

Carbon Tracker Initiative: comments on the FSB-Task Force's Phase II Recommendations

Given the uncertainties around climate, not everyone will agree on the timing or scale of [market] adjustment required. The right information allows sceptics and evangelists alike to back their convictions with their capital. A market in transition to a two-degree world can be built. It will reveal how the valuations of companies that produce and use fossil fuels might change over time.

--Mark Carney (at the 2016 Arthur Burns Memorial Lecture, Berlin)¹

Summary

The Task Force has taken a significant step forward in making climate-related financial risk more transparent; we focus on scenario analysis at the most promising recommendation. Investors are the primary audience for disclosure and they require comparability and consistency.

The Task Force recommends companies consider a 2°C scenario analysis; this is critical but without a reference scenario may not go far enough. Different 2°C pathways can be constructed, making comparisons difficult. A reference scenario would focus comparisons on the financial and business implications rather than the scenario modelling assumptions.

We believe that Task Force should recommend the use of a specific demand profile such as the IEA's 450 or 2DS scenario that can serve as a common yardstick. Since consistency and comparability should be the guiding lights, choosing one is more important than which one is chosen.

The value of scenario-based disclosure is that it can illuminate a company's relative position vis-à-vis the climate target and competitors. Utilizing a reference scenario would also reduce the reporting burden for preparers of disclosure.

Existing disclosure requirements often employ even arbitrary reference points to provide a uniform approach and comparability of outputs. In light of this, the Task Force should not be dissuaded from recommending a specific reference scenario.

Sensitivity analysis can illuminate the potential impact of a single variable upon company cash flows. It can also be produced immediately, without the need for scenario selection or development. The Task Force should put greater emphasis on this item in the final report.

¹ <http://www.bankofengland.co.uk/publications/Documents/speeches/2016/speech923.pdf>

Discussion

The Task Force recommendations aim to improve the disclosure of climate-related financial risks

While much climate-related information has been thrust into the public domain, financial markets participants have suffered from a lack of sufficient useful, comparable information to price future outcomes into current decision-making.

The Task Force's Phase II Report (Report) represents the most significant step taken yet towards translating the evident and identifiable risks of climate change into financial risks that can then be internalized by markets.

The recommendations recognize, implicitly, the speed of the energy transition has the potential to register short-term economic impact; one need look no further than the \$100 billion impact on the EU's top five utilities resulting from a 10% shift in market share,² or the 10% shift in demand that precipitated the bankruptcies of the largest US coal companies,³ or the fact that oil prices more than halved in response to 2% shift in the supply/demand balance.⁴

As the Task Force notes, many of the legal predicates for these disclosures already exist—indeed, many of the Report's recommendations may already be required under general disclosure obligations, but standards and guidance for such disclosure are lacking, making disclosures inconsistent, incomparable, and fragmented in a way that lacks economic focus.⁵ The Report also considers new elements, such as scenario analysis. Shedding light on how company assets will perform in a world in transition will, as Governor Carney notes, allow investors to back conviction with capital.

Consistency and comparability require a reference scenario

Scenario analysis is the Task Force's most significant contribution

The Task Force's focus on scenario analysis holds the most promise to deliver on this objective. The Task Force recommends that companies include at least one 2°C scenario, disclosing both the driving assumptions and business impact of the scenarios run. Therefore, our comment focuses on why a reference scenario is needed, and how it could be done.

² Carbon Tracker (2015) *Coal: Caught in the EU Utility Death Spiral*. Available at: http://www.carbontracker.org/report/eu_utilities/

³ Carbon Tracker (2015) *The US Coal Crash – Evidence for Structural Change*. Available at: <http://www.carbontracker.org/report/the-us-coal-crash/>

⁴ Spedding, P. (2016) *Is oil becoming stranded?* Available at: <https://www.project-syndicate.org/commentary/is-oil-becoming-stranded-asset-by-paul-spedding-2016-02>

⁵ Furthermore, trends in climate mitigation at the technology and policy levels may alter assumptions made in the financial reports, triggering more scrutiny from auditors in preparing financial statements.

While the recommendations serve many audiences, investors should come first—even if disclosure serves the purpose of minimizing systemic risk

We believe that investors are the primary audience for these disclosures and investors require comparability, making that principle central to the success of the recommendations.

The Report recognizes a number of users of disclosure—including lenders, insurance underwriters, and investors.⁶ Each is important and all would benefit from climate-related risks being priced into firm-specific costs of capital.

