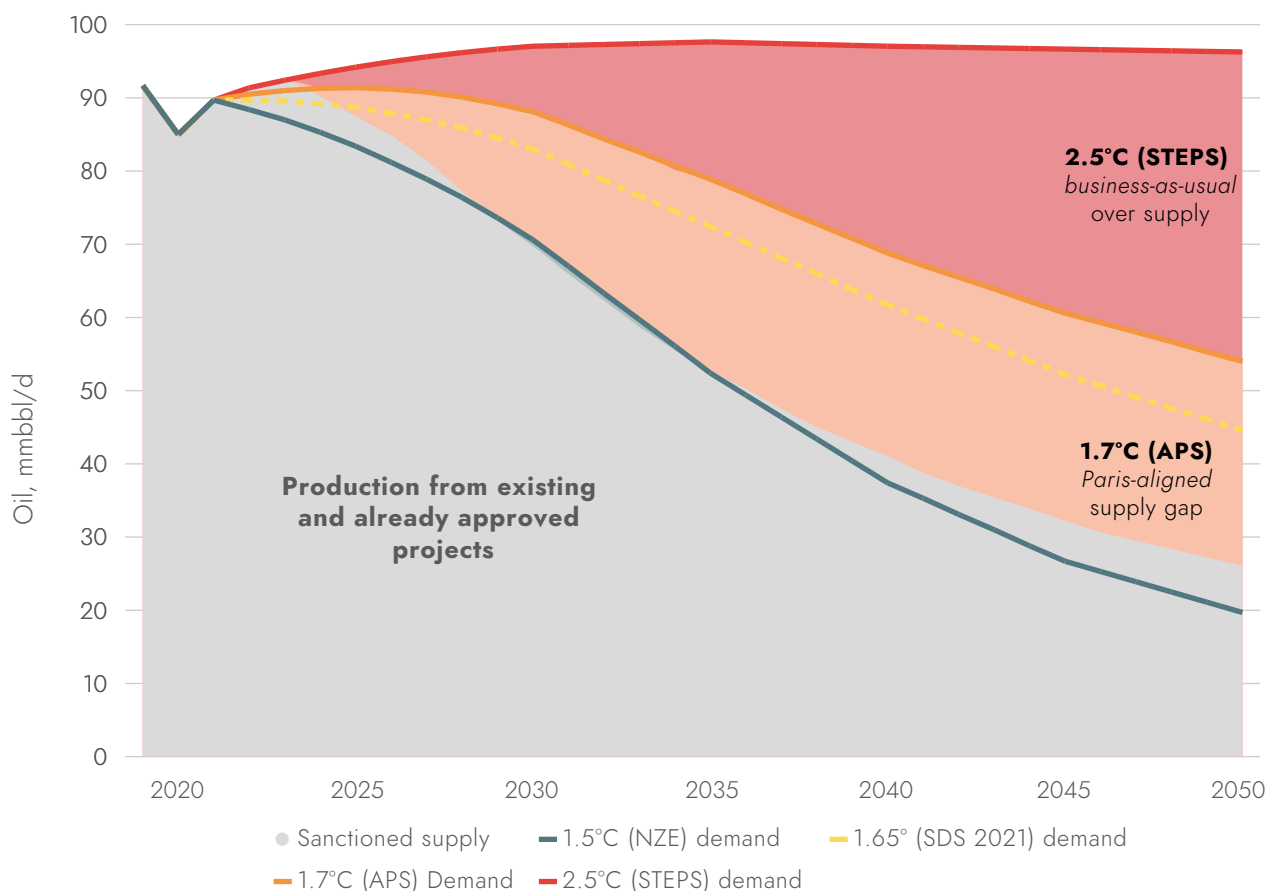
FPS forecasts short-term demand growth followed by a rapid decline due to an acceleration of climate policy by 2025; we explored the implications of this ‘non-linear’ demand forecast in our *Managing Peak Oil*<sup>8</sup> report. As with RPS and NZE, aggregate demand to 2040 under FPS is similar to that under APS.

A comparison of global oil demand under the IEA scenarios is shown in Figure 3, alongside the future supply from already-sanctioned projects (i.e., projects which are producing or under development). The future “supply gap” under any given scenario (e.g., the orange wedge for APS) is thus the aggregate production from new projects that could be considered compatible with any given scenario.

<sup>7</sup> <https://www.unpri.org/inevitable-policy-response/the-inevitable-policy-response-2021-forecast-policy-scenario-and-15c-required-policy-scenario/8726.article>

<sup>8</sup> Carbon Tracker report: *Managing Peak Oil* (2022), available at: <https://carbontracker.org/reports/managing-peak-oil/>



**Figure 3: Oil demand under different IEA scenarios vs future supply from existing projects**

Source: IEA, Rystad Energy and CTI analysis

Note: Oil demand under temperature scenarios used in analysis compared to supply from existing fields, in million barrels per day.

For a Paris-aligned scenario we now use APS, whereas previously we used SDS. In the 2022 edition of the IEA's WEO, the 2100 temperature outcome modelled for APS fell significantly, from 2.1°C to 1.7°C, reflecting new climate pledges made over the past year, particularly those on methane<sup>9</sup> and the net zero pledges of India<sup>10</sup> and Indonesia<sup>11</sup> made at COP26 in Glasgow. However, some of the announced targets rely on CO<sub>2</sub> removal technologies<sup>12</sup>, whereas SDS provided a pathway without assuming any net-negative emissions.<sup>13</sup>

Furthermore, SDS kept the door open to achieving 1.5°C if some level of net-negative emissions were to be deployed in the later part of the century, something that will be harder to achieve under APS. We therefore continue to include SDS in some charts as a measure of a more ambitious interpretation of Paris-alignment and for comparability with our previous research.

For business-as-usual industry behaviour, we use the IEA's STEPS, which our modelling shows to have a marginal oil break-even price of around \$61 USD<sup>14</sup>, which is similar to, or below, the long-term price assumption used by many oil & gas companies. Exxon for example is explicitly planning on STEPS.<sup>15</sup>

9 <https://www.iea.org/reports/global-methane-tracker-2022/the-global-methane-pledge>

10 <https://www.iea.org/commentaries/cop26-climate-pledges-could-help-limit-global-warming-to-1-8-c-but-implementing-them-will-be-the-key>

11 <https://www.weforum.org/agenda/2022/02/indonesian-businesses-cop26-climate/>

12 World Energy Outlook 2022 (p.251) <https://www.iea.org/reports/world-energy-outlook-2022>

13 World Energy Outlook 2021 (p.95) <https://www.iea.org/reports/world-energy-outlook-2021>

14 See the Methodology section of the appendix

15 Carbon Tracker blog: ExxonMobil is planning on climate failure despite 'Advancing Climate Solutions', available at: <https://carbontracker.org/>

The background is a grayscale photograph of an industrial facility, possibly a refinery or chemical plant, with various structures, pipes, and a body of water in the foreground. A large, bold, red number '04' is superimposed over the center of the image. The '0' is a thick, rounded shape, and the '4' is a thick, blocky shape. The top of the image has a horizontal bar with a color gradient from red to teal to green.

# 04

**Assessing  
1.5°C-alignment using  
production plans**

For stakeholders looking to understand which, if any, oil and gas producers could be viewed as 1.5°C-aligned, then production plans are a good place to start. We first consider modelled future production using data from Rystad Energy, before then reviewing companies' stated plans, for 20 of the largest companies by market capitalisation<sup>16</sup> included in the 'Exploration & Production' and 'Integrated' segments of the S&P Global Oil Index.

Aligning with 1.5°C means declining production for oil & gas companies

Pathways limiting temperature rises require global greenhouse gas emissions to peak by 2025 at the latest and fall by around 43% by 2030 compared to 2019 levels.<sup>17</sup> Even accounting for expanded carbon capture, operational emissions and methane reductions, this still translates to significant production cuts. Oil & gas consumption, and therefore production, falls by 22% by 2030 and 44% by 2035 compared to 2019 under the 1.5°C NZE scenario.

Under NZE we see that future production from already-sanctioned projects outstrips oil demand over the next two decades (Figure 3), supporting the IEA's conclusion<sup>18</sup> that demand "could be met without approving the development of any new long lead-time upstream conventional oil and gas projects". Without investment in new projects – n.b. this is not the same as "no new investment" – then overall production will fall as production from individual projects declines naturally without being replaced.

Figure 4 shows the average company production expected in the 2030s compared to 2019 levels from existing projects (coloured bars), and that which would result from business-as-usual investment (STEPS, 2.5C) shown by the grey bars. The larger the grey bar, the less aligned the company's potential future production under business as usual.

