OIL AND GAS COMPANIES' TRANSITION STRATEGY

METHODOLOGY

To help financial institutions navigates oil and gas majors 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.

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.

Scope of our analysis

Reclaim Finance scrutinized the current plans and climate targets of the top 9 publicly listed integrated oil and gas companies from Europe and the United States, selected on the 2021 oil and gas production criteria.

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 Exxon Mobil.**

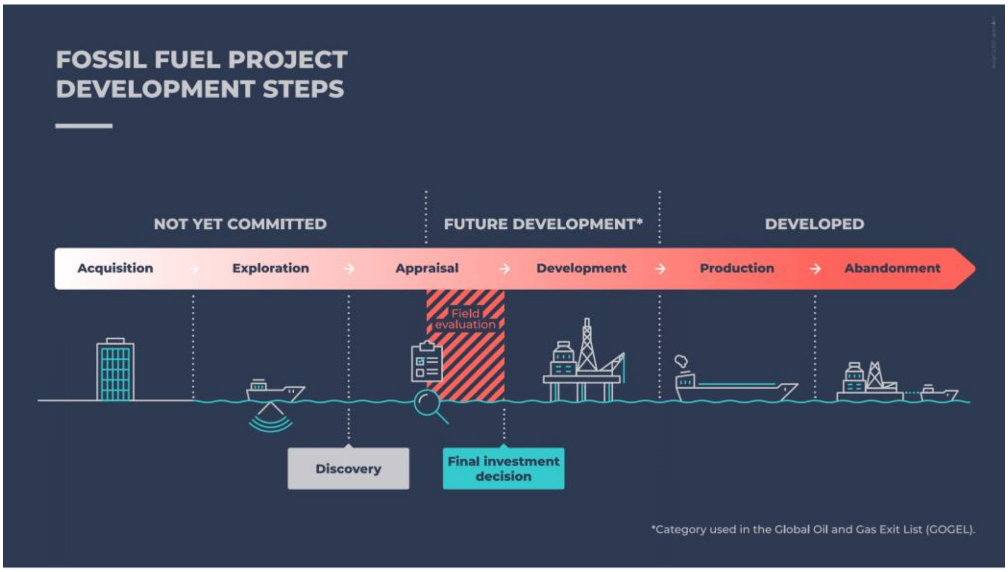
N°1. Expansion plans of companies

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 they energy production as per the reference scenario. 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 four main categories:

- Undiscovered: these assets relate to geological formation that may contain oil and gas, but that have not been explored yet.
- Not yet committed or 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, or producing: 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*

[1] Resources, expressed in millions of barrels of oil equivalent, are a metric similar to 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.

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

Under production resources:

This is total resources still in the ground of assets that are producing.
Except from explicit mentions in briefing, this data was extracted from Rystad Energy UCube in March 2023.

Under development or field evaluation resources:

This is the total amount of hydrocarbon resources that are either under development or ongoing field evaluation. These assets are highly likely to enter production in a near future.
Except from explicit mentions in briefing, this data was extracted from Rystad Energy UCube in March 2023.

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.
Except from explicit mentions in briefing, this data was extracted from Rystad Energy UCube in March 2023.[2]

Resources are represented in million barrels of oil equivalent and in number of years of its 2022 production level. 2022 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

$$X = \frac{Under\ development\ resources + Under\ field\ evaluation\ resources}{2022\ production}$$

Then theoretically, the company would have enough under development and under field evaluation resources to maintain its current production for X more years. However, as production from oil and gas fields reaches a plateau before decreasing, company's production with these resources will last longer at a 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 fracking, 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]

[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/

The share of companies' production and expansion plan across these different activities has been sourced from Urgewald analyses based on data from Rystad Energy.[5]

N°2. Oil and gas production evolution

<u>Forecasted 2030 production levels:</u>

This indicator shows the evolution of oil and gas production between *2023* and 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[6] from fields under production and fields under development or field evaluation 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[7] from fields under development or field evaluation 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.

<u>Overshoot based on companies' plans</u>

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

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

<u>Companies' production forecasts declaration:</u>

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".[8]

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.[9]

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[5] https://urgewald.org/english

[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] 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.

