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Agenda

Advancing economics in business

Renewable energy: low appetite for investment in low-carbon technologies?

Significant investment in low-carbon electricity generation will be required over the next decade to achieve the UK government's carbon-reduction targets, with a large share expected to be funded by the private sector. The risk (and expected return) associated with an investment in low-carbon technologies, which tend to be capital-intensive, is highly dependent on the technology's maturity and future government policy. A clear and credible government policy could reduce the discount rate associated with targeted technologies by 2–3% in the next decade, thereby encouraging further investment

The investment challenge

The UK government has committed itself to reducing carbon emissions by 80% by 2050 against 1990 levels, and it looks set to propose intermediary targets of 34% in 2020 and 50% in 2030 in its upcoming fourth carbon budget.[1] To achieve these targets, carbon emissions will need to be cut across the UK economy, particularly in relation to transport, demand for heating, and electricity generation. In its Renewable Energy Review published in May 2011, the Committee on Climate Change (CCC) concluded that the UK should also include a target penetration rate for renewable energy of around 30% by 2030, up from 3% in 2009, with the bulk of new renewable energy coming from heat and electricity generation.[2]

In its consultation on the Electricity Market Reform (EMR), DECC estimates that, to achieve the government's challenging 2020 target, an investment of £70–£75 billion will be required for new renewable generation over the next decade—ie, double that seen over the last decade.[3] This is also unlikely to be a peak, since the investment requirement looks set to accelerate further in the 2020s in order to meet the ambitious target set for 2030. This poses questions about who will finance the transition towards a low-carbon future, the relative costs of various low-carbon technologies, and the extent to which the risk profile associated with such investment differs from that of traditional electricity generation. These questions are considered below from the perspectives of investors evaluating the business case for a particular technology, and policy-makers assessing the relative merits of various 'pathways' for the development of electricity generation.

Private, public, or something in between?

The money required to finance the investment challenge could be obtained from either public funds or private investors. Given the state of public finances and recent budget cuts, the private sector is likely to be expected to play an important role in financing the transition to a low-carbon economy, either by itself or in conjunction with public funding, such as that expected to be made available through the Green Investment Bank (see box below).[4]

In terms of private investment, renewable generation technologies could be developed and funded by a variety of capital providers, such as:

- large, vertically integrated energy companies with interests across several regions internationally, such as the 'Big Six'[5] incumbent electricity and gas companies in Great Britain;
- energy companies or independent generators with a more limited geographic reach and/or breadth of assets and operations, some of which may have recently entered the GB electricity market by acquiring or developing selected generation assets;
- investment funds and private commercial owners, including managed investment structures such as private equity and infrastructure funds.

As investment requirements shift from conventional (especially gas-fired) generation—which in the UK is typically funded by the 'Big Six' incumbent electricity generators and a few independent players—towards

Green Investment Bank

In a speech on May 23rd 2011, Deputy Prime Minister, Nick Clegg, stated that a government-sponsored Green Investment Bank (GIB) would be operational from April 2012, capitalised with proceeds from the sale of approximately £3 billion of government assets.[1] The Green Investment Bank Committee proposed that the GIB would then raise the majority of its funding by issuing long-term government-guaranteed 'green bonds', with additional funding coming from 'green ISAs'.[2] It expects demand for these bonds to come from institutional and retail investors alike, in particular pension funds and other institutions with demand for high-quality, long-term assets. In the same speech, Mr Clegg stated that the GIB would have borrowing powers from April 2015, provided that national debt-reduction targets have been met.

The structure of the investments that the GIB would make has yet to be confirmed, but the Committee suggested both equity and debt investments, as well as the provision of insurance products designed to mitigate risks that impede private sector investment. Early proposals to prevent the crowding-out of private sector investment include a provision that the GIB require a commercial rate of return on its investment, as well as a mandate to invest only in areas where no investment would otherwise take place. Scottish & Southern Energy (SSE), for example, discusses an energy co-investment model put forward by the international investment bank, Rothschild, in which the GIB would purchase a 'passive' equity stake alongside a lead investor (the developer). This stake could be sold after the construction phase, by which point project-specific risk could be significantly reduced.[3]

