AN OPTIONS APPROACH TO UNLOCKING INVESTMENT IN CLEAN ENERGY

THE BANKING ENVIRONMENT INITIATIVE (BEI) **NOVEMBER 2012**

UNIVERSITY OF CAMBRIDGE
PROGRAMME FOR SUSTAINABILITY LEADERSHIP

THE BEI IS A GROUP OF LEADING INTERNATIONAL BANKS LOOKING FOR WAYS TO DIRECT CAPITAL TOWARDS SUSTAINABLE, LOW CARBON GROWTH AND AWAY FROM ACTIVITIES THAT UNDERMINE IT

This is a Banking Environment Initiative (BEI) report. It should be cited as: Banking Environment Initiative (BEI), 2012, *An Options Approach to Unlocking Investment in Clean Energy*

About the Banking Environment Initiative (BEI)

The BEI was convened by the Chief Executives and Chairs of some of the world's largest banks in 2010 to identify new ways in which banks can collectively stimulate the direction of capital towards sustainable, low-carbon growth and away from activities that undermine it. The secretariat is provided by the University of Cambridge Programme for Sustainability Leadership (CPSL).

The BEI has been laying the foundations for an exciting new approach to tackling key sustainability issues through innovative bank-corporate partnerships. Two partnerships have been pioneered initially, drawing on CPSL's experience of developing business-led collaboratories: time-bound, problem-solving groups which focus on particular sustainability challenges.

This report is the product of the BEI Collaboratory on Clean Energy, which was delivered through a partnership between BEI members and a group of oil and gas and electric utility companies. Its central aim was to find ways to unlock greater mainstream investment in clean energy. This is complemented by an independent evidence base compiled by experts at the University of Cambridge's Judge Business School (JBS).

Acknowledgements

This report was written by **Dr Chi-Kong Chyong** (Research Associate, JBS) and **Andrew Voysey** (Senior Programme Manager for the Finance Sector, CPSL). Expert guidance and review was provided by **Professor Daniel Ralph** (Professor of Operations Research, JBS), **Dr David Reiner** (Senior Lecturer in Technology Policy, JBS), **Dr Jake Reynolds** (Deputy Director, CPSL) and **Richard Burrett** (Senior Associate, CPSL).

This report was championed and guided throughout by members of the BEI Collaboratory on Clean Energy, which comprised BEI banks (**Barclays**, **Deutsche Bank**, **Lloyds Banking Group**, **Nomura**, **Northern Trust** and **Westpac**) and energy companies (**BG Group**, **DONG Energy**, **Duke Energy**, **EDF Energy**, **RWE npower** and **Shell**).

This report, as well as its Technical Annex, can be downloaded from www.cpsl.cam.ac.uk/bei.

Executive Summary

Summary of the Summary

1. Valuation methodologies like Discounted Cash Flow (DCF) do not, on their own, offer an explicit way to incorporate uncertain future market or policy conditions that could have asymmetric impacts on investment performance into valuations.
2. Nor do they account for managerial flexibility to respond as uncertainties are resolved.
3. Clean energy investments are particularly exposed to this set of conditions, so such tools could lead to suboptimal investment decisions if not used appropriately.
4. A group of banks and energy firms has assessed clean energy case study investments in three market contexts compiled by the University of Cambridge's Judge Business School.
5. We conclude that where these conditions of uncertainty exist, enhancing valuation methodologies with approaches that explicitly value embedded optionality to respond should become standard practice. This would formalise some existing market practices.
6. Implications are drawn for equity investors, company boards, providers of debt and policymakers.

Equity investors and company boards are facing a challenging set of policy and market conditions in the energy sector.

2011 saw more investment globally in new renewables than in new fossil fuels.[1] However, governments are still creating significant uncertainty around key energy policies in various markets, as well as around new market signals such as the price of carbon.

If uncertainties are not appropriately incorporated into investment analysis, capital can be diverted away from investments that would later have yielded significant upside or resilience under emergent market conditions. Yet some uncertainties like policy change could have asymmetric impacts on investment performance and are not amenable to precise quantification.

