Financing the UK Power Sector: Is the Money Available?

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Abstract

The power generation sector faces a major new round of investment to replace retiring plant and meet carbon reduction and renewable energy targets. Achieving low-cost power generation depends in part on the availability of low-cost finance. The traditional channel for this has been through bonds and shares of large utility companies. However, utilities' balance sheets are suffering from a combination of high corporate debt, reduced electricity demand, and suppressed wholesale prices. We find that the link between the finance sector and the electricity sector is not 'broken', but the flow of money to the sector is threatened by the current weakness of the utilities' business model. This paper compares different published estimates of the scale of investment required in the UK with historical investment rates. It uses literature review and interviews with practitioners to summarise contemporary views of current industry conditions and trends in the UK. Potential policy interventions that might be needed to bridge the gap are explored. These include ways to scale-up traditional utility and project finance routes. The potential for alternative new routes of channelling institutional investor funds directly into physical energy assets is reviewed.

1. Introduction

The electricity sector faces a level of capital investment in the coming two decades that is far higher than the previous two decades (Ofgem, 2010b). This is driven by greater than average retirement rates of existing plant, partly due to ageing of the generation fleet, accelerated by the retirement of coal plant as a result of the EU Industrial Emissions Directive to control local pollutants (Environment_Agency), and planned retirement of most of the UK's nuclear plant.

The most important factor that determines whether or not these investments are achievable is the underlying business case, i.e. the fundamentals of the electricity market, and the details of any subsidy regimes. Whilst this forms an essential backdrop, this is not the primary focus of this paper. Instead, we focus here on an important secondary and enabling factor, namely whether or not there are constraints to capital flows into the sector that could jeopardise these investments. We aim to clarify uncertainties over whether finance is available in sufficiently large volumes on sufficiently attractive terms to make the scale of investment required feasible.

The analysis in this report is based on literature review combined with interviews with a range of different practitioners in the UK finance and electricity sectors. Many of the observations and conclusions drawn in this report therefore reflect a synthesis of contemporary views of various participants (see Appendix A).

2. Scale of the Investment Challenge

2.1. Review of Published Estimates

Over the past several years, various organisations have published figures for the amount of capital required to finance future investments in the UK power sector, summarised in Table 1.

	Study Year	Scenario	Investment (£bn)						Emissions Intensity gCO2/kWh		
			2020		2025		2030		2020	2025	2030
			Ann.	Total	Ann	Total	Annual	Total			
OFGEM	2009	Green Transit'n GT	**7.8**	**78**	**8.1**	**117**			304	196	
		Green Stimulus GS	**7.3**	**73**	**7.7**	**111**			228	167	
		Dash for Energy DE	**4.3**	**43**	**5.1**	**74**			364	315	
		Slow Growth SG	**3.3**	**33**	**4.2**	**60**			379	328	
Ernst &Young	2009	Central			**11.3**	**164**				134	
DECC	2012	Central	9.9	77	7.7	98	8.0	140	206	186	129
National Grid	2013	Gone Green GG	**11.1**	**77**	14.4	173	15.1	257	200	75	50
		Slow Progression SP	**5.9**	**42**	6.9	83	8.2	139	251	153	118
Committee on Climate Change	2013	Ambitious Nuc AN					13.5	229			49
		Ambitious RE AR					17.2	292			48
		Ambitious CCS ACCS					13.2	224			55
		Ambitious EE AEE					11.7	199			52
London School of Economics	2012	Hitting the target HtT					18.8	330			
		Gas is key GK					10.3	180			
		Austerity reigns AR					7.4	130			
The Crown Estate (OffshWind only, excludes transmission)	2012	Slow Progression 1	3.1	24							
		Tech. Acceleration 2	4.5	35							
		Supply Chain Eff. 3	4.5	35							
		Rapid Growth 4	6.1	48							

Table 1 Comparison of investment requirements between studies[a]

[a] Notes to Table 1. Figures in bold in the table correspond to where the study explicitly states an investment figure. Non-bold figures have been calculated by taking capacity addition figures and multiplying by a common capital cost.

Source: (Ofgem, 2010a, Ernst & Young, 2009, DECC, 2012, National Grid, 2013, CCC, 2013, LSE, 2012, PWC, 2012)

A key difference between scenarios is the level of ambition in terms of carbon emissions. Since low-carbon technologies are more capital intensive, the more ambitious scenarios in terms of emissions intensities have a higher CAPEX requirement as can be seen from Table 1.

2.2. How Big is the Investment Gap?

Investment in power generation is quite cyclical. By contrast with much of the 2000s, the period 2009-2012 saw a significant increase in the rate of new additions to an average of 4 GW per year, comprising 2.3 GW of gas, 1.3 GW of wind (0.6 GW onshore, 0.8GW offshore), and 0.5 GW of solar. Figure 1 shows the implied new plant capacity additions for the future scenarios. At 4 GW per annum, the total build rate of the past four years is higher than the OFGEM 2020 scenarios, and is not far behind the National Grid 'Gone Green' scenario, albeit with a significantly smaller share of renewables (1.9GW vs. 3.7GW for the NG scenario).

Total CAPEX estimates in Figure 1 Comparing historical and projected build rates (MW) and CAPEX (£m)Figure 1 are similar to others in the literature, quoted at £5 billion (SSE, 2011) and £5.7 billion per annum (PWC, 2012). At £4.8bn, average CAPEX over the past four years is below OFGEM Green Transition and Green Stimulus investment requirements for 2020 (£7.6bn and £7.1bn respectively), but somewhat ahead of the more pessimistic Slow Growth and Dash for Energy scenarios (£4.1bn and £3.1bn respectively).

2012 was a strong year, with wind investment reaching 1.9 GW (0.7 GW onshore, 1.2 GW offshore). This compares to around 2 GW of wind required annually, as an average across the different future scenarios. Total investment exceeded £7bn, with £5bn for renewables, close to the OFGEM 2020 scenarios. Therefore, over recent years, and for 2012 in particular, investment rates compare quite favourably with the expected investment requirements up to 2020. The period post-2020 looks more challenging, largely because of the increasing need to replace retiring plant.

In summary, the investment trends of recent years look more than sufficient to meet the near-term less environmentally ambitious scenarios. The more ambitious and more long-term scenarios, especially those of the CCC for the 4th Carbon Budget would require scaling up by around £2.5 – 7.5bn compared to the average CAPEX over the past four years.

