

## A Time Machine for Climate Risk: bringing the future forward with 2°C scenario analysis

### “Breaking the Tragedy of the Horizon”

It has been two years since the Bank of England’s Governor, Mark Carney, cautioned London’s insurance industry and the world’s capital markets concerning the “catastrophic impacts of climate change [that] will be felt beyond the traditional horizons of most actors”.<sup>1</sup>

Since then, Carney’s message has been echoed by a string of financial regulators. Under his chairmanship, the Financial Stability Board established a Task Force on Climate-related Financial Disclosures (hereafter Task Force), which scrutinised the ways in which the adverse impacts from climate change might ripple across sectors to become “systemic.”

The Task Force concluded that a key forward-looking tool is **scenario analysis** and recommended that companies analyse the potential business impacts from a **reference scenario** that results in a global average warming of 2°C or lower.

Companies’ scenario analyses are now entering the market and a [two-day conference](#) on the subject hosted last week by the Bank of England and the Task Force indicates the significance of issue for the financial community. Here, we explore how the use of 2°C scenario analysis by fossil fuel companies can be made useful for investors and regulators.

### How can 2°C scenario analysis meet what the market requires?

Climate change presents significant market risks and scenario analysis allows companies to glimpse into the future, enabling it to measure its resilience against countless possibilities. Any long-term forecast is likely to be wrong in meaningful ways, so companies should – and some do – consider a range of scenarios, a valuable exercise in risk management.

Still, investors lack a good understanding of how companies’ strategies are robust to these risks. This is no surprise: advanced scenario analysis of the kind performed in bank stress testing is complex; climate-related scenario analysis is novel and will take time to develop. Furthermore, existing scenario analyses lack detail, transparency, and, most importantly, a standard framework for comparability.

All things considered, **comparability** is the lynchpin for decision-useful capital markets disclosure. Investors interested in managing the risk by shifting sector allocations or tilting indexed portfolios need a common yardstick by which they can measure and price the relative exposure of individual companies. Such market pricing of the risk is critical for passive investors, too, who cannot so easily exit individual companies.

A key question then, as Carney has posed, is “what form these scenarios should take”<sup>2</sup>? We see value in starting simply, not allowing the perfect to become the enemy of the good.

Our framework begins with the 2°C carbon budget, codified by the Paris Agreement as the upper-boundary of countries’ commitments to limit global warming. The modelling community has taken the 2°C carbon budget and calculated how it might be compatible with the future provision of energy. There are many models depicting different pathways to achieving a 2°C outcome.

<sup>1</sup> <http://www.bankofengland.co.uk/publications/Documents/speeches/2015/speech844.pdf>

<sup>2</sup> <http://www.bankofengland.co.uk/publications/Documents/speeches/2016/speech923.pdf>

While an abundance of choice isn't necessarily a bad thing, investors want to know how a company stacks up against its peers. Comparability requires a common methodology and a single **reference point**. Indeed, for energy companies we believe it requires these 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.

This is not a case of "either/or". A company can choose to run a reference scenario alongside any other scenario. Indeed, an explanation of how the company views the world relative to the reference scenario can form an important part of its narrative disclosure.

## Putting demand at the heart of scenario analysis

To understand the impacts of a 2°C scenario, it must be placed in the context of a "business as usual" (BAU) scenario. By this, we mean the result of modelling future oil, gas and coal demand that is expected should existing policies remain and announced policies come into effect. The 2°C scenario differs from this in that it imposes a top-down constraint and reduces the quantity of oil, gas and coal demand required to meet the 2°C carbon budget.

Figure 1, taken from the International Energy Agency's (IEA) analysis, shows the result. The difference between the IEA's New Policies Scenario (a BAU pathway) and its 450 Scenario (a 2°C-consistent pathway) indicates material reduction in oil, gas and coal demand. By 2040, the 450 Scenario contains 30%, 23% and 52% less demand for oil, gas and coal, respectively, than the New Policies Scenario.

We can debate the relative merits of different scenarios, but few offer sufficient credibility and detail. The IEA's 450 Scenario satisfies these criteria and is one we have applied in our 2 Degrees of Separation scenario analysis, produced with UNPRI, to enable comparison across companies.

In our view, the most important output from scenario analysis for the investor or regulator trying to look across a portfolio or market is an understanding of first, how sector-wide erosion of demand might impact the company and second, how aligned or resilient its strategy is to this scenario?

