Assessing Energy Transition Risk in the Oil and Gas Industry: The Role of 2°C Scenario Analysis

The world is moving to a low-carbon economy. The transition will require substantial changes to the global energy system, as more than 80% of the world's primary energy demand is currently met by carbon-based fuels.[1]

The shift to a low-carbon economy, driven primarily by advances in technology, new energy policies, and evolving consumer preferences, will expose oil and gas companies to a new category of risk (energy transition risk) that will challenge their existing business models. Companies that realign their business models to fit the new low-carbon reality, will find enormous opportunities in the energy transition.

The move to a low-carbon economy also presents significant challenges for capital market participants (CMPs) and policymakers. CMPs will have to accurately identify, assess and manage energy transition risk as part of their asset valuation and investment decisions. Policymakers will have to find the right combination of economic, environmental and social policies that will ensure a successful transition.[2]

The challenges facing policymakers and CMPs are quite different, but neither can succeed without access to the same invaluable tool: timely, decision-useful information about energy transition risk.

This report will focus on energy transition risk in the oil and gas industry and the role of 2℃ scenario analysis in helping CMPs better understand and manage the risk.

Energy transition risk is poorly understood in today's capital markets. Besides being very difficult to measure, the longer-term nature of the risk has created widely divergent views on what is considered "material" in the context of a reporting company's disclosure obligations. As a result, CMPs receive inconsistent and incomplete information about energy transition risk and its potential impact on their asset valuations and investment decisions.

One way to bridge this information gap is through scenario analysis. Scenario analysis is described by the Task Force on Climate-Related Financial Disclosures (TCFD) as "a process for identifying and assessing the potential implication of a range of plausible future states under conditions of uncertainty".[3] A scenario is not a prediction of the future, but a view of what the future might look like under a given set of assumptions. In the case of energy transition risk, scenario analysis is intended to better inform CMP's risk assessment and decision making by showing the potential impacts of the energy transition on oil and gas companies' business models, strategic planning, capital allocation decisions and financial performance.[4]

An important scenario for assessing energy transition risk is the "2℃ scenario". A 2℃ scenario is a view of what the future might look like if global greenhouse gas (GHG) emissions are limited to a level that will hold the increase in global average temperatures to "well below 2℃

above pre-industrial levels" (the Target Concentration Level). The 2℃ scenario is important because it lays out an emission concentration pathway consistent with the goals of the Paris Agreement and can provide CMPs with decision-useful information concerning the timing and potential impacts of the energy transition.[5]

Problematically, the lack of well-defined criteria for preparing Transition Risk Reports can result in a wide disparity in the quality of reporting. Look no farther than the 2℃ scenario analysis reports recently issued by ExxonMobil, Chevron, Royal Dutch Shell, Total and others (the Transition Risk Reports), and you'll see just how differently major companies can choose to interpret what should be the same set of facts.

It is imperative that we differentiate a high-quality, decision-useful Transition Risk Report from one that is not. This analysis will be guided by the TCFD's Seven Principles for Effective Disclosure (the Disclosure Principles).[6]

SELECTING A 2℃ SCENARIO

The first step in assessing the quality of a Transition Risk Report, is evaluating the appropriateness of the 2℃ scenario that forms the basis of the report.

Many people are surprised to learn there are a large number of 2℃ scenarios to choose from, including the more than 100 2℃ scenarios

assessed by the Intergovernmental Panel on Climate Change (the IPCC Scenarios), the 2°C scenarios generated by the International Energy Agency (the IEA Scenarios), the 2°C scenarios generated by reporting companies, and others.[7]

Although each 2°C scenario describes a GHG emission pathway consistent with the Target Concentration Level, each pathway is based on different modelling assumptions and input variables. If these differences are significant, they will result in 2°C scenarios that have vastly different views of what the global energy system may look like in a "2°C world".

There are three points that are essential in ensuring a Transition Risk Report contains decision-useful information.

- First, in order for a Transition Risk Report to meet the Disclosure Principles' criteria of being "comparable among companies within a sector, industry or portfolio", it should contain a 2°C scenario that is available for use by all reporting companies (e.g. the IEA Scenarios). This does not mean a reporting company should not include other 2°C scenarios in its Transition Risk Report. If the Transition Risk Report contains a 2°C scenario that meets the TCFD's "comparability" criteria, the reporting company can and should include any other 2°C scenarios it wants, as long as they are all based on reliable, verifiable and objective data.

