ASSESSMENT OF ENI'S CLIMATE STRATEGY

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ASSESSMENT OF ENI'S CLIMATE STRATEGY

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INTRODUCTION

In 2022, Eni ranked as the 19th biggest oil and gas producer and 15th biggest oil and gas upstream developer worldwide. The company is the 26th biggest Liquified Natural Gas (LNG) export terminal developer.[1]

AAs one of the six oil and gas majors and one of the largest greenhouse gas (GHG) emitters globally, Eni is among the few companies in the world whose climate transition (or lack thereof) in the coming years will have a determining impact on our collective ability to limit global temperature rise to 1.5°C. In 2020, the company pledged to achieve carbon neutrality across its entire operations on an absolute basis by 2050 or sooner.

Eni's investors and other financial stakeholders have both a key interest and a crucial responsibility to ensure the company swiftly aligns with a 1.5°C pathway. In addition to targeted restriction policies, shareholder engagement is an important tool to reach this objective.

Key findings:

- Eni does not provide sufficient information on its decarbonization plan to allow investors and other financial stakeholders to correctly assess its capacity to align with a 1.5°C pathway. Insufficient information is given on the company's capital expenditure (CAPEX) plan, its 2030 targeted energy mix and production volumes, as well as on the scenario it uses to establish its climate plan.
- Taking into account Eni's oil and gas production from currently producing fields, plus its fields under development and field evaluation, the company's production in 2030 will be 35% higher than the level required to align with the International Energy Agency (IEA)'s Net Zero Emissions by 2050 Scenario (NZE).
- Eni plans an increase of its oil and gas production to 1,900 kboe per day, composed of 40% of oil and 60% of gas, and to maintain its production at plateau to 2030. If it meets this target, its production will be 71% higher than the NZE.
- Eni is constructing and plans to develop new liquefaction terminals in the coming years. Consequently, with its current LNG strategy, 49% of Eni's 2030 total net liquefaction capacity will exceed the NZE.
- For every euro invested in its "Plenitude" business – its low carbon division – in 2022, Eni invested more than 15 euros in oil and gas. However, considering the "Plenitude" division also includes non-renewable energy activities, such as gas marketing and retail that are still its main activities, for every euro invested in fossil fuels, less than seven cents were invested in sustainable renewable energies.
- For every euro invested in "Plenitude" in 2022, more than 11 euros were distributed to shareholders through dividends and share buyback.
- Eni's "Plenitude" division annual organic CAPEX is set to increase three to four-fold. However, it still represents less than 20% of its investments planned.
- Eni's targeted carbon intensity by 2030 is 22% higher than the NZE, and 9% higher than in the IEA's Announced Pledges Scenario (APS) which covers commitments towards a below-2°C pathway. If Eni meets these targets and reduces its energy supply in ine with the IEA scenarios, by 2030 the company will have overshot its share of the 2023-30 carbon budget by 22% under the NZE, and by 5% under the APS.

1. ENI TODAY IN A NUTSHELL

Eni accounts for 1.4% of global oil and gas production and 1.0% of short-term expansion plans.[2]

As of August 1st, 2023:[3]

- Eni currently has 6,110 million barrels of oil equivalent (mmboe) of resources under production, including 3,627 million barrels (mmbbl) of oil and 2,483 mmboe of fossil gas. This represents the equivalent of 11.4 years of production at 2022 levels.
- Eni also has 2,876 mmboe of resources under development or field evaluation, including 1,454 mmbbl of oil and 1,422 mmboe of fossil gas. This represents 5.3 years of production at 2022 levels.
- Eni owns 3,263 mmboe of oil and fossil gas discoveries, including 1,357 mmbbl of oil and 2,213 mmboe of fossil gas. This represents 6.1 years of production at 2022 levels.

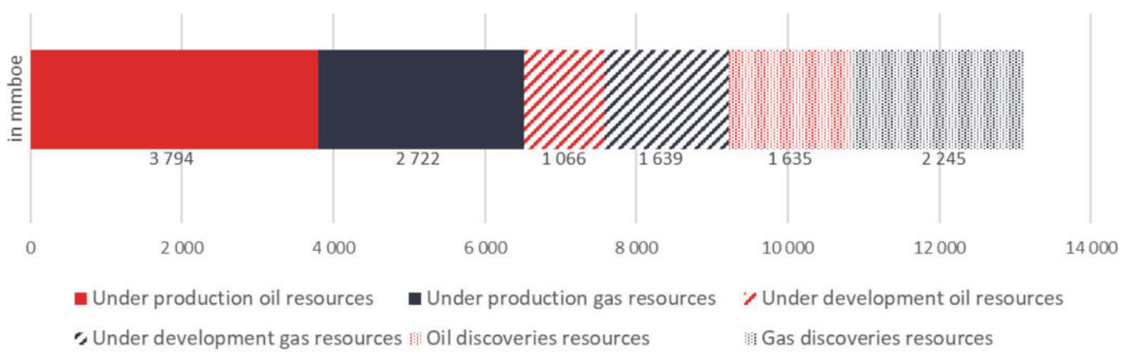
In 2022, Eni extracted 274 mmbbl of oil and 314 mmboe of fossil gas. Beyond exploration and production, Eni is also active in other segments such as midstream and downstream, particularly in LNG, oil refining, renewable and gas power generation, retail, electricity distribution through "Plenitude" business.

In 2022, Eni sold 9.4 Mt of LNG, while contracted LNG volumes are expected to exceed 18 million tons per annum (Mtpa) by 2026 due to developments in Africa, Southeast Asia, Oceania, and Europe. Eni is also present in marketing with a refinery throughput of 27.1Mt, petrochemical sales were 3,75Mt and petroleum product sales were 16.1Mt in 2022.[5]

Eni's renewables portfolio is composed mainly of solar energy, wind energy, and storage. Installed capacities reach 2.2 Gigawatt (GW), with a strategic focus on solar energy and on Europe. It also has more than 10 GW of forecasted capacities in project pipeline and plans to reach 15 GW of total installed capacity in 2030 with renewable projects located in Southern Europe, offshore wind projects in the United Kingdom, solar and storage projects in the United States.[6]

Eni's oil and gas resources

(based on current ressources in million barrels of oil equivalent)



Source: Rystad Energy, accessed in August 2023

2. TRANSPARENCY OF ENI'S CLIMATE PLAN

The adoption and publication of sufficiently detailed targets and indicators are a prerequisite for assessing how a company's transition plan aligns with a 1.5°C trajectory.

Eni published a climate plan and indicators regarding its climate strategy in the "Eni for 2021" publications.[7] Eni published a climate plan and indicators regarding its climate strategy in its "Eni for 2021" publications and slightly reviewed its methane pledge in the 2023 market day.[8]

However, while Eni provides information about its decarbonization targets, it does not include significant indicators, and the information provided lack the granularity needed to allow investors and other financial stakeholders to correctly assess its capacity to align with a 1.5°C pathway. The information given does not allow investors to understand the company's trajectory for GHG emissions and its production model through to 2030, or the risks associated with financial exposure to the company.

For example, Eni does not disclose its split between growth and maintenance CAPEX for upstream as well as for renewables business lines. Moreover, CAPEX is aggregated at Plenitude level, that includes renewable as well as retail and electric vehicles charging network.

The table below summarizes the disclosure by Eni or lack of disclosure of a few key transition indicators. It does not provide a comprehensive assessment of the transparency and completeness of Eni's climate plan, but rather focuses on the basic indicators that should be at the foundations of any oil and gas major's plan.

Assessment of the transparency of Eni's climate plan

Does ENI publish detailed information about the following indicators up to 2030?	Yes - No Partially	Comment
Absolute and relative GHG emissions reduction targets covering scope 1, 2 and 3.	Yes	
Contribution to emission reduction targets of carbon capture and storage (CCS) along the company's value chain .	Yes	
Contribution to emission reduction targets of offsets and offsetting approaches.[9]	Yes	
CAPEX breakdown by activity, and by production maintenance and growth.	No	• Eni details its 2023 to 2026 average CAPEX range target with upstream activities and its CAPEX target dedicated specifically to oil and gas exploration, without detailing other oil and gas CAPEX targets. • Eni details its 2023 to 2026 CAPEX target dedicated to renewable energy. • Eni's CAPEX targets are not split between maintenance and growth CAPEX neither for oil and gas nor for renewable energy.
2030 targeted energy mix and production volumes.	Partially	• Eni reports its total energy produced projections by 2026. Eni's 2030 total energy produced and the 2030 energy mix is not fully disclosed. • Eni communicates on its 2025 oil and gas production level projection and informs that it will reach a plateau until 2030. Eni forecasts its 2030 fossil gas to oil ratio. • Eni reports its current renewable capacities installed and discloses its 2030 minimum installed capacity projection.
Reference scenario used to define climate targets.[10]	Partially	• Eni does not explicitly indicate which scenario was used to define its targets.[11] • Within the Annual Report and resilience tests, Eni applies the IEA Sustainable Development Scenario (SDS) and NZE low carbon scenarios.

Source: 2022 FY Financial statements and 2021 20-F, 2022 and 2023 Investor presentations, Eni for 2021 report

3. QUALITY OF ENI'S CLIMATE PLAN

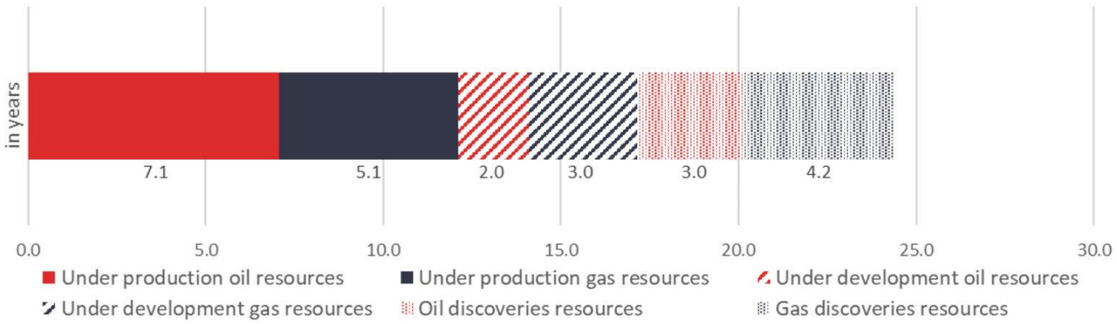
a. Oil and gas trajectory

In May 2021, the IEA published its Net Zero Emissions by 2050 Scenario (NZE) which provides a pathway to meet global energy needs while having a 50% chance of keeping global temperature increases below 1.5°C.[12] It was used as the reference scenario in the World Energy Outlook (WEO) 2021 and was updated in the WEO 2023 published in October 2023.[13] It projects a reduction in oil and gas production by 2030 compared to 2021 levels of 20.9% and 17.9%, respectively,[14] and an end to the development of new oil and gas production projects and LNG terminals.