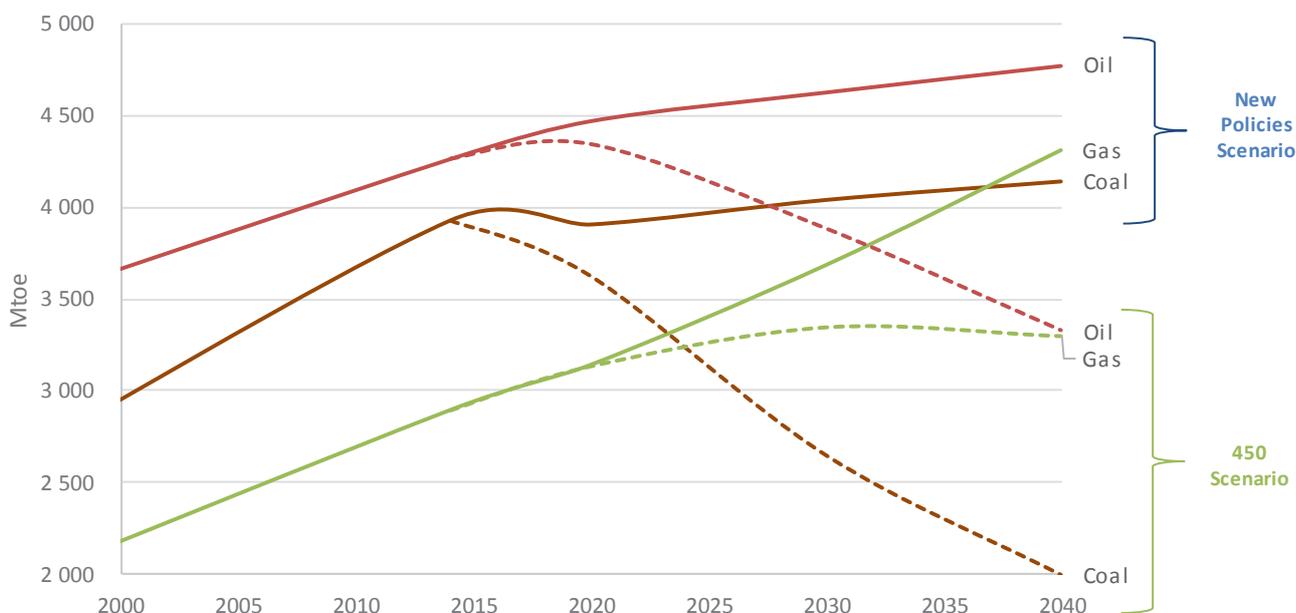


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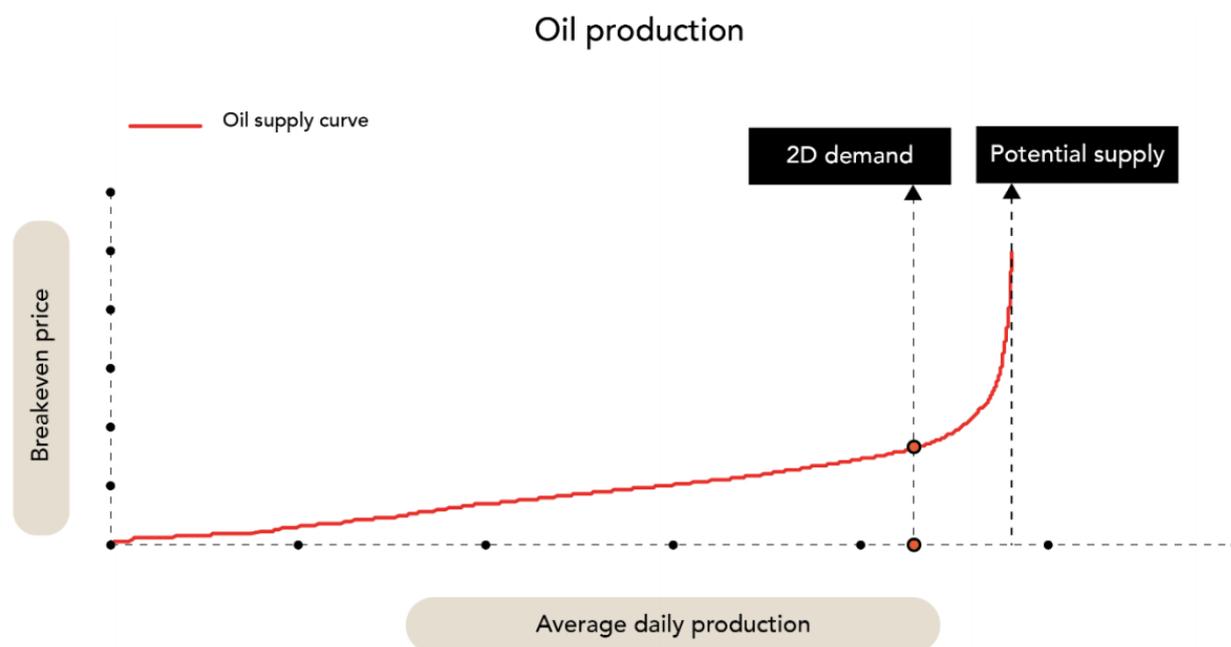
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## 2°C at the company-level

The crux of our scenario analysis is a comparison of this 2°C demand pathway with a forward-looking view of supply. Assuming the lowest cost supply will be consumed first, we can build a picture of those projects that are needed to meet 2°C demand and those that are surplus (see Figure 2).