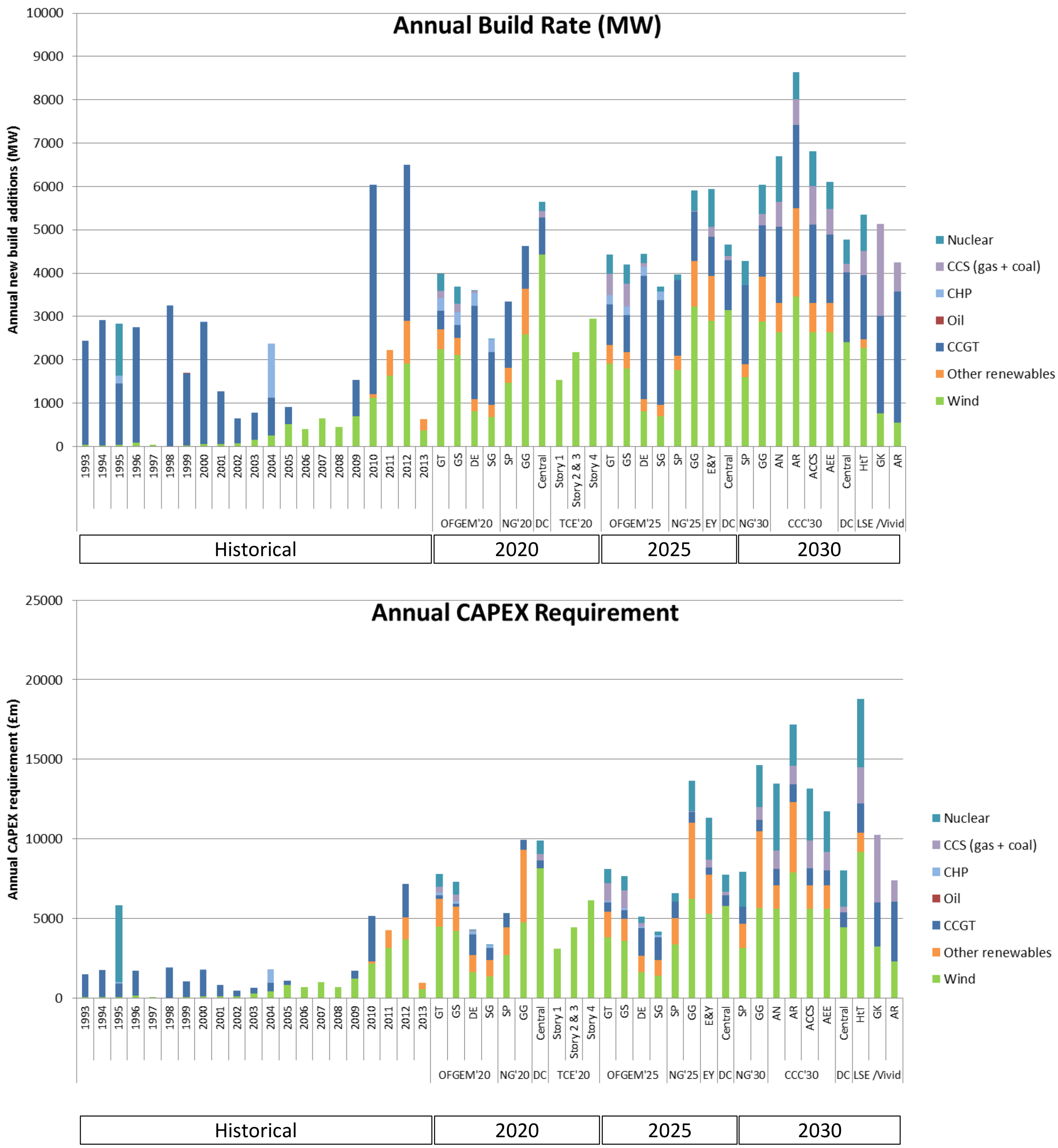


Figure 1 Comparing historical and projected build rates (MW) and CAPEX (£m)

3. Investment Channels

3.1. Utility investment

Of the 16.5 GW of new capacity added to the UK system between 2006-2012, approximately 85% (14 GW) has been built by the major utility companies (BNEF, 2012). The ability of utilities to maintain or expand these investment rates depends on the overall health of their balance sheets. CAPEX is financed directly from cash available to the business either from accumulated retained earnings or from access to sufficient credit. For the top 25 European utilities as a whole, the earnings margin is set to remain well below pre-recession levels.

The CAPEX plans for the 'big 6' electricity companies operating in the UK shown in Figure 2. These are the total CAPEX for the company as a whole, not just for the UK. These figures show that CAPEX plans are set to be reasonably steady on average to 2015, but this average is skewed by the large expected increase in CAPEX for EDF as a result of the additional safety-related expenditure to their fleet following Fukushima (EDF, 2012). Taking this out implies that for the other 5 companies, total planned CAPEX is set to drop relative to 2012 levels by 12% in 2013, 24% in 2014, and 30% in 2015.

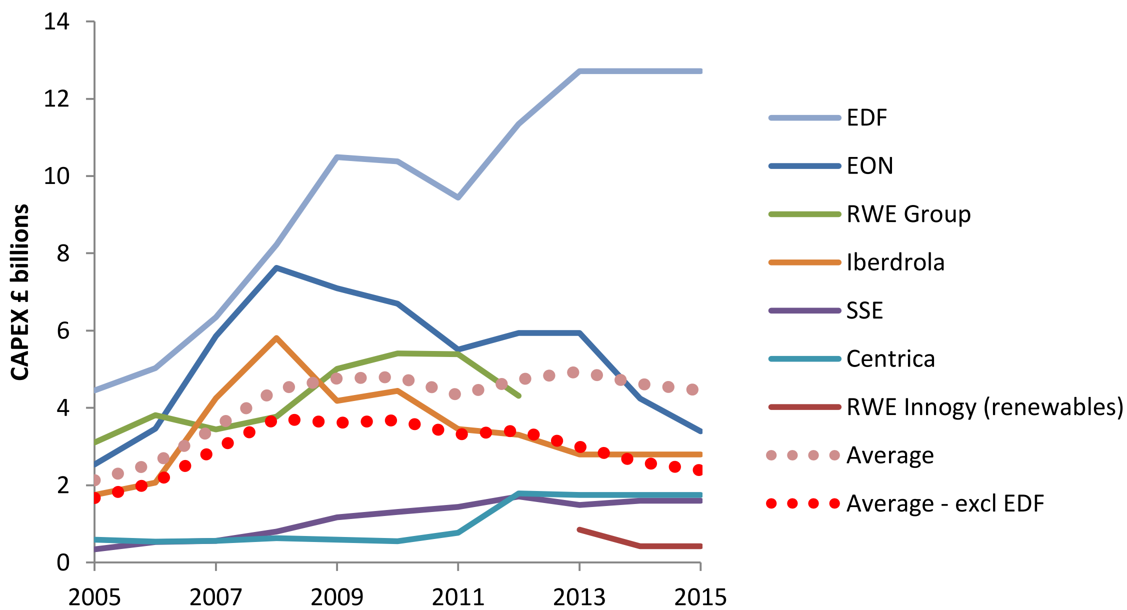


Figure 2 Total CAPEX plans for the 'big 6'

Source: (Eon, 2013, Reuters, 2013a, RWE, 2013, SSE, 2013, Centrica, 2013, Iberdrola, 2013b, Iberdrola, 2013a, EDF, 2013, Boxell, 2012, Thomson Reuters Datastream, 2013a)

Source: (DECC, 2011a, Investment Management Association, 2012)

Poor profitability is exacerbated by the utilities' need to reduce debt, which increased 10 fold from 2000 to 2010 for the European utilities as a whole (CCC, 2012). Since 2009 however, they have embarked upon major cost reduction programmes and disposal of assets to reduce their debt levels (Ofgem, 2010b) which have also affected corporate spending priorities.

