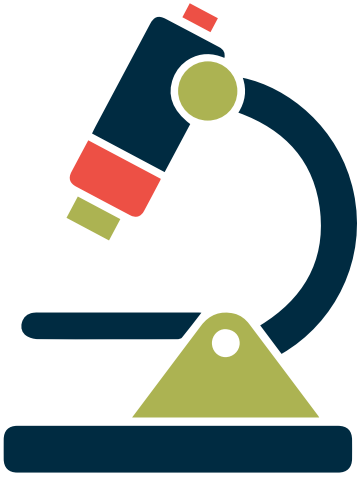
Under the Microscope:
Are companies' climate scenario analyses meeting investors' requirements?



Carbon Tracker Initiative

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EXECUTIVE SUMMARY

At the front-line of the low-carbon transition, fossil fuel companies are publishing reports to assure investors of their continued resilience to efforts that limit global warming to well-below 2°C. In this report, Carbon Tracker takes a closer look at the climate scenario analyses of the largest listed oil and gas companies.

Scenario analysis is second nature for the oil and gas business

For decades, the largest oil and gas companies have been performing "scenario analysis". These exercises are intended to be an exposition of the company's views about how global energy markets might develop over the next decades. They have historically delivered the message that demand for oil and gas is only going in one direction: upwards.

Climate-related scenario analysis flips this process on its head. It asks companies to take a limited carbon budget and think about what the impact might be upon their business as the world meets future demand for energy while producing fewer emissions. For fossil fuel companies thinking about the risk to their assets and investments, the key question that management should be asking is: what will be the impact on the demand for, and prices of, our products in the future?

The state of play suggests that a minority of companies plan for 2°C

Almost universally, the largest oil and gas companies are not planning on a world consistent with well-below 2°C. Some companies, such as Shell and Statoil, are beginning either to set targets for decarbonisation of their business or to diversify their portfolio away from fossil fuels. Total goes one step further, indicating that is has placed 2°C at the heart of its strategy.

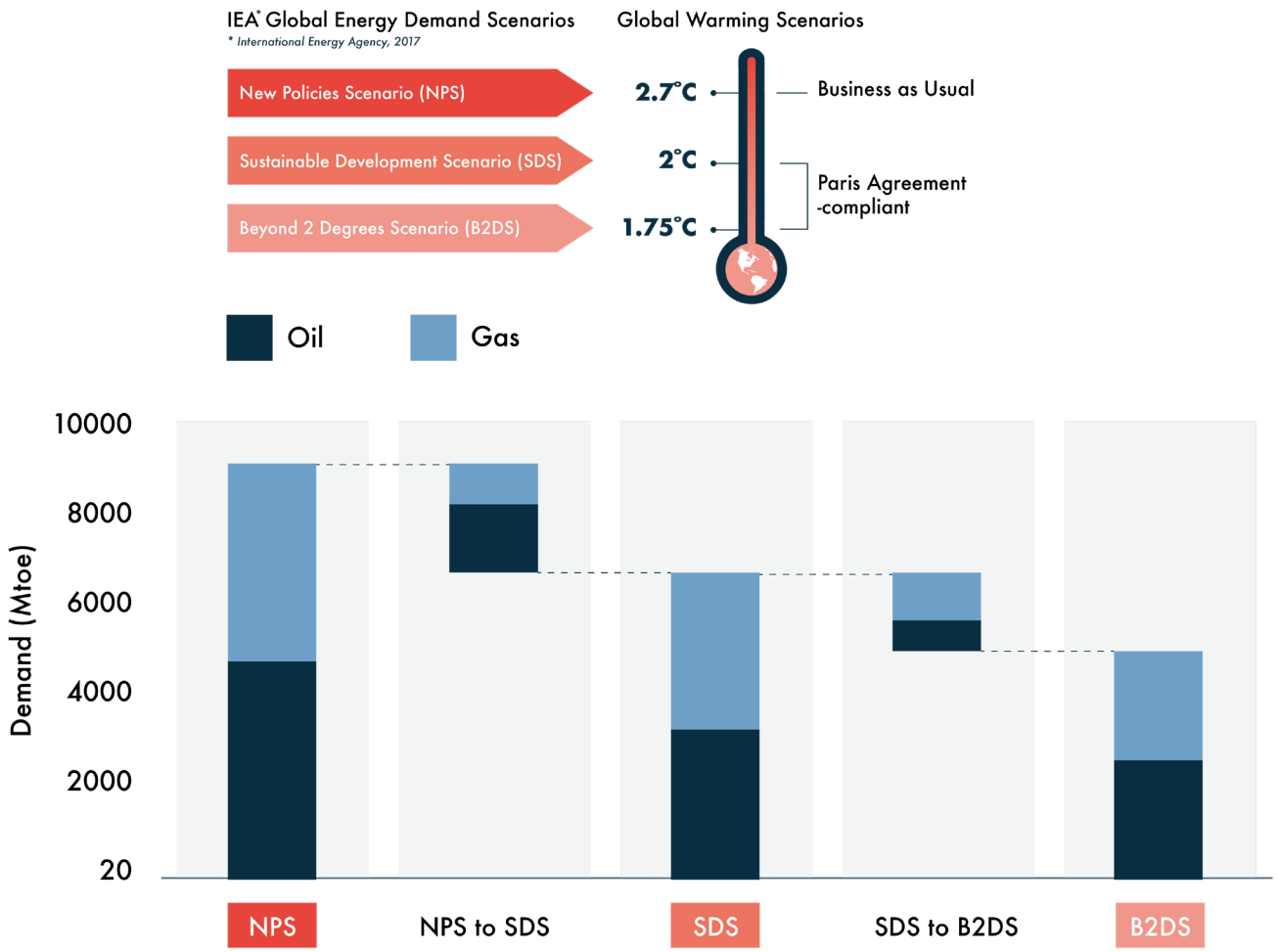
Such optimism among the industry for the increasing consumption of fossil fuels beyond the levels required under a Paris-compliant scenario is not surprising. More surprising is the confidence of these companies that, despite not planning on 2°C, they will nonetheless be able to adapt.

Companies agree that the low-carbon transition could have financial implications

Whether brought about by regulation or improvement in low-carbon technologies, companies recognise that the resulting reduction in fossil fuel demand might be bad for business. As Statoil writes, "the transition to a low-carbon energy future poses fundamental strategic challenges for the oil and gas industry". The question driving shareholders' interest is "how bad?"

To begin to answer this question, companies are right to take a step-back and consider what might happen to fossil fuel demand. The International Energy Agency's (IEA) assessment of different scenarios indicates long-term decline. Even under a pathway consistent with 2°C, the IEA's Sustainable Development Scenario (SDS) sees one-third and one-fifth less oil and gas, respectively, in 2040 compared to its New Policies Scenario (NPS), which is considered a business-as-usual (BAU) outlook. Looking at a pathway considered more faithful with the ambition of the Paris Agreement, demand for oil and gas in 2040 under the IEA's Beyond Two Degrees Scenario (B2DS) is almost 50% lower than a business-as-usual case.

Figure 1 – *Oil and gas demand in 2040 in three IEA scenarios*



Source: IEA, Carbon Tracker analysis

Even those who do accept the risk claim medium-term resilience

When confronted by their exposure to possible stranded assets, companies continue to declare that they are made resilient by the value locked away in their proven oil and gas reserves. At least Shell and Total use this argument, claiming that the bulk of their proven reserves will be produced over the next two decades or less.

This continues to ignore two simple points: first, that proven reserves are not immune to a loss of value; and second, that oil and gas companies continue to reinvest their cash into more exploration and more development of their "resources". This process only extends the maturity of the company's portfolio, exposing those assets to future climate risk. We estimate that the largest oil and gas companies have reinvested about 80% or more of their operating cashflow in capex over the last five years.

There are clear inconsistencies in the current use of scenario analysis

A key theme of the Financial Stability Board's Task Force on Climate-related Financial Disclosures' (TCFD) recommendations is comparability of disclosure. Companies should strive to consider a range of scenarios, but without at least one common reference point against which they can assess their resilience, the results of scenario analysis have limited use for investors. This points to the need for standardisation of scenarios.

Table 1 – *Companies' scenario selection and use of IEA*

	Proprietary or third-party scenario used	Which third party scenario?	Primary use of IEA scenario
BP	Proprietary	*Not disclosed*	Comparison of emissions pathway
Chevron	3rd Party	IEA SDS	Use IEA demand to derive own prices
ConocoPhillips	Proprietary	*Not disclosed*	*Not disclosed*
Eni	3rd Party	IEA 450	Use IEA prices
ExxonMobil	3rd Party	Stanford EMF	Use IEA prices
Shell	Proprietary	*Not disclosed*	Use IEA prices (also discloses its own low price scenario)
Statoil	Proprietary	*Not disclosed*	Use IEA prices
Total	3rd Party	IEA 450/SDS	Use IEA demand to derive own prices

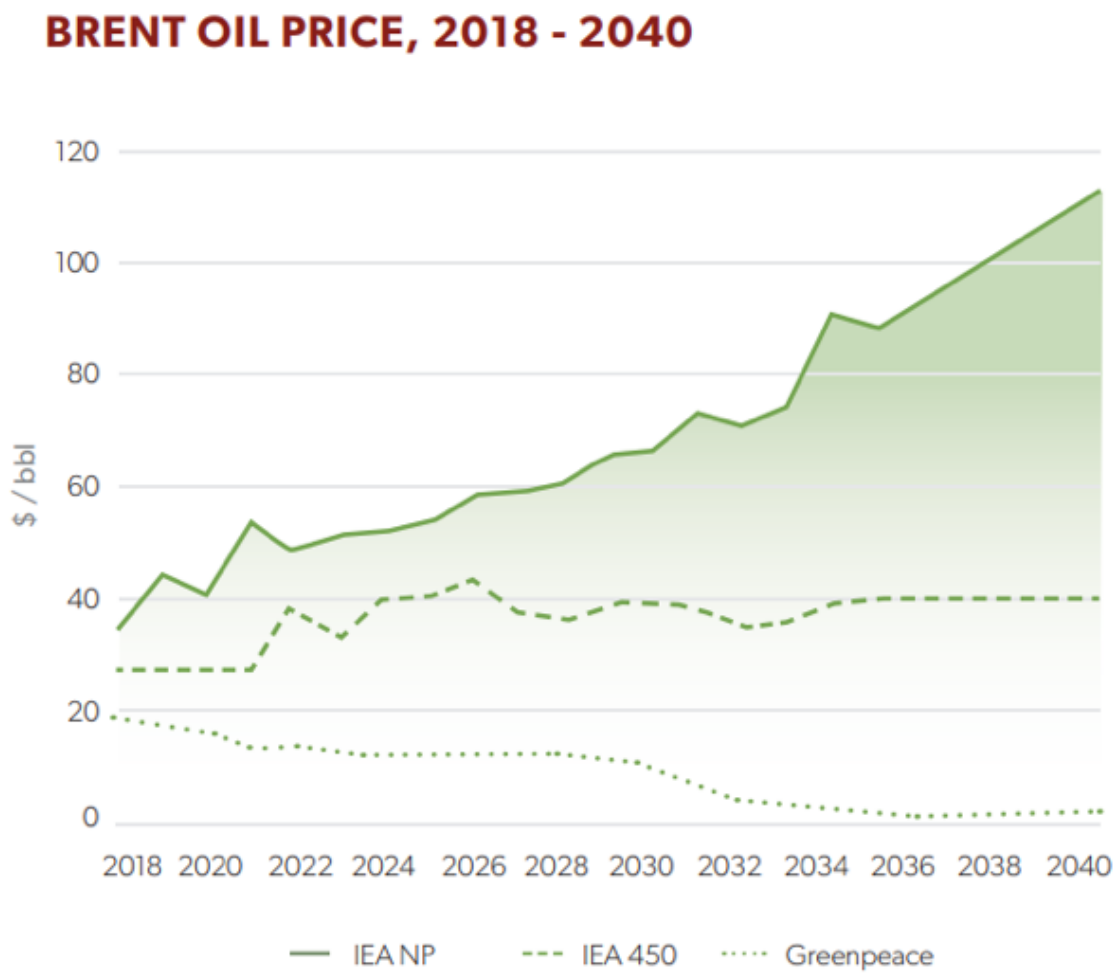
Furthermore, some examples of companies constructing proprietary scenarios demonstrate that the oil and gas industry cannot be relied upon to faithfully model its own decline. The emissions pathway of Shell's Sky Scenario, which takes until the early-2030s for emissions to fall below today's level, highlights a reluctance within the industry to stretch its thinking about how energy markets might evolve, at least in the near term.

Analysing third-party price assumptions is not a substitute for a rigorous stress test

Oil and gas companies largely concede that lower future demand might bring lower commodity prices. Modelling this relationship sits at the heart of scenario analysis for fossil fuel companies. Some, such as Chevron, have examined the impact of falling demand on prices (though the results are not as clear). However, others, such as Eni, have skipped this process, instead measuring their resilience against the price assumptions of the IEA's scenarios. This can lead to counter-intuitive outcomes, where the value of assets for a company that is not planning for 2°C performs better under the IEA's 2°C scenario simply because the prices in the IEA's scenario are higher, as Shell and Statoil concluded in previous years. Adopting the price assumptions of third-party scenarios, rather than modelling the impact of changing demand should not be considered a rigorous climate stress test.

Companies much smaller than the oil and gas majors have demonstrated that this form of scenario analysis can be conducted and the results disclosed. Oil Search, with a market value of $13 billion, considered the potential impacts of several demand pathways, including that of the IEA's 450 Scenario (a 2°C pathway) and Greenpeace's 1.5°C scenario. Oil Search then asked a third-party to model the prices that might result from these scenarios, identifying Brent oil prices of about $40 per barrel under the IEA's 450 Scenario and $5 per barrel in the Greenpeace scenario.

Figure 2 – *Changing oil prices in Oil Search's climate scenario analysis. Source: Oil Search, Climate Change Resilience Report 2017*



Source: Oil Search, Climate Change Resilience Report 2017

If financial statements were prepared using assumptions in line with a consistent, 2°C scenario, there might be additional implications

Presenting a fair picture of oil and gas companies' financial health requires that management make certain assumptions about future events and conditions – including long-term commodity prices – within the audited financial statements. Companies are entitled to use their own assumptions, to the extent that they stand up to auditor scrutiny, and disclosure is required where they materially impact on the financial statements.

Where companies have disclosed their estimates of future commodity prices, investors are allowed a glimpse into management's expectations. Such glimpses show that prices are expected to head upwards over the long-term, implying an expectation of demand to follow the same trend. Consequently, companies appear to believe the world will not meet the Paris targets. The question we would ask, therefore, is, what happens if the Paris Agreement targets are met? Other things being equal, we'd expect that prices would be lower than the company's expectations, putting companies' assets at higher risk of financial stranding.

This risk is not just theoretical. Companies have already written down the value of their assets by billions of dollars based primarily upon changes in long-term price expectations. With no guarantee that fossil fuel demand will continue to grow, there is a real risk that further asset impairments will materialise. Investors need assurance that companies are appropriately planning and safeguarding against this risk.

A 2°C pathway means that some companies will lose, but current scenario analyses see everyone winning

Despite a general lack of assessment of the financial consequences of a 2°C scenario, several analyses do point to some company-level impact from meeting the Paris Agreement targets. Most companies have opted for a narrative discussion. In some instances, this can still provide useful insights, such as Chevron's tacit acknowledgement that, under a 2°C scenario, some projects would generate cash, but not earnings. Exxon notes greater risks in the development of its liquids resource base, outside the US.

But there are inconsistencies in the ways in which companies have thought about these impacts, if at all. Some companies, such as Statoil, have considered the implications for the value of their assets from different oil prices; others have looked at the costs of carbon prices or the amount of capital invested in the riskiest portions of the resource base. But overall, quantification of financial impact is largely absent. Why? Total has suggested that a lack of standardised analysis and assumptions may make quantified results unhelpful. There is some truth to this.

The company reports still serve to reinforce the message that their long-term exposure is minimal. But the carbon budget maths is largely uncontested, and it indicates that not all fossil fuel projects will be needed. Where do these projects sit in the companies' portfolio of investment options? Can they identify them (even if in aggregate)? And can they provide assurance to investors that the company is not spending shareholders' capital to develop them? Existing scenario analyses offer no insight into this issue.

Table 2 – *Companies' analysis of the financial impact in their climate scenario analyses*

	Company assessment of 2°C	Impact of assessment	Narrative discussion of 2°C impact
BP	*Not disclosed*	*Not disclosed*	No expectation of asset stranding
Chevron	*Not disclosed*	*Not disclosed*	Some major projects would generate cash flow but implies no earnings
ConocoPhillips	*Not disclosed*	*Not disclosed*	*Not disclosed*
Eni	Sensitivity of value of new/existing projects to IEA SDS prices	4% reduction in fair value of existing projects	Assets remain resilient: using the IEA 450 scenario, "the impacts on Eni's portfolio are increased."
ExxonMobil	*Not disclosed*	*Not disclosed*	Not all resources will be extracted. Exposure of undeveloped liquids but value at risk is only 5% of total property, plant and equipment carrying value
Shell	*Not disclosed*	*Not disclosed*	Little risk of stranded assets even under low oil price scenario
Statoil	Sensitivity of upstream assets and investments' NPV to IEA SDS prices	-13% NPV vs. base case	Resilience of next generation projects with average breakeven ($21/ barrel)
Total	Sensitivity of upstream/ downstream assets to $40/tCO2 price	-5% PV vs. base case	*Not disclosed*

Companies defer to a carbon price test, but it is a weak proxy for profound change

The companies consistently use carbon prices to test their investments. However, current carbon price tests will likely have little financial impact for companies and are another poor substitute for stress testing their resilience.

Our review points to a general convergence around three points: (1) a carbon price of about $40 per tonne of carbon dioxide (tCO_2); (2) an assessment built upon on the company's scope 1 and 2 emissions; (3) applied in the planning process or to estimate the impact on producing assets. For an

oil and gas company, we estimate that a carbon price of $40/tCO$_2$ would add about $1 to $2 onto the per barrel cost. This seems a weak proxy for the profound effects that the low-carbon transition will have upon oil and gas companies. Ignoring scope 3 emissions (from the use of the products) only further minimises the utility, as these typically comprise 80-90% of an oil and gas company's overall emissions.

At least one company, Exxon, claims to model the impact that actual carbon prices may have on demand; others may do this as well, but none disclose their conclusions.

	Scope	Price USD/tCO2	Timing	Coverage
BP	Assumed to be scope 1 and 2	40	*Not disclosed*	Potential new projects in industrialised countries
		80	*Not disclosed*	Stress test of the above potential new projects
Chevron	Not disclosed	Not disclosed	*Not disclosed*	Not disclosed
ConocoPhillips	Assumed to be scope 1 and 2	40 (6-66 quoted in other place)	*Not disclosed*	Future projects and opportunities
Eni	Assumed to be scope 1 and 2	40	*Not disclosed*	Potential new projects and recoverability of existing assets
ExxonMobil	Assumed to be scope 1 and 2	80	By 2040	OECD countries
Shell	Assumed to be scope 1 and 2	40	*Not disclosed*	Potential new projects
Statoil	Assumed to be scope 1 and 2	50 or current price if higher	Post 2020	Global portfolio
Total	Assumed to be scope 1 and 2, unclear if scope 3 also included	30-40 or current price if higher	*Not disclosed*	Potential new projects
		40 Plus sensitivity tests at 60 and 80	*Not disclosed*	Resilience of overall portfolio

INTRODUCTION

- Investors and financial regulators are asking companies for decision-useful disclosure and analysis of 2°C scenarios given the targets of the Paris Agreement. Companies are now producing voluntary reports.
- Carbon Tracker has identified key themes such reports should address to be decision-useful. This paper identifies Carbon Tracker's approach to analysing companies' 2°C scenario analyses across a consistent set of themes to ensure they are useful.
- Accompanying sections of this report examine individual company disclosures in detail—specifically, those of the largest oil and gas companies.
- Figure 1 indicates the relative performance of each company across the four themes that we have analysed: **2°C scenario modelling**, **scenario outputs**, **market risk** and **carbon pricing**. It reveals that, while some progress is being made in how fossil fuel companies model a 2°C pathway, a large gap remains in their consideration of the potential business impacts.

- We believe any useful scenario analysis by an oil and gas producer would consider the following:

  - Climate change is effectively market risk for fossil fuel companies and scenarios must grapple with this reality.
  - A common reference scenario is needed to make scenario outputs comparable.
  - For the oil and gas sector, the key upstream risks are to investments in new projects and this should be discussed and quantified.
  - Lower demand expectations imply lower price expectations and therefore a focus on project costs is essential.
  - In a carbon budget context, the relative cost position of a company relative to its peers is critical.
  - Price expectations drive corporate reporting, making it necessary to understand a company's forward price assumptions.

Figure 1 – *Summary of companies' relative performance in their climate scenario analyses*
See further below for detailed key.

poor | moderate | high

	BP	Chevron	Conoco Phillips	ENI	Exxon Mobil	Royal Dutch Shell	Statoil	Total
Scenario Modelling								
Scenario Outputs								
Market / Price Risk								
Carbon Pricing								

Source: Carbon Tracker analysis

METHODOLOGY

On September 29, 2015, Bank of England Governor Mark Carney expressed his concern that "the catastrophic impacts of climate change will be felt beyond the traditional horizons of most actors".[1] Only three months later, as Chair of the Financial Stability Board, Carney established the Task Force on Climate-related Financial Disclosures (TCFD). The TCFD has produced a framework that helps organisations to better consider how they are impacted by climate change. Its recommendations are another critical step to improving market transparency of climate-related risks and opportunities, ultimately enabling capital markets to make better decisions.

This process has been driven in no small part by investor concern that the energy transition will impact the business models of investee companies. The recent success of shareholder resolutions, which continues to gather momentum, has sent a clear message: companies need to consider the risk and demonstrate a plan for addressing it.[2]

Fossil fuel companies, in particular, are responding to this pressure by offering more disclosure and scenario analyses – a welcome acknowledgement of market demand. However, much of this disclosure falls short of being decision-useful because it lacks transparency and comparability. Indeed, many company reports have failed to fully grapple with the fundamental driver of requests for improved transparency; namely, that in a two-degree (2°C) scenario (whether driven by policy, technology, changes in consumer preferences, or anything else), the demand for their key products will be drastically reduced, with potentially unpredictable consequences.

Better disclosure, not more disclosure

Corporate disclosure of climate-related risk factors is not a new subject. Indeed, the fossil fuel industry has long acknowledged[3] the general thesis that addressing climate change may pose risks to its business (though, curiously, many companies now assert in their 2°C scenario analyses that they will be just fine).

Some companies have recognised the need to do more.[4] However, very little disclosure successfully answers questions around which of their potential investments are most exposed or delivers investors with a means of monitoring whether or not capital is being spent on projects that are surplus to a 2°C outcome, much less how companies might adapt to falling demand for their products or compete in such a scenario.

For example, our research suggests that, at least for the larger companies, the greatest concerns for the oil and gas industry pertain to reinvestment of cashflows in the resource base of future project options.[5] Many reports instead choose to focus on the resilience of nearer-term proven reserves. This fails to provide much-needed transparency that can fuel investor engagement. What is needed is better disclosure, not more disclosure.

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1 *http://www.fsb.org/wp-content/uploads/Breaking-the-Tragedy-of-the-Horizon-%E2%80%93-climate-change-and-financial-stability.pdf*

2 *https://www.ceres.org/2DSResolutions.*

3 *http://www.carbontracker.org/wp-content/uploads/2016/05/Shell-Deja-Vu-1.pdf*

4 *For example, in its recent 2017 report on climate change, Rio Tinto states: "…we recognise that there is still more that needs to be done, and in future reports we will include additional information about our resilience to a 2°C climate change scenario." See http://www.riotinto.com/documents/RT_Climate_change_report.pdf*

5 *https://www.carbontracker.org/reports/responding-to-ihs-ipieca-focus-on-oil-gas-capex/*

Trust in company planning is not enough; verification is needed

Climate change is a megatrend and addressing it has significant implications for the energy sector. Clearly, we cannot reasonably forecast the future by simply extrapolating the past. Where past is not prologue, financial results may not give a clear picture of how a company's future performance will evolve. This is where analysis of alternative future states can bridge the gap.

Companies have reiterated that they conduct strategic and scenario analysis to test their portfolios and many have concluded that their business remains resilient even in a low-carbon transition. Yet, few have provided meaningful disclosure of assumptions or useful framing of outcomes to substantiate those conclusions in the context of a scenario consistent with the 2°C outcome. Despite this, the fact that the companies do analyse the long-term indicates both the importance of the work and the possibility that decision-useful disclosure can be produced.

Disclosure is a "means," not an "end". Specifically, it is a means of facilitating dialogue between a company and its investors and allowing investors to better assess the quality and prospects of their investments. To meet these ends, that disclosure must provide sufficient detail and assurance to allow investors to "trust, but verify".

Making scenario analysis decision-useful

The TCFD has made clear that scenario analysis needs to be "decision-useful". By and large, recent company disclosures have failed to satisfy this objective. We believe this is because many companies have failed to structure the scenario analysis in a way that picks up the central themes of a low-carbon transition or provide scenario outputs that grapple with the areas of greatest concern. This paper aims to improve upon that by:

- Identifying the core themes and issues that we would expect fossil fuel companies to consider;
- Providing a framework that takes a step-by-step approach to analysing key elements to gauge how well companies have engaged with the spirit of the TCFD recommendations;
- Assessing companies' scenario analyses to provide investors with a snapshot of the key assumptions, uncertainties, omissions, issues and useful data points from each disclosure, all in a context that allows comparison across otherwise disparate disclosures.

Notably, our focus at this time is limited to a company's scenario analysis with limited cross-checking against figures used in their annual reports.

Over time, we will expand coverage of companies' disclosures to include company presentations and regulatory filings in order to provide a more complete picture.

We will supplement these views of the disclosure work with Carbon Tracker's company-level research and analysis.[6] Through this process we aim to build a comprehensive review, succinctly presented, of what companies are saying and how that compares to both what they are doing and where they stand relative to their peers.

In Part One, we discuss the key themes every company should address. Part Two details our approach to analysing those themes. In Part Three, we discuss the key issues that have emerged from our analysis of disclosures by the oil majors. Part Four contains individual company analyses that can be read as stand-alone documents. The first of these, related to disclosures by ExxonMobil, was published on March 27, 2018[7].

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6 *See, e.g., Carbon Tracker, Two Degrees of Separation (2017).*

7 *https://www.carbontracker.org/reports/company-profile-exxon-mobil/*

PART ONE: KEY THEMES AND STRUCTURE OF ANALYSIS

We believe any useful scenario analysis by an oil and gas producer would analyse the following themes:

- Climate change is effectively market risk for fossil fuel companies and scenarios must grapple with this reality.
- A common reference scenario is needed to make scenario outputs comparable.
- For the oil and gas sector, the key upstream risks are to investments in new projects and this should be discussed and quantified.
- Lower demand expectations imply lower price expectations and therefore a focus on project costs is essential.
- In a carbon budget context, the relative cost position of a company relative to its peers is critical.
- Price expectations drive corporate reporting, making it necessary to understand a company's forward price assumptions.

Climate change is a market risk for fossil fuel companies

Transition risks may materialise through multiple channels: policy, reputational, market, and technological risks, for example. In building scenarios to model the challenges facing fossil fuel companies[8], each channel is really a tributary leading to impact upon demand for oil, gas and coal based on the emissions reductions necessary to achieve a 2°C outcome.

What might demand look like if the climate targets of Paris are met? The International Energy Agency's (IEA) "Sustainable Development Scenario" (SDS) (formerly, the "450 Scenario"[9]), which is consistent with a 50% probability of limiting global warming to 2°C, indicates a future for coal, oil and gas that is materially different from today. This would be at the very upper end of what could be considered compliance with the Paris Agreement and therefore by no means a robust test of the "well below 2°C" standard that Agreement imposes. By 2040, the SDS contains 30%, 20% and 55% less demand for oil, gas and coal, respectively, than the IEA's New Policies Scenario, which presents a "business-as-usual" scenario based on committed or announced policies (Figure 2). The emissions associated with meeting that demand form the key link between any climate-outcome focused scenario (i.e., a 2°C scenario), and its related level of fossil fuel consumption.

Given the use of only a 50% chance of limiting warming to 2°C, users may prefer more stringent limits such as the IEA's "Beyond Two Degrees Scenario" (B2DS), which offers a 50% chance of limiting warming to 1.75°C. The choice of scenario is important and has real implications for company investments,[10] but as some companies have not even taken the 2°C demand-pathways as their starting point, we believe it important to note that any 2°C scenario analysis must begin with a 2°C-compliant climate outcome that then models related demand for fossil fuels. We view this as a baseline requirement and would suggest that companies also consider more stretching scenarios (as some already have).

Focusing on the impact of diminishing demand for fossil fuel commodities is the lynchpin of any useful scenario analysis. Scenarios that model taxes on carbon or other local policies may, or may not, relate to a specific climate outcome. Sensitivities to various elements of the energy transition, such as

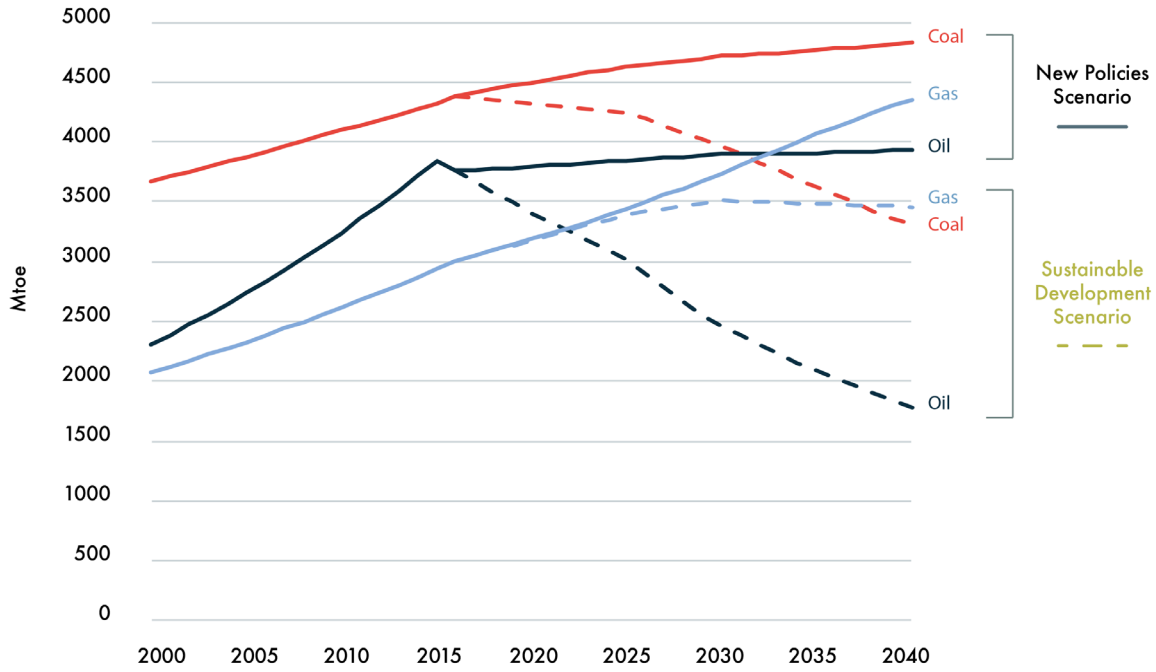
8 *Our usage of this term includes oil, gas, coal, mining and utilities companies, but here we focus principally on upstream oil and gas companies.*

9 *450 parts per million (ppm) is the quantity of carbon dioxide in the atmosphere that provides an even chance of limiting average temperature increase to 2-degrees Celsius above pre-industrial levels.*

10 *See, e.g., Andrew Grant, Mind the Gap, (Carbon Tracker Feb. 2018).*

electric vehicle adoption rates, may yield useful insights on that area but will not encapsulate the full range of risks — for this a focus on demand trajectories associated with the well-below 2°C objective is essential.

Figure 2 – *Comparison of IEA scenarios for fossil fuel demand*



Source: IEA; Carbon Tracker analysis

A reference scenario and common approach is needed to make outputs comparable

To be sure, one can envision a number of different fossil fuel demand pathways that might be 2°C-compliant. Like any future assessment, there are inherent uncertainties and it is impossible to prove today which scenario will unfold tomorrow. But the purpose of the exercise is not to predict the future.

For the purposes of disclosure where investors are endeavouring to assess a single risk across seemingly similarly situated competitors, one important objective is to understand how companies compare. This requires use of a similar yardstick, or at least one reference scenario.

This is not to the exclusion of running other scenarios (for internal planning purposes or disclosure) or reconsideration of scenario choice in the future, provided they are sufficiently detailed. Similarly, it does not supplant supplemental financial analysis by analysts and intermediaries.

We are already seeing a number of companies report against the IEA's demand scenarios (though some have focused on IEA price decks, which may not be sufficiently robust as we explain elsewhere).[11] This is welcome, and we have principally used the IEA's 2°C-compliant scenarios for our analysis of the fossil fuel sector. This is not because we deem them the most plausible – or even the most aggressive – downside cases. Rather, IEA scenarios have credibility within the industry, are widely used, represent plausible views of the future and can at least be an intermediary step to bringing comparability to the exercise.