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

[9] https://www.eni.com/en-IT/media/press-release/2020/02/long-term-strategic-plan-to-2050-and-action-plan-2020-2023.html

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",[10] but also stated it will be "maintaining production level in 2025-2030".[11]

Shell. The company announced it passed its oil production peak in 2019, and expects it to decline 1-2% per annum by 2030. In the same time, it anticipated its gas share of hydrocarbon production to reach 55% by 2030.[12] 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 decreasing 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)".[13]

Chevron. The company aims to increase its production by 3% per year through 2026.[14] 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.[15] 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.[16] 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.

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 if the company respected the IEA NZE scenario. The overshoot is expressed in %:

$$\text{Production overshoot as compared to the IEA NZE scenario} = \frac{\begin{array}{c}Company's\ 2030\ production\ \ from\ under\ production,\\ under\ development\ and\ under\ field\ evaluation\ fields\end{array}}{Production\ from\ fields\ that\ obtained\ the\ FID\ before\ 2022}$$

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10 Repsol, Stepping up the transition - Driving growth and value, 2023

11 Repsol, Stepping up the Transition, Driving growth and value, 2020

12 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

13 https://totalenergies.com/system/files/documents/2022-03/DEU_21_VA.pdf

14 https://chevroncorp.gcs-web.com/static-files/5a798840-e083-4339-a83b-f0f565227655

15 https://static.conocophillips.com/files/resources/sensitivity-guidance-items-1q23-initial-posting.pdf

16 https://corporate.exxonmobil.com/investors/investor-relations/corporate-plan-update

Future production may be impacted by oil and gas expansion, as well as acquisition or sale of oil and gas assets.

N°3. Cash-flows analysis

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.

CAPEX[17] allocation of a company is indicative of activities it aims to develop. Depending on each company's transparency, CAPEX are separated between CAPEX allocated to renewables or low carbon, CAPEX dedicated to upstream, other Oil and Gas CAPEX and other CAPEX.

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

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

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

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

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

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, bio-energy, 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.

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.

[17] Find out financial definition in the glossary.

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.

Exploration CAPEX:

This is the Capital Expenditure of a company for 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 – does not make sense.

This indicator is taken from the Global Oil and Gas Exit List, and is the 3-years average of companies exploration CAPEX over 2020 – 2022.

Near-term CAPEX

Too low shares of CAPEX allocations for renewable 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.[18]

ENI. Eni details 2023-2026 CAPEX plan with CAPEX dedicated to renewables.[19]

Equinor. Equinor details 2023-2025 gross CAPEX share dedicated to renewable and low carbon solutions.[20]

Repsol. Repsol details 2021-2025 CAPEX plan with CAPEX dedicated to low carbon solutions.[21]

[18] https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/investors/bp-fourth-quarter-2022-results-presentation-slides-and-script.pdf
[19] https://www.eni.com/assets/documents/eng/investor/presentations/2023/2023-capital-markets-update/2023-Capital-Markets-Update-presentation.pdf
[20] https://www.equinor.com/content/dam/statoil/documents/quarterly-reports/2021/cmd-2021/cmd-2021-all-presentations-equinor.pdf
https://cdn.equinor.com/files/h61q9gi9/global/4f657cc565efdde0a3103fb055b6c7b5374b601e.pdf?2023-cmu-all-presentations.pdf
[21] https://www.repsol.com/content/dam/repsol-corporate/en_gb/conocenos/2025-strategy/II26112020_presentation_on_the_strategic_plan_2021_2025.pdf

Shell. Shell details 2023 cash CAPEX target. No details are given further on CAPEX allocation strategy.[22]

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.[23]

Chevron. Chevron details 2023-2027 CAPEX plan. No CAPEX are reported in renewable energy.[24]

ConocoPhillips. ConocoPhillips details 2023 CAPEX plan. No CAPEX are reported in renewable energy.[25]

ExxonMobil. ExxonMobil details 2022-2027 CAPEX plan. No CAPEX are reported in renewable energy.[26]

[22] 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

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

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

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

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

N°4. 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' document to retrieve plans of fossil fuel production by 2030, as well as development plans for renewable. 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 majors plans for fossil fuel production in 2030