This is driven by utilities' need to maintain credit ratings. Credit ratings provide information to creditors about the health of companies' balance sheets, including the risk of default on corporate loans, and creditors will charge more for loans to companies with riskier credit ratings (Brealey et al., 2006). The pattern of decreasing ratings is confirmed by the shifting of ratings distributions for the EMEA top 25 utilities, mostly energy (electricity and gas), shown in Figure 3.

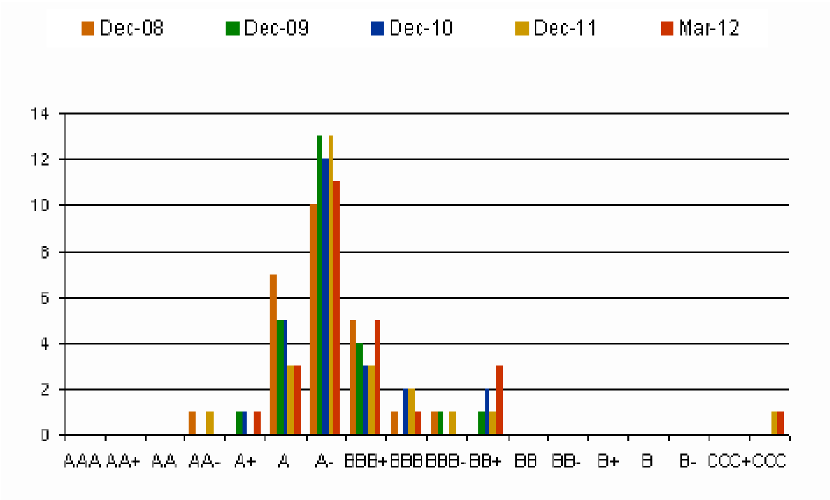


Figure 3 - EMEA Top 25 utilities long term ratings distributions. Source: (Standard & Poor's, 2013)

3.2. Project-financed Investment

Project finance is secured against the assets of a particular project rather than the asset base of a wider company. Since the Enron and other financial mismanagement scandals, the ability of large companies to ring-fence the liabilities associated with off-balance-sheet investments in this way has largely disappeared (PWC, 2012). Nevertheless, project finance has been an important source of finance for smaller developers. Project finance stagnated between 2008-2010 in the financial crisis (Standard & Poor's, 2013, Della Croce et al., 2011a), but late 2012 saw a re-emergence of capital issuances for recycling project finance debt, followed by a number of other sizable infrastructure projects early in 2013 (Standard & Poor's, 2013).

3.2.1. Role in UK Onshore Wind

Project finance has been widely used by project developers in the UK for onshore wind (Mazars, 2012). Bank loans were a key contributor to financing these projects and helping to grow the UKs cumulative onshore wind capacity. During the 2000s, pre-crisis, bank credit was cheap because of low central bank base rates. Banks were keen to extend credit to projects that could earn a margin over low-yielding national gilts and treasuries. With a track record of reasonably profitable projects, reliable income payment structures, renewable energy subsidies, and technical risk, the wind sector was able to attract a high share of debt (from below 60% to above 80% (Mazars, 2012). Since the financial crisis however, lenders appear to be imposing a general cap. In 2012, maximum gearing ratios dropped from above 80% to below 75% (Mazars, 2012), reflecting lenders increasing risk aversion.

Lenders have also altered pricing of debt. Project spreads (i.e. the risk premiums charged on loans) became very low in the run up to the financial crisis as credit-providers competed to lend to projects. Since then, despite a drop in base rates and inter-bank borrowing rates, the cost of debt for project financing wind projects has not dropped much, with lenders taking a wider spread (Figure 4).

Traditionally refinancing schemes have been on a 15 year basis or longer, but these have been reducing to as little as 7 years (Mazars, 2012).

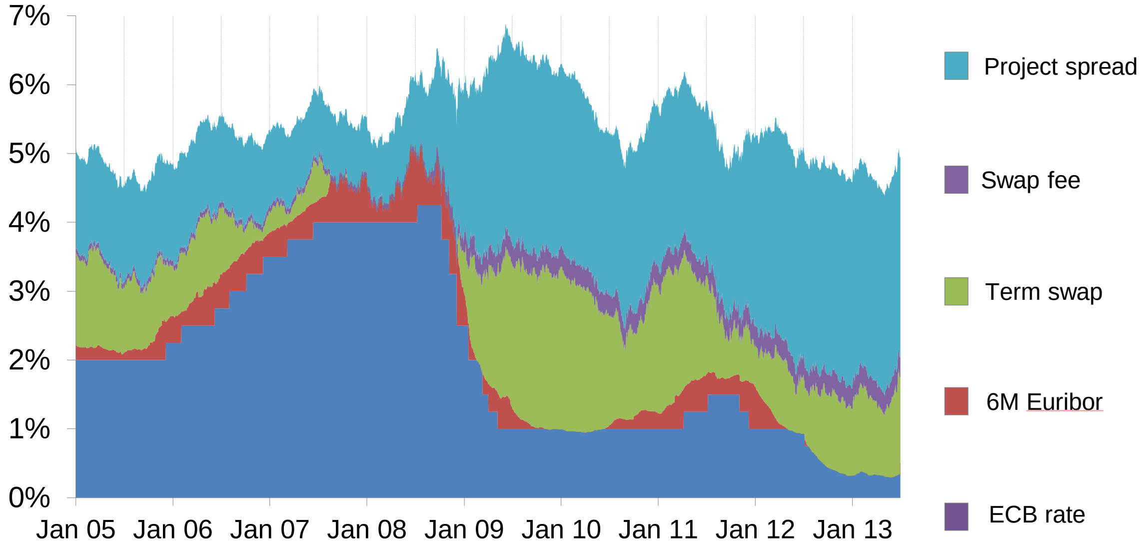


Figure 4 Cost of debt for European onshore wind

Source: (BNEF, 2013)

3.2.3. Financing UK Offshore Wind

The challenging physical environment and the larger turbine sizes significantly increases technical risks both during construction and operation phases. In addition, the sheer size of offshore wind farm developments usually requires the involvement of large companies. In practice this has meant that offshore wind consortia has included large utilities, energy companies and technology providers, who can cover the equity position and provide the technical expertise required (Figure 5). Much of the equity is owned by consortia of utility companies (on-balance sheet), whilst debt is often provided on a project-finance type arrangement with consortia of banks (Nelson and Pierpont, 2013), with loans often covered by guarantees from public institutions. The maximum debt leverage has been limited to between 15 - 40% (PWC, 2012).