According to the Global Oil and Gas Exit List (GOGEL), Eni is the 15th top global oil and gas upstream developer. 71% of its expansion plans did not obtain their Final Investment Decision (FID) before 2022 and therefore are overshooting the IEA NZE. Among Eni's main fields that are not yet entered into production and that did not obtain their FID before 2022, we identified several carbon bombs,[15] and new very emissive oil and gas projects. Eni's carbon bombs include the Kashagan oilfield in Kazakhstan, currently under appraisal, and represent Eni's largest upstream project in terms of resources, as well as Umm Shaif/Nasr in the United Arab Emirates.[16] Beside carbon bombs, Eni plans to develop new resources in Mozambique, and in the Barents Sea in Northern Europe.[17] Eni is continuing exploration for oil in Mexico, for gas in Southeast Asia and Middle East, for oil and gas in Northern Europe, Africa and central Asia.[18]

Despite the disrupted energy environment caused by the invasion of Ukraine, the need to halt oil and gas expansion as soon as possible remains a key feature of the NZE. The May 2021 NZE projected a halt to the development of new oil and gas fields for which a FID was not approved by January 1st, 2022. The updated WEO 2022 version of the NZE also highlights the need to end the development

Eni's oil and gas resources
(based on current ressources and 2022 level of production)



Source: Rystad Energy, accessed in August 2023

"I am also calling on CEOs of all oil and gas companies to be part of the solution. They should present credible, comprehensive and detailed transition plans in line with the recommendations of my High-Level Expert Group on net-zero pledges.

These plans must clearly detail actual emission cuts for 2025 and 2030, and efforts to change business models to phase out fossil fuels and scale up renewable energy."

Antonio Guterres,
Secretary-General of the United Nations,
March 2023

of new LNG terminals beyond those approved by January 1st, 2023, which is significant when considering Eni's LNG capacity additions in 2022.

The completion of some projects that can swiftly enter production and operate for a limited time only – mainly shale oil and gas projects – is not expressly forbidden in the WEO 2022 version of the NZE. However, the IEA notably stresses that the invasion of Ukraine cannot justify a "new wave of oil and gas infrastructure", and that any new oil and gas fields will make it "even more challenging" to meet carbon neutrality targets and "creates the clear risk that [the 1.5°C] target moves out of reach". Concretely, any such project will require even greater reduction efforts in other sectors and activities.

The IPCC also highlights the risks associated with the development of any new fossil fuel projects.[19] This concurs with a large and growing body of scientific evidence showing the need to immediately end fossil fuel development and a growing consensus on this in net-zero policy discussions.[20]

Oil and gas production should decrease by 20.9% and 17.9%, respectively, during this decade according to the NZE.[21] However, without developing any new oil and gas fields and by only extracting resources that are already under production, Eni has enough resources to produce the equivalent of 11.4 years of oil and gas production at its 2022 level. Eni's resources under development and field evaluation will provide the equivalent of another 5.3 years of production at its 2022 production level. Additionally, if the company exploits all its oil and gas discoveries, it will have enough resources to produce the equivalent of a further 6.1 years of production at its 2022 level.

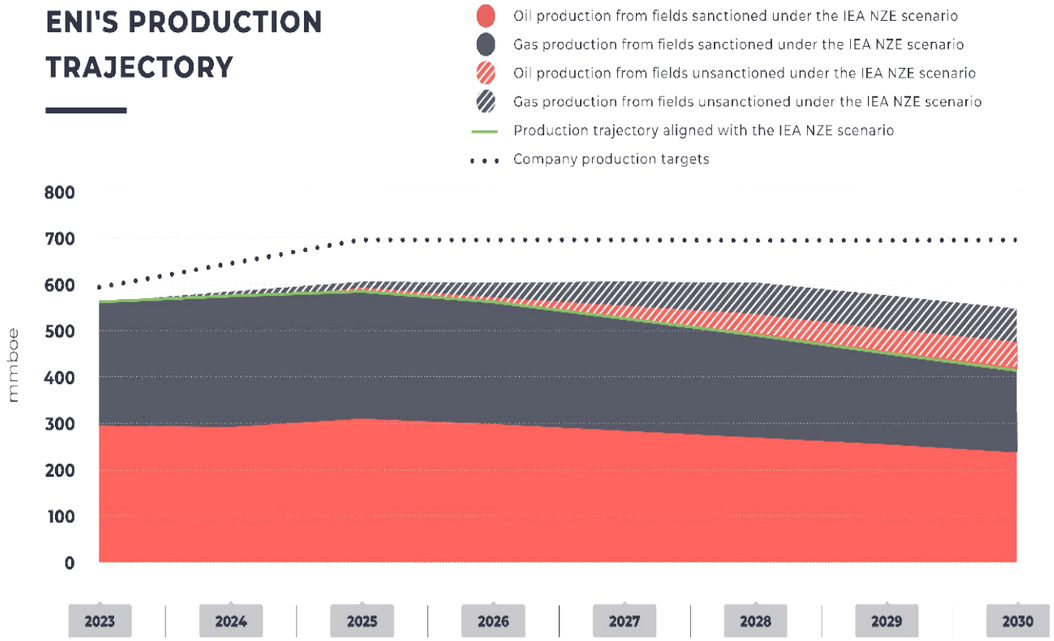
In the IEA's NZE, the rate of oil and gas production declines due to the combination of the natural depletion of existing oil and gas fields and the absence of new fields to fill the gap. This decline happens even though the NZE relies on material levels of negative emissions, including through the deployment of technologies unproven at scale, and would be much faster without such a reliance. Other prominent 1.5°C scenarios with no or low overshoot also show oil and gas production declining by 2030. These include the One Earth Climate Model (OECM),[22] the Network for Greening the Financial System's (NGFS) net zero climate scenarios,[23] and the IPCC 1.5°C with no or low overshoot scenarios filtered to limit to reasonable volumes the reliance on negative emissions (CCS, NBS, etc.).[24]

The following chart compares Eni's planned oil and gas production level in 2030 with NZE alignment (the company plans to increase its oil and gas production to 1,900 kboe per day (kboepd) of oil and gas with a peak in 2026, composed of 40% of oil and 60% of gas). The level is an aggregate of both its producing fields and its fields under development with a FID obtained before 2022.[25] The chart also indicates the level achieved from fields under production as well as those under development and under field evaluation. To reach its production target, Eni will have to increase its oil and gas production beyond its current short-term expansion plans. This means that Eni will have to develop part of its discoveries and/or buy new fields.

In 2030, with oil and gas from currently producing fields, plus fields under development and under evaluation, Eni's production level will be 35% higher than the NZE.

Eni's 2030 production target for oil and gas will be 71% above NZE alignment.

Eni has not committed to stop developing new oil and gas projects beyond those already in development and could review its production targets, either up or down. Consequently, the level of field-based production indicated in the chart could be conservative and lower than Eni's own forecasts. Eni owns 3,263 mmboe of discovered hydrocarbon resources that have not yet entered the field evaluation or development stage. From 2021 to 2023, **Eni spent on average US$1.0 billion per year on exploration** making it the 14th biggest investor in exploration over that period.[26] From 2023 to 2026 €2.1 billion exploration CAPEX are planned.[27]



Source: Rystad Energy on oil and gas production and expansion, accessed in August 2023; Eni reporting and investor presentations on company production plans

b. LNG expansion plans

LNG activities are a key element of Eni's energy strategy. Eni plans to become mostly a gas player by 2030, with gas representing 60% of its upstream production by then while it only represented 48% of its 2022 extracted resources. In August 2023, gas represented 40.6% of all its resources present in its fields that are already under production. Gas also represents 49.5% of its resources from fields under development and under evaluation, and 73.6% of its resources from discovered assets. Along with its 2030 gas production target and resources detained, Eni intends to increase its LNG business.

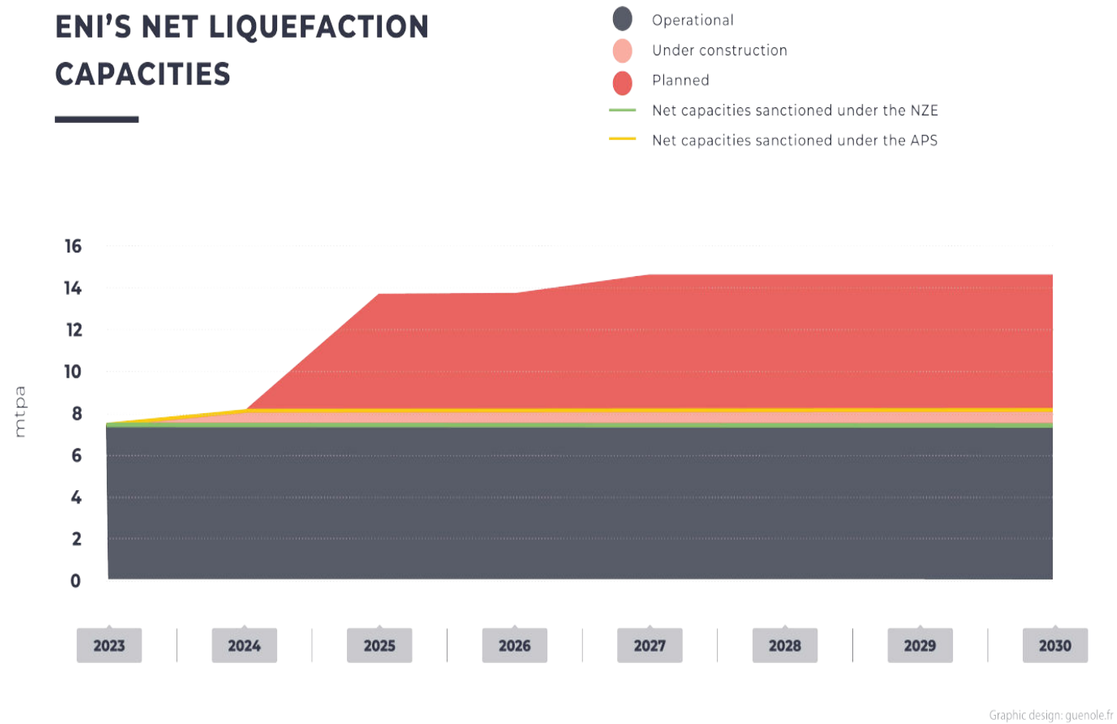
Eni's gas strategy relies on liquefaction terminals. Eni owns existing LNG export terminals and constructs and plans to construct new LNG export terminals in the decade.

- Eni is already the main shareholder of the existing export terminals Damietta train 1 located in Egypt as well as the two new liquefaction terminals Rovuma Coral FLNG located in Mozambique and Congo Fast LNG located in the Republic of the Congo that were commissioned in 2022 and 2023 respectively. These export terminals represent for Eni 4.8 million tons per annum (Mtpa) net liquefaction capacity. Eni is also a shareholder of the Darwin LNG terminal in Australia, of Oman LNG, Angola LNG and NLNG in Nigeria. Altogether, Eni's current net liquefaction capacity reaches 7.8 Mtpa.
- Eni is constructing new liquefaction capacities with NLNG train 7 in Nigeria. That would add net liquefaction capacities of 0.8 Mtpa to its portfolio.
- The Italian major is also planning to construct Rovuma Mozambique LNG Train 1 et 2 in Mozambique with net capacities of 3.8 Mtpa, and Congo FLNG II in the Republic of the Congo with net capacities or 2.4 Mtpa. The company is also involved in Qatar North Field LNG with net capacities of 1.0 Mtpa.
- Consequently, with its current LNG plans, 49% of Eni's 2030 total net liquefaction capacity will exceed the NZE and 44% will exceed the APS.