- Second, in this time of rapidly changing energy markets, it is important that the 2°C scenario be based on current information that is capable of being updated at least once a year. Otherwise, both the relevance and reliability of the Transition Risk Report will

be called into question. While some time lag in gathering, analyzing and reporting data is to be expected, any 2°C scenario that is based on information more than 2-3 years old should be questioned. Unlike wine, a 2°C scenario does not get better with age.

- Third and finally, each of the key assumptions embedded in the 2°C scenario should be evaluated to ensure the 2°C scenario can support credible, verifiable and decision-useful disclosures. To identify what these assumptions are and why they are important, it is useful to know something about how 2°C scenarios are generated.

Most 2°C scenarios are generated by integrated assessment models (IAMs) that are designed to provide insights into how changes to the drivers of GHG emissions can induce a range of impacts on energy systems, land-use systems, and other human and natural systems.[8] The IAM constructs the 2°C scenario by first making a number of assumptions concerning future energy demand, the availability and cost of low-carbon technologies (LCTs), the type and strength of policy support for LCTs, the emission levels of non-CO2 forcing agents (i.e. methane, nitrous oxides and other gases) and the percentage probability of achieving the Target Concentration Level.[9] Based on these assumptions, the IAM calculates the "least cost" concentration pathway that will achieve the Target Concentration Level.[10] Both the concentration pathway and its projected impact on the global energy system are highly dependent upon the input variables for these assumptions. To illustrate this, I will review how variations in the LCT

assumptions can dramatically influence the results of the modelled 2℃ scenario.

According to the IPCC's Fifth Assessment Report, limiting the increase in global average temperatures to "well below 2℃ over pre-industrial levels" depends on restricting cumulative emissions of GHG's to no more than 3,670 Gigatons of CO2 equivalent (CO2 eq) through the year 2100 (the Carbon Budget).[11] Meeting this Carbon Budget requires extensive deployment of LCTs, primarily in the power generation, transportation and industrial sectors.[12] The role each LCT will play in a 2℃ scenario depends on the availability and cost of the LCT, the availability and cost of competing LCTs, the timing of emission reductions, and other region-specific factors.[13] If the input variables for the LCTs are inaccurate or out-of-date, the IAM will not select the least-cost technology mix for satisfying projected energy demand, and the 2℃ scenario's view of how the global energy system will transition to a 2℃ world will be distorted.

For example, a reporting company recently issued a Transition Risk Report with a 2℃ scenario that is based on data that is more than 5 years old. Due to the age of the data, the LCT assumptions for this 2℃ scenario do not include the most recent declines in the levelized cost of wind and solar energy, nor do they consider the significant headwinds facing CCS deployment due to the lack of any supportive policy framework or a viable business model. A closer look at the assumptions underlying this 2℃ scenario reveals that it assumes the deployment of 1,300 Gigatons of CCS through the year 2100.[14] To give the enormity of this number some context, the IEA's "2DS scenario" assumes 250 Gigatons of CCS deployed through the year 2100, and

Statoil's projection for CCS deployment is about half of the IEA's number.[15]

Why does this matter to CMPs? Because the potential impact of the energy transition on fossil fuel companies is very sensitive to the assumed rate and magnitude of CCS deployment. All other things being equal, more CCS in our future means more fossil fuels in our future; and in this example, it means a lot more fossil fuels. The result is a 2°C scenario and Transition Risk Report that can significantly understate energy transition risk to the reporting company.

THE TRANSITION RISK REPORT

The purpose of a Transition Risk Report is to help CMPs assess the reporting company's exposure to energy transition risk and make informed valuation and investment decisions concerning the reporting company. Since energy transition risk can have short-term, medium-term and long-term impacts, the Transition Risk Report should include information on the potential impacts to the reporting company's business models, strategic planning, capital allocation decisions and financial performance.

Business Model Impacts. A number of changes are already taking place in global fossil fuel markets, with significant implications for the oil and gas industry's business models. These changes include the shift from resource scarcity to resource abundance as a result of the unconventional oil and gas revolution, the unfolding globalization of

the natural gas industry, the rapid advances in renewable energy and energy storage technologies, and OPEC's recognition that there are limits to its supply-side control over oil prices. Old business models based on resource scarcity, growing demand and upward pricing trends are no longer valid. Some industry executives have responded to these changes by adjusting their business models from a pure reserve growth focus to a focus on growing "cost-advantaged" reserves.[16] In other words, oil industry executives are realizing their companies are more vulnerable to marginal cost pricing and must focus on moving their asset portfolios "down and to the left" on the supply cost curve.