However, the interests of investors are paramount. Lenders and insurers contract directly with their borrowers or insureds and can demand additional information through these relationships—a comparably more difficult task for investors (even when they act collectively). Investors are therefore more reliant upon disclosures for information.

The Task Force’s remit also contemplated generating data sufficient to inform “assessments of the materiality of any risks posed by climate change to the financial sector, and the channels through which this is most likely to be transmitted.”⁷ From a systemic risk point of view, investors in the capital markets are the first line of defence against rapid re-pricing of assets. Thus, even if a proper evaluation of systemic risks requires information on firm-level financial impacts, it is appropriate to give primacy to the needs of equity investors in discerning those risks.

Both investors and financial authorities need comparability and consistency

The scenario analysis recommendation responds to investor calls for such analysis⁸ and represents an improvement over current disclosure requirements. The need for a reference scenario flows naturally from the aims of the Task Force, which seeks to provide useful, comparable information that markets can incorporate into valuation assessments and capital allocation decisions.⁹

Both financial authorities and investors considering portfolio risks may want an assessment of the total exposure of listed or owned companies (as the case may be). But how can a portfolio manager understand the impact on its holdings, or the financial regulator the potential for market level impact, if scenarios with differing assumptions are applied across different companies? Similarly, how can an investor, seeking to differentiate companies based on transition risk exposure, compare company outlooks if each company uses its own scenario? While company-produced scenarios could yield insights into how management views the company’s prospects, the use of different assumptions and models will not yield comparable outputs.

⁶ Report, at 3.

⁷ Report, at 3.

⁸ See, <http://ceres.org/investor-network/resolutions#!/subject=&year=2016&company=&filer=§or=Oil%20and%20Gas&status=&memo=&all=>.

⁹ Report, at 2-3.

Firm-level impacts can best be assessed through scenario analysis

Scenarios can help address uncertainty

The future is inherently uncertain; this leaves room for disagreement for how it will unfold.

Scenario analysis identifies plausible future developments and provides insight on such uncertainties; it asks, “how the future might look if... certain conditions are met.”¹⁰ An entity may believe a given scenario is unlikely yet still consider its ramifications; analysing the implications of a 2°C scenario analysis does not compel companies to follow it.¹¹

In this way it differs from a prediction or forecast that makes claims about the probability of an event occurring. There, evidence of the basis for those predictions is critical. Scenarios, on the other hand, are primarily focused on the impact of a hypothetical state.¹² The focus is on the implications, not the likelihood, of the scenario coming to pass.¹³ Scenarios ask not how the underlying conditions are met, but what happens if they are. As discussed further below, we believe this is an important consideration in how the scenarios are constructed.

In the disclosure context, there are an abundance of company forecasts as to what they believe will likely transpire, and only a small (but growing) number of scenarios endeavouring to explain what might happen if climate targets are met. Investors may come to their own views on the likelihood of an energy transition, what they need from companies is an understanding of the magnitude of the impact.

Current disclosure lacks a comparable long-term view

In many jurisdictions, companies are required to discuss, in regulatory filings, key risks and uncertainties and are permitted (and encouraged) to provide management’s forecasts of the future.¹⁴ Despite this, a number of leading companies fail to even mention actual climate targets, much less discuss their implications.

On the numbers, the 2°C target poses a challenge to continued growth in demand for fossil fuels. Some leading energy companies have, in effect, indicated that they believe the

¹⁰ Report, at 27.

¹¹ Again, we recognize that existing disclosure requirements may compel, where deemed material, the revelation of downside scenarios the company runs internally.

¹² We would further note that a scenario built around a 2°C outcome is entirely plausible—governments have said that they will aim to limit global warming to “well below” this level. In addition, using a baseline proxy carbon price implied by the Nationally Determined Contributions and the latest information on cost declines for just two technologies, electric vehicle batteries and solar photovoltaics, Carbon Tracker’s recent report concludes that the world comes close to achieving this goal. See Carbon Tracker (2016), *Expect the Unexpected: The Disruptive Power of Low-carbon Technology*. Available at: <http://www.carbontracker.org/report/expect-the-unexpected-disruptive-power-low-carbon-technology-solar-electric-vehicles-grantham-imperial/>

¹³ The same is true of supervisory stress tests on banks, which establish plausible (but severe) macro-economic parameters that form the basis of a stress-test and then apply those parameters to the firm’s assets. Authorities utilize plausible but severe parameters without establishing how those parameters may come to pass because the focus is on what their implications would be at firm level, not their likelihood.