Under the NZE, gas demand by 2050 is met with all existing LNG terminals. Under the APS, gas demand is met with operational and under construction facilities. In either case, no new LNG terminal plans are necessary to meet the demand. With its current plans, none of Eni's LNG expansion plans are aligned with the NZE, while only the infrastructure already under construction are aligned with the APS.

c. Cash-flow allocation

The future energy mix of a company is determined by its current investment strategy. In the NZE, total energy investment needs to more than double by 2030, with a shift from high-carbon energy to clean alternatives. Investment in clean energy, end-use and



Source: Enerdata LNG database accessed in July 2023 for operational terminals and Global Oil and Gas Exit List 2023 for under construction and planned terminals

efficiency more than triple in the NZE, and ten euros must be spent on clean energy, end-use and efficiency for each euro spent on fossil fuels by 2030.[28]

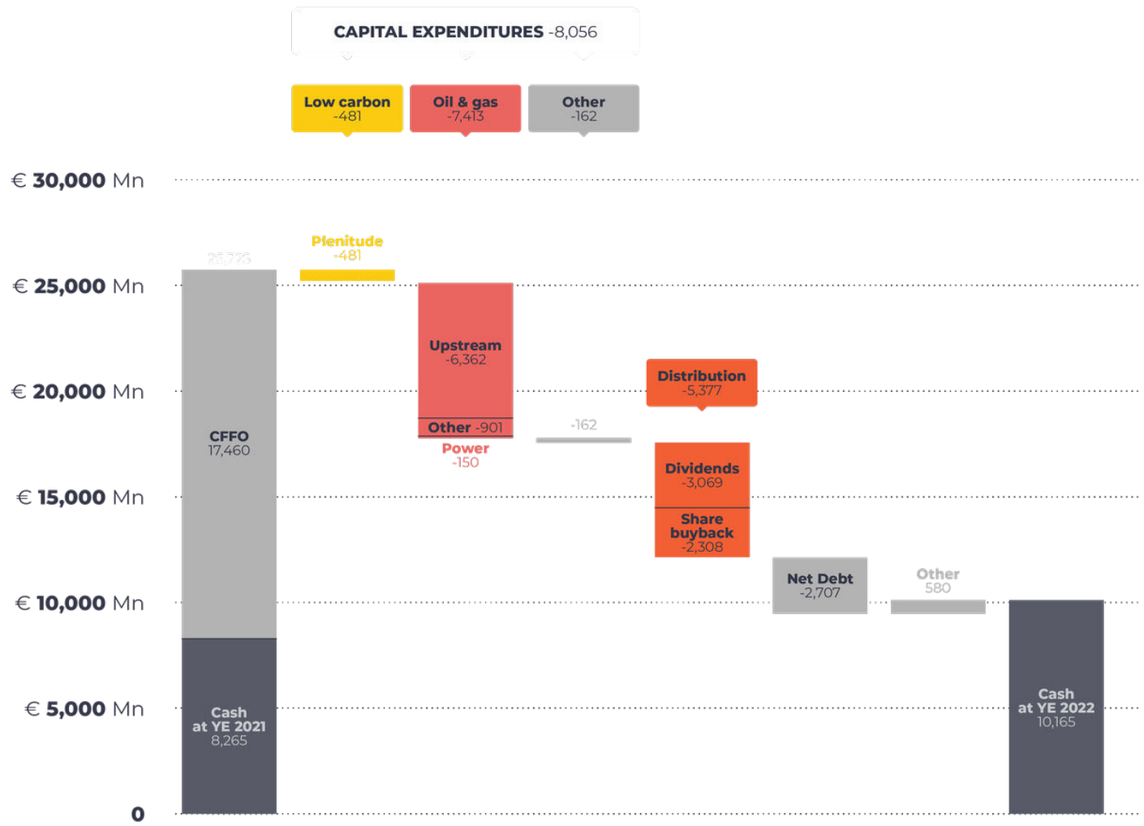
In its 2022 financial statement released in February 2023,[29] Eni provides some information that show us how the cash flows generated from its operational activities were spent in 2022:

1. Eni invested €481 million in "Plenitude" business -its low carbon division – that includes solar and wind energy, nuclear research, retail and e-mobility such as electric vehicle charging.
2. Eni allocated €7.3 billion to oil and gas, including €6.4 billion to oil and gas exploration and production, and €0.9 billion to other oil and gas activities, that include LNG, refining and petrochemical activities.[30]

   In total, for every euro invested in Plenitude, more than 15 euros are invested in oil and gas.

   Eni's Plenitude division integrates non-renewables activities such as retail. This means that for every euro invested in fossil fuels, less than seven cents were invested in sustainable renewable energies.
3. Eni provided its shareholders with €5.4 billion, through dividend payment (€3.1 billion) and share buybacks (€2.3 billion).[31]

Breakdown of Eni's 2022 Cash-flows



Source: Eni 2022 unaudited financial results

In total, for every euro invested in Plenitude, more than 11 euros are distributed to shareholders through dividends and share buyback.

From 2023 to 2026, Eni forecasts €37 billion CAPEX, slightly more than €9 billion per year. On this period, €2 billion per year is dedicated to Plenitude, including €1.65 billion per year in renewable energy and €150 million per year in e-mobility that include electric vehicle charging network. At the same time, Eni will invest €6 billion to €6.5 billion per year in its upstream activities, including €2.1 billion in exploration. **These targets represent a three to four-fold increase of its "Plenitude" organic CAPEX by 2026, however it still represents less than 20% of Eni's overall investments planned.**

In 2023, Eni's CAPEX plan has been updated, from €28 billion from 2022 to 2025 to €37 billion from 2023 to 2026. However, this update is mainly due to higher investments in incremental gas that include gas and LNG projects in Algeria, Congo, Qatar, Libya, Mozambique, Egypt, Indonesia and Italy.

Eni's investment strategy is also centered on Eni's merger and acquisition strategy in its exploration and production segment. Indeed in 2022, Eni acquired a 100% stake in the company Export LNG Ltd which owns the Tango FLNG floating liquefaction plant in the Republic of Congo.[32] In 2023, Eni and its subsidiary Vår Energy acquired the independent exploration and production company Neptune Energy, for 4.5 billion euros,[33] with a closing date expected in the first quarter of 2024.[34] Neptune Energy's acquisition represents the expected investments of Eni in renewable energy for 3 years according to its 2021 to 2026 CAPEX plan.

Due to its CAPEX strategy, Eni aims to develop renewable energy, whose capacity will increase from 2.2 GW today to more than 7 GW in 2026 and double to 15 GW by 2030. Even in the case that Eni meets its targets, the maximum renewables share of the company's energy supply mix in 2030 would remain under 7%.

c. Decarbonization targets and emissions trajectory

Eni pledged mitigation targets for 2025 and 2030, compared to its 2018 and 2020 levels, measured in absolute and intensity terms, including scope 1, 2 and 3.[35]

Using the IEA energy supply data from the NZE and APS in the WEO 2022, Reclaim Finance has calculated Eni's GHG emissions overshoot.

We have assumed thatEni will follow the IEA scenario pathways for total global energy supply. In the NZE total energy supply decreases by 9.1% between 2022 and 2030 while in the APS, it increases by 1.6% in the same period. Our analysis is likely to be conservative: Eni does provide indications regarding its projection for its 2030 energy supply, aiming for an oil and gas production target significatively higher than in the NZE.

In our hypothesis, we assume that Eni reaches its targets with a decrease of both its scope 1 and 2 absolute emissions of upstream production by 65% by 2025 and its scope 1, 2 and 3 carbon intensity of sold energy products by 35% by 2030.

Eni relies on CCS and offsets and will capture 10 Mtpa and offset an extra 15 Mtpa in 2030.[33] These technologies have a significant place in the company's decarbonization plan: 14.1% of its absolute emission reduction by 2030 is planned through using them. As highlighted by the IPCC, however, CCS in the energy sector still has limitations to overcome before it can be scaled up, which means it comes with limited potential and prohibitive costs. Too high reliance on these type of mitigation approaches represents a material risk factor for Eni's ability to reach its decarbonization targets.[36]

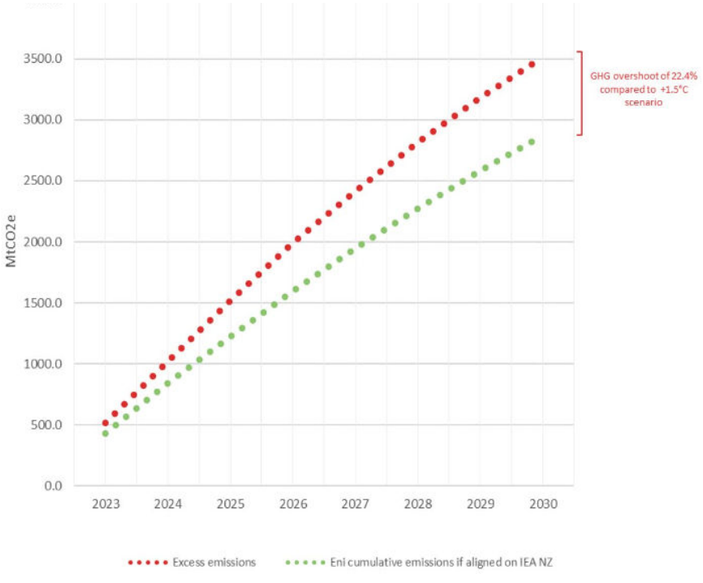
By 2030, Eni' targeted carbon intensity would remain 22.3% and 9.4% higher than in the NZE and APS respectively. If it meets targets and reduces its energy supply in line with the IEA scenarios, Eni will have overshot its share of the 2023-30 carbon budget by 22.4% under the NZE, and by 5.0% under the APS.

Eni's pledged mitigation targets

Base year	Target year	Reduction target	Net target	Geographical scope	Emission scope	Emission Type
2018	2025	-65%	Yes	World	1 & 2, upstream operationnal control	Absolute
2018	2025	-40%	Yes	World	1 & 2, group level	Absolute
2020	2030	-100%	Yes	World	1 & 2, upstream operationnal control	Intensity
2018	2030	-35%	Yes	World	1 & 2 & 3	Absolute
2018	2030	-15%	Yes	World	1 & 2 & 3, carbon intensity of sold energy products	Intensity

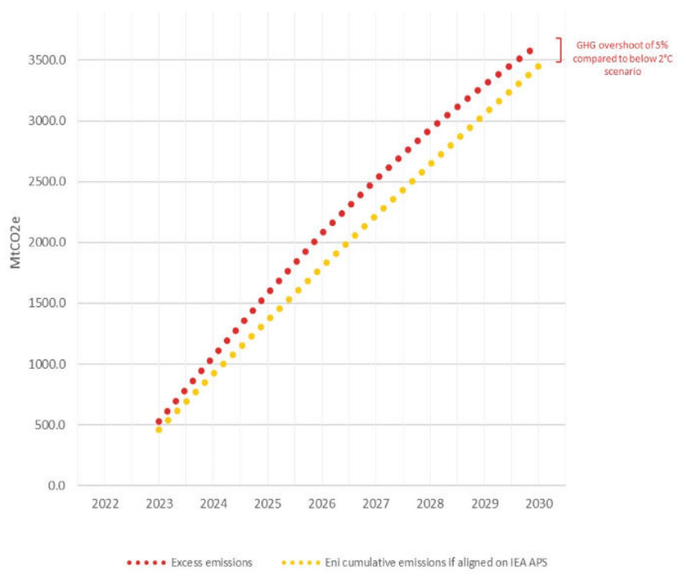
Source: Eni's website and reports, as of end of 2022

2023-2030 Eni's GHG emissions compared to the NZE pathway
(in million tons of CO2e to 2030)



Calculations based on data from company's disclosed data and scenario data taken from IEA's NZE and APS scenarios. See the methodology section below for more details on these calculations.