[1] Clegg, N. (2011), 'Deputy Prime Minister's Speech on Green Growth at the Climate Change Capital', May 23rd.
[2] House of Commons Environmental Audit Committee (2011), 'The Green Investment Bank: Second Report of Session 2010–11, Volume 1', March 11th.
[3] SSE (2011), 'An Energy White Paper – A Package of Reforms to Encourage Investment in Electricity Generation', May, pp. 35–6.

low-carbon and renewable technologies, one might expect the investor mix to change. For example, a third of onshore and offshore wind projects under construction in 2010 were being developed by non-British energy groups (such as Dong Energy, Vattenfall and Statoil).[6] Given the sheer size of the required investment, new investors are likely to play a critical role in funding the transition to a greener future.

Which technology?

A variety of technologies can play a role in the transition. To select the mix, investors need to consider the costs of building and operating each technology (ie, the capital and operating costs), as well as the costs related to financing the investment. Similarly, policy-makers need to evaluate whether intervention is necessary, for example if conventional generation is cheaper, has a more immediate payback, and is thus more attractive to investors (even though it is carbon-emitting).

A natural starting point in evaluating the relative costs of technologies is to assess the operating and capital costs. In a recent study, for example, the CCC found that 'nuclear appears to be [the] lowest-cost low-carbon technology with significant potential for increased deployment',[7] and that increasing reliance on offshore wind is likely to have an adverse impact on energy bills over the next decade.

In addition to the operating and capital costs, a thorough cost–benefit analysis (CBA) needs to incorporate the cost of raising capital to finance the investment. Because most renewable generation technologies are relatively capital-intensive, the cost of capital plays an important role in the CBA of these technologies. To undertake this analysis, it is necessary to understand the risk profile of these plants in financial terms, as discussed in the following section.

High-risk, high-return, low emissions

A wide range of risk factors can affect discount rates for low-carbon technologies. Some (such as wholesale electricity prices and government policy) are unrelated to a particular technology and outside the control of the technology's developer, and others (such as load factor, cost structure and technology maturity) are 'intrinsic' and pertain to a particular type of technology. Identifying the risk areas could help to inform which specific areas policy mechanisms should be designed to target.

An Oxera study in April found that key technological characteristics affecting the discount rate are the level of capital expenditure (CAPEX) required, the technology's 'maturity' (assumed to be directly related to the extent of its deployment), and operational factors such as technical performance.[8] Three risk factors in particular stand out as having an effect on low-carbon investment:

- the maturity or deployment of a given technology relates to the uncertainty associated with it as a result of being relatively unproven in the marketplace. This risk factor is particularly important for technologies such as CCS and wave energy;
- technologies characterised by capital intensity are perceived as being more risky, as a result of their higher operating gearing (ie, the ratio of fixed costs to total operating costs);

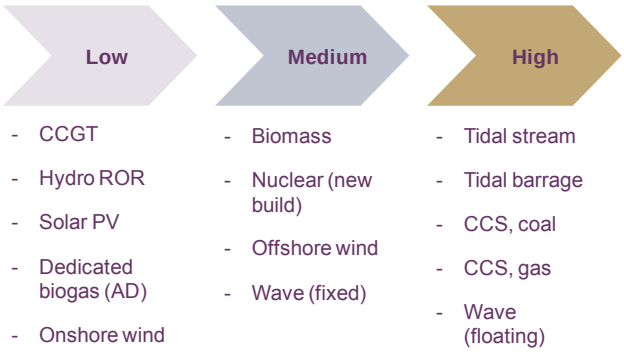
– policy risk—ie, the risk that a particular policy might not be sustained over a sufficient period of time for the investment to provide the required return. Policy risk can be classified as an 'extrinsic' risk factor, in that it is outside the control of a developer, or inherent within a technology.

The Oxera study classifies each technology as low-, medium- or high-risk, as shown in Figure 1. The overall risk classification reflects the relative importance of individual risk factors—for example, while CCS and nuclear are exposed to similar risks (in particular, construction cost risk), the former is associated with a higher risk classification due to its relative immaturity.