¹⁴ See, e.g., Item 303 of Regulation S-K.

outcome unlikely and therefore are planning on climate targets from the Paris Agreement being exceeded. Others view the issue as significant enough to run scenarios internally, but few disclose the results in sufficient detail, or present the information in a way that is consistent and comparable. Still others have indicated that 2°C scenario analysis informs company planning, demonstrating the potential materiality of the analysis, but again, very little has been disclosed.¹⁵ While there are many views on whether the 2°C outcome is material, there is very little forward-looking data that has been provided. Scenario analysis could fill the gap.

A common reference point is needed

The Report does recommend that companies use a 2°C scenario—a “common reference point.”¹⁶ However, some of the recommended scenarios do not model a 2°C demand pathway.¹⁷ In addition, it is possible to construct different pathways to meeting the 2°C target. Without a common yardstick, consistency and comparability suffer and financial institutions cannot aggregate up potential impact. A reference scenario built upon a particular demand profile, if set alongside a company’s own scenarios, would yield consistency and comparability and reveal management insights.

We therefore believe that the Task Force should recommend the use of a specific scenario built upon a 2°C demand profile. The primary candidates for such an analysis are, in our view, the IEA 450 or 2DS scenarios. We suspect that the additional granularity in the 2DS scenario may be preferable, but since consistency and comparability should be the guiding lights, choosing one is more important than which one is chosen.

Utilizing a reference scenario would also yield benefits for preparers of information by reducing the resource needed to develop alternative scenarios, as many starting assumptions would be incorporated into the reference scenario itself. The use of a reference scenario would allow the best-positioned companies vis-à-vis a low carbon transition to disclose this competitive advantage.

Key Questions on Scenarios

All disclosure evolves to meet market needs; future evolutions should not impede the advancement of a reference scenario today

As we discuss in the next section, the means to conduct scenario analysis is available today. Even if modelling techniques, assumptions, and transparency can and will improve, those issues are not reasons to delay recommending a reference scenario and methodology requirement.

¹⁵ See, e.g., <http://www.conocophillips.com/sustainable-development/environment/climate-change/climate-change-strategy/Pages/carbon-scenarios.aspx>

¹⁶ Report, at 29.

¹⁷ These include the IRENA and Deep Decarbonization Pathways Project. To be clear, we believe these efforts are useful in other ways but may not be fit for purpose in characterizing a 2°C demand pathway.

We recognize that no scenario will be perfect in all eyes, particularly in light of the targets outlined in the Paris Agreement. Obviously, the IEA 450 and 2DS scenarios do not capture the full impact of all potential transition scenarios—indeed, a scenario built upon a 50% probability of limiting anthropogenic warming to 2°C does not capture the full downside case for carbon-intensive companies. Here we would highlight that using an existing 2°C scenario offers the possibility for instant comparison. If the purpose is to identify or impose a state of stress on the sector or entity then a different scenario would be needed.

We also acknowledge the significant ways that scenarios may underestimate the potential for change. Carbon Tracker’s research has examined the potential for the constituent elements of energy demand forecasts to vary in the downside case, considered the modelling implications of demand destruction using the latest available data, and even created a modified lower demand scenario to test our analysis and assumptions.¹⁸ Therefore, we do not believe the IEA scenarios exhaustively define the downside case for fossil fuels, and would certainly qualify as being reasonably conservative and plausible.

Notwithstanding these concerns, we believe comparability is the most important attribute of useful scenario disclosure and that the IEA is the obvious instant solution, which will continue to be updated, and provides sufficient detail on fossil fuel demand at a regional level.

Imposing a reference scenario based on an IEA scenario might also spur further development of such scenarios. The recent release of the IEA’s “well-below” 2°C scenario (which uses a 66% rather than 50% probability of achieving climate targets)¹⁹ and the fact that IEA will soon publish a 1.5°C scenario suggest that the IEA is responding to policy developments and, potentially, the need for a reference scenario consistent with climate ambition.

Do existing scenarios offer sufficient detail?

As we discuss below, the critical component of any reference scenario for the energy sector is the demand profile. The profile should be sufficiently granular that the demand profile corresponds to real world geographic and market segmentation. On this point, for energy supply, we believe that, for the most part, the IEA scenarios provide a sufficient level of demand detail. Using the demand profile of the IEA 450 or 2DS scenarios would provide a common starting point that could be consistently applied across a range of suppliers of fossil fuels.

