THE RENEWABLE ENERGY INFRASTRUCTURE INVESTMENT OPPORTUNITY FOR UK PENSION FUNDS
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The Renewable Energy Infrastructure Investment Opportunity for UK Pension Funds
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The Green Finance Initiative (GFI)2

The City of London Corporation has taken a leading role in the growing global green finance market. The private sector is already playing a significant role in financing the low-carbon energy transition. The City of London has established the Green Finance Initiative (GFI), to leverage the experience and expertise of the City of London to deliver listed and unlisted investment in UK and global green infrastructure, ranging from the successful work in growing the Green Bond market to over $100 billion of annual issuance, to pioneering direct renewable infrastructure investments by UK pension funds.3

About the authors

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2 http://greenfinanceinitiative.org/
3 https://www.climatebonds.net/
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Infrastructure has become one of the fastest growing investment sectors worldwide, with private sector infrastructure investment reaching record levels in 2016. In the wake of the Paris Climate Agreement – with an estimated $1 trillion of investment required to achieve global decarbonisation and energy goals – renewable energy infrastructure in particular has emerged as an opportunity to generate significant returns. In this report, we highlight the opportunities for UK pension funds and others to invest in unlisted renewable energy infrastructure. The benefits of this emerging asset class, from fund diversification to positive risk adjusted returns and higher yielding long duration inflation-linked income streams are highlighted, as are risks such as the potential for long-term income volatility. It also describes the potential for institutional investors in the UK to step up participation.

Analysis in this report shows that despite a stable regulatory policy framework and impressive growth potential, UK-based pension fund allocations to renewables infrastructure is currently well below other leading pension funds, including those in Australia and Canada.

In Chapter 2, the report looks at the growth of unlisted renewables infrastructure in the context of a booming market for wider infrastructure investment. It examines whether the characteristics of unlisted renewables infrastructure match the requirements of UK pension funds in terms of potential returns, risks and time horizons, and provides estimates of market size. It finds, for example, that available performance data from unlisted funds, listed renewable energy asset companies and academic research indicate unlevered, low risk returns of around 5-10%.

We also consider the overall growth of the wider renewable energy market as a fundamental driver accelerating growth in renewables infrastructure.

In Chapter 3 we briefly review the UK’s recently published Clean Growth Strategy, which proposes bold targets for a low-carbon transition through to 2030. Based on existing low carbon investments and planning consent, we conclude that operational UK solar PV and wind assets present an investment market in excess of £40 billion, with at least a further £25 billion of projects with planning consent which remain to be financed and built. While the initial focus for most UK investors will be domestic renewables infrastructure investment, some pension funds will seek to invest overseas, much as they already do in other asset classes and look at the strong growth potential for renewable infrastructure in emerging markets.
India is a case in point, because of an exceptionally ambitious target, to reach 175 gigawatts of renewables by 2022, three times present installed capacity of 58 GW. The chapter also provides deal flow analysis.

These findings all suggest that renewables infrastructure is a valuable new asset class for long-term buy and hold investors such as UK defined benefit pension schemes and life insurance companies. However, in Chapter 4, we find that the UK pension fund industry as a whole has been slower to take up the investment opportunity than large Canadian and Australian pension scheme counterparts. UK local government pension scheme (LGPS) data illustrate how pension funds allocations are small, but also how they can catch up. The LGPS have to date invested just 0.6% of their aggregate £216 billion assets to infrastructure. However, these 89 pension funds are now aggregating their asset management into eight pools. As a result, the pools are collectively targeting a doubling of their allocation to infrastructure, equivalent to investment of an additional £8 billion.

Similar collaboration could scale up UK pension fund allocations more generally. The LGPS pooling process has already led to a higher level of collaboration on infrastructure investments knowledge and experience. In the most striking example, pension funds participating in the Northern and LPP pools have become partners in the new GLIL infrastructure fund, which has already made investments in UK biogas and onshore wind.

The report concludes in Chapter 5 with case studies of two successful investments by UK pension funds.

It is clear that the growing market for renewable infrastructure is paving the way both for potentially substantial returns for UK institutional investors; and for a swifter, more affordable transition to a low-carbon economy.
Electricity generated by large-scale renewable sources is now competitive with or cheaper than new fossil fuel power in many markets. Onshore wind and solar PV account for a majority of global power sector investment. Such competitiveness is driving investment opportunities in the renewables infrastructure market.

Despite the market opportunities, UK pension fund allocations to infrastructure remain collectively small. Data suggests that UK-based defined benefit (DB) pension schemes in aggregate allocate less than 2% of assets under management (AuM) to unlisted infrastructure, compared with allocations of up to 5-10% at large pension schemes globally.

The local government pension scheme (LGPS) pooling initiative is partly driven to increase allocations to infrastructure. The LGPS is currently pooling the management of assets of 89 pension funds into eight pools with an aggregate AuM of £216 billion.

“In aggregate, they currently allocate just 0.6% of AuM to infrastructure. But they have doubled their targets to 7.5% from 3.7% of AuM, implying an additional £8 billion available for infrastructure investment.

UK pension funds often initially focus on a domestic renewables infrastructure allocation, as a familiar, low-risk, sterling-denominated market backed by the UK Government’s ‘Clean Growth Strategy’. Investments in renewables infrastructure overseas, especially in emerging markets, offer strong follow-up potential for most.
Investors

- Institutional investors should implement the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD) to disclose their climate-related risks and opportunities, on a comply or explain basis.