11 *For example, the 450 Scenario (pre-2017), the SDS (which has now subsumed the 450 Scenario), the 2°C Scenario and the Beyond 2°C Scenario The two former scenarios are included in the IEA's World Energy Outlook publication; the latter two scenarios are included in the IEA's Energy Technology Perspectives publication. Both publications are updated annually and these scenarios may change over time.*

For oil and gas, the key upstream risks are to reinvestments in new projects

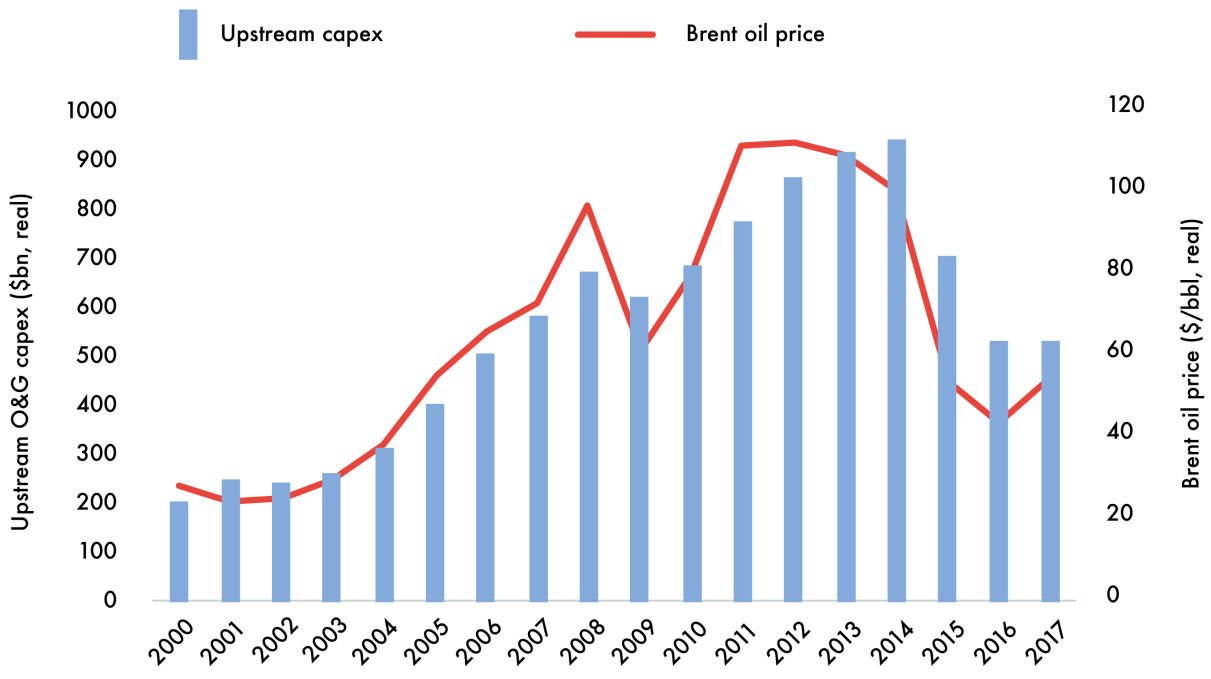
Many upstream energy companies have noted that already producing wells have some built-in resilience to declining demand. This is due principally to sunk costs — those assets will continue to produce if revenues exceed operational costs — even if those projects ultimately fail to recover capital. Natural decline rates also improve the competitive position of those projects. If production naturally declines at 4% p.a., any demand loss would have to be greater than 4% p.a. to force rationalisation of the *already producing assets*.

The greatest potential risks are to the deployment of capital on new projects that are not otherwise needed in a low-carbon scenario. This is where company judgment will be critical — how are companies reinvesting, or not, the proceeds from current production, particularly in exploration and development stage projects? The risk of "stranding" for these projects may lie in the future, but the capital is being sunk now, locking in those projects for the long-term.

Most oil and gas companies tout their long-term planning and risk management procedures as a reason that they will not waste shareholder capital through over-investment. As we have discussed previously, the track records indicate a different story.[12] Against this background, and given the commonly held belief among fossil fuel companies that the Paris Agreement targets will not be achieved, questioning companies' preparedness is a reasonable response from an investment fiduciary.

Moreover, we recognise that the best laid plans of mice and men often go awry. While companies may plan strategically around long-term supply and demand considerations, Figure 3 suggests that actual capex decisions correlate with fluctuations in the oil price, which is subject to many other influences (e.g. producer behaviours and geopolitical tensions). Will reinvestments soar above a climate-secure level should commodity prices rise? This is a key question for investors. To get a company-level picture of this, investors need to understand which projects are likely resilient, which are likely only economic in higher-demand environment, and how much of each the company is investing in.

Figure 3 – *Upstream capex and Brent oil price, 2000-2016*



Source: Rystad Energy; Carbon Tracker analysis

12 *Carbon Tracker and LAPFF, Engaging for a Low Carbon Transition (July 2016).*

Lower demand expectations imply lower price expectations and therefore a focus on costs

Given both industry forecasts/scenarios predicting more fossil fuel demand than is consistent with a 2°C outcome and the observed tendency for the industry to invest in line with short-term oil price fluctuations, understanding the impact of climate mitigation upon future prices would be a critical element of scenario analysis. Weak or falling demand for any commodity increases pressure on prices. We see echoes of this in recent industry mantras "lower for longer" and "lower forever" and in presentations from companies indicating a laser focus on keeping the cost basis low.[13] This lies in contrast to heady predictions (and associated project sanctioning) of high-cost projects in the 2011-2014 period, only a few years earlier.

At least one company has considered the impact of lower future prices on its asset base.[14] We believe this emphasis is a tacit recognition that in a carbon-constrained world, markets will sort winners and losers based on costs. Indeed, Exxon explicitly states as much. This means that any 2°C scenario analysis should aim to address how a company's management believes its projects rank, relative to peers, in that competition.

In a carbon budget context, the relative cost position of a company's assets compared to its peers is important information

One discrete way of utilizing future prices in the service of scenario analysis is to lay the costs of potential supply globally against a future demand curve consistent with a 2°C outcome. The intersection between the supply curve and the demand line for any given scenario gives an equilibrium cost of supply, the theoretical price required to satisfy demand for the last marginal barrel. A higher demand scenario necessitates supply from projects higher up the cost curve. This approach enables the company to consider which projects are, from a supply/demand standpoint, within the carbon budget, and which are not.

As we have noted previously,[15] the purpose of the exercise is not to derive a price forecast from the equilibrium costs, since the curve is in aggregate and therefore does not give the timing of the marginal supply unit and hence the point at which this price would need to be met. Second, such analysis is only a snapshot, since it is based on present-day knowledge and assumptions that can move significantly.

Accordingly, we do not place significant emphasis on the precise value of the marginal cost. For the purposes of this exercise it merely signifies the dividing point between projects that are within or outside of a given carbon budget. This delineation is quite useful, however, as it serves as the building block for assessing both the range of likely resilient projects a company has available and a means of delineating which projects are more or less at risk. Here, companies also need to demonstrate some internal consistency — testing against a 2°C scenario should involve prices that are lower than the base case (not the same or higher as some have done), as the base cases appear nearly universally to assume higher demand than in a 2°C scenario.

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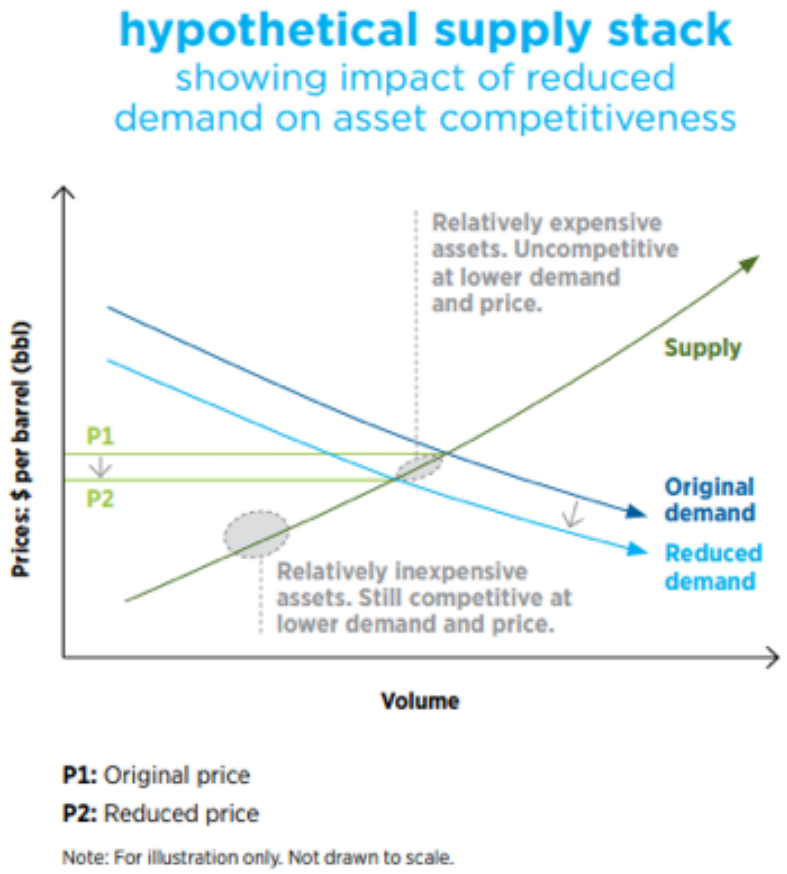
13 ConocoPhillips' announcement it would no longer sanction projects with break-evens greater than $50/bbl. See, e.g., https://www.ft.com/content/e313e1f6-cd47-11e7-b781-794ce08b24dc

14 See, e.g., Oil Search, Climate Change Resilience Report, at: http://www.oilsearch.com/__data/assets/pdf_file/0005/18968/OSL-Climate-Change-Resilience-Report_FINAL.pdf

15 Carbon Tracker, Mind the Gap report. See https://www.carbontracker.org/reports/mind-the-gap/

Though perhaps not the intended purpose of the graphic, the logic of the approach can be seen in a hypothetical example provided by Chevron in its scenario report (Figure 4).[16] There, Chevron reassures investors that "those high-cost assets for which a final investment decision has yet to be made would not find a place in our investment portfolio given our risk management processes." That is important but not enough, as Chevron itself concedes they have sanctioned projects that would fail this test. Investors need to understand the magnitude of the risk; that is to say, how much of the company's potential supply sits above the "reduced demand" intersect line and further, when the company has decided to sanction a project above that line.

Figure 4 – *Chevron's analysis of price impact from demand changes.*



Source: "Managing Climate Change Risks", Chevron Corp., 2017

Price expectations drive corporate reporting

Forecasting oil prices is complex. We would partly agree with ConocoPhillips' Matt Fox, EVP for strategy, exploration and technology, when he says that, "predicting price is useless but scenario planning is priceless."[17] However, the fact is that future price expectations (whether used for planning or not and whether disclosed or not), undergird a number of tests central to financial reporting — including impairment testing, reserves estimation, fair value estimation, asset retirement obligations/decommissioning provisions, and useful life calculations — making it important to understand both the company's underlying price assumptions and how they would be impacted in a 2°C scenario — a "prospective accounting" to borrow a phrase.

16 *Chevron Corp., Managing Climate Change Risks: a perspective for investors, 2017. See https://www.chevron.com/-/media/shared-media/documents/climate-risk-perspective.pdf*

17 *http://s3.amazonaws.com/prod-conocophillips/files/reports/2017-aim-transcript.pdf*

There are certainly instances where changed demand expectations have impacted price expectations thus leading to impairments, demonstrating the rough linkage between supply/demand balance and price. Indeed, in the recently oversupplied market, billions in impairments were registered.[18] If these impairments can be triggered by moments of oversupply, it is possible that significant revisions to management's demand expectations in line with a 2°C outcome could lead to similar results.[19]

For investors, the key question is whether those assumptions would change if company management decide that the 2°C scenario was, in fact, the most likely outcome?

To date, we are unaware of any companies who have explicitly addressed this issue, but some have given indications of the price parameters used in impairments (something we believe all companies should do, but many do not). In those instances where that information is available, it is important to consider how estimates under a carbon-constrained scenario compare to those that form the basis for the company's financial statements — this is the case even though current reporting standards would not necessarily require companies to use the carbon prices derived from 2°C scenarios in their accounting estimates.

Having identified what, in our view are the "central elements" and the "key factors that will drive future developments,"[20] we now turn to what we would expect from voluntary company reports.

PART TWO: WHAT TYPE OF SCENARIO ANALYSIS CAN DELIVER INSIGHTS ON THE MARKET RISKS FROM A LOW-CARBON TRANSITION?

The TCFD recommends the application of a 2°C reference scenario but does not specify either a single scenario or methodology.[21] The recommendations further note the critical importance of delivering information that is comparable and suggests that the outputs should focus on the impact that the scenario modeling has on key operational measures (i.e., input/operating costs, revenues, cash flow timing).[22]

In light of the TCFD guidance and considering the central elements discussed above, we believe that compliance with the TCFD recommendations, and consistent with the demands shareholders have made upon companies, should be structured around these basic elements:

1. A reference scenario;
2. Built upon a 2°C-compliant demand pathway;
3. Compared to a sector-wide, project level view of supply.

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18 See, e.g., http://www.ogfj.com/articles/print/volume-14/issue-1/features/the-top-10-impairments-in-oil-and-gas.html

19 For examples of such impairments, see, Chevron 2015 10-K at FS-18 (Feb. 25, 2016) ("The company reported impairments for certain oil and gas properties during 2015 primarily as a result of downward revisions in the company's longer-term crude oil price outlook."); see also Royal Dutch Shell 2015 Annual Report, at 131 ("Following the revisions to Shell's long-term oil and gas price outlook in 2015, relevant assets were identified for an impairment review resulting in impairment charges in 2015 of $4.4 billion, principally related to Upstream North American shale properties").

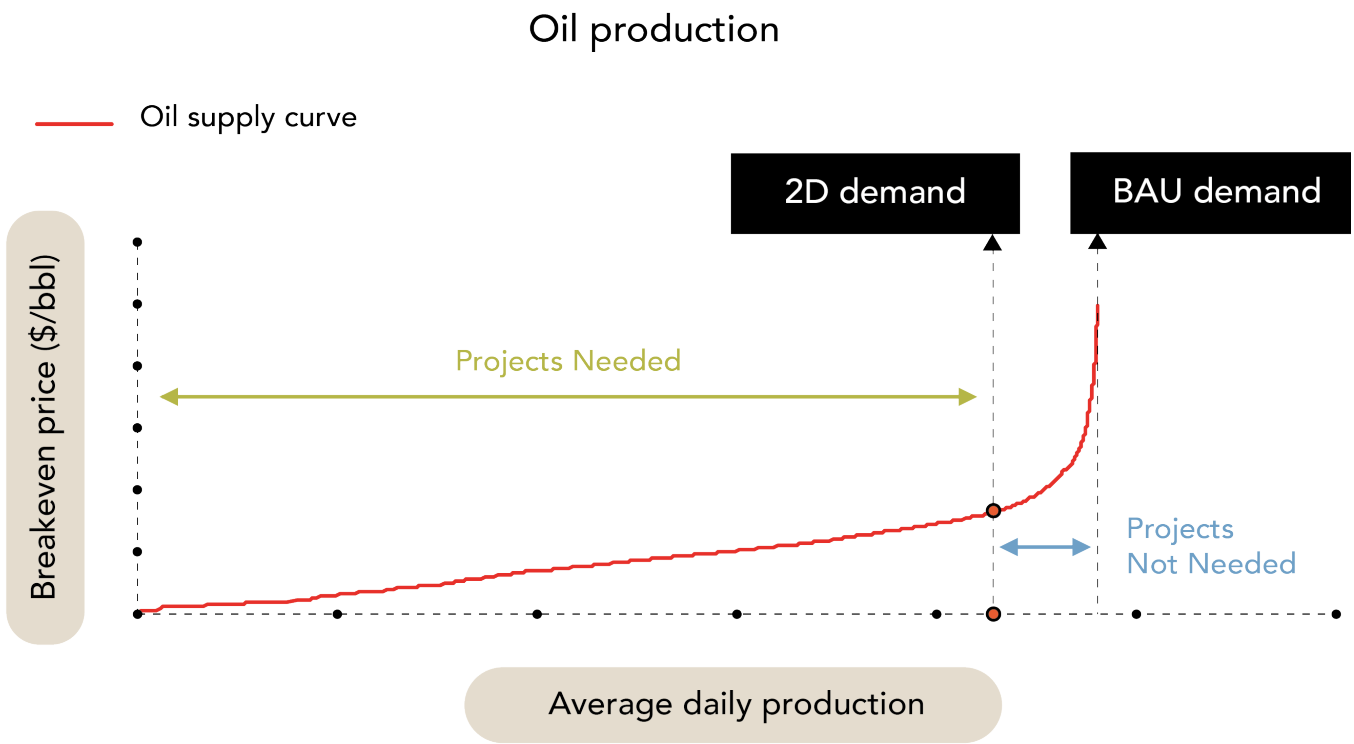
20 See, FSB Task Force, Technical Supplement: The Use of Scenario Analysis in Disclosure of Climate-Related Risks and Opportunities (Dec. 14, 2016), at 2 ("Scenarios are not intended to represent a full description of the future, but rather to highlight central elements of a possible future and to draw attention to the key factors that will drive future developments.").

21 Id., at p.3

22 Technical Supplement: The Use of Scenario Analysis in Disclosure of Climate-Related Risks and Opportunities at 6 (June 2017).

We have characterised this approach in greater detail elsewhere.[23] We offer this simplified view to focus on the key elements. The crux of this approach is a comparison of the 2°C demand pathway with a forward-looking view of supply. Assuming the lowest cost supply will be consumed first, the issuer can build a picture of those projects that are needed to meet 2°C demand and those that are surplus (see Figure 5). Early returns from several company analyses clearly indicate that companies can and, in some cases, are taking a similar approach.

Figure 5 – *Example supply-demand cost curve to compare supply*



Source: Carbon Tracker Initiative

A framework for analysing disclosure of climate risks in company reports

Our approach here focuses on one stage-setting set of questions followed by five substantive areas, described below. We employ a "decision-tree" logic to each section, identifying what companies have done, how they have done it, whether it appears reasonably in line with a low carbon transition and what gaps and omissions exist in their disclosure.

Where relevant and available, we have collected the details on their assumptions, methodology, and outputs, which we have used as inputs to a qualitative analysis of the disclosures. Ultimately, our objective is to provide useful information to shareholders as they evaluate the quality of each company's scenario analysis disclosure and, further, whether it has improved over time.

Our focus here is on what companies have *disclosed* regarding their processes — that means that companies which have conducted other portfolio testing but not disclosed those results will fare poorly compared to those that have. We believe this is reasonable, as it is well within company control to offer more robust disclosure.

23 *See Appendix in https://www.carbontracker.org/reports/carbon-trackers-submission-to-the-fsb-task-force-on-climate-related-financial-disclosures/*

1. STATIC VIEW

We begin by asking some basic questions about the company's current position to establish a baseline that we can evaluate year over year. This can help investors determine whether the company has followed through on key themes.

2. SCENARIO MODELING

Here, we examine the company's approach to scenario analysis, including the following issues:

a. Whether they have modeled at least one 2°C scenario and whether they have used a publicly available or internally generated scenario;
b. If using a proprietary scenario, whether the assumptions and drivers that underpin its modelling are clear and how it compares with other reference scenarios;
c. Whether the company has modified the scenario used and how;
d. Whether it has identified the internal logic of the scenario and key drivers of results;
e. What is the demand profile for fossil fuels consumed over the lifetime of the scenario is; and
f. Whether the scenario is incorporated into company strategic planning.

Our focus is on understanding the overall logic of the scenario and whether the results it yields can be compared to results from other companies.

3. 2°C SCENARIO OUTPUTS

This section examines the company's outputs of the scenarios that may relate to operational or financial terms. Companies may choose to express results in any of a number of ways (i.e., VaR, NPVs, sensitivities, production profiles) at the portfolio level. Results may also be expressed at the project level (i.e., differences in project sanction protocols or examples of projects that would or would not proceed). We will also examine whether the scenario analysis has impacted the company investment decision/project sanction process and how. As with the scenario modeling component, we seek to glean what is available from the disclosures to understand the overarching logic and coherence of the analysis.

4. PRICES

As noted above, we believe that a critical step is translating these risks into long-term price expectations, not for purposes of forecasting but instead in assessing the quality and resilience of the underlying assets and comparing those price conclusions to the ones used in the company's financial statements. This section therefore examines any insight the company's scenario analysis has provided with respect to price assumptions and compares that to the prices assumptions, where disclosed, in the financial reporting process. Here, we will look outside of the scenario analysis produced by the company for any price reporting or guidance they have offered, whether for planning purposes, impairment testing, or other uses and whether found in regulatory filings or other reports.

5. SPECIAL MODULE: CARBON PRICING

Special module: Carbon Pricing. Though we do not believe the use of carbon prices is the best way to effect the TCFD recommendations, we recognise that many companies have used the carbon pricing model as a way of framing the problem and for use in internal sensitivity checks. Here, we are therefore examining whether the information disclosed on carbon pricing is consistent with a robust practice, or not. As discussed in Box 1, below, there are a number of questions that investors should ask.

In Part III we discuss some of the early considerations of how the scenario analyses of ExxonMobil, Royal Dutch Shell, BP, Chevron, Total, ENI, ConocoPhillips and Statoil fare through this lens.

BOX 1. A Note on Scenarios Built on Carbon Prices

Many companies have used carbon prices in a variety of ways to prepare for transitioning existing and planned operations. This has evolved from internal emissions trading schemes to participating in carbon markets. For scenario modelling, this takes the form of a price per tonne/CO_2 (or CO_2e) that serves as a proxy for a range of potential future policy outcomes. This is a simple but easily misused tool for modelling an energy transition and investors should be wary of this. A number of questions need to be asked:

1. If an "internal" carbon price is applied by a company, what scope of emissions is it applied to and how does it affect capital deployment?
Many companies use a carbon price at the project's planning stage to evaluate the impact of the potential direct emissions and test its resilience across a range of future scenarios, rather than impose an internal carbon cost. For upstream projects this likely does not change the economic considerations for a project's final investment decision, due to operational emissions only accounting for around 10-15% of total lifecycle emissions. For a large number of projects, a carbon price of \$40/tCO_2 would translate to an approximate carbon cost of \$1 to \$2 per barrel at the upstream level and will fall well within the price volatility against which the projects are likely already tested. Where regulators are already starting to apply or propose upstream carbon taxes, such as in Norway or Canada, this has not had any discernible impact on capital deployment decisions, especially if taxes are revenue neutral and can be offset against other liabilities. When only applied to upstream emissions, the implications are unlikely to be significant compared to commodity price volatility. This was confirmed by the 2017 Wood Mackenzie study,[24] which concluded that the value at risk for upstream operations due to carbon prices is just 2% overall (with greater impacts on selected projects).

2. How does the carbon price affect different fuels?
The carbon price assumed relative to commodity and technology prices is especially important for gas. There could be scenarios where gas gains an advantage over coal but is not displaced by renewables for example. Or gas could be leapfrogged by renewables and storage at higher carbon prices. However, for transport fuels, studies in Europe have shown that a carbon price of over EUR200 would be needed to deliver the equivalent changes in consumption seen as a result of changes to vehicle efficiency standards[25]. For example, in the UK, adding a CO_2 price of \$40/tCO_2 would only add \$0.05-\$0.10 to the current retail price of ~\$1.70 per litre (which already contains ~\$1.10 tax), should it be passed through to the consumer.

3. Is the carbon price used dynamically to model its impacts on demand and substitution effects?
Unless the carbon price is applied throughout the value chain, the potential knock-on impacts on demand may not be incorporated. One key component of Integrated Assessment Models (IAMs) is to identify key tipping points; that is, inflection points in the relative costs different sources of energy supply where switching en masse, for economic reasons, may occur. Depending on the model, such tipping points may be market specific. Does the company use the carbon price to model fuel demand impacts? Similarly, does the company use the carbon price as a proxy for a price needed to result in a 2°C demand profile?

24 *WoodMackenzie, Beyond Paris: benchmarking upstream emissions to 2025, 2017. See https://www.woodmac.com/news/editorial/beyond-paris-strategies-for-tackling-carbon-risk/*

25 *Cambridge Econometrics, The Impact of Including the RoadTransport Sector in the EU ETS, 2014. See http://www.ebb-eu.org/EBBpressreleases/Cambridge_ETS_transport_Study.pdf*

CARBON TRACKER'S APPROACH TO SCORING

Our aim is to provide investors with clarity on the substantive climate-related disclosure issues for each of the companies assessed. While we have scored the disclosures, one should not be misled by the ordinal rankings but instead should focus on the substance of what companies have said. Our individual company-level reports, drawn from the results of these analyses, therefore focus more on the principal issues in the reports rather than the overall quantitative ranking.
In accordance with Carbon Tracker's decision tree logic and approach for assessing climate-related disclosure (see Part One), we apply a scoring framework across each of the identified areas of focus. Table 1 provides a high-level representation and broad description of the criteria we consider in our scoring framework and the weight we apply to each area of disclosure.

Table 1 – *High level representation of Carbon Tracker's scoring framework*

Area	Objective	Weighting (%)
Scenario Modelling	To what extent is the company clear on the assumptions, drivers and parameters used in its scenario modelling and how it uses its scenarios internally.	**40%**
Scenario Outputs	What methods are used (and what level of detail is provided) to assess the impact of the company in a 2C scenario and to what outcomes are disclosed in such an analysis.	**40%**
Market/Price risk	To what extent does the company disclose and evaluate future market and price assumptions in its reporting.	**20%**
Carbon Pricing (scored separately)	How does the company use carbon pricing internally and what is the level of detail provided.	**10%** (additional)

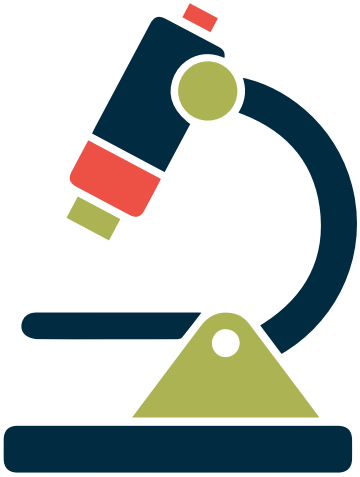
Table 2 – *Key for grading of companies' disclosure performance*

	Possible Score	Poor	Moderate	High
Scenario Modelling	40%	0-9%	10-24%	25-40%
Scenario Outputs	40%	0-9%	10-24%	25-40%
Market/Price Risk	20%	0-4%	5-9%	10-20%
Carbon Pricing	10%	0-2%	3-6%	7-10%

BP

Under the Microscope:

Are companies' climate scenario analyses meeting investors' requirements?



KEY TAKEAWAYS

1. BP's comprehensive annual Energy Outlook points to significantly changing energy markets and the difficulty of accurately predicting low-carbon technologies' erosion of fossil fuel demand.

2. BP has pivoted away from presenting a base case scenario, making it unclear as to which scenario most informs the company's decision-making, but indications are its management are not planning for a pathway consistent with the Paris Agreement.

3. BP does not meaningfully discuss how its business might be affected by a 2°C or below scenario, making it a laggard in this regard.

Carbon Tracker Initiative

May 2018

SUMMARY

The following analysis seeks to assist investors with their navigating of companies' climate-related disclosure.

Using our proprietary framework, we scrutinise companies' disclosure according to four key themes: 2°C scenario modelling, 2°C scenario outputs, market/price risk and the use of carbon prices.

The table below brings together multiple criteria to provide investors with an indication of the company's disclosure, with red signifying the poorest disclosure and green the best, in relative terms.

Table 1 – *Summary of companies' relative performance in their climate scenario analyses*

poor | moderate | high

	BP	Chevron	Conoco Phillips	ENI	Exxon Mobil	Royal Dutch Shell	Statoil	Total
Scenario Modelling								
Scenario Outputs								
Market / Price Risk								
Carbon Pricing								

Source: Carbon Tracker analysis

QUESTIONS FOR MANAGEMENT

1. Several companies, including the much smaller Oil Search, have produced more robust and detailed 2°C scenario analysis than BP's – if they can do it, why can't BP?

2. Does BP plan to assess the financial implications of a scenario consistent with 2°C or lower, particularly with regard to the resilience of its existing and potential projects?

3. Has the company considered expected prices in a "well below 2°C" commodity demand scenario, and if so, what impact the use of those prices would have if used in the preparation of the financial statements?

INTRODUCTION

For some time, BP has been part of a cluster of the largest oil and gas companies that perform regular macroeconomic analysis of the energy sector, both forward- and backward-looking. Its annual *Energy Outlook* explores a range of scenarios, seeking to explore the state and trajectory of energy sector trends. BP's *Energy Outlook* contributes both to BP's own decision-making and the wider discussions.

Historically, BP has discussed the potential for carbon emissions constraints to change the face of energy demand. In recent editions of the *Energy Outlook*, BP has more seriously considered the transition towards a low-carbon economy with two scenarios: its Faster Transition and Even Faster Transition scenarios. In large part, this appears to be a response to a 2015 request by shareholders under the *Aiming for A Coalition*[1], which called on BP to disclose its long-term strategic resilience to potential climate change-related impacts.

A key part of this resolution, which was passed by 98% of shareholder support, was for BP to assess its portfolio resilience to the International Energy Agency's scenarios. The lack of a detailed assessment of a 2°C scenario, therefore, remains a key omission of the Energy Outlook.

Simply, BP fails to move beyond long established practice of identifying climate change as a generic risk. The company nods in the direction of the Task Force on Climate-related Financial Disclosures, but fails to respond to the driver behind those recommendations, namely to assess the possible financial implications of the transition to an energy system aligned with the Paris Agreement. This should concern those investors engaged on this subject.

Below, we review BP's *2017 Annual Report*[2], *2016 Sustainability Report*[3], and *2018 Energy Outlook*[4] focusing on four critical elements:

1. How the company structures its 2°C scenario analysis, if provided;
2. The outputs of that analysis, and whether they are useful to investors;
3. Whether it has evaluated the market risk (i.e., price implications) from secular demand destruction for its commodities, as suggested by most 2°C scenarios; and
4. Whether it has used carbon prices in a robust and defensible way as a proxy for a 2°C scenario.

For additional details on our methodology and approach, please see our paper[5] (hereinafter, "Methodology Paper").

1 *https://engagements.ceres.org/ceres_engagementdetailpage?recID=a0I1200000BJczeAAD.*
2 *https://www.bp.com/content/dam/bp/en/corporate/pdf/investors/bp-annual-report-and-form-20f-2017.pdf.*
3 *https://www.bp.com/content/dam/bp/en/corporate/pdf/sustainability-report/group-reports/bp-sustainability-report-2016.pdf.*
4 *https://www.bp.com/content/dam/bp/en/corporate/pdf/energy-economics/energy-outlook/bp-energy-outlook-2018.pdf.*
5 *https://www.carbontracker.org/reports/under-the-microscope/*

BP's evolving scenario analysis shows some progress, but not enough

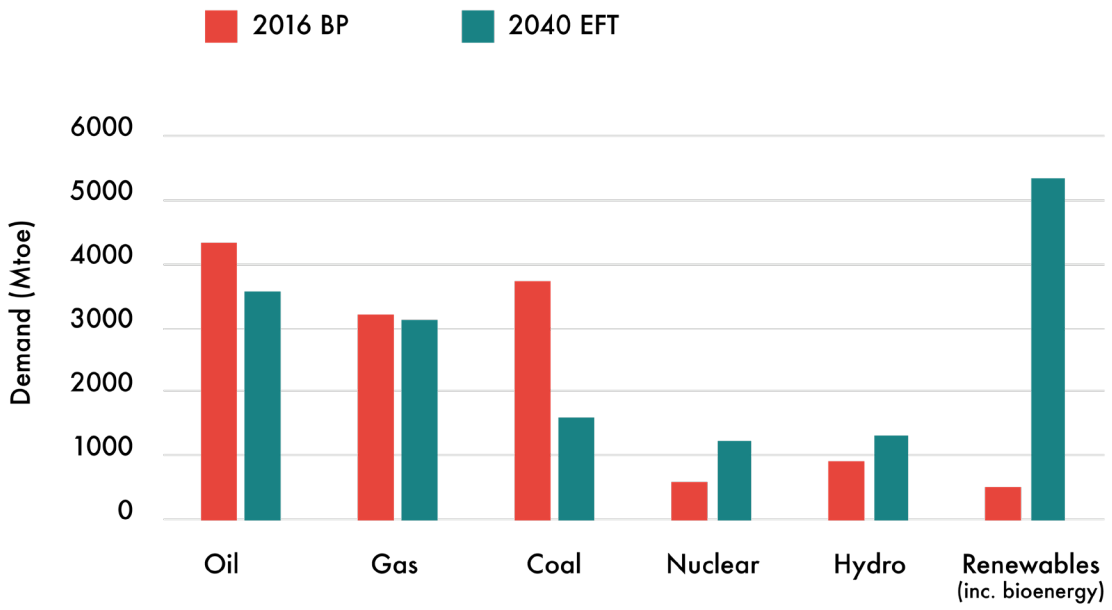
Each year BP produces its macroeconomic analysis, the Energy Outlook. This exercise yields a range of forward-looking scenarios that, in the words of its 2018 edition, "explore the possible implications of different judgements and assumptions by considering a series of 'what if' experiments." The company claims that these scenarios are not predictive, but that they collectively inform the its decision-making.

BP's consideration of a 2°C scenario has typically only gone so far as to reference the emissions gap between its base case scenario and the IEA's 450 Scenario[6] (consistent with a 50% chance of limiting energy sector emissions to 2°C) rather than appearing to seriously consider the business implications of secular decline in demand for fossil fuels that underlies any reasonable 2°C scenario.

This practice has improved, somewhat, with the inclusion of a proprietary "Faster Transition" scenario, which slots in somewhere between the IEA's 2°C Sustainable Development Scenario (SDS), (which now replaces the 450 scenario mentioned above) and 2.7°C New Policies Scenario (NPS), and in most recent editions the "Even Faster Transition" (EFT) scenario (which is broadly aligned with the emissions trajectory of the SDS).

Consistent with almost all Energy Outlook scenarios, only two data points on energy demand are provided for the Even Faster Transition scenario: the beginning (2016) and end (2040). The trendline between these two points reflects BP's basic acknowledgement that a move towards 2°C will entail material, secular decline in the demand for fossil fuels (Figure 1).

