

Zeroing In

A guide for the finance sector on the IEA's Net Zero Emissions scenario and its implications for oil and gas finance

**Briefing by Greenpeace,
the International Institute for
Sustainable Development (IISD)
and Oil Change International**
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Key messages

- **The IEA has published a scenario aligned with 1.5°C for the first time: financial actors should use this scenario as a new minimum standard for guiding decision-making, in place of other less ambitious scenarios.**
 - The IEA's Net Zero Emissions by 2050 scenario (NZE) is now one of three main scenarios included in the World Energy Outlook (WEO).
 - Full global data on NZE are available in the WEO, though regionally disaggregated data remain to be added in 2022.
- **Oil and gas production must decline by about 3-4% per year; this leaves no room for new oil or gas fields to be developed after 2021.**
 - The conclusion about ending new oil and gas field development is not a product of scenario design; it's the arithmetic of 1.5°C. Limiting emissions at this level requires global oil and gas use to fall 3-4% per year – including in IPCC scenarios – which is roughly equal to the expected decline of production from existing fields.
 - The only 1.5°C scenarios that require new oil and gas fields rely on future deployment of carbon dioxide removal (CDR) or carbon capture and storage (CCS) technologies to a greater extent than is plausible.
 - If anything, the IEA's conclusion may be a conservative one. The NZE scenario itself relies on extremely rapid growth in CCS, breaking with current trends. If we are more cautious about the likelihood of very large-scale CCS or CDR, or if we aim for a greater than 50% probability of limiting warming to 1.5°C, some existing fields will have to close early.
- **All sectors must rapidly decarbonise.**
 - Limiting warming to 1.5°C requires a transformation of the energy system, not just incremental emissions reductions. This has implications across investment portfolios, including rapid decarbonisation in power, vehicle manufacture, buildings and heavy industry.
 - Conversely, NZE indicates a market exceeding USD 1 trillion per year by 2050 – comparable to today's global oil market – in wind turbines, solar panels, lithium-ion batteries, electrolysers and fuel cells.
- **The financial sector can play an essential role in ensuring oil and gas company investments are aligned with the Paris goals.**
 - The NZE is a vital tool for financial institutions to assess alignment of their portfolios with the Paris goals, and the transition risks they face. We suggest some topics financial actors can ask investees and borrowers about to judge their alignment.
 - Financial actors should consider incorporating the issue of new oil and gas licences and development into their public policy work on climate change; and support calls on governments to cease issuing new licences and approvals for extraction projects.

Introduction

The International Energy Agency's (IEA's) new Net Zero Emissions by 2050 (NZE) scenario, published in May 2021 and incorporated in the **World Energy Outlook** published in October, sparked wide debate on the future of oil and gas.¹ It made headlines with the finding that oil and gas in already-producing or under-development fields will be sufficient to meet demand in a world that limits warming to 1.5 degrees Celsius (°C): there is no need for any new oil or gas fields to be developed after 2021.

This briefing aims to give financial institutions an overview of the new scenario and what it means for corporate, investor and lender capital allocation decisions and engagement, especially in oil and gas.

Box 1: Limiting warming to 1.5°C requires transformation of energy systems, on an urgent timescale

The world has so far warmed by about 1.1°C since pre-industrial times.² This is already causing grave impacts on human lives, natural systems and economies. In the last year alone, we have seen unprecedented temperature extremes such as the polar vortex in Texas and the heat dome in western Canada; catastrophic floods in Indonesia, northern Europe, China and British Columbia. There are indications the crisis may be spinning out of control, with releases of methane from Siberian permafrost,³ and parts of the Amazon rainforest becoming a carbon source rather than sink.⁴

It is now widely agreed that warming should be limited to 1.5°C to avoid extreme dangers of climate change, as scientific evidence has shown that the dangers at 2°C of warming (once considered a guardrail) are more severe than previously thought.⁵

To limit warming to 1.5°C requires CO₂ emissions to be reduced by 45% by 2030 (compared to 2010 levels), and to reach net zero by around 2050.⁶ Meanwhile, the carbon budget for a 50% probability of limiting warming to 1.5°C is just 460 Gt of carbon dioxide (CO₂) as at the start of 2021, equivalent to just 11.5 years of annual emissions.⁷ In other words, unless global emissions start to decrease, the budget will be fully exhausted by 2032.

This rapid change requires transformation of energy systems, and cannot physically be achieved only by incremental emissions reduction such as process efficiencies, nor by focusing on one aspect of the energy system (such as coal power). It requires a fundamental shift away from fossil fuels and in favour of electrification, renewables and other clean energy.⁸

Finance sector calls for a 1.5°C scenario

The importance of the Paris Agreement's goal of limiting warming to 1.5°C was further underlined by the publication of the Working Group I report of IPCC's **Sixth Assessment Report** in August 2021, which warned that while human-induced climate change is already affecting weather and climate extremes, there will be increasing incidence of unprecedented extreme events even at warming of 1.5°C, and these extremes will get worse for every additional fraction of a degree of warming.⁹ For example, concurrent extremes of heatwaves and drought will be more frequent at 2°C than 1.5°C, including in crop-producing areas.¹⁰