We look at companies plans of oil and gas production. Calculations can be found in our dataset, 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.[27]

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[28] to estimate the relative importance of different renewable technologies across this sector, and calculated the capacity-weighted average capacity factor, that is:

$$\sum\nolimits_{technologies} Capacity\ Factor\ \times Total\ Capacity \Big/ \sum\nolimits_{technologies} Total\ Capacity$$

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, 364 days per year :

$$Max\ Theoretical\ Generation = Renewable\ Capacity\ \times 24\ \times 364$$

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

Non-combustible renewable energy[29] consists in final energy, which is energy consumed directly by the final user. Each MWh produced and sent onto the grid is consumed on the other end by a client.

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

On the other hand, oil and gas products consists in primary energy: they need to undergo combustion to deliver energy for the final user, or client. This process of combustion comes with efficiency losses. Hence, when consumed, primary energy of oil and gas products leads to energy losses and final 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[30] : energy produced from non-combustible renewable 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 BP's Statistical Review of World Energy to source the most recent thermal efficiency factor and conduct our calculations.[31]

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:

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

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:

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

[30] https://www.eia.gov/todayinenergy/detail.php?id=41013
[31] 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.[32] Assuming an average capacity factor of 25%[33], 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.[34] Assuming an average capacity factor of 25%,[35] we calculated the average annual electricity generation for a renewable capacity of 14 GW. 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.[36] Assuming an average capacity factor of 25%[37], we calculated the average annual electricity generation for a renewable capacity of 14 GW. 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.[38] Assuming an average capacity factor of 25%,[39] we calculated the average annual electricity generation for a renewable capacity of 14 GW. 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.[40] Given that the renewable uptake is happening faster in more developed countries, we considered the average annual consumption of an Australian household.[41]

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[32] https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/investors/bp-fourth-quarter-2022-results-presentation-slides-and-script.pdf
[33] 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
[34] https://www.eni.com/en-IT/investors/long-term-plan.html
[35] 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
[36] https://www.equinor.com/content/dam/statoil/documents/quarterly-reports/2021/cmd-2021/cmd-transcript-2021-06-15-equinor.pdf
[37] 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
[38] http://www.repsol.com/en/press-room/press-releases/2021/repsol-increases-its-targets-for-renewable-generation-and-emission-reductions/index.cshtml
[39] 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
[40] https://www.shell.com/energy-and-innovation/the-energy-future/our-climate-target/_jcr_content/par/relatedtopics.stream/1635426463090/54e9db7e3118ac2c9f4bc1c06d36051a5dc1a982/our-climate-target.pdf
[41] https://www.aer.gov.au/system/files/Residential%20energy%20consumption%20benchmarks%20-%209%20December%202020_0.pdf

TotalEnergies. The company announced a target of 100 GW of renewable capacity by 2030.[42] Assuming an average capacity factor of 25%,[43] we calculated the average annual electricity generation for a renewable capacity of 14 GW. 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.

[42] https://totalenergies.com/system/files/documents/2022-03/DEU_21_VA.pdf

[43] 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

N°5. 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[44] 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.

<u>Why is our approach conservative?</u>

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 actually do so given the means set in place. For instance, some targets are dependent on customer actions and hereby defers 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[45]:* ***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.

Calculating the carbon intensity pathways and absolute carbon emissions

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

[44] Carbon budget refers to the amount of greenhouse gases that can be emitted expressed in CO2 equivalent.

[45] Note that here and throughout this document, the term production refers to the volume of sold energy products.

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 Degrees scenario"[46] and "below 2°C"[47], drawing on IEA scenario for CO_2 emissions and energy demand, and on IPCC scenario for methane emissions.[48]

- **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 from 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.[49] 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[50] pathway modeled by TPI using the International Energy Agency's (IEA) Net Zero (NZ) scenario from November 2021 as it is the only one that aims for 1.5°C, as well as the below 2°C scenario.[51] 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

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[46] This scenario gives a probability of 50% of holding the global temperature increase to 1.5°C.
[47] This scenario gives a probability of 50% of holding the global temperature increase to 1.65°C.
[48] https://www.transitionpathwayinitiative.org/publications/96.pdf?type=Publication.
[49] 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.