The transition to a low-carbon economy will bring significant changes in demand for oil and gas, oil and gas prices and capital investment in oil and gas production capacity and delivery infrastructure. The Transition Risk Report should describe how the reporting company plans to adjust its business model to respond to these changes. While limiting capital investments to the development of cost-advantaged reserves is a legitimate (and popular) answer, it falls short of a complete response. The reporting company should also disclose its plans for capital allocation when the opportunities to develop cost-advantages reserves are gone.

Strategic Planning. Energy transition risk is often viewed as a long-term risk, the impacts of which will not be felt for decades to come. This is a dangerously inaccurate view of the energy transition. While it is true that the transition itself will take decades to complete, the impacts of the transition are already being felt. The critical question for CMPs is not over what time period the energy transition will take place, but the timing and magnitude of the impacts to energy markets as the

transition unfolds. The impacts on energy markets will happen on a much shorter times scale than the transition itself. Therefore, the Transition Risk Report should describe the reporting company's short-term, medium-term and long-term strategic plans for responding to the 2°C scenario's impact on its business.

Capital Allocation Decisions. Under most 2°C scenarios, oil and gas will continue to supply a substantial portion of global energy demand for decades to come. Since the production decline rate from existing oil and gas fields is greater than the projected rate of decline in oil and gas demand, it is clear that, even in a 2°C scenario, additional capital investment will be required to close the gap between the production decline rates and the decline in oil and gas demand (the Hydrocarbon Supply Gap). However, two critical questions must be answered in connection with this conclusion: (1) How much investment will be needed to fill the Hydrocarbon Supply Gap; and (2) Where should the investment come from? How close the answers to these questions come to matching reality will be a major factor in determining how much investment will become "stranded" in the energy transition.[17]

Predicting how fossil fuel markets will react in a world of declining demand will be exceedingly difficult. This is especially true for global oil and gas markets where supply constraints, geopolitical issues and many regional considerations complicate the analysis. One possible reaction to declining demand is that oil and gas markets will become "more efficient", in the sense that reporting companies, OPEC producers and non-OPEC producers will be forced to compete to be the low-cost supplier(s) for the Hydrocarbon Supply Gap. In this event, the positioning of the reporting company's asset portfolio on the supply

cost curve will be a critical factor in determining which capital investments will be recovered and which capital investments will be stranded in a 2℃ scenario.

One final point to make on capital allocation decisions. CMPs should question any reporting company assumption that it will maintain its market share under a 2℃ scenario. As the Carbon Budget removes more and more marginal cost producers from the right side of the supply cost curve, and competition to fill the Hydrocarbon Supply Gap adds more and more low-cost production from the left side of the supply cost curve, it is very likely the reporting company's market share will drop.

Financial Performance. Most 2℃ scenarios see CO2 emissions cut in half by 2040 through a combination of sharp reductions in energy demand (increased energy efficiency) and rapid deployment of LCT's.[18] To accommodate this emission pathway, fossil fuel demand must decline between 30-50% by 2040, even with high levels of CCS deployment.[19] It is clear this dramatic drop in demand (the 2℃ Demand Curve) would have profound impacts on global fossil fuel markets. However, translating these market impacts into decision-useful information about the reporting company's future financial performance can be a challenge.

The TCFD recommends that Transition Risk Reports include information concerning the potential impact of a 2℃ scenario on the reporting company's asset values, capital investments, operating costs, revenues and earnings.[20] The Transition Risk Reports issued to date have

provided a range of "company-level" information on financial performance impacts, including (1) qualitative comparisons between the 2℃ scenario and other scenarios, (2) impairments to asset carrying values, and (3) impacts on future cash flows based on internally generated pricing projections. Whether these disclosures constitute decision-useful information is open to debate.