So how should equity investors differentiate corporate clean energy strategies? Should company boards continue to invest in clean energy projects when the policy context seems so uncertain? What should debt investors be looking for to judge the resilience of energy companies in the face of policy uncertainties? And what can policymakers do to continue to drive investment into clean energy?

The difficulty traditional investment valuation methodologies have in valuing 'optionality' is a further material challenge.

Traditional investment valuation methodologies like Discounted Cash Flow (DCF) analysis are static tools that work best when future market conditions are relatively certain. However, the implications of uncertainties with asymmetric impacts that are particularly difficult to quantify can be difficult to build into such methodologies and they do not place a value on managerial flexibility to adapt to changing

[1] Bloomberg (2011) *Renewable Power Trumps Fossils for First Time as UN Talks Stall*

market conditions over time. Management and investors typically have to apply qualitative analysis to DCF calculations in these circumstances.

At the company level, this flexibility is derived from having the optionality embedded in its portfolio of activities to change direction strategically in response to emergent market conditions; the investment is said to yield 'optionality' and because these investments are in assets like capital equipment or non-tradable government permits, rather than financial instruments, they are termed 'real options'.

Investors and companies already use a range of quantitative and qualitative analyses in their strategic decision-making, but traditional investment valuation methodologies do not, on their own, offer an explicit way to value optionality. This could mean that valuable investment opportunities are overlooked. Enhanced investment valuation methodologies, able to reflect the value of real options in a more explicit way, already exist and are used in both the investment and energy industries (either formally or informally), but their diffusion is still not as wide as is desirable. **Figure A** illustrates the conceptual difference between valuation methodologies that do, and do not, explicitly value optionality and highlights the potential value of that optionality.

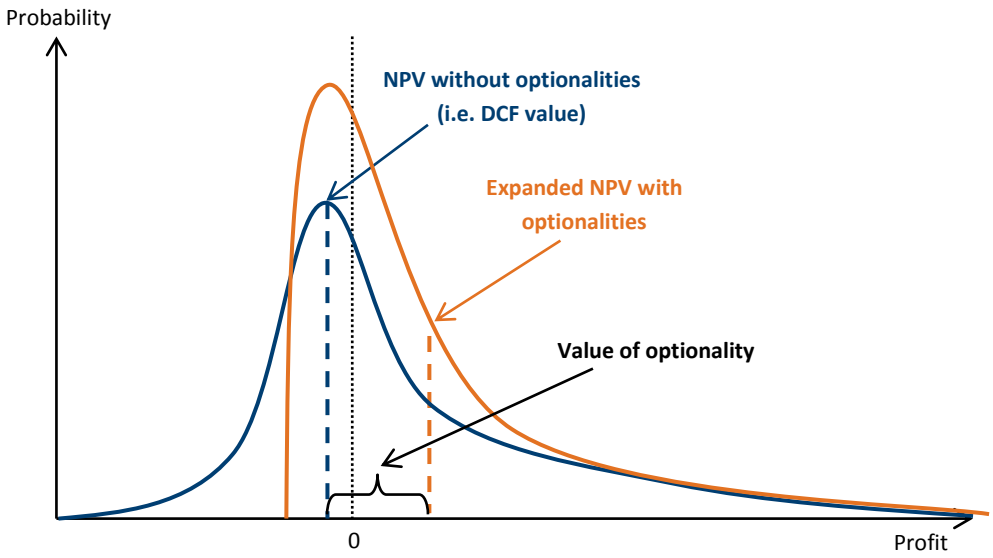

Figure A: Illustrative valuations following DCF and options approaches

An options approach is of particular relevance to the energy sector.

Although an options approach is not specific to the energy sector and it is not designed to deal with completely unforeseen events, there is a strong case to be made for its relevance, even urgency, in the energy sector at the moment; the fundamental need for a long-term transition to a clean energy system is widely accepted, but market and policy uncertainties with asymmetric profiles abound (eg the future price of fossil fuels, the nature and timing of carbon legislation, energy policy) which limits investment. The potential value of real options to deploy clean energy investments is increased by this uncertainty.