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

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.

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 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[52]. 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,

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

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.

Two companies, ConocoPhillips and ExxonMobil, 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

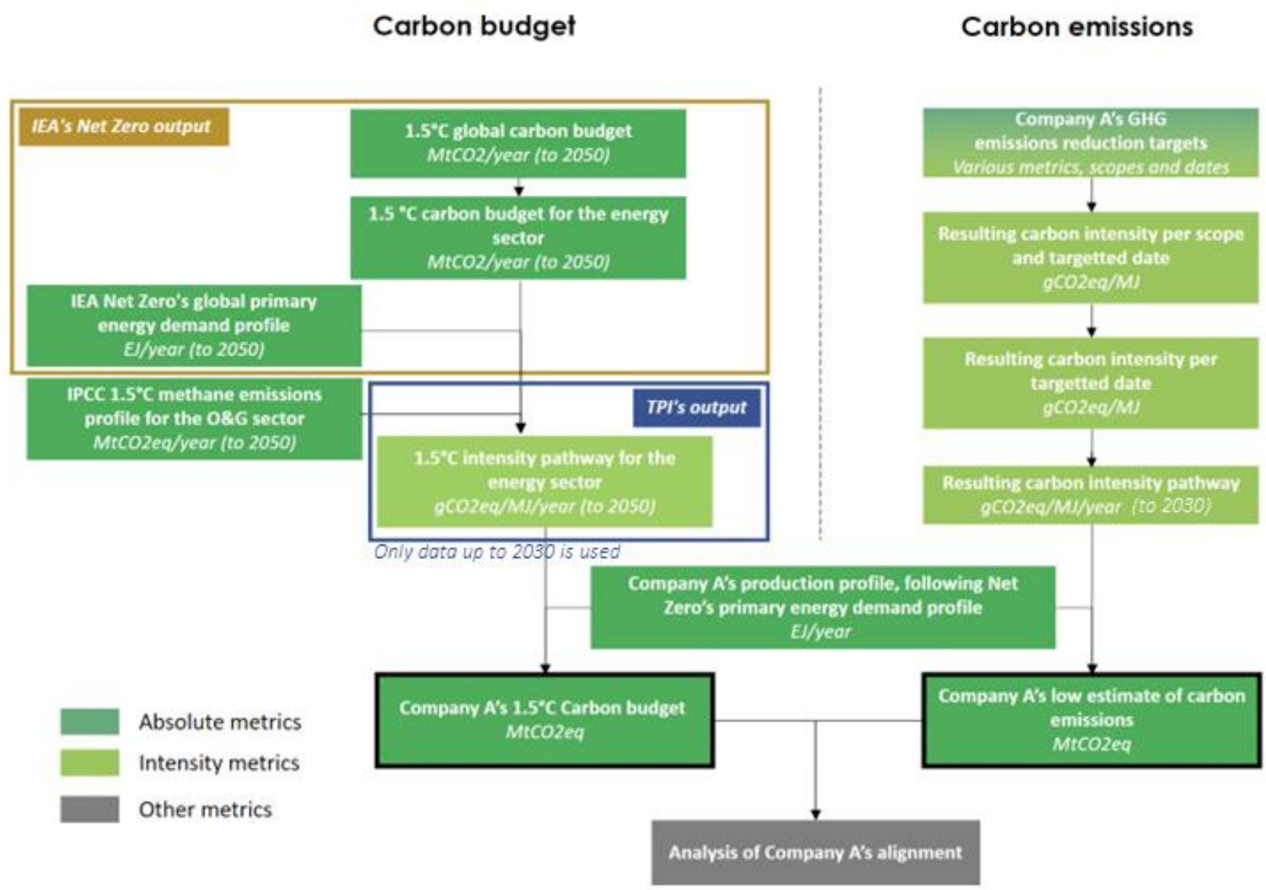
By design, for any year, one company's emissions are given by:

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

The cumulated emissions of a company are then the sum of its absolute emissions over a given time 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 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 - 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.