- Pension funds could publish their actual and targeted allocations to renewable energy infrastructure. There is limited data available on allocations and targets presently, except in the local government pension scheme (LGPS) sector.

- Local government pension schemes should build on growing collaboration under the LGPS pooling, for example between the LPP and Northern pool in the GLIL infrastructure fund. This will help share knowledge and experience, supporting the achievement of infrastructure allocation targets which presently far exceed actual investment.

- At both public and corporate pension funds, internal investment staff should take the lead in harnessing the opportunities offered by unlisted renewables infrastructure, by encouraging investment consultants and external asset managers to find relevant deals, and by explaining the opportunity to pension fund asset owners and boards of trustees.

Policy makers

- Government could align the tax status of infrastructure with that of real estate, where income from direct pension fund investment in non-residential property is tax exempt. Government could also consider REIT status for infrastructure: property holdings by real estate investment trusts are tax exempt, with taxes levied on distributions to unit holders.

- As renewables move beyond subsidies, central and local government can support new renewables through price stability by becoming buyers of electricity from privately funded renewable projects using power purchase agreements (PPAs). This can be done in a manner to ensure low costs to the government by holding competitive auctions to supply renewable electricity to the public estate, including government offices, ministries, universities, schools and hospitals. Government could also fast-track planning on public land to increase deal flow. Such initiatives could boost renewables PPAs in the corporate sector and increase subsidy-free renewable energy generation capacity in the UK.

- The Pensions Regulator should convene UK pension schemes and investment professionals to develop TCFD guidance on disclosure of climate-related risks and opportunities, and to encourage disclosure.  

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5 Power purchase agreements are electricity supply contracts between a provider and a purchaser, often long term agreements.

6 We suggest working with existing groups such as Institutional Investors Group on Climate Change (IIGCC), Principles for Responsible Investment (PRI) and UK Sustainable Investment and Finance Association (UKSIF)
2. Renewables infrastructure: Paving the way for long-term returns

2.1 A convenient truth: The growing market for renewables infrastructure is attracting increasing pension fund allocations

Infrastructure assets are “real assets” that generate predictable cashflows for economic services such as transportation, energy generation and water provision. In recent years infrastructure has become one of the fastest growing investment sectors worldwide. In 2016, private sector infrastructure investment reached a record $413 billion, up 14 per cent on the year before, according to data provider Preqin. A Preqin survey in 2016 found that more than half of investors planned to increase their infrastructure allocations.

As with any other asset class, infrastructure carries risks. However investor interest continues to be fuelled by commitments from governments for increased infrastructure spending, and the involvement of generally established companies or projects that will mature over a very long time. This tends to translate into stable long-term cash flows. From a long-term perspective, infrastructure plays an important role in an investment portfolio, be it through debt or equity, as it offers a great deal of security and usually provides regular cash flow.

This report focuses specifically on renewable energy infrastructure – which sits alongside energy efficiency and transport electrification as one of the biggest areas of low carbon investment. As explained in Box 2 this is ultimately driven by market fundamentals supporting growth in renewable energy more widely and by government commitments around the world to meet climate goals. Infrastructure assets can include debt and equity, listed and unlisted assets, but the emphasis in this report is on the opportunity for equity investment in unlisted infrastructure, especially in the UK.

The role of a pension fund is to invest contributions of employers and employees to pay for future long-term pensions. The largest UK pension plans are “final salary” (defined benefit or DB) schemes that pay fixed with inflation-linked amounts to retirees. To meet these obligations, pension funds need a diverse portfolio to reduce risk, but also one that focuses on long-term income. The need
for long-term income increases as pension populations age. Life insurance companies have the same need. Historically, gilts and corporate bonds provided the income backbone. However, in the “new normal” of low interest rates, pension funds and insurance companies are struggling with low income levels.

Infrastructure has many of the same, and additional, characteristics to government bonds: low-risk, quasi-governmental backing, higher levels of long-term income, inflation-hedging and uncorrelated returns. This is why many pension and insurance company allocations to infrastructure are increasing. These characteristics include:

**Low risk.** Pension funds have to meet regular payments to pension scheme members, a liability which places a premium on stability and predictability over high returns. This is the kind of stability that renewables infrastructure assets generate, as a result of government-mandated off-take agreements, such as PPAs. In the UK, almost all new generation receives some form of contracted price support, including renewables. Quasi-government bodies are typically the counterparty to such contracts, either directly or indirectly, reducing risk levels.

**Long term.** Institutional investors such as pension funds and insurance funds have long-dated liabilities of 20 to 50 years or more, reflecting legal obligations to pay pensions or insurance benefits to scheme participants long into the future. That is particularly the case for defined benefit (DB) pension plans and life insurers offering long-term fixed guarantees. Energy infrastructure assets match the time horizons of pension funds. For example, solar and wind farms operate for decades, with a known rate of annual degradation, and low, predictable operating costs. Under various forms of power purchase agreements (PPAs) with governments or industrial consumers, where the buyer commits to a fixed (or inflation linked) offtake price, typically for 10 to 20 years, investments are repaid with a reasonable level of profit and certainty.