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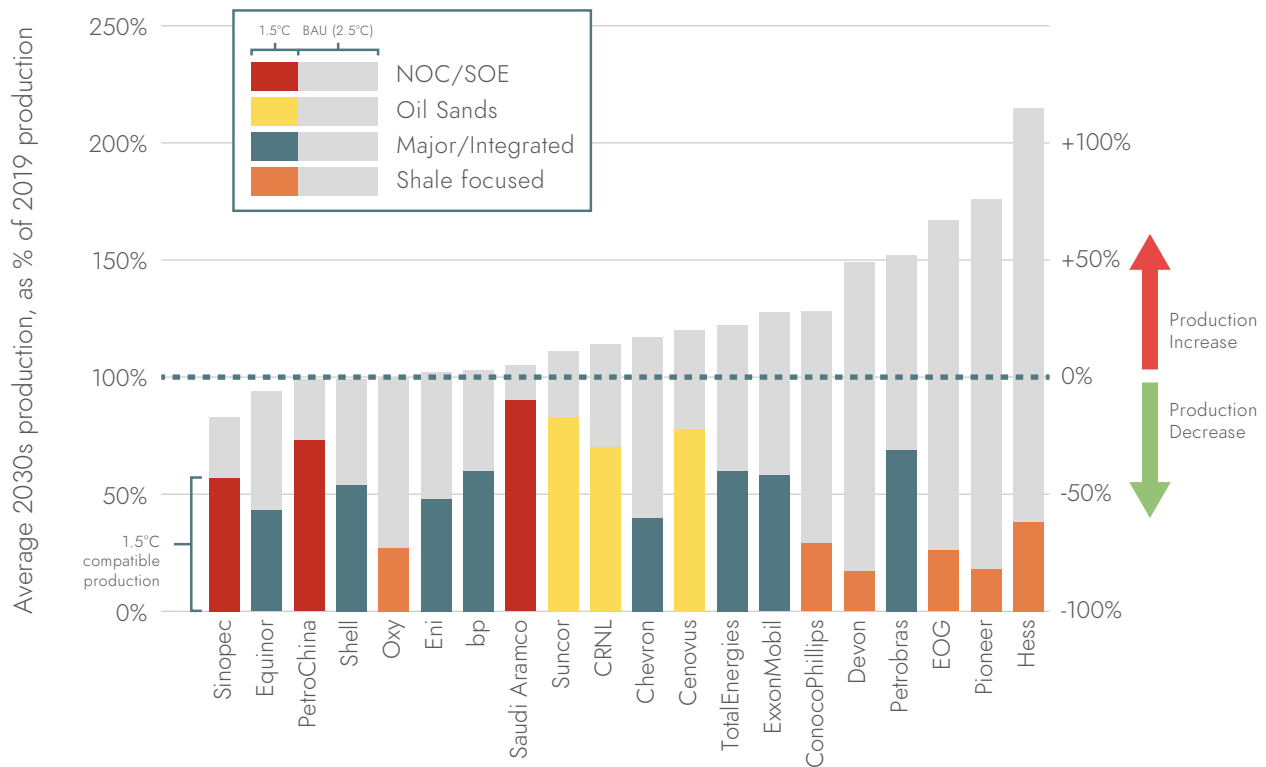
[exxonmobil-is-planning-on-climate-failure-despite-advancing-climate-solutions/](https://www.exxonmobil.com/uk/press-releases/exxonmobil-is-planning-on-climate-failure-despite-advancing-climate-solutions/)

<sup>16</sup> as of 22nd August 2022

<sup>17</sup> IPCC Climate Change 2022: Mitigation of Climate Change, available at: <https://www.ipcc.ch/working-group/wg3/>

<sup>18</sup> World Energy Outlook 2022, p.134.

**Figure 4: Oil and gas production in the 2030s from already-sanctioned developments vs business-as-usual plans**



Source: Rystad Energy, IEA, CTI analysis

Notes: 2030-2039 average production as a % of 2019 production in barrels of oil equivalent. Coloured portion of bars show future production from already-sanctioned projects that is potentially aligned with the IEA's 1.5°C Net Zero Emissions by 2050 (NZE) scenario – bar colour indicates the company classification. Grey bars show production modelled under IEA's 2.5°C Stated Policies Scenario (STEPS). Top 20 producers by market capitalisation from the S&P global oil index.

Companies on the right-hand side of Figure 4 – primarily the shale-focused companies alongside Petrobras – are modelled under business-as-usual investment to have significant production increases into the 2030s, compared to 2019. On the left, the partially listed Chinese companies, state-owned Equinor and European majors are modelled to have smaller increases or declining production.

If all these companies were truly to be 1.5°C-aligned, then they would be planning for the decline indicated by the coloured bars, yet few have stated that they expect their production volumes to fall, let alone by the levels implied by this chart.

## The shale industry faces the largest production declines in order to align with 1.5°C

Shale-focused companies show the largest production declines from existing projects in Figure 4 required for alignment with 1.5°C (NZE). This reflects the rapid decline rates of shale wells and the need for continued investment in new wells by these firms to maintain production. Although - as we outlined in *Managing Peak Oil* - the short life cycle of their projects also means that shale-focused companies could be well positioned to fulfil the anticipated supply gap (see Figure 3) under well below 2°C scenarios such as APS and FPS.

Shale companies, however, are currently planning to increase production well beyond the more modest declines required under a well-below 2°C scenario (APS). For example, by 2027 ExxonMobil is planning to ramp up shale production from Permian assets by 69% - equivalent to an 8% increase in the company's total 2021 production.

The decommissioning legacy of the shale industry also needs to be factored in by investors with orphaned wells and Asset Retirement Obligations (ARO) - a substantive climate and financial issue. In 2020, plugging costs for onshore US wells was estimated at roughly \$288 billion by Carbon Tracker<sup>19</sup>, with ExxonMobil's plugging liabilities estimated at around \$2.7 billion in the Permian alone.

### **Oil sands producers see smaller declines from existing projects, but new projects are less aligned**

In contrast to shale, oil sands-focused companies see lower production declines under a 1.5°C scenario due to the long-life cycle of projects and *opencast mining* nature of operations. However, any new oil sands projects risk significant carbon lock-in from energy and capital-intensive projects with inherently high methane emissions.

### **Saudi Aramco requires significant production cuts to align with 1.5°C**

Saudi Aramco appears to have the smallest production cuts in % terms required for alignment with 1.5°C (NZE) in Figure 4, yet given the scale of Saudi Aramco's production, these reductions are significant in absolute terms. And unfortunately, Saudi Aramco is planning on doing just the opposite, with a stated target to increase production to 2027 by around 8% against a 2021 baseline.<sup>20</sup>

It is important to note that the majority of this modelled business-as-usual production in Figure 4 comes from not-yet-approved projects, and companies may choose different production pathways. An alternative to looking at future production via anticipated project sanctions, is to compare companies' stated production guidance, shown in Table 1, where disclosed.

19 Carbon Tracker report: Billion Dollar Orphans: Why millions of oil and gas wells could become wards of the state (2020), available at: <https://carbontracker.org/reports/billion-dollar-orphans/>

20 <https://www.offshore-technology.com/news/aramco-13-million-bpd-2027/>

**Table 1: Disclosed company production plans, with calculated % change compared to 2019**

Company	Production guidance/ target	Target year, for achieving production	% change in production vs 2019 baseline
bp <sup>1</sup>	Expected reduction in upstream oil and gas production from 2.6 mmbbl/d in 2019 to around 1.5 mmbbl/d	2030	-43%
CNRL <sup>2</sup>	Unspecified increase in oil and gas production	N/A	Increase
Cenovus Energy <sup>3</sup>	Upstream production guidance range of 780,000-810,000 boe/d	2022	n/a ¥
Chevron <sup>4</sup>	Expected production growth of >3% CAGR	2026	+16%
ConocoPhillips <sup>5</sup>	Full-year production forecast of 1.74 mmbbl/d	2022	+29%
Devon Energy <sup>6</sup>	Projected full-year production of 600,000-610,000 boe/d	2022	n/a ¥¥
Eni <sup>7</sup>	Expected oil and gas production plateau at 1.9 mmbbl/d in 2025 [followed unspecified decline]	2025	+2%
EOG Resources <sup>8</sup>	Guidance range of 884,300-924,400 boe/d	2022	+10%
Equinor <sup>9</sup>	Estimated production increase of around 2% on 2021 output	2022	+2%
ExxonMobil <sup>10</sup>	Expected production of around 4.27 mmbbl/d in 2027	2027	+8%
Hess <sup>11</sup>	Net production forecast of 320,000 boe/d	2022	+10%*
Occidental Petroleum <sup>12</sup>	Continued focus on 'its highest-return assets with the flexibility to adjust based on fluctuations'	N/A	Demand dependent
Petrobras <sup>13</sup>	Expected total production of 3.2 mmbbl/d, including 2.6 mmbbl/d of oil and 600,000 boe/d of gas, both commercial and non-commercial	2027	+15%
PetroChina <sup>14</sup>	Planned total output of 1,670 mmbbl	2022	+7%
Pioneer Natural Resources <sup>15</sup>	Anticipated total production of 623,000 to 648,000 boe/d	2022	n/a ¥¥¥
Saudi Aramco <sup>16</sup>	Increased crude oil capacity to 13 mmbbl/d by 2027, plus potential increase in gas output by more than 50%	2027	+16%** (+13% oil / +50% gas)
Shell <sup>17</sup>	Expected gradual reduction in oil production [ from 2021 onwards] of around 1-2% each year, including divestments and natural decline	2030	-27% oil***
Sinopec <sup>18</sup>	Unspecified increase in O&G reserves and production	N/A	Increase
Suncor Energy <sup>19</sup>	Anticipated upstream production of 750,000 to 790,000 boe/d	2022	Stable**** (-3.5 to +1.6%)
TotalEnergies <sup>20</sup>	Oil production peak in 2020s, with a subsequent decrease to around 1.4 mmbbl/d in 2030 / Gas production increase to 2 mmbbl/d in 2030	2030	+13% (-2% oil / +26% gas)

Source: See the References section in appendix for sources.