We also believe that focusing on the demand profile, rather than other outputs of the scenario such as the commodity price, is essential. In theory, the price of a good or service

¹⁸ See, e.g., Carbon Tracker (2016) *Expect the Unexpected*. Carbon Tracker (2015), *Lost in Transition: How the energy sector is missing potential demand destruction*. Available at:

http://www.carbontracker.org/report/lost_in_transition/. Carbon Tracker (2015), *The \$2 trillion stranded assets danger zone: How fossil fuel firms risk destroying investor returns*. Available at: <http://www.carbontracker.org/report/stranded-assets-danger-zone/>.

¹⁹ See Carbon Tracker (2016), *Latest IEA Outlook outlines an accelerated low-carbon transition*. Available at: <http://www.carbontracker.org/latest-iea-outlook-outlines-an-accelerated-low-carbon-transition/>.

might be expected to converge on a market-clearing price—the price at which the quantity supplied is equal to the quantity demanded. In practice, actual prices are subject to many intervening factors and price predictions have been less than accurate. Focusing on demand allows comparison of projects along a relative cost basis (as discussed below), where relative ranking will vary less.

Could companies utilize these scenarios?

We believe so, and there is evidence that companies model analogous 2°C scenarios which suggests that it is possible.²⁰ A scenario constrained to 2°C demand reverses the typical company practice, which builds a “bottom-up” profile of future demand, which then informs planning. In lieu of this bottom-up approach, the use of a 2°C demand scenario imposes a top-down constraint upon demand that, like the top-down approach, yields a demand curve that could, in theory, be planned against.

If there are different plausible 2°C scenarios, is the choice of a reference point arbitrary?

It is true that different pathways to that outcome can be constructed with potentially meaningful differences. In our view the value of scenario-based disclosure is that it can illuminate a company’s relative position vis-à-vis the climate target and competitors. If one thinks of other financial tests, the choice of reference points could also be considered arbitrary, but necessary to provide a uniform approach. The upshot of not having this results in what we see today on matters such as impairment, where each company and its auditors can take a view on what the test parameters should be, and fundamental aspects such as whether and how future cash flows are discounted are inconsistent across sectors.

Uncertainties regarding the future are unavoidable, but this is what drives the need for scenario analysis.

Utilizing a reference point in the face of real uncertainties has analogues in existing reporting. For example, in estimating quantities of proven reserves, the SEC requires that companies test against a common benchmark—the rolling first-day, twelve-month average spot price.²¹ The U.S. Securities and Exchange Commission acknowledges that the 12-month rolling average price may not reflect likely pricing when those reserves are developed, nor is it indicative of management’s expectations. Nevertheless, the regulation imposes averages to elicit comparable reserves disclosure.²² As with the reserves estimates, the key is to provide a means to compare between companies, not predict the future. For the same reason, the SEC’s PV-10 test imposes a standardized discount rate of 10% to value

²⁰ Examples include Statoil’s “renewal” scenario and BP’s “even faster” scenario. See, <https://www.statoil.com/content/dam/statoil/documents/energy-perspectives/energy-perspectives-2016.pdf>; <http://www.bp.com/en/global/corporate/energy-economics/energy-outlook/a-lower-carbon-world.html>.

²¹ SEC Rel. Nos. 33-8995; 34-59192 (Jan. 1, 2010). Available at: <https://www.sec.gov/rules/final/2008/33-8995.pdf>

²² Id. (“The objective of reserves estimation is to provide the public with comparable information about volumes, not fair value, of a company’s reserves available to enable investors to compare the business prospects of different companies.”).

the discounted net cash flows of proven reserves, even though company costs of capital may differ.

Clarifying analytical choices for scenario analysis

A reference scenario can be built

As discussed above, a reference scenario built for disclosure would make investors the primary audience and focus on outcomes of transition risks for key sectors. Such a scenario should take a uniform two-degree demand profile as a starting point and examine market risks. Outputs would identify company alignment with the 2°C demand profile and corresponding business impact.

The elements of a 2°C demand scenario, applied to company assets

For illustrative purposes, we have outlined Carbon Tracker's approach in the Appendix. To evaluate global upstream assets, the approach overlays a 2°C carbon budget on a global supply cost curve to identify which projects would be needed even in a 2°C demand scenario. It would sort a company's potential projects into those that fall within and those that lie outside a 2°C scenario. Various indicators can then be calculated based on this allocation – for example the proportion of a company's future production that is within the budget, or the proportion of its potential future investment. These can then be compared to the company's planning case and expectations and addressed through disclosure.