2023-2030 Eni's GHG emissions compared to the below 2°C pathway
(in million tons of CO2e to 2030)



Calculations based on data from company's disclosed data and scenario data taken from IEA's NZE and APS scenarios. See the methodology section below for more details on these calculations.

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9. The IPCC estimates between 500 and 3,600 million metric tons of CO_2 could be removed annually through planting new forests by 2050. See Greenpeace, Net expectations - Assessing the role of carbon dioxide removal in companies' climate plans, 2021.
10. To meet this criterion, the company must disclose the publicly available 1.5°C no or low overshoot pathway it uses to set its targets. While all oil and gas companies somewhat rely on 1.5°C pathways to conduct analysis and inform their decision making, this does not mean that the targets set are coherent with such a pathway.
11. Eni declared that the company "has relaunched its GHG emission reduction targets, with new short and medium-term targets that accelerate the path towards carbon neutrality in 2050, confirming Eni's commitment to further align its reduction trajectory with low carbon scenarios.", IEA low carbon scenarios used being the SDS and NZE
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29. Eni, 2023 capital markets update & 2022 full year results, 2023.
30. Eni allocated €7.263 billion to oil and gas, including €6.362 billion to oil and gas exploration and production, and €901 million to other oil and gas activities, that include LNG, refining and petrochemical activities.
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Methodology - Glossary

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ASSESSMENT OF ENI'S CLIMATE STRATEGY

Reclaim Finance is an NGO affiliated with Friends of the Earth France. It was founded in 2020 and is 100% dedicated to issues linking finance with social and climate justice. In the context of the climate emergency and biodiversity losses, one of Reclaim Finance's priorities is to accelerate the decarbonization of financial flows. Reclaim Finance exposes the climate impacts of financial players, denounces the most harmful practices and puts its expertise at the service of public authorities and financial stakeholders who desire to bend existing practices to ecological imperatives.

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OIL AND GAS COMPANIES' CLIMATE STRATEGY

METHODOLOGY

To help financial institutions navigate oil and gas integrated companies transition plans, Reclaim Finance selected key indicators to look at when assessing the climate credibility of a company's business plans. This data is sourced directly from companies' documents, or results from our calculations and publicly available analyses.

This methodological note aims to provide readers with detailed pieces of information about how these indicators have been computed.

For more details on specific financial and technical terms used by the companies, find out our glossary.

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Scope of our analysis

Reclaim Finance scrutinized the current strategy and climate targets of the top 9 publicly listed integrated oil and gas companies from Europe and the United States, and the top 5 National Oil Companies worldwide selected on the 2022 oil and gas short-term expansion plans criteria according to the 2023 Global Oil and Gas Exit List.

Companies included are the following six European oil and gas producers: **BP, Eni, Equinor, Repsol, Shell and TotalEnergies** as well as the three American producers: **Chevron, ConocoPhillips and ExxonMobil** and the 5 National Oil Companies: **Saudi Aramco, QatarEnergy, Gazprom, Petrobras and ADNOC.**

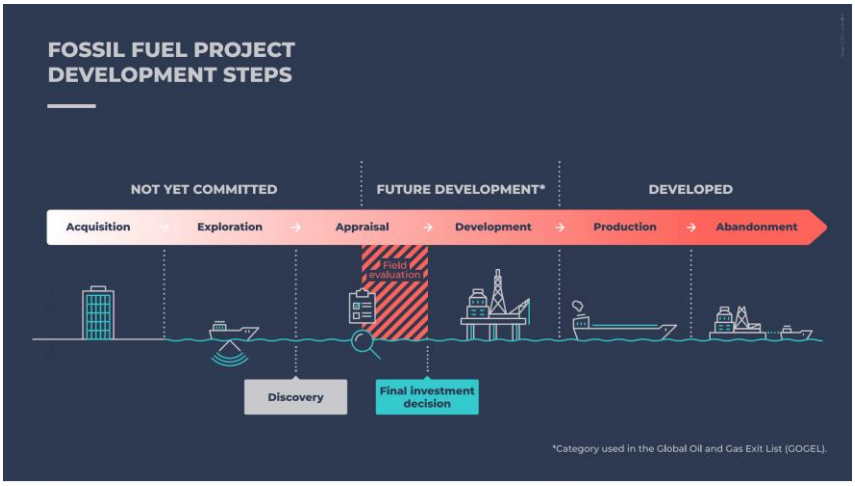
Indicator N°1. Expansion plans of companies

To keep within carbon budgets compatible with climate requirements, companies not only need to reduce the carbon intensity of the energy products they sell, but also to decrease their energy production as per the reference scenario they chose to use. To that purpose, expansion should stop immediately in a 1.5°C scenario, as stressed by the International Energy Agency (IEA) in its Net Zero scenario.

Companies' assets[1] fall into three main categories:

- Not yet committed:
  - Undiscovered: these assets relate to geological formation that may contain oil and gas, but that have not been explored yet.
  - Discovered: these assets relate to oil and gas fields that have been subject to a preliminary assessment, but for which no significant development investment has been made. These assets could eventually be developed, but no strategic or financial commitment has been made yet.
- Future Development, or short-term expansion: these assets relate to oil and gas fields that have been subject to further assessment and significant investment to plan for their development, or to develop them. These assets are highly likely to be developed to avoid financial losses.
- Developed: these assets relate to oil and gas fields that have already been developed and are currently producing.

Graph 1. Fossil fuel projects development steps



Source: Urgewald, *Global Oil and Gas Exit List*

Despite calls to end new oil and gas developments, companies are still engaging in expansion and even exploration activities. This is reflected in our analysis through a set of indicators presented below.

[1] Resources, expressed in millions of barrels of oil equivalent, are a metric like Reserves. The difference lies in the fact that reserves estimate the current potential of assets, while resources also account for additional volumes that could be extracted over assets' lifetime, due to "future upside unlocked through technical revisions, improved recovery, etc." Resources is a metric computed by Rystad Energy.

Under production resources:

This is the total amount of hydrocarbon resources still in the ground from assets that are currently producing.
This data was extracted from Rystad Energy UCube with the extraction date given in each briefing.

Under development or field evaluation resources:

This is the total amount of hydrocarbon resources from assets that are either under development or ongoing field evaluation. These assets are highly likely to enter production soon.
This data was extracted from Rystad Energy UCube with the extraction date given in each briefing.

Discovered resources:

Companies hold portfolios of discovered assets that could eventually be developed. This provides an indication of how much more resources companies could develop.
These data were extracted from Rystad Energy UCube with the extraction date given in each briefing.[2]

Resources are represented in million barrels of oil equivalent (mmboe) and in number of years of production, using its last year production level as a reference. Last year's level of production is extracted from company's reportings.

For example, the number of years of production from under development or field evaluation resources, X, is calculated with the following formula:

$$X = \frac{Under\ development\ resources + Under\ field\ evaluation\ resources}{last\ year\ production}$$

Then theoretically, once under development and under field evaluation resources will be brought into production, the company will be able to maintain its current production level for X more years at last year level. However, as production from oil and gas fields naturally declines in the long term due to depleting fields, company's production with these resources will last longer at a natural declining level.

Unconventional activities

The oil and gas industry is developing unconventional oil and gas.[3] Unconventional sources of oil and gas are particularly harmful for the environment and the climate. These activities include oil and gas production from fracking activities, tar sands, coalbed methane, extra heavy oil, and ultra deepwater. For more information about these activities, see the methodology note of the Global Oil and Gas Exit List.[4]

The share of companies' production and expansion plan across these different unconventional activities has been sourced from the Global oil and gas Exit List based on data from Rystad Energy.

[2] Production data extracted from Rystad covers production of crude oil, condensate, NGLs and gas. Contributions from minority interests are included and government entitlement to production is removed.
[3] https://cdn.sei.org/wp-content/uploads/2021/04/trends-in-fossil-fuel-extraction.pdf
[4] https://gogel.org/

Indicator N°2. Oil and gas production evolution

Forecasted 2030 production levels:

This indicator shows the evolution of oil and gas production by 2030, using different forecasts:

- Production from fields sanctioned under the IEA NZE scenario is computed using Rystad Energy UCube: it is the aggregate of future oil and gas production[5] from fields currently under production, under development, or under field evaluation, and that obtained their Final Investment Decision before 2022 as defined in the NZE scenario.
- Production from fields unsanctioned under the IEA NZE scenario is computed using Rystad Energy UCube: it is the aggregate of future oil and gas production[6] from fields currently under production, under development, or under field evaluation, and that did not obtain their Final Investment Decision before 2022.
- Company production targets are provided by the companies in their financial reports, investor presentations or sustainability reports. For companies only publishing production capacity targets, the indicator calculation was based on capacity rather than actual production.

Overshoot based on companies' plans.

The company's 2030 production target is compared to the theoretical production of the company if it followed the IEA NZE scenario. The overshoot is expressed in %:

$$Target\ based\ production\ overshoot\ = \frac{Company's\ 2030\ production\ \ target}{Production\ from\ fields\ that\ obtained\ their\ FID\ before\ 2022} - 1$$

For companies only publishing production capacity targets, the indicator was based on capacity rather than actual production, considering their production reach full capacity.

$$Target\ based\ production\ overshoot\ at\ full\ capacity = \frac{Company's\ 2030\ production\ capacity\ \ target}{Production\ from\ fields\ that\ obtained\ the\ FID\ before\ 2022} - 1$$

Companies' production forecasts declaration:

BP. The company announced it "anticipates its oil and gas production will be around 2.3 million barrels of oil equivalent a day (mmboe/d) in 2025 and aims for it to be around 2.0 mmboe/d in 2030. This 2030 production would be around 25% lower than bp's production in 2019, excluding production from Rosneft".[7]

[5] To do these forecast, Rystad Energy UCube runs algorithms that takes as input characteristics of assets such as their location, their physical characteristics, and their content, to determine their outputs such as their net present value, their starting date, and their production profile.

[6] To do these forecast, Rystad Energy UCube runs algorithms that takes as input characteristics of assets such as their location, their physical characteristics, and their content, to determine their outputs such as their net present value, their starting date, and their production profile.

[7] https://www.bp.com/en/global/corporate/news-and-insights/press-releases/4q-2022-update-on-strategic-progress.html

ENI. The company declared its upstream production will grow up to 2025, then plateau from 2025 at around 1 900 kboe/d. This plateau is assumed to last up to 2030. In 2030, gas will represent 60% of its oil and gas production.[8]

Equinor. The company declared on its Capital Market Day, on the 15th of June 2021, that "over the next years, our oil and gas production will grow before expected to return to around same level as for 2020 in 2030."

Repsol. The company announced a "flexible production level of around 620 kboe/d over 2021 – 2025",[9] but also stated it will be "maintaining production level in 2025-2030".[10]

Shell. The company announced it passed its oil production peak in 2019 and expects it to decline 1-2% per annum by 2030. At the same time, it anticipated its gas share of hydrocarbon production to reach 55% by 2030.[11] This enables us to calculated 2030 level of oil production, then to access the 2030 level of gas production using the ratio 45%/55%.

TotalEnergies. The company aims to "an oil production peak this decade and then decrease to around 1.4 Mb/d in 2030. It aims to increase gas production by around 50% between 2015 and 2030 (from 1.3 Mboe/d to 2 Mboe/d)".[12]

Chevron. The company aims to increase its production by 3% per year through 2026.[13] To integrate the 2030 production overshoot compared to the company's target, we input the conservative hypothesis that Chevron's production will plateau from 2026 while the company's strategy relies on production increase by 2026 and did not make any comment about a production reduction.