Notes: Production increases/declines calculated by CTI using the company's own production figures, or Rystad Energy production figures where company figures not available. See Section 7.3 for specific references. Where the target is expressed as a range, the midpoint is used. Annual increases/decreases assumed to be compound unless stated otherwise. Target Year is the year in which production guidance or target is expected to be achieved. \*Hess's forecast excludes production in Libya. \*\*Saudi Aramco's oil figure is for Maximum Sustainable Capacity (MSC), not actual production. \*\*\*Shell's target is for oil only and includes the impact from Permian divestment completed in December 2021. \*\*\*\*Suncor production increases +5% compared to 2021 levels. Production change shown as n/a where effect by significant M&A activity: ¥ Cenovus acquired Husky Energy in Dec 2021, production is stable compared to 2021 levels. ¥¥ Devon Energy merged with WPX in 2021, production increase is +6% compared to 2021 levels. ¥¥¥ Pioneer bought Parsley Energy in Jan 2021, production increase is +3% compared to 2021 levels.

## Oil & gas company production plans are far from aligned with 1.5°C

Only four companies in our universe have indicated oil production reductions - bp, TotalEnergies, Eni and Shell - but only bp has indicated that both oil and gas production will fall, publicly committing to reducing its production by around 40% by 2030 from a 2019 baseline, broadly consistent with the required decline under a 1.5°C from Figure 4.

Of course, reducing production and emissions – and thus claims of climate alignment needs to be done in a credible way<sup>21</sup>, and so whether bp plans to achieve its reduction by holding back on project sanctions, shutting-in existing production (both potentially positive for the climate), or through divestment (at best climate neutral) is therefore significant.

Eni, Shell and TotalEnergies have also published less concrete plans to reduce production, at least in oil, but they fall far short of that required for 1.5°C (NZE). Eni has committed to a reduction of its absolute emissions (Scope 1, 2 & 3) by 2030, necessitating production cuts, but is nonetheless targeting production increases until 2025 before unspecified declines, mainly in oil.

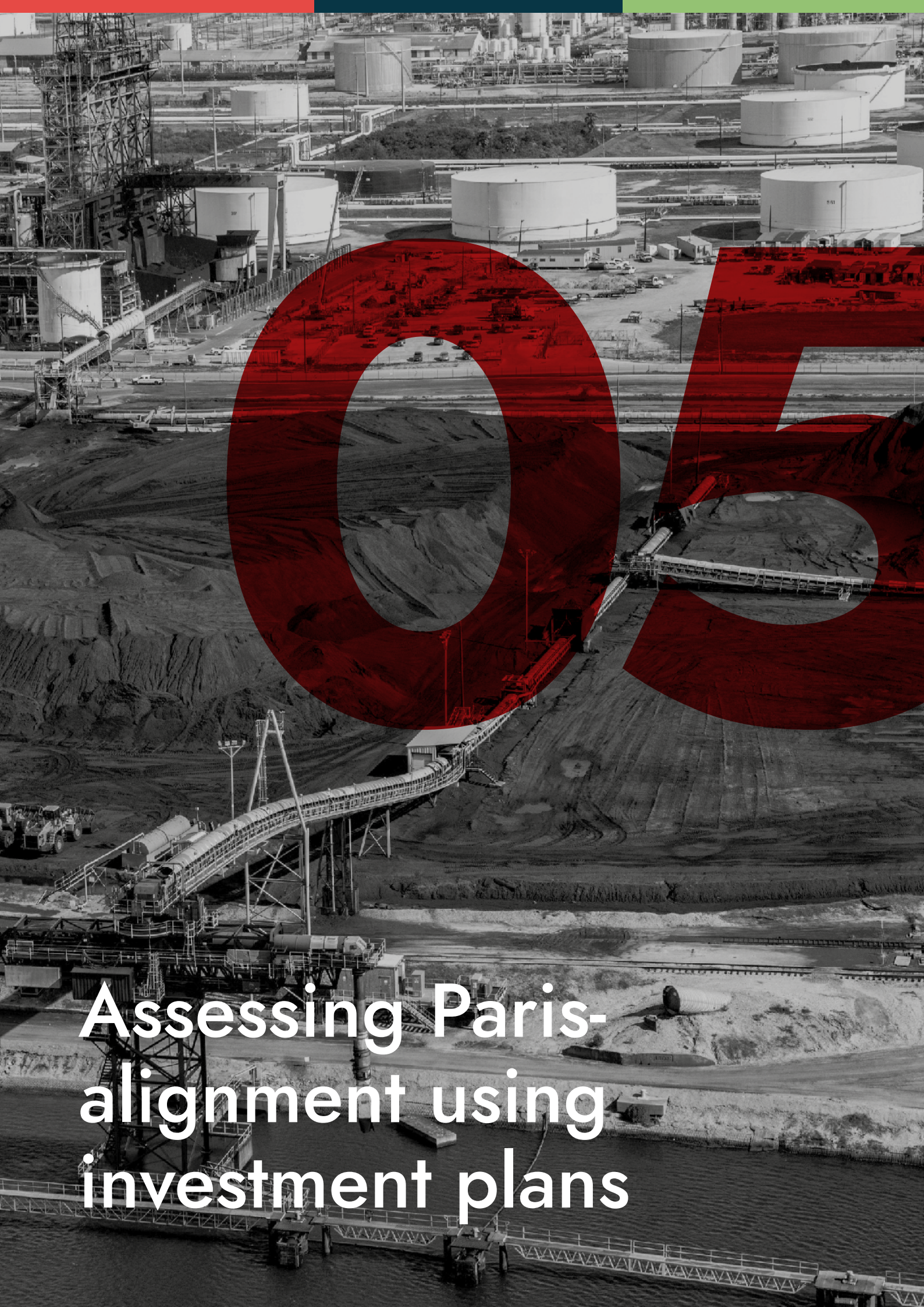
TotalEnergies, which also has an absolute emissions reduction target by 2030, but only for products sold in Europe, sees oil production falling by around 2% in 2030 compared to 2019, whilst simultaneously increasing gas production by around 26%. We calculate this will actually increase TotalEnergies' production in oil equivalent terms by around 13% in 2030 compared to 2019. Similarly, Shell, which doesn't have an absolute emission target for 2030, *expects* to reduce oil production by around 1-2% a year, whilst shifting to gas and targeting LNG capacity growth.<sup>22</sup>

Overall, and consistent with their relatively-weaker climate targets compared to European peers, the North American companies are all targeting near term production growth. Chevron for example, expects its production to grow by over 3% a year to 2026, equivalent to a 16% increase from 2019, whilst Exxon's expected production in 2027 we calculate as an 8% increase compared to 2019. Both companies' *net zero 2050* goals exclude end-use (Scope 3) emissions.

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21 Carbon Tracker report: Absolute Impact: Why Oil and Gas Companies Need Credible Plans to Meet Climate Targets, available at: <https://carbontracker.org/reports/absolute-impact-2022/>

22 Shell presentation: Energy transition strategy 2021 (pg. 17), available at: [https://www.shell.com/promos/energy-and-innovation/shell-energy-transition-strategy/\\_jcr\\_content.stream/1618407326759/7c3d5b317351891d2383b3e9f1e511997e516639/shell-energy-transition-strategy-2021.pdf](https://www.shell.com/promos/energy-and-innovation/shell-energy-transition-strategy/_jcr_content.stream/1618407326759/7c3d5b317351891d2383b3e9f1e511997e516639/shell-energy-transition-strategy-2021.pdf)