Our engagement with companies demonstrates how those who produce multiple commodities related to the energy sector need a defined scenario (or scenarios) to enable understanding of what this means for the enterprise as a whole. Consider a mining company that produces coal, oil, gas, uranium, lithium, etc., and seeks to analyze which business lines should grow or shrink in a 2°C demand scenario. If each business applies a scenario that suits its strategy it would be difficult to consider which units should be drawn down or receive additional funds. Even an oil and gas company needs to understand the allocation of the carbon budget across fossil fuels to understand the impact on oil and gas, respectively.

We believe that companies in the extractive sectors have the capacity to generate a similar analysis, which could then tie into many of the Task Force's recommended outputs. However, allowing each company to develop its own demand profile would make the results difficult to compare. Therefore, we believe that Task Force should recommend a specific demand profile such as the IEA's 450 or 2DS scenario that can serve as a common yardstick or, as an alternative, acknowledge that one is needed.

Discussions with companies and disclosure responding to resolutions also suggests that they are already testing their businesses against a number of demand and price scenarios as part of existing risk management processes. This may not be labelled as climate scenario analysis, but probably includes many of the core elements, and just needs extending to ensure the reference scenario is included and linked to these internal processes. If companies are not already thinking about how they would fare in a low demand / low

carbon / low price future, then this would raise concerns about the quality of their risk management and strategic decision-making processes.

By focusing on how scenarios are constructed, the recommendations emphasize bottom-up scenario development but scenarios built for disclosure may require a common yardstick

The recommendations' Technical Supplement provides greater detail on how scenarios could be constructed, and Figure 3 (Technical Supplement) identifies the parameters/assumptions, analytical choices and business impacts/effects that should be disclosed.

The Technical Supplement seeks disclosure of underlying scenario assumptions, emphasizing those made in developing a bottom-up analysis of how energy demand may evolve.²³ We would agree that, for a bottom-up analysis, disclosure of these elements is essential, and believe transparency can be achieved. In our recent paper, *Expect the Unexpected*, we modelled the impact that cost reductions for solar PV and EV, along with a range of policy ambition, might have on fossil fuel power generation and transportation markets. In the Appendix to that report, we endeavoured to provide the relevant disclosure of key assumptions made.²⁴

This kind of disclosure would be useful for any company-developed scenarios that are disclosed alongside the reference scenario so that investors can understand the differences. This would help explain the company's strategy. However, this transparency is not a substitute for having a reference scenario. Our concern is that just having details on lots of different scenarios will make comparison between companies impossible and, if anything, focus those comparisons upon the assumptions and drivers of their demand scenarios rather than the financial and business implications that the scenarios were intended to reveal.

A reference scenario would simplify scenario analysis

Under the recommendations, companies can adjust any component of a 2°C model. Without a reference scenario, it will be possible to have differentiation on climate modelling elements that may make comparisons difficult and overshadow any business impacts disclosed.

For example, Figure 3 asks companies to identify climate sensitivities used—an important variable. Royal Dutch Shell uses a single climate model on the low end of estimates to disclose the climate impact of its scenarios.²⁵ This effectively increases the carbon budget and minimizes the climate impact that would otherwise be inferred from the emissions profiles associated with their scenarios. There is little value for investors if companies cherry-pick climate sensitivity assumptions, particularly when those factors lie beyond company expertise.

²³ Technical Supplement, at 7 (Figure 3).

²⁴ See *Expect the Unexpected*, at 41-48.

²⁵ Royal Dutch Shell utilizes an MIT model for climate sensitivity. See Sergey Paltsev, et al., *Scenarios of Global Climate Change: Integrated Assessment of Climate Impacts*, Report No 291 (Feb. 2016).

Standardizing these assumptions would reduce the work needed to construct the scenarios and focus instead on developing a comparable set of disclosures.

The Technical Supplement suggests that companies develop their own scenarios, focusing on “how a particular pathway might develop.”²⁶ The potential variations, should companies develop their own scenarios, are significant. It is perhaps for this reason that the Technical Supplement acknowledges that, given the “number of variables and analytical approaches...there will be a wide range of scenarios...” potentially making “direct comparability across organizations ... a very real challenge.”²⁷ Our contention is that the use of a reference scenario would go a significant way towards ameliorating these concerns.