ConocoPhillips. The company only publishes the 2023 guidance.[14] To integrate the 2030 production overshoot, we input the conservative hypothesis that ConocoPhillips' production will plateau from 2023 while the company's strategy relies on production increase in 2023 and did not make any comment about a production reduction.

ExxonMobil. The company aims to increase its production to 4.2 Mboe/d in 2027.[15] To integrate the 2030 production overshoot compared to the company's target, we input the conservative hypothesis that ExxonMobil's production will plateau from 2027 while the company's strategy relies on production increase by then and did not make any comment about a production reduction.

ADNOC. The company aims to increase its oil production capacity to 5 Mboe/d in 2027[16] and to rise its gas production capacity to 11 billion cubic feet per day (bcf/d) by 2030.[17] To integrate the 2030

[8] https://www.eni.com/en-IT/media/press-release/2020/02/long-term-strategic-plan-to-2050-and-action-plan-2020-2023.html
[9] Repsol, Stepping up the transition - Driving growth and value, 2023
[10] Repsol, Stepping up the Transition, Driving growth and value, 2020
[11] https://www.shell.com/investors/investor-presentations/2021-investor-presentations/shell-energy-transition-strategy-2021/_jcr_content/par/textimage.stream/1620389862956/ac95286779fb51553cc144afc77f201744c907e0/shell-energy-transition-strategy-2021-presentation.pdf
[12] https://totalenergies.com/system/files/documents/2022-03/DEU_21_VA.pdf
[13] https://chevroncorp.gcs-web.com/static-files/5a798840-e083-4339-a83b-f0f565227655
[14] https://static.conocophillips.com/files/resources/sensitivity-guidance-items-1q23-initial-posting.pdf
[15] https://corporate.exxonmobil.com/investors/investor-relations/corporate-plan-update
[16] https://www.adnoc.ae/en/ourstrategy/responsible-growth
[17] https://adnocdrilling.ae/en/investor-relations/Investment-Case/Strategy#:~:text=Capitalize%20on%20ADNOC's%20plans%20to%20increase%20crude%20oil%20production%20capacity,per%20day%20of%20unconventional%20gas

production capacity overshoot compared to the company's target, we input the conservative hypothesis that ADNOC's oil production capacity will plateau from 2027 while the company's strategy relies on production increase by then and did not make any comment about a production reduction.

QatarEnergy. The company does not report production nor production capacity targets.

Saudi Aramco. The company aims to increase its oil production capacity to 13 Mboe/d in 2027 and to expand its gas production by 50% by 2030.[18] To integrate the 2030 production capacity overshoot compared to the company's target, we input the conservative hypothesis that Saudi Aramco's oil production capacity will plateau from 2027 while the company's strategy relies on production increase by then and did not make any comment about a production reduction. We also considered that gas production and gas production capacity target were similar.

Petrobras. The company aims to increase its oil production to 2.5 Mboe/d its gas production to 0.3 Mboe/d by 2027.[19] To integrate the 2030 production overshoot compared to the company's target, we input the conservative hypothesis that Petrobras' production will plateau from 2027 while the company's strategy relies on production increase by then and did not make any comment about a production reduction.

Gazprom. The company does not report production nor production capacity targets.

Overshoot based on companies' current portfolio (as of March 2023)

The 2030 company's production trajectory if it produces oil and gas from under production, under development and under field evaluation assets is compared to the production trajectories from fields sanctioned under the IEA NZE scenario. The overshoot is expressed in %:

$$Portfolio\ based\ production\ overshoot = \frac{Company's\ 2030\ production\ \ from\ under\ production,\ under\ development\ and\ under\ field\ evaluation\ fields}{Production\ from\ fields\ that\ obtained\ the\ FID\ before\ 2022} - 1$$

Future production may be impacted by oil and gas expansion, as well as acquisition, sale of oil and gas assets or geopolitical decision such as OPEC's production target.

[18] Saudi Aramco, FY 2022 Results Presentation, 2023
[19] Petrobras, 2022 20-F Report, p.169

Indicator N°3. Net liquefaction and regasification capacities

Past and current LNG capacities

Current regasification and liquefaction capacities are calculated using Enerdata LNG database with data extracted at the date indicated in each briefing. The net capacities are calculated using the prorated capacities using company's ownership share of the LNG terminal infrastructures.

Future LNG capacities

Future liquefaction and regasification capacities are calculated using the 2023 Global Oil and Gas Exit List database, updated when companies involved in an LNG terminal published a press release on LNG terminal infrastructures. Infrastructures are classified as operational, under construction and planned. Only infrastructure with a planned commissioned date or FID date were added to the calculation.

Net capacities sanctioned under the NZE are capacities that are operational in 2023. Net capacities sanctioned under the APS are capacities that are operational or under construction in 2023. This threshold relates to the IEA's 2023 World Energy Outlook that indicates that "*Since natural gas demand peaks in all WEO scenarios by 2030, there is little headroom remaining for either pipeline or LNG trade to grow beyond then. With around 650 bcm of annual liquefaction capacity in operation and a further 250 bcm under construction, global LNG markets look amply supplied in the STEPS until at least 2040. In the APS, LNG demand peaks by 2030 and projects under construction today are sufficient to meet demand. In the NZE Scenario, a global supply glut forms in the mid-2020s and under construction projects are no longer necessary.*"[20]

[20] https://iea.blob.core.windows.net/assets/42b23c45-78bc-4482-b0f9-eb826ae2da3d/WorldEnergyOutlook2023.pdf, p.139

Indicator N°4. Cash-flows analysis

Exploration CAPEX:

This is the Capital Expenditure of a company for oil & gas exploration, which is the very first step in the life cycle of an asset.

At that time, the company is looking for potential new oil and gas fields. At a time where no new projects should be sanctioned for development, new exploration – which purpose is precisely to find new oil and gas fields to develop – is not necessary to respond to the long-term energy demand.

This indicator is taken from the Global Oil and Gas Exit List and is the 3-years average of companies' exploration CAPEX over 2021 – 2023.

Past cash-flows

Past cash-flows are calculated using the Annual reports and 20-F reports for the European companies, and 10-K reports for the North American companies. When last audited financial reports are not published at the time of the analysis, the last full year unaudited financial statements are used.

Past CAPEX[21] allocation of a company is indicative of activities it is developing. Depending on each company's transparency, CAPEX may be ventilated between renewables or low carbon CAPEX, upstream CAPEX, other Oil and Gas CAPEX, and other CAPEX.

Oil and gas to renewable or low carbon CAPEX ratios (in %):

$$Oil\ and\ gas\ to\ low\ carbon\ CAPEX\ ratio\ = \frac{Upstream\ CAPEX + Other\ oil\ and\ gas\ CAPEX}{Renewable\ or\ Low\ carbon\ CAPEX} - 1$$

Shareholder distribution to renewable or low carbon CAPEX ratios (in %):

Distribution to shareholders is the sum of dividends and share buybacks, net of share issuance.

$$Shareholder\ distribution\ to\ renewable\ or\ low\ carbon\ CAPEX\ ratio\ = \frac{Dividends + net\ share\ buybacks}{Renewable\ or\ Low\ carbon\ CAPEX} - 1$$

Declaration on companies' CAPEX use and companies' low carbon definition:

BP. BP details organic and inorganic CAPEX per business line. Renewable energy investments are included in "low carbon energy" business line that also includes low-carbon electricity, bioenergy, electrification, future mobility solutions, CCUS, hydrogen and "low carbon" trading.

ENI. Eni details organic CAPEX per business line. Renewable energy investments are included in "Plenitude" business line that also includes customer base, circular economy, biorefining and sustainable mobility investments.

Equinor. Equinor details organic and inorganic CAPEX per business line. Renewable energy investments are included in "Renewable and Low Carbon Solution" business line that also includes CCUS, hydrogen from gas and oil and gas platforms electrification.

Repsol. Repsol details operating investments per business line. Renewable energy investments are reported separately.

[21] Find out financial definition in the glossary.

Shell. Shell details cash CAPEX per business line. Renewable energy investments are included in "Renewables & Energy solutions" business line that also includes power generation, trading and supply, hydrogen, and nature-based solutions.

TotalEnergies. TotalEnergies details net investments per business line. Renewable energy investments are included in "Integrated Gas, Renewable and Power (iGRP)" business line that also includes gas power and gas sales.

Chevron. Chevron details capital and exploratory expenditures per business line.

ConocoPhillips. ConocoPhillips details organic and inorganic CAPEX per business line.

ExxonMobil. ExxonMobil details Capital and exploration expenditures per business line.

ADNOC. The company does not detail its CAPEX per Business Line.

QatarEnergy. The company does not detail its CAPEX per Business Line.

Saudi Aramco. The company details its CAPEX per Business Line. Sustainable energy is included in the downstream business line.

Petrobras. The company details its CAPEX per Business Line. Sustainable energy CAPEX is included and detailed in Research & Development CAPEX.

Gazprom. The company does not detail its CAPEX per Business Line.

Near-term CAPEX:

As for past CAPEX, near-term CAPEX[22] allocation of a company is indicative of activities it is aiming to develop. Depending on each company's transparency, CAPEX may be ventilated between renewables or low carbon CAPEX, upstream CAPEX, other Oil and Gas CAPEX, and other CAPEX.

Too low shares of CAPEX allocations for renewable or low carbon indicate too slow transitions toward a more sustainable energy system, but also indicate high shares of CAPEX allocation toward fossil activities at a time where fossil production should decrease.

This indicator comes directly from companies' public documents.

BP. BP details 2023-2030 CAPEX plan with CAPEX dedicated to low carbon solutions.[23]

ENI. Eni details 2023-2026 CAPEX plan with CAPEX dedicated to renewables.[24]

Equinor. Equinor details 2023-2025 gross CAPEX share dedicated to renewable and low carbon solutions.[25]

[22] Find out financial definition in the glossary.
[23] https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/investors/bp-fourth-quarter-2022-results-presentation-slides-and-script.pdf
[24] https://www.eni.com/assets/documents/eng/investor/presentations/2023/2023-capital-markets-update/2023-Capital-Markets-Update-presentation.pdf
[25] https://www.equinor.com/content/dam/statoil/documents/quarterly-reports/2021/cmd-2021/cmd-2021-all-presentations-equinor.pdf

Repsol. Repsol details 2021-2025 CAPEX plan with CAPEX dedicated to low carbon solutions.[26]

Shell. Shell details 2023 cash CAPEX target. No details are given further on CAPEX allocation strategy.[27]

TotalEnergies. TotalEnergies details 2023-2030 CAPEX plan. CAPEX dedicated to "integrated power" and "new molecules" are detailed. The share of growth CAPEX in oil and gas have been reported in the company's last sustainability report.[28]

Chevron. Chevron details 2023-2027 CAPEX plan. No CAPEX is reported in renewable energy.[29]

ConocoPhillips. ConocoPhillips details 2023 CAPEX plan. No CAPEX is reported in renewable energy.[30]

ExxonMobil. ExxonMobil details 2022-2027 CAPEX plan. No CAPEX is reported in renewable energy.[31]

ADNOC. ADNOC details 2023-2027 CAPEX. CAPEX dedicated to "low-carbon solutions and new energies" is published.[32]

QatarEnergy. The company does not detail its 2021-2025 CAPEX plan in its reportings.