This report draws on an evidence base to identify the circumstances in which valuation methodologies enhanced by an options approach are more appropriate.

A group of energy firms is working with banks of the Banking Environment Initiative (BEI) to draw on the banks' roles in capital markets to promote discussion of this topic further. This has been supported by an evidence base compiled independently by the University of Cambridge's Judge Business School.

Our objective is to highlight the circumstances in which traditional investment valuation methodologies understate the potential value of clean energy investments. Three illustrative clean energy investment case studies are presented: investments in Carbon Capture and Storage (CCS) optionality facing uncertainty around the European price for carbon, investments in offshore wind farms facing uncertainty around UK renewables policy and investments in onshore wind farms facing uncertainty around US gas prices. The conclusions drawn are not limited to the technologies or markets that feature in these case studies, indeed a clean energy future requires a broader range of technologies than feature in this report.

These case studies demonstrate that the use of traditional investment valuation methodologies like DCF would be unlikely to see energy sector companies investing in clean energy real options like CCS readiness or pipeline development for offshore and onshore wind farms. These real options are relatively inexpensive and could deliver significant upside potential, or provide resilience, under plausible future market conditions. An options approach provides a valuable perspective beyond DCF.

Table 1 shows the circumstances in which we conclude that an options approach should be incorporated into investment valuation methodologies. These circumstances are present for a range of clean energy technologies, in a range of markets. An options approach should not replace traditional DCF analysis, but is a complementary tool to help improve decision-making under challenging conditions.

Valuation methodology **Conditions**	**Use traditional valuation methodology (eg DCF)**	**Enhance valuation methodology with an options approach**
Degree and nature of uncertainty around future market conditions	Uncertainty is limited and can be credibly quantified	Uncertainty is significant and cannot be credibly quantified
Shape of probability distribution of future market conditions	Close to symmetric	Asymmetric, with the possibility of high-impact, low-probability events
Management flexibility to change strategy in response to new information	Management flexibility is low; investment problem does not have optionality embedded	Management does have flexibility; investment problem has optionality embedded

Table 1: Conditions under which different approaches to investment valuation are more appropriate

These findings have implications for investors, company boards and policymakers.

Equity investors in energy companies that are making significant, long-term infrastructure investment decisions in the face of significant market and policy uncertainties should be looking for affordable real options in a company's portfolio. In different contexts, such optionality could yield valuable resilience or significant upside, but without them a company is far less likely to be able to respond to changing market conditions. Incorporating an options approach into their own valuations where the conditions detailed in Table 1 prevail should become standard practice.

For **company boards** in the energy sector, actively incorporating an options approach into portfolio strategy-setting processes seems both a prudent risk management approach and a strategy that could potentially secure the company significant value in the future. An options approach should be a useful way to articulate to investors the rationale behind investment strategies.

Providers of corporate and project debt, as well as **ratings agencies**, will be interested in the fact that real options can yield tangible resilience to a company's performance in future market conditions. An options approach therefore presents a meaningful additional way to understand the likely future operating cash flow of a company.

For **industry regulators** and **policymakers**, this analysis shows that focusing on whether the base case Net Present Value (NPV) of a particular clean energy technology is positive is not necessarily the only way to stimulate the desired investment. An options approach should allow those developing real options to justify continuing to do so during discrete periods of unavoidable policy or market uncertainty, thereby mitigating an investment hiatus. However, this does not detract from the importance of giving investors certainty and the more that policy action can remove the most extreme, and most unfavourable, market conditions for clean energy, the more an options approach will favour clean energy investments as well.

Next steps

An options approach is a complementary extension of traditional investment valuation analysis and so does not represent a complicated 'new' approach to investment valuation. Details of the approach adopted for this report are found in the Technical Annex to this report.

Nevertheless, members of the BEI Collaboratory on Clean Energy championed this report because they did not feel that an options approach has been sufficiently widely adopted by investors, companies or policymakers. We hope to stimulate further awareness of, and debate about, the use of an options approach so that the circumstances in which it is appropriate are well understood, commonly identified and it becomes standard practice. This would formalise some existing market practices. Doing so will lead to more robust analysis of the optionality embedded in certain investment opportunities today and therefore better capital allocation decisions in the context of current uncertainty. If the range of that market and policy uncertainty is narrowed to favour a clean energy future more clearly, investment guided by an options approach will follow.