A final note on valuation

The Report indicates “the lack of consistent information hinders investors and others from considering climate-related issues in their asset valuation and allocation processes.”²⁸ We suggest that further guidance should be provided which ties the financial impact of scenarios to valuation methodologies. Current valuation methodologies rely upon historic multiples (enterprise value/EBITDA, enterprise value/reserves, price/free cash flow, price/reserves, for example) and are relative to peer group. Based on historical data, the multiples valuations implicitly assume that the future will replicate the past. However, scenario analysis provides a lens on how the future may not replicate the past.

This may mean that other valuation models, such as discounted cash flow and net present value analyses of company segments may become more appropriate measures, or at least points of comparison, for analysts considering valuation impact. Those models consider net operating cash flows over time using an appropriate discount rate. A scenario model might assist those analyses by generating production outlooks and illustrative price expectations consistent with a 2°C demand profile.

Sensitivity analysis can provide a “bridge” to scenario analysis

Finally, we agree with the Report recommendations that sensitivity analysis can bridge the gap towards more robust scenario analysis.²⁹ Just as scenario analysis can illuminate a variety of future pathways, sensitivity analysis, built upon a single variable, can illuminate the potential impact of that variable upon company cash flows, reserves volumes and other metrics that investors can use to understand the quality of a company’s asset base.

As discussed in the Appendix, a requirement that provided a robust range of price outcomes and their implications for company cash flows would inform investors on the potential variability of cash flows. Additionally, it could be produced immediately, without the need for scenario development. To the extent the sensitivity analysis also included an intermediate output relating to prices the scenario analysis could build upon the sensitivity

²⁶ Technical Supplement, at 7.

²⁷ Id.

²⁸ Report, at 2. (Citing, Mercer LLC. Investing in a Time of Climate Change, 2015, <https://www.mercer.com/our-thinking/investing-in-a-time-of-climate-change.html>.)

²⁹ Report, at 31 (n. 44); Technical Supplement, at 8.

analysis provided as an intermediate step. This suggests it should receive greater emphasis in the final report.

CONCLUSION

In conclusion we appreciate the significant steps the Task Force has taken in enhancing the disclosure of the financial risks of climate change. We believe that the recommendations would benefit from the introduction of a reference scenario, built directly upon a 2°C demand profile, that could be applied consistently and yield comparability of outputs. Alongside this, we agree that sensitivity analysis might further assist in demonstrating a company's resilience to key variables.

Sincerely,

The Carbon Tracker Initiative

Appendix: Establishing a 2°C carbon budget/demand scenario to upstream projects

The first step in testing a project portfolio relative to a 2°C global warming carbon budget is to establish the details of an applicable demand scenario that would result in this outcome. In theory this can be any scenario that results in a 2°C outcome. However, in practice there are a multitude of pathways to delivering 2°C, and a number of parameters or assumptions that can be flexed (for example, the probability of achieving 2°C).

1. **Selection of 2°C demand pathway** – this should be based on a scenario that is (a) considered reasonable; (b) published by a credible institution; and (c) published with sufficient accompanying detail to enable the preparer to apply it meaningfully to their business. Most importantly, this would include an allocation of demand across various fuels and geographies. The IEA’s 450 Scenario or 2DS scenario is suggested as a standard reference point for energy sector companies.
2. **Preparation of 2°C pathway for use (where necessary)** – the chosen 2°C demand pathway may not contain all information needed to apply to the preparer’s business (for example demand in a particular geography or market), and accordingly may require additional analysis. The preparer should briefly state assumptions where made.
3. **Disclosure of 2°C pathway** – The preparer should disclose details of the 2°C demand pathway which has been used, including any additional assumptions used, such that there is sufficient publicly available detail to enable the demand pathway to be able to be replicated by a reasonably knowledgeable reviewer.

In the event the preparer also wishes to produce its own 2°C demand scenario, or a variant of a publicly available one, sufficient detail should be disclosed to enable replication as above.

Determining within/outside 2°C budget - cost curve methodology

Once a 2°C level of demand for a product has been established, it can then be compared to potential supply. If the preparer does not maintain a database of potential supply, in the example of the fossil fuels there are a number of specialist data provider companies from where this detail can be obtained. The potential supply picture should be as complete as possible within reasonable knowledge; where there are known data gaps, an attempt should be made to allow for these using estimates to the extent possible.