Figure 1 – *Primary energy demand by energy source for BP's Even Faster Transition scenario*



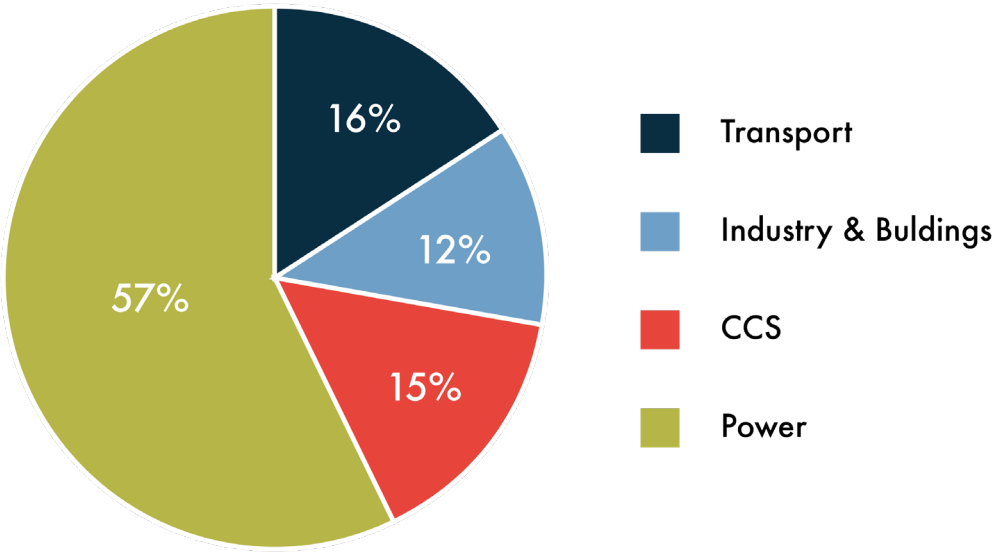
Source: BP, Carbon Tracker analysis

6 *Until 2017, the 450 Scenario was the IEA's 2°C-compliant scenario for the energy sector. As of November 2017, it has been replaced by the Sustainable Development Scenario.*

However, aside from this, BP provides few details for its modelling of a 2°C outcome, which leaves the user scrambling for a full appreciation of how it has considered energy demand under a carbon-constrained pathway. In this regard, it lags both peers who provide more detail for their proprietary scenarios and third-party providers, such as the IEA, where key assumptions are relatively more transparent. Its disclosure would be significantly improved with greater transparency on the pathways of fuels within its scenarios, such as indicating how demand changes in five-year intervals.

The scant information about lower carbon scenarios lies in stark contrast to the copious mapping of BP's Evolving Transition scenario. If the company can provide substantial detail on one scenario, why is this not the case for another, particularly given investors' concern about BP's strategic resilience to 2°C?

Figure 2 – *Drivers of CO_2 reductions between BP's Evolving Transition and Even Faster Transition scenarios*



Source: BP, Carbon Tracker analysis

BP's scenario analysis inadequately scrutinises its own admissions

The complexities of the global energy system guarantee that any projection of its future state beyond the short-term will be wrong. This is clear within BP's own work: its long-term projections for renewable power have been revised upward by roughly 60% over the last three years alone. Such uncertainty justifies looking at plausible downside scenarios, especially those that put at their centre the committed ambition of the world's governments.

At the beginning of his foreword to the Energy Outlook, Mr. Dudley (Group CEO) writes that the speed of the low-carbon transition is a central theme. Yet, despite implicit recognition by the company that unpredictable disruption can quickly materialise, overwhelming focus within the Energy Outlook is placed upon a scenario (Evolving Transition) in which change, at least for BP's principal products – oil and gas – is incremental.

No discussion of the company's future supply leaves a gap

For the purposes of placating investors' concerns about how future changes to energy demand might adversely impact BP's future financial results, this disclosure falls short. There is no discussion of BP's potential future production, much less a discussion of how lower demand trajectories would have both value and volume implications.

To be useful to investors we believe companies' scenario analysis should contain the following elements[7]:

1. A reference scenario;
2. Built upon a 2°C-compliant demand pathway;
3. Compared to a sector-wide, project-level view of supply.

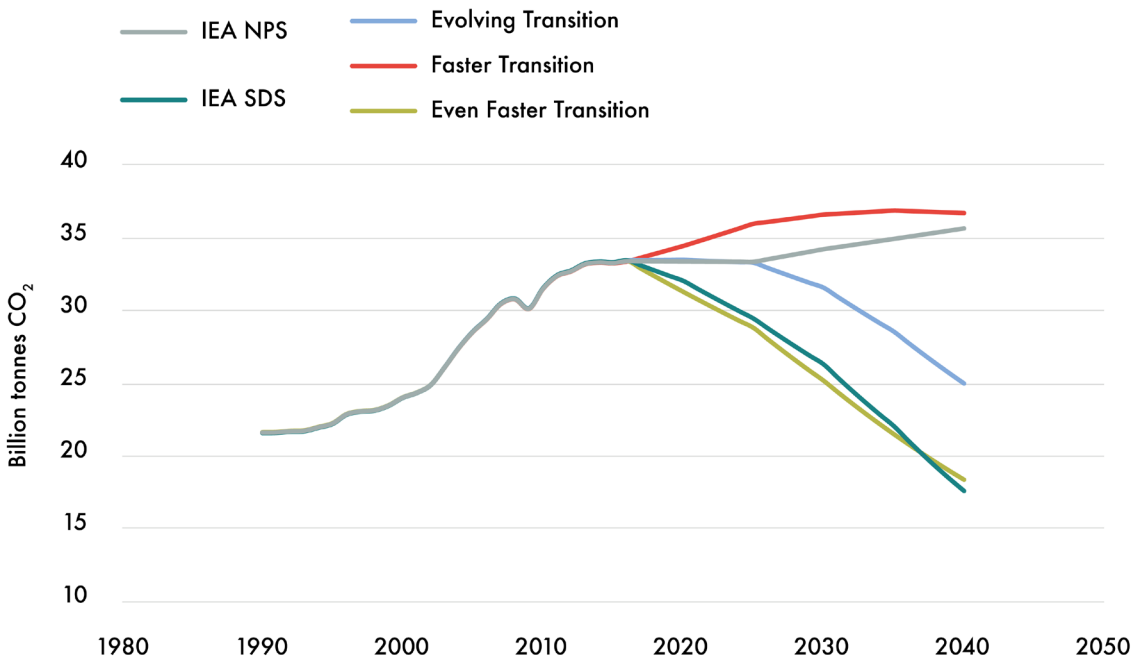
BP dodges the question of whether it plans for a 2°C world

In 12 months, BP has repositioned from presenting a Base Case scenario of the "most likely path for global energy markets over the next 20 years"[8], to not probability weighting any of its scenario analyses. Its 2018 Energy Outlook writes up-front that all scenarios presented inform the company's long-term strategy. However, the bulk of its discussion is still devoted to its Evolving Transition.

The implications of this shift are unclear. Either the Evolving Transition, as the apparent heir to BP's Base Case, should be considered a ballpark proxy for management's long-term thinking; or the company has significantly shifted its expectations and strategy.

If the former inference is accurate, Figure 3 demonstrates that BP is not planning for a 2°C world. If the latter holds true, then investors should expect a much more rigorous examination of the possible business implications of a 2°C scenario.

Figure 3 – *Comparison of emissions pathways between BP and IEA scenarios*



Source: BP, Carbon Tracker analysis

7 *For more information, see https://www.carbontracker.org/time-machine-climate-risk-bringing-future-forward-2%CB%9Ac-scenario-analysis/*

8 *https://www.bp.com/content/dam/bp/en/corporate/pdf/energy-economics/energy-outlook/bp-energy-outlook-2017.pdf*

SCENARIO OUTPUTS

Our Methodology Paper focuses heavily on whether companies have endeavoured to identify those assets (or potential assets) that would appear economic in their business-as-usual outlook but unattractive in a 2°C scenario.

Understanding the delta between the two scenarios is an essential element to evaluating the climate-related risks and the key building block for providing indicators to the market of that risk (whether expressed in terms of reserves volumes, capital expenditure, discounted future cash flows, or some other metric) as we have discussed elsewhere[9].

BP does not publicly discuss any financial or strategic impact, positive or adverse, that might result from its Even Faster Transition scenario or any third-party 2°C scenario. Relative to its peers, BP should be considered a laggard in this regard.

BP's failure to consider the financial impact of a 2°C scenario could leave it exposed

In its *2016 Sustainability Report*, BP writes that "[w]e don't expect our oil and gas portfolio to be 'stranded' in the future. This is because we produce and replace our proved reserves over a 15-year time frame on average – which gives us the flexibility to shift our investment strategy." Given the industry's historic inability to predict market cycles, we do not consider vague statements that they will see it coming as sufficient reassurance.

Further, its *2017 Annual Report* outlines the company's value proposition as one that "progress[es] hydrocarbon resources and turns them into proved reserves or divests them if they do not fit with our strategic priorities" (emphasis added). We believe that BP's references to proven reserves alone somewhat mischaracterise its potential long-term exposure.

As discussed in our Methodology Paper, the potential to monetize existing balance sheet value (BP's proved reserves) does not imply that "resources" and reserves of lower confidence than proven, which sit outside the balance sheet, do not have current economic value, nor that this value is safe from loss. BP's argument ignores the risks from reinvesting cash flows from the nearer term reserves into those currently non-producing assets that might be rendered surplus to demand in a transition away from fossil fuels. Should BP not invest in the production of supply outside of its current proved reserves then its assumed immunity to stranded assets might be correct. But that is not how the company is run. Between 2013-2017, BP has spent an average of 84% of its cash flows on upstream capex, with 85% of its 2017 cash flows having been reinvested in upstream projects.[10]

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9 *https://www.carbontracker.org/time-machine-climate-risk-bringing-future-forward-2%CB%9Ac-scenario-analysis/*

10 *See BP's 2017 20-F and 2015 20-F. Calculations exclude 2013 capital expenditure in the Rosneft acquisition. In 2016, BP changed how it accounted for certain non-cash items and therefore the periods of 2013, 2014-2015 and 2016-17 are not directly comparable; comparisons here reflect internal year calculations.*

MARKET RISK

All things being equal, lower expected demand (as in the 2°C scenario) implies lower expected prices. Clearly other factors might drive near-term price volatility and structural elements to oil pricing, and cartel (OPEC) production constraints might structurally shift oil prices towards an oligopoly price over longer periods. But whichever other considerations are taken into account, we believe most companies would agree that reducing demand forecasts would likely imply reduced price expectations in the long-term.

Considering future commodity prices – what is BP's view?

In the documents examined in this analysis, the company does not offer its own view of future oil and gas prices, nor acknowledge, as peers have, that a 2°C scenario might depress future prices.

This marks a notable change from BP's *2016 Annual Report* that responded to the prevailing low oil price environment by reassuring users that the company tests its investments "against a range of oil and gas prices to check their profitability over the long term."[11] In this statement, BP nodded to its consideration of a "long-term [price] outlook" without offering the range of prices that it uses to assess the viability of its assets.

BP does disclose its longer-term price assumptions used to determine recoverable amounts of $75 per barrel (Brent) and $4/mmBtu (Henry Hub) (both in 2015 prices) from 2023 onwards for the remaining lifetime of the asset. Whether these are the same prices used for planning purposes is unclear.

Given this background, a key question should focus on the extent to which BP has considered that global oil and gas demand might underperform its long-term expectations and, therefore, fail to meet its assumed impairment price or planning prices, if different.

CARBON PRICES

Many companies have used carbon prices in a variety of ways to prepare for a low carbon transition for both existing and planned operations. For scenario modelling, this takes the form of a price per tonne/CO_2 (or CO_2e) that serves as a proxy for a range of potential future policy outcomes. This is a simple but easily misused tool for modelling an energy transition and investors should be wary of this. We have detailed the ways in which carbon prices can provide false reassurance in our Methodology Paper[12].

Carbon prices are often limited by geography or emissions scope (i.e., only operational emissions) limiting their utility as a proxy for a 2°C scenario. Indeed, many do not approximate that outcome. Seemingly commonplace carbon prices (i.e., $40/tonne CO_2) may add only a $1-$2 increase to upstream costs on average, if completely absorbed by the company — an insignificant number and well within the range of price sensitivities companies already examine.

11 *BP, Annual Report and Form 20-F 2016, 2017, https://www.bp.com/content/dam/bp/en/corporate/pdf/investors/bp-annual-report-and-form-20f-2016.pdf*

12 *https://www.carbontracker.org/reports/under-the-microscope/*

In the context of an integrated assessment model, carbon prices may be useful in identifying how policy costs imposed on a polluting fuel can trigger tipping points when one energy source becomes more economic than another (and under a least-cost approach, result in the insurgent energy source taking market share from the now costlier incumbent). Understanding whether a given carbon price might hit a tipping point, however, requires knowledge of the inputs and assumptions in the model and cannot be derived from the carbon price alone.

BP's use of a carbon price: does it materially impact its business?

BP provides a patchwork of disclosure on its consideration of carbon prices. The company appears to theoretically acknowledge in its Annual Report the potential for carbon price policies to affect its business operations. It claims that its evaluation of some projects includes a carbon cost of $40/ tCO_2e and that the company "also stress [tests] at a carbon price of $80/t".

However, this paints half a picture. First, the $40/t price is applied only in industrialised countries. Our estimates suggest the impact of this price upon BP's production would fall within the $1-2/bbl range and therefore immaterial. Second, while an $80/$tCO_2$ price would obviously more significantly increase BP's cost of production, it is unclear to what price is being applied.

In neither instance does BP align a particular price with one that could be considered reasonable in a 2°C scenario. Instead, its Energy Outlook explains that its Even Faster Transition includes "high" carbon prices.

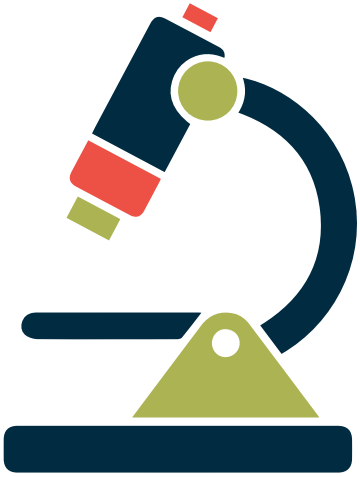
CONCLUSION

BP is well-known for its macro-economic modelling, but its 2°C scenario disclosure is poor. A lack of transparency and detail as to the drivers and pathway of its 2°C scenario is a cause for concern. Moreover, despite the overwhelming support of its shareholders for the company to assess its long-term resilience, BP offers little or no evidence that it has seriously considered the financial implications of a carbon-constrained scenario. With several peer companies now producing more reasonably robust scenario analysis, the relative quality of BP's disclosure is becoming more apparent.

CHEVRON

Under the Microscope:

Are companies' climate scenario analyses meeting investors' requirements?



KEY TAKEAWAYS

1. Chevron's climate-related disclosure has progressed in recent years and its latest report considers the resilience of its portfolio of projects to a 2°C scenario.

2. However, a lack of transparency as to how its 2°C scenario analysis was performed, and a failure to quantify the financial impacts of the analysis, limits its use for investors.

3. Chevron's strategic planning is based on global warming of more than 2°C and the company views a near-term peak in oil demand as unlikely.

Carbon Tracker Initiative

May 2018

SUMMARY

The following analysis seeks to assist investors with their navigating of companies' climate-related disclosure.

Using our proprietary framework, we scrutinise companies' disclosure according to four key themes: 2°C scenario modelling, 2°C scenario outputs, market/price risk and the use of carbon prices.

The table below brings together multiple criteria to provide investors with an indication of the company's disclosure, with red signifying the poorest disclosure and green the best, in relative terms.

Table 1 – *Summary of companies' relative performance in their climate scenario analyses*

poor | moderate | high

	BP	Chevron	Conoco Phillips	ENI	Exxon Mobil	Royal Dutch Shell	Statoil	Total
Scenario Modelling								
Scenario Outputs								
Market / Price Risk								
Carbon Pricing								

Source: Carbon Tracker analysis

QUESTIONS FOR MANAGEMENT

1. What are the financial implications of the main differences between Chevron's internally modelled 2°C scenario and its "base case"?

2. How does the company factor into its forward-looking planning the uncertainties in implications of the world heading to global warming of more than 2°C?

3. Has the company considered expected prices in a "well below 2°C" commodity demand scenario, and if so, what impact the use of those prices would have if used in the preparation of the financial statements?

INTRODUCTION

Chevron, one of the major listed integrated oil and gas companies, had not until 2017 produced any report that addressed climate risk, nor publicly disclosed how it would fair in a 2°C scenario. However, following pressure from shareholders[1] it published its *Managing Climate Change Risks*[2] report in 2017 and its *Climate Change Resilience* report in March 2018, which aimed to address some of these concerns.

Below, we review Chevron's *2017 Form 10-K*[3], the latest *Corporate Responsibility Report*[4] and the *Climate Change Resilience Report*[5], focusing on four critical elements:

1. How the company structures its 2°C scenario analysis, if provided;
2. The outputs of that analysis, and whether they are useful to investors;
3. Whether it has evaluated the market risk (i.e., price implications) from secular demand destruction for its commodities, as suggested by most 2°C scenarios; and
4. Whether it has used carbon prices in a robust and defensible way as a proxy for a 2°C scenario.

For additional details on our methodology and approach, please see our accompanying paper[6] on this topic (hereinafter, "Methodology Paper").

SCENARIO MODELLING

Chevron's use of forward-looking scenario analysis and assessment of 2°C

Chevron has performed scenario analysis for many years to help inform business strategy, portfolio management and capital allocation decisions. Scenario modelling helps to inform an internal view - or "base case"[7] - as well as draw up other possible "alternative" scenarios to challenge management's thinking. As part of its strategic processes, internal models are used to forecast long-term demand, supply, energy mix, commodity prices and carbon prices, based on a host of drivers.

In 2017 Chevron published its first analysis addressing climate risk[8], which made some explicit and welcomed admissions on lower demand in an existing 2°C environment, notably that reduced fossil fuel demand under a "carbon-constrained" scenario would render marginal, relatively higher cost assets uneconomic. In March 2018, the company released its second iteration titled *Climate Change Resilience*.

1 *https://www.ft.com/content/b32f9d10-3984-11e7-821a-6027b8a20f23*
2 *See Managing Climate Change Risk, https://www.chevron.com/-/media/shared-media/documents/climate-risk-perspective.pdf*
3 *https://chevroncorp.gcs-web.com/static-files/a72f5243-7a00-48b3-9224-efa7ee1aeaec*
4 *https://www.chevron.com/-/media/shared-media/documents/2016-corporate-responsibility-report.pdf*
5 *https://www.chevron.com/-/media/shared-media/documents/climate-change-resilience.pdf*
6 *https://www.carbontracker.org/reports/under-the-microscope/*
7 *This base case serves as the basis for its business strategy, investment decision-making and portfolio management processes.*
8 *See Managing Climate Change Risk, https://www.chevron.com/-/media/shared-media/documents/climate-risk-perspective.pdf*

Modelling a 2°C outcome: considering and applying a 2°C scenario

To understand its 2°C scenario analysis, it is important to comprehend, to the extent possible, how Chevron conducts its modelling internally. As part of its business planning process, Chevron uses proprietary models to forecast the long-term changes to the energy mix, commodity prices, carbon prices and supply and demand of oil, gas and refined products. For each constituent part of its model, Chevron identifies the types of drivers and assumptions that underpin it, such as oil demand relying on a set of economic, policy and technology assumptions (see Appendix for a more comprehensive list of drivers noted in the *Climate Change Resilience* report). Chevron however, does not provide any detail with regards to the assumptions that feed into its modelling work.

In conducting its modelling of a 2°C outcome, Chevron has substituted its own long-term views on demand with the demand pathway in the International Energy Agency's (IEA) main decarbonisation scenario – the Sustainable Development Scenario (SDS) – which assumes a 50% probability of limiting global temperature rises to 2°C. This results in Chevron's model producing commodity price projections, against which it tests the resilience of its portfolio. Chevron does not indicate the prices its model delivers, leaving uncertainty regarding the prices used, and whether or not they are comparable to the old IEA 450 price deck (where, for example, oil reaches $79/bbl[9] in 2040) or the new IEA SDS price deck (where oil reaches $64/bbl in 2040). Although, to assure investors of not interpreting a "mis-read" in future demand, Chevron acknowledges that these prices for oil and gas are "comparable" and "similar" respectively with regards to what it tests against already; specifically, its existing "low-price scenario[s]". Similarly, in its preceding climate risk report in 2017, Chevron conceded resulting prices "generally align" with the low-end price trajectory considered internally.

One key takeaway is that Chevron's approach to modelling a 2°C outcome, which is based on supply/demand fundamentals, is consistent with its long-term planning processes and demonstrates that such modelling can be done. However, whilst the assumptions that underpin the SDS demand are captured in the demand pathway, Chevron provides scant details on any of its own internal assumptions in this modelling exercise and fails to provide meaningful details of the impact.

Is Chevron planning for a 2°C future?

Chevron's base case is not premised upon a 2°C target. Chevron acknowledges that most outlooks that it considers "conclude that oil and gas demand will continue to grow over the coming decades".[10]

Chevron notes some cases of general alignment[11] between its base case and the IEA New Policies Scenario (NPS) – a scenario that would only feature current and announced policies for the next 22 years – whilst acknowledging that there are differences between its base case and "downside scenarios, such as the IEA's SDS." Moreover, Chevron suggests that a peak in oil demand which would be needed in a 2°C scenario "is unlikely in the near-term".

Companies are free to take their own view on how they believe future demand will play out, however disclosure of the delta between their base case and a 2°C scenario would provide clarity on the extent of divergence.

9 *Adjusted from 2015 real USD in IEA's World Energy Outlook 2016 to 2016 real USD.*

10 *www.chevron.com/-/media/shared-media/documents/climate-change-resilience.pdf*

11 *Such as total energy demand, drivers for energy demand and demand for specific resources.*

SCENARIO OUTPUTS

Understanding the delta between the company's base case scenario and a 2°C scenario is an essential element to evaluating climate-related risks. It is the key building block for providing indicators that could help investors price that risks (whether expressed in terms of future production volumes, capital expenditure, discounted future cash flows, or some other metric) as we have discussed elsewhere[12].

How does Chevron fare in a 2°C world?

Chevron posits that its portfolio of assets are competitive and therefore resilient in a demand-constrained environment under a 2°C scenario. Chevron discloses some high-level, qualitative results of its portfolio test and basic examples of assets impacted, however we see an absence of detail in both the approach taken and quantitative impact on its portfolio.

Compared to its peers, Chevron offers some useful discussion of selected projects. For example, the base business in Kazakhstan, deepwater assets in the Gulf of Mexico and Nigeria, and heavy oil in California will "generate cash and earnings".[13] In contrast, Chevron notes that its Kazakhstan Future Growth Project, the Australian Gorgon and Wheatstone LNG projects will "generate cash".

Why are the latter three projects unable to attain "earnings" in a lower demand environment? It should not be a surprise that any project would generate cash once it has been built, even in a challenging price environment. If the majority of capital investment has already been sunk, it will continue to produce while it can cover its variable costs, which are likely to be relatively low. The real test, however, is whether such a project will ultimately deliver adequate financial returns on the original investment. We therefore read this as tacit admission that the latter three projects don't create value in a low-demand world – i.e. that these already sanctioned projects would be stranded. While this example indicates that Chevron has done the financial analysis, the discussion fails to clearly state the implications.

Contrary to the above, Chevron dismisses the concept of stranded assets, albeit with shortcomings in its arguments. Chevron is not the first to attempt to limit the definition of stranding to a) proven reserves only; and b) whether these will be physically produced. However, this artificially narrows the scope. The generally understood definition is a financial test and applies to all assets, not just the proven reserves subset. For example, in the IEA report that Chevron cites frequently, stranded assets are "capital investment in fossil-fuel infrastructure that ends up failing to be recovered over the operating lifetime of the asset because of reduced demand or lower prices resulting from climate policy".[14]

Chevron discusses some of its potential strategic responses to a 2°C-compliant scenario. In its Upstream segment, the company would shift towards brownfield and short-cycle projects[15], as these would require lower investments upfront and have the potential to recover capital quickly. Indeed, Chevron has recently increased its spending in shorter-cycle projects, with an estimated total spend of around $6.8 billion in shale and tight resource investments in 2017[16] and 2018.[17] Given the present focus on shorter-cycle projects, one might ask whether Chevron's shift to short-cycle projects is not an expression of increasing uncertainty about volatility in long-term demand?

12 *https://www.carbontracker.org/time-machine-climate-risk-bringing-future-forward-2%CB%9Ac-scenario-analysis/*
13 *www.chevron.com/-/media/shared-media/documents/climate-change-resilience.pdf*
14 *International Energy Agency, "World Energy Outlook 2017", November 2017.*
15 *Such as tight oil projects in the Permian basin.*
16 *https://chevroncorp.gcs-web.com/static-files/f14ac84b-47c7-4910-8b0e-cd776d50b7b0*
17 *https://chevroncorp.gcs-web.com/static-files/a72f5243-7a00-48b3-9224-efa7ee1aeaec*

With regards to its Downstream & Chemicals operations, Chevron discloses that it would be resilient due to investments already made as well as a focus towards higher-return products such as lubricants, additives and petrochemicals. However, the company recognises some fundamental differences under an SDS demand scenario, with lower volumes noted to have impacts on profitability and a subsequent rationalisation of excess capacity due to declining demand across refined products, particularly over the long-term. This broadly aligns with Carbon Tracker's view[18].

MARKET RISK

Our assessment of company scenario analysis also includes consideration of the long-term price assumptions, where disclosed, that form the basis of the company's financial reporting. These may seem tangential to investors focused on 2°C scenarios, but are highly relevant to understanding the quality of the results in the financial statements which may rely heavily upon commodity price assumptions that have been developed around higher long-term demand expectations. Chevron has recent experience in this regard, where substantial impairments were reported in its 2015 annual report, "primarily as a result of downward revisions in the company's longer-term crude oil price outlook."[19]

Considering future commodity prices – what is Chevron's view?

Chevron considers low, medium and high price trajectories across a number of fuels as well as cost of goods and services, but indicates that it cannot disclose commodity prices (as well as carbon costs) because of the potential for commercial harm. We believe that commercial sensitivities around long-term prices are overstated, given the difficulty of forecasting prices accurately.

As mentioned previously, future commodity prices are modelled internally and drive Chevron's strategic and business planning processes, where central views are formed on pricing assumptions; impairment reviews included. Although there is an absence of the disclosure of these assumptions, Chevron indicates that its impairment reviews use assumptions that align with the company's business plans, not the modelled prices which are derived from the IEA SDS.

Management's long-term commodity price estimates are highly relevant to investors to the extent those prices are used as the basis for testing the recoverable amount of assets held on the balance sheet, the results of which are disclosed in corporate reports. Indeed several companies, including BP and Shell, already recognise the material nature of these estimates on the preparation of the financial statements and disclose this information. This allows investors to assess for themselves the reasonableness of management's asset valuations. Further, it enables investors to compare the basis of asset valuations across companies, drawing their own conclusions about those which are most exposed to lower long-term commodity prices.

To demonstrate to investors the robustness of the company's financial reporting, Chevron should disclose their long-term price assumptions and compare those to modelled 2°C prices. The valuation results would further offer investors decision-useful information, as it would give a better understanding of the company's conservativeness and what the potential future risk of asset write-downs could be under a 2°C scenario.

18 *https://www.carbontracker.org/reports/margin-call-refining-capacity-2-degree-world/*

19 *See Chevron 2015 10-K at FS-18 (Feb. 25, 2016), https://chevroncorp.gcs-web.com/static-files/fc38aac7-b918-4fec-94f7-f1734e38ddfa*

CARBON PRICES

Many companies have used carbon prices in a variety of ways to prepare for a low carbon transition for both existing and planned operations. For scenario modelling, this takes the form of a price per tonne of CO_2 (or CO_2e) that serves as a proxy for a range of potential future policy outcomes. This is a simple but easily misused tool for modelling an energy transition and investors should be wary of this. We have detailed the ways in which carbon prices can provide false reassurance in our Methodology Paper[20].

In the context of an integrated assessment model, carbon prices may be useful in identifying how policy costs imposed on a polluting fuel can trigger tipping points when one energy source becomes more economic than another (and under a least-cost approach, result in the insurgent energy source taking market share from the now costlier incumbent). Understanding whether a given carbon price might hit a tipping point, however, requires knowledge of the inputs and assumptions in the model and cannot be derived from the carbon price alone.

Chevron's use of a carbon price: does it materially impact its business?

Chevron dedicates a considerable amount of its 'Climate Change Resilience' report to the role of pricing carbon, with it noted as being used in the company's investment decision-making, impairment reviews and reserve accounting. Chevron states that it cannot disclose its this as it could "erode" its competitive advantage, despite its peers doing so. Although carbon prices can give significant differentiation between particular assets, internal carbon prices are likely to have a limited impact on upstream project evaluation or sanctioning activity overall. For example, a price of $40/t$CO_2$, a price far above those currently prevailing, would add $1-2/bbl to upstream costs on average. Even then, it would only impact margins if it could not be passed through to consumers, as Chevron notes.

CONCLUSION

Chevron has taken some important steps in the past two years with regards to its climate-related disclosure. Chevron's chosen method of inputting the demand pathway from a well-recognised reference scenario – the IEA SDS – into its proprietary model has merit. There are also some welcome implicit admissions of potential uneconomic projects and the possibility that some of its large assets may not deliver positive earnings. However, the lack of disclosure of the assumptions used deprives investors of decision-useful information.

We would argue that improvements could be made in two principal areas: transparency of its scenarios (both its base case and 2°C scenario) and in its disclosure of the impacts to Chevron's business in a demand-constrained environment.

The drivers that support the IEA SDS demand projections are well documented, which allows investors a degree of comparability and transparency. However, this represents only one portion of Chevron's modelling process. We would encourage Chevron to disclose the assumptions of supply, as well as the resultant prices that derive from its proprietary model. We would also suggest Chevron make explicit some of the underlying assumptions in its base case on the drivers listed in the Appendix, which informs business strategy, portfolio management and capital allocation decisions. Ultimately, this would enable investors to understand the delta between the two scenarios and any potential climate-related risk.

20 *https://www.carbontracker.org/reports/under-the-microscope/*

Moreover, Chevron assures shareholders that its portfolio would be resilient in a 2°C-compliant scenario. We would encourage Chevron to support this assertion by shifting from providing high-level qualitative examples of potential impacts to providing quantifiable financial or operational metrics across its business and what those associated implications would be. Furthermore, we would recommend that Chevron provides further detail and assurance to investors on why its business is resilient to stranded asset risk, by going beyond evaluating its proven reserves.

APPENDIX

Disclosed principal drivers considered in Chevron's modelling[21]

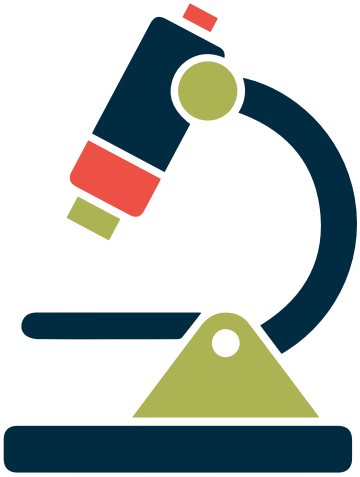
Area of Modelling	Drivers considered
Demand for oil, gas and refined products	• Economic indicators: GDP growth, income levels, industrial activity and global trade • Capacities of electricity generation and refineries by feedstock • Demand use indicators: global vehicle fleet, motor vehicles sales, vehicle miles travelled and airline passenger miles • Taxes and subsidies • Carbon prices, policies and regulations • Competition from potential substitute products • Consumer preferences • Urbanisation
Supply	• Resource supply curves • Production constraints • Capacities of LNG plants, regasification facilities and refineries • Fiscal and financial requirements • Geopolitical trends
Energy mix	• Economic indicators • Energy trends: efficiency standards, energy intensity, fuel mandates • Policy instruments: carbon prices, FiTs, fuel taxes • Technology
Commodity prices outlooks	• Population and economic growth • Renewable fuel penetration • Energy efficiency standards • Climate-related policy actions • Demand response to oil and natural gas prices
Carbon prices	• Emissions limits • Economic indicators, such as GDP growth and industrial activity • Energy mix • Abatement opportunities, such as fuel switching, methane reductions, and carbon capture and storage • Limits on prices, like price floors and ceilings • Interaction with other policies, like renewable and efficiency standards • Interaction with other markets, such as offsets

21 *Although these drivers are discussed in the report, Chevron does not disclose or quantify the assumptions. See 'Climate Change Resilience: A Framework for Decision Making report.'*

CONOCOPHILLIPS

Under the Microscope:

Are companies' climate scenario analyses meeting investors' requirements?



KEY TAKEAWAYS

1. The quality of Conoco's climate scenario disclosure lags far behind its peers. The company claims to produce internal scenarios but provides no detail as to what underpins them.

2. Conoco has apparently considered the implications for commodity prices of long-term falling demand for oil and gas, but not offered disclosure on it. It should not just ask investors to trust, it should provide a means of verifying its resilience.

3. Conoco provides no metrics of the potential financial impact that low carbon scenarios would have on the business, making what it has said of little use for investors.

Carbon Tracker Initiative

May 2018

SUMMARY

The following analysis seeks to assist investors with their navigating of companies' climate-related disclosure.

Using our proprietary framework, we scrutinise companies' disclosure according to four key themes: 2°C scenario modelling, 2°C scenario outputs, market/price risk and the use of carbon prices.

The table below brings together multiple criteria to provide investors with an indication of the company's disclosure, with red signifying the poorest disclosure and green the best, in relative terms.