Closing the gap between the existing level of disclosure and the goals of the TCFD will likely require some "standardization" to ensure the financial performance information is transparent, verifiable and comparable. For example, the 2℃ Demand Curve used by reporting companies to project future oil and gas prices (the 2℃ Transition Prices) should meet the TCFD's comparability criteria. In addition, reporting companies should provide at least one "comparison case", where the projected financial performance impacts are based on the same 2℃ Transition Prices used by other reporting companies. If reporting companies want to model other cases that project different 2℃ Transition Prices, they should be free to do so, as long as they disclose the 2℃ Demand Curve and other assumptions used to generate the cases.

By "standardizing" these valuation assumptions, reporting companies can provide decision-useful information concerning potential 2℃ scenario impacts on its production, cash flows and asset values without disclosing proprietary or commercially sensitive information. A useful analogy is the Securities and Exchange Commission's PV-10 reported values.

One final comment concerning financial performance disclosures. A more complete picture of financial performance impacts would require "asset-level" data on production volumes, capital expenditures, operating expenses and production costs for a substantial portion of the reporting company's asset portfolio. In addition, to effectively assess the impact of carbon pricing on the value and cost competitiveness of its asset portfolio would require asset-level carbon intensity data. Since reporting companies are likely to view this data as commercially sensitive, CMPs may need to consult one or more third party databases to access this information.

CONCLUDING THOUGHTS

Energy has made possible the development and adoption of many innovative technologies, leading to unprecedented economic growth and tremendous advances in society's standard of living. Fossil fuel companies have played, and continue to play, a big role in this success story by supplying customers with affordable and reliable sources of energy. But the world is transitioning to a low-carbon economy, and the market is moving to low-carbon sources of energy. The demand for affordable and reliable sources of energy will continue, but unlike in years past, more and more of this energy will come from low-carbon sources. There's no question this transition is happening, the only question is how quickly and effectively industry will adapt and adjust to capitalize on it, as industry has during past transitions in the marketplace. To adapt, good, reliable information is critical – which is why CMPs and fossil fuel companies must work together to improve the quality of Transition Risk Reports. We all have a stake in ensuring the transition to a low-carbon economy is a successful one.

FOOTNOTES

[1] International Energy Agency (IEA), World Energy Outlook (2017.)

[2] A "successful transition" is one that achieves the objectives of the Paris Agreement and (i) sustains the growth of the world economy, (ii) brings modern energy to those that lack it today, and (iii) enhances energy security around the world.

[3] Recommendations of the Task Force on Climate-related Financial Disclosures (TCFD) (June 2017).

[4] Recommendations of the TCFD (June 2017.)

[5] Recommendations of the TCFD (June 2017).

[6] In summary, the Disclosure Principles provide that for information concerning climate-related risks to be "decision-useful", it should be (1) relevant, (2) specific and complete, (3) clear, balanced and understandable, (4) consistent over time, (5) comparable among companies within a sector, industry or portfolio, (6) reliable, verifiable and objective, and (7) provided on a timely basis.

[7] IPCC Fifth Assessment Report, Working Group III, (2014); IEA World Energy Outlook (2017); IEA Energy Technology Perspectives (2017).

[8] IPCC Fifth Assessment Report, Working Group III (2014).

[9] IPCC Fifth Assessment Report, Working Group III (2014).

[10] IPCC Fifth Assessment Report, Working Group III (2014).

[11] IPCC Fifth Assessment Report, Working Group III (2014).

[12] LCTs include energy efficiency, renewable energy, energy storage, biofuels, alternative fuel vehicles, carbon dioxide capture and storage/utilization (CCS), nuclear energy and others.

[13] IPCC Fifth Assessment Report, Working Group III (2014).

[14] Uncertainty in Carbon Capture and Storage (CCS) Deployment Projections: A Cross-Model Comparison Exercise, D. P. van Vuuren, et al (February 2014).

[15] IEA Energy Technology Perspectives 2013 (2013); Statoil Energy Perspectives (Statoil-2017).

[16] "Cost-advantaged" refers to hydrocarbon reserves that are projected to have lower break-even prices and shorter investment cycles/payback periods.

[17] A "stranded" asset is one that does not fully recover its capital investment over the operating lifetime of the asset.

[18] Energy Transitions Commission (ETC), The future of fossil fuels: How to steer fossil fuel use in a transition to a low-carbon energy system (2017).

[19] ETC, The future of fossil fuels: How to steer fossil fuel use in a transition to a low-carbon energy system (2017).

[20] Recommendations of the TCFD (June2017)

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