Saudi Aramco. The company does not detail its CAPEX plan in its reportings.

Petrobras. The company details its 2023-2027 CAPEX plan per Business Line**.** No CAPEX are reported in renewable energy.[33]

Gazprom. The company does not detail its CAPEX per Business Line.

https://cdn.equinor.com/files/h61q9gi9/global/4f657cc565efdde0a3103fb055b6c7b5374b601e.pdf?2023-cmu-all-presentations.pdf

[26] https://www.repsol.com/content/dam/repsol-corporate/en_gb/conocenos/2025-strategy/II26112020_presentation_on_the_strategic_plan_2021_2025.pdf

[27] https://www.shell.com/investors/results-and-reporting/quarterly-results/2022/q4-2022/_jcr_content/root/main/section/simple/call_to_action_1923337102/links/item2.stream/1675308282410/8e37c31351b79d4223dda24e7b52fc7e414d79ca/q4-2022-slides.pdf

[28] https://totalenergies.com/system/files/documents/2022-03/Sustainability_Climate_2022_Progress_Report_EN_0.pdf

[29] https://chevroncorp.gcs-web.com/static-files/733c80ae-1571-49cf-9199-99e3b3d56da6

[30] https://conocophillips.gcs-web.com/static-files/93ced561-e23a-4949-9b88-ec7ad6606df5

[31] https://corporate.exxonmobil.com/-/media/global/files/investor-relations/corporate-plan-update/2022/2022-corporate-plan-update-presentation-slides.pdf?la=en&hash=63B0F3583F26C71850CC185897EDE3885AC81E56

[32] https://www.adnoc.ae for low carbon CAPEX, https://adnocgas.ae/en/investor-relations/investment-case for total investments

[33] Petrobras 2022 annual report and sustainability report.

Indicator N°5. Forecasted energy production for 2030.

Ratio of renewable and fossil energy production in 2030, and share of renewable in the energy mix in 2030

Another indicator we looked at is the future energy mix. To that purpose, we looked through companies' documents to retrieve fossil fuel production plans and renewable development plans by 2030. This data has then been processed in different ways on a company-per-company basis, depending on the available information. The different steps of the calculation are described below.

Step 1. Estimating the plans for fossil fuel production in 2030

We look at companies' targets for oil and gas production. Calculations can be found in our data set, available for download.

Step 2. Estimating companies' plan of renewable production

Renewable energy does not always produce energy, as their output can depend on weather or network conditions. However, it is possible to measure how much they produce over time, as compared to what they would produce would they be running 24/7 at full power: this is the **capacity factor**. As of 2018, this typically ranges from 10 to 21% for photovoltaic power, from 23 to 44% for onshore wind power, and from 29 to 52% for offshore wind power.[34]

Short of knowing which technology companies will choose to meet their renewable targets, we calculated an average capacity factor. To that purpose, we referred to IEA[35] to estimate the relative importance of different renewable technologies across this sector, and calculated the capacity-weighted average capacity factor, that is:

$$\frac{\sum_{technologies} Capacity\ Factor\ \times Total\ Capacity}{\sum_{technologies} Total\ Capacity}$$

This average capacity factor then needs to be applied to the maximum theoretical generation of the renewable capacity, would it run 24 hours per day, 365.25 days per year:

$$Max\ Theoretical\ Generation = Renewable\ Capacity\ \times 24\ \times 365.25$$

We can then estimate the average annual generation from companies' renewable capacity targets as follow:

$$Avg\ Renewable\ Generation = Avg\ Capacity\ Factor\ \times Max\ theoretical\ generation$$

Step 3. Comparing fossil fuel production and renewable production

Most of current renewable energy sources[36] produce electricity, a form of energy directly usable by the final user, also called final energy. Each MWh produced and sent onto the grid is consumed on the other end by a client and suffers little transmission losses.

On the other hand, oil and gas products need to undergo combustion to deliver energy for the final user, or client. This process of combustion comes with significant efficiency losses. Hence, when consumed, energy contained in oil and gas products leads to final energy and energy losses. This energy

[34] IEA Average annual capacity factors by technology, 2018
[35] IEA Renewable 2020 Data Explorer
[36] These renewable energies make the bulk of today's renewable energy as per IEA Renewable 2020 Data Explorer

contained in oil and gas products is also called primary energy. In other words, primary energy is a source of final energy, but not all of it can be turned that way.

To be comparable, it is then necessary to express production from both sources either in primary or final energy. To that purpose, we used the fossil fuel equivalence method[37] : energy produced from renewable electricity sources is multiplied by a coefficient leading to the equivalent primary energy that would have been needed if this electricity came from thermal generation. This coefficient depends on current thermal power plant's efficiency; we referred to the 2022 BP's Statistical Review of World Energy to source the most recent thermal efficiency factor and conduct our calculations.[38]

In the end, the primary energy equivalent of renewable generation is given by:

$$Renewable\ primary\ energy\ equivalent = \frac{Avg\ Renewable\ Generation}{Thermal\ efficiency\ factor}$$

Step 4. Ratio of renewable production to fossil fuel production

The ratio between renewable production and fossil fuel production is finally calculated based on the fossil fuel equivalent of companies forecasted renewable production, and on the companies' fossil fuel production plans, as follow:

$$X = \frac{Renewable\ primary\ energy\ equivalent}{Fossil\ fuel\ production}$$

Step 5. Maximum share of renewable in the energy mix in 2030

The share of renewable in the energy mix in 2030 is given by:

$$Renewable\ share = \frac{Renewable\ primary\ energy\ equivalent}{Total\ primary\ energy\ production}$$

Our analysis considers only fossil fuel and renewable production levels by 2030, regardless of other energy production means. Would a company resorts to other energy production means, such as biofuels or hydrogen, its 2030 total primary energy production would exceed the aggregate of its renewable primary energy equivalent and fossil fuel production.

Consequently, the sum of fossil fuel production and renewable primary energy equivalent leads to a low estimate of 2030 total primary energy production, and using it to compute the renewable share in 2030 gives a high estimate of the renewable share in the energy mix in 2030:

$$Max\ renewable\ share = \frac{Renewable\ primary\ energy\ equivalent}{Renewable\ primary\ energy\ equivalent + Fossil\ fuel\ production}$$

[37] https://www.eia.gov/todayinenergy/detail.php?id=41013
[38] https://www.connaissancedesenergies.org/sites/default/files/pdf-actualites/bp-stats-review-2021-full-report.pdf

BP. The company announced a target of 10 GW of net installed renewable capacity by 2030.[39] Assuming an average capacity factor of 25%[40], we calculated the average annual electricity generation. Finally, this annual electricity generation has been converted into primary energy using the fossil fuel equivalence method. See Below for more details on this method.

ENI. The company announced a target of 15 GW of renewable capacity by 2030.[41] Assuming an average capacity factor of 25%,[42] we calculated the average annual electricity generation for a renewable capacity. Finally, this annual electricity generation has been converted into primary energy using the fossil fuel equivalence method. See Below for more details on this method.

Equinor. The company announced a target of 12 to 16 GW of renewable capacity by 2030.[43] Assuming an average capacity factor of 25%,[44] we calculated the average annual electricity generation for a renewable capacity. Finally, this annual electricity generation has been converted into primary energy using the fossil fuel equivalence method. See Below for more details on this method.

Repsol. The company announced a target of 20 GW of renewable capacity by 2030.[45] Assuming an average capacity factor of 25%,[46] we calculated the average annual electricity generation for a renewable capacity. Finally, this annual electricity generation has been converted into primary energy using the fossil fuel equivalence method. See Below for more details on this method.

Shell. The company announced it aims to serve 50 million of households with renewable energy by 2030.[47] Given that the renewable uptake is happening faster in more developed countries, we considered the average annual consumption of an Australian household.[48]

TotalEnergies. The company announced a target of 100 GW of gross renewable capacity by 2030,[49] that is equivalent to 66 GW net renewable capacity. Assuming an average capacity factor of 25%,[50] we

[39] https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/investors/bp-fourth-quarter-2022-results-presentation-slides-and-script.pdf
[40] Using IEA Average annual capacity factors by technology, 2018; solar ranges from 10% to 21%, onshore wind from 23% to 44%, and offshore wind from 29 to 52%. The average capacity factor has been calculated over technologies according to their relative installed capacity, sourced from IEA Renewable 2020 Data Explorer
[41] https://www.eni.com/en-IT/investors/long-term-plan.html
[42] Using IEA Average annual capacity factors by technology, 2018; solar ranges from 10% to 21%, onshore wind from 23% to 44%, and offshore wind from 29 to 52%. The average capacity factor has been calculated over technologies according to their relative installed capacity, sourced from IEA Renewable 2020 Data Explorer
[43] https://www.equinor.com/content/dam/statoil/documents/quarterly-reports/2021/cmd-2021/cmd-transcript-2021-06-15-equinor.pdf
[44] Using IEA Average annual capacity factors by technology, 2018; solar ranges from 10% to 21%, onshore wind from 23% to 44%, and offshore wind from 29 to 52%. The average capacity factor has been calculated over technologies according to their relative installed capacity, sourced from IEA Renewable 2020 Data Explorer
[45] http://www.repsol.com/en/press-room/press-releases/2021/repsol-increases-its-targets-for-renewable-generation-and-emission-reductions/index.cshtml
[46] Using IEA Average annual capacity factors by technology, 2018; solar ranges from 10% to 21%, onshore wind from 23% to 44%, and offshore wind from 29 to 52%. The average capacity factor has been calculated over technologies according to their relative installed capacity, sourced from IEA Renewable 2020 Data Explorer
[47] https://www.shell.com/energy-and-innovation/the-energy-future/our-climate-target/_jcr_content/par/relatedtopics.stream/1635426463090/54e9db7e3118ac2c9f4bc1c06d36051a5dc1a982/our-climate-target.pdf
[48] https://www.aer.gov.au/system/files/Residential%20energy%20consumption%20benchmarks%20-%209%20December%202020_0.pdf
[49] https://totalenergies.com/system/files/documents/2022-03/DEU_21_VA.pdf
[50] Using IEA Average annual capacity factors by technology, 2018; solar ranges from 10% to 21%, onshore wind from 23% to 44%, and offshore wind from 29 to 52%. The average capacity factor has been calculated over technologies according to their relative installed capacity, sourced from IEA Renewable 2020 Data Explorer

calculated the average annual electricity generation for a renewable capacity. Finally, this annual electricity generation has been converted into primary energy using the fossil fuel equivalence method. See Below for more details on this method.

Chevron. The company did not announce a renewable capacity target.

ConocoPhillips. The company did not announce a renewable capacity target.

ExxonMobil. The company did not announce a renewable capacity target.

ADNOC. Masdar, 24% detained by ADNOC, announced a target of 20 GW of renewable capacity by 2030.[51] That represents a prorated capacity of 4.8 GW for ADNOC. Assuming an average capacity factor of 25%,[52] we calculated the average annual electricity generation for a renewable capacity. Finally, this annual electricity generation has been converted into primary energy using the fossil fuel equivalence method. See Below for more details on this method.

QatarEnergy. The company announced a target of 3 GW of renewable capacity by 2030.[53] Assuming an average capacity factor of 25%[54], we calculated the average annual electricity generation for a renewable capacity. Finally, this annual electricity generation has been converted into primary energy using the fossil fuel equivalence method. See Below for more details on this method.