Table 1 – *Summary of companies' relative performance in their climate scenario analyses*

poor | moderate | high

	BP	Chevron	Conoco Phillips	ENI	Exxon Mobil	Royal Dutch Shell	Statoil	Total
Scenario Modelling								
Scenario Outputs								
Market / Price Risk								
Carbon Pricing								

Source: Carbon Tracker analysis

QUESTIONS FOR MANAGEMENT

1. Conoco claims that it models three 2°C scenarios. Are any of these aligned with international ambition for "well below 2°C" of warming? Further, will it provide detail of the underlying modelling, such as pathways for energy demand by fuel and critical assumptions of the scenarios?

2. Conoco has carried out a significant divestment program over the last year and a half; are there potential projects remaining in the pipeline that it would not sanction if its central scenario was consistent with the Paris Agreement?

3. Has the company considered expected prices in a "well below 2°C" commodity demand scenario, and if so, what impact the use of those prices would have if used in the preparation of the financial statements?

INTRODUCTION

ConocoPhillips ("Conoco") is the world's largest independent exploration and production oil and gas company. Conoco has escaped relatively unscathed from the growing wave of shareholder resolutions asking companies to analyse the impact of a 2°C scenario – in the past four years, it has seen only one shareholder resolution in 2016 asking for such analysis. That resolution was withdrawn based on a commitment by the company to address it. As of this writing, Conoco has published additional information on its website but no report as sought by shareholders. No such resolutions have yet gone to a vote at Conoco.

This general lack of disclosure can be contrasted with actions that Conoco's management has taken to position the company for a low-price environment, as other companies have done. In late 2016, Conoco embarked on changes to its approach and value proposition to the markets, looking to prioritize shareholder returns over production growth and focus on reducing break-evens to create value at low (sub-$50) oil prices. In this strategy are echoes of Conoco's "shrink to grow" strategy under former CEO James Mulva nearly a decade ago. In recent years this has involved asset dispositions of approximately $16 billion, primarily on US natural gas and North American oil sands holdings.

ConocoPhillips has billed these changes as a significant strategic shift.[1] Clearly much of this is in response to concerns about lower than expected prices materialising in the future. As we noted in 2015, a focus on value over volume and returning more cash to shareholders is one strategic response to the energy transition.[2] A key question is whether Conoco's own internal scenario analysis, little of which is disclosed, has helped motivate this shift?

Here, the answers are mixed. While Conoco has provided the broad outlines of its scenario analysis, it does not publish a report on the same. Of all companies we have reviewed in this peer group set, Conoco is in the minority for not having produced a 2°C scenario report.

Below, we focus on Conoco's *2017 Annual Report*[3], *2016 Sustainability Report*[4] and Conoco's website pages related to climate change, current as of May 8, 2018.[5]

Here, we focus on four critical elements:

1. How the company structures its 2°C scenario analysis, if provided;
2. The outputs of that analysis, and whether they are useful to investors;
3. Whether it has evaluated the market risk (i.e., price implications) from secular demand destruction for its commodities, as suggested by most 2°C scenarios; and
4. Whether it has used carbon prices in a robust and defensible way as a proxy for a 2°C scenario.

For additional details on our methodology and approach, please see our paper[6] (hereinafter, "Methodology Paper").

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1 The key test of claims of continued capital discipline through cycles will be whether companies overinvest on the back of currently rising oil prices. Conoco's CEO, Ryan Lance suggests they won't: "[W]e're confident our value proposition is sound. So, we're building on that momentum and sticking to our priorities, even as oil prices recover. As evidence, in January we paid down $2.25 billion of debt. In February, we announced a 7.5 percent increase in our quarterly dividend and a 33 percent increase in our planned 2018 share buybacks. We took these actions while maintaining discipline on our low cost of supply investment plan." (ConocoPhillips 2017 Annual Report, available at: https://static.conocophillips.com/files/resources/2017-annual-report.pdf

2 https://www.carbontracker.org/reports/companyblueprint/

3 https://static.conocophillips.com/files/resources/2017-annual-report.pdf

4 http://static.conocophillips.com/files/resources/16sr.htm#1

5 http://www.conocophillips.com/environment/climate-change/climate-change-strategy/

6 https://www.carbontracker.org/reports/under-the-microscope/

Conoco's use of forward-looking scenario analysis and assessment of 2°C

Though details are lacking, Conoco strongly suggests that it has endeavoured to incorporate scenario analysis into its strategic processes. Conoco examines four internally-generated scenarios, including three that deliver CO_2 emissions pathways similar to that outlined by the IPCC, at least out to 2030:

Figure 1 – CO_2 *emissions pathways in Conoco Scenarios*

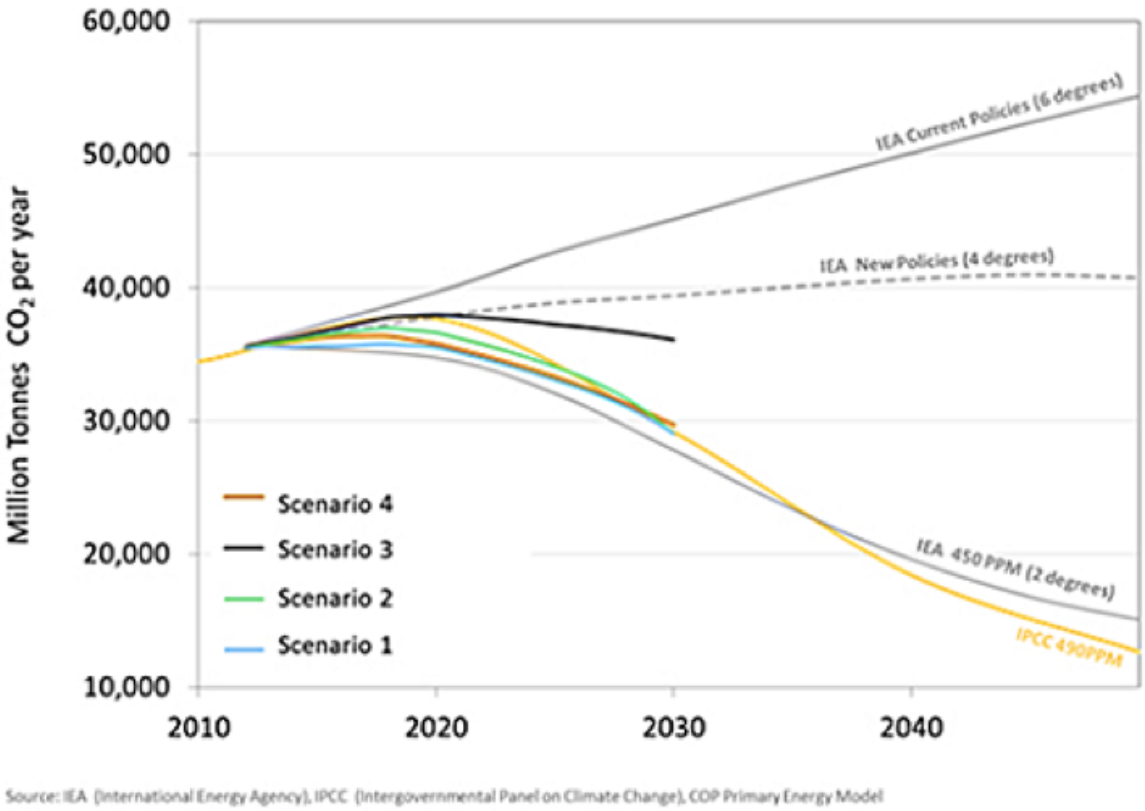

Figure 2: Scenario Comparison - Global Emissions Trajectories

Source: ConocoPhillips website 2018

Conoco indicates that the purpose of these scenarios is to stretch management's thinking about rates of change and ensure that business planning is resilient across a range of scenarios. As a consequence, Conoco does not assign probabilities to any of its scenarios, including those that do not define a carbon-constrained future. However, it does claim to assess the scenarios in a proprietary energy systems model, which translates the risks into commodity price outlooks, which Conoco then uses to test its portfolio of assets and investment opportunities.[7]

Very little in Conoco's disclosures provide investors with the ability to understand its assumptions—indeed, Conoco does not even include the mix of fuels that it models as coincident with the emissions profiles it discloses (Figure 1). This makes it very difficult for readers to gauge the true extent of the challenge presented by the scenarios.

7 *http://www.conocophillips.com/environment/climate-change/climate-change-strategy/scenarios-in-the-capital-planning-process/*

From a review of its website, only the top-level drivers of the scenarios are identified. For example, in one scenario, "the technological transformation is so rapid that CO_2 capture and storage is not required."[8] What assumptions drive this conclusion and how plausible are they? Other scenarios apparently examine a range of different policy outcomes, including globally coordinated action and changes in energy efficiency and demand. However, there are no details beyond this. Conoco indicates that the scenarios are designed to be "plausible", but plausibility is in the eye of the beholder. We therefore believe there would be value to investors in understanding the underlying assumptions.

Conoco values scenario analysis in the planning process, but does not value disclosing it

Conoco views its scenario planning as essential to ensuring that future investments are resilient to future uncertainties. We would agree this is valuable and this further demonstrates why investors might seek quantitative information from management on how it is considering the issues. However, Conoco's disclosure lags its peers. A key question is, why?

In part, this may be because Conoco focuses solely on one purpose of scenario planning: ensuring that management is robustly considering key risks. Certainly this purpose would emphasize management's as opposed to investors' use of the scenarios. But if they are robust across a range of potential uncertainties, better disclosure could only help instil confidence that management has conducted a robust assessment.

A separate benefit of enhancing climate scenario disclosure is to help investors assess peer companies on a like-for-like along this dimension of risk. This would require a common reference point that allows inter-company comparisons, something akin to what the US SEC already requires through the standardization of reserves estimates and presentation of those elements in a present value measurement ("PV-10"). This use case sits alongside (and could further be compared to) company planning scenarios. We believe this is more aligned with what Governor Carney of the Bank of England may have contemplated in identifying the need to make a market in climate-related financial risk.

One of the key needs expressed by investors to the TCFD was to provide comparability of disclosure. To deliver, standardized scenarios are likely necessary. As we have stated elsewhere, to be useful to investors we believe such disclosure-focused scenario analysis should contain the following elements[9]:

1. A reference scenario;
2. Built upon a 2°C-compliant demand pathway;
3. Compared to a sector-wide, project-level view of supply.

8 *http://www.conocophillips.com/environment/climate-change/climate-change-strategy/carbon-scenarios/*

9 *For more information, see https://www.carbontracker.org/time-machine-climate-risk-bringing-future-forward-2%CB%9Ac-scenario-analysis/*

SCENARIO OUTPUTS

Our Methodology Paper focuses heavily on whether companies have endeavoured to identify those assets (or potential assets) that would appear economic in their business-as-usual outlook but would appear unattractive in a 2°C scenario.

Understanding the delta between the two scenarios is an essential element to evaluating the climate-related risks and the key building block for providing indicators to the market of that risk (whether expressed in terms of reserves volumes, capital expenditure, discounted future cash flows, or some other metric) as we have discussed elsewhere.[10]

How does Conoco fare in a 2°C world?

Conoco provides virtually no disclosure regarding the impact of scenarios on its assets and potential investments and in this regard lags other companies who have evaluated whether certain investments would be attractive in downside scenarios or estimated the NPV impact of possible commodity price changes. Oil Search, for example, has utilized price decks developed by Wood Mackenzie to understand the impact that a demand pathway similar to the IEA's 2°C scenario would have upon its business and provided asset-level analysis of those impacts. Given Conoco has the internal capacity to model the price implications of changes in demand, we would think this would be well within their abilities to do. This process is not about getting the price forecast right, but reflecting the lower demand scenario in prices against which its assets and future investments are tested, and understanding what would change in the lower price environment.

Is Conoco's strategy altered by a transition to 2°C?

Notwithstanding the foregoing, Conoco has substantially reshaped the business since its announcement of a strategic shift in late 2016. Conoco indicates that its scenario analysis points to several key components of its strategy, including lowering supply costs and shortening product cycle times.[11]

It is not the only company to have taken such measures largely in response to the more volatile price environment. Many of these are also consistent with actions a company might take in response to a carbon-constrained scenario. Like others, Conoco insists that these shifts are permanent, suggesting that higher oil prices will not drastically shift the strategy.

These moves correspond with reductions in overall capital spending compared to years past and $16 billion in asset sales in 2017. While the asset sales generated a substantial amount of cash (some of which was used to accelerate debt repayments) it is notable that impairments accompanied many of those sales, suggesting that the current (market) view of those assets was that they would likely not recover their carrying values.[12] Sub-economic returns from those assets are now in the rear-view mirror. But they evidence that the company may have overreached in the past.

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10 https://www.carbontracker.org/time-machine-climate-risk-bringing-future-forward-2%CB%9Ac-scenario-analysis/

11 http://www.conocophillips.com/environment/climate-change/climate-change-strategy/scenarios-in-the-capital-planning-process/

12 We note that the primary measure of value for assets Conoco has held for use has been a discounted cash flow analysis (an internal measure of value) whereas the accounting treatment shifts to fair value less costs to sell (a market perspective of value) on assets that are designated as held for sale as was the case here.

There is some evidence that Conoco is showing capital discipline. Between 2013-2017, Conoco spent an average of 102% of its cash flows on upstream capex, but in 2017 only 65% of its cash flows were reinvested in upstream projects.[13] The 2017 spending on capex and investments totalled roughly $4.6 billion, a 73% decrease from a high in 2014 of $17.1 billion.

To the extent the company sees its new strategy as a point of differentiation from market peers pursuing margins over volume, we would ask whether it would better socialize these actions with investors were the company to back its value proposition with robust disclosure of the scenarios underlying its shift.

MARKET RISK

All things being equal, lower expected demand (as in the 2°C scenario) implies lower expected prices. Clearly other factors might drive near-term price volatility and structural elements to oil pricing, and cartel (OPEC) production constraints might structurally shift oil prices towards a monopoly price over longer periods. But whichever other considerations are taken into account, we believe most companies would agree that reducing demand forecasts would likely imply reduced price expectations in the long-term.

Considering future commodity prices – what is Conoco's view?

In the reports reviewed, Conoco does not provide information on future expected commodity prices used in either planning processes or in testing for impairments.

Management's long-term commodity price estimates are highly relevant to investors to the extent those prices are used as the basis for testing the recoverable amount of assets held on the balance sheet, the results of which are disclosed in Conoco's financial statements. Information on long-term price expectations is important to all oil and gas companies, and this year, to Conoco, which took an impairment of $2.4 billion on its APLNG holdings (natural gas producing assets) in Australia based upon a reassessment of future prices in the first and second quarters of 2017 which resulted in "significantly reduced price outlooks".[14] This follows an impairment of these same assets of $1.5 billion in 2015 based upon the same rationale. We would suggest that the prices used to test these impairments, and how they compare to company planning cases, would be material to investors seeking to understand the reasonableness of management's future commodity price estimates and therefore whether further impairments can be expected.

CARBON PRICES

Many companies have used carbon prices in a variety of ways to prepare for a low carbon transition for both existing and planned operations. For scenario modelling, this takes the form of a price per tonne of CO_2 (or CO_2e) that serves as a proxy for a range of potential future policy outcomes. This is a simple but easily misused tool for modelling an energy transition and investors should be wary of this. We have detailed the ways in which carbon prices can provide false reassurance in our Methodology Paper[15].

13 *Conoco Annual Reports (calculated from the Consolidated Statement of Cash Flows by dividing the "capital expenditures and investments" figures by "net cash provided by operating activities").*

14 *2017 Annual Report, at 93.*

15 *https://www.carbontracker.org/reports/under-the-microscope/*

Carbon prices are often limited by geography or emissions scope (i.e., only operational emissions) limiting their utility as a proxy for a 2°C scenario. Indeed, many do not approximate that outcome. Seemingly commonplace carbon prices (i.e., \$40/tonne CO_2) may add only a \$1-\$2 per barrel increase to upstream costs on average, if completely absorbed by the company — an insignificant number and well within the range of price sensitivities companies already examine.

In the context of an integrated assessment model, carbon prices may be useful in identifying how policy costs imposed on a polluting fuel can trigger tipping points when one energy source becomes more economic than another (and under a least-cost approach, result in the insurgent energy source taking market share from the now costlier incumbent). Understanding whether a given carbon price might hit a tipping point, however, requires knowledge of the inputs and assumptions in the model and cannot be derived from the carbon price alone.

Conoco's use of a carbon price: does it materially impact its business?

Conoco's Annual Report indicates that it applies an estimated market costs of GHG emissions of \$40 metric tonne CO_2e "to evaluate future projects and opportunities."[16] (This contrasts with both Conoco's website, which indicates that it evaluates carbon prices in the range of \$6-\$66/tCO_2, and its *2016 Annual Report*, which quoted a range of price tests between \$9-\$43/tCO_2, depending on the timing and country considered).[17] Conoco does not say what scope of emissions this price applies to, but in context it appears to follow the industry practice of applying to Scopes 1 and 2 (operational and supply chain emissions), but not Scope 3 (emissions from use of its products), nor does it indicate whether the \$40/tonne price varies regionally. We would estimate that even the highest prices identified would add no more than \$2-\$3.50 (depending on whether the \$40 or \$66 price is used) per barrel — likely well within the sensitivities Conoco normally runs. Conoco does not indicate it believes either price is aligned with a certain climate outcome.

CONCLUSION

There is some evidence that Conoco has taken business decisions consistent with a high degree of uncertainty about the future direction of travel for oil prices, one driver of which may be concerns about efforts to mitigate climate risks, given their claims that they incorporate climate scenario analysis into the strategic planning process. Many of its competitors have tried to thread this needle as well. However, the limited scenario disclosure provides little evidence of the quality of its internal assessment of those risks. Were we to create a league table of disclosures by oil and gas oil majors, we believe Conoco would find itself at or near the bottom. Certainly the increasing number of investors wanting to understand how businesses fit within the low carbon transition will be disappointed.

But should the company care about disclosure, particularly if it believes it is taking steps that will make it resilient in future low oil price environments? If climate risks are factoring into Conoco's concerns about a "lower forever" scenario, as some have put it, they can be assured that investors care as well. And if management believes it has positioned the company to compete in that environment, it should support that contention by providing investors with evidence of how the company is set to compete for a dwindling carbon budget.

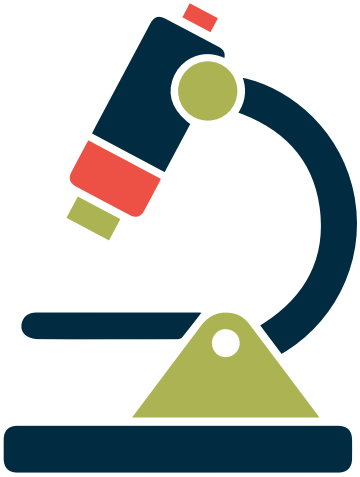
16 *2017 Annual Report p. 64.*

17 *See 2016 Annual Report p. 66; http://www.conocophillips.com/environment/climate-change/climate-change-strategy/carbon-pricing-in-our-decision-making/*

ENI

Under the Microscope:

Are companies' climate scenario analyses meeting investors' requirements?



KEY TAKEAWAYS

1. Despite setting ambition to decarbonise its business, Eni's forward-looking strategy does not appear to be based on a scenario consistent with the ambition of the Paris Agreement to limit global warming to "well below 2°C".

2. The company provides no assessment of the impact of warming greater than 2°C and little consideration of the potential implications for its portfolio should the Paris Agreement be achieved.

3. Eni measures its resilience against the price assumptions of the International Energy Agency's 2°C scenario, which might not accurately reflect the financial impacts for the company of significantly lower long-term oil and gas demand.

Carbon Tracker Initiative

May 2018

SUMMARY

The following analysis seeks to assist investors with their navigating of companies' climate-related disclosure.

Using our proprietary framework, we scrutinise companies' disclosure according to four key themes: 2°C scenario modelling, 2°C scenario outputs, market/price risk and the use of carbon prices.

The table below brings together multiple criteria to provide investors with an indication of the companies' disclosure, with red signifying the poorest disclosure and green the best, in relative terms.

Table 1 – *Summary of companies' relative performance in their climate scenario analyses*

poor | moderate | high

	BP	Chevron	Conoco Phillips	ENI	Exxon Mobil	Royal Dutch Shell	Statoil	Total
Scenario Modelling								
Scenario Outputs								
Market / Price Risk								
Carbon Pricing								

Source: Carbon Tracker analysis

QUESTIONS FOR MANAGEMENT

1. What is Eni's principal scenario that underpins its forward-looking strategy, and if it diverges from one consistent with the Paris Agreement, can it estimate the volumes of potential supply that would sit outside a 2°C, or lower, scenario?

2. What would be the implications for Eni's assets that have not yet been sanctioned of a commodity demand pathway consistent with 2°C, or lower, such as the IEA's Sustainable Development Scenario and Beyond Two Degrees Scenario?

3. Has the company considered expected prices in a "well below 2°C" commodity demand scenario, and if so, what impact the use of those prices would have if used in the preparation of the financial statements?

INTRODUCTION

Eni is one of Europe's largest oil and gas companies engaged in the oil and gas upstream, midstream, downstream and power segments. While it doesn't undertake and publish its own scenario analysis like some of its peers, Eni has in recent years provided investors with more information around climate risk and the energy transition across a range of reports.

Below, we review Eni's *2017 Annual Report*[1], *Sustainability Report*[2] and *Decarbonization and Sustainability in the Plan Report*[3] and focusing on four critical elements:

1. How the company structures its 2°C scenario analysis, if provided;
2. The outputs of that analysis, and whether they are useful to investors;
3. Whether it has evaluated the market risk (i.e., price implications) from secular demand destruction for its commodities, as suggested by most 2°C scenarios; and
4. Whether it has used carbon prices in a robust and defensible way as a proxy for a 2°C scenario.
5. For additional details on our methodology and approach, please see our paper[4] (hereinafter, "Methodology Paper").

SCENARIO MODELLING

Eni's use of forward-looking scenario analysis and assessment of 2°C

Eni produces and examines scenarios to inform its business strategy, production plans and sustainability agenda. Its Sustainability and Scenarios Committee provides recommendations to Eni's Board of Directors on the integration of scenarios, strategy and the sustainability of the business over the mid to long-term. Yet, it is not clear to what extent internal scenario modelling or third-party scenarios inform its investment decisions or strategy.

Modelling a 2°C outcome: considering and applying a 2°C scenario

Contrary to some of its peers who build and publish their own scenarios, Eni relies on a widely recognised 2°C scenario from the IEA: the "Sustainable Development Scenario" (formerly the "450 scenario")[5]. We would note that this sits at the upper-end of what could be considered as a compliant scenario with the Paris Agreement, which aims to limit the rise in temperature to "well below two degrees". However, the SDS does provide a clear and sufficiently detailed reference scenario with a 2°C demand pathway to investors seeking comparability and an understanding of the scenario's underlying assumptions.

1 *https://www.eni.com/docs/en_IT/enicom/publications-archive/publications/reports/rapporti-2017/Integrated-Annual-Report-2017.pdf*

2 *https://www.eni.com/docs/en_IT/enicom/sustainability/EniFor-2016.pdf*

3 *https://www.eni.com/docs/en_IT/enicom/investors/Decarbonization.pdf*

4 *https://www.carbontracker.org/wp-content/uploads/2018/05/Intro_Methodology_Designed1.pdf*

5 *While the 450 from the IEA 2016 World Energy Outlook shared the same temperature goal of 2C (at 50% probability) as the SDS in the 2017 WEO, the SDS incorporates two further goals of improving air quality and achieving universal access to modern energy services. The 450 parts per million (ppm) is the quantity of carbon dioxide in the atmosphere that provides an even chance of limiting average temperature increase to 2-degrees Celsius above pre-industrial levels.*

To be useful to investors we believe it should contain the following elements[6]:

1. A reference scenario;
2. Built upon a 2°C-compliant demand pathway;
3. Compared to a sector-wide, project-level view of supply.

However, as we discuss in "Scenario Outputs", we would argue that the approach adopted by Eni is misguided and not useful to investors.

Is Eni planning for a 2°C future?

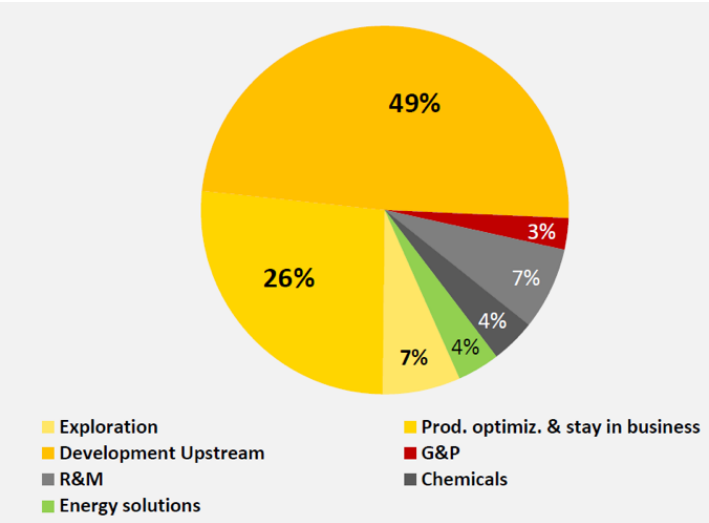
Eni states that it "intends to play a leading role in the energy transition process, supporting the objectives of the Paris Agreement". Eni is however not clear whether it is planning for a scenario aligned with a 2°C outcome.

While management doesn't explicitly state its view on long-term demand, it does make tacit admissions on both continued growth for oil and gas as well as a path to decarbonisation, drawing reference to the IEA SDS on occasion.

In its "Path to decarbonization" report, it outlines its climate strategy and highlights four principal strategic themes to prevent risks and seize opportunities in such a transition: reduction in direct emissions; a focus on a "low-carbon" oil and gas portfolio; growing its "green business"[7]; and commitment to R&D. Eni's four-year outlook shines a light on how that long-term strategy is articulated over the short-term. Eni points to low breakevens of new upstream projects and the growth of natural gas in the future as an example of "low carbon" oil and gas and its resilience in a demand constrained environment.

Over the next four years, Eni has ambition to grow its existing oil and gas portfolio at an annual rate of 3.5% and has approximately $2 billion earmarked towards the exploration of resources. Moreover, around 95% of the 31.6 billion Euros planned capital expenditure has been allocated towards hydrocarbons (with 80% towards the upstream) and 4% apportioned to Energy Solutions[8] (see Figure 1). Eni plans to invest a substantial proportion of its overall capex to oil and gas exploration and development.

Figure 1 – *Capex Plan: 2018-2021*



Source: 2018-2021 Capex Strategy, Eni (2018), p. 32

6 *For more information, see https://www.carbontracker.org/time-machine-climate-risk-bringing-future-forward-2%CB%9Ac-scenario-analysis/*

7 *"Green business" includes renewable energy generation and bioenergy. Eni note investments in utility scale PV and growth and development in biorefining capacity.*

8 *Energy Solutions relates to the activities pertaining to Eni decarbonisation agenda.*

As noted in its annual report "Eni's business depends on the global demand for oil and natural gas"[9] and argues that vast investment will be needed even in a demand-constrained environment under a 2°C scenario in order to offset the natural decline rates of existing fields. Eni states in its strategy that it will continue to focus on the organic growth of conventional assets as well as focus on simple, modular projects to ultimately bring down project breakevens to lower levels.

Efforts to bring down project break-evens underscore the increasing importance of cost controls one would expect in a carbon-constrained future. However, given this is a strategy deployed by all companies, the benefits of doing so are mitigated and, in any event, would not increase a limited carbon budget.

Planned growth in solar, wind and biofuel investments are certainly welcomed, but this currently only represents ~3-4% of total capex with most of investment being directed towards oil and gas and therefore does not represent a full-blown energy diversification strategy. Indeed, over the past five years, Eni has reinvested roughly 85% of its cash flows from operating activities into upstream projects (80% in 2016, when oil prices were so low that upstream capex exceeded cash from operating activities)[10]. It plans to continue to reinvest roughly 80% of its capex in the upstream, further suggesting that little has changed.

SCENARIO OUTPUTS

Our Methodology Paper focuses heavily on whether companies have endeavoured to identify those assets (or potential assets) that would appear economic in their business-as-usual outlook but would appear unattractive in a 2°C scenario.

Understanding the delta between the two scenarios is an essential element to evaluating the climate-related risks and the key building block for indicating that risk to the market (whether expressed in terms of reserves volumes, capital expenditure, discounted future cash flows, or some other metric) as we have discussed elsewhere.

How does Eni fare in a 2°C world?

Like many of its peers, Eni assures investors that its portfolio is resilient in a low carbon transition. It contends that the composition of its portfolio minimises any stranded asset risk. In its 2017 Annual Report Eni perform two assessments to buttress this conclusion.

Firstly, Eni stress-tests the internal rates of return for new and existing projects against two sets of assumptions:

1. A CO_2 cost of the total emissions of a project; and
2. The IEA's SDS commodity price decks and carbon costs.

The prices disclosed in the SDS rise in the interim before falling to $64/bbl for oil and $3.4/mmBtu for natural gas by 2040. Eni concludes that this would have only a "marginal reduction in [its] internal rates of return".

9 *https://www.eni.com/docs/en_IT/enicom/publications-archive/publications/reports/rapporti-2017/Integrated-Annual-Report-2017.pdf*

10 *Calculated from Eni's Annual Reports using E&P from "tangible assets" and exploration rights in "intangible assets."*

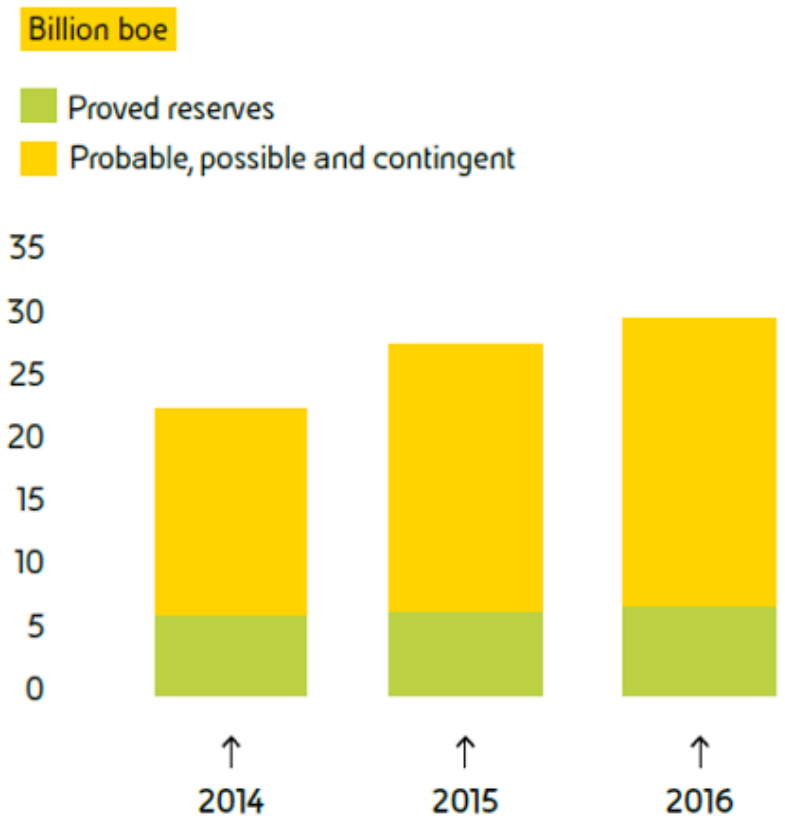
Instead of performing a downside stress test on its portfolio with regards to the long-term falling demand in the SDS, Eni rely on estimated oil and gas prices and carbon costs in the scenario. We would argue this is not a defensible proxy for a robust stress test as the IEA derives these prices from internal reference points for supply and demand, which may not align with Eni's view of project costs and potential supply. For example, if the IEA assumed a lower amount of supply with higher costs that would lead it to derive a higher oil price based on the interaction of supply with 2°C demand levels; if Eni assumed lower supply costs for the same projects, the IEA's price would be a mismatch and give an overoptimistic price scenario than if Eni had looked at the intersection of supply and demand themselves. To be clear, the importance is not about correctly predicting oil prices, but ensuring that the effects of weakening demand are reasonably reflected in the test. We would argue that focusing on the impact of diminishing demand for fossil fuel commodities is integral to any useful scenario analysis, whereas testing against prices alone may fall short in this regard by not giving an "oranges with oranges" comparison.

While we advocate the use of a recognised reference scenario such as the IEA SDS, we would encourage using the SDS and IEA B2DS underlying demand pathways as an input into Eni's own analysis[11].

Over the long-term, Eni contends that its assets will remain resilient as new projects under execution achieve an average breakeven price of less than $30/bbl, even though it concedes that, when using the IEA 450 scenario "the impacts on Eni's portfolio are increased."[12]

Additionally, given that since 2014 Eni has increased its non-proven reserves and resources by nearly a third, we would be interested to see whether these resources achieve these break-evens.

Figure 2 – *Eni's Evolution of reserves and resources*



Source: 2018-2021 Capex Strategy, Eni (2018), p. 32

11 *See, e.g., Chevron's scenario analysis.*

12 *Eni Sustainability Report (2017) p. 21.*

Secondly, Eni performs a sensitivity analysis on the book value of its oil and gas upstream assets, adopting the assumptions in the IEA SDS scenario. The stress test highlighted a 4% reduction of the fair value of its assets , which was stated to be due to the relatively higher carbon prices in the SDS. Oil prices were stated to be "consistent" with Eni's forecast, whereas for SDS natural gas prices are higher by "approximately 15% than Eni's forecast". However, the SDS carbon price in the EU of \$140/tCO_2 by 2040 was noted as being higher than internal estimates. Eni then concludes that "The sensitivity test...confirmed the resiliency of Eni's asset portfolio". We would question whether such an exercise demonstrates conservativeness by management and would encourage more consideration of lower prices. All things being equal, it would be reasonable to anticipate lower prices in a lower demand scenario. The fact that Eni's forecast, presumably built around higher demand, is consistent with the IEA SDS price deck suggests that testing against lower prices would be warranted.