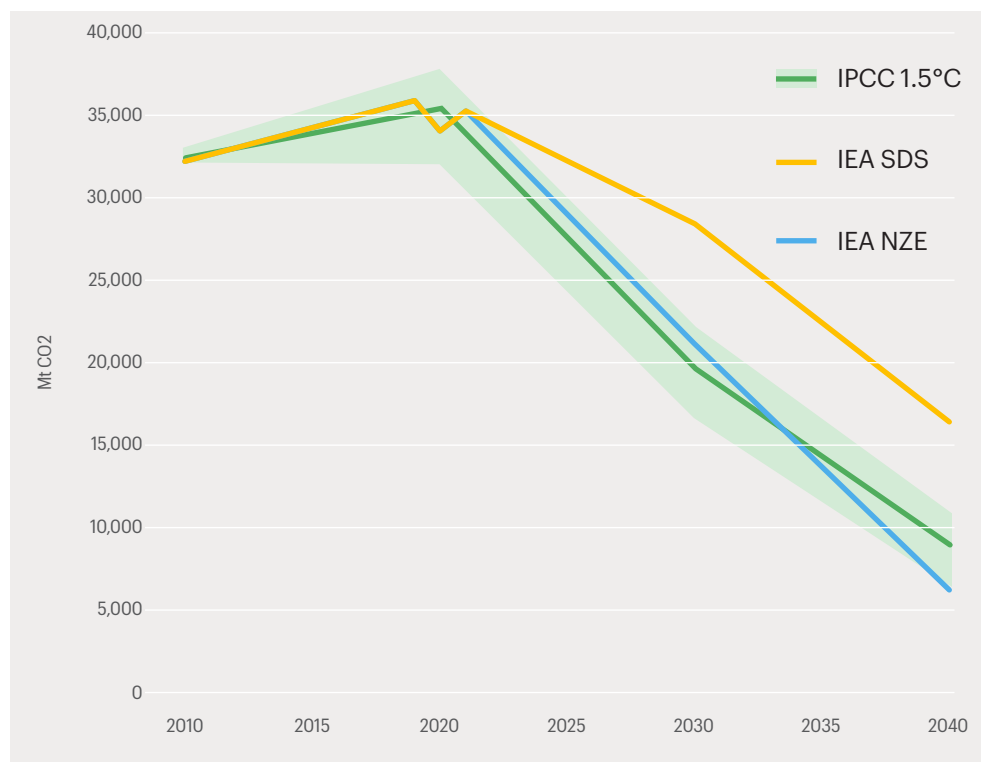
Investment decisions are increasingly shaped by the use of scenarios, especially in relation to the uncertainties of the energy transition in response to climate change. Through initiatives such as Climate Action 100+ and following the recommendations of the Task Force on Climate-Related Financial Disclosures (TCFD), financial institutions use scenarios to test the robustness of their portfolios against a range of possible futures. Since 2020, many financial firms have announced “net-zero by 2050 or sooner” ambitions and high-level commitments to align financing practices with the Paris Agreement.

However, there has been a shortage of user-friendly scenarios aligned with 1.5°C. One of the most influential projections of future trends in energy systems is in the IEA's annual **World Energy Outlook**. It is popular because it presents data in a form that is readily digestible for use in policy and investment decisions. Over recent years, numerous investors and investor groups have asked the IEA to publish a scenario aligned with the 1.5°C temperature limit, and were a key influence on the IEA's decision to do so.¹¹ Until the NZE, the IEA did not publish any scenarios aligned with the ambition of the Paris goals, and so the World Energy Outlook misdirected energy investments and policies.

Until publication of the NZE, the IEA's previous climate scenario, known as the Sustainable Development Scenario (SDS), was designed to align with the upper limit of the Paris goals: keeping warming well below 2°C. Figure 1 compares carbon dioxide (CO₂) emissions in the NZE and SDS with 1.5°C scenarios published by the IPCC. As can be seen, the emissions trajectory of the SDS does not match what is needed to meet the 1.5°C ambition, but the NZE's does (with a 50% probability of limiting warming to 1.5°C). That is not to say that the NZE is without flaws – like the SDS, it relies on some questionable assumptions (on which more below) – but rather that its ambition is correctly aligned.

Figure 1: CO2 emissions from energy and industrial processes under IEA NZE and SDS compared to IPCC 1.5°C scenarios

(green line is median, shaded area is interquartile range of IPCC low-overshoot scenarios)



Sources: IAMC/IIASA database of IPCC scenarios,¹² IEA.¹³

Furthermore, in contrast to some previous editions of the **WEO** where more ambitious scenarios were sidelined, the NZE is one of the main scenarios in **WEO 2021** (see Box 2). However, the data tables in this edition of the **WEO** include the NZE only at the global level; we understand that the IEA needs more time to develop the scenario in order to give full data disaggregated by region.



Until the NZE, the IEA did not publish any scenarios aligned with the ambition of the Paris goals, and so the World Energy Outlook misdirected energy investments and policies.

Recommendations for financial institutions:

- **Use the NZE scenario as a new floor for ambition to underpin climate strategies, to assess transition risk and portfolio alignment with the Paris Agreement, and end any usage of non-Paris aligned scenarios such as the SDS.¹**
- **Continue to engage with the IEA:**
 - Welcome the publication of the NZE scenario, and encourage the IEA to make regional NZE data available as soon as possible.

¹ Note that the NZE scenario gives a 50% probability of limiting warming to 1.5°C; given the dangerous climate change expected at that level, the NZE should therefore be considered a floor for ambition, not a ceiling.