The study also presents a mapping of risk factors onto discount rates for the same technologies: 'high'-risk technologies are associated with a higher and wider discount rate range, which partly reflects the greater uncertainty associated with less well-established technologies such as CCS and tidal energy.

Government policies can be implemented to reduce the return required by investors for a given technology. This could be achieved through a combination of i) improving the expected return of targeted technologies; and ii) reducing the variability in future cash flows. The impact of any given policy would vary across technologies; for example, a policy designed to remove wholesale electricity price risk would be of most benefit to technologies with a large CAPEX investment, such as nuclear.

Figure 1 Risk classification for conventional and low-carbon technologies



Note: CCGT, combined-cycle gas turbine; ROR, run-of-the-river; PV, photovoltaic; AD, anaerobic digestion.
Source: Oxera (2011), op. cit.

The study estimates that the discount rate for technologies that are supported by government policy could be as much as 2–3% lower over the next decade, and could fall by a further 1–2% by 2040.[9] The estimates for future discount rates are largely derived from an implicit assumption that, first and foremost, the underlying government policy is credible and effective at triggering the development of targeted technologies. Then, all else being equal, as a technology becomes increasingly established and hence less risky, the return required by equity and debt investors decreases, while at the same time the capital structure can increasingly rely on debt, which is cheaper than equity. The assumption that an investor is able to access more debt at cheaper rates, as the overall risk declines, is consistent with the methodology applied by credit rating agencies. Moody's states that companies with low business risk 'may have lower financial ratios and higher leverage than most peer companies on a global basis, but still maintain higher overall ratings'.[10] Of course, while the right policies may help to reduce investors' risk perceptions, it remains to be seen whether existing EMR proposals will achieve such benefits.

Conclusion

Having laid out the main drivers for the costs of renewable technologies, we can now return to the central question: do private investors have an appetite for low-carbon technologies? Assuming no constraints in the availability of private funds, the costs of financing low-carbon technologies could prove to be high, in particular for those technologies that are still being developed and have no proven track record. Those financing costs could be mitigated, at least partly, depending on the outcome of the government's review of the electricity market. Increased clarity on the government's planned policy could go some way to reducing the perceived policy risk, unless market participants remain sceptical about the ability of policy-makers to credibly commit to specific measures over the long term. Nevertheless, as the overall risk exposure of green technologies reduces, the combined impact of lower capital, operating and financing costs could have a significant impact on the economic viability of low-carbon projects.

[1] HM Government (2011), 'Implementing the Climate Change Act 2008: The Government's Proposal for Setting the Fourth Carbon Budget', policy statement, May.
[2] Committee on Climate Change (2011), 'The Renewable Energy Review', May.
[3] Department for Energy and Climate Change (2010), 'Electricity Market Reform: Consultation Document', December.
[4] The government has already committed £1 billion for the development of carbon capture and storage (CCS) technology.
[5] The 'Big Six' firms are E.ON UK, RWE npower, SSE, ScottishPower, EDF Energy, and British Gas.
[6] Department for Energy and Climate Change (2010), op. cit., p. 35.
[7] Committee on Climate Change (2011), op. cit., p. 18. The CCC results are based on a study of operating and capital expenditure for low-carbon technologies. Mott MacDonald (2011), 'Costs of Low-Carbon Generation Technologies', May. A few weeks after the publication of the CCC report, the UK Chief Inspector of Nuclear Installations, Mike Weightman, published an interim report to the effect that the accident at the Fukushima nuclear power station in Japan would be unlikely to happen in the UK, thereby easing concerns that the UK would eventually move away from nuclear. See Office for Nuclear Regulation (2011), 'Japanese Earthquake and Tsunami: Implications for the UK Nuclear Industry. Interim Report', May 18th.
[8] Oxera (2011), 'Discount Rates for Low-Carbon and Renewable Generation Technologies', report for the Committee on Climate Change, April.
[9] Oxera (2011), op. cit.
[10] Moody's (2009), 'Rating Methodology: Regulated Electric and Gas Utilities', August, p. 24.

If you have any questions regarding the issues raised in this article, please contact the editor, Dr Gunnar Niels: tel +44 (0) 1865 253 000 or email g_niels@oxera.com

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