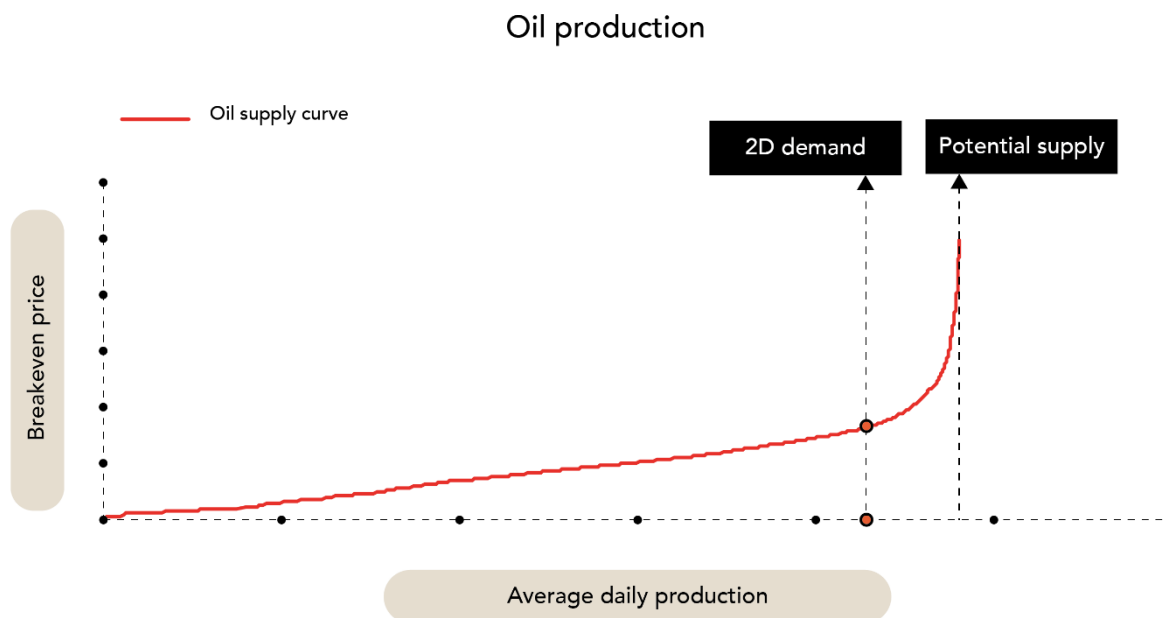
Potential supply may be considered either globally or in a particular market as appropriate. For example, it may make sense for oil to be treated as a globally traded commodity; hence supply can be compared to demand on a single, global basis. For natural gas, conversely, given the difficulties of transportation and therefore regional segmentation of markets, it may make sense to split into different markets reflecting approximate trading patterns – e.g., gas that can supply North America being compared to North American 2°C demand for gas. LNG may also be considered separately.

A cost curve should then be prepared for each relevant market, showing breakeven prices on the y-axis and cumulative supply on the x-axis.

Breakeven price – defined as the oil or gas price needed to give at each individual project an NPV of 0 at a given discount rate. The discount rate should be stipulated so it is the same for all projects, to give an even basis for comparison. FAS 69, which uses a 10% discount rate and flat cost and price assumptions, could be utilized to simplify the analysis.³⁰ Further, costs should be based on all future cash flows, to make sure that initial capital expenditure is captured for new projects, rather than just the cash costs of running once built. There may be other assumptions needed to calculate the breakeven price, e.g. the assumed price of other co-products. These should be disclosed accordingly.

Cumulative supply – the potential supply from possible projects, in order of increasing breakeven price. Supply can be measured either in terms of reserves or potential production in a period – potential production is preferred, includes likely future development of the resource base, and because it includes a time element and accordingly can be directly compared to demand. Potential production and 2°C demand should be calculated over the same period as each other (e.g. 2017-2040 supply being compared to 2017-2040 2°C demand).

An illustrative example curve for global oil production is shown below. The extent of the curve along the x-axis amounts to the full potential supply from the entire industry for the chosen period.



The 2°C level of aggregate demand is then added on the x-axis, illustrating the amount of supply needed to satisfy that demand. When the vertical 2°C demand line is drawn on, the

³⁰ See,

http://www.fasb.org/jsp/FASB/Document_C/DocumentPage?cid=1218220127391&acceptedDisclaimer=true

low cost supply to the left of the demand line is that which will be “needed” to satisfy demand (or more accurately “within the 2°C budget”). To the right of the 2°C demand line is the high cost potential supply which is outside the budget.