Box 2: Scenarios in the World Energy Outlook 2021

Previous editions of the **World Energy Outlook (WEO)** focused primarily on the Stated Policies Scenario (STEPS),^{II} a business-as-usual scenario based on the existing policy landscape (as well as specific policies that governments are currently developing), i.e. assuming no further climate policy. This scenario leads to warming of around 2.6°C in 2100.¹⁴ Those editions also included a secondary Sustainable Development Scenario (SDS), which aimed to keep warming well below 2°C as well as achieving the other energy-related sustainable development goals.¹⁵

WEO 2021 changes this structure, presenting three equally-prominent scenarios:¹⁶

- **STEPS reflects the current policy situation;**
- **The Announced Pledges Scenario (APS) assumes governments meet all their climate pledges including their Nationally Determined Contributions (mostly 2030 pledges) and net-zero targets (mid-century); this would limit 2100 warming to 2.1°C.¹⁷**
- **The Net Zero Emissions by 2050 Scenario (NZE) aims to reduce CO₂ emissions from the global energy system to net zero by 2050, to achieve the energy-related Sustainable Development Goals by 2030, and to keep cumulative net CO₂ emissions within the carbon budget for a 50% probability of keeping warming below 1.5°C.¹⁸**

Much of the **WEO** examines the gaps between these scenarios: the **implementation gap** between STEPS and APS (i.e. where governments have not yet designed or announced policies to implement the ambition expressed in their pledges) and the **ambition gap** between APS and NZE (i.e. where governments' pledges are insufficient to meet the 1.5°C goal).¹⁹ The ambition gap is the larger of the two: the APS closes only 20% of the gap in 2030 between STEPS and NZE.²⁰

No new oil and gas development

The headline finding of the IEA's NZE scenario is that no new oil or gas fields are needed, beyond those already producing or under development. While some have attempted to avoid this conclusion by downplaying the applicability of NZE,²¹ the conclusion in fact flows from simple arithmetic, in the context of climate urgency (see Box 1).

Oil and gas fields commonly produce for 15 or 20 years, and in some cases more. Over their life, fields' rates of production decline as extraction reduces reservoir pressures, even with ongoing investment in those fields. For conventional fields, this decline is generally around 4% per year.²² Historically the oil and gas industry has continually developed new fields in order to sustain and grow total production.

Meanwhile, limiting warming to 1.5°C requires a similar rate of reduction of oil and gas consumption. In the NZE scenario, oil consumption falls on average by 3.5% per year between 2025 and 2030, and gas consumption by 2.6%; this decline then accelerates respectively to 5.4% and 5.3% per year between 2030 and 2040.²³ This is the reason the IEA concludes that no new fields are needed: in a 1.5°C world, oil and gas consumption will decline at roughly the same rate as production from existing fields.^{III} The IEA adds that the decline rate of existing fields can be managed and moderated with some continued investment in those fields, which is a less expensive and less risky strategy compared to sinking large amounts of capital into developing new fields.

This rate of decline is seen in other 1.5°C scenarios. For example, the **Production Gap Report** – co-published by Stockholm Environment Institute, IISD, the UN Environment Programme and others – finds that in IPCC 1.5°C scenarios, global oil production declines by a median of 4% and gas production by 3% annually between 2020 and 2030.²⁴ Again, this matches the expected

II STEPS was previously known as the New Policies Scenario (NPS), renamed in 2019.

III From 2021 to 2025, the NZE scenario sees slower decline than this in oil use: this demand is met by production coming onstream from under-development fields. Gas use increases until 2025 in the NZE: in this case, in addition to the under-development fields, additional wells are drilled in existing shale plays, and reduction of methane venting and flaring provides more for marketing. Both oil and gas production go into regular decline after 2025.

decline from existing fields. One cannot avoid the conclusion that there is no need to develop new oil and gas fields by referring to other 1.5°C scenarios, as some have hoped to do:²⁵ the conclusion that there is no room for new oil and gas fields to be developed follows from the arithmetic of 1.5°C, not from modelling choices. The difference with the IEA is that it aims to guide policy and investment decisions, and so explicitly spells out these implications.

Figure 2 shows oil consumption in IPCC scenarios and in the NZE, compared with production from existing fields (projected by Rystad Energy).

The NZE considers “existing” fields to be both already-producing fields and under-development fields that have received a final investment decision (FID) before the end of 2021. The 2021 date is an artefact of the modelling process: the IEA designed the scenario so as to minimise the stranding of upstream production assets, e.g. to avoid early closure of fields where significant capital has already been invested.²⁹ This is why it selected that cut-off date for defining “existing” fields that ‘fit’ in the scenario. Thus, fields that received a FID in 2021 or earlier are not necessarily aligned with

1.5°C – that depends on assumptions about future deployment of carbon capture and storage and negative emissions measures (see below).