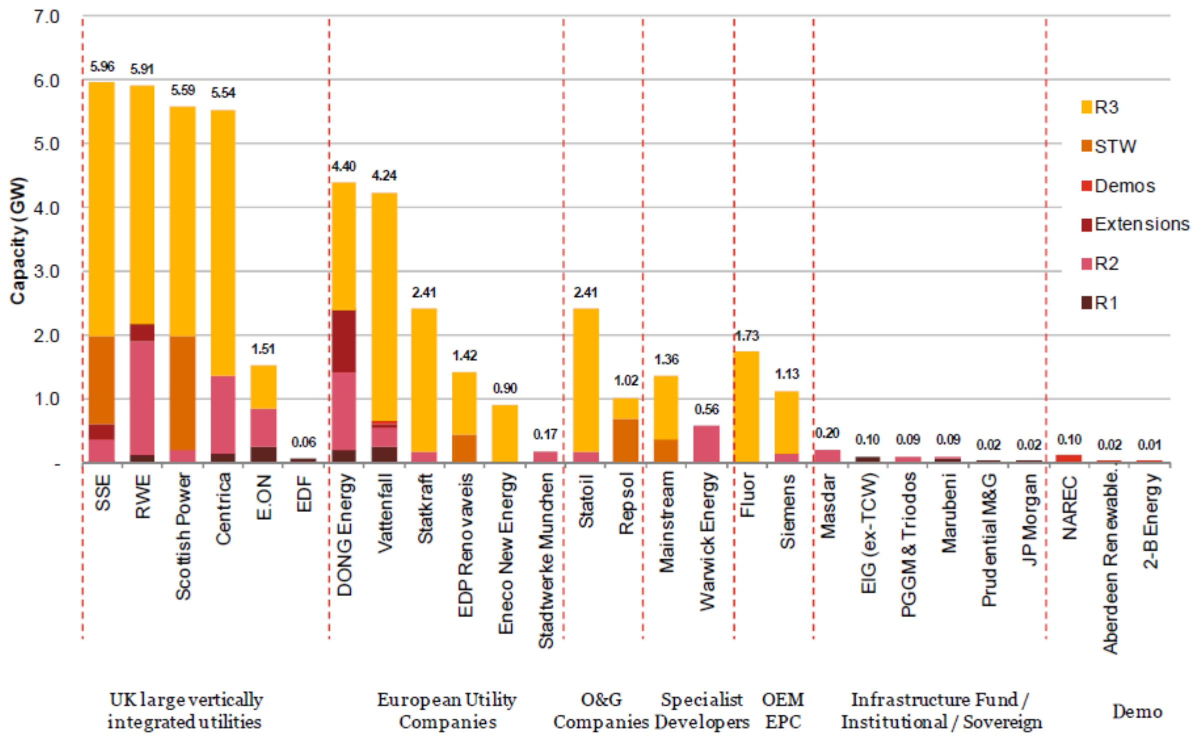


Figure 5 Equity ownership: shares of UK offshore wind by capacity

Source: (PWC, 2012)

Scaling up depends on two issues. Firstly, if the current round of early projects shows operational risks to be low, this will encourage the emergence of a secondary market allowing project developers to refinance by selling-on the projects once construction is complete. This would enable construction capital to be recycled more quickly back into new projects, helping to accelerate overall investment rates.

Secondly, more debt is needed at the pre-construction stage. This looks difficult because constructing offshore wind plants is challenging, involving extreme weather conditions, marine logistics, a fledgling supply chain which has been prone to delays (Greenacre et al., 2010) and involving complex multi-contracting structures, so they do not achieve investment grade status (Fitch Ratings, 2012). Some commentators have suggested that project bonds could however start to play a role by 2017 and beyond (PWC, 2012).

4. Sources of Finance

The total size of global financial markets amounted to over $200 trillion in 2010 ((Roxburgh et al., 2011) with over $100 trillion potentially available for corporate finance in the form of bank loans (discussed in Section 4.1) and institutional investments (discussed in Section 4.2).

4.1. Bank finance

Loans (mostly from commercial banks) make up almost half of the pool of finance available for corporate financing. This includes various lending instruments for mortgages, businesses and consumer credit (Bank of England, 2013). Global debt doubled in the past decade from €78 trillion in

2000 to $158 trillion in 2010 mostly attributable to governments and financial institutions, and 31% of this is in the form of loans held by banks, credit agencies and other financial institutions (Roxburgh et al., 2011).

Leading up to the financial crisis, according to figures from the Bank of England, a massive increase in debt lending from banks was noted in the UK (RBS Group, 2013) (Figure 6.).

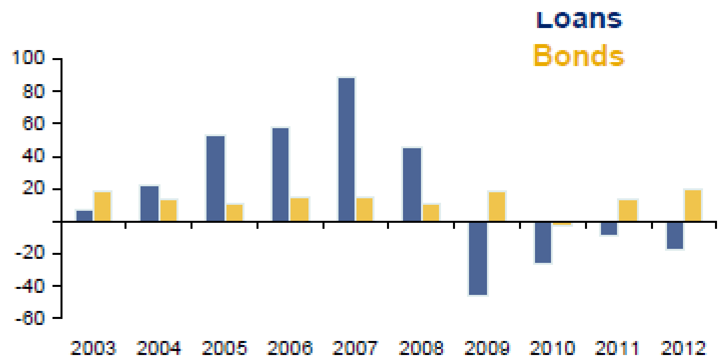


Figure 6 – UK net corporate loans and bond issuance £ billion (2003-2012)

Source: (RBS Group, 2013) with data from BOE & Group Economics

Following the financial collapse, this trend reversed (PWC, 2012, IHS CERA, 2013) (Bank of England, 2013). Banks' constrained balance sheets, together with increasing pressure to de-leverage from Basel III regulations made the provision of low cost long term finance more difficult (PWC, 2012, IHS CERA, 2013, Roxburgh et al., 2011, Kapan and Minoiu, 2013). Research by (RBS Group, 2013) showed that bond issuance also stalled in 2010.

Economy-wide, there are signs that access to credit is easing, with bank borrowing and bond issuance both being viewed more positively in a survey of CFOs (Deloitte, 2013). For the energy sector however, it is still proving difficult to obtain attractive bank loans with the long maturities required for low-carbon generation projects due to on-going liquidity and capital constraints, see (Kaminker and Stewart, 2012).

At a global and European level, bank loans for renewable energy projects have been dominated by multilateral and development banks, particularly after the financial crisis when regulations have been stricter on commercial banks (UNEP, 2012). Global lending from these institutions for clean energy projects was $79 billion in 2012. For renewable energy, development bank finance in 2012 was $51 billion (UNEP, 2013). In Europe, $20 billion was made available from Germany's KfW, and $4.3 billion came from the European Investment Bank in 2012 (UNEP, 2013).

In the UK by contrast, public bank involvement has been limited, with most bank debt for onshore wind being sourced from commercial banks. Offshore wind in the UK has attracted funds from KfW. The EIB have only two generation projects listed in the UK, both currently under appraisal (an offshore wind farm and the Drax coal to biomass conversion) (EIB, 2013).

4.2. Institutional investors

Institutional investors are specialised financial institutions that manage savings collectively on behalf of other investors such as pensions, insurance and private wealth funds (BIS, 2007) (Nelson and Pierpont, 2013) (Kaminker and Stewart, 2012) (see Figure 7).