Of course, associated with each project is an investment cost. We can aggregate the capital expenditures for projects needed and not needed to gauge the extent to which a company's spending plans align with a 2°C scenario. This is one metric and does not encapsulate a company's entire exposure or resilience to climate change. But it is a starting point, and indicator, from which those projects that are needed to meet 2°C demand and those that are surplus (see Figure 2).

Figure 2 Example supply-demand cost curve to compare supply. Source: Carbon Tracker



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## So, what does this achieve?

### 1. Linking credible demand projections to future business prospects.

The adverse effects of climate change will undoubtedly trickle down to companies through more than one channel. However, each of these is really a tributary leading to impact on demand. Therefore, focusing on demand impacts, however achieved, captures how all the various policy and technology developments may impact companies. Aligning the demand target with that of the Paris Agreement can also serve as a useful proxy for the stated objective of the world's governments.

## 2. A peek into a company's financials.

The Task Force identified that climate change-related issues will penetrate the core financial considerations of a company. Our focus on capital expenditure provides one indication of how exposed the company is to relevant risks and opportunities. Is the company too heavily exposed to high-cost, surplus projects, or is it maximizing value by focusing on low-cost options? Our cost-curve approach, which allows for aggregating project-level spending by company, can provide this insight.

## 3. A point of reference.

Understanding risk across a sector requires comparability and consistency of results. This is delivered by some level of standardisation in the analytical approach. If companies are transparent in their key modelling assumptions, the simplicity of scenario analysis as described above can at least inform the market of how companies are relatively placed. The use of a quantitative metric provides a clear measure for comparison. Companies may, if they choose, disclose other scenarios around that.

## 4. Transcending sectors

Aside from comparing within sectors, it is also insightful to compare the trajectories of sectors on different sides of the demand-supply nexus. For example, is the power sector indicating the same level of demand for thermal coal going forward as coal mining companies are expecting? Are auto manufacturers seeing the same rate of electric vehicle take up as oil companies?

## 5. Beginning and deepening a dialogue with investors.

For passive investors, climate change poses economy-wide challenges and a threat of "unhedgeable risk". Investors' dialogue with companies on the extent to which their forward-looking strategy is inclusive of these risks is rapidly picking up speed, but remains in its infancy. Our report, 2 Degrees of Separation, produced in collaboration with UNPRI and five European pension funds, has confirmed a desire for comparison and clarity of conclusion (see Figure 3). The process we have outlined provides a point from which a company's engagement can begin and move forward.

## Conclusion

The transition is underway and accelerating. Against this background, scenario analysis is a useful tool for investors and regulators to assess how companies are addressing the transition and the risk of shorter-term horizons. It can, as Carney argued, "act as a time machine, shining a light not just on today's risks, but on those that may otherwise lurk in the darkness for years to come."

Company	Country of headquarters	% of upstream capex outside 2D budget (% band)	2017-2035 carbon budget (GtCO <sub>2</sub> )	Potential CO <sub>2</sub> outside 2D carbon budget (GtCO <sub>2</sub> )
Southwestern Energy	United States	60% - 70%	1.0	0.6
Apache	United States	60% - 70%	1.1	1.0
Cabot Oil and Gas	United States	50% - 60%	0.6	0.4
Energen	United States	50% - 60%	0.2	0.1
Murphy Oil	United States	50% - 60%	0.4	0.3
Concho Resources	United States	50% - 60%	0.4	0.3
Imperial Oil (Public traded part)	Canada	50% - 60%	0.4	0.2
Vermilion Energy	Canada	50% - 60%	0.1	0.1
Oil Search	Papua New Guinea	50% - 60%	0.2	0.1
Encana	Canada	50% - 60%	1.0	0.6
Tatneft	Russia	0% - 10%	1.1	0.0
Range Resources	United States	0% - 10%	2.0	0.0
Saudi Aramco	Saudi Arabia	0% - 10%	30.2	0.4
Novatek	Russia	0% - 10%	2.8	0.1
Arc Resources	Canada	0% - 10%	0.5	0.0
Gulfport Energy	United States	0% - 10%	0.8	0.0
Tourmaline Oil	Canada	0% - 10%	1.0	0.0
Diamondback Energy	United States	0% - 10%	0.4	0.0
Antero Resources	United States	0% - 10%	1.3	0.0
Seven Generations Energy	Canada	0% - 10%	0.7	0.0

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For more information please visit [www.carbontracker.org](http://www.carbontracker.org)