Saudi Aramco. The company announced a target of 3 GW of renewable capacity by 2030.[55] Assuming an average capacity factor of 25%[56], we calculated the average annual electricity generation for a renewable capacity. Finally, this annual electricity generation has been converted into primary energy using the fossil fuel equivalence method. See Below for more details on this method.

Petrobras. The company did not announce a renewable capacity target.

Gazprom. The company did not announce a renewable capacity target.

[51] https://www.adnoc.ae/en/sustainability-net-zero/growing-our-lower-carbon-solutions/renewables
[52] Using IEA Average annual capacity factors by technology, 2018; solar ranges from 10% to 21%, onshore wind from 23% to 44%, and offshore wind from 29 to 52%. The average capacity factor has been calculated over technologies according to their relative installed capacity, sourced from IEA Renewable 2020 Data Explorer
[53] QatarEnergy, 2022 sustainability report
[54] Using IEA Average annual capacity factors by technology, 2018; solar ranges from 10% to 21%, onshore wind from 23% to 44%, and offshore wind from 29 to 52%. The average capacity factor has been calculated over technologies according to their relative installed capacity, sourced from IEA Renewable 2020 Data Explorer
[55] Saudi Aramco, 2022 sustainability report
[56] Using IEA Average annual capacity factors by technology, 2018; solar ranges from 10% to 21%, onshore wind from 23% to 44%, and offshore wind from 29 to 52%. The average capacity factor has been calculated over technologies according to their relative installed capacity, sourced from IEA Renewable 2020 Data Explorer

Indicator N°6. Are the companies' pledged decarbonization targets aligned with a 1.5°C and below 2°C carbon budget?

A critical indicator to assess if a company's decarbonization pathway is at the scale required and aligned is whether it fits within the 1.5°C and below 2°C carbon budget. This requires two types of calculations:

- Calculating the allocated carbon budget[57] for the company until 2030 in a 1.5°C pathway and below 2°C pathway, building on sectoral decarbonization pathways provided by the International Energy Agency (IEA), the Intergovernmental Panel on Climate Change (IPCC) and the Transition Pathway Initiative (part A)
- Calculating the projected volumes of absolute carbon emissions each year until 2030 by the company, building on the company's decarbonization targets and energy production volumes.

Why is our approach conservative?

To calculate carbon intensity targets and associated absolute emissions, we had to make hypotheses:

- *(H1) About current emissions:* ***we assumed the companies' disclosure cover all significant emission sources*** *as they are expected to do,*
- *(H2) About future emissions:* ***we assumed the companies will meet their decarbonization targets****, regardless of how likely they are to do so given the means set in place. For instance, some targets are dependent on customer actions and hereby defer part of the target's accomplishment responsibility: it does not show signs of a strong commitment and strategy, but it is still assumed the target will be met. Indicators N°1 to N°4 and N° 6 are here to discuss the likelihood and impact of this hypothesis.*
- *(H3) About future production[58]:* ***we assumed the companies will keep the same market share over their energy activities*** *and will consequently see their energy supply decrease in line with the IEA Net Zero scenario for the 1.5°C reference scenario and with the IEA Announced Pledges Scenario for the below 2°C reference scenario.*

Note that hypotheses 2 and 3 are conservative and tend to underestimate companies' future emissions. Most of the researched companies plan to increase their oil and gas production between 2023 and 2030.

Calculating the carbon intensity pathways and absolute carbon emissions

Step 1. Build on IEA's and Transition Pathway Initiative (TPI)'s decarbonization pathways for the oil and gas sector

We didn't start from scratch. To define decarbonization expectations from the oil and gas sector, we used the two sectoral decarbonization pathway computed by TPI: the "1.5 Degree's scenario"[59] and

[57] Carbon budget refers to the amount of greenhouse gases that can be emitted expressed in CO2 equivalent.
[58] Note that here and throughout this document, the term production refers to the volume of sold energy products.
[59] This scenario gives a probability of 50% of holding the global temperature increase to 1.5°C.

"below 2°C"[60], drawing on IEA scenario for CO_2 emissions and energy demand, and on IPCC scenario for methane emissions.[61]

- What is a decarbonization pathway? It's a series of year-on-year carbon intensity targets and energy production levels. Carbon intensity is given in gCO2e/MJ, which is the amount of greenhouse gases emitted per megajoule produced. Taken together with the energy production levels, this gives a series of year-on-year absolute carbon emission targets, the magnitude of which depends on the size of the company at the beginning of the timeframe.

- Why do we need a sectoral decarbonization pathway? It stems from the fact that emissions and the short-term ability to decarbonize vary across industries. As such, it would not make sense to ask each economic actor to decrease its emissions at the same rate. Hence, for each sector, a different decarbonization pathway is computed.

- What kind of data is required to compute a sectoral decarbonization pathway? It relies on three key inputs:
    - A timeseries for absolute carbon emissions up to 2030, whose total stays below the carbon budget associated with the scenario's global warming limit.
    - A breakdown of this absolute greenhouse gas emission timeseries in between key economic sectors (becomes the numerator of sectoral emissions intensity).
    - Forecasts, for each economic sector, of the timeseries of the sector's activity (becomes the denominator of sectoral emissions intensity).

- Which data sources did TPI use? TPI drew on three pathways ("1.5 degrees", "Below 2 degrees", and "National Pledges") computed by the IEA using a least-cost model and different underlying hypotheses.[62] Given that the IEA's pathways look only at carbon emissions and do not take into account other potent greenhouse gases such as methane, TPI factored in methane emissions (by using one of IPCC's Oil and Gas-related methane emissions projections consistent with a 1.5°C global warming, and using a 100-year global warming potential factor of 28).

For our analysis, we focused and sourced the carbon intensity[63] pathways modeled by TPI using the International Energy Agency's (IEA) Net Zero (NZ) and Announced Pledge scenarios from November 2021, consistent with keeping global warming respectively below 1.5°C and 2°C.[64] These scenarios are the 1.5°C and below 2°C reference scenarios (referred as "reference scenario" by then) for our analysis. This allowed us, after calculating a company's total GHG emissions, to compare plans to reduce carbon intensity and figure out whether or not these plans are in line with the IEA 1.5°C and below 2°C scenarios.

[60] This scenario gives a probability of 50% of holding the global temperature increase to 1.65°C.
[61] https://www.transitionpathwayinitiative.org/publications/96.pdf?type=Publication.
[62] The IEA models the path of emissions and the supply of energy in various sectors consuming energy from fossil fuels under key assumptions such as population and economic growth or technology improvement. To figure out where to reduce carbon emissions, IEA models run a least-cost approach: emissions cut are made wherever it is cheaper to make them. The outputs are then cost-effective.

[63] Carbon intensity refers to the greenhouse gasses intensity expressed in CO2 equivalent.
[64] https://www.transitionpathwayinitiative.org/sectors/user_download_all

Step 2. Calculate the company's carbon intensity pathway based on its current targets.

All covered companies set targets to reduce their emissions against a base year. Consequently, their carbon intensity is expected to decrease over the years to come. **Our carbon intensity pathway calculations reflect the impact of these pledged reduction targets**.

There are different methodologies to calculate carbon intensity. As the purpose of this analysis is not to put forward one methodology in particular, but to make an assessment of the company's pledged transition plan, we used the data disclosed by the company instead of calculating it ourselves.

Companies disclosed their emissions originating from scope 1, 2, and 3, as well as their carbon intensity of sold energy products. Given these companies are essentially energy providers, it is assumed their emissions are mostly related to their energy production[65]. As such, carbon intensity can be split in between contributions prorated to the different scopes' absolute figures. Hence, whenever an emission reduction target applies to:

- Absolute GHG emissions: we compute the future level of absolute GHG emissions for that scope, and the future emission intensity at a future date assuming an energy production growing as in IEA's Net Zero scenario and Announced Pledges scenario.
- Carbon intensity: we compute that scope's contribution to the carbon intensity directly.

If a company sets incomplete targets (e.g. some targets are set for some scopes, but not all scopes), we assume that uncovered scopes' contributions of the carbon intensity remain constant from the most recent previous target.

Target scopes can overlap. For instance, one target can cover scope 1+2 while a second one can cover scope 1+2+3, or a target can cover the world while a second one can cover a specific subregion. When two targets with different coverages overlap, we assume that the target with the broader one takes precedence. If two targets have the same coverage, the most ambitious one takes precedence.

For each date for which targets have been set, we compute the impact on carbon intensity scope-by-scope, as described above, then sum them up to calculate overall expected carbon intensity.

Example:

Company A has a carbon intensity of 100gCO2e/MJ, 10 gCO2e/MJ coming from scope 1, 10 gCO2e/MJ from scope 2, and 80 gCO2e/MJ from scope 3.

In 2025, Company A pledged to reduce its scope 1 emission intensity by 20%: the new contribution of scope 1 emissions to the carbon intensity is 8 gCO2e/MJ, leading to a carbon intensity of 8 + 10 + 80 = 98 gCO2e/MJ.

In 2030, Company A pledged to reduce its scope 3 emissions by 50%; the new contribution of scope 3 emissions to the carbon intensity is 40 gCO2e/MJ. Referring to the most recent previous target, scope 1 and scope 2 contributions are respectively 8 and 10 gCO2/MJ. As a result, Company A's pledged carbon intensity for 2030 is 8 + 10 + 40 = 58 gCO2e/MJ.

[65] A less constraining assumption is that the company has the same share of non-energy product related emissions over its base year and 2019.

Eight companies, ConocoPhillips, ExxonMobil, ADNOC, QatarEnergy, Saudi Aramco, Petrobras and Gazprom do not give sufficient details on scope 3 emissions and scope 3 decarbonization targets to allow us to calculate their emission intensity.

Step 3. Calculate the company's GHG emissions using their annual carbon intensity levels.