**Inflation-linked cash flows.** Dependable, inflation-linked cashflows are especially relevant for UK DB pension schemes, as the pensions that they pay are usually indexed to inflation, and they are largely closed to new entrants, meaning that they are presently de-risking their assets away from global equity allocations towards

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‘annuity-like’ streams of inflation linked cash yielding assets. Of course, regular cash flows are also important for other institutional investors, including insurance companies and defined contribution (DC) pension schemes. Historically, long-term UK PPAs have had full or partial inflation linkage, making renewable investments attractive to these inflation yield seeking investors. In the UK, contracts-for-difference (equivalent to PPAs) are explicitly linked to UK inflation, while electricity prices are implicitly linked as an input into the inflation basket.

Uncorrelated returns. Pension funds are traditionally heavily invested in publicly listed equities, as a source of long-term return premium, and for the liquidity they offer. Diversification is therefore important. Unlisted infrastructure exhibits low correlation with listed equities, assisting portfolio diversification.

2.2 Renewables infrastructure investment approaches

Infrastructure assets can be broadly categorised into debt and equity, and listed and unlisted. Debt includes publicly and privately issued asset or balance sheet-backed bonds, and project finance loans. Equity includes publicly issued shares in companies which own infrastructure assets, such as electric utilities, as well as shares in infrastructure vehicles called “YieldCos”, which specifically invest in energy assets such as solar and/or wind farms. The focus of this report is equity investment in unlisted infrastructure.

Project life cycle

There are three main stages of infrastructure projects, with different levels of risk and return. Development and construction activities involve more risk than owning an operating asset, with commensurately higher returns.

1 Development

Before construction begins, the development stage involves sourcing sites, and achieving planning permission, grid connections, permits and available subsidies such as offtake agreements. Large risks revolve around failing to achieve one or more of these. Development costs are often minimal.

2 Construction

The construction phase involves preparation of construction plans, securing financing and construction of the project. Risks include delays and cost overruns. Investors can avoid such risk by investing at completion, with another party taking overrun, delay and performance risks. For most renewable energy projects, the cost of construction and equipment is significant, as a proportion of the total cost of the project.


10 A YieldCo is formed by transferring operational power generation assets into a new company which is generally listed. YieldCos distribute majority of earnings to their shareholders.

3 Operation
Operating assets are defined as those that have already been operating for 12 months or more after construction completion. Typically, renewables projects have two operational stages: first during the life of a government-back PPA or similar price support or guarantee, and second, after the contract has expired (see Figure 1 below). During the PPA, risks are confined to operation and management of the assets. Institutional investors traditionally prefer operational projects, prioritising long-term, stable cashflows. Once the subsidy or PPA has expired, the project will revert to selling electricity at the market or “merchant” price, and the risk rises again, although the capital expenditure at this stage has been fully paid off.

FIGURE 1. Cashflows, risks and return requirements for three time phases of a renewables project

<table>
<thead>
<tr>
<th>REVENUE:</th>
<th>INVESTMENT:</th>
<th>REQUIRED RETURNS:</th>
<th>MAJOR RISKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development construction and commissioning</td>
<td>Operations under long-term contract</td>
<td>Post-contract operation under wholesale market</td>
<td>Medium to high</td>
</tr>
<tr>
<td>Delays</td>
<td>Asset performance and output</td>
<td>As with operation phase plus</td>
<td></td>
</tr>
<tr>
<td>Cost overruns</td>
<td>Operations and maintenance costs</td>
<td>Wholesale electricity prices</td>
<td></td>
</tr>
<tr>
<td>Project failure or cancellation</td>
<td>Resource risk (wind or solar)</td>
<td>More variable output</td>
<td></td>
</tr>
<tr>
<td>Planning and regulation</td>
<td>Counterparty risk (from energy purchaser)</td>
<td>Remaining life</td>
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<td></td>
<td>Changes to law or regulation</td>
<td>Regulation and repermitting</td>
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<tr>
<td></td>
<td></td>
<td>Maintenance repowering upside</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Retirement costs</td>
<td></td>
</tr>
</tbody>
</table>

CPI, “Mobilising low-cost institutional investment in renewable energy: Structuring the Clean Energy Investment Trust”, August 2017
Direct versus fund investing

Institutional investors can invest in unlisted infrastructure assets in a variety of ways, along a spectrum of involvement in deal execution. They can invest in infrastructure indirectly, via dedicated infrastructure funds managed by professional managers. With increasingly direct involvement, they can also make minority investments in infrastructure alongside other investors, or take a controlling stake. By investing in funds, investment decisions are delegated to an asset manager, under a pre-defined investment mandate. At the other end of the spectrum, the institutional investor can invest directly, sourcing, executing and managing assets using an in-house team. Some asset owners may find infrastructure funds less attractive, whether due to the level of asset management fees, or liquidity needs, where fund terms are shorter than the asset life.\(^\text{13}\)

This spectrum of involvement in executing deals is summarised as follows:

1. **Invest in a fund of funds.** The pension fund pays a fee to an asset manager whose fund in turn invests in infrastructure funds, providing indirect access to several pools of assets. The individual pension fund will have less control, although also less liability, and often little transparency over the specific assets invested in. Assets are often sold once operational, thus denying the investor the long-term, inflation-linked cash flows which may be a priority appeal. The fund of fund model provides good diversification for a small investor but comes with two sets of fees.

2. **Invest directly in a fund.** In this case, the pension scheme selects an asset manager whose fund directly invests in a portfolio of infrastructure assets. Again, the pension fund will have no direct control over investments. However, a pension fund can sometimes be offered the option to co-invest with its fund manager in a “separate account”, giving it more control to select and manage specific investments.