# Assessing Paris- alignment using investment plans



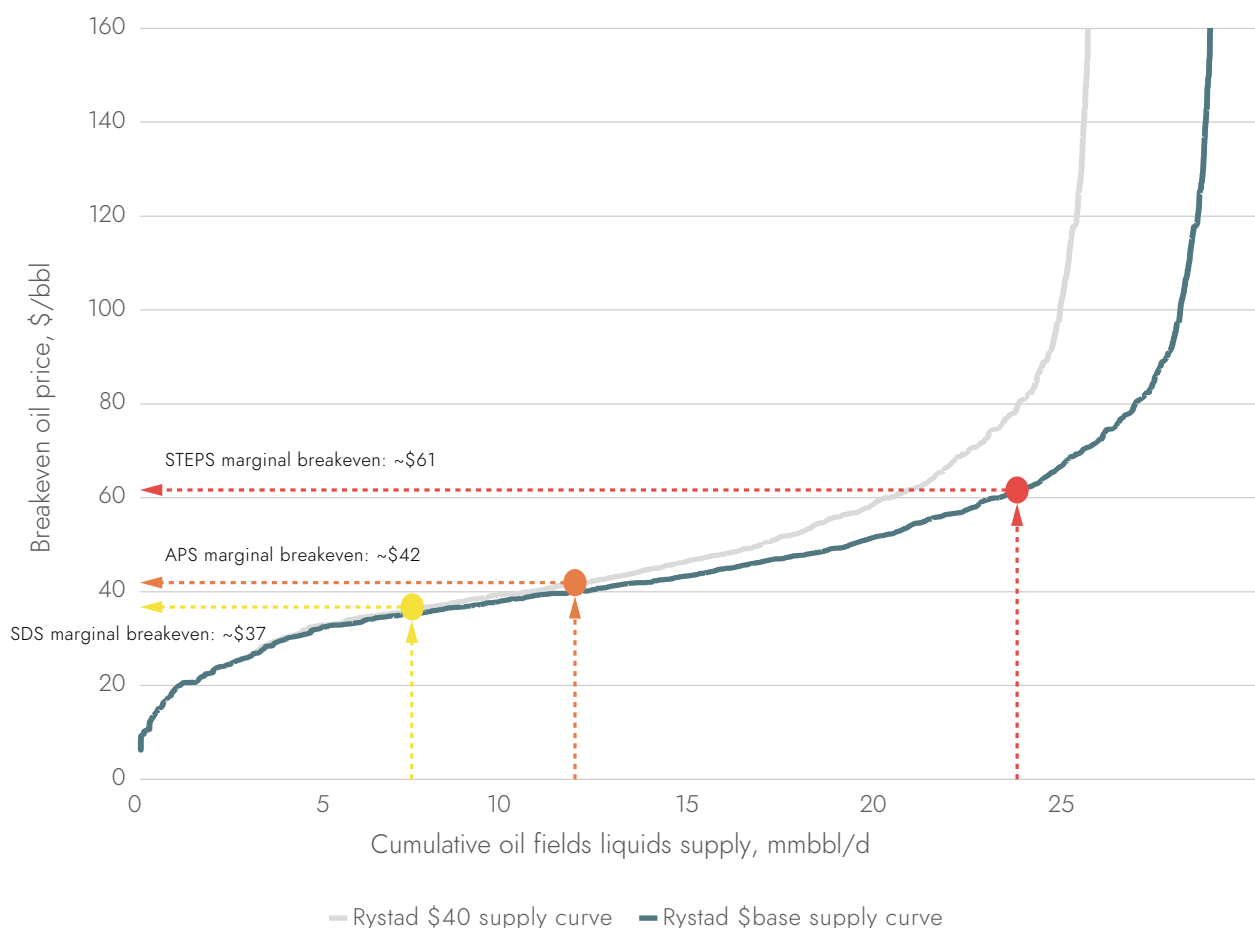
Alongside production plans, another way to assess the degree of company climate-alignment is to consider companies plans for investment in new projects, and their compatibility with a given scenario. The interpretation of “Paris”, be it 1.5°C or “well-below 2°C”, determines the set of projects which could be viewed as “Paris-aligned”.

## 5.1 Capex alignment

As discussed in the previous section, alignment with 1.5°C means no new long-cycle oil and gas projects. However, those seeking alignment with only a less ambitious ‘well below 2°C’ outcome, could expect to see some new developments go ahead.

Here we use our least cost methodology to determine whether individual projects are compatible, or not, with a Paris-aligned scenario (APS), before then aggregating these by company ownership to determine the degree to which companies’ investment plans could be considered “Paris-aligned”. A summary of the approach is illustrated in Figure 5, which shows cost-curves (at two different price cases) for all potential oil project options, ranked in order of breakeven price, alongside the average annual supply demanded under SDS, APS and STEPS, less that provided by future production from existing projects (the supply gaps as shown in Figure 3).

**Figure 5: Global cost curves for potential oil projects**



Source: IEA, Rystad Energy, CTI analysis

Note: Breakeven prices assume a 15% IRR.

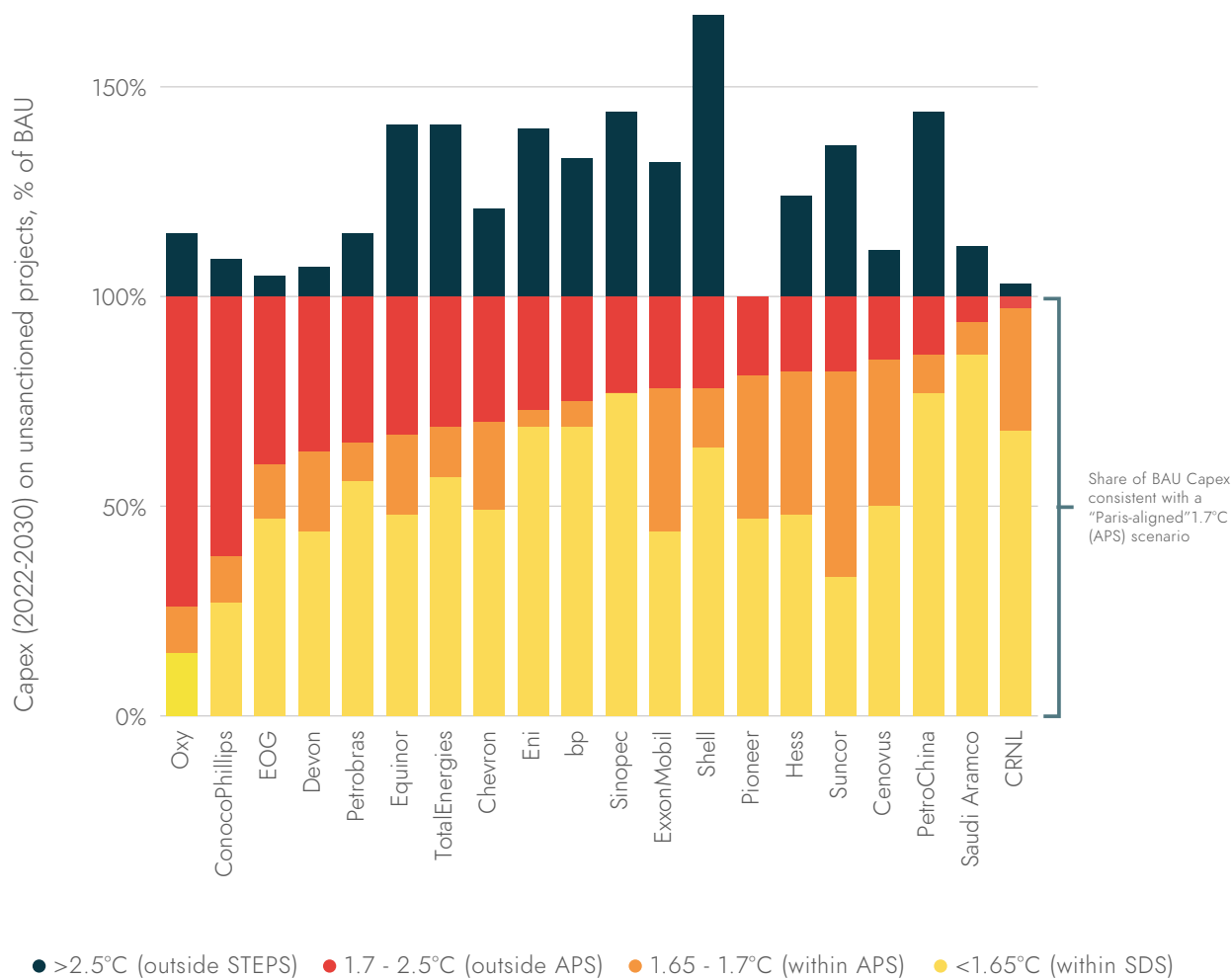
Those projects that fall to the left of the APS demand line are “compatible” with the scenario; those higher-cost projects to right of the line are not. The y-axis of Figure 5 shows the marginal breakeven price of the last project required to satisfy demand under the scenario, but we stress that this an output of the modelling, rather than an input. See Appendix for further details.

The results of this analysis – which primarily should be used to compare companies in a relative sense – is shown in Figure 6, where bars are coloured to show the compatibility of projects with different temperature outcomes:

- **Yellow** - projects with a relatively-low breakeven price that are potentially consistent with a 1.65°C Paris-aligned scenario (SDS).
- **Orange** - projects that are incompatible with a 1.65°C scenario, but potentially consistent with demand under a 1.7°C Paris aligned scenario (APS).
- **Red** - projects that are assessed to be incompatible with a Paris scenario (APS), but are likely to go ahead under business-as-usual plans (STEPS, 2.5°C).
- **Black** - projects with very high breakeven prices that are inconsistent with even a business-as-usual scenario (STEPS, 2.5°C). These are the projects that are the least climate-aligned.

Under any scenario, the degree of company alignment is expressed as the capex on new projects compatible with a given scenario as a proportion of spending on new projects under business-as-usual investment (STEPS, 2.5°C). In other words: the smaller the red bar, the more aligned a company's potential future investment plans are with a well-below 2°C scenario.

While our main “well below 2°C” Paris scenario is now APS, we have included results under SDS in Figure 6 to show comparability with previous years, and also to highlight that despite having just a 0.05°C difference in temperature outcome, APS has significantly more space for oil and gas compared to SDS. This is in part because, unlike SDS, APS requires negative emissions technologies to achieve its stated 1.7°C outcome.

**Figure 6: Degree of paris-alignment of companies' business-as-usual investments**

Source: Rystad Energy, IEA, CTI analysis

Notes: Upstream oil & gas capex (2022-2030) on unsanctioned projects compatible with different scenarios, as a % of business-as-usual (BAU) plans (2.5°C, STEPS) Top 20 producers by market capitalisation from the S&P global oil index sorted by % capex aligned with a 1.7°C (APS) scenario.

Occidental Petroleum (Oxy) tops the list as the company of those assessed with the least Paris-aligned portfolio, reflecting the relatively high break-even prices required for much of its portfolio. Oxy has ambitious plans for direct air capture (DAC) of atmospheric carbon dioxide tied to enhanced oil recovery (EOR) where CO<sub>2</sub> is injected into an oil field to boost production. However, as discussed in a recent CTI blog<sup>23</sup>, how much CO<sub>2</sub> is actually sequestered in the process is disputed and is largely offset by the emissions from the additional oil produced. It is our view that DAC to EOR is not an effective strategy for climate alignment and tying projects to DAC in this way largely serves to increase project costs, therefore lowering alignment with a low carbon world.