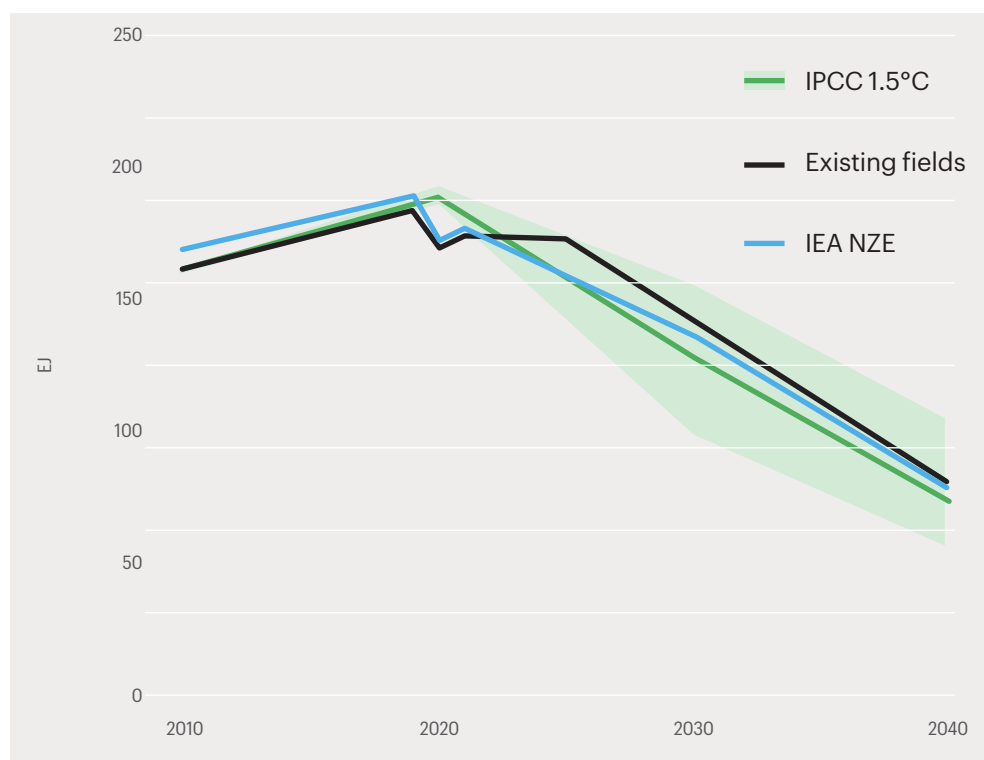
The NZE scenario does not entail an end to capital investment in existing oil and gas fields, such as drilling of additional wells or maintenance and improvement of production equipment; however, with less risky scenario assumptions, some of the capital investment in existing fields would be affected too.

If existing fields received no capital investment, their production rates would decline faster, at around 8-9% per year.³⁰ The reason for the focus on new fields is that the IEA aimed to design a scenario that minimises the stranding of assets. Since the largest portion of capital is invested in the initial development of a field, ending the development of new fields (rather than reducing the production from existing ones) will lead to less stranding of assets.

Another way to consider the climate mitigation challenge is through a carbon budget, or the maximum cumulative CO2 emissions that can be emitted while staying below a given temperature

Figure 2: Oil consumption under IEA NZE scenario and IPCC 1.5°C scenarios compared to production from producing and under-development fields

(green line is median, shaded area is interquartile range of IPCC low-overshoot scenarios)



Sources: Sources: IAMC/IIASA database of IPCC scenarios,²⁶ IEA,²⁷ Rystad Energy.²⁸

limit. Looked at this way, we can again see why the IEA's conclusion inevitably flows from the urgency of the climate situation. Analysis by Oil Change International, using Rystad Energy's UCube database/model, shows that if the world's already-producing and under-development oil and gas fields are operated for their full economic life, the resulting CO₂ emissions from the oil and gas will be more than 500 Gt,³¹ exhausting the 1.5°C carbon budget of 460 Gt even before we consider emissions from coal and other sources. This implies that no new fields can be developed in a 1.5°C world, and in fact (when we consider coal) some existing fields must be closed before the end of their economic life.³² The reason the IEA's NZE scenario reaches a less strong conclusion is that it assumes a large portion of the emissions from existing fields will be captured and stored (see below).

Similarly, a recent study in **Nature** found that nearly 60% of global oil and gas reserves and 90% of coal reserves must remain unextracted by 2050 to limit warming to 1.5°C.³³

BOX 3: Energy prices in the transition

Oil and gas markets are highly sensitive to the balance of supply and demand. At the time of writing, the world is experiencing a period of high oil and gas prices, caused in large part by demand recovering more quickly than supply following the Covid-19 disruptions.

The IEA points out that restricting supply while allowing demand to grow would also lead to price spikes. But conversely, “actions on the supply side remain crucial to orderly and rapid energy transitions. Over-investment creates the risk of underutilised, unprofitable or stranded assets, putting greater financial pressure on producing countries and companies alike.”³⁴ In short, decarbonisation requires action on both sides of the energy system.

The inherent volatility of oil and gas markets means that price fluctuations should be expected whether or not there is an energy transition: in fact, the best way to reduce economic and social vulnerability to these fluctuations is to reduce the share of oil and gas in the energy system.³⁵

Implications for oil and gas investment

Taking into account the findings of the NZE and other scenarios, development of new oil and gas fields can logically have only two effects. Either the additional oil and gas will find a market, increasing emissions and making it harder to limit warming to 1.5°C and leading to more extreme climate impacts. Or if governments overcome the inertia of carbon lock-in³⁶ and succeed in limiting emissions consistent with 1.5°C, many oil and gas production assets will have to close early, stranding assets and wasting capital.³⁷ It is also possible for both of these to occur simultaneously: climate policy could drive a demand reduction that leads to low prices and investment losses, but is not sufficient to constrain fossil fuel emissions within the 1.5°C carbon budget. To avoid these twin risks, a wise course would be to develop no more oil and gas fields, limiting both the further lock-in of pollution and stranded assets.