3. **Co-invest alongside an asset manager.** In this case, the pension fund can co-invest in the underlying infrastructure asset, alongside a fund manager. It should be noted that most fund managers give co-investment preference to fund investors, and therefore it may be harder to secure such rights as a non-fund investor. The approach may have the advantage of lower management fees, and the opportunity to learn how to source deals, conduct due diligence, and structure and execute deals. There will be varying levels of involvement by the asset owner. The asset manager may still conduct due diligence and manage the asset. As the pension fund manager becomes more actively involved, they will need more in-house resources and expertise, for deal sourcing, due diligence and asset management.

4. **Direct investment.** Direct investment requires in-house expertise and resources, either to conduct due diligence, deal execution and asset management, or to contract these services to advisors. During the due diligence process to select assets, the pension fund will appoint experts to consider technical, economic, market, policy-related risks. Prospective deals will be evaluated against required returns above the risk-free rate or long-term inflation rate plus a pre-determined risk premium linked to the various perceived risks. The final deal will have to be approved through a credit or investment committee.

This variety of different approaches illustrates how there is no one model to fit all pension schemes, although in recent years larger schemes above around $40-50 billion assets under management (AuM) have been moving to a direct investment model.\(^\text{14}\)

Box 1 provides an overview of UK based asset managers and asset owners investing in renewables. Historically, private equity firms and specialist renewable energy funds have provided the most development and construction, short-term, high-risk finance. YieldCos, large pension funds and insurance companies are increasingly providing long-term finance through direct ownership of operational assets.


14 Mapping Channels to Mobilise Institutional Investment in Sustainable Energy; OECD http://dx.doi.org/10.1787/9789264224582-en
A wide range of global asset managers and asset owners can provide exposure to renewable infrastructure. The list below shows examples of UK-based investors active in renewable energy across a broad range of categories:

**Dedicated renewable energy asset managers:**
Provide development and construction capital. E.g. Blackrock, Greencoat, HgCapital, Impax Asset Management and Riverstone.

**General infrastructure fund managers:**
Provide construction capital, recently shifting towards operating assets. E.g. 3i Infrastructure, Balfour Beatty, John Laing Infrastructure and Macquarie Infrastructure.

**Private equity funds:**
Provide construction capital. E.g. Blackstone, Englefield Capital and Good Energies.

**YieldCos:**
Listed companies that own and manage operating assets with the objective of generating stable yields. E.g., Foresight Solar and Greencoat Wind.

**Asset owners:**
Generally invest directly in operating assets; including pension funds. E.g. BT Pension Scheme, USS, GLIL.

**Other quasi government investors:**
such as the UK Green Investment Bank (now owned by Macquarie Group) and European Investment Bank.

**Source:** Two Lights Energy Advisors
Doing a deal

Infrastructure investing, including renewable infrastructure, like other forms of investing is, not that difficult in theory. In the case of renewables, a long-term tariff or contract provides a relatively high revenue certainty, and an experienced operator runs the asset for a fixed or largely fixed price. But in practice, knowledge of various issues and structures can be critical to win an auction or source private assets. “Doing a deal” in renewables involves accessing that knowledge, and having a multi-disciplinary team. We focus here on the example of investing in an operating renewable asset.

In a simple deal, let us say one equity investor, and a single developer behind the project, the equity investor will need:

- **A legal team that can:**
  - Conduct legal due diligence on the quality of the permits, land rights, construction and operation agreements, power sales agreements and other related contracts;
  - Negotiate the terms with the developer including warranties;
  - Assess regulatory risks that could attach to the investment, such as scheduled reviews of tariffs and subsidy schemes.

- **A technical advisor or team that can:**
  - Confirm the quality of the wind or solar resource, and the risk that production could be lower (mis-estimation of resource has often been a cause of lower than expected returns);
  - Confirm the equipment selected is appropriate for the site, and is of sufficient quality to last for 20-30 years or more with viable warranty protections;
  - Confirm the expected energy to be produced, considering the renewable resource and the conversion ability of the equipment selected.

- **A financial advisor or team that can:**
  - Analyse the cashflows of the project under a variety of scenarios (e.g. lower energy yield, higher inflation; seasonal and annual production variability);
  - Confirm that the financial model reflects the terms of contracts (PPA revenues, construction contracts, operating agreement) and economic and regulatory assumptions such as amortization and depreciation, tax rates and tax credits;
  - Assess the terms of the subsidy or credit of the PPA purchaser;
  - Consider long-term performance assumptions. For example, UK renewables PPAs currently span 15 years with inflation-linked revenues. The projects, however, may operate for 25 years or more. The investor will need to make assumptions about operating performance, merchant risk associated with wholesale power prices and inflation rates 15 years from now, to ensure the analysis considers full operating life cashflows.

- **An insurance advisor** to review the adequacy of the variety of insurances used for projects, such as liability and casualty, delayed opening insurance, construction all-risk insurance, business interruption, extreme weather events and marine transport (most wind turbines end up on a boat for delivery).

- **An operational and maintenance advisor** to review the operational cost including any assumptions on maintenance expenditure such as repowering or replacing electrical equipment.
This overview does not address other practical aspects of finding and closing investment opportunities. Most operating renewable energy projects of scale will be sold in a competitive process run by an investment bank or financial advisor. This means the investor must be known to the seller or their advisor. In these processes, there can be many investors. Initial bids will be based on an information memorandum and limited access to underlying data and contracts. If an initial bid is acceptable, a short-list of investors will be allowed to access the underlying data and contracts and to meet the seller and physically inspect the project. The time frames of these auctions can be tight, at six to eight weeks, at the end of which the investor must put in a bid price with a proposed binding agreement all accompanied by any investment committee approvals required by the investor.