"This report makes a valuable and timely contribution to understanding the complex investment decisions faced by energy companies, and should be considered by company boards, investors, credit rating agencies and policymakers alike. We believe the real options approach warrants a more prominent role in valuation analysis, and is particularly useful when extended from single assets to diversified portfolios."
Alan Brown, Managing Director, Co-Head Global Natural Resources Group, Deutsche Bank

"Clean energy investments, due to policy uncertainties, are a fitting case for real option type valuation. As highlighted in this report, the asymmetrical payoffs in this sector underline the advantage of using a real options approach in conjunction with DCF approaches (which do not capture asymmetrical outcomes such as policy changes). It is very helpful to have a framework that industry practitioners can agree on and that can be promoted more widely. While the real options approach captures the value from investments better than DCF, the benefits are not just limited to returns (valuation). With sophisticated risk management practices used by major energy players and institutional investors, the benefits also lie in better capturing the risk of investments at the portfolio level. A better management of risk through quantification, control and portfolio diversification would also bring down the barrier against investments in this sector."
Yoko Ohta, Managing Director, Quantitative Solution Research Department, Nomura Securities Co., Ltd.

"Energy policy in countries around the world is in flux, shaped by the politics of natural disasters (nuclear, following Japan's tsunami), carbon legislation (coal), extraction (shale gas), supply (oil) and technological advancements (wind, solar). Lloyds Bank's core mission is to bring value to its customers - through the BEI we have enjoyed dialogue and collaboration with our customers and shared our perspective on the clean energy debate through our substantial experience in financing Renewable and Conventional power projects. We hope that an options-based approach will assist our customers in making their important high value investment decisions and in doing so build sustainable businesses that prosper through the cycle, drive the economy and provide mutual business opportunities for years to come."
Dan Carr, Senior Vice President, Project Finance, Lloyds Banking Group

"In a world currently characterised by political and economic uncertainty it takes real leadership to look over the parapet and see what else is on the horizon. Climate change is one such challenge we all have to face and it presents a host of 'inevitable surprises' and real business issues. Westpac accepts the scientific consensus that climate change is real and is happening, and has led several initiatives over the years to support the transition to a low carbon economy. The collaboration of leaders from the fields of finance, business and academia under the umbrella of BEI, is one such tangible attempt to find practical solutions and encourage more investment in clean technology. The concept of 'real options value' provides an innovative way to integrate the risks, and opportunities, in relation to the uncertainties faced by the long term investment decisions in clean technology. Westpac, with its long tradition and acknowledged leadership in sustainability, is proud to be part of the BEI and the Collaboratory on Clean Energy."
Martin Hancock, Chief Operating Officer, Westpac Institutional Bank

"In a capital constrained environment, and with the pressing need to evaluate clean technology power investments in a dynamic regulatory environment, we believe the BEI's real option analysis can be a powerful incremental tool for asset managers, corporates and financial institutions to allocate investments. Real option analysis, when combined with a traditional discounted cash flow, can more accurately capture value creating outcomes that otherwise would be lost - or worse - projects that would not be undertaken."
Tim Whittaker, Head of Equity Research EMEA, Barclays

The University of Cambridge Programme for Sustainability Leadership (CPSL) works with business, government and civil society to build leaders' capacity to meet the needs of society and address critical global challenges. Our seminars and leadership groups and our partnerships with those who make or influence decisions are designed to transform public and private sector policies and practices and build greater understanding of our interdependence with one another and the natural world. Our network of alumni brings together the most influential leaders from across the world who share an interest in and a commitment to creating a sustainable future.

CPSL is an institution within Cambridge University's School of Technology. We work in close collaboration with individual academics and many other departments of the University. HRH The Prince of Wales is our patron and we are also a member of The Prince's Charities, a group of not-for-profit organisations of which His Royal Highness is President.

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