MARKET RISK

As noted, lower expected demand (as in the 2°C scenario) implies lower expected prices. Clearly other factors might drive near-term price volatility and structural elements to oil pricing, and cartel (OPEC) production constraints might structurally shift oil prices away from those suggested by pure supply and demand fundamentals over longer periods. But whichever other considerations are taken into account, we believe most companies would agree that reducing demand forecasts would likely imply reduced price expectations in the long-term.

Considering future commodity prices – what is Eni's view?

As part of its four-year strategy, Eni develops an agreed, internal view of future oil and natural gas prices, which feeds into multiple areas of the business, including: economic and financial projections, production plans, portfolio reviews and recoverability of the carrying amounts of its oil and gas assets. For oil, Eni assumes \$60/barrel in 2018 rising gradually to \$72/barrel in 2021 (slightly raised from its previous year's assumption of \$71.4) and then growing in line with projected inflation thereafter. The disclosure of this oil price forecast runs contrary to claims by other companies that this information is too commercially sensitive to be disclosed.

Eni's management estimates that for every one-dollar change in the oil price there would be an impact of around €200 million to its net profit and net cash from operations. If that were the case, then Eni could be exposed to large risks should prices deteriorate. For example, more than half of its net profit could erode should oil prices drop \$10[13] from its internal base case.

As Eni point out lower oil and gas prices can result in the debooking of reserves and lead to asset impairments. Understanding the conservativeness of management's view on prices is useful for investors. Further, it enables investors to compare the basis of asset valuations across companies, drawing their own conclusions about those which are most exposed to lower long-term commodity prices. We would encourage Eni to test its assets over a wide range of commodity price assumptions, including a low-price scenario, and disclose the results.

CARBON PRICES

Many companies have used carbon prices in a variety of ways to prepare for a low carbon transition for both existing and planned operations. For scenario modelling, this takes the form of a price per tonne of CO_2 (or CO_2e) that serves as a proxy for a range of potential future policy outcomes. This is a

13 *Net profit recorded in 2017 reached 3,374 million Euros – Eni Annual Report 2017 (p. 99).*

simple but easily misused tool for modelling an energy transition and investors should be wary of this. We have detailed the ways in which carbon prices can provide false reassurance in our Methodology Paper[14].

In the context of an integrated assessment model, carbon prices may be useful in identifying how policy costs imposed on a polluting fuel can trigger tipping points when one energy source becomes more economic than another (and under a least-cost approach, result in the insurgent energy source taking market share from the now costlier incumbent). Understanding whether a given carbon price might hit a tipping point, however, requires knowledge of the inputs and assumptions in the model and cannot be derived from the carbon price alone.

Eni's use of a carbon price: does it materially impact its business?

Eni uses a $40 price on every tonne of CO_2 it emits, although it is unclear to what extent this is applied. However, it is unlikely to be compliant with a two-degree target. To be clear, Eni does not suggest the contrary, however we would argue that the use of this carbon price in its modelling is not a defensible substitute for assessing the impacts of a lower demand consistent with a 2°C outcome.

Eni applies a carbon price of $40/t$CO_2$ to the operational emissions of potential new projects as well as when reviewing existing assets. As noted in Eni's review of its existing projects, carbon prices were shown to only marginally affect the internal rates of return on aggregate. We would tend to agree as typically such a carbon price may only add $1-3[15] to upstream costs on average for oil projects — an insignificant number and well within the range of price sensitivities companies already examine. While there can be significant variation between assets in particular cases, we generally believe that this carbon price in itself is unlikely to generate a meaningful stress test at the portfolio level.

Lastly, Eni does not mention whether the carbon price will be passed on to its customers and whether it evaluates the impact from a carbon price on demand for its products.

CONCLUSION

Eni does not present a clear view for what it expects over the long-term, however it has in recent years refined its strategy on four strategic themes intended to allow it flexibility to adjust to a low carbon transition. On the whole, we believe that Eni has provided investors little tangible and decision-useful detail on the key areas assessed in our report.

Eni discloses a clear, high-level decarbonisation ambition, particularly around focusing on low cost, conventional projects and growing its New Energy Solutions business. However, it is confusing why Eni has not performed a properly challenging analysis of how its business would be affected in a demand constrained environment under a 2°C or lower scenario, especially as this has already been done by other companies[16]. Instead of relying on the supply/demand fundamentals in its 2°C analysis, Eni tests against the SDS oil and gas prices which are not dissimilar from the levels witnessed in the past six months. We would argue that this is not a defensible, nor robust test of its risks and would recommend that this be addressed in the next iteration.

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14 https://www.carbontracker.org/wp-content/uploads/2018/05/Intro_Methodology_Designed1.pdf

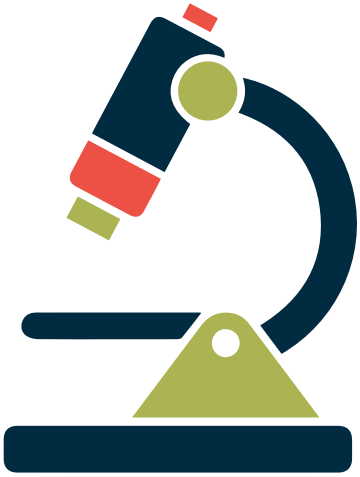
15 Based on Eni's 2016 production and Scope 1 and 2 emissions we estimate that this amounts to a carbon price of $3 per barrel.

16 See Oil Search, Climate Change Resilience Report, (2017). http://www.oilsearch.com/__data/assets/pdf_file/0005/18968/OSL-Climate-Change-Resilience-Report_FINAL.pdf

ExxonMobil

Under the Microscope:

Are companies' climate scenario analyses meeting investors' requirements?



KEY TAKEAWAYS

1. Exxon presents its first 2°C scenario analysis. However, the basis on which it has been prepared is questionable and its assumptions are out of date.

2. Exxon recognizes that not all fossil fuel resources will be required if the global warming goals of the Paris Agreement are achieved but does not indicate that it has examined how the company might be impacted by this conclusion.

3. In the context of the information requested by Exxon's shareholders in 2017, we consider Exxon's disclosure to be inadequate.

Carbon Tracker Initiative

May 2018

SUMMARY

The following analysis seeks to assist investors with their navigating of companies' climate-related disclosure.

Using our proprietary framework, we scrutinise companies' disclosure according to four key themes: 2°C scenario modelling, 2°C scenario outputs, market/price risk and the use of carbon prices.

The table below brings together multiple criteria to provide investors with an indication of the company's disclosure, with red signifying the poorest disclosure and green the best, in relative terms.

Table 1 – *Summary of companies' relative performance in their climate scenario analyses*

poor | moderate | high

	BP	Chevron	Conoco Phillips	ENI	Exxon Mobil	Royal Dutch Shell	Statoil	Total
Scenario Modelling								
Scenario Outputs								
Market / Price Risk								
Carbon Pricing								

Source: Carbon Tracker analysis

QUESTIONS FOR MANAGEMENT

1. What are the implications for Exxon's analysis of using the average growth rates for fossil fuel demand from several different scenarios, rather than considering the pathways of demand under the IEA's 2°C and below-2°C scenarios?

2. How would Exxon invest in converting its resources into producing reserves differently if its planning scenario was aligned with the Paris Agreement, rather than assuming global warming in excess of 2°C?

3. Has the company considered expected prices in a "well below 2°C" commodity demand scenario, and if so, what impact the use of those prices would have if used in the preparation of the financial statements?

INTRODUCTION

ExxonMobil ("Exxon"), the largest listed integrated oil and gas company, conducts long-term forecasting to inform its future investment decision-making and business strategy. Its annual publication Outlook for Energy highlights the company's view of how the energy system will evolve over the long-term. It is largely predicated on business-as-usual growth in oil and gas.

In 2017, over 60% of shareholders voted for Exxon to begin disclosing how the company would be affected in a demand-constrained environment in line with a 2°C scenario, following the Paris Agreement. As a result, in February 2018, Exxon published the *Energy and Carbon Summary*. This report avoids some of the glaring defects of a report published by Exxon in 2014[1], but still falls short across a number of critical areas. These are outlined below.

Below, we review ExxonMobil's 2017 *10K Form*[2], *2016 Corporate Citizen Report*[3], *2018 Energy & Carbon Summary*[4] and *2018 Energy Outlook*[5], focusing on four critical elements:

1. How the company structures its 2°C scenario analysis, if provided;
2. The results of that analysis, and whether they are useful to investors;
3. Whether it has evaluated the market risk (i.e., price implications) from secular demand destruction for its commodities, as suggested by most 2°C scenarios; and
4. Whether it has used carbon prices in a robust and defensible way as a proxy for a 2°C scenario.

SCENARIO MODELLING

Exxon use of forward-looking scenario analysis and assessment of 2°C

Exxon has for years provided investors with a relatively detailed view of future demand, supply and the role of energy sources over the long-term in its *Outlook for Energy*, which underpins the company's business strategy and future investment decisions, and can be referred to as Exxon's "base case". In producing its annual *Outlook*, Exxon assures its investors that it "incorporates recent developments in economic conditions, policy and technology."[6]

1 *In its 2014 report Energy and Carbon - Managing Climate Risks, http://cdn.exxonmobil.com/~/media/global/files/energy-and-environment/report---energy-and-carbon---managing-the-risks.pdf , Exxon argued that a low-carbon transition was prohibitively costly and therefore unlikely, relying heavily on an interpretation of a integrated assessment model from MIT that the MIT authors indicated was a misinterpretation of their work. See: https://www.climateliabilitynews.org/2017/08/08/exxon-climate-change-risk-report-fraud-investigation-new-york-ag/*

2 *http://ir.exxonmobil.com/phoenix.zhtml?c=115024&p=irol-SEC*

3 *http://cdn.exxonmobil.com/~/media/global/files/corporate-citizenship-report/2016_ccr_full_report.pdf*

4 *http://cdn.exxonmobil.com/~/media/global/files/energy-and-environment/2018-energy-and-carbon-summary.pdf*

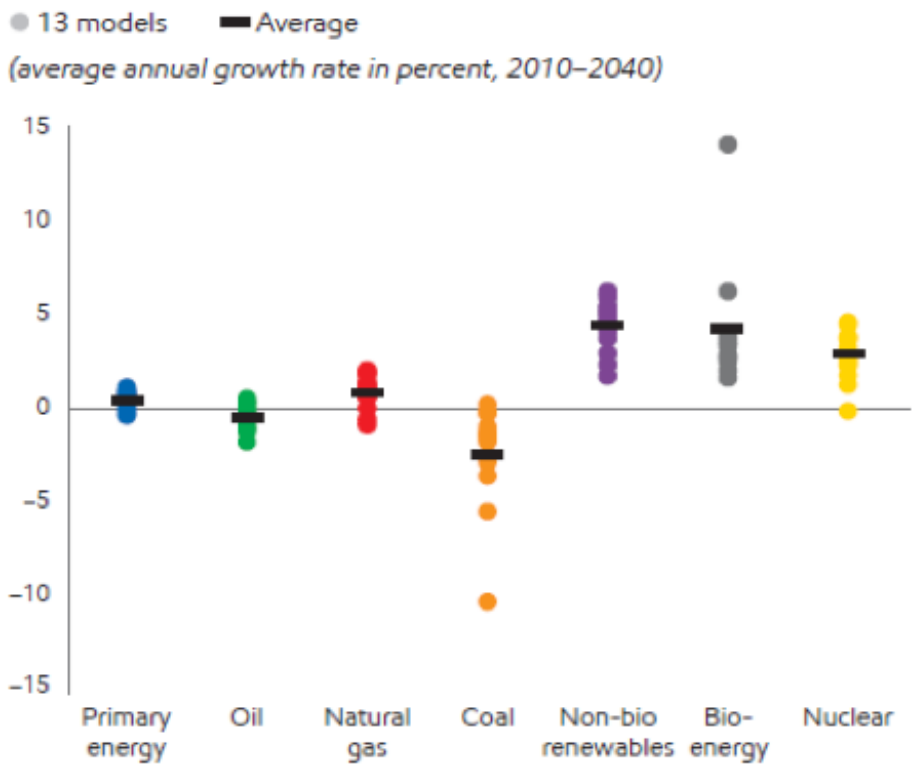
5 *http://cdn.exxonmobil.com/~/media/global/files/outlook-for-energy/2018/2018-outlook-for-energy.pdf*

6 *ExxonMobil 2018 Energy & Carbon Summary, p. 2.*

Modelling a 2°C outcome: considering and applying a 2°C scenario

In the *Energy and Carbon Summary*, Exxon for the first time discusses the impact of a 2°C "scenario". Rather than rely on recognised third-party scenarios used by other oil and gas companies[7], Exxon constructed its scenario by taking the average annual demand growth rates of different energy sources from thirteen 2°C scenarios found in the 2013 *Stanford Energy Modeling Forum Study 27* (EMF27)[8] for the period of 2010 to 2040. The EMF27 was comprised of 18 energy-economy and integrated assessment models. Exxon selected those scenarios that reached 450ppm[9] stabilisation targets and used all available technologies. In effect this means that the models may rely heavily on CCS and bio-energy to achieve the necessary emissions reductions to reach a 2°C outcome (see Figure 1).

Figure 1 – *Ranges of predicted changes in global demand in Assessed 2°C Scenarios*



Source: Exxon, 2018 Energy and Carbon Summary

Exxon an outlier for using a set of models almost one decade old

Unlike any other company to date, Exxon has chosen to premise its forward-looking demand using scenarios from older models with a 2010 baseline year; this is surprising and raises a red flag.

Such a framing effectively replaces actual data from 2010-2018 (where available) with modelling forecasts. Since oil demand was lower in 2010 than it is now, using that baseline also minimizes the actual total declines needed to arrive at Exxon's *Average of Assessed 2°C Scenarios* (A2S) level of oil demand in 2040. For example, Exxon indicates that to be compliant with the A2S, oil demand would have to decline 0.4 % per year through to 2040. By contrast, using a 2016 baseline, the IEA's

7 *See Chevron and its use of IEA SDS - https://www.carbontracker.org/chevron-takes-tentative-steps/*

8 *The Energy Modelling Forum (EMF) at Stanford University brought together 18 energy-economy and integrated assessment models in a multi-model study.*

9 *450 ppm CO_2e in 2100.*

Sustainable Development Scenario (SDS) (which has a 50% probability of achieving 2°C) requires decline rates of 1.2% per annum through 2040--a significant margin of difference, particularly when Exxon has focused on this metric.

Exxon's use of older modelling is also curious given its contention that it focuses on the latest technology costs and trends. An article summarizing seven of the EMF27 models (DNE21+, GCAM, IMAGE MERGE, MESSAGE, POLES and REMIND), indicates 2050 capital costs[10] in the range of $1,140-3,200/kW for solar PV and $530-1,570/kW for onshore wind.[11] By contrast IRENA indicates that the global weighted average installed cost today of utility-scale solar PV and onshore wind is $1,388/kW and $1,477$/kW, respectively[12]. Achieving the average rates used in these EMF27 models would merely require learning rates of 0.8% p.a. through to 2050 for onshore wind. Utility-scale solar PV has already witnessed the capital cost declines envisaged for 2050 in the EMF27 study. To put that into context, since 2010, learning rates for utility-scale solar PV and onshore wind have been 13% p.a. and 3% p.a., respectively. These differences may be significant to the extent they shift the relative costs and competitiveness of renewables deployment and thereby favour emissions reductions to come from other sources.

These models may contain outdated technology costs and modelling constraints

This impact is not limited to obsolete technology costs, it can also extend to constraints imposed in the models themselves. For example, several of the models Exxon refers to (REMIND, MERGE and GCAM) seek to model the system integration costs of variable renewable energy by either imposing substantial integration costs on those technologies at penetration rates as low as 10%[13], or by capping the total renewables penetration possible in the model (see e.g., BET, IMACLIM, and POLES). The BET model, for example, "limits the combined share of wind and solar to 30%."[14]

It is reasonable to consider the costs of integrating variable power sources, but as some of the researchers that participated in EMF27 have noted, "experience with integrating [variable renewable energy] into power systems has increased…" and "[t]hese developments suggest that hard bounds may substantially overestimate integration challenges."[15]

The results can be seen in the way in which bio-energy is adopted in Exxon's stylized analysis. Table 1 below summarises the growth rates that underpin the average of 2°C scenarios as well as how it compares to the scenario outlined in its *Outlook for Energy*. The delta in annual growth rates between the two scenarios may appear small, however it is important to note that these get compounded over time and result in large difference over the long-term.

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10 Assuming total installed cost which includes on-site equipment, auxiliary equipment, grid connection, project development, site preparation and working capital.

11 Prices adjusted to 2017 USD. Cf., Gunnar Luderer, et al., "The role of renewable energy in climate stabilization: results from the EMF27 scenarios", Climate Change 123:427-441 (2014)

12 Renewable Power Generation Costs in 2017 (IRENA), http://www.irena.org/publications/2018/Jan/Renewable-power-generation-costs-in-2017

13 Luderer, p. 439.

14 Id.

15 Id.

Table 2 – *Summary of demand growth rates*

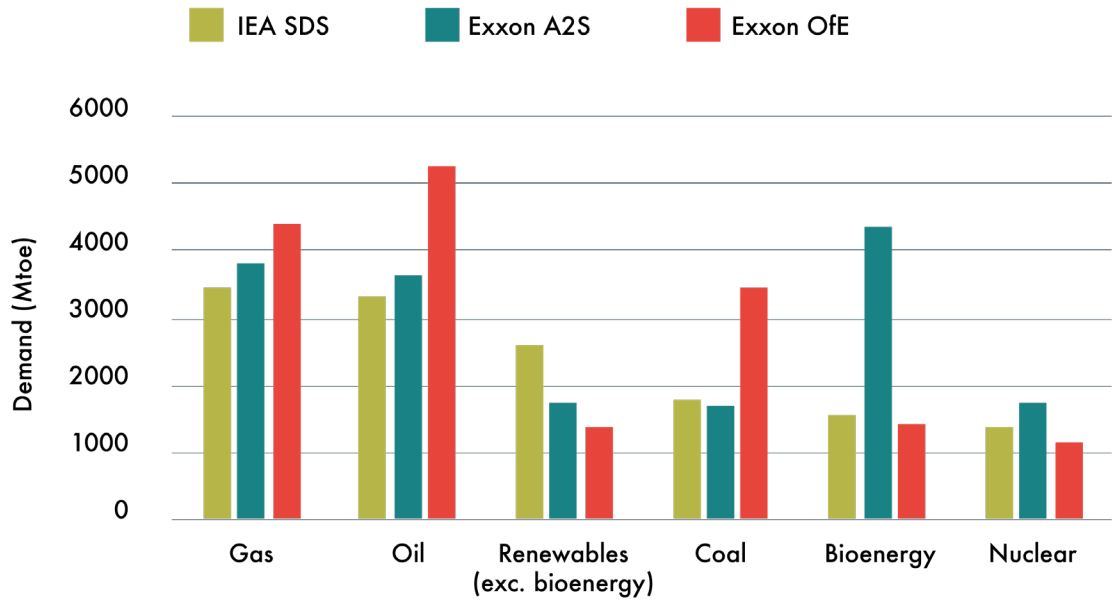
Summary of demand growth rates Mean annual demand growth rate 2010-2040	Average of the Assessed 2°C Scenarios[17]	ExxonMobil 2018 *Outlook for Energy*	2010-2016 Actual
Energy demand	▲ 0.5%	▲ 0.9%	▲ 1.2%
Oil	▼ (0.4)%	▲ 0.8%	▲ 1.3%
Natural gas	▲ 0.9%	▲ 1.4%	▲ 1.6%
Coal	▼ (2.4)%	0.0%	▲ 0.1%
Nuclear	▲ 3.0%	▲ 1.6%	▼ (1.0)%
Bioenergy	▲ 4.3%	▲ 0.7%	▲ 1.9%
Non-bio renewables	▲ 4.5%	▲ 3.7%	▲ 5.8%

Source: Exxon, 2018 Energy and Carbon Summary

Using the data pages in Exxon's *Outlook for Energy*[16], one can apply the annual average growth rates to illustrate how global energy demand by fuel might play out and compare against other scenarios in absolute terms by 2040 (see Figure 2).

In comparison with the IEA SDS, Exxon's A2S illustrates higher global energy demand, a more positive outlook for oil and gas and a relatively slower uptake in renewables in 2040. Most notably, the A2S envisages exponential growth in bio-fuels and pervasive use of CCS in fossil fuel and bio-energy power generation, implying that renewables cannot fill the gap in a cost-effective way and that alternatives to electrification of transport (such as bio-fuels) will be needed to bridge the gap. As a result, oil-consuming internal combustion engines remain viable for far longer than in scenarios in which ground transport is electrified.

Figure 2 – *Demand by energy type in 2040 across three scenarios*[17]



Source: Exxon (2018), Energy and Carbon Summary; Exxon (2018), Outlook for Energy 2018; IEA (2017) WEO 2017; CTI analysis

16 *http://corporate.exxonmobil.com/en/energy/energy-outlook/download-outlook-for-energy-reports*

17 *IEA SDS, Exxon's Assessed 2-degree scenario (Exxon A2S) and Exxon's Outlook for Energy (Exxon OfE)*

In addition, and as others have noted,[18] Exxon's A2S indicates a 2°C scenario which assumes significant negative emissions across the energy, industry and land-use sectors beyond the 2040 period which it reviews. While other climate models make similar assumptions, these may not be to the same extent as the A2S and investors should recognize that this effectively expands the carbon budget available for the period studied and may result in a less than robust test of the business plan as a result.

Given the foregoing, we believe Exxon's scenario modelling is lacking. To be useful to investors we believe Exxon should use a widely recognised reference scenario, such as the IEA SDS, to provide standardisation in assumptions and comparability for investors. Additionally, we believe that any scenario in such an exercise should use a 2°C-compliant demand pathway[19]. Exxon's approach provides little detail for investors on both the underlying assumptions and whether the scenario even implies a 2°C outcome. The chosen approach by Exxon is more puzzling than it is informative.

SCENARIO OUTPUTS

Understanding the delta between the company's planning case scenario and a 2°C scenario is an essential element to evaluating climate-related risks. It is the key building block for providing indicators that could help investors price that risk (whether expressed in terms of reserves volumes, capital expenditure, discounted future cash flows, or some other metric) as we have discussed elsewhere.[20]

How does Exxon fare in a 2°C world?

Exxon makes two significant concessions in the report: (1) it recognizes that not all resources can be extracted in a 2°C scenario and, (2) that lower demand could potentially lead to lower prices and increasing cost-focused competition. It fails to provide any useful detail on the magnitude of the impact of those conclusions, or even demonstrate that it has conducted this level of analysis.

Specifically, Exxon estimates that at the end of 2016, its non-proven resource base included roughly 71 billion barrels of oil-equivalent (BBOE) but would need to replenish 35 BBOE in the A2S, assuming it retains its share of global production over the period.[21] It notes that in such a scenario, "it is possible that some higher-cost assets, which could be impacted by many factors including future climate policy, may not be developed."[22] On Exxon's numbers, this would be some portion of the approximate 35 BBOE, though the total volume at risk is not specified. Exxon likely anticipates that much of the remaining resource base would nonetheless be developed outside of the period, though the A2S scenario Exxon uses assumes significant negative emissions post-2040.

Exxon further concedes that under conditions where supply exceeds demand, "the lowest cost of supply will be advantaged"[23] – in other words, cost-based competition will become more important (as evidenced by low prices brought on by an oversupplied market between 2014-2017).

Taking a cost of supply approach and comparing demand in the IEA's SDS against its New Policies Scenario (NPS), Carbon Tracker's independent analysis of Exxon's potential production suggests that a substantial portion (34%) of Exxon's relatively higher-cost potential capital expenditure (capex) that might go ahead in a 2.7°C scenario should not be developed in a 2°C scenario.[24]

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18 *See, e.g., Greg Rogers, http://www.era-tos-thenes.com/wp-content/uploads/2018/03/Grading-Exxon's-First-Climate-Risk-Assessment.pdf.*

19 *For more information, see https://www.carbontracker.org/time-machine-climate-risk-bringing-future-forward-2%CB%9Ac-scenario-analysis/*

20

21 *ExxonMobil 2018 Energy & Carbon Summary, p. 11.*

22 *Id.*

23 *Id., at 12.*

24 *Notably, our Mind the Gap report compares the volumes needed in the IEA's New Policies (NPS) scenario against the IEA "Below Two Degrees" (B2DS) scenario. Comparing against the IEA's NPS, which assumes lower demand for oil and gas than Exxon's Outlook, we implicitly assume that Exxon*

The foregoing concessions suggest that Exxon should therefore evaluate both the value impact of a 2°C scenario, i.e., the impact that reduced demand will have on pricing of future reserves production, and how such a scenario would shift capital deployed to develop the resource base.

Here, the report largely falls short. Exxon states that, "it is not possible to identify which specific assets ultimately will be commercialized and produced."[25] However, a recent report from Oil Search, an oil and gas company listed in Australia and Papua New Guinea, discloses analysis of the impact of different scenarios on individual assets, a strong indication that Exxon could have provided investors with what they are asking for. Indeed, it is likely that Exxon has far greater capacity than Oil Search to conduct this analysis, especially given its annual *Outlook* publication.

Exxon concludes that the company is resilient in the A2S and has a limited exposure to assets that could become uneconomic in such a scenario. All proved reserves, producing assets, unconventional liquids assets (US shale plays) and natural gas assets are indicated as safe, but there is a lack of analysis that demonstrates this. The only resources it implies that could be at risk relate to undeveloped liquids.

Exxon emphasise that these undeveloped liquids resources represent "less than 5 percent of ExxonMobil's total carrying value of property, plant and equipment". We would argue that this is not fair representation of the true risk. Focusing on the current carrying value ignores continued investments in developing its resource base. This should be a cause of concern for investors as, in 2017, Exxon committed $16.7bn of capital and exploration expenditure towards its upstream segment but only $8 billion of this was allocated to the development of proven reserves.[26] Moreover, Exxon has further plans to aggressively increase its capex over the next few years. How do investors know whether capital will be allocated to these assets that Exxon indicates may be at risk of stranding?

Certainly, there are variables and intervening factors that will ultimately impact development decisions but the building blocks for providing a snapshot of the company in a 2°C scenario are already there.

Exxon already claims to test its assets "over a wide range of commodity price assumptions and market conditions,"[27] though it does not indicate whether that range includes a 2°C scenario and a range of associated prices[28] — it should, and disclose the potential downside case. Moreover, we would expect that Exxon could make a reasonable estimate as to which of its non-proven resource base would not appear attractive investments in the A2S and/or in relation to globally recoverable resources, even if that snapshot changes over time.

Implicitly, Exxon suggests that these higher risk resources wouldn't be sanctioned. However, given that Exxon's Outlook assumes oil and gas use will continue to grow through to 2040 (and that the world will miss its climate commitments by some margin), we would argue that the question investors are more interested in is: if the company makes investments in projects based on assumptions that subsequently turn out to be overly optimistic, what is the financial risk?

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would not sanction some of its highest cost assets that might otherwise be needed in its Outlook.

25 *ExxonMobil 2018 Energy & Carbon Summary, p. 11.*

26 *ExxonMobil 2017 10-K, p. 7.*

27 *ExxonMobil 2018 Energy & Carbon Summary, p. 12.*

28 *Third party prices from the IEA are noted as falling "within the range" used to test investments; ExxonMobil 2018 Energy & Carbon Summary, p. 12*

Examples of the company underestimating projects' resilience can be seen in Exxon's recent past. As noted in Exxon's 2016 10-K[29], 3.5 BBOE reserves at the Kearl oil sands project in Canada were debooked under SEC rules as a result of low sustained prices[30]. The Kashagan supergiant off-shore oil field provides another example, where despite the total invested capital amounting to more than $50 billion[31] since the field's discovery in 2000, little oil production has materialised. This is in part due to experienced project delays, significant cost overruns and heavy investment requirements in supporting infrastructure.

MARKET RISK

Our assessment of company scenario analysis also includes consideration of the long-term price assumptions, where disclosed, that form the basis of the company's financial reporting. These may seem tangential to investors focused on 2°C scenarios, but are highly relevant to understanding the quality of the results in the financial statements which may rely heavily upon commodity price assumptions that, in turn, are based on long-term demand expectations.

Considering future commodity prices – what is Exxon's view?

Clearly, changes to long-term prices are financially relevant, as Exxon notes in discussing its process for assessing indicators of impairment: "because the lifespans of the vast majority of the Corporation's major assets are measured in decades, the value of these assets is predominantly based on long-term views of future commodity prices and production costs".[32] Exxon does not disclose the prices (or costs) used in its impairment testing. As lower demand expectations would likely yield lower expected prices, these long-term price expectations could similarly be expected to impact present-day valuation metrics in the financial statements.

Preparing for a future of lower prices ensures resilience

To demonstrate to investors the robustness of the company's financial reporting, Exxon should disclose their long-term price assumptions and compare those to modelled 2°C prices. The valuation results would further offer investors decision-useful information, as it would give a better understanding of both the company's conservativeness and whether their 2°C analysis represents a meaningful test or a mere tick-box exercise.

29 *ExxonMobil 2016, p. 6*

30 *SEC rules require that oil and gas reserves can be produced economically within the next five years, using price trends from previous 12 months.*

31 *Total investment by a consortium of oil and gas companies including Exxon. Exxon holds 16.81% stake.*

32 *ExxonMobil Form 10K, page 72.*

CARBON PRICES

Many companies have used carbon prices in a variety of ways to prepare for a low carbon transition for both existing and planned operations. For scenario modelling, this takes the form of a price per tonne/CO_2 (or CO_2e) that serves as a proxy for a range of potential future policy outcomes. This is a simple but easily misused tool for modelling an energy transition and investors should be wary of this. Carbon prices are often limited by geography or emissions scope (i.e., only operational emissions) limiting their utility as a proxy for a 2°C scenario. Seemingly commonplace carbon prices (i.e., $40/tonne CO_2), applied only to a company's scope 1 and 2 emissions, may add only a $1-$2 increase to upstream costs on average, if completely absorbed by the company—an insignificant number and well within the range of price sensitivities companies already examine.

In the context of an integrated assessment model (IAM), carbon prices may be useful in identifying how policy costs imposed on a polluting fuel can trigger tipping points when one energy source becomes more economic than another (and under a least-cost approach, result in the insurgent energy source taking market share from the now costlier incumbent). Understanding whether a given carbon price might hit a tipping point, however, requires knowledge of the inputs and assumptions in the model and cannot be derived from the carbon price alone.

Exxon's use of a carbon price: does it materially impact its business?

Exxon applies a cost of carbon internally as a proxy to estimate the potential impacts on consumer demand, which informs its assessment of potential energy demand in different sectors and jurisdictions. However, Exxon does not provide a clear indication of any carbon prices used currently. Instead, the company states that a proxy carbon cost "is assumed to reach $80 per tonne on average in 2040 in OECD countries"[33], which does not imply a 2°C-compliant demand trajectory in itself. To be clear, Exxon does not suggest to the contrary, but this modelling is not a substitute for evaluating the impact of declines in oil and gas demand consistent with a 2°C outcome.

CONCLUSION

Exxon's report, like those of many of its peers, concludes that it is at minimal risk from a 2°C scenario. Its conclusion is based on the analysis of an average of scenario models that are outdated. Even using these models, Exxon concedes that there may be risks to both value and volume but fails to provide investors with any detail of those risks.

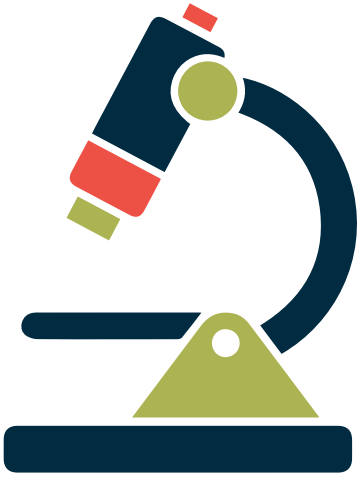
Ultimately, this means that Exxon's report is fundamentally lacking the kind of information investors need to understand how Exxon is positioned for a low carbon outcome and that shareholders requested in the 2017 resolution.

33 *ExxonMobil 10K Form 2017, p. 42.*

SHELL

Under the Microscope:

Are companies' climate scenario analyses meeting investors' requirements?



KEY TAKEAWAYS

1. Shell's climate-related disclosure has progressed in recent years and the company has presented targets for lowering the emissions intensity of its entire business.

2. In its "Sky" scenario, Shell provides its first view of what is ostensibly a below 2°C scenario. However, it differs little from many business as usual forecasts and assumes that demand for oil and gas in 2035 is still higher than today. "Sky" then relies on enormous deployment of carbon capture and storage in the long-term to rein in emissions.

3. It remains unclear whether the company's investment strategy is aligned with the Paris Agreement and what the financial implications might be for Shell if a pathway materialises that limits warming to "well below 2°C".

Carbon Tracker Initiative

May 2018

SUMMARY

The following analysis seeks to assist investors with their navigating of companies' climate-related disclosure.

Using our proprietary framework, we scrutinise companies' disclosure according to four key themes: 2°C scenario modelling, 2°C scenario outputs, market/price risk and the use of carbon prices.

The table below brings together multiple criteria to provide investors with an indication of the company's disclosure, with red signifying the poorest disclosure and green the best, in relative terms.

Table 1 – *Summary of companies' relative performance in their climate scenario analyses*

poor | moderate | high

	BP	Chevron	Conoco Phillips	ENI	Exxon Mobil	Royal Dutch Shell	Statoil	Total
Scenario Modelling								
Scenario Outputs								
Market / Price Risk								
Carbon Pricing								

Source: Carbon Tracker analysis

QUESTIONS FOR MANAGEMENT

1. Shell states that most of its proven reserves will be produced before 2030 and are therefore not at risk of stranding. If Shell were to extend its assessment to supply beyond proven reserves, what is the risk of financial and/or economic asset stranding?