The bidding process requires the investor to bear the costs of all the advisors. For a large project, such as an offshore wind farm, or a portfolio of smaller projects being sold by a utility or developer, these costs can easily amount to £1 million or more, which the investor will still pay if their bid is unsuccessful.

2.3
Expected returns

Return estimates and sources

Unlisted infrastructure equity is an asset class in itself and has unique financial characteristics. Given that these assets are unlisted, public return and risk data are more difficult to come by, compared with publicly listed stocks and bonds. Such data are important to measure historical performance, and to benchmark investments today. Gradually, however, relevant data are becoming available.

For renewables infrastructure, we can find relevant return data from managers publishing their own return performance; from UK-listed renewable energy asset companies (YieldCos); and from work undertaken by the EDHEC Infrastructure Institute Singapore, Imperial College Business School, Bloomberg New Energy Finance (BNEF), and similar research institutes and data firms. A selection of such data are summarised in Table 1 below. While there is some debate around different measurement methodologies, these data suggest that unlisted infrastructure is generally lower risk than equities, and well-suited to long-term, buy-and-hold investors.

In more detail, analysis by BNEF of secondary market purchase prices for operational assets suggests falling yields, over time, with unlevered internal rates of return (IRR’s) for UK Solar currently around 7%, and for onshore wind around 8-9%. BNEF defines renewables assets in the UK as low-risk, given factors such as policy certainty and energy price risk. Such findings are supported by the energy advisory and research company, Mercatus, which sees solar IRRs falling from 7.6% in 2015 to below 6% in the first half of 2017, and investors’ growing comfort in the asset class.

The UK YieldCo market (c. £5 billion market cap) provides an alternative, market-determined indicator of returns. Analysis by Imperial College suggests that UK-listed YieldCo stocks have significantly out-performed a similar group of

16 Conference presentation, at BNEF London Sept 18 2017: EMEA Solar Data Trends and Insights
oil and gas companies, since 2013.17 We note that returns depend critically on the YieldCo investment strategy. For example, analysis for this report by Two Lights Energy Advisors shows that investment in the first UK-based YieldCo, Greencoat Wind, would see a 9-11% IRR, if bought at the initial public offering in 2013 and sold at the time of writing (mid-October 2017). That return falls to 8-9% if the stock was bought 18 months after the IPO. Today, the stock delivers a 5-6% inflation linked dividend yield. Research by Imperial College Business School into UK YieldCos indicates an average annual return of 6.8% and volatility of 7%.18

Expected returns are similarly falling in the case of European offshore wind, as investors grow more confident in the performance of the technology. Figure 2 below shows how expected returns are falling to levels of solar PV and onshore wind.

<table>
<thead>
<tr>
<th>Source</th>
<th>Technology</th>
<th>Levered/ unlevered</th>
<th>Geography</th>
<th>Year (of data)</th>
<th>Annual Returns (IRR), %</th>
<th>Annual Volatility, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDHEC</td>
<td>All Infrastructure (unlisted, direct)</td>
<td>Unlevered</td>
<td>Global</td>
<td>1999-2016</td>
<td>11%</td>
<td>4.8%</td>
</tr>
<tr>
<td>Preqin</td>
<td>All funds</td>
<td>Unlevered</td>
<td>Global</td>
<td>1999-2016</td>
<td>12.5%</td>
<td>11.8%</td>
</tr>
<tr>
<td>Preqin</td>
<td>All renewables infrastructure (funds)</td>
<td>Levered (funds)</td>
<td>Global</td>
<td>2004-2014</td>
<td>5%</td>
<td>16%</td>
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<tr>
<td>BNEF</td>
<td>Solar PV</td>
<td>Unlevered</td>
<td>UK</td>
<td>2016</td>
<td>7%</td>
<td>N/A</td>
</tr>
<tr>
<td>BNEF</td>
<td>Onshore wind</td>
<td>Unlevered</td>
<td>UK</td>
<td>2017</td>
<td>8-9%</td>
<td>N/A</td>
</tr>
<tr>
<td>Mercatus</td>
<td>Solar PV</td>
<td>Unlevered</td>
<td>Europe</td>
<td>2016-2017</td>
<td>6%</td>
<td>N/A</td>
</tr>
<tr>
<td>Imperial</td>
<td>Solar, wind YieldCos</td>
<td>Low leverage</td>
<td>UK</td>
<td>2013-2017</td>
<td>6.8%</td>
<td>7%</td>
</tr>
</tbody>
</table>

**TABLE 1.** Estimates for returns to renewables energy infrastructure investments

**Sources:** EDHEC,19 Preqin,20 Mercatus,21 BNEF,22 Imperial College Business School Centre for Climate Finance and Investment

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17 https://www.imperial.ac.uk/business-school/intelligence/centre-for-climate-finance-investment/is-clean-energy-a-safe-bet-for-individual-investors/
18 Dymystifying UK YieldCos – an overview and performance analysis, Li (2017), Imperial College Business School unpublished
19 https://benchmarks.infrastructure.institute/equity/
21 Conference presentation, at BNEF London Sept 18 2017: EMEA Solar Data Trends and Insights
Risk context for renewables infrastructure returns

Following is a brief summary of issues which will affect the calculation of risk in a renewables infrastructure project. Table 2 below compares renewable energy risks with fossil fuels.