While the IEA NZE scenario sees no new oil or gas fields developed in a 1.5°C world, existing fields face transition risk even if no new fields are developed. The IEA notes that “the NZE projects significant stranded capital and stranded value”, because the supply/demand balance drives a lower oil price in the NZE scenario compared to recent history and compared to expectations at the time many fields were developed.³⁸ The NZE projects oil prices of USD 35/barrel in 2030, and USD 28/barrel in 2040.³⁹



Reducing the available pool of finance, expertise and institutional capacity to fossil fuel production will necessarily contribute to the process of decarbonising the economy

The more new fields get developed, the greater these transition risks become, for **all** oil and gas investments (not just new ones). If new fields are developed whilst demand is limited in line with 1.5°C, the effect of additional supply will be to drive down the oil price, with the greatest impacts on the returns of the costliest projects.⁴⁰

Some financial actors or even oil companies might ask whether adjusting their portfolio in line with the Paris goals can make a difference, or whether a competitor might simply step up to replace their fossil fuel activities. The answer is that this “carbon leakage” effect is at most only partial.^{IV} In some circumstances, studies have found that reducing oil and gas supply is a more effective way to reduce global CO2 emissions (when taking leakage into account) than reducing demand by an equivalent amount.⁴¹ Put more simply, reducing the available pool of finance, expertise and institutional capacity to fossil fuel production will necessarily contribute to the process of decarbonising the economy, whereas continued investment in fossil fuels will necessarily make reducing emissions harder. In any case, the possibility of carbon leakage does not mitigate the financial risks from investing in fossil fuels in a time of energy transition: there is both an ethical and a self-interested argument for aligning portfolios with the Paris goals.

One particular dimension of this “leakage” question relates to production by state-owned national oil companies (NOCs). Only a few NOCs have management, technical or investment capacities comparable to those of investor-owned international oil companies (IOCs), so in most countries, reduced production by IOCs would reduce overall production. Furthermore, while climate advocacy to date has focused more on IOCs, advocates are now turning their attention also to production by NOCs.⁴²

Recommendations for financial institutions:

- **Develop a 1.5°C-aligned fossil fuel finance phase-out and transition policy.**
- **Refrain from providing or arranging financial services for projects and other activities which are incompatible with the NZE, including development of new oil and gas fields.**⁴³

- **Phase out financing to companies that are still developing new oil and gas fields or undertaking other activities that are incompatible with the NZE; require oil and gas clients to produce a credible 1.5 degree transition strategy including at least a 3-4% annual rate of decline of oil and gas production.**
- **Engage with investees, borrowers, and other client companies about their alignment with the NZE, including on oil price assumptions, reliance on CDR or CCS (below), phaseout timelines and lobbying activities.**

Implications for oil and gas policy

In light of the science indicating no room for development of new oil and gas fields, there is an emerging policy trend towards ending the issuing of new licenses to explore for and extract oil and gas. In December 2020, Denmark – a modest North Sea producer producing around 100,000 barrels per day⁴⁴ – became the largest producer so far to end new licensing, joining Costa Rica, Belize, France, New Zealand (offshore), Spain, Portugal and Ireland. In April 2021, the state of California – which produces 360,000 barrels per day⁴⁵ – announced that it would end production by 2045.⁴⁶ And at COP26 in November, eleven governments formed the Beyond Oil and Gas Alliance, calling on other governments to join them in ending new concessions, licensing or leasing rounds and in setting end dates for oil and gas production in their territories.⁴⁷

Even ending licensing falls short of the IEA recommendation, as it still allows already-licensed fields to be explored and developed. But it is an important lever in the hands of governments, and a strong step towards climate compatibility. Furthermore, if governments go further and end new development within existing licenses - which is necessary to limit warming to 1.5°C - they could face compensation claims from companies under investment treaties such as the Energy Charter Treaty. Governments will need to find a way to ensure climate policies are not undermined or frustrated by such investment treaties.⁴⁸

IV in technical terms, the extent of leakage depends on the relative price elasticities of supply and demand

Unfortunately, most governments continue to expand oil and gas production, including awarding new licenses, with the result that collectively governments' plans for oil production in 2030 exceed what would be aligned with 1.5°C by 57% and for gas production by 71%.⁴⁹ In the UK, for example, the government indicated that it intended to approve the development of the major new Cambo oilfield west of Shetland (although that project has now been put on hold by the companies involved,) and in spring 2021 the UK decided not to end new licensing,⁵⁰ subject to a still incomplete "climate compatibility checkpoint".⁵¹

As stated above, continued licensing presents twin risks of stranded capital and unsafe levels of global warming. Financial institutions should, in addition to engaging with companies, support policy efforts geared towards ending oil and gas expansion.

Recommendation for financial institutions

- **Financial institutions should, in addition to engaging with companies, incorporate the issue of new oil and gas licences into public policy work on climate change; and support calls for an end to licences and for national and subnational governments to join the Beyond Oil and Gas Alliance.**



In the Beyond Oil and Gas Alliance, governments commit to ending new licensing rounds and setting end dates for oil and gas production in their territories.