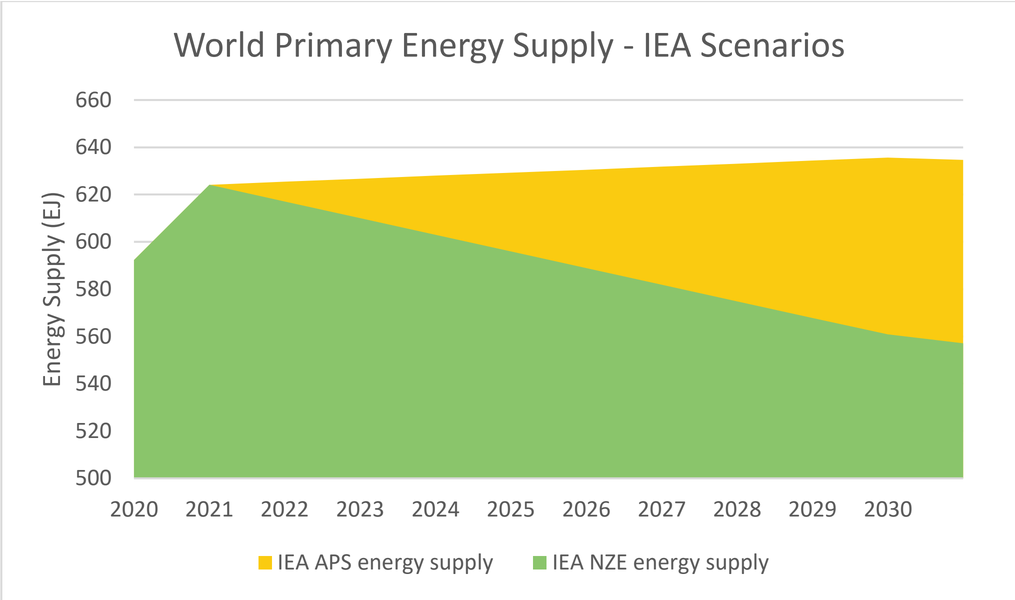
Yearly absolute emissions of a company are given by the product of its carbon intensity and its production. Hence, the cumulative absolute emissions of the company are given by:

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

Because companies do not accurately disclose their production plans for the years to come, we took the conservative hypothesis[53] 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 demand 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

[53] 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 on 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 as:

- In absolute terms (in MtCO2e): *LECE (2030) – Carbon budget (2030)*

- In relative terms (in %): $\frac{LECE\ (2030) - Carbon\ budget\ (2030)}{Carbon\ budget\ (2030)}$

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

<u>2030 Carbon intensity excess:</u>

We defined the 2030 carbon intensity excess:

- In absolute terms (in MtCO2e):

$$\text{Carbon intensity absolute excess} = \left[\underset{over\ 2023-2030}{average}\begin{pmatrix}company\ pledged\\ carbon\ intensity\end{pmatrix}\right] - \left[\underset{over\ 2023-2030}{average}\begin{pmatrix}reference\ scenario\\ carbon\ intensity\end{pmatrix}\right]$$

- In relative terms (in %):

$$\text{Carbon intensity relative excess} = \frac{\left[\underset{over\ 2023-2030}{average}\begin{pmatrix}company\ pledged\\ carbon\ intensity\end{pmatrix}\right] - \left[\underset{over\ 2023-2030}{average}\begin{pmatrix}reference\ scenario\\ carbon\ intensity\end{pmatrix}\right]}{\underset{over\ 2023-2030}{average}\begin{pmatrix}reference\ scenario\\ carbon\ intensity\end{pmatrix}}$$

N°6. Reliance on Carbon Capture, Utilization and Storage (CCUS) and Offset mechanisms

CCUS and offset figures have been sourced directly from companies document or website. 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.

<u>Step 1. Company's pledged reliance on offset</u>

This indicator aims to measure to what extend 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.

<u>Step 2. Feasibility of this reliance on CCUS and NBS:</u>

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 was 28 CCUS centers of average capture capacity of 1.5 $MtCO_2e$ per year.[54] 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 $1.16 kgCO_2e/m^2/year$. This coefficient is the result of a peer-reviewed study. [55]

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

[55] 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.