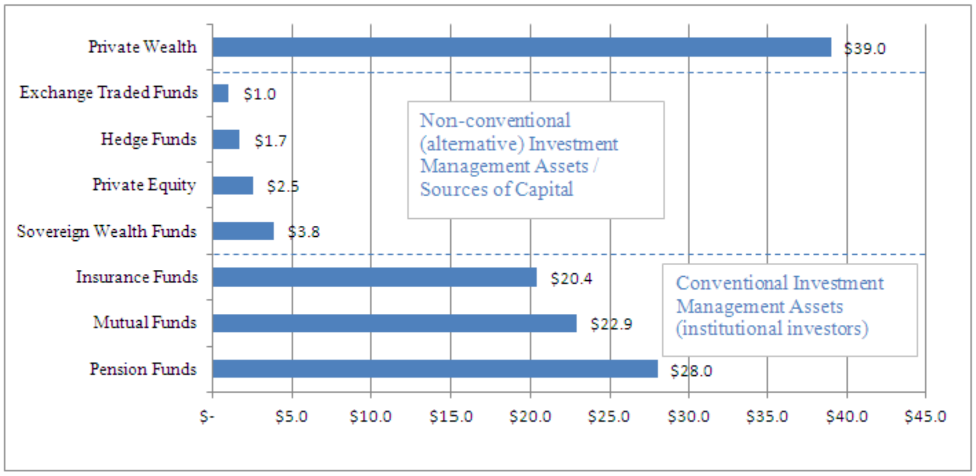


Figure 7 - Global fund management industry, assets under management (USD $ trillion)

Source: (Della Croce et al., 2011a) adapted from Climate Change 2011, (Deutsche Bank 2011)

The structure of institutional investors typically means that their liabilities range from short-term to very long-term (e.g. pension funds). Most financial institutions aim to hold a range of assets which broadly match their liabilities. Since there is a limited range of financial assets with such long lifetimes, it has been posited that institutional investor money could be well-matched to long-lived physical assets including energy infrastructure (Kaminker and Stewart, 2012), (PWC, 2012, CEPA, 2011, Holmes et al., 2012). Three main routes are proposed (ibid), and discussed in the following sections:

- Invest via bonds and shares of energy companies involved in the projects,
- Invest directly in the projects
- Invest via pooled investment vehicles and infrastructure funds

4.2.1. Investing through bonds & shares

As dominant players in traded equities and bond markets, institutional investors are already indirectly supplying the majority of finance into the electricity sector. Figure 8 shows the allocation plans of UK managed assets. Although the composition of allocation has changed, around 80% is designated for equities and bonds (Investment Management Association, 2012), reflecting institutional investor’s preference for liquid assets.

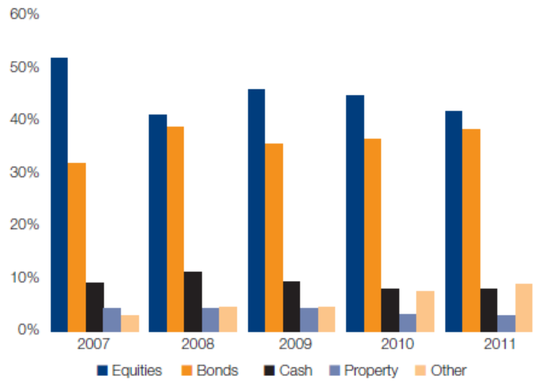


Figure 8 - Allocation of UK managed assets (2007 – 2011)

Source: (Investment Management Association, 2012)

Bonds

From the financial market perspective, institutional investors are required to limit exposure to risky investments. This leads to an important dynamic in the relationship between energy markets and financial markets. Acceptable levels of risk in the energy market are effectively constrained by the level of acceptable risk in the regulated sectors of the financial market. If risks rise to the extent that utilities lose their A ratings, they may lose their investment-grade status. This not only puts them at a disadvantage in terms of having to borrow at higher interest rates, but the volumes of money available at these higher risk ratings may simply not be large enough to sustain the utility financing model.

Nevertheless, economy wide, bond issuances have recently increased on the back of decreased bank lending, and record low sovereign bond yields, as investors seek more attractive alternatives (Deutsche Bank, 2013). Bond issuances from four of the 'big 6' integrated energy utilities has been fairly active since the financial crisis (Thomson Reuters Datastream, 2013b) (RWE, EDF, Centrica, SSE) (Miller, 2011).

An increase in bond issuances could in principle expand utility balance sheets. However, if utilities are simply changing the composition of their debt by moving towards bonds instead of bank loans, overall potential investment for the energy sector will not expand. The net increase of finance relies on the ability of utilities to expand their balance sheets without increasing credit risks, which is determined by electricity market conditions.

Shares

Unless companies are in high growth sectors, issuance of new equity is seen in financial markets as dilutive of company value, even if they are linked to investment in assets that should increase the value of the company (Financier, 2013). Equity issuance is possible in conditions where share prices are increasing, and there is investor confidence in market growth. However, these conditions are far from being met in the European utility sector (Figure 9). Utilities have therefore been reluctant to issue equity for the construction of new low carbon generation assets (SSE, 2011). For this to change, investors will have to believe in feasible returns from the more challenging energy projects, and companies will need to perform better, which would be eased by an improved economic landscape.

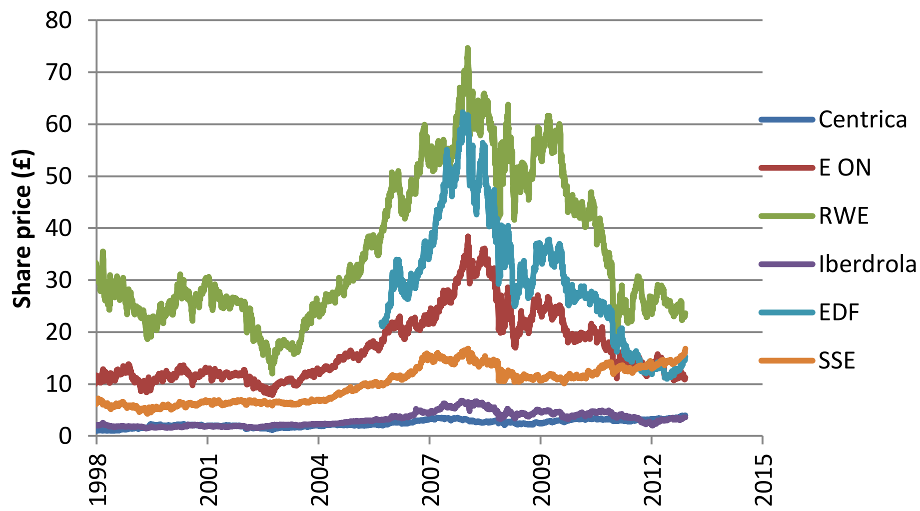


Figure 9 - UK integrated utility share prices from 1998 - 2013 (£)

Source: (Thomson Reuters Datastream, 2013a)

4.2.2. Direct investment, private equity & infrastructure funds

The great majority of institutional investment is allocated to liquid assets such as bonds & shares. Over recent years, a small but growing fraction of allocation is being made in alternative (illiquid) investment vehicles (Capgemini and RBC Wealth Management, 2013, Mercer, 2013) (Figure 10), though market practitioners typically expect that funds allocated to these alternatives would not exceed 10-15% of assets under management (ibid).