As well as assessing the alignment of companies' full portfolio of project options, it is important also to scrutinise projects which are expected to be sanctioned in the near future. Table 2 provides a list of the largest projects incompatible with a Paris-aligned 1.7°C scenario (APS), held by companies in our universe, where final investment decisions are expected in 2023.

23 Carbon Tracker blog: A magical CCUS unicorn will not save the oil industry, available at: <https://carbontracker.org/a-magical-ccus-unicorn-will-not-save-the-oil-industry/>

**Table 2: The 15 largest projects approaching FID in 2023 that are outside of a 1.7°C scenario (APS), projects incompatible with 2.5°C (STEPS) highlighted in blue**

Project/ Asset	Country	Approval Date	2022-2030 Capex (\$bn)	Production Start	Resource Theme	Ownership
<b>Bahr Es Salam (A&amp;E Structures)</b>	Libya	2023	5.4	2026	Deepwater, gas	Mellitah Oil & Gas B.V* ; Eni; NOC Libya
<b>Trion</b>	Mexico	2023	4.5	2027	Ultra deepwater, oil	<b>Woodside*</b> ; Pemex
<b>North Platte (GB958)</b>	United States	2023	4.3	2026	Deepwater, oil	<b>Equinor**</b>
<b>Uaru</b>	Guyana	2023	3.5	2027	Ultra deepwater, oil	<b>ExxonMobil*</b> ; Hess; CNOOC
<b>Seat, Pao de Acuca</b>	Brazil	2023	2.9	2028	Ultra deepwater, oil	<b>Equinor*</b> ; Petrobras; Repsol; Sinopec
<b>Cameron LNG T4</b>	United States	2023	2.5	2027	LNG Plant	Cameron LNG* ; Sempra; Mitsui; <b>TotalEnergies</b> ; Mitsubishi Corp; Nippon Yusen Kabushiki Kaisha (NYK Line)
<b>Preowei, Egina project</b>	Nigeria	2023	2.1	2026	Deepwater, oil	<b>TotalEnergies*</b> ; CNOOC; NNPC Nigeria; Africa Oil Corp; BTG Pactual; South Atlantic Petroleum (SAPETRO)
<b>Patwa, Greater Turbot (Stabroek block)</b>	Guyana	2023	2.0	2027	Ultra deepwater, oil	<b>ExxonMobil*</b> ; Hess; CNOOC
<b>Linnorm (6406/9-1)</b>	Norway	2023	1.9	2026	Deepwater, gas	<b>Shell*</b> ; Petoro; <b>Equinor</b> ; <b>TotalEnergies</b>
<b>Cavala (SEAP)</b>	Brazil	2023	1.5	2027	Ultra deepwater, oil	<b>Petrobras*</b> , Bharat Petroleum Corp, Videocon
<b>Peon (35/2-1)</b>	Norway	2023	1.2	2026	Deepwater, gas	<b>Equinor*</b> ; Idemitsu Norway; Petoro
<b>Halten Ost (6507/11-6)</b>	Norway	2023	1.2	2025	Deepwater, gas	<b>Equinor*</b> , Vaar Energi, Sval, Petoro
<b>Asterix (6705/10-1)</b>	Norway	2023	1.1	2026	Deepwater (Arctic), gas	<b>Equinor*</b> , Petoro, Wintershall Dea, <b>Shell</b>
<b>Onshore block 4 (Well #1)</b>	UAE	2023	0.8	2024	Onshore, oil	<b>Inpex*</b>
<b>CLOV Phase 3</b>	Angola	2023	0.7	2025	Deepwater, oil	<b>TotalEnergies*</b> , <b>Equinor</b> , <b>ExxonMobil</b> , <b>bp</b> , Sonangol

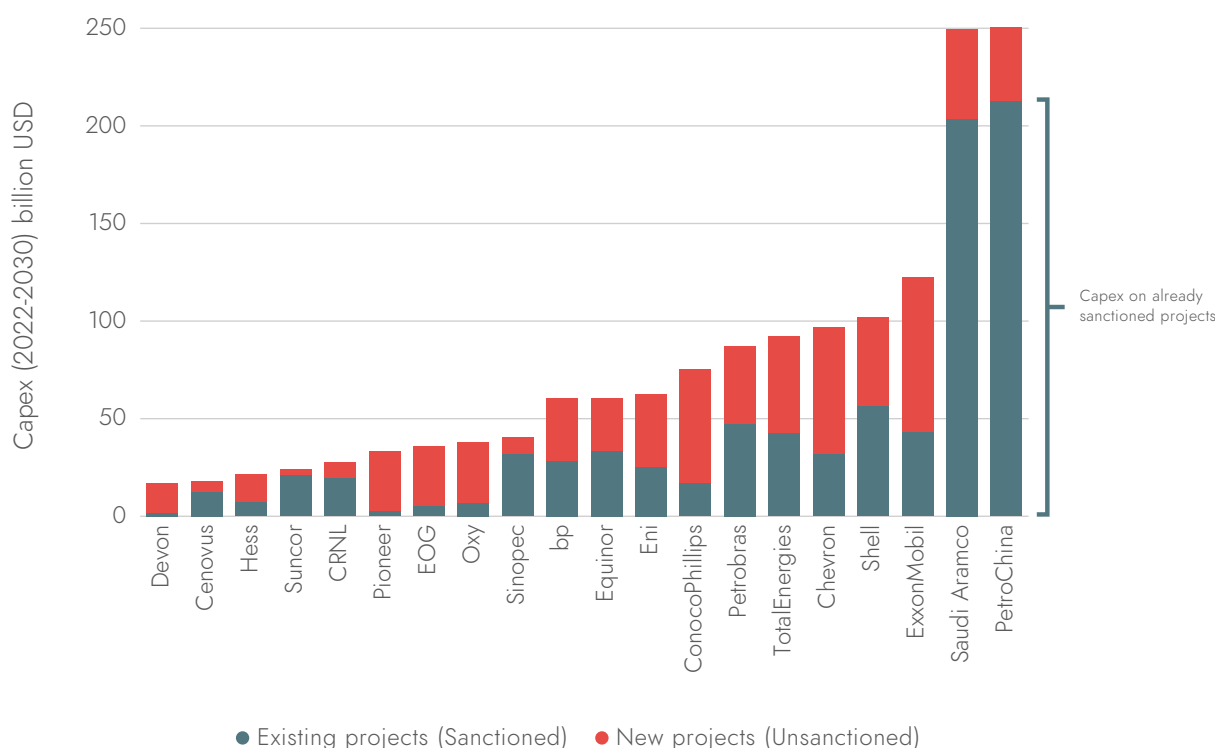
Source: Rystad Energy and CTI analysis

Notes: 15 largest projects by capex (2022-2030) that are considered incompatible with a Paris-aligned 1.7°C scenario (IEA's APS) held by companies within the S&P Global Oil Index, where a Final Investment Decision (FID) is expected in 2023. A \$5/boe margin of error has been applied above the APS marginal breakeven for oil fields, and a \$1.5/kcf margin for gas. Onshore tight/shale excluded. Companies within the S&P Global Oil Index's Integrated and Exploration & Production segments highlighted in bold. Projects incompatible with a 2.5°C scenario (IEA's STEPS) are shown in dark blue. \*Operator. \*\*As of May 2022; we note that in June 2022 Equinor agreed to sell a stake in the project and transfer operatorship to Shell, with the project to be renamed to the Sparta development.

## Saudia Aramco and Petrochina are pursuing production growth through further investment on existing fields

Figure 7 shows the split of future capex between projects already approved and therefore potentially aligned with 1.5°C (NZE), blue bars, and *business-as-usual* (STEPS, 2.5°) capex on new projects shown by the red bars.

**Figure 7: Future capex to 2030 on both existing (post-FID) and potential new 'business as usual' projects (pre-FID, within STEPS)**



Source: IEA, Rystad Energy, CTI analysis

Notes: \* denotes oil-sands focused companies, P denotes national oil companies. Both company types show a larger share of potential future capex associated with already sanctioned projects. Top 20 producers by market capitalisation from the S&P global oil index.

Figure 7 is dominated by the future potential spending of Saudi Aramco and PetroChina, with the majority of capex on projects already approved, and therefore potentially aligned with 1.5°C. The scale of capex on existing projects partly reflects the continued development of giant fields within their portfolio but may also reflect a data bias towards these companies where less granular details are available and projects are insufficiently split into phases of development. Caution should therefore be applied when assessing companies based on a single or limited metrics; instead, a holistic approach should be applied. As discussed in a recent blog<sup>24</sup> about Saudi Aramco's sustainability report, the company's emissions targets are a long way from Paris-aligned.