The role of carbon capture and storage

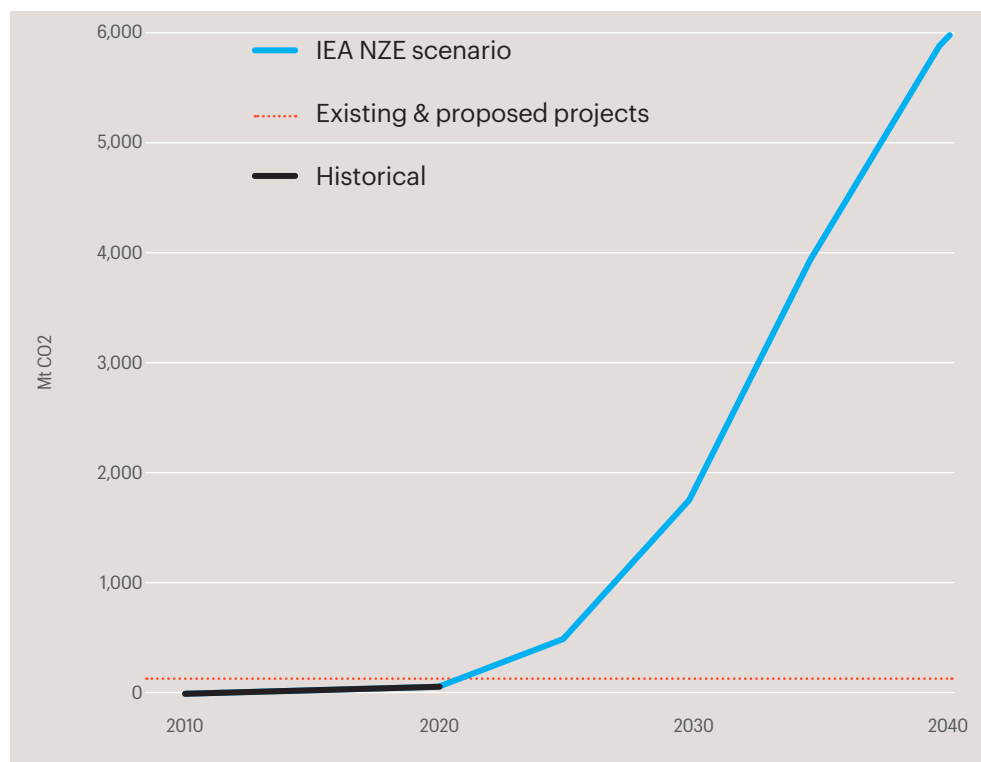
One respect in which climate scenarios differ is in their degree of reliance on carbon dioxide removal (CDR, also known as negative emissions). Scenarios with significant CDR permit greater CO₂ emissions in the near term, by assuming CO₂ will later be removed from the atmosphere. However, the IPCC has said "CDR deployed at scale is unproven, and reliance on [CDR] is a major risk in the ability to limit warming to 1.5°C."⁵²

Financial institutions are increasingly cautious about over-reliance on CDR. Climate Action 100+ "is of the view that the use of offsetting or carbon credits should be avoided and limited, if applied at all".⁵³ Banks joining the Net Zero Banking Alliance commit to "use decarbonisation scenarios which: are from credible and well-recognised sources; are no/low overshoot; rely conservatively on negative emissions technologies; and to the extent possible, minimise misalignment with other Sustainable Development Goals."⁵⁴

In fact, the only way to make continued development of new oil and gas fields consistent with 1.5°C is by trying to offset it with implausibly large future reliance on CDR. For example, Shell's Sky 1.5 scenario sustains significant oil and gas demand, remaining above present levels until 2050, by relying on 12 Gt / year of CO₂ removal by new forests in 2060 (more than three times the IPCC's estimate of maximum sustainable potential in 2050), with global CO₂ emissions considerably higher than all IPCC scenarios.⁵⁵

The NZE scenario entails a smaller amount of CDR than some other scenarios. Unlike some others, the NZE does not rely on forests to offset energy emissions: in the NZE, the energy sector achieves net zero emissions on its own. Furthermore, the NZE's use of bioenergy with carbon capture and storage (BECCS) – 1.4 Gt of CO₂ removed from the atmosphere by BECCS in 2050⁵⁶ – is within the IPCC's range of estimates of maximum sustainable potential of between 0.5 and 5 Gt. This means the NZE's use of BECCS is not implausible, though this level of deployment still remains far from certain. The NZE's reliance on direct air capture and storage (DACCS), at nearly 1 Gt of CO₂ in 2050, is similarly lower than some other scenarios, although also a risky bet, given that DAC is unproven at scale, and is expected to remain very costly.

Figure 3: Global carbon capture and storage, historical, proposed and projected in NZE scenario:



Sources: Global CCS Institute;⁶¹ IEA⁶²

Another technology that the industry often promotes to prolong the life of fossil fuels is carbon capture and storage (CCS) on fossil fuel and industrial plants, to prevent most of their CO₂ emissions^V from entering the atmosphere (rather than later removing them when CCS is applied to bioenergy combustion or direct air capture). CCS in this context does not address the CO₂, methane, and other air pollutants caused by extracting and transporting fossil fuels. While the NZE's reliance on CDR is fairly modest compared to other scenarios, it uses fossil CCS to a very bold extent.