2. What would be the change in Shell's scenario analysis if it were to use the oil and gas demand pathways of the IEA's Beyond 2 Degrees Scenario, rather than its Sky scenario?

3. Has the company considered expected prices in a "well below 2°C" commodity demand scenario, and if so, what impact the use of those prices would have if used in the preparation of the financial statements?

INTRODUCTION

Royal Dutch Shell ("Shell") is Europe's largest oil and gas company and has been undertaking scenario analysis and long-term outlooks for approximately five decades.[1] Its proprietary scenarios have been used to help inform its strategic thinking by considering possible "alternative futures" that could materialise over the long-term.

Shell was also one of the first energy companies to acknowledge climate change and the challenge it presents for its business.[2] In 2015, over 98% of shareholders voted for Shell to provide annual disclosure of climate change risk to the business, including Shell's operational emissions and an assessment of the portfolio's resilience against long-term scenarios (such as those provided by the IEA)[3].

Below, we review Shell's *Annual Report*[4], *Sustainability Report*[5], *Energy Transition Report*[6] and *Shell Scenarios: Sky Report*[7] focusing on four critical elements:

1. How the company structures its 2°C scenario analysis, if provided;
2. The outputs of that analysis, and whether they are useful to investors;
3. Whether it has evaluated the market risk (i.e., price implications) from secular demand destruction for its commodities, as suggested by most 2°C scenarios; and
4. Whether it has used carbon prices in a robust and defensible way as a proxy for a 2°C scenario.

For additional details on our methodology and approach, please see our paper[8] (hereinafter, "Methodology Paper").

1 *https://www.shell.com/investors/news-and-media-releases/investor-presentations/2017-investor presentations/shell-scenarios-modelling-and-decision-making-webcast/_jcr_content/par/textimage_158f.stream/1504857536756/7f287fc47cb72372f3d3704eeb24b482681f749d6a668e6723549da2daca7359/scenarios-modelling-and-decision-making-webcast-london-8-september-2017.pdf*

2 *See Shell 1998 Sustainability Report - https://www.shell.com/sustainability/sustainability-reporting-and-performance-data/sustainability-reports/previous/_jcr_content/par/expandablelist/expandablesection_332888471.stream/1454157664246/7419d7c0b96ee36e92059e205107e3106d35d9d8f3a4909c8523f49ded9e4727/shell-sustainability-report-1998-1997.pdf*

3 *https://engagements.ceres.org/ceres_engagementdetailpage?recID=a0I1200000BJFNOAA5*

4 *https://reports.shell.com/annual-report/2017/servicepages/download-centre.php*

5 *https://reports.shell.com/sustainability-report/2017/servicepages/download-centre.html*

6 *https://www.shell.com/energy-and-innovation/the-energy-future/shell-energy-transition-report.html*

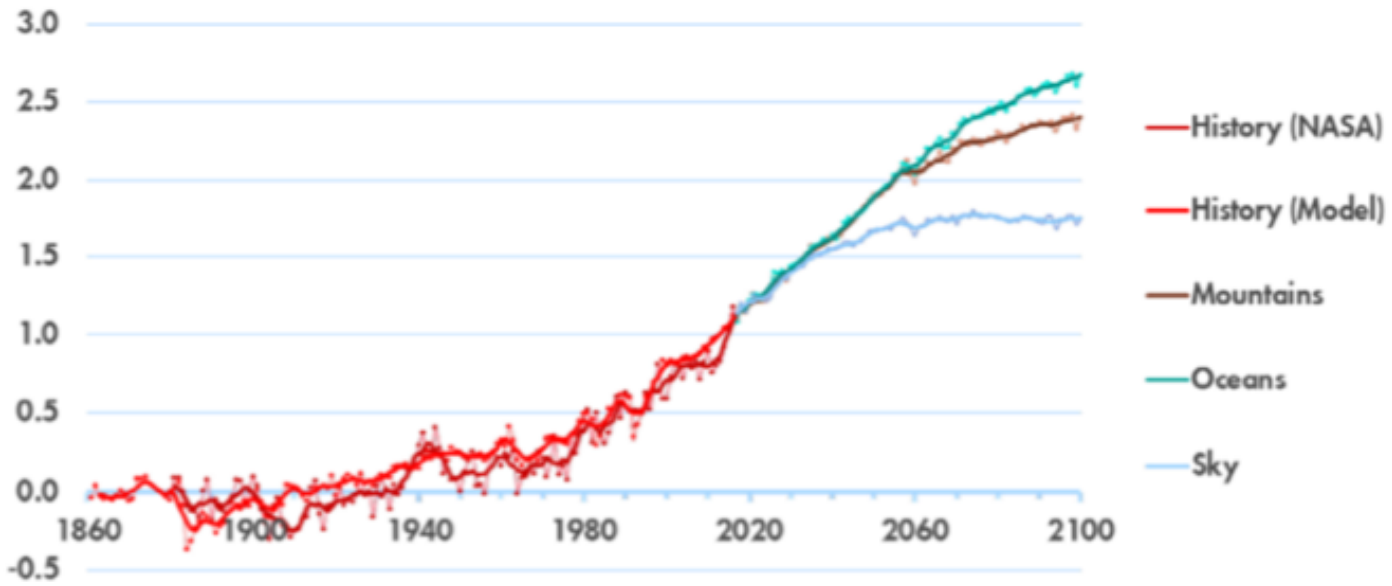
7 *https://www.shell.com/energy-and-innovation/the-energy-future/scenarios/shell-scenario-sky.html (Sky Scenario)*

8 *https://www.carbontracker.org/reports/under-the-microscope/*

Shell's use of forward-looking scenario analysis and assessment of 2°C

In the past five years, Shell has published a host of reports and proprietary scenarios on energy and climate change. In 2013, Shell published two discrete scenarios (under the title of "New Lens" scenarios) – called Mountains and Oceans.[9] These paint two alternative futures according to projections of contrary socio-political trends; neither of which achieve a two-degree target (see Figure 1).

Figure 1 – *Global average surface air temperature change relative to the pre-industrial level of 1861–1880 (°C)*[10]



Source: Massachusetts Institute of Technology (MIT)

Thereafter, Shell began to explore how such a target may be achieved in its *Better Life with a Healthy Planet*[11] report. This provided some of the foundations to its publication of its "Sky" scenario, which aims to comply with the Paris Agreement and the "well-below" 2°C temperature target[12]. Shell characterizes the Sky scenario as, "an ambitious scenario to hold the increase in the global average temperature to well below 2°C."[13]

9 *"Mountains" is premised upon strong governmental action that emphasises strong growth in natural gas, CCS and urbanisation. The "Oceans" scenario envisages that market forces shape the global energy system, rather than governments. A rise in emissions brings about damaging effects from climate change. Both New Lens scenarios reach net-zero global emissions by 2100, however go beyond 2°C. According to Shell, Mountains reaches ~2.4C and Oceans reaches ~2.6C.*

10 *The Massachusetts Institute for Technology Join Program on the Science and Policy of Global Change (MIT) used Shell's energy model outputs to calculate the global warming trajectories for Sky, Mountains and Oceans. See https://globalchange.mit.edu/sites/default/files/MITJPSPGC_Rpt330.pdf*

11 *https://www.shell.com/energy-and-innovation/the-energy-future/scenarios/a-better-life-with-a-healthy-planet.html*

12 *The authors of the MIT Joint Program on the Science and Policy of Global Change (Report 330), indicate that the Sky scenario has a 50% chance of remaining below 1.75C and an 85% probability of remaining below 2°C*

13 *Shell Sky Scenario, p. 5.*

Modelling a 2°C outcome: considering and applying a 2°C scenario

In its simplest form, Sky purports to chart a pathway to achieving the Paris accord with a 50% probability of achieving 1.75°C, where Shell estimates net-zero emissions would need to be reached by 2070.[14]

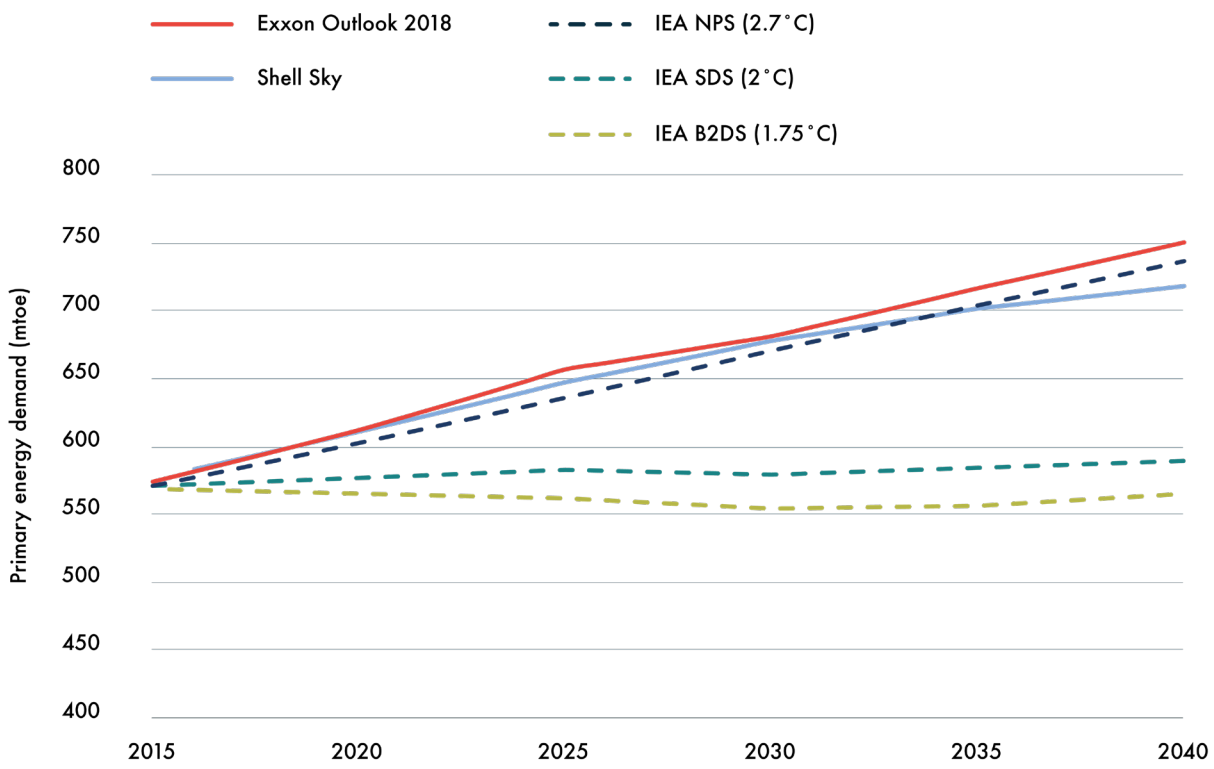
The Sky scenario provides an outlook of energy through to 2100 and provides ample detail across several areas including future energy mix, emissions and macroeconomic indicators to name a few. While we welcome this as progress in Shell's climate-related disclosure and to allow investors transparency and comparability of the information, we are concerned about the pace of change in its Sky scenario and the assumptions needed to conform this scenario to the Paris target, especially when compared to other recognised scenarios. Moreover, as a stress test of a fossil fuel company business plan, it merely confirms rather than challenges management's thinking over the next few decades.

Shell's Sky scenario goes easy on fossil fuels

Similar to the two New Lens scenarios, Shell forecasts energy and socioeconomic trends until 2030 with an emphasis on incremental changes based on current trends. The result is that Shell's scenario provides no robust test of the business model over the next 12 years. Thereafter, Shell applies a "normative" (or "backcasting")[15] approach to its modelling – i.e. starting from the end point and finding a pathway that delivers that goal.

For example, Shell's Sky scenario through to 2040 is more similar to the Exxon's Outlook for Energy, which is Exxon's planning case and which by Exxon's admission falls well short of even a 2°C outcome. (See Figure 2.)

Figure 2 – *Comparison of Shell's Sky Scenario with Exxon's Outlook and selected IEA scenarios, Total Primary Energy Demand*



Source: Shell, ExxonMobil, IEA, Carbon Tracker analysis

14 *Shell defines this as a 50% chance of reaching 1.75C in its modelling approach.*

15 *This approach lays out plausible pathways to a desired end state. In this case, this is premised upon a target of 1.75°C level of warming above pre-industrial levels.*

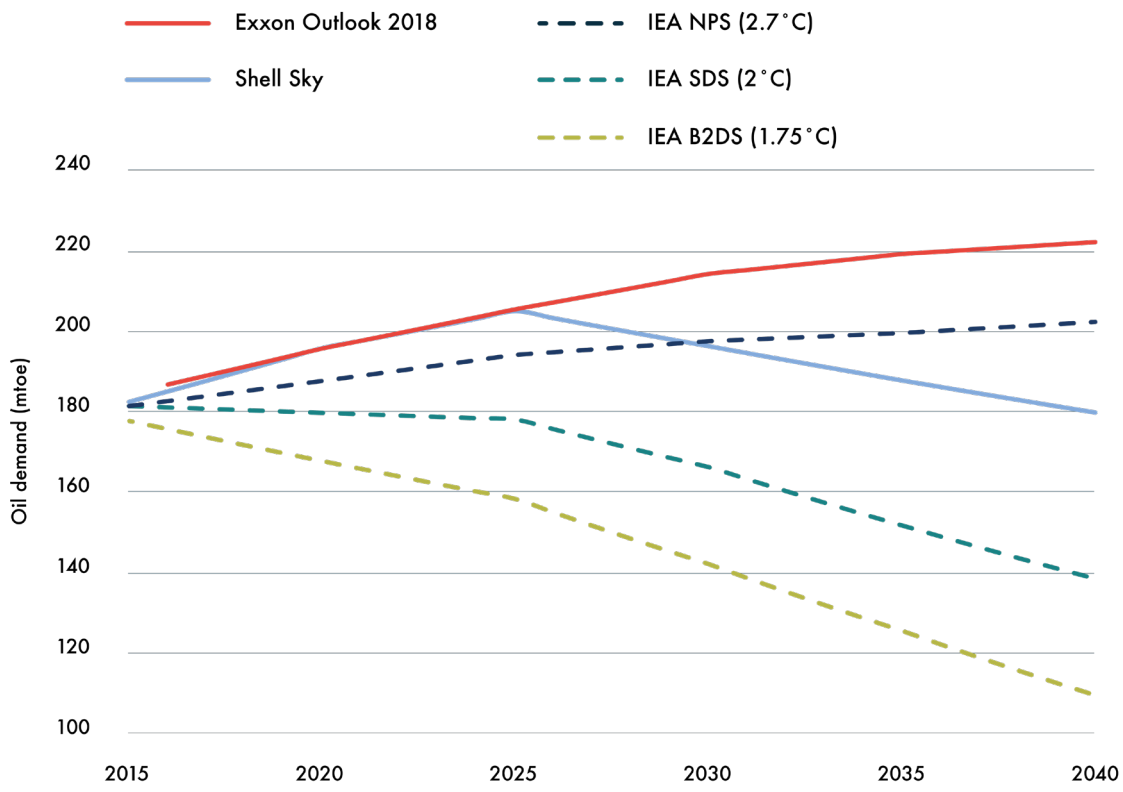
Any 2°C scenario will use backcasting to identify the emissions reductions necessary to achieve the desired climate goal. This can be seen in other scenarios[16], but those typically require rapid change in the energy system in the short and long terms. For example, the IEA Beyond 2 Degrees Scenario (B2DS) – which also estimates a 50% chance of limiting temperature rises to 1.75°C – observes a reduction in global demand for oil, gas and coal of around 40%, 19% and 68% respectively by 2040 (see demand pathways in Figure 3).

In Sky, however, Shell avoids considering short and medium term changes in the energy system by projecting its business case over that period. Shell models relatively flat oil demand (near 1% decline) over the same period. Gas demand grows 22% and coal only starts to show a marked structural decline beyond 2035. By contrast, the IEA Sustainable Development Scenario (SDS) (which claims only a 50% probability of reaching 2°C) nonetheless sees significantly more reductions in fossil fuel demand than Shell's Sky scenario through 2040.

However, to meet the goal of "well below 2°C" studies have shown that marked progress needs to have been made in the short term.[17] As a stress test of the business plan, Shell's scenario does not impose significant restraints because it places the burden of emissions reductions on carbon capture and storage (CCS).

Figure 3 – *Global Demand for Oil, Natural Gas and Coal in the Shell Sky scenario, ExxonMobil Outlook, and selected IEA scenarios*[18]

Fig 3a – Oil demand



16 *For example, see the IEA's Beyond 2 Degrees Scenario (B2DS) Energy Technology Perspectives 2017, IEA (p. 23)*

17 *See Global Energy Transformation: A Roadmap to 2050, IRENA (2018), http://www.irena.org/publications/2018/Apr/Global-Energy-Transition-A-Roadmap-to-2050*

18 *'The numbers behind Sky', Shell (2018); Energy Technology Perspectives, IEA (2017); Carbon Tracker analysis.*

Fig 3b – Gas demand

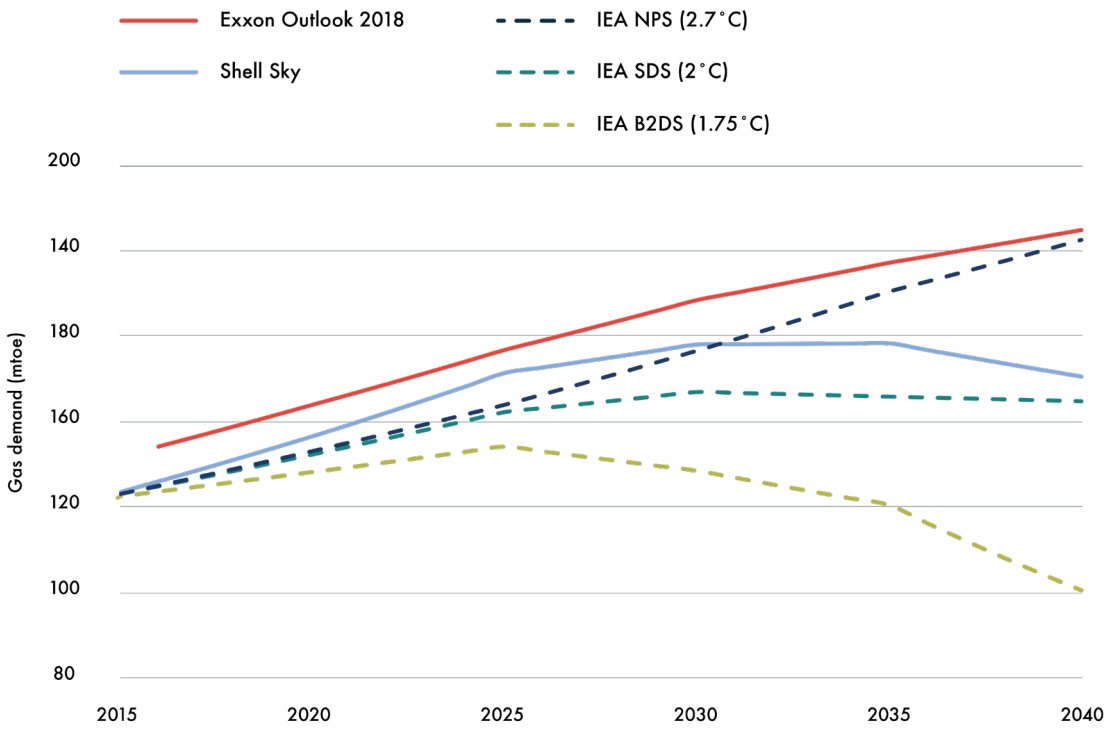
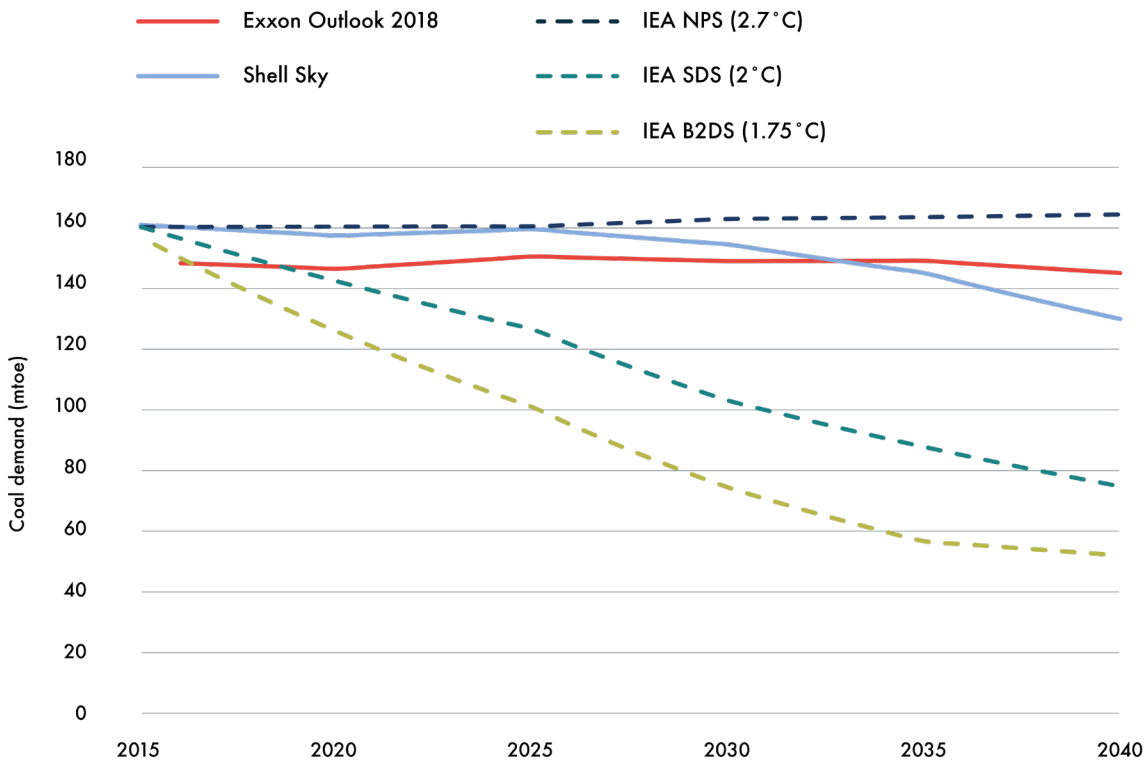


Fig 3c – Coal demand



Source: IEA 2017 ETP; Shell Sky scenario; Carbon Tracker analysis

Note: we would caution that interpolations have been made between provided data points, and the IEA's scenarios do not include 2020.

Shell's scenario does not analyse the risk to its assets; it assumes the assets will not be at risk

Shell justifies its incremental approach to emissions reductions in stating that "the potential for dramatic short-term change in the energy system is limited, given the installed base of capital across the economy and available technologies".[19] The first part of this argument assumes away the very issue confronting its investors; specifically, whether the installed base of capital will live out its expected economic life. Shell's Sky scenario does not address this question because it assumes that the risk of asset stranding means it will not happen. (A similar logic might apply, with greater force, to society addressing climate risks given their severity).

We are surprised with this level of assurance. Likely Shell was confident in the Carmon Creek project when it sanctioned it in 2013, but only 2 years later was forced to shutter it during construction, saddling shareholders with a $2 billion impairment and de-booking 418 million barrels of oil.[20] Moreover, the potential for financial losses to European utility investors did not prevent those utilities from rapid decline. We therefore do not see how Shell can justify incremental changes with confidence.

Shell's scenario burns through the carbon budget and leans heavily on CCS

Having assumed that oil and gas demand is barely impacted for the next 12 years, squaring the circle to a 1.75°C outcome requires some challenging assumptions in other aspects of the modelling. The implications are enormous – Shell's Sky scenario requires some 10,000 large-scale carbon capture and storage facilities to be built over the timeframe (more than one every other day for the next 50 years)[21] and capturing over 550GtCO_2 (equivalent to 15 years of current global emissions from the energy sector). This is a considerable feat given that CCS has not proven to be an economic or scalable technology yet. Huge land management and reforestation efforts are also assumed. Shell are far from the only company or institution to rely on such factors at a later date, to ease the path in the nearer term. But when this is required to such an extent as to allow aggregate fossil fuel use to 2040 more comparable with the 2.7°C IEA New Policies Scenario than other "low carbon" scenarios, we see dangers of complacency. We suspect that many readers will not share Shell's description of the Sky scenario as "ambitious" and "realistic". And the use of such a scenario underscores the need for challenging but plausible scenarios to be used in the scenario analysis process.

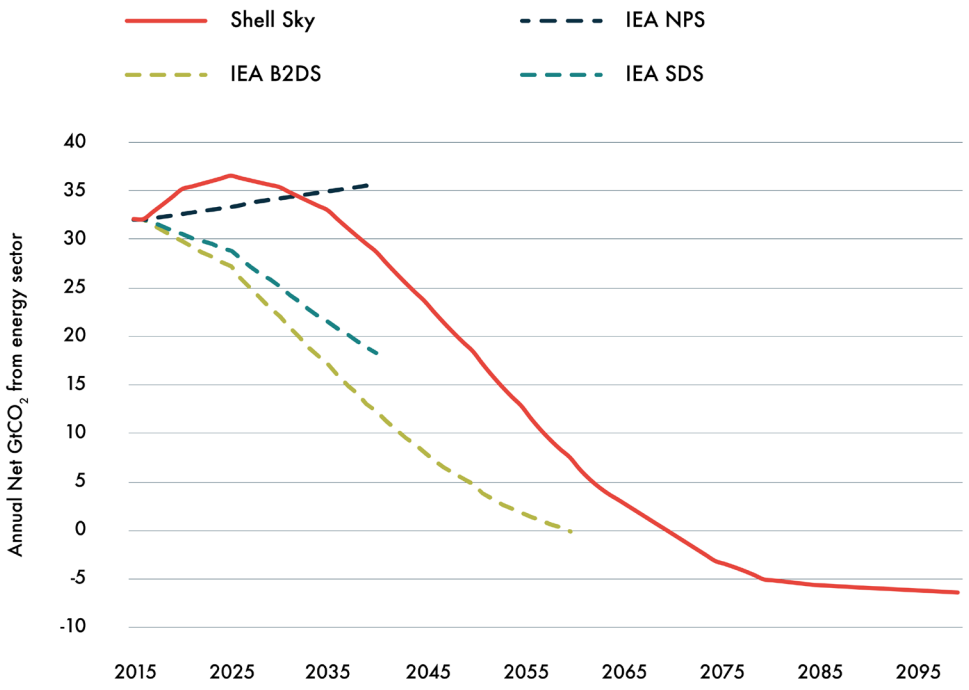
Figure 4 compares emissions pathways derived from three different scenarios (IEA B2DS, IEA SDS and Shell Sky). Despite the IEA B2DS and Shell's Sky scenario both sharing the same target of 1.75°C, the emissions trajectories illustrate a clear difference. The Sky scenario assumes a total carbon budget from the energy sector of approximately 1,150GtCO_2 between 2018-2060. In contrast, the IEA B2DS estimates that just over half of this (600-650GtCO_2) can be emitted over this period and carbon neutrality must be reached by 2060. The Sky scenario's only plausible claim to a climate safe outcome is the assumption that beyond 2070, more carbon dioxide would have to be captured and stored than what is emitted (around 120 Gt net negative CO_2 emissions from 2060 to 2100).

19 *Shell Sky scenario p. 23.*

20 *https://biv.com/article/2015/10/shell-stops-construction-carmon-creek-project-will*

21 *Sky Scenario report (2018), p. 6.*

Figure 4 – *Annual Net Emissions from the Energy Sector Globally ($GtCO_2$)* [22,23]



Source: IEA 2017 WEO; IEA 2017 ETP; Shell Sky; Carbon Tracker analysis

Note: we would caution that interpolations have been made between provided data points, and the IEA's scenarios do not include 2020.

As an assessment of risk to the company, the scenario avoids the thorniest questions about how the company's shareholders might be impacted.

Furthermore, the little change in the role of fossil fuels in the energy system in Shell's "well below 2°C" Sky scenario is worrying. Current and planned regulations to 2030 cause little change to annual emissions over this timeframe and hinder it beyond that. Subsequently, Shell's Sky scenario uses up the 1.75°C carbon budget adopted in the IEA B2DS in under 20 years. This raises concerns over how conservative Shell's assumptions are in its approach.

Shell's generous carbon budget and copious use of CCS highlight the need for investors and markets to utilize a relatively robust 2°C scenario to clarify the risks to fossil fuels, and ensure that they can compare companies on an approximately consistent basis.

To be useful to investors we believe it should contain the following elements[24]:

1. A reference scenario;
2. Built upon at least a 2°C-compliant demand pathway;
3. Compared to a sector-wide, project-level view of supply.

22 *In the absence of disclosed annual figures for the B2DS, we have interpolated between the intervals provided. This is intended to provide an indication rather than the actual pathway as this method doesn't capture peaks given the notable gaps between intervals, particularly between 2016 to 2025.*

23 *Includes carbon dioxide (CO_2) only.*

24 *For more information, see https://www.carbontracker.org/time-machine-climate-risk-bringing-future-forward-2%CB%9Ac-scenario-analysis/*

SCENARIO OUTPUTS

Our Methodology Paper focuses heavily on whether companies have endeavoured to identify those assets (or potential assets) that would appear economic in their business-as-usual outlook but would appear unattractive in a 2°C scenario.

Understanding the delta between the two scenarios is an essential element to evaluating the climate-related risks and the key building block for providing indicators to the market of that risk (whether expressed in terms of reserves volumes, capital expenditure, discounted future cash flows, or some other metric) as we have discussed elsewhere.[25]

How does Shell fare in a 2°C world?

In its Energy Transition Report, Shell assures investors that its portfolio is resilient across a number of scenarios due to its diverse portfolio, capital discipline and internal processes. It tests its portfolio under different scenarios - including a "prolonged low oil prices" scenario - as Shell argues that the risks attributed to the energy transition will ultimately be reflected in the price of oil and gas. From this exercise, Shell concludes that there is little risk of assets becoming stranded. We nevertheless see several issues with its approach behind these assertions and would argue it is understating its exposure post-2030.

Shell argues that the bulk of its reserves will be produced by 2030. It estimates that 80% of its proven reserves and 76% of its probable reserves will be produced by then. We would firstly highlight that the 24% of its reserves that will not be produced by 2030 represents a material proportion of Shell's asset base; having nearly a quarter of its business exposed to falling demand should raise a red flag. Secondly, as Carmon Creek demonstrated, the fact that current assets are classified as reserves does not mean that the value they represent is safe.

Thirdly, Shell does not include "resources" in its 76-80% calculation. These represent existing oil and gas discoveries that have yet to be sanctioned and still have value to shareholders. Clearly, these "resources" are not producing or even under development, so there is little balance sheet value that is currently at risk. However, they do have economic value and hold risk over the longer term.

Shell also go on to mention that "even if oil prices fell to $40 per barrel, the lower end of our range, Upstream would still generate cash flow from operations". While it may be true that existing oil fields will remain in production under Shell's low-price scenario ($40/barrel), that does not mean that they create value. Existing oil fields are likely to remain operating as long as oil prices remain above cash operating costs. To add value, they have to also recover the original development costs and deliver a return above the cost of capital: Shell's annual report and accounts for 2017 shows that depreciation on production assets (a measure of past development costs) is of a similar order to production costs. That means that a field with production costs of $35/barrel could continue to produce under Shell's $40 scenario. But it might need $70/barrel or higher to return value to shareholders.

Several oil & gas companies have sought to define stranded assets narrowly as meaning physically produced. This is a departure from the wider financial definition used by e.g. the IEA: *"Stranded assets are defined as capital investment in fossil-fuel infrastructure that ends up failing to be recovered over the operating lifetime of the asset because of reduced demand or lower prices resulting from climate policy."*[26]

25 *https://www.carbontracker.org/time-machine-climate-risk-bringing-future-forward-2%CB%9Ac-scenario-analysis/*

26 *IEA, World Energy Outlook 2017, p463.*

Hence, Shell might not regard such a field as "stranded" in the very limited sense of ceasing production. However, it could well remain in production but still destroy shareholder value. It is the latter form of stranding that is relevant to investors. Shell has several fields that we believe have shown potential to destroy value. The Kashagan field is an excellent example.

With regards to its downstream segment, Shell argues that its downstream businesses (refining, marketing and chemicals) provide a natural hedge against weak oil prices, which it has done over the past four years. We would however question whether that would be so in an environment when oil demand was falling.[27] The price collapse of 2015 was not caused by weak demand but by increased supply as Saudi Arabia forced oil on to the market. Demand remained healthy, so Shell's refineries were able to take advantage of cheap crude to meet continued demand. In a market where demand is falling or flat, that may not be the case.

Lastly, there is concern that beyond 2030 whether cashflows will translate into new oil and gas discoveries. For example, in 2008 Shell's proven reserves would last for another 10 years. In 2017, despite 10 years of production, Shell's proven reserves would continue for another nine years. Clearly the cash flow from the "safe" reserves was reinvested into more exploration, more appraisal and more developments. Historically, Shell has reinvested a material proportion of its operating cashflow. Over the past three years, about 80% of its cashflow was reinvested. Shell's financial targets suggest it expects a lower reinvestment in future, around 50%, but even so, this will mean that a material proportion of the cashflow from the so-called "safe", pre-2030 production will be re-invested. And it will be reinvested in projects that will steadily push the maturity of Shell's portfolio beyond 2030, exposing those assets to growing climate risk and possible economic stranding.

Is Shell strategy altered by a transition to 2°C?