Having established which projects are within the budget and which are not needed, each individual company’s exposure to these assets can be reviewed. A given company’s projects positioned on the left of the demand line are within the budget, and those to the right are outside. Various indicators can then be calculated based on this allocation – for example the proportion of a company’s future production that is within the budget, or the proportion of its potential future investment. These can then be compared to the company’s planning case and expectations. The key output here is the relative sorting of projects between those “within” and “outside” a 2°C demand profile—actual market prices may fluctuate due non-supply/ demand considerations and changes in costs. However, relative position along the cost curve is likely to remain more constant.

NPV sensitivity analysis

A preparer can provide an instructive sensitivity of company net present value (NPV – the sum of future discounted cash flows) to key variables, i.e. showing the NPV of the company’s future cash flows based on a range of different values for a given variable. For example, an oil company may provide an NPV sensitivity to a range of oil and/or gas prices. To do so would require defining both the variable range and the discount rate.

Variable range – preparers may have a base case view of the outlook for a particular variable, again for example the oil price, and the preparer may choose to disclose an NPV on this basis. However, in order to have maximum utility to users, the values used for a given variable should be broadly comparable between companies. Accordingly, sensitivities should also be given with variables fixed at constant levels (in real terms where relevant) going forward rather than increasing or decreasing. A regulatory might specify the range of variables used to ensure that they are sufficiently robust. Should the preparer select the variables, a sufficiently wide range of variable values should be used to assure a reasonable user would estimate that most eventualities would be covered. The range of variable values should be sufficient to include or go beyond long-term historic averages.

Discount rates – the discount rate at which the NPV is calculated is itself an important variable, and ideally should also be provided a sensitivity analysis in respect of. A central case might be the weighted average cost of capital (WACC) applicable to the company, with further examples of discount rates above and below this provided by way of reference. For example, a company with a WACC of 7.1% might provide details of NPV at the range of prices (as above) at discount rates of 6%, 7.1% and 8%. Again, the range should cover that including long-term historic averages. A regulator might also specify a single discount rate, such as the 10% discount rate used in the Standardized Measure the SEC requires in measuring the NPV of proven reserves.

An example format for an NPV sensitivity analysis table to oil prices (with an illustrative 20-year average of \$30/barrel) for an example company might thus be in the below format.

	Discount rate (%)
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		6%	7.1%	8%
Oil price (\$/barrel)	\$140			
	\$100			
	\$60			
	\$20			

As new projects are likely to be more geared to future prices (compared to existing projects where capital has been sunk), it may be appropriate to provide sensitivities for “new” and “existing” projects separately. New/future projects should be included based on the preparer’s current estimates.

An NPV sensitivity analysis of the value of projects both “within” and “outside” projects from the preparer’s scenario analysis, above, could also be provided.

Cost disclosure

In order for users to better understand a company’s resilience to potentially low prices for its products, the preparer should give an indication of the range (rather than just the average) of its production costs.

Clearly, cost of production has some commercial sensitivity that should be balanced against the benefits of improved disclosure. Accordingly, there is no need for costs to be disclosed in unnecessary granularity, and reasonable aggregation (which would give users an overall impression of costs) is appropriate.

For example, an oil company may choose to disclose the volume of its potential future production, or the quantum of its potential future expenditure, in breakeven oil price bands. An example is shown below.

		Potential production (millions of barrels)	Potential investment (billion dollars, real 2017)
Breakeven oil price (\$/barrel)	\$100-120		
	\$80-100		
	\$60-80		
	\$40-60		

As above, costs should be based on all future cash flows, to give a full impression of the prices required to cover future investment. To continue the oil company example, a future project might have a full-cycle breakeven cost of \$80/barrel (the project delivers an NPV of 0 at \$80/barrel oil price) including initial capital expenditure, but will have operating costs of \$20/barrel once built. In this case, the full \$80/barrel will need to be disclosed to demonstrate to users what prices will be needed to deliver a return on the full investment. If the project had already been built however, and the capital investment sunk, the breakeven might be closer to the \$20/barrel cash costs, and should be disclosed as such.

Given the importance of delivering a return on initial capital, any applicable new/future projects should be included in the cost banding based on the preparer's current cost estimates, rather than just projects that are already in production. This may include projects that have not already been sanctioned. To reflect the varying degrees of uncertainty for different projects, it may be appropriate for the costs of "new" and "existing" projects to be disclosed separately.