In addition to 2.4 Gt of CO₂ removed from the atmosphere by BECCS and DACCS, the NZE scenario sees 5.2 Gt of CO₂ captured from fossil fuels and industrial processes in 2050. In a combination of these uses, the NZE sees CCS deployed rapidly to capture 1.7 Gt / year of CO₂ by 2030 and 7.6 Gt by 2050.⁵⁷ To deliver 1.7 Gt would require 800 CCS plants, building two plants every week between now and 2030. After 30 years of attempts to commercialize CCS, its costs

have remained high compared to expectations,⁵⁸ and there are only 27 commercial-scale plants in existence worldwide, with capacity to capture 40 Mt/year. Even adding all current early-stage proposals for CCS projects would take total global capacity only to 150 Mt/year,⁵⁹ less than 9% of the IEA's proposed 2030 capture rate (Figure 3). While CCS may be needed in some hard-to-abate sectors, the IEA's NZE scenario applies it in a broad range of uses where renewables are cheaper and more effective, with the effect of preserving fossil fuel use where it is not the most efficient option such as in power generation.⁶⁰

The IEA itself notes that the amount of CCS is one of the largest uncertainties in the scenario.⁶³ It also indicates that relying on this potentially infeasible scale-up of CCS is not necessary. The IEA's report includes an alternate Low-CCS case, in which no new fossil fuel-based CCS capacity is added above current levels. Greater investment in rapid electrification of end-use sectors using clean energy sources leads to faster direct reductions in fossil fuel emissions. Again, avoiding the uncertainties related to CCS would require a faster phase-out of fossil fuels, including early closure of some existing oil and gas fields. Unfortunately, the IEA does not publish full data on this Low-CCS scenario.

^V CCS plants commonly capture 80-90% of CO₂ emissions from a waste gas stream

More broadly, the IEA notes that nearly half of the emission reductions in 2050 rely on technologies that are currently only in the demonstration or prototype phase, including process technologies for some heavy industries, advanced batteries for trucks and electrolyzers for green hydrogen, as well as CCS and CDR.⁶⁴

However, there is an important distinction here between **disruptive technologies** and **sustaining technologies**, both of which appear in the NZE. Disruptive technologies such as renewables, batteries and green hydrogen fundamentally change the mechanisms of production, and likely the landscape of companies and institutions involved in it. Sustaining technologies such as CCS and CDR aim to mitigate climate change while helping to preserve the status quo.

There is a significant danger in over-reliance on sustaining technologies, as their future promise can lead to excessive emissions in the near term (sometimes called mitigation deterrence or moral hazard). Whereas if the rollout of disruptive technologies disappoints, it does not mean that the 1.5°C target cannot be achieved, but rather that some aspects of the pathway will have to be different. Sustaining technologies may also prove less likely to be delivered, as they generally incur an additional cost compared to status quo production (e.g. a coal plant with CCS is more expensive than a coal plant without), whereas disruptive technologies function according to their own economics, and if successful may out-compete the status quo.

The IEA appears to have a selective-optimism bias between these two types of technologies: it assumes optimistically that CCS deployment will increase faster than past experience and costs suggests, while assuming pessimistically that renewable energy deployment will increase more slowly than past experience.⁶⁵ In short, the NZE scenario is, if anything, conservative on the pace of fossil fuel phase-out: a more even spread of optimism between sustaining and disruptive technologies would lead to faster reductions in fossil fuel use.

Recommendations for financial institutions

- **Engage with investees, borrowers and other client companies about the extent to which the company is relying on offsetting through CDR (through forests or new technologies) rather than absolute emissions cuts, and how robust does it judge this reliance based on the science.**
- **Ask the IEA to give more data on the low-CCS case, to indicate the implications of less optimism about sustaining technologies.**



The NZE scenario is, if anything, conservative on the pace of fossil fuel phase-out: less heavy reliance on carbon capture and storage would require faster reductions in fossil fuel use.

Figure 4: Implications of IEA NZE scenario in sectors beyond oil and gas

The NZE scenario – and other 1.5°C scenarios with low or moderate reliance on CDR – has particularly striking implications for oil and gas investments, as outlined above. Some implications for other sectors are outlined in Figure 4 below: these indicate that greater ambition is needed by both financial institutions and policymakers than currently exists. Note that the timelines mostly relate to the global picture: in many respects, developed countries will be expected to move faster than this.⁶⁶



Utilities / power generation

- From 2021, no new unabated coal plants are built.
- Unabated coal plants are closed by 2030 in advanced economies / by 2040 elsewhere.
- Electricity generation is net-zero by 2035 in advanced economies / by 2040 elsewhere.



Property / buildings

- From 2025, there are no new sales of fossil fuel boilers.
- From 2030, all new buildings are zero-carbon ready.
- 50% of existing buildings have been retro fitted to be zero-carbon ready by 2040, and 85% by 2050.



Vehicle manufacture

- By 2030, 60% of global car sales are electric.
- From 2035, no more internal combustion engine (ICE) cars sold.
- By 2035, 50% of heavy truck sales are electric.