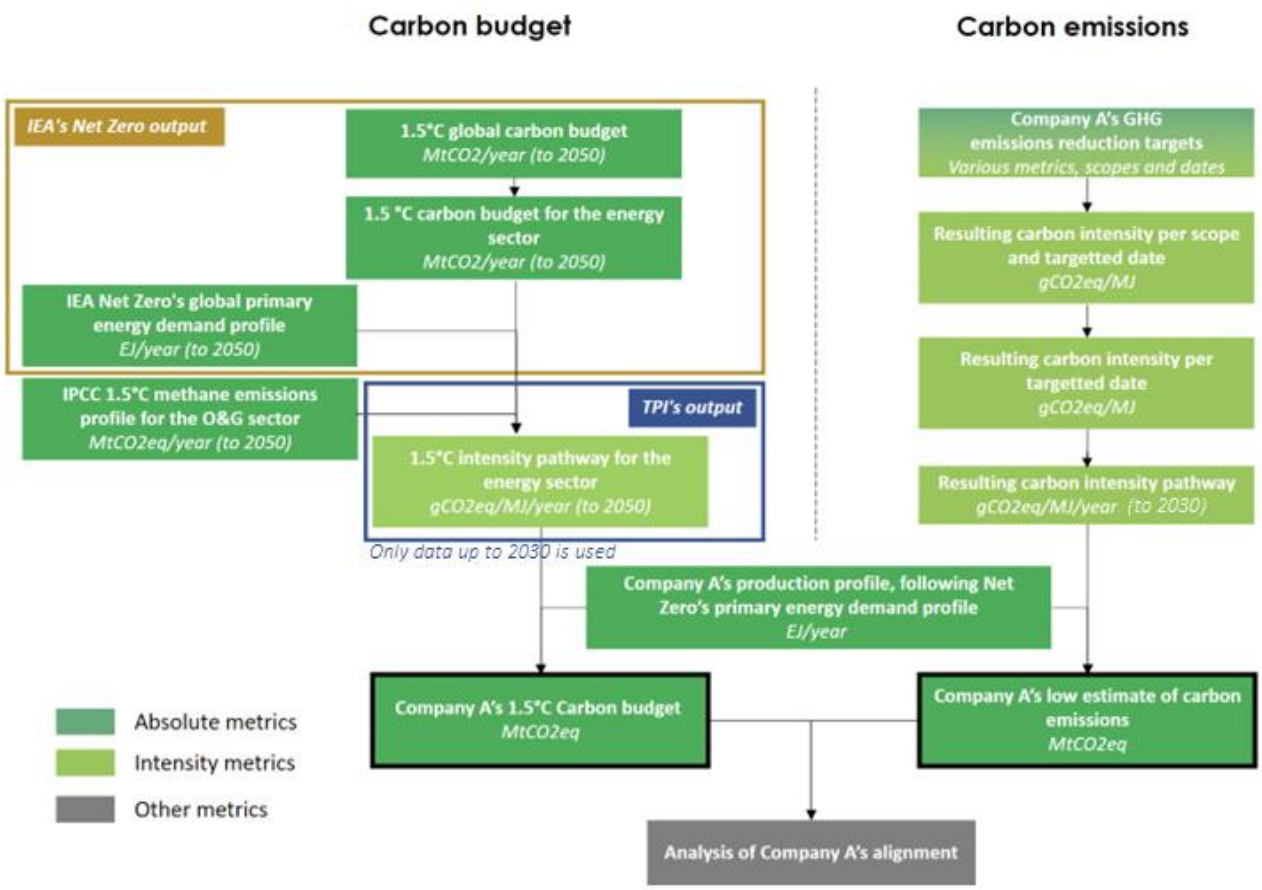
By design, for any year, one company's emissions are given by:

$$Absolute\ emissions = Carbon\ intensity\ \times Production$$

The cumulated emissions of a company are then the sum of its absolute emissions over a given period. Such emissions can be calculated in several ways, and leads to different quantities:

- Assuming the company's production grows as in the reference scenario, and its carbon intensity pathways equals the one of the reference scenarios, the calculation gives the **total amount of greenhouse gases the company can emit**, or its **allocated carbon budget.**
- Assuming the company's production grows as in the reference scenario, but using the company's pledged carbon intensity pathway, the calculation gives a **low estimate of the cumulated emissions of the company's pledged strategy**. This estimate is highly conservative, as it assumes companies will meet their decarbonization targets, but will also align their production with the reference scenario: this latter hypothesis is already proven wrong, as detailed in the research.

Graph 2. Schematic representation of carbon emissions and budget calculations under the NZE scenario hypotheses



Note that calculations under the APS hypotheses follow the same logic as presented on the graphic above, set aside the use of the APS scenario instead of the NZE, and of a below 2°C methane emissions profile for the O&G sector instead of a 1.5°C one.

Step 4. What does it mean to be aligned on such a pathway?

Sectoral decarbonization pathways are created to guide the decarbonization effort at the sector level and keep sectors' absolute emissions within limits. Its purpose is therefore to limit absolute emissions. To be aligned on such a pathway, it then takes for a company to not overshoot its allocated carbon budget.

This can happen in two ways:

- The company's energy production is too carbon intensive. Even if the production level is aligned with the reference scenario, it emits too much GHG per unit of produced energy. This would be the case of a company reducing its production without transitioning toward other clean energy generation.
- The company has too high a production: even if the carbon intensity is aligned, an extra production will bring extra emissions. This would be the case of a company diversifying its production - for instance with renewable energy - without reducing its fossil fuel production.

We acknowledge this methodology is not suited to state on a company's alignment, but only to state on misalignment. Indeed, short of knowing the company's future production plans, and as explained in

step 3, we can only calculate a low estimate of the cumulated emissions of the company's pledged strategy. Would this low estimate exceed the company's *allocated carbon budget*, then the company's future cumulated emissions are highly likely to exceed this target too. On the other end, if this low estimate falls below its *allocated carbon budget*, it cannot help state where the future cumulated emissions will fall.

Calculation of alignment indicators:

Short-term, medium-term, and long-term alignment:

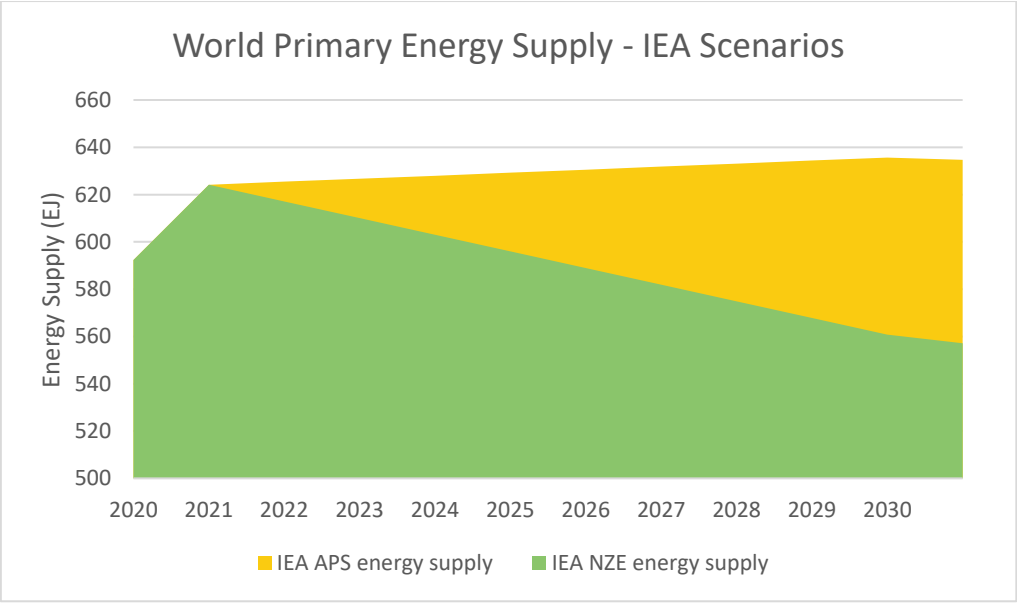
To be aligned on a scenario on a specific timeframe it takes a company to keep its absolute emissions within the budget it is allocated by the scenario.

Yearly absolute emissions of a company are given by the product of its carbon intensity and its production. Hence, the cumulative absolute emissions of the company are given by:

$$X = \sum_{i=2023}^{End\ Year} Companies'pledged\ carbon\ intensity\ (i) \times Companies\ pledged\ \ production\ (i)$$

Because companies do not accurately disclose their production plans for the years to come, we took the conservative hypothesis[66] that their production will evolve following the same trend as the IEA's Net Zero scenario for the 1.5°C reference scenario and Announced Pledges Scenario for the below 2°C reference scenario, starting from their 2019 production level. This is equivalent to say companies would keep a constant market share in a world where global primary energy supply evolves as prescribed by each scenario.

Graph 3. World primary energy supply forecast in the IEA Net Zero Emission scenario and in the IEA Announced Pledges Scenario



[66] This hypothesis is conservative as none of the oil and gas companies covered in this analysis are reducing their production as needed. In fact, most of them are still planning on growing hydrocarbon production, and more broadly on growing energy production.

Source: IEA, *World Energy Outlook*, 2022

As such, we have:

- The companies' low estimate cumulated emissions given as a function of the end year*:*

$$LECE\ (End\ Year) = \ Low-estimate\ cumulated\ emissions\ (End\ Year)$$

$$= \sum_{i=2023}^{End\ Year} Companies'\ pledged\ carbon\ intensity\ (i)\ \times\ Ref\ Scenario-aligned\ \ production\ (i)$$

- The companies carbon budget given as a function of the end year:

$$Carbon\ budget\ (End\ Year) = \ \sum_{i=2023}^{End\ Year} Ref\ Scenario\ carbon\ intensity\ (i)\ \times Ref\ Scenario-aligned\ \ production\ (i)$$

We declare a company not aligned in the period 2023 – 2030 if its *Low-estimate cumulated emissions* (LECE) exceeds its *Carbon budget*.

Consequently, a company is not aligned over 2023 – 2030 if *LECE (2030) > Carbon budget (2030)*

The overshoot is defined as the exceeding emissions of a company's *Low-estimate cumulated emissions* (LECE) compared to its *Carbon budget* over the same period. Reusing the functions defined previously, overshoots by 2030 are defined, In relative terms (in %):

$$X = \frac{LECE\ (2030) - Carbon\ budget\ (2030)}{Carbon\ budget\ (2030)}$$

A company not aligning will emit in excess and have a positive overshoot: the higher, the more misaligned.

2030 Carbon intensity excess:

We defined the 2030 carbon intensity excess in relative terms (in %):

$$X = \frac{\left[\underset{over\ 2023-2030}{average\ (Company's\ pledge\ carbon\ intensity)}\right] - \left[\underset{over\ 2023-2030}{average\ (reference\ scenario\ carbon\ intensity)}\right]}{\underset{over\ 2023-2030}{average\ (reference\ scenario\ carbon\ intensity)}}$$

Indicator N°7. Reliance on Carbon Capture, Utilization and Storage (CCUS) and Offset mechanisms

CCUS and offset figures have been sourced directly from companies document or websites. To collect this data, we have been looking through companies' annual reports, sustainability plans, strategic reports, and investor presentations. We then aimed to assess to what extend offsets are part of companies' decarbonization strategies.

Step 1. Company's pledged reliance on offset.

This indicator aims to measure to what extent a company relies on offsets to meet its decarbonization targets. To do so, we:

- Consider the latest offset targets, expressed in MtCO2e captured per year.
- Look, on the same year, at the ambitioned absolute emissions reduction of the company, expressed in MtCO2e emitted per year.
- Calculate the ratio of the two quantities.

This gives the magnitude of reliance on captured emissions and offset to meet decarbonization targets, in percentages. This calculation has been conducted separately for CCUS and Nature-Based Solutions, two popular but problematic ways of offsetting emissions.

Step 2. Feasibility of this reliance on CCUS and NBS:

Finally, to give sense of how realistic offsets targets are, we processed pledged offsets targets and *forecasted needs of offset by 2030* as follow:

- CCUS: at the end of 2020, there were 28 CCUS centers of average capture capacity of 1.5 MtCO2e per year.[67] This value is used to translate companies' ambitioned use of CCUS into number of needed centers, to illustrate how likely or unlikely companies are to reach this goal. Let's also emphasize that most of these centers are economically viable since the carbon is used to enhanced oil and gas recovery; without this, CCUS is not expected to be economic unless a high enough price of carbon emission.
- NBS: Nature-Based Solution are highly space-consuming. To give a sense of it, all NBS targets are translated into equivalent area using a coefficient of 1.16kgCO2e/m²/year. This coefficient is the result of a peer-reviewed study. [68]

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[67] https://carbontracker.org/oil-companies-should-hedge-their-bets-on-ccus-and-offsetting/

[68] https://doi.org/10.1038/s41586-020-2686-x; In this study, authors calculated the area-weighted average of carbon accumulation potential of lands in 10 countries showing variable climatic conditions, which are key factors driving carbon accumulation potential through reforestation.