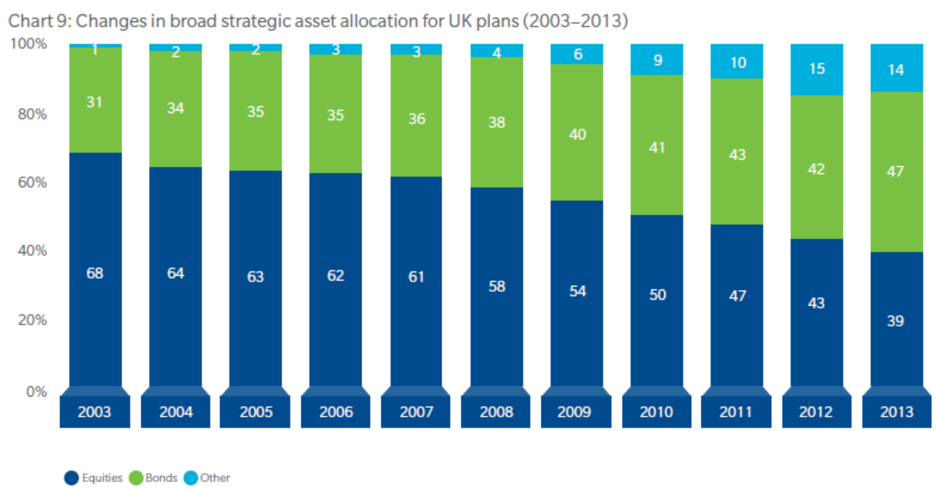


Figure 10 - Changes in asset allocation for UK pension plans (2003 – 2010)

Source: (Mercer, 2013)

The main channels for financial flows into the energy sector are outlined in the following table.

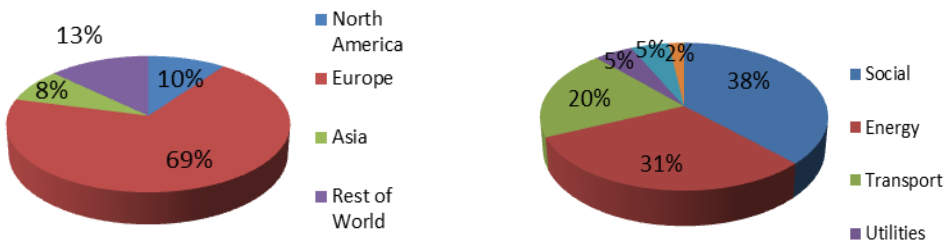
Direct investment	A benefit of direct investment is cutting out the use of a fund manager, resulting in higher returns and more control over the asset (Inderst, 2009). Building direct investment teams changes organisation culture, as well as the risk and return profiles of projects (Nelson and Pierpont, 2013). The drawback to having a dedicated team are the high expenses involved. Currently, there is a gap between the institutional community's interest and their actual investment due to this lack of capability (LCFG, 2012). Experience to date has often focussed on property investment (Inderst, 2009). Sovereign wealth funds may have different risk appetite and regulatory constraints, and have shown some entry to offshore wind (Section 3.2.3), although typically as much as 85% of funds are allocated to liquid and / or fixed income assets (IMF, 2013).
Infrastructure funds	Infrastructure funds enable institutional investors to pool finance whereby a manager with suitable expertise can lower risk and ensure sufficient returns. They are traditionally used to fund large infrastructure projects such as roads, hospitals and housing, but have gained some ground in funding low carbon renewable projects (Mazars, 2012, PWC, 2012). They still play a relatively small role in the energy context. In 2007 \$35.9 billion was raised globally with a small fraction for European energy projects, contrasted with £73 billion issued in bonds by European energy utilities alone in the same year (Caldecott, 2010). However Asian markets seem to be growing rapidly, with shares to energy and to Europe taking a significant share of global totals (see Figure 11).  **Figure 11 - Breakdown of infrastructure deals by region and industry Q1 2013 (%)** Source: (Prequin, 2013a) (Taylor-DeJongh, 2009) note a target return from private infrastructure fund from 18-20% reducing after the crisis to 13-15%. This demonstrates that such sources are not necessarily low-cost. Regulatory limits may arise from the Volker Rule and the Alternative Investment Fund Manager Directive (AIFM) (Della Croce et al., 2011b).
Private equity and hedge funds	These are investment vehicles used to pool investor capital (Forbes, 2013). Some investors lack the scale of finance required to invest in a particular asset such as energy generation, so the pooling mechanism can be effective, whereby a fund manager with expertise in the industry can be responsible for investment. Private equity funds alone make up an estimated \$3 trillion (Forbes, 2013), so they are a potentially sizable resource.

Table 2 – Main routes for investment funds to flow into electricity sector assets

Global investment through these routes into long-term fixed assets is estimated at $2.4 trillion (World Economic Forum 2011). This large total is however greatly fragmented into smaller sectoral and geographical allocations. Investment into European clean energy infrastructure is a small share of this total, as shown in Figure 12. The chart shows that the average annual amounts invested over the four years 2009-2012 from these sources was almost €2bn (€0.5bn for direct investment, €1.1bn for infrastructure funds and €0.3bn for hedge funds and private equity). Figures are not available for the UK, but could represent perhaps 10% or more of these European totals (i.e. around £200m) given the relative size of UK and European renewable markets.

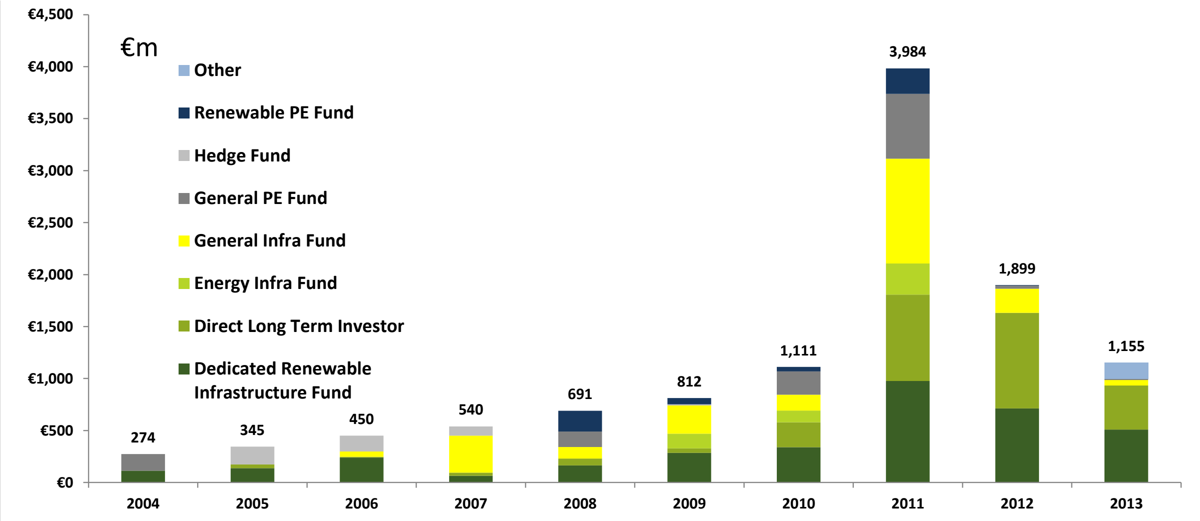


Figure 12. Direct Institutional Investment in EU low-carbon infrastructure €m. Source: (Hg Capital)

The OECD (Kaminker and Stewart, 2012) has estimated the institutional investor's global capital value of $71 trillion. The WEF (World Economic Forum, 2011) identifies a subset of these investors who could potentially invest in long-term assets, and arrive at an estimate of around $27tn assets held by these groups. Of this, they estimate that $15tn is required to be invested in structurally short-term assets, and a further $5.5tn tends to be in short term assets because of investment processes. This leaves around $6tn that could potentially be available for investment in long-term assets.