Heavy industry

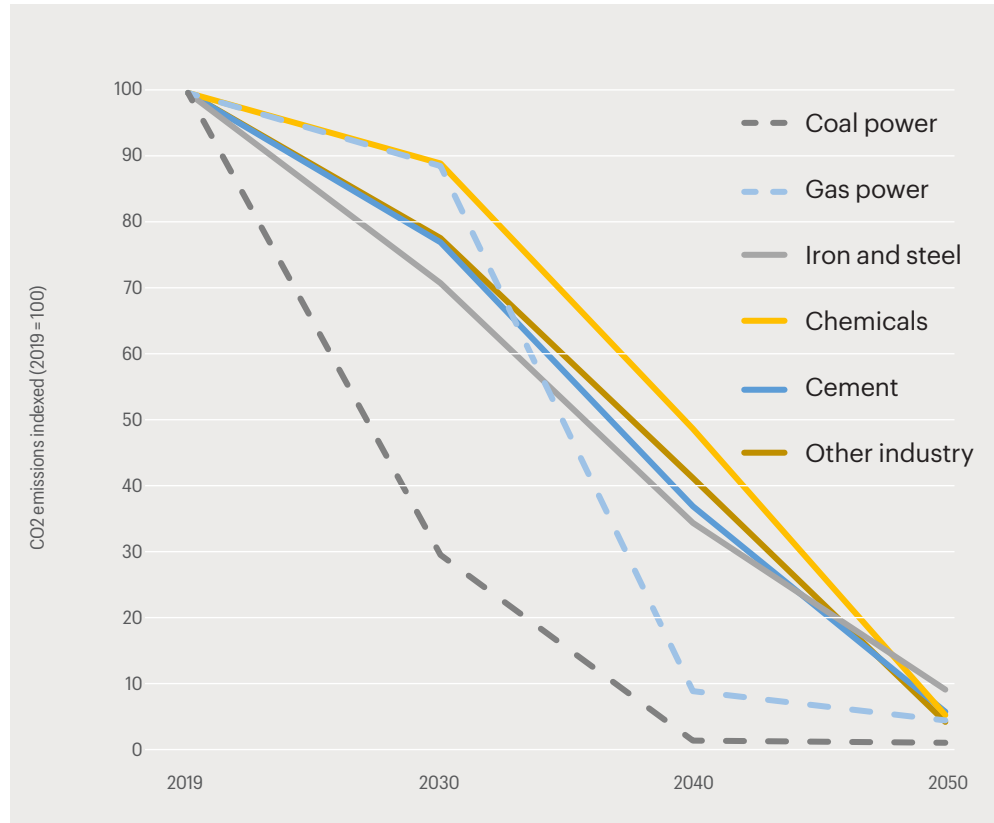
- CO2 emissions from heavy industry decline by 20% by 2030 and 93% by 2050.
- By 2050, 90% of heavy industrial production is low emissions.

Sources: IEA, *Net Zero Emissions by 2050*

Since new capital equipment tends to have an economic life beyond the dates specified, new investments in long-lived facilities must be mostly low-carbon: in power and transport almost all investments, and in heavy industry an increasing share of investments over the next decade. Investors may want to discuss with companies their allocation of corporate capital to enable alignment with these timelines.

Figure 5: Emissions (indexed) in NZE scenario, selected sectors

Conversely, the NZE scenario indicates huge investment opportunities in clean energy, with a market exceeding USD 1 trillion per year by 2050 – comparable to today’s global oil market – in wind turbines, solar lithium-ion batteries, electrolyzers and fuel cells. As the IEA notes, “this creates enormous prospects for companies that are well positioned along an expanding set of global supply chains”.⁶⁷



Recommendations for financial institutions

- **The NZE presents an important tool for financial actors to understand the energy transition and to assess companies' strategies. We recommend that investors and banks:**
 - Use the NZE scenario as a minimum standard to underpin their climate strategies and to assess transition risk and portfolio alignment with the Paris Agreement, and end any usage of non-Paris aligned scenarios such as the SDS.
- **Note that the NZE scenario gives a 50% probability of limiting warming to 1.5°C; given the dangerous climate change expected at that level, and the NZE's heavy reliance on CCS, the NZE should be considered a floor for ambition, not a ceiling.**
- **Develop a 1.5°C-aligned fossil fuel finance phase-out and transition policy.**
- **Refrain from providing or arranging financial services for projects and other activities which are incompatible with the NZE, including development of new oil and gas fields.⁶⁸**
- **Phase out financial services to companies that are still developing new oil and gas fields and undertaking other activities that are incompatible with 1.5°C; require oil and gas clients to produce a credible 1.5°C transition strategy including at least a 3-4% annual rate of decline of oil and gas production.**
- **Engage with investees, borrowers, and other client companies about their alignment with the NZE, including on oil price assumptions, reliance on CDR or CCS, phaseout timelines and lobbying activities.**
- **Continue to engage with the IEA:**
 - Welcome the publication of the NZE scenario, and encourage the IEA to make regional NZE data available as soon as possible.
 - Ask the IEA to give more data on the low-CCS case, to indicate the implications of less optimism about sustaining technologies.
- **Incorporate the issue of new oil and gas licences into public policy work on climate change; and support calls for an end to licences and for national and subnational governments to join the Beyond Oil and Gas Alliance.**

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Oil Change International is a research, communications, and advocacy organization focused on exposing the true costs of fossil fuels and facilitating the ongoing transition to clean energy. Rooted in community solidarity and principled policy analysis, we work within larger movements to build a fossil free future. <http://priceofoil.org/>

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