24 Carbon Tracker blog: Oil giant Aramco still doing minimum to tackle emissions, available at: <https://carbontracker.org/oil-giant-aramco-still-doing-minimum-to-tackle-emissions/>

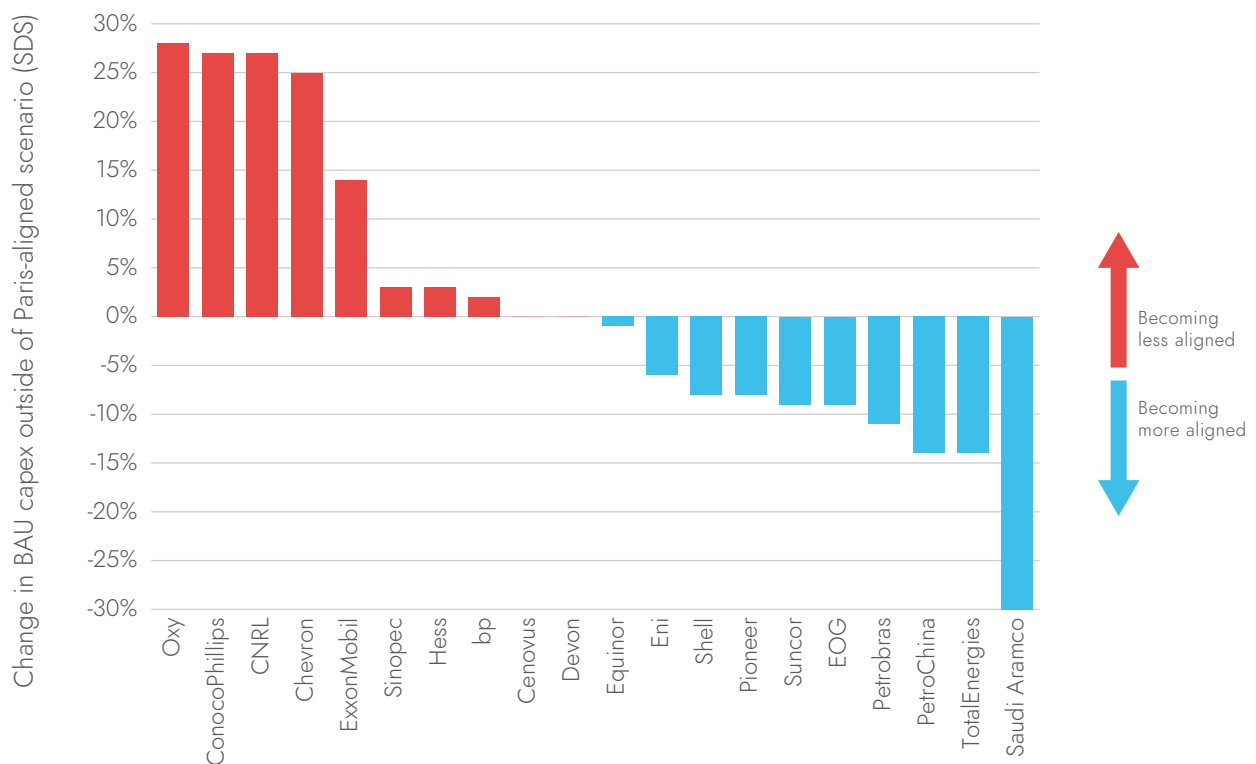
Similar caution should be applied to the oil sands producers, including Cenovus, Suncor and CNRL. As in Figure 7, a significant proportion of potential future capex for these companies is on already approved projects (relative size of the blue bar), however, new oil sand projects are far from Paris-aligned.

Also of note is the overall scale of future investment - bp notably has the lowest overall capex among the majors, consistent with its stated production declines as in Section 4.

## 5.2 Changes in capex alignment over time

In Carbon Tracker's *Two Degrees of Separation* Series of reports we have modelled projects compatible with different temperature outcomes, allowing us to consider changes in company alignment over time. Figure 8 below shows the change in future capex on projects outside of a Paris-aligned scenario between 2019 and 2021/2022 assessments.<sup>25</sup> While we primarily use APS as our Paris scenario in this report, here we use SDS for comparability with previous reports, to show the trend over time.

**Figure 8: Change in degree of Paris-alignment of companies' investment plans over time**



Source: IEA, Rystad Energy, CTI analysis

Notes: Percentage point (%) change in share of future potential business-as-usual (BAU) capex on new projects outside of a 1.65°C Paris-aligned scenario (SDS), 2021/2022 vs. 2019 assessments. Top 20 producers by market capitalisation from the S&P global oil index.

<sup>25</sup> We note that there are minor differences in modelling methodologies between assessments, as detailed in the appendices to the relevant reports

Figure 8 shows that many companies assessed have become less aligned over time in our modelling. Changes in modelled alignment can result from both changes in company portfolios (new discoveries, updated reserve estimates, project sanctions, mergers and acquisitions such as Oxy's acquisition of Anadarko in 2019), as well as changes to the IEA's scenarios. The relative alignment of companies in Figure 8 broadly reflects companies' actions – the North American companies have notably become less aligned to the greatest extent - whilst the worsening alignment of the industry at large reflects reducing demand in successive iterations of the SDS scenario.

### **Companies have become less aligned over time as the remaining carbon budget continues to shrink**

As the carbon budget has shrunk, demand has had to fall under the SDS scenario, meaning that fewer projects were required and portfolios became less aligned. Oil demand in 2040 for example fell by 7% between the 2018 WEO, used for the 2019 assessment, and the 2021 WEO. Gas demand in 2040 fell by 26% between the same WEOs.

Now under APS, the 'well below 2°C' scenario in the latest WEO, oil demand in 2040 is 12% higher than in SDS from 2021 whilst gas demand is similar, making many companies appear more Paris-aligned than they had been previously (compare yellow and orange bars in Figure 6). Unlike SDS however, APS requires net negative emissions to achieve its 1.7°C temperature outcome; and whereas SDS left the door open to 1.5°C, aligning with the current APS will make achieving 1.5°C a lot harder.

### 5.3 Recent unaligned investments

In the previous section we considered potential future projects of companies in production and capex terms, but it is also important to consider the alignment of recent investment decisions and to scrutinise upcoming projects. Table 3 below lists a selection of projects approved in 2021 and the early part of the 2022, held by companies in our universe, which we consider to be inconsistent with Paris.

**Table 3: The 15 largest upstream projects approved in 2021 and Q1 2022 that are incompatible with a Paris aligned scenario (1.7°C APS), projects incompatible with 2.5°C (STEPS) highlighted in blue**

Project/ Asset	Country	Approval Date	2021-2030 Capex (\$bn)	Production Start	Resource Theme	Ownership
Tilenga project	Uganda	2022	8.2	2026	Onshore, waxy oil	<b>TotalEnergies*</b> , CNOOC, Government of Uganda
Scarborough (Pluto LNG)	Australia	2021	6.3	2026	Deep water, gas	<b>Woodside*</b>
Pluto LNG T2	Australia	2021	5.4	2026	LNG Plant	<b>Woodside*</b> , Global Infrastructure Partners (GIP)
Yellowtail	Guyana	2022	5.3	2026	Ultra deep water, oil	<b>ExxonMobil*</b> , <b>Hess</b> , CNOOC
Barossa (Darwin LNG)	Australia	2021	4.1	2025	Deep water, gas	<b>Santos*</b> , SK Innovation, JERA
Mero 4	Brazil	2021	2.5	2025	Ultra deep water, oil	<b>Petrobras*</b> , <b>Shell</b> , <b>TotalEnergies</b> , CNOOC, <b>CNPC</b>
Kingfisher South	Uganda	2022	1.8	2026	Onshore, waxy oil	CNOOC*, <b>TotalEnergies</b> , Government of Uganda
Jerun (MLNG Satu)	Malaysia	2021	1.5	2024	Shallow water, gas	SapuraOMV*, Petronas, <b>Shell</b> , <b>OMV</b> , Sapura Energy
Leon	United States	2022	1.5	2025	Ultra deep water, oil	LLOG*, <b>Repsol</b> , Beacon Offshore Energy
Sanha Lean Gas (Angola LNG)	Angola	2021	1.1	2023	Shallow water, gas	<b>Chevron*</b> , Sonangol, <b>TotalEnergies</b> , <b>Eni</b>
Marine XII Fast LNG	Congo	2022	0.9	2023	Shallow water, gas	<b>Eni*</b> , Lukoil, SNPC (Congo)
Timi (MLNG Satu)	Malaysia	2021	0.8	2023	Shallow water, gas	<b>Shell*</b> , Petronas
Akacias Phase 2	Colombia	2021	0.6	2023	Onshore, heavy oil	<b>Ecopetrol*</b> , <b>Repsol</b>
Lavrans (6406/2-1) Phase 1	Norway	2022	0.6	2024	Deep water, gas	<b>Equinor*</b> , Petoro, Vaar Energi, <b>TotalEnergies</b>
Snohvit Phase 3 (Askeladd Vest)	Norway	2021	0.6	2024	Deep water (Arctic), gas	<b>Equinor*</b> , Petoro, <b>TotalEnergies</b> , Neptune Energy, Wintershall Dea

Source: Rystad Energy and CTI analysis

Notes: 15 largest upstream projects by capex (2022-2030) incompatible with a Paris-aligned 1.7°C scenario (IEA's APS) approved by companies within the S&P Global Oil Index between 1st Jan 2021 and 30th April 2022. A \$5/boe margin of error has been applied above the APS marginal breakeven for oil fields, and a \$1.5/kcf margin for gas. Onshore tight/shale excluded. Companies in the S&P Global Oil Index highlighted in bold. Projects incompatible with a 2.5°C scenario (IEA's STEPS) are shown in dark blue. \*Operator.