This represents an increase of 2.5 times the level currently made to investing in all categories of long-term assets globally (WEF 2011). If the share of finance to European energy infrastructure were to scale up by the same amount, then the volumes could increase from the level of around €2bn to perhaps €5bn for Europe as a whole. Perhaps around 10% of this might be available for the UK, but it seems unlikely that investment volumes for the UK electricity sector would exceed £1bn per annum at the most. This makes a signficant contribution, closing perhaps up to a quarter of the investment gap identified in Section 2, but is not sufficient on its own to solve the financing problem.

These rough estimates are backed up by other estimates in the literature. (Ernst & Young, 2010) estimate a contribution of around £1bn per year for UK low carbon energy investment in total over this decade. (Nelson and Pierpont, 2013) are somewhat more optimistic, suggesting that such funds could provide up to a maximum of a quarter of required project equity, and up to a maximum of half of debt requirements. However, they point out that significantly more attractive risk return profiles would be needed to achieve these levels of investment (ibid).

5. Ways to boost investment

5.1. Overhaul Utility Model

The ability of utilities to expand their balance sheet is strongly linked to the fundamentals of the electricity market, and the prospects for profitability and growth. Given the prevailing political focus on cost reduction, policy options for improving the outlook of sector appear limited. In this light, simply improving market conditions by allowing for greater returns on investment looks politically infeasible. Two alternatives are briefly outlined.

So far in the UK, utility companies have tended to invest in a portfolio of technologies. While this can reduce overall risk for the companies themselves, it does not reduce risk for the investors, who are able to pool risk by choosing a portfolio of shares across different companies (Brealey et al., 2006).

An alternative is for a number of investors to group together to form a large investment arm, with the expertise and finance required to undertake the risks involved to specialise in low carbon energy investment (Murray, 2013). One option is to set up a dedicated utility which specialises in low carbon projects. This would combine the advantages of the utility model (large companies with balance sheet scale matched to the scale of the investment required, and with access to low-cost capital through bond and share markets) with the advantages of specialisation, whereby the company can maximise learning and technology cost reduction through accumulation of project experience (Hagel and Brown, 2005).

(Helm, 2009) argues that during the two decades after privatisation when there was considerable excess generation capacity, the liberalised market was well suited to driving efficiency into the generation business to reduce costs, but that now the sector faces a need to renew its capital stock, it may be time to return to a regulated asset base (RAB) model in order to allow access to low-cost capital sources that would come with the increased certainty of returns this would bring.

Under RAB regulation, returns to investments in energy infrastructure would effectively be a contractual arrangement with the regulator, providing a much greater degree of security regarding future repayments through bills (ibid). It would still be necessary to convince consumers of the need to pay potentially higher prices, so that regulatory risk would not be entirely removed. However, experience in other areas of the energy sector, such as the gas network industry in Europe indicates that institutional investors are more prepared to enter these kinds of RAB assets.

5.2. Ramp up Project Finance through refinancing

Once the construction phase is complete and a generation plant has operated for a period of time to show it is functioning as expected, the technical risks for the project are significantly reduced, and projects are often refinanced to get better terms for the debt. Early stage refinancing has been an important feature for onshore wind. It allows project developers to recycle their capital into new projects.

A similar model is beginning to appear for offshore wind projects. For the Walney projects, the OPW joint venture who own 24.8% of the project, secured financing from DONG, and are looking to refinance their position under a 15 year PPA (Hervé-Mignucci, 2012).

The use of bridge financing is another method of accelerating finance for construction. Project development consortia with suitable combined experience undertake the initial construction phase using equity financing. After a short term of 12 months operation, sponsor equity investment can be refinanced, freeing up funds for further construction projects for the investors (PWC, 2012).

This process suggests a potential new business model for utilities (Financier, 2013) as project developers, rather than long-term owners of generation assets. This would allow their balance sheet capital to be spread over a larger number of projects. Such a model would require a sufficiently large pool of investors prepared to act as long-term owners of generation assets for the utilities to sell to. This in turn would require significant improvement in the risk-return profile of the UK electricity market (ibid).

5.3. Increased Role of Public Institutions

The UK has introduced the Government Guarantee Scheme and the treasury have proposed the Private Finance 2 (PF2) initiative, to boost project finance (Standard & Poor's, 2013). The UK Guarantee scheme has been set up by the treasury to provide up to £40 billion of government guarantees for projects deemed nationally significant in the governments National Infrastructure Plan (HM Treasury, 2012). Guarantees are more complex than debt, with the government effectively acting as an underwriter to the project (Standard & Poor's, 2013). Due to the complexity, banks may consider it more difficult to refinance projects with guarantees than straightforward debt (PWC, 2009). Nevertheless, out of the 23 pre-qualified projects that have applied, 12 are in the energy sector. Notable examples include the conversion of major coal plants to biomass, and guarantees for Hinkley Point C nuclear power station (IUK, 2013) (HM Treasury, 2012).

Some commentators argue that the PF2 scheme would lead to a high cost of capital, and would be expensive and unrealistic to scale up (Leach, 2010). Others argue that this scheme has been successful in the past for important infrastructure and is being used now for large infrastructure projects such as train stock worth £1 billion for London's Crossrail.

The Green Investment Bank (GIB) was set up by the UK Government in October 2012, with £3.8 billion in capital and borrowing power (Knott, 2013). This capital could grow to £18 billion within three years if co-financing support from the private sector can be secured. They are a for-profit bank with the aim of accelerating UK towards a green economy.

Although some commentators point out the small scale of the bank compared to the size of the total investment required, they are an the hope is that they catalyse funding the construction phases of projects before refinancing (SSE, 2011), although at present as a fledgling institution, they do not appear to have the appetite for such risks, and are focussing attention on boosting secondary markets for refinancing of existing projects (Financier, 2013).

The European Investment Bank (EIB) is one of the largest investors in clean energy projects in Europe, providing €47 billion of funds during the period from 2007 to 2012 (IHS CERA, 2013), with €4.5 billion in 2012 alone for energy projects in the EU (EIB, 2012). To date, the role of the EIB in UK has been limited (Section **Error! Reference source not found.**). Nevertheless, the quantity of finance committed from the EIB shows from an EU level the important role public bodies can provide in securing finance from the wider investment community for low carbon energy projects.