Shell highlights that active portfolio management is an integral part of its strategy to manage its risks and opportunities in the energy transition, including the improvement of its portfolio's "CO_2 performance". The company has identified a goal of diversifying its portfolio in areas that it believes will thrive in such a transition, namely: integrated gas, chemicals and new energies.[28]

A key pillar to its portfolio diversification is its Net Carbon Footprint[29] ambition and methodology, which it released in 2018. The NCF aims to cut the emissions intensity of its energy products in line with the Paris Agreement by 2050.[30] Furthermore, Shell has stated that it will publish its numbers with regards to its Net Carbon Footprint on an annual basis and review them every five years. In line with this target Shell aims to reduce its emissions' intensity by half by 2050.

Despite this, Shell clearly signals that it has no medium term intention of moving its trajectory to one that would result in the net zero ultimately required in a 2°C world, stating in the fine print, that "we have no immediate plans to move to a net-zero emissions portfolio over our investment horizon of 10-20 years."[31]

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27 See our report on refining, which identifies where rationalization might occur in a 2°C scenario: https://www.carbontracker.org/reports/margin-call-refining-capacity-2-degree-world/Chevron would seem to agree with our analysis. See also, https://www.chevron.com/-/media/shared-media/documents/climate-change-resilience.pdf

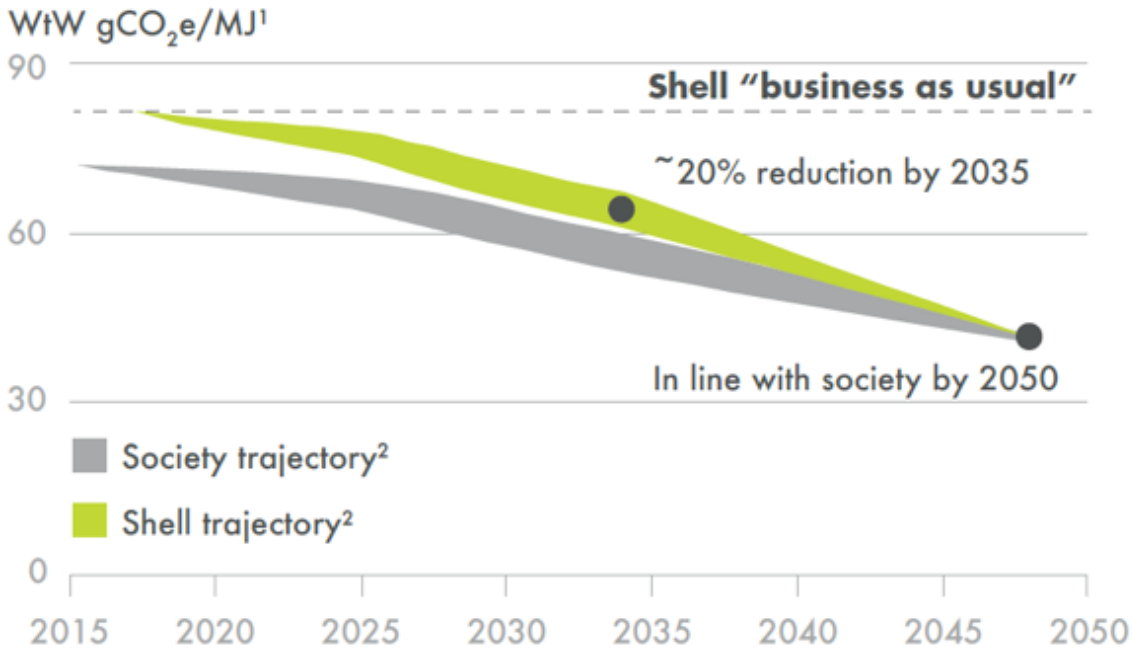
28 New Energies theme comprises power and new fuels.

29 Premised on its Sky scenario and the IEA 2017 Energy Technology Perspectives report, Shell has developed its own carbon footprint methodology which articulates the necessary reduction of net zero additional CO_2e emissions by 2070 in the global energy system (and Shell) "to achieve a reasonable chance of limiting global warming to well below two degrees Celsius".

30 Shell estimates that to reach the Paris target, energy intensity needs to reach 43g/CO_2e in 2050, whereby the current energy system is at 74g/CO_2e today and the emissions from Shell's carbon footprint stands at 83g/ CO_2e.

31 Sky Scenario report (2018), p. 68.

Figure 5 – *Shell's Ambition for Net Carbon Footprint*[32]



Source: Shell (2018), Energy Transition Report

Shell goes beyond the common practices of its peers with the NCF by incorporating greenhouse gas (GHG) emissions associated with the products it sells (also known as Scope 3 emissions). Typically, oil and gas companies limit their reporting to their operational emissions (Scopes 1 and 2).[33] Scope 3 emissions typically represent 85-90% of the lifecycle emissions in the oil and gas sector. We would highlight that Shell has made positive steps by including Scope 3 emissions and announced capital expenditure plans for its New Energies segment (although it only represents 3-8% of total planned capital expenditure).

On the other hand, Shell states that it is "confident that Shell's Net Carbon Footprint ambition is consistent with the aims of the Paris Agreement and is an appropriate approach to address the activities of the company". We would view this metric with caution. As a relative measure, an intensity metric relieves any absolute constraint on the amount of fossil fuels that can be extracted, processed or sold; provided that there is enough low carbon energy to provide the counterbalance. For example, there have been concerns that Shell could reduce its carbon intensity by 50% but that might represent only a 25 per cent decrease in absolute terms, should Shell maintain its energy market share that is forecast to grow by 50 per cent by 2050.[34] Setting such targets relating to intensity further doesn't totally preclude the risk of investing in stranded assets.

On balance however, we note the intentions represented by NCF strategy and look forward to further details.

32 *In the graph, the y-axis represents the aggregate "well to wheel"/"well to wire" intensity, from production through to consumption, on grams of CO_2 equivalent per megajoule of energy products consumed.*

33 *Scope 1 and 2 emissions are those associated with direct emissions (such as emissions from extraction, combustion) and indirect emissions (such as emissions derived from its purchased electricity and steam).*

34 *https://www.ft.com/content/fae8e478-2eba-11e8-9b4b-bc4b9f08f381*

All things being equal, lower expected demand (as in the 2°C scenario) implies lower expected prices. Clearly other factors might drive near-term price volatility and structural elements to oil pricing, and cartel (OPEC) production constraints might structurally shift oil prices towards an oligopoly price over longer periods. But whichever other considerations are taken into account, we believe most companies would agree that reducing demand forecasts would likely imply reduced price expectations in the long-term compared to higher demand forecasts.

Considering future commodity prices – what is Shell's view?

Shell sits in the better company of its peers who provide investors with an understanding of the prices it tests against internally for financial planning and for impairments. This rebuts the commonly held view that this information is commercially sensitive.

In its Energy Transition report, Shell considers a range of prices (see Scenario Outputs) from $40/bbl to $100/bbl as part of the stress test of its portfolio. The $40 floor is the price which Shell believes is needed to bring sufficient new, low-cost projects to market, which we would tend to agree is a reasonable stress test. But Shell then notes, that, "it is unlikely that oil prices would remain at the lower end of our price range for several years".

The "unlikely" comment and the choice of an implied central case of $65 for financial planning suggests that Shell shows little consideration towards a $40 price. Under a scenario where oil demand is falling by at least 1% a year, low oil prices are more likely than not. Following the recession of the early 2000s, the oil price (in real terms) was below $40 or lower for every year between 2002 and 2007. And it was below $50 for all thirteen years between 1998 and 2010 — all against the backdrop of growing oil demand. The implied base case price of $65 could be at risk in a "Sky" scenario. Shell notes that each $10 change in oil prices, costs Shell $6 billion in cash flow. So, if $40 prevailed, Shell could see $15bn disappear from its base case cash flow.

Shell also discloses its pricing assumptions used for impairment testing over the short and long-term. Management's long-term commodity price estimates are highly relevant to investors to the extent those prices are used as the basis for testing the recoverable amount of assets held on the balance sheet, the results of which are disclosed in Shell's financial statements[35]. In 2021, oil prices for impairment testing are assumed to escalate to $70 in real terms, beyond the implied base case of $65 and 75% higher than its low price scenario of $40. This indicates that a potential future risk of asset write-downs may arise under a 2°C scenario should a low oil price materialise. Indeed, downward revisions to long-term commodity price expectations in 2015 resulted in impairments of $4.4bn in the same year.

35 *Brent crude oil (nominal $/bbl): 50, 60 and 65 for 2018, 2019 and 2020. Thereafter $70 (real). Henry Hub natural gas (nominal $/mmBtu): 3, 3, 3.25 for 2018, 2019 and 2020. Thereafter $4 (real). See: Shell 2017 Financial Statements and Supplements, p. 154.*

CARBON PRICES

Many companies have used carbon prices in a variety of ways to prepare for a low carbon transition for both existing and planned operations. For scenario modelling, this takes the form of a price per tonne of CO_2 (or CO_2e) that serves as a proxy for a range of potential future policy outcomes. This is a simple but easily misused tool for modelling an energy transition and investors should be wary of this. We have detailed the ways in which carbon prices can provide false reassurance in our Methodology Paper.[36]

Carbon prices are often limited by geography or emissions scope (i.e., only operational emissions) limiting their utility as a proxy for a 2°C scenario. Indeed, many do not approximate that outcome. Seemingly commonplace carbon prices (i.e., $40/tonne CO_2) may add only a $1-$2 increase to upstream costs on average, if completely absorbed by the company — an insignificant number and well within the range of price sensitivities companies already examine.

In the context of an integrated assessment model, carbon prices may be useful in identifying how policy costs imposed on a polluting fuel can trigger tipping points when one energy source becomes more economic than another (and under a least-cost approach, result in the insurgent energy source taking market share from the now costlier incumbent). Understanding whether a given carbon price might hit a tipping point, however, requires knowledge of the inputs and assumptions in the model and cannot be derived from the carbon price alone.

Shell's use of a carbon price: does it materially impact its business?

Shell discloses that it uses an internal carbon price – or "project screening value" (PSV) – to test the resilience of new projects, however is not clear as to the scope it applies the carbon price to. The uniform PSV of $40 per tonne of carbon dioxide is applied for the total GHG emissions of each investment that Shell considers. Beyond this Shell does not provide much detail to how else a carbon price might be used or what it is applied to, nor does Shell give much reasoning to whether it believes such a price is aligned with a certain climate outcome or how it could impact the business.

CONCLUSION

In 2018, Shell has progressed its climate-related disclosure by releasing a low carbon scenario, and articulating a long-term strategic ambition to lower emissions intensity. It also offers a degree of transparency around Shell's forward-looking assumptions and price forecasts.

Whilst these steps warrant qualified praise, we also have concerns across the aforementioned areas, particularly Shell's modelling assumptions and its portfolio stress test. Firstly, Shell's Sky scenario presents a pathway that assumes slow change over the near to medium-term which results in the need for enormous CCS deployment and assumptions around land-use globally. Secondly, by omitting resources in its portfolio stress test it ignores a large portion of potential future risk to stranded assets and understates any exposure post-2030. Third, the company fails to provide sufficient useful detail on the financial impact of a low carbon scenario.

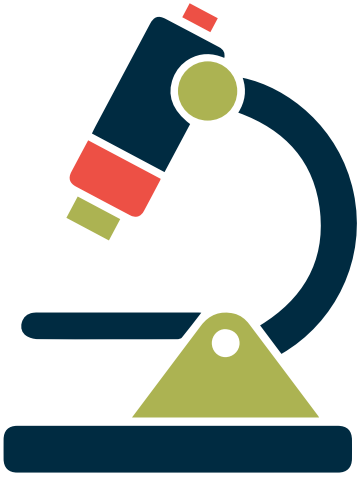
We would also encourage Shell to provide investors more detail should a "prolonged low price" persist and how the business would manage that scenario.

36 *https://www.carbontracker.org/reports/under-the-microscope/*

STATOIL

Under the Microscope:

Are companies' climate scenario analyses meeting investors' requirements?



KEY TAKEAWAYS

1. Statoil's broad consideration of climate-related risks and opportunities is reflected in its stated ambition to become an "energy company", rather than simply and oil and gas major.

2. However, its assessment of the potential financial implications of a scenario for oil and gas demand consistent with the Paris Agreement is weaker. The company declares its limited exposure to stranded assets without assuring investors that its future projects are resilient to potentially lower than expected oil and gas demand.

3. Further, the company does not appear to align its forward-looking strategy with a 2°C or lower pathway, nor does it explain the implications its own statement that warming of more than 2°C might have broader and adverse economic impact.

Carbon Tracker Initiative

May 2018

SUMMARY

The following analysis seeks to assist investors with their navigating of companies' climate-related disclosure.

Using our proprietary framework, we scrutinise companies' disclosure according to four key themes: 2°C scenario modelling, 2°C scenario outputs, market/price risk and the use of carbon prices.

The table below brings together multiple criteria to provide investors with an indication of the company's disclosure, with red signifying the poorest disclosure and green the best, in relative terms.

Table 1 – *Summary of companies' relative performance in their climate scenario analyses*

poor | moderate | high

	BP	Chevron	Conoco Phillips	ENI	Exxon Mobil	Royal Dutch Shell	Statoil	Total
Scenario Modelling								
Scenario Outputs								
Market / Price Risk								
Carbon Pricing								

Source: Carbon Tracker analysis

QUESTIONS FOR MANAGEMENT

1. If Statoil's forward-looking strategy is not aligned with the ambition of the Paris Agreement, could it provide details on those projects that it would sanction under its planning scenario but not under one consistent with warming "well below 2°C"?

2. Statoil's net present value (NPV) assessment appears to exclude potential projects that would return a negative value, which might assume foresight of changing market conditions. How would the NPV test change if those projects are included?

3. Has the company considered expected prices in a "well below 2°C" commodity demand scenario, and if so, what impact the use of those prices would have if used in the preparation of the financial statements?

INTRODUCTION

Norwegian oil and gas company, Statoil, is well-known for its analysis of macroeconomic and energy markets trends in its annual paper, Energy Perspectives, which it has published since 2011. Since the 2015 edition, *Energy Perspectives* has included discussion of a scenario that considers a 2°C outcome. This is part of the company's broader efforts to align with the evolving energy transition: its *Climate Roadmap* outlines a revised strategy to support the energy transition, including an expectation that 15-20% of the company's capital expenditure will be directed to new energy technologies by 2030. In 2015, almost 100% of Statoil's shareholders voted for a resolution calling for additional transparency as to the company's long-term strategic resilience[1].

Below, we review Statoil's *Annual Report 2017*[2], *Sustainability Report 2017*[3], *Climate Roadmap*[4], and *Energy Perspectives 2017*[5] focusing on four critical elements:

1. How the company structures its 2°C scenario analysis, if provided;
2. The outputs of that analysis, and whether they are useful to investors;
3. Whether it has evaluated the market risk (i.e., price implications) from secular demand destruction for its commodities, as suggested by most 2°C scenarios; and
4. Whether it has used carbon prices in a robust and defensible way as a proxy for a 2°C scenario.
5. For additional details on our methodology and approach, please see our paper[6] (hereinafter, "Methodology Paper").

SCENARIO MODELLING

Statoil's use of forward-looking scenario analysis and assessment of 2°C

Statoil's Energy Perspectives is a detailed analysis of current and potential energy market trends, combining narrative discussion with some quantitative backdrop.

The 2017 edition contemplates three scenarios: Reform, Renewal and Rivalry. Reform takes countries' nationally determined contributions to the Paris Agreement as a starting point, building a future similar to the International Energy Agency's (IEA) New Policies Scenario. Renewal seeks to deliver a CO_2 trajectory for energy sector emissions consistent with a 50% probability of limiting global warming to 2°C. It can be viewed as broadly aligned with the IEA's 2°C 450 and Sustainable Development scenarios. Rivalry puts geopolitics at its centre, examining the implications of inward-looking and short-term policymaking coupled with climate scepticism.

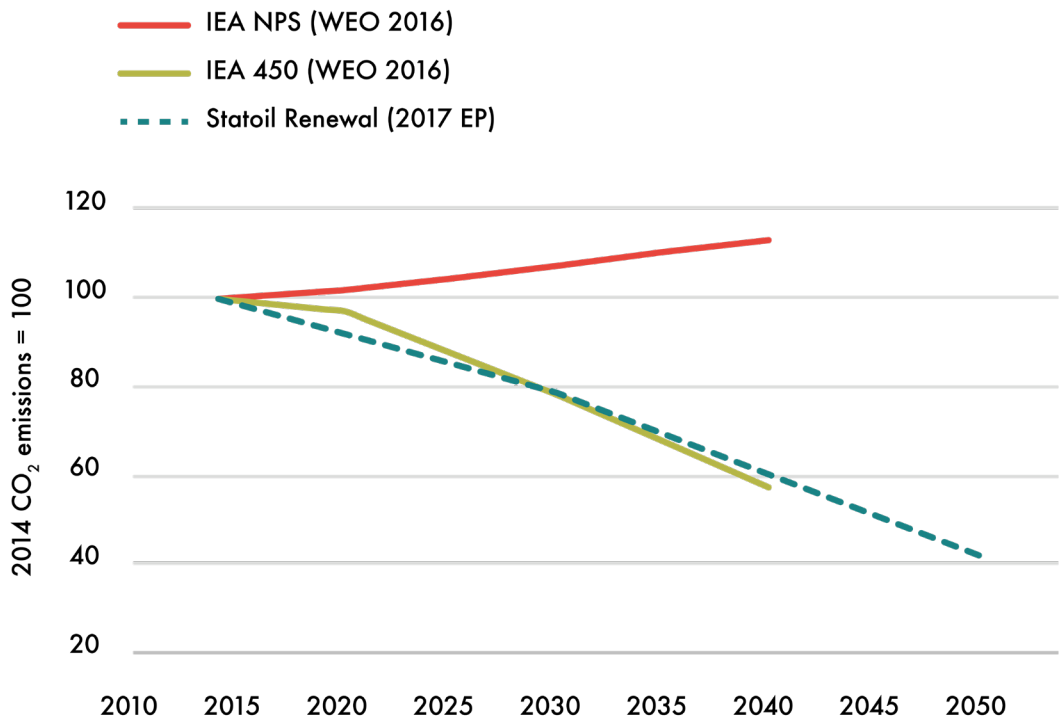
Statoil first referenced but did not include a 1.5°C in its *2016 Energy Perspectives*. The most recent edition does not go much further, stating that a benchmark 1.5°C scenario has yet to be produced, hindering its consideration by the company. We believe Statoil should consider the IEA's "below two-degrees" (B2DS) scenario, which the IEA estimates will yield a 50% chance of 1.75°C. However, the *2017 Energy Perspectives* at several points draws comparisons to more "ambitious" scenarios, in climate terms, to situate its own analysis in the context of what might be required to meet the Paris Agreement's objective of limiting warming to "well below 2°C".

1 https://www.ipe.com/news/esg/shell-statoil-investors-vote-for-climate-change-disclosure/10008085.article
2 https://www.statoil.com/content/dam/statoil/documents/annual-reports/2017/statoil-annual-report-20f-2017.pdf
3 https://www.statoil.com/content/dam/statoil/documents/sustainability-reports/statoil-sustainability-report-2017-23march.pdf
4 https://www.statoil.com/content/dam/statoil/image/how-and-why/climate/A4-climate-roadmap-digital.pdf
5 https://www.statoil.com/content/dam/statoil/documents/energy-perspectives/energy-perspectives-2017-v2.pdf
6 https://www.carbontracker.org/reports/under-the-microscope/

Modelling a 2°C outcome: considering and applying a 2°C scenario

Statoil's Renewal scenario is back-casted from an emissions pathway similar to that of the IEA's 450 Scenario[7]. As Figure 1 shows[8], there is not much to separate the 450 and Renewal Scenarios with regards to emissions profiles. Cumulative emissions in the Renewal scenario (which runs through 2050) remain marginally below the 450 Scenario through 2040.

Figure 1 – *Comparing emissions profiles of Statoil Renewal and IEA scenarios*



Source: Carbon Tracker analysis

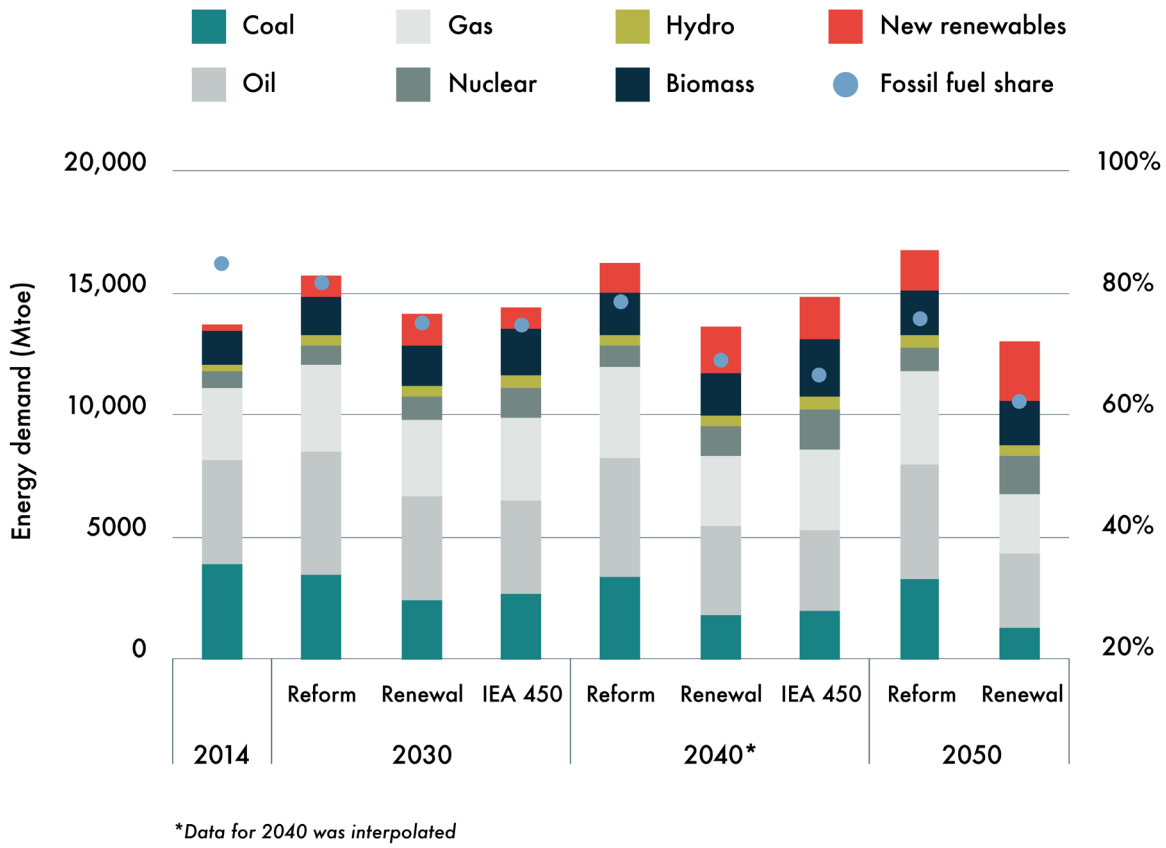
The Renewal and 450 Scenarios are also comparable in terms of how the fuel mix changes over time. Looking at 2040, the 450 Scenario models higher total energy demand, principally a result of higher quantities of gas and biomass, but a marginally lower share of this demand taken by fossil fuels as a group. Still, the differences are relatively immaterial.

One point of interest, continued from prior *Energy Perspectives*, is that economic growth is slowed under the Rivalry scenario due to adverse climate change-related economic impacts. In the 2017 edition, GDP in 2050 is 24% higher under Renewal than Rivalry. To our knowledge no other company seeks to account for the financial impact of warming in their "greater than" 2°C scenarios, though they should consider those implications.

7 *Since the publication of the 2017 Energy Perspectives (EP), the 450 Scenario has been subsumed into a new Sustainable Development Scenario as part of the IEA's 2017 World Energy Outlook (WEO). With regards to energy demand and emissions profile, there is little distinction between the two scenarios. We would expect the next edition of the Energy Perspectives to refer to the Sustainable Development Scenario.*

8 *The emissions profiles have been indexed due to slightly different data for the same start year. Annual data points have been interpolated for all three scenarios graphed.*

Figure 2 – *Analysis of total primary energy demand by scenario*



Source: IEA, Statoil, Carbon Tracker analysis

Statoil's NPV "stress test" seeks to build more confidence in its risk analysis...

Starting in 2016, Statoil began analysing the potential impact of IEA 450 price decks upon the net present value (NPV) of its future cash flow. While we have some concerns with the structure of that analysis, it importantly demonstrates that such analysis can be done. Statoil now discloses the results of this "portfolio stress test" in its *Annual Report*, *Sustainability Report* and *Climate Roadmap*[9], which we welcome.

...but its utility is limited and construction questionable

Statoil's portfolio stress test is in reality a price sensitivity analysis, wherein the company substitutes its own commodity and carbon price assumptions with those of the *IEA World Energy Outlook*'s (WEO) scenarios.[10] We endorse the use of sensitivity analysis – Carbon Tracker published analysis in 2016 to show the results of sensitising companies' NPV to oil and gas price ranging from $40-180/barrel.[11] The most recent test results in the IEA's Sustainable Development Scenario (SDS) having a negative 13% impact on the company's NPV (as opposed to a positive 6% NPV impact in the prior year).

9 *The most recent version of the Climate Roadmap features an old iteration of the portfolio stress test.*

10 *Discussion of Statoil's NPV portfolio stress test include references to the IEA's Sustainable Development Scenario (SDS), rather than 450 Scenario. This is because Statoil's most recent Annual Report was produced after the most recent World Energy Outlook, in which the SDS was first introduced.*

11 *See https://www.carbontracker.org/reports/fossil-fuels-stress-test-paris-agreement-managed-decline/ for analysis of a comparison of the NPV between the largest oil and gas companies' potential production profile and a 2°C-compliant one. The result is that the 2°C profile could result in a materially positive NPV.*

We have some concerns as to the way in which Statoil performs the NPV test. The first discussion of the NPV sensitivity in the *2015 Sustainability Report* states that it excludes any non-sanctioned projects that return a negative NPV, the logic being that the company would not sanction such projects.[12] No similar explanation exists in the current scenario analysis, but as no changes are noted either, we assume that Statoil has taken a similar approach here.

Statoil does not claim, and does not appear, to align its oil and gas investments with a 2°C scenario. Moreover, its planning prices appear to be higher than those produced by a 2°C scenario as evidenced by the fact that the company expresses a relative decline in expected NPV when sensitizing its assets against the IEA's SDS.

In effect, assuming perfect foresight means that negative NPV projects are excluded from the overall calculation – even though such projects would appear attractive under the company's current planning outlook (and therefore have a high probability of being sanctioned). This has the effect of understating the overall potential value at risk; Statoil could improve this disclosure by identifying where those risks lie.

This is not to say that Statoil would knowingly sanction uneconomic projects, but recent oil and gas company reports are rife with examples of assets that failed to live up to expectations following a subsequent and unforeseen change in supply/demand dynamics.[13]

Analysing supply and demand fundamentals is more informative

The notable absence from each of Statoil's scenario analyses is a consideration of what portion of its potential supply would be needed to meet demand in a 2°C scenario. This would entail contrasting the actions the company would take in its current planning case with those it would take in a 2°C scenario and involve Statoil's assessment of how its own planning price decks might shift in a world of secular decline in demand for its commodities. Carbon Tracker has previously outlined this approach[14]; some oil and gas companies have begun taking an approach quite similar to ours (albeit without disclosing the results).[15]

Simply put, to be useful to investors we believe one form of scenario analysis should contain the following elements[16]:

1. A reference scenario;
2. Built upon a 2°C-compliant demand pathway;
3. Compared to a sector-wide, project-level view of supply.

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12 *https://www.statoil.com/content/dam/statoil/documents/sustainability-reports/statoil-sustainability-report-2015.pdf*

13 *http://www.ogfj.com/articles/print/volume-13/issue-9/departments/capital-perspectives/unprecedented-reserve-write-downs.html*

14 *See Appendix, https://www.carbontracker.org/reports/carbon-trackers-submission-to-the-fsb-task-force-on-climate-related-financial-disclosures/*

15 *See, for example, Oil Search's 2017 Climate Change Resilience Report - http://www.oilsearch.com/__data/assets/pdf_file/0005/18968/OSL-Climate-Change-Resilience-Report_FINAL.pdf - and Chevron's 2018 Climate Change Resilience - https://www.chevron.com/-/media/shared-media/documents/climate-change-resilience.pdf*

16 *For more information, see https://www.carbontracker.org/time-machine-climate-risk-bringing-future-forward-2%CB%9Ac-scenario-analysis/*

Statoil's shift of strategy to low-carbon but no overt 2°C alignment

Statoil is well-regarded as a leader in its peer group for attempting to shift from an "oil and gas" company to an "energy" company that embraces renewables, among other opportunities. This is embedded throughout its public disclosure and symbolised by the Board's request to change the company's name to Equinor.

While publicly supportive of the Paris Agreement, the company is less committed to clarifying whether one of its core three scenarios – Reform, Renewal, and Rivalry – constitutes greater influence in the formulation of the company's strategy. Instead, the company writes in its *Energy Perspectives* that it "refrain[s] from ascribing probabilities to the individual outlooks."

SCENARIO OUTPUTS

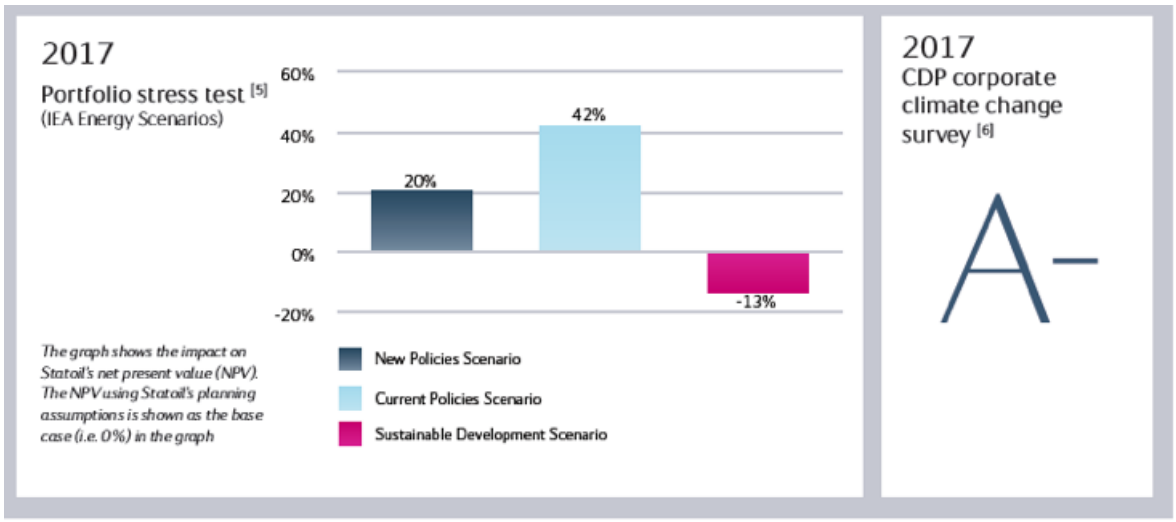
Our Methodology Paper focuses heavily on whether companies have endeavoured to identify those assets (or potential assets) that would appear economic in their business-as-usual outlook but would appear unattractive in a 2°C scenario.

Understanding the delta between the two scenarios is an essential element to evaluating the climate-related risks and the key building block for providing indicators to the market of that risk (whether expressed in terms of reserves volumes, capital expenditure, discounted future cash flows, or some other metric) as we have discussed elsewhere.[17]

Most recent NPV sensitivity shows marked change from the previous year

As discussed, to some extent Statoil does analyse the financial impacts of a 2°C scenario through its NPV sensitivity analysis against the commodity and carbon price assumptions of IEA scenarios. Figure 3 shows the results for this year's analysis: the IEA's New Policies Scenario and Current Policies Scenario yields a much higher NPV than the IEA's SDS – an uncontroversial result given the higher fossil fuel demand, and therefore price, under the former two scenarios.

Figure 3 – *Statoil's portfolio stress test*



[5] The portfolio stress test is used to assess the changes in the value of Statoil's project portfolio when replacing the internal planning assumptions for prices for oil, gas and CO_2 with those from the International Energy Agency's (IEA) energy scenarios, as laid out in their 'World Economic Outlook 2017' report
[6] Statoil's voluntary participation in the CDP corporate climate change survey forms a component of our response to the shareholder resolution arising from the 2015 annual general meeting (AGM), which included a call for Statoil to aim for attaining an A-rating in the CDP survey. The 2017 score is based on performance during 2016

Source: Statoil Annual Report 2017

17 https://www.carbontracker.org/time-machine-climate-risk-bringing-future-forward-2%CB%9Ac-scenario-analysis/

The results show that Statoil's test should not replace analysis of long-term demand destruction

However, comparing the results of this sensitivity to the previous year indicates the limits of the test. The negative 13% impact of the SDS upon Statoil's NPV compares with a positive 6% impact of the 450 Scenario from the previous year. The company claims that the difference is "largely related to significantly different oil and gas price assumptions in the IEA [SDS]". Indeed, the commodity price assumptions of the IEA SDS have been revised since the 2016 WEO: the 2040 IEA crude price has changed from $78/barrel in the 450 Scenario to $64/barrel in the SDS, while the average regional gas prices for 2040 are roughly one-fifth lower under the SDS than 450 Scenario. There is no significant year-on-year change for the assumed carbon price.

The formulation of IEA commodity prices is not entirely transparent. However, the decline in prices from 2016 to 2017 may be a lagging indicator of preceding declines in the cost of supply across the industry — certainly they are not driven by changes in expected fossil fuel demand which is curiously higher in 2017 SDS, compared to 2016 450. By contrast, Wood Mackenzie used the demand profiles from the IEA 450 scenario to produce an analysis, used by Oil Search, to project oil prices of roughly $40/bbl over the long term.