**Levered vs unlevered.** Much of the data above refer to unlevered returns, in other words to equity investments made with cash rather than a combination of cash and borrowed money. Leverage can increase risk for an equity investor as it magnifies default risk, for example in the event that the renewable resource underperforms.\(^\text{23}\)

For renewable energy assets, the generation of energy has a very low marginal cost, given that inputs are essentially free and operational costs are a fraction of generation income. As a result, an unlevered asset, with few other costs, has a very low default risk.

**Income volatility.** Renewables projects generally have low income volatility, compared with listed equities. For example, while seasonal variations occur during the year, annual year on year variability of natural resources infrastructure such as wind and solar in the UK implies long-term income volatility (assuming stable electricity prices) of about 7%.\(^\text{24}\)

**Maturity of technology.** Inevitably, the more mature and more widely deployed the technology, the lower the expected returns. An OECD renewables survey indicates that investors expect the lowest returns from solar and wind, and as much as 10% annual higher returns from marine, biomass and geothermal sources.

**Climate risk.** Analysis suggests that renewables and other infrastructure investments will outperform other sectors and asset classes, in scenarios which factor in climate risk.\(^\text{25}\) That is because climate action will drive economic transformation and investment in infrastructure. Additionally, renewable energy assets will benefit from expected higher carbon prices (on merchant tariffs beyond the PPA term) that result from government decarbonisation policies.

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23 [https://climatepolicyinitiative.org/publication/beyond-YieldCoYieldCos/](https://climatepolicyinitiative.org/publication/beyond-YieldCoYieldCos/)

24 Authors estimation using monthly solar and wind data


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**FIGURE 2.** Investor expected levered returns to European offshore wind, % IRR, construction vs hold-for-life operating assets

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Source: Two Lights Energy Advisors
TABLE 2. Investment risks: fossil fuels vs renewables

<table>
<thead>
<tr>
<th>Risk parameter</th>
<th>Fossil fuel generation</th>
<th>Renewables (solar, wind)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Funding cost sensitivity</td>
<td>Lower upfront capital costs, and therefore lower sensitivity to funding costs; for example, capital costs account for around 40% of total cost in the case of gas-fired power plants</td>
<td>Significant upfront capital cost, at around 80% of total cost for wind</td>
</tr>
<tr>
<td>Construction risk</td>
<td>Complex large-scale projects, where planning and construction can span 4-6 years</td>
<td>Generally lower risk, ranging from simple construction and rapid build-out for solar PV (less than one year), and onshore wind (1-4 years), to more complex offshore wind projects, with lead times of many years and higher risks involving location and weather</td>
</tr>
<tr>
<td>Fuel price exposure</td>
<td>Exposure to volatile fuel input prices &amp; currency risk (if imported)</td>
<td>Minimal costs, EBITDA margins of 80-90% over project life</td>
</tr>
<tr>
<td>Performance risk</td>
<td>Significant operational management</td>
<td>Minimal operation management</td>
</tr>
<tr>
<td>Carbon price exposure</td>
<td>Returns negatively impacted by a rising carbon price</td>
<td>Returns positively impacted by a rising carbon price</td>
</tr>
</tbody>
</table>

Source: Authors’ own analysis and experience and Carbon Tracker 26

BOX 2: The market fundamentals driving the growth of renewable infrastructure

One of the most significant underlying factors behind the growth in renewable infrastructure is the continued global growth in renewable energy in general. This is a market supported by three drivers: falling costs, rising generation and rising investment.

Falling costs

The cost of generating electricity from solar and wind has fallen steadily and dramatically over the past decade. Renewables are increasingly the low-cost option, with subsidy-free projects recently emerging in the UK, Germany, Saudi Arabia, India and Mexico. These falls are partly because of advances in technology plus economies of scale in manufacturing and installation. Costs have also fallen as investors have become increasingly comfortable, with a better understanding of the technologies. In addition, long term contracts to supply renewables, such as power purchase agreements (PPAs), are increasingly sold through government-led reverse auctions, driving more competitive pricing, and more cost effective uptake (see Figure 3). The IEA estimates that around half of utility-scale renewable energy investments globally will be made via competitive auction over the next five years.

FIGURE 3. Deflation in global wind and solar power average auction prices, by commissioning date

Source: IEA

28 https://www.iea.org/renewables/
Focusing on renewables costs and competitiveness domestically, the UK Department for Business Energy and Industrial Strategy (BEIS) publishes regular updates of the so-called levelised cost of electricity (LCOE). Measures of LCOE derive cost per unit of electricity, by combining the estimated total capital and operating costs over the life of an energy asset, with its expected total generation. Figure 4 below shows BEIS latest LCOE estimates, indicating that new onshore wind and large-scale solar projects will be competitive with new combined cycle gas turbine (CCGT) power plants in 2020. We note that some private sector analysts estimate even lower costs for renewables.

Rising generation

Power generation from renewables has risen steadily over the past decade and a half, setting new annual records, year on year. In 2016 alone, renewable generation grew by 7% to reach 24% of the global electricity mix. The main engines of this growth are wind and solar power. Renewables are now growing twice as fast as gas and coal based generation combined. The International Energy Agency (IEA) forecasts that renewables will become the world’s main source of electricity, passing coal in the mid-2020s (see Figure 5). In the UK, BEIS data show that renewables accounted for a quarter of UK power generation in 2016.