5.4. Green bonds

In 2012 the EIB set up the Project Bond Initiative (PBI) to attract institutional investors to important infrastructure investments. The initiative will enable project companies to issue investment grade bonds through an EIB risk sharing mechanism, and as part of the 2012-2013 pilot, up to €230 million in guarantees will be provided (EIB, 2012). (Caldecott, 2010) poses a similar idea for green infrastructure bonds as a method of refinancing project operational cash flows providing easily tradable long term liquid assets with a lower cost of capital. The real prize would be for green bonds to be issued to fund the risky construction phase of projects, where acquiring low cost debt finance is a struggle, but if they are still seen as high risk they are unlikely to obtain investment grade ratings, and therefore would not attract sufficient investment.

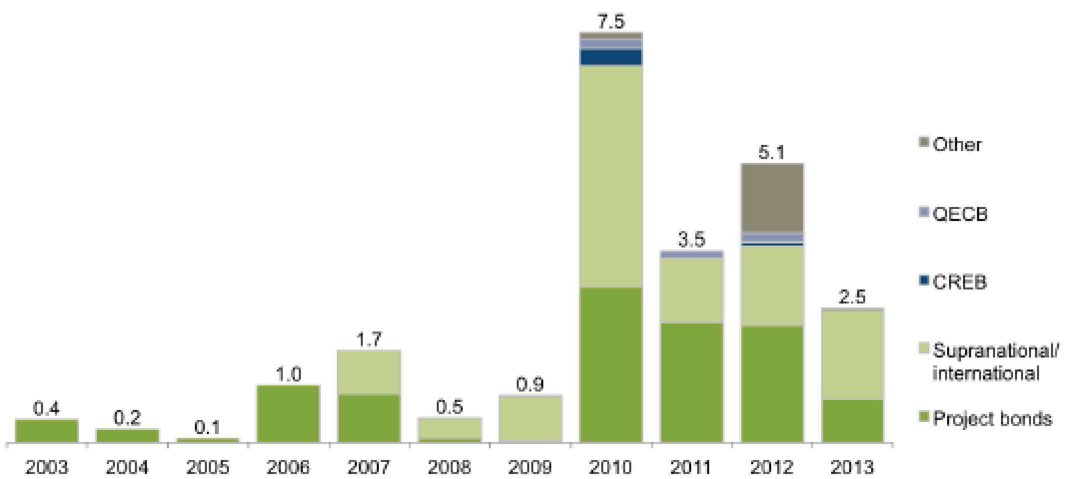


Figure 13 – Tier 1 Green bond issuance ($ billion)

Source: (UNEP, 2013) with data from BNEF

The period 2010 -2012 saw a considerable increase in green bond issuances, albeit from a very low level (Figure 13). (Padraig and Boulle, 2013) arrive at a higher figure of $11.6 billion in issuance globally in 2012 by counting total bond issuances for companies and projects which can be linked to low carbon energy investments, but which are not necessarily labelled as green bonds.

The UK held only two issues in 2012 for small solar and wind energy projects. A barrier (Kaminker and Stewart, 2012) is that these bonds will be at the lower end of the investment grade ratings, which means they will require higher capital charges. (Veys, 2011) suggests that a typical minimum issuance size for a standard institutional investment grade bond is around £300 million, so only large projects, or pools of smaller projects would be able to access these sources.

Recently green bond issuances by the private sector have overtaken those of public institutions, but so far have been made by large companies: EdF (€1.4bn), Toyota ($1.75bn) and Unilever (£250m) (Economist, 2014). The EdF example is interesting as it shows the ability of the power company to raise debt for new investments in the current market conditions. However, these examples do not show that green bonds can yet stand separate from large corporate backing, so do not yet on their own provide an alternative financing route to the utility model.

6. Conclusions and Policy Implications

Very large volumes of finance are only available for relatively low-risk investments. The traditional utility model is designed to exploit this by providing an 'investment grade' vehicle that can be financed through low cost bonds and shares which meet the liquidity needs of large institutional investors.

Questions have been raised about whether this model is still working, but recent evidence suggests that required investment levels up to 2020 are achievable ***if*** investment rates of recent years can be maintained. This is a major caveat, considering that current CAPEX plans across Europe for the 'big 6' utilities operating in the UK are due to be cut by as much as 30% over the two years to 2015.

Investment post-2020 will need to step up more significantly. If the utility model is to survive, they need to be able to make a profit in the market. This suggests that the primary focus of policy should be getting the investment conditions right in the electricity sector, and keeping risks down. If the market remains unattractive to utilities, it is unlikely that other major investors would find it attractive.

One alternative would be to facilitate creation of a new utility-scale company for investing in renewable energy generation, which could attract low-cost financing through bonds and shares, whilst benefitting from technological specialisation and expertise. Another alternative would be to completely re-regulate electricity generation on a fixed rate of return model which removes most of the risk for the investor. The regulated asset base model has proved attractive to institutional investors in the energy networks sector, and is likely to make finance readily available to the sector. The downside of reduced competitive pressures and innovation should not however be underestimated.

Feed-in tariffs being introduced in the UK for low-carbon generation are a half-way house, providing fixed income, though not fixed returns because of uncertainty over construction and operating costs. It is yet to be seen whether these instruments will attract different business models that could structure new types of finance around these contracts.

There are ways to encourage this diversity of financing sources into the sector. In the short-term, there is a role for public financial institutions such as the Green Investment Bank and the European Investment Bank to take direct stakes in projects to leverage other investors in and to stimulate secondary markets for projects post-construction which can help accelerate the recycling of pre-construction capital into new projects. Project bonds may start to play a more significant role, but evidence is mixed about whether they will really take off to any significant extent.

In the longer term, ownership structures in the electricity sector are set to evolve. For example, whilst utilities own the majority of equity in offshore wind projects, they generally involve quite wide consortia. Direct stakes in energy projects by institutional investors are currently low, but could grow to a sizable level (though they seem unlikely to become dominant). Equipment manufacturers often take a stake in offshore wind, and could do so also for nuclear. The capacity mechanism could also attract more diverse ownership, and could start to engage the demand side more actively. Combined with the growth of embedded generation with very diverse ownership profiles, this may alter the characteristics of the market substantially over the next two decades, bringing with it a diversification of financing models for the sector.

Appendix

A. Organisations Consulted During Research

This research therefore benefited considerably from interviews with a range of practitioners in the finance sector. Since the individuals generally wished to remain anonymous, only organisation names are listed. In some places in the text, individual views have been referenced to personal communication. However, more generally throughout this text, these interviews have been synthesised to provide the basis for the views expressed in the report. The authors wish to express their gratitude to all those who gave their time to be involved in this study.

- Bank of America Merrill Lynch
- Barclays Bank
- Climate Change Capital
- Climate Policy Institute
- Ethix SRI Advisors
- Foresight Group
- Green Investment Bank
- Hg Capital
- IHS CERA
- Low Carbon Finance Group
- National Grid
- New Energy Finance
- Ofgem
- Pöyry
- Renewable Energy Generation
- Standard & Poor's
- University of Leeds
- Z/Yen

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