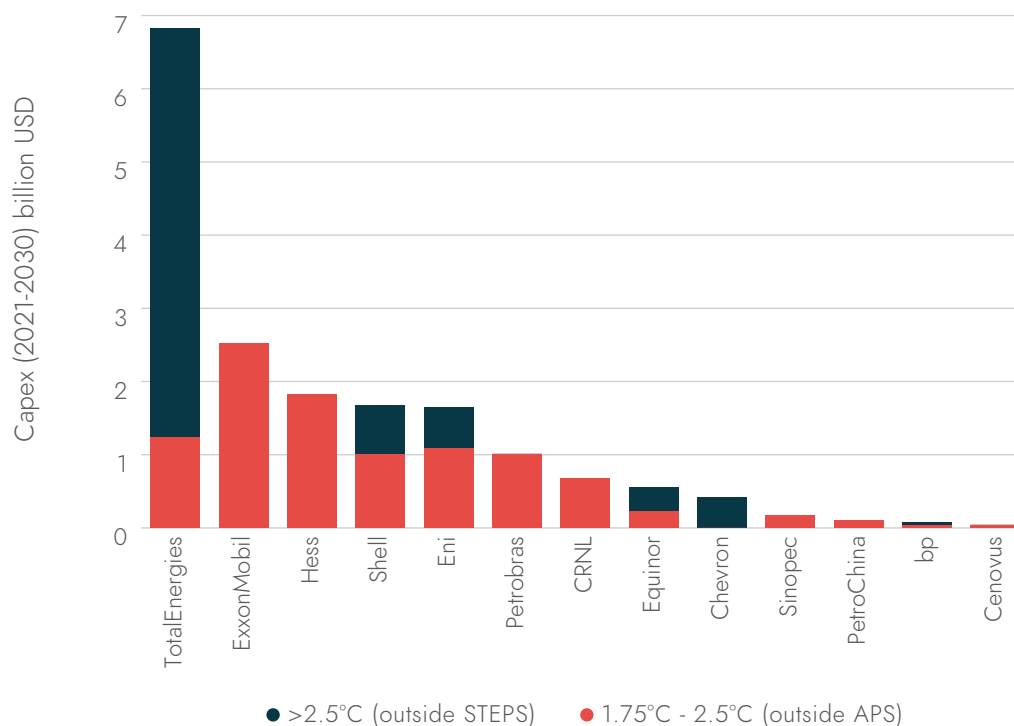
In 2022 the controversial<sup>26</sup> Lake Albert oil developments in Uganda – the **Tilenga** project operated by TotalEnergies and **Kingfisher South** operated by CNOOC - were approved. The projects will feed the East Africa Crude Oil Pipeline (**EACOP**), the world's longest heated pipeline, which is needed to transport the waxy crude to the Tanzanian coast for international export. The projects are expected to reach peak production in 2027 – around the time that oil demand is expected to fall rapidly in Paris-aligned scenarios. Our modelling shows them to be incompatible with even a 2.5°C scenario (STEPS), and with production anticipated to continue into the 2050s, the projects risk substantial carbon lock-in.

Woodside's giant **Scarborough** gas field offshore Western Australia, alongside the construction of a second train at the **Pluto LNG facility**, is an even larger investment. Our modelling shows Scarborough/Pluto T2 to be incompatible with a 2.5°C scenario (STEPS) and, as with the EACOP projects, risks carbon lock-in.

The **Yellowtail** asset offshore Guyana is another example of significant investment into a fossil fuel asset that falls outside of our Paris-aligned scenario (1.7°C APS). Operated by ExxonMobil, the project was sanctioned in April 2022 and is understood to require more than \$5bn investment this decade. The scale of the deep-water project necessitates a long economic production life that risks carbon lock-in, whilst a high breakeven price makes the project inconsistent with APS in our modelling.

To expand on Table 3 and illustrate the scale of unaligned capital, Figure 9 below shows future investments on all projects approved in 2021 and early 2022 that fall outside of a Paris-aligned scenario (1.7°C APS).

**Figure 9: Investments approved in 2021/early 2022 that are not Paris-aligned**



Source: IEA, Rystad Energy, CTI analysis

Notes: Capex (2021-2030) committed on new upstream oil & gas projects that were approved in 2021 or before May 2022, that are inconsistent with a Paris aligned 1.7°C (APS) scenario, billions USD. Top 20 producers by market capitalisation from the S&P global oil index.

The background is a grayscale photograph of an industrial plant with various towers, pipes, and smokestacks. A large plume of dark smoke rises from the facility into a cloudy sky. Overlaid on the upper half of the image are two large, bold, red numbers, '0' and '6', which are semi-transparent, allowing the background scene to be seen through them.

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# Investor Implications

Meeting the goals of the Paris agreement will require the phase out of fossil fuels and a rapid transition to a low-carbon energy system. Oil and gas companies will need to wind-down the legacy parts of their businesses, while choosing what to do with earnings that would historically have been reinvested in new production.

Whether they choose to return capital to investors or seek to re-invest in new business opportunities is up to shareholders to determine. Investment in new low-carbon businesses, although perhaps important to the survival of the company, does not in any way offset emissions from existing production, or somehow justify new investment into the system we need to leave behind: from the climate's perspective, what matters is the amount of greenhouse gases released into the atmosphere, which for an upstream oil & gas company is inextricably linked to its production.

While multiple additional metrics can be used to help assess company alignment – from emissions targets to remuneration policies and appropriate disclosure – company investment plans are a clear signal of corporate intent. The argument is clear-cut: companies cannot be considered climate-aligned if they are developing oil & gas fields inconsistent with investors' chosen climate scenario, with 1.5°C or a less ambitious interpretation of Paris goals.

Given we see that no oil and gas producers are aligned with "Net Zero" (1.5°C), investors seeking to align with this temperature outcome must either sell holdings in such companies, or meaningfully engage with companies to change strategy. Investors can use the implied production declines from the runoff of existing projects (Figure 4) to compare with disclosed company guidance on planned production to assess the degree of misalignment. The IEA's 1.5C Net Zero by 2050 scenario requires both a herculean role out of CCUS capacity and drastic cuts in production. Deploying CCUS and other NETs does not negate the need for production cuts.

Some companies - notably bp, Shell and Eni - have committed to reducing production and/or full-lifecycle emissions in absolute terms by the 2030s. Investors should support such companies in this but also hold them to their stated targets. Investors must also ensure that companies are achieving emission reductions in a credible way, without just selling assets to create "space" in production plans, or against emissions goals.

Alignment with the looser "well below 2°C" goal of the Paris agreement also requires oil & gas production to decline – with global oil demand under a 1.7°C (APS) scenario falling by 14% in 2035 compared to 2019. This does allow for some new developments, but our assessment of new project approvals in 2021/2022 shows that the majority were inconsistent with such a Paris-aligned scenario. Investors seeking to be Paris-aligned must press companies to demonstrate how any new oil and gas developments are compatible with a credible Paris scenario. Companies making significant investments in unaligned projects cannot be considered aligned with Paris.

Our assessment of potential future investment opportunities (Figure 6) provides a relative ranking of the degree of alignment of companies' portfolios – and we stress that these results should be read primarily in a relative sense – with in general the shale-focused companies being the least aligned.

Investors should also scrutinise companies' upcoming specific investment decisions, with Table 3 highlighting some of the largest projects approaching FIDs in 2023 that we assess to be unaligned with Paris. The approval of such projects should be challenged by investors, especially if made by companies presenting themselves as part of the solution on climate.



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Appendix

## 7.1 Supplementary company results

**Table 4: Unsanctioned capex (2022-2030) by IEA scenario – ranked alphabetically within SDS quartile**

SDS Quartile	Company	Unsanctioned upstream capex inconsistent with a 1.65°C (SDS*) budget, (% of STEPS)	Unsanctioned upstream capex inconsistent with a 1.7°C (APS) budget, (% of STEPS)	Unsanctioned upstream capex inconsistent with a 2.5°C (STEPS) budget, (% of STEPS)
1	Antero Resources	0-10%	0-10%	10-20%
1	Beach Energy Limited	0-10%	0-10%	>100%
1	EQT Corporation	0-10%	0-10%	>100%
1	Range Resources	0-10%	0-10%	70-80%
1	Sasol	0-10%	0-10%	0-10%
1	Southwestern Energy	0-10%	0-10%	>100%
1	Aker BP	0-10%	0-10%	20-30%
1	Tourmaline Oil	0-10%	0-10%	0-10%
1	Woodside	0-10%	0-10%	50-60%
1	Arc Resources	10-20%	10-20%	0-10%
1	Saudi Aramco	10-20%	0-10%	10-20%
1	OMV	10-20%	10-20%	80-90%
1	PetroChina	20-30%	10-20%	40-50%
2	Sinopec	20-30%	20-30%	40-50%
2	Coterra Energy	20-30%	0-10%	50-60%
2	Inpex	20-30%	20-30%	30-40%
2	BP	30-40%	20-30%	30-40%
2	Canadian Natural Resources (CNRL)	30-40%	0-10%	0-10%
2	Eni	30-40%	20-30%	30-40%
2	Whitecap Resources	30-40%	10-20%	30-40%
2	Shell	30-40%	20-30%	60-70%
2	Galp Energia SA	30-40%	30-40%	10-20%
2	Repsol	30-40%	10-20%	20-30%
2	Vermilion Energy	40-50%	20-30%	50-60%
2	TotalEnergies	40-50%	30-40%	40-50%
2	Petrobras	40-50%	30-40%	10-20%
3	Cenovus Energy	40-50%	10-20%	10-20%
3	Imperial Oil (Public traded part)	40-50%	10-20%	0-10%
3	Chevron	50-60%	20-30%	20-30%
3	Equinor	50-60%	30-40%	40-50%
3	Hess	50-60%	10-20%	20-30%
3	EOG Resources	50-60%	30-40%	0-10%
3	Pioneer Natural Resources	50-60%	10-20%	0-10%
3	Diamondback Energy	50-60%	20-30%	0-10%
3	PDC Energy	50-60%	40-50%	0-10%
3	CNX Resources Corporation	50-60%	50-60%	60-70%
3	APA Corporation	50-60%	40-50%	10-20%
3	Murphy Oil	50-60%	20-30%	70-80%
3	Devon Energy	50-60%	30-40%	0-10%
4	ExxonMobil	50-60%	20-30%	30-40%
4	Santos	50-60%	40-50%	50-60%
4	Matador Resources	60-70%	10-20%	10-20%
4	Suncor Energy	60-70%	10-20%	30-40%
4	Ecopetrol	60-70%	30-40%	60-70%
4	Marathon Oil	60-70%	50-60%	10-20%
4	ConocoPhillips	70-80%	60-70%	0-10%
4	Crescent Point Energy	70-80%	60-70%	0-10%
4	Occidental Petroleum	80-90%	70-80%	10-20%
4	Continental Resources	90-100%	30-40%	60-70%
4	Ovintiv	90-100%	40-50%	0-10%
4	Magnolia Oil & Gas	90-100%	90-100%	0-10%
4	Parex Resources	90-100%	90-100%	>100%