FIGURE 4. LCOE estimates for projects starting in 2020, £/MWh

Source: BEIS 30

Rising investment

Renewable energy already accounts for a large part of global energy sector investment. Global energy investment in 2016 reached $1.7 trillion in 2016, according to the IEA. Of this total, the electricity sector was the biggest, and renewable power received most investment ($300 billion).

That level of investment is expected to rise in coming decades, under all policy scenarios. The IEA has estimated global power sector investment required to meet demand through 2060, according to different levels of ambition to tackle climate change. Its three scenarios are: a business as usual reference technology scenario (RTS); a more ambitious 2C scenario (2DS), to limit global average warming to 2 degrees Celsius; and its most ambitious, Beyond 2C Scenario (B2DS), in line with the Paris Agreement’s goal to limit warming to “well below 2C” (the IEA scenario refers to 1.75C). In all these scenarios, power sector investment is expected to grow rapidly. In every scenario, renewables will receive the most investment, rapidly growing beyond the $300 billion annually at present (see Figure 6 below).

FIGURE 5.
Renewables are poised to become the world’s main source of power generation

Source: IEA

FIGURE 6.
Projected annual investment in the power sector, 2017-2060, compared with actual investment in 2015, $ billion

Source: IEA

31 https://www.iea.org/Textbase/npsum/WEI2017SUM.pdf
32 https://www.iea.org/Textbase/npsum/WEI2017SUM.pdf
33 https://www.iea.org/ftp/tp/2017/
3. Renewables infrastructure potential in the UK and emerging markets

3.1 The UK opportunity

The UK’s transition to a low-carbon economy is well underway. From 1990 to 2016, greenhouse gas emissions fell 42% whilst GDP grew 67%. Coal-fired power generation fell 60% in 2016 alone, and will end in 2025 under a planned coal phase-out. Government data shows that renewables accounted for a quarter of UK power generation in 2016 (see Figure 7).

The shift to more, decentralised, local and low-carbon electricity generation in the UK presents large investment opportunities. Since 2012, more than half of all institutional investor financing of unlisted renewables in the European Union has been in UK assets. This highlights a stable regulatory framework in the UK, set in law by the 2008 Climate Change Act, which is open and supportive of significant foreign ownership of infrastructure. In October 2017, the UK government published its Clean Growth Strategy, which reaffirmed a long-term commitment to decarbonisation, and provides some clarity on the regulatory framework going forward, with a budget to support further offshore wind development.


Deal flow

Renewables infrastructure is an important part of this wider low carbon growth story, and within this we see an important engine for renewables deal flow going forwards as capital recycling by utilities, selling stakes in operational renewables assets that they continue to manage. Pension funds will be natural acquirers of these assets, for long-term buy-and-hold strategies. A classic example was the recent sale by the utility SSE of a 49% stake in its Clyde wind farm in Scotland. The sale to the YieldCo Greencoat and to a consortium of UK pension funds (GLIL), allowed SSE to recycle capital to fund the expansion of the asset. SSE then repeated the process, allowing the same investors to increase their exposure in the expanded wind farm in August 2017.36

Such capital recycling will allow pension funds to access the asset class. Investment alongside the utility will minimise risk, while giving them a say in governance, an important issue for long-term investors. In addition, the approach will enable publicly listed utilities to free up low-returning capital to build more renewable projects. Recycling capital via pension fund investment in this way can become an important driver of renewables financing going forwards, exploiting utility skills in building and operating large-scale wind and solar projects within the restrictions of their balance sheets, while deploying pension fund capital to finance capacity growth.

This capital recycling is indeed a global phenomenon. We note that one of Europe’s largest utilities, Enel, with one of the world’s largest renewable energy pipelines, has made a “build sell operate” model into its core business development strategy. Exemplifying the strategy, Enel sold in October 2017 its Mexican onshore wind project pipeline to Mexican and Canadian pension funds.37

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The secondary market potential

There is also a secondary market opportunity for pension funds seeking to invest in or acquire operational renewables assets in the UK. The Department for Business Energy and Industrial Strategy (BEIS) provides data for cumulative installed wind and solar capacity in the UK, and the planning pipeline for as yet unbuilt assets, which already have planning permission. We focus on projects over 1MW, given that small, roof-top solar assets will be unavailable to institutional investors.

Table 3 summarises these BEIS data, updated as of August 2017. We show that wind and solar projects over 1MW presently have an installed capacity of 25 gigawatts (GW). Looking forwards, we show that there is a further pipeline for an additional 25 GW of unbuilt wind and solar assets with planning permission. Not all of this planning pipeline will be built, given that most projects are still unfinanced, and awaiting contracts for government-backed or private sector power purchase agreements or grid connections.

We make a rough estimate for the secondary market value of these operating and planned, unbuilt assets. Values of individual projects will depend on cashflows per MW, which in turn will depend on project-specific factors, including project size, location and associated solar/wind resource. Critically, values will depend on specific project support contracts, whether a feed-in tariff, renewable obligation certificate (ROC) scheme, contract-for-difference (CfD) or corporate PPA, with or without exposure to wholesale power prices. Acquisition values will also depend on competition among buyers. Regarding operating assets, we assume a secondary market range of £1-3 million per MW for solar, £2-3 million for onshore wind, and £2-4 million for offshore wind. We assume a lower valuation range for assets presently in the planning pipeline, given that these will qualify for more recent, less generous support as well as lower unit prices. In summary, we calculate an investable range of £42-81 billion for operating UK renewables assets, and more than £25 billion for planned unbuilt assets.