We would argue that the use of the IEA price deck is not a defensible proxy for a robust stress test as the IEA derives these prices from internal reference points for supply and demand, which may not align with Statoil's view of project costs and potential supply. For example, if the IEA assumed a lower amount of supply with higher costs that would lead it to derive a higher oil price based on the interaction of supply with 2°C demand levels; if Statoil assumed lower supply costs for the same projects, the IEA's price would be a mismatch and give an overoptimistic price scenario than had Statoil looked at the intersection of supply and demand themselves. To be clear, the importance is not about correctly predicting oil prices, but ensuring that the effects of weakening demand are reasonably reflected in the test. We would argue that focusing on the impact of diminishing demand for fossil fuel commodities is integral to any useful scenario analysis, whereas testing against prices alone may fall short in this regard by not giving an "oranges with oranges" comparison.

While we advocate the use of a recognised reference scenario such as the IEA SDS, we would encourage using the SDS and IEA B2DS underlying demand pathways as an input into Statoil's own analysis of supply and demand fundamentals to ensure consistency with its own price considerations.[18]

Statoil still immune to stranded assets, despite negative NPV stress test?

The company claims that, "despite the negative impact on NPV in the 'sustainable development scenario', we see very limited stranding of assets." How Statoil defines "stranded assets" is not clear; certain oil & gas producers have redefined this term to narrow the scope and suit their purposes. It may refer to assets being physically not produced, but the standard definition also incorporates the greater risks of value destruction relating to assets that remain in production but don't deliver adequate returns.

This statement might also be valid if by "assets" it means balance sheet items, since a negative impact on NPV will not necessarily lead to the impairment of these assets. But as we have noted before, the key risks are to future investments which are not necessarily recognised on the balance sheet now; whether Statoil is also contemplating these is less clear. But we would note that this is an important consideration for even a company like Statoil that has stated the ambition to become an energy company because it devotes so much capital to upstream development. A review of Statoil's *Annual Reports* 2014-2017 indicates that it has spent on average more than 100% of the cash flows from

18 *For example, Chevron has shown that this has been done – See Chevron analysis.*

operating activities on capital expenditures and investments, between 2012-2017.[19]

Statoil qualifies its statement of reassurance by writing that the breakeven oil price for "next generation" projects continues to be relatively low — $21/bbl (presumably these are the cash costs). Statoil has also determined that oil sands and extra heavy oil will not be considered for development in the future. We recognize that certain of Statoil's projects such as Johan Sverdrup are relatively low cost and likely not subject to stranding, and we approve of Statoil's disclosure of estimated breakevens for this and certain other key projects. But there are other higher cost projects in the potential portfolio as well — the key issue with reinvestment risk is ensuring that companies do not stretch for these. Providing a better picture of those currently undeveloped projects using full-cycle break-evens would offer more clarity on this assessment.

MARKET RISK

All things being equal, lower expected demand (as in the 2°C scenario) implies lower expected prices. Clearly other factors might drive near-term price volatility and structural elements to oil pricing, and cartel (OPEC) production constraints might structurally shift oil prices away from those suggested by pure supply and demand fundamentals over longer periods. But whichever other considerations are taken into account, we believe most companies would agree that reducing demand forecasts would likely imply reduced price expectations in the long-term.

Considering future commodity prices – what is Statoil's view?

The company provides little transparency as to the range of prices used in capital allocation decisions. Nor does it disclose a range of prices invoked under the Renewal scenario, leaving a significant gap. Statoil's commodity price assumptions used for its impairment estimates indicate an upward trajectory from current prices through 2030. Its assumption for (real) Brent crude increases from $60/barrel in 2018 to $77/barrel in 2025 to $80/barrel in 2030. Since the NPV sensitivity against IEA 450 Scenario prices was positive and negative against SDS prices, and the impairment testing prices fall between those, one might assume the impairment estimates to be a reasonable ballpark proxy management's planning prices.[20] But Statoil could clarify this explicitly, having already given the above hints.

CARBON PRICES

Many companies have used carbon prices in a variety of ways to prepare for a low carbon transition for both existing and planned operations. For scenario modelling, this takes the form of a price per tonne/CO_2 (or CO_2e) that serves as a proxy for a range of potential future policy outcomes. This is a simple but easily misused tool for modelling an energy transition and investors should be wary of this. We have detailed the ways in which carbon prices can provide false reassurance in our Methodology Paper[21].

19 *Our calculation is based on dividing "capital expenditures and investments" by "cash flows from operating activities" for the period referenced.*

20 *Under SDS, Brent crude is $72/barrel in 2025; under 450 Scenario, it is $85/barrel in 2030.*

21 *https://www.carbontracker.org/wp-content/uploads/2018/05/Intro_Methodology_Designed1.pdf*

Carbon prices are often limited by geography or emissions scope (i.e., only operational emissions) limiting their utility as a proxy for a 2°C scenario. Indeed, many do not approximate that outcome. Seemingly commonplace carbon prices (i.e., $40/tonne CO_2) may add only a $1-$2 increase to upstream costs on average, if completely absorbed by the company—an insignificant number and well within the range of price sensitivities companies already examine.

In the context of an integrated assessment model, carbon prices may be useful in identifying how policy costs imposed on a polluting fuel can trigger tipping points when one energy source becomes more economic than another (and under a least-cost approach, result in the insurgent energy source taking market share from the now costlier incumbent). Understanding whether a given carbon price might hit a tipping point, however, requires knowledge of the inputs and assumptions in the model and cannot be derived from the carbon price alone.

Statoil's use of a carbon price: does it materially impact its business?

Statoil's carbon price assumptions are clear: a minimum price of $50/t$CO_2$ for all projects after 2020, except for those in regions where a higher price is in effect, in which case that higher prices is taken. We welcome Statoil's transparency that these prices are used in the company's investment processes. However, we believe that the impact upon the per barrel costs for the company falls within the range of volatility that would be considered under normal market conditions. Moreover, it is unclear as to whether Statoil assumes the carbon price will be absorbed by the company or passed onto the consumer, further questioning the extent to which it presents financial "stress" in the way that the unfolding energy transition might.

CONCLUSION

Statoil's scenario work compares favourably to its peers, likely related to its stated ambition to become an "energy" company as opposed to simply an "oil and gas" company.

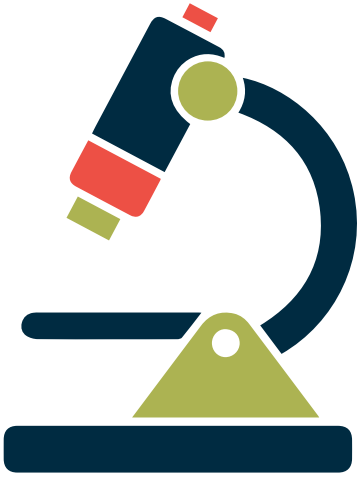
Statoil seems to welcome a well below 2°C scenario but does not yet provide one; it should consider utilizing the IEA's B2DS as a benchmark that might aid investors perform a comparison with other companies.

Perhaps of greater importance, Statoil's scenario modelling should not just borrow the IEA's price deck, but instead borrow the demand profile to build a price deck focused on supply and demand fundamentals, while also being consistent with the company's view of the global costs of supply.
It's use of NPV analysis to evaluate potential financial impact in a 2C scenario demonstrates what companies are capable of disclosing, but would be improved if it did not implicitly assume perfect foresight, i.e., that the company would not sanction a project that subsequently turned out to have a negative NPV; investors need a demonstration that the company has the risks in hand, not just an assurance that the company will "see it coming". This can be achieved by identifying and disclosing which assets are potentially the riskiest, and how they feature in future development plans.

TOTAL

Under the Microscope:

Are companies' climate scenario analyses meeting investors' requirements?



KEY TAKEAWAYS

1. Total is arguably the only major oil and gas company to disclose that it places a 2°C target at the heart of its strategy.

2. Without seriously assessing the implications of a scenario consistent with the ambition to limit warming to "well-below 2°C", the company might still be exposed to falling demand for its fossil fuel products over the long-term.

3. Total provides strong assurance that its proven reserves are mostly resilient to economic stranding but provides limited rationale for how it arrives at this conclusion. It ignores both the potential for the value of these reserves to be lost and the reinvestment of the company's cash into developing new reserves.

Carbon Tracker Initiative

May 2018

SUMMARY

The following analysis seeks to assist investors with their navigating of companies' climate-related disclosure.

Using our proprietary framework, we scrutinise companies' disclosure according to four key themes: 2°C scenario modelling, 2°C scenario outputs, market/price risk and the use of carbon prices.

The table below brings together multiple criteria to provide investors with an indication of the company's disclosure, with red signifying the poorest disclosure and green the best, in relative terms.

Table 1 – *Summary of companies' relative performance in their climate scenario analyses*

poor | moderate | high

	BP	Chevron	Conoco Phillips	ENI	Exxon Mobil	Royal Dutch Shell	Statoil	Total
Scenario Modelling								
Scenario Outputs								
Market / Price Risk								
Carbon Pricing								

Source: Carbon Tracker analysis

QUESTIONS FOR MANAGEMENT

1. Total indicates it will prioritise low-cost projects. Can it estimate the volumes of the company's potential supply that sit outside that prioritisation?

2. What are the potential financial implications for Total's assets that it has not yet sanctioned as it increases its production of renewable energy and strives to meet its portfolio carbon intensity target?

3. Has the company considered expected prices in a "well below 2°C" commodity demand scenario, and if so, what impact the use of those prices would have if used in the preparation of the financial statements?

INTRODUCTION

French company, Total (hereinafter "the company"), is the world's fourth largest oil and gas major with both upstream and downstream businesses. It is viewed as a leader among its peers in its consideration of both the company's impact upon the climate and of the potential business impacts of the energy transition to a market aligned with the global warming goals of the Paris Agreement.

The company has made efforts to embed climate change into its internal and external practices: the creation of a "Strategy and Climate Division" seeks to ensure that climate change-related issues are incorporated into the company's overall strategy. Further, it has published two editions of the report *Integrating Climate Into Our Strategy* (we expect the third edition to be released later this year) and, although Shell has similarly presented a method for lowering the carbon intensity of its production in line with 2°C, it is the only oil and gas major to put the 2°C target at the heart of its strategy.

Since Total has chosen to align its strategy with 2°C, the kind of scenario analysis that we have written about in our other company analyses[1] (which typically examines the implications of the gap between a company's existing strategy and one consistent with 2°C) does not fully apply here. This is not to say that there is no room for improvement. Investors must scrutinise the quality of the company's assurance that it is resilient to market volatility presented by the energy transition. Total may be aligning with 2°C on a carbon emissions basis, but investors will also want to be comfortable that they are aligned on a cost-basis; that is, that the oil and gas projects that they continue to own will be competitive in a lower demand world.

Below, we review Total's *Registration Document 2017*[2] and *Integrating Climate Into Our Strategy 2017*[3] focusing on four critical elements:

1. How the company structures its 2°C scenario analysis, if provided;
2. The outputs of that analysis, and whether they are useful to investors;
3. Whether it has evaluated the market risk (i.e., price implications) from secular demand destruction for its commodities, as suggested by most 2°C scenarios; and
4. Whether it has used carbon prices in a robust and defensible way as a proxy for a 2°C scenario.

For additional details on our methodology and approach, please see our paper[4] (hereinafter, "Methodology Paper").

1 *https://www.carbontracker.org/reports/under-the-microscope/*

2 *https://www.total.com/sites/default/files/atoms/files/ddr2017-va-web.pdf. This document includes Total's Annual Report 2017.*

3 *https://www.total.com/sites/default/files/atoms/files/integrating_climate_into_our_strategy_eng.pdf*

4 *https://www.carbontracker.org/reports/under-the-microscope/*

Total should avoid complacency despite its adoption of 2°C as its "baseline"

Upfront in its *Registration Document* and reiterated in the Chief Executive's foreword to *Integrating Climate Into Our Strategy* (*Integrating Climate*), Total makes clear that its strategy to become the "responsible energy major" is built upon a 2°C scenario as its baseline. Specifically, Total adopts the 2°C scenario taken from the International Energy Agency's (IEA) World Energy Outlook, currently the "Sustainable Development Scenario" (SDS).

Previous editions of the Registration Document – and the current edition of Integrating Climate, which is yet to be updated in 2018 – referred to Total's more general consideration of the IEA's "2°C scenarios" (2DS). This includes not only the 2°C scenario produced in the World Energy Outlook, but also the 2°C scenario produced in another annual IEA publication, *Energy Technology Perspectives* – the Two Degrees Scenario (2DS). As with the SDS, the 2DS models a 50% probability of keeping energy sector emissions to 2°C.

This tilt towards a single scenario rather than using both of the IEA's 2°C scenarios might not seem too significant. But given that Total has justified increasing the proportion of gas in its portfolio on the basis of the IEA's SDS, it is worth noting that absolute demand for gas under the IEA's 2DS peaks earlier and declines at a greater rate over the long term than it does under the SDS.

As the charts and tables below show, arguably more significant than Total's selection of the IEA's SDS, is its absent consideration of a scenario consistent with warming "well below 2°C" and thus more in line with the Paris Agreement. In the IEA's "Beyond Two Degrees Scenario" (B2DS), which is consistent with a 50% chance of meeting 1.75°C, demand for oil and gas, in absolute terms, experiences near-term and long-term decline. In 2040, demand for oil and gas in the B2DS is approximately one-fifth and one-third lower, respectively, than the SDS.

Simply put, despite Total's welcome decision to place 2°C at the centre of its long-term strategy, the company should avoid by considering how energy markets might further shift away from oil and gas in coming years. The company and its investors should view the IEA's SDS as minimally complying with the Paris Agreement's ambition.

Figure 1 – *Waterfall chart for oil and gas demand under IEA SDS and B2DS in 2025*

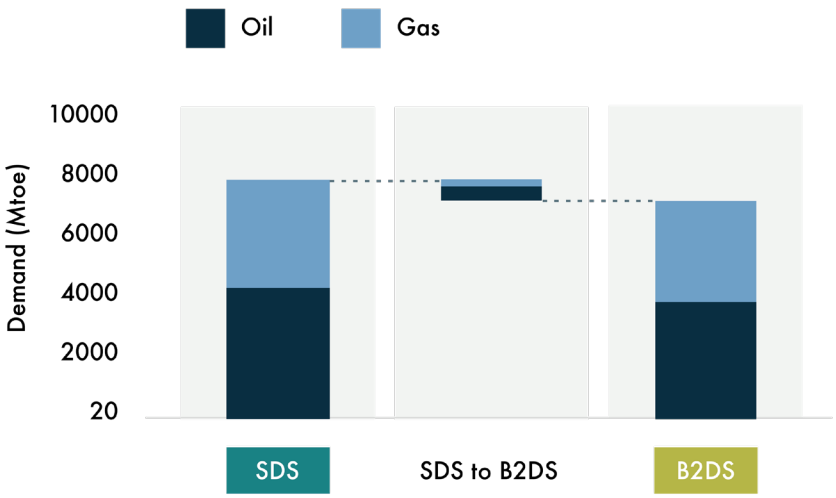


Table 2 – *Oil and gas demand in the B2DS relative to SDS in 2025.*

	2025 demand	
	SDS	B2DS
Oil	4247 mtoe	-11%
Gas	3397 mtoe	-6%

Figure 2 – *Waterfall chart for oil and gas demand under IEA SDS and B2DS in 2030*

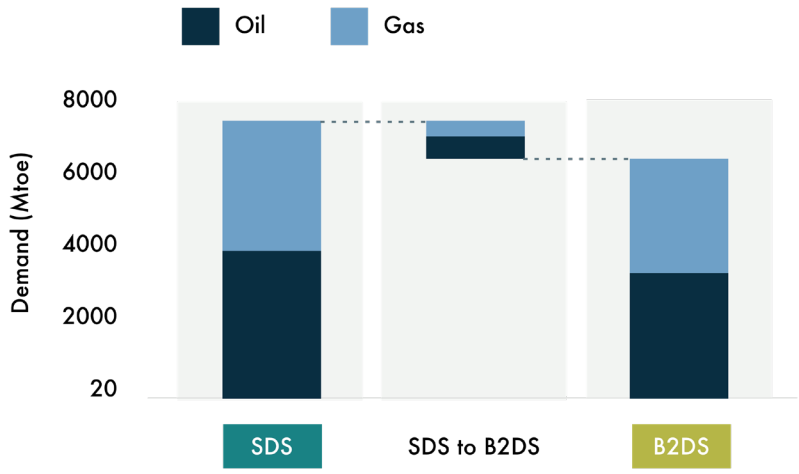


Table 3 – *Oil and gas demand in the B2DS relative to SDS in 2030*

	2030 demand	
	SDS	B2DS
Oil	3396 mtoe	-15%
Gas	3510 mtoe	-12%

Figure 3 – *Waterfall chart for oil and gas demand under IEA SDS and B2DS in 2040*

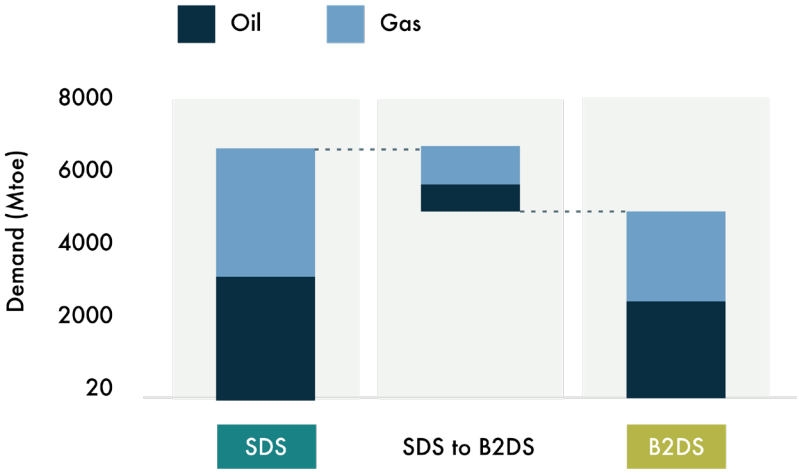


Table 4 – *Oil and gas demand in the B2DS relative to SDS in 2040*

	2040 demand	
	SDS	B2DS
Oil	3306 mtoe	-21%
Gas	3458 mtoe	-31%

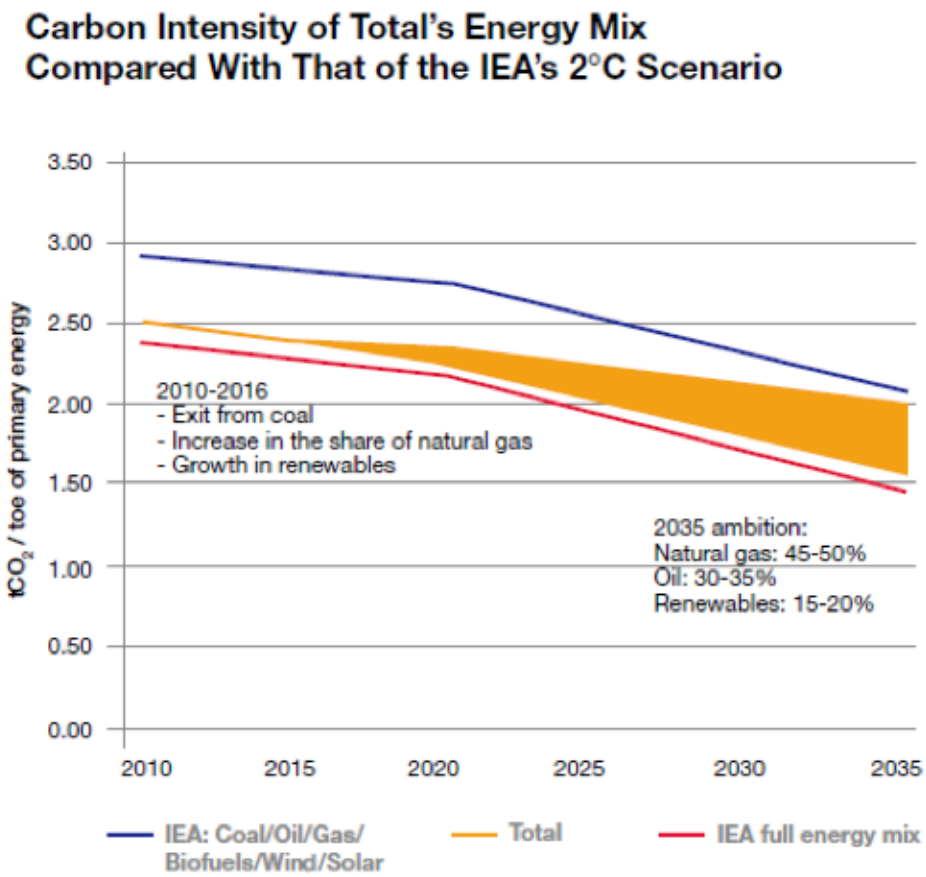
Source: IEA; Carbon Tracker analysis

Total's two-part consideration of 2°C

Total applies the 2°C scenario in two ways. The first is an assessment of the long-term trends indicated by the 2°C scenario compared to a continuation of "business-as-usual". These trends include a greater use of electricity and the vast development of low-carbon alternative energies. As a result, the company appears to be cognisant of the high-level risks and opportunities presented by the low-carbon energy transition.

The second application of the 2°C scenario is the setting of targets for the carbon intensity of the company's production over the next two decades (Figure 4). Here, Total compares the carbon intensity of its energy mix with the changes envisioned under the IEA's SDS. This is a welcome addition to carbon intensity targets produced by fossil fuel companies, which have typically focused on reducing the emissions attached to their operations only, rather than their entire product mix. We assume that Total's carbon intensity target includes the company's scope 3 emissions, as is the case with Shell. It would be useful for that to be clarified as well as whether this target includes only carbon dioxide – Shell's carbon intensity target is expressed in CO_2-equivalent terms. Finally, since Total's 2035 reduction target appears not too dissimilar to Shell's – approximately 20% at the upper-end of the range – greater transparency regarding the methodology for calculating these targets would be useful.

Figure 3 – *Total's targets for reducing the carbon intensity of its portfolio in line with 2°C*



The bottom curve shows the trajectory of the global energy mix as a whole.

The top curve shows the trajectory for energies that are comparable to our business (coal[1], oil, natural gas, solar, wind and biofuels).

Our 20-year ambition is to gradually reduce the carbon intensity of the energy we produce and deliver to customers, through continued growth in natural gas and renewables.

Source: Total

Standardised scenario analysis can demonstrate relative resilience

It is clear from the analysis above that Total's placement of the 2°C scenario at the heart of its business strategy marks it out from its peers. However, there is still a gap - Total's disclosures do not include an analysis of the potential impacts on its existing projects and investments in a 2°C scenario.

The company writes that it "believes that the quantification of impacts of different scenarios may not be relevant to investors as assumptions made by different companies may strongly diverge."[5] We agree with Total's inference that quantified impacts would be most useful for investors if they are comparable across companies and we believe that such comparability can be best delivered by use of a standardised reference point. We believe that companies like Total, which are seeking to compete within a climate-resilient carbon budget, would encourage the standardization of such disclosures to demonstrate their competitive position.

To be useful to investors we believe scenario analysis should contain the following elements[6]:

1. A reference scenario;
2. Built upon a 2°C-compliant demand pathway;
3. Compared to a sector-wide, project-level view of supply.

As we detail in our Methodology Paper, this approach permits both the consideration of project-level impacts and a comparability across peer companies.

SCENARIO OUTPUTS

Our Methodology Paper focuses heavily on whether companies have endeavoured to identify those assets (or potential assets) that would appear economic in their business-as-usual outlook but would appear unattractive in a 2°C scenario.

Understanding the delta between the two scenarios is an essential element to evaluating the climate-related risks and the key building block for providing indicators to the market of that risk (whether expressed in terms of reserves volumes, capital expenditure, discounted future cash flows, or some other metric) as we have discussed elsewhere.[7]

Carbon intensity goal points to change if 2°C alignment achieved

Total offers no substantive disclosure or assurance that it has assessed project-level resilience as it transitions from its historic strategy, which we assume from Figure 4 is not 2°C-aligned, to its desired long-term destination. This is surprising, especially since the company publicly acknowledges that the restricted carbon budget implied by a 2°C scenario will place even greater emphasis on the relative economic competitiveness of energy companies' projects.

Total's portfolio carbon intensity goals imply significant change over the next two decades. Appreciating the financial and business implications of this change is difficult as Total's disclosure provides scant detail.

Its *Registration Document* indicates that natural gas was 48% of overall production in 2017, with plans to increase this share over the long-term. We presume that this reconciles with the stated target for gas

5 *Registration Document, p.189.*

6 *For more information, see https://www.carbontracker.org/time-machine-climate-risk-bringing-future-forward-2%CB%9Ac-scenario-analysis/*

7 *https://www.carbontracker.org/time-machine-climate-risk-bringing-future-forward-2°c-scenario-analysis/*

to make up 45-50% of the company's energy mix in 2035. Regardless, something in Total's portfolio must relent in the long-term; the continued presence of gas implies that there must be changes in the oil portfolio (though, in theory, an intensity target would permit continued developments if the company grows lower carbon forms of energy more quickly).

What the intensity targets do not provide is a sense of how it will impact project sanction, particularly with respect to oil investments. An important question is: what are the financial implications for Total's non-sanctioned fossil fuel assets as the company increases the share of its renewables assets while constraining the carbon intensity of its production to within 2°C?

Current value of "reserves" does not render Total's "resources" safe as its portfolio changes

Total briefly discusses this concern about long-term value resilience. It claims that "the average reserve life of its proved and probable reserves is approximately 20 years and the discounted value of proved and probable reserves with a reserves life of more than 20 years is less than 10% of the discounted value of the Group's upstream assets."[8]

From this, one might infer that 90% of the company's discounted present value is expected to be realised over the next 20 years. First, as Total's oil sands project Fort Hills demonstrated, the fact that current assets are clarified as reserves does not mean that the value they represent is safe. Second, this 20-year horizon covers a period of time during which the company plans to significantly alter the mix of its portfolio. Unless the company plans to entirely invest the cash from producing these reserves into its alternative energies, or return it to shareholders, the company will reinvest at least some of it into developing its "resource" base.

These resources might currently remain off-balance sheet, but they possess economic value. As the company moves through time and invests more in these potential future prospects, the risk of wasting capital increases. The cashflows from reserves are therefore only "safe" to the extent that they are distributed to shareholders. We estimate that Total has invested, on average, more than 90% of its cash flows from operating activities over the last five years on exploration and production capex and organic investments in the upstream.[9]

We appreciate that Total recognises this as a critical risk and that diversifying its portfolio is one method to mitigate it. The company links its decisions to reduce its exposure to high-cost Canadian oil sands and divest entirely from coal to its strategic environmental ambitions, although prevailing market conditions no doubt made those decisions easier. For investors, understanding how the strategy will apply, in practice, to the reinvestment of capital and the oil project sanction process is a critical cross-check of Total's strategy.

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8 *Registration Document, p.191.*

9 *Figures used for the calculation were taken from Total's Registration Document. Cash flows from operating activities have been taken from the Consolidated Statement of Cash Flows, exploration and production capital expenditure and organic investments have been taken from Total's Business Overview (Exploration & Production segment).*

MARKET RISK

All things being equal, lower expected demand (as in the 2°C scenario) implies lower expected prices. Clearly other factors might drive near-term price volatility and structural elements to oil pricing, and cartel (OPEC) production constraints might structurally shift oil prices towards a monopoly price over longer periods. But whichever other considerations are taken into account, we believe most companies would agree that reducing demand forecasts would likely imply reduced price expectations in the long-term.

Considering future commodity prices – what is Total's view?

Total does not explicitly disclose its commodity price assumptions used for planning. However, the company claims that it derives its oil and gas price assumptions (used for impairment testing) by taking a view of energy demand from the IEA's *World Energy Outlook* scenarios and comparing this with a view of its own supply to develop price forecasts. We endorse the consideration of prices derived in this way as opposed to simply adopting third-party price decks, as other companies have done. However, we note that the prices Total uses in its impairment testing, with Brent crude prices rising from $50/bbl in 2017 to $80/bbl in 2021 and inflating from 2023 onwards, do not seem to reflect the impact that declining demand (consistent with 2°C) would have on commodity prices.

For gas, it assumes an NBP price (Europe) of $5/mmBtu in 2018 and $7/mmBtu in 2020, which is inflated after 2023.

Total accepts carbon budget could squeeze cost competition and considers 2°C demand to arrive at a price

Total does tacitly acknowledge that a constrained carbon budget will put greater emphasis on project cost competitiveness. As a result, the company says that it prioritises "selecting and developing hydrocarbon projects based on their economic merit order, which incorporates their resistance to low price scenarios".[10] However, it is not clear what Total might classify as a "low price" or how far up the economic merit order Total's policy extends.

CARBON PRICES

Many companies have used carbon prices in a variety of ways to prepare for a low carbon transition for both existing and planned operations. For scenario modelling, this takes the form of a price per tonne/CO_2 (or CO_2e) that serves as a proxy for a range of potential future policy outcomes. This is a simple but easily misused tool for modelling an energy transition and investors should be wary of this. We have detailed the ways in which carbon prices can provide false reassurance in our Methodology Paper[11].

Carbon prices are often limited by geography or emissions scope (i.e., only operational emissions) limiting their utility as a proxy for a 2°C scenario. Indeed, many do not approximate that outcome. Seemingly commonplace carbon prices (i.e., $40/tonne CO_2) may add only a $1-$2 increase to upstream costs on average, if completely absorbed by the company — an insignificant number and well within the range of price sensitivities companies already examine.

10 *Registration Document, p.186.*

11 *https://www.carbontracker.org/reports/under-the-microscope/*

In the context of an integrated assessment model, carbon prices may be useful in identifying how policy costs imposed on a polluting fuel can trigger tipping points when one energy source becomes more economic than another (and under a least-cost approach, result in the insurgent energy source taking market share from the now costlier incumbent). Understanding whether a given carbon price might hit a tipping point, however, requires knowledge of the inputs and assumptions in the model and cannot be derived from the carbon price alone.

Total considers and applies carbon prices in relation to its business activity in two ways.

Approach 1: Impact on new investments

In assessing whether or not to proceed with new investments, Total either examines a long-term carbon price of \$30/tCO_2 to \$40/tCO_2 (depending on the price of Brent crude), or the actual CO_2 price of a given country if that is higher. This is fairly consistently done by all oil companies we have evaluated.

However, Total could provide further detail that would assist in understanding whether these carbon prices should be viewed as a reasonable way to ensure the sustainability of the company's projects over the long-term relative to climate-related concerns. For example, it is unclear to what these carbon prices apply – scope 1, 2, or 3 emissions? Our estimates suggest that if the prices apply to scopes 1 and 2 emissions, the price impact per barrel would be minimal and within the range considered expected under price volatility. If scope 3 is includes, the impact could be between 7-10 times greater.

Approach 2: Impact on the company's portfolio

Total assesses the resilience of its overall portfolio of assets against globally-applied, long-term carbon prices and regional changes in carbon prices.

The company claims that a \$40/tCO_2 price applied worldwide would have a negative impact of 5% upon the discounted present value of the company's upstream and downstream assets. Further, the company sensitises this test to \$60/barrel and \$80/barrel Brent prices compared to a reference scenario that incorporates existing regional carbon prices.

Additionally, Total considers the possible implications of the changing European carbon market, revealing that the financial risks related to this reforming market will only increase in the future. Total provides its estimates of future prices of emissions allowances of ~€15/tCO_2 in 2020, rising to at least €30/tCO_2 during the period 2021-2030. We would caution that these estimates may be viewed as conservative. Carbon Tracker's analysis suggests that Total's 2020 estimated price could be reached within the next year.[12]

Considering 2°C energy demand, but not a 2°C carbon price?

As noted above, Total's approach of examining the potential demand implications of a 2°C pathway and its integration into the company's core strategy is more progressive than most of its peers. It is surprising then that the company appears to avoid assessing the economic viability of its assets and future investments against what it considers a proxy carbon price for a 2°C trajectory. In addition, its chosen carbon price as applied - \$40/tCO_2 – is unlikely to reflect that trajectory. Under the IEA's SDS, 2040 carbon prices range between \$125-140/tCO_2, depending on the region. One might query what the possible impact on Total's discounted present value might be if its assumed carbon price was three times higher.

12 *https://www.carbontracker.org/reports/carbon-clampdown/.*

CONCLUSION

Relative to many of its peer companies, Total's overall climate scenario analysis and related disclosure is good. To our knowledge, it is the first of the oil and gas majors to embed the 2°C warming target at the heart of its strategy, though it is not the only company to adopt a 2°C target to lower the carbon intensity of its production.

However, despite Total publicly recognising that a smaller carbon budget will increase the emphasis on companies producing low-cost supply, it does little to reassure investors that its current supply is resilient to an unexpected erosion of demand for oil and gas. Its focus on the value embedded in its proved reserves ignores both the potential for that value to be lost (as its impaired assets demonstrate) and the reinvesting of capital to develop oil and gas "resources" into reserves.

Against this background, we consider Total's view, that investors would not be helped by companies quantifying the potential impacts of scenario analysis, to be misplaced. Some companies are beginning to show that using a cost curve approach to assess dynamics between supply and demand can be simple, and outputs can be comparable and useful. Among all of Total's promising disclosure, understanding how its existing and future supply of oil and gas might be affected by scenarios consistent with the ambition of the Paris Agreement to limit global warming to "well-below 2°C" is likely to remain at the centre of investors' concerns.

Authors:
Sebastian Ljungwaldh, Energy Analyst, Carbon Tracker Initiative - sljungwaldh@carbontracker.org
Tom Drew, Research and Policy Associate, Carbon Tracker Initiative - tdrew@carbontracker.org
Robert Schuwerk, Executive Director North America, Carbon Tracker Initiative - rschuwerk@carbontracker.org
This report was also reviewed by colleagues: Andrew Grant and Kate Woolerton. Design and typeset: Margherita Gagliardi

About Carbon Tracker
Carbon Tracker is an independent financial think tank that carries out in-depth analysis on the impact of the energy transition on capital markets and the potential investment in high-cost, carbon-intensive fossil fuels.

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