Note: \*SDS from WEO 2021

## 7.2 Methodology

The analysis in this report is based on the latest iteration of our *least cost modelling* of upstream oil & gas assets. The methodology is largely unchanged from recent reports in our *Two Degrees of Separation* series: *Breaking the Habit* (September 2019), *Fault Lines* (October 2020), and *Adapt to Survive* (September 2021).

The most detailed description can be found within the accompanying *methodology document* to *Breaking the Habit*. This appendix gives a summary of the key elements of the approach.

### 7.2.1 Data sources

#### Asset data

We use *Rystad Energy* as our primary source of asset-level upstream oil & gas data on a global basis. We then make minor adjustments to some of the data such as reclassifying regional gas markets to fit our methodology. This analysis is based on a data cut from the May 2022 update of Rystad Energy's Cube dataset.

#### Company data

Company-level data is supplemented with data from *Bloomberg*, which we use to define our universe of 52 companies. We have included all the companies from the E&P and Integrated segments of the S&P Global Oil Index as of 22nd August 2022. A notable change from last year's analysis is the exclusion of Russian oil & gas companies from the index. The charts in this report show the 20 companies from our universe based on market capitalisation as of 22nd August 2022.

#### Demand Scenarios

Oil & gas demand used to assess alignment in our modelling is taken from scenarios in the IEA's *World Energy Outlook 2022* extended dataset. In addition, we reference the Required Policy Scenario (RPS, 1.5°C) and the Forecast Policies Scenario (FPS, 1.8°C) from the UN's *Inevitable Policy Response* consortium.

### 7.2.2 Modelling

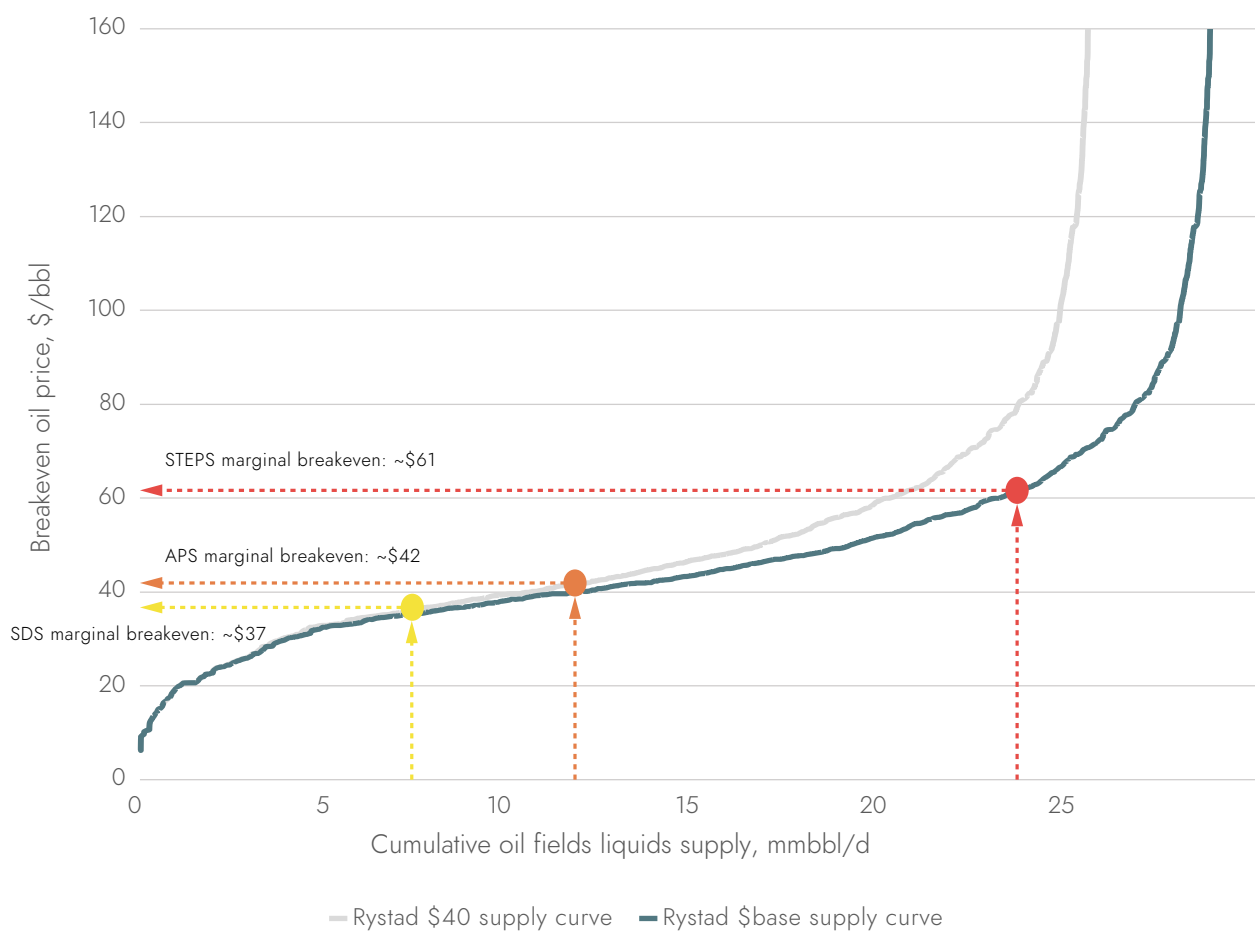
Our modelling approach is to balance supply and demand for both oil and liquefied natural gas (LNG) on a global basis, and for gas in four regional markets (Europe, North America, Russia, Australia) and the rest of the world. After supply from sanctioned oil and gas assets (those producing and under development) is accounted for, the remaining demand is satisfied by new projects using supply cost in oil/gas breakeven price terms to determine the merit order of each unsanctioned oil and gas asset. This is done on an aggregate 2022-2040 basis, using breakeven prices defined using a 15% IRR. The model includes both associated gas from oil fields supplying gas demand and natural gas liquids supplying oil demand, with the merit order of an asset based on its primary resource type.

The model then produces cut-off points for each scenario in the form of marginal breakeven prices, which delineate what we consider aligned or unaligned project options. These are shown in Table 5 below.

**Table 5: Indicative marginal breakeven prices at 15% IRR for unsanctioned oil fields under IEA scenarios**

Scenario	Approximate Marginal Breakeven oil price, \$/barrel
STEPS	61
APS	42
SDS	37
NZE	NA

As was introduced in last year's analysis *Adapt to Survive* (September 2021) we adjust our oil supply and corresponding capex assumptions based on the demand scenario used. This is because under a lower commodity price the ultimate recoverable reserves and production for a given field are lower as the end of its economic life is reached sooner (the point at which operational expenditure becomes greater than revenues from production). Capex is also reduced under lower price assumptions due to lower cost (e.g., rig rates) and fewer late-life interventions (e.g., well workovers). We therefore make use of Rystad Energy's production and capex data available under different price cases.

**Figure 10. Cumulative potential oil supply (2022-2040) from unsanctioned oil fields**

Source: IEA, Rystad Energy, CTI analysis

Note: Breakeven prices assume a 15% IRR.

STEPS is modelled using Rystad Energy's base case price assumptions (\$50/bbl long term, as of May 2022), whilst under APS and SDS we assume that oil fields produce at Rystad's \$40/bbl price case, the option that aligned best with the marginal break-even price (\$42 and \$37 respectively) output from our modelling. Using a lower price deck decreases the production volumes, which in turn increases the supply gap available for new fields leading to high marginal break-even and more assets aligned with the scenario. A caveat to this approach is that Rystad determines asset break-evens using its base case prices. Therefore, as in previous reports, we encourage readers to view the marginal break-evens that result from our analysis as indicative.

Gas fields are modelled at Rystad's base price case regardless of the scenario, based on our assumption that lower oil prices would not necessarily drive down gas production in a symmetrical fashion. Gas production is more dependent on regional demand dynamics, which cannot be adjusted in UCube; therefore, we take a conservative approach and assume they produce at "normal" levels.

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