Table 3. Capacity and estimated value of UK operating and planned renewables projects

<table>
<thead>
<tr>
<th>Operational projects</th>
<th>Planning pipeline</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Capacity (MW)</td>
</tr>
<tr>
<td>Onshore wind</td>
<td>11,241</td>
</tr>
<tr>
<td>Offshore wind</td>
<td>5,929</td>
</tr>
<tr>
<td>Solar PV</td>
<td>7,996</td>
</tr>
<tr>
<td>Total</td>
<td>25,166</td>
</tr>
</tbody>
</table>

Source: Author interpretation of BEIS planning data updated as of August 2017

Note: British pounds (£)
3.2 The emerging market opportunity

The focus of this report is renewables infrastructure investment in the UK. UK-based investors may at first prefer infrastructure assets at home, given lower perceived risks. However, having accumulated such domestic experience, investors may wish to pursue further opportunities overseas. The French business school, EDHEC, found last year that more than half of asset owners wanted to increase their allocation in emerging markets, in a survey of asset owner attitudes to infrastructure.39 There is precedent for using domestic renewable energy infrastructure as a stepping stone to investments in emerging markets investments with higher potential returns, and risks, in this way. For example, the first renewable investments by Danish pension schemes were in Denmark, with a Danish energy partner, prior to making overseas investments.40

The emerging market investment opportunity in renewables infrastructure is driven by a large financing gap to meet rapidly growing energy demand and to support a low-carbon transition, with a resulting potential for higher returns. This opportunity is balanced by higher risks, including political risk; currency risk; a lack of long term capital markets; a lack of data; and enforceability risk in contracts.

In the energy sector, emerging markets are the engine of global growth. The World Bank’s International Finance Corporation (IFC) estimates that emerging markets require $4 trillion annually to maintain and build infrastructure. Specifically regarding low-carbon energy, the IFC estimated that emerging markets needed around $1.75 trillion investment through 2030, in renewable power, electric networks, transport, waste and efficiency in buildings and industry.41 The Paris Climate Agreement has increased the opportunity, because of the climate action programmes that almost all countries have proposed, called nationally determined contributions (NDCs).

One of the emerging markets most associated with renewable energy opportunity is India, alongside Latin America and Africa. India has an exceptionally ambitious target, to reach total installed capacity of some 175 gigawatts of renewables by 2022, three times present installed capacity of 58 GW, in a concerted effort to provide the country with an economic alternative to new coal.42 Supportive policies include “plug and play” solar parks which include grid integration, and reliable off-take contracts, and “green energy corridors” to expand national transmission. Partly as a result, Indian auctions of solar PPAs have fallen below the level of coal tariffs, driving competitiveness and growth. Wind and solar tariffs set in India have fallen 50% over the last two years, reaching record lows of Rs2.44/kWh (US$38/MWh) with zero indexation for inflation over the 25-year PPA duration.

Over the next five years, China will remain the biggest growth market in renewables capacity, followed by the United States. But for the first time, growth in India is set to outstrip both Europe and Japan. Mexico, Chile and Brazil are also increasingly cost-competitive markets for renewable energy, opening infrastructure investment opportunities at scale.

40 https://pkaap.dk/direct-infrastructure/
4. Stepping up pension fund allocations

Infrastructure allocations to date

How pension funds in the UK compare with those in OECD countries

The Investment Association (IA) estimates total retail and institutional assets under management by its members at £6.9 trillion, as of end-2016.43 That figure rises to £8.1 trillion after accounting for other sections of the industry, including private equity and hedge funds. These numbers underscore that the UK is a hugely significant, global asset management hub, second only to the United States.

Narrowing down to UK-based pension funds, the IA estimates that total corporate and public defined benefit (DB) pension schemes managed assets totalling £1.8 trillion. As we have noted earlier, it is these funds that are especially well-matched to infrastructure assets, including renewables infrastructure.

Data is limited for aggregate infrastructure allocations by UK institutional investors in general, and pension funds in particular. However, we can combine various available data sources to make some approximate estimates. The IA estimates that its members manage £29 billion of unlisted infrastructure, compared with £6.9 trillion assets in total. We note that more than half of these infrastructure assets will be owned by DB pension schemes. For example, the data provider Preqin estimates that three fifths of UK-based infrastructure investors are pension funds.44 However, even if we assumed that all this UK unlisted infrastructure was owned by pension funds, that would still represent less than 2% of their total £1.8 trillion of assets. This figure is consistent with an estimate of 1.8% allocation to infrastructure by DB schemes made by the PLSA in 2016.45

How does such an allocation compare with other countries or globally? Research by the OECD shows that pension funds allocations to unlisted infrastructure debt and equity in aggregate is indeed low, at 1.1% in 2014, the latest data available.46 However, that number rises for pension funds which specifically report their infrastructure allocations, which tends to be larger funds. The OECD reported that 23 pension funds which specifically report their unlisted infrastructure equity allocations saw these rise to 3.5% in 2014, from 2.8% in 2010.

45 PLSA Annual Survey 2016 https://www.plsa.co.uk
Selected, large pension funds indicate the potential to go much further. At the top of the OECD table of 30 large pension funds comes Canada’s OMERS, at 14.1% allocated to unlisted infrastructure, followed by Australia’s HESTA (9.2%), AustralianSuper (9.1%), Canada’s Ontario Teachers (8.3%) and Brazil’s Previ (6.8%). The OECD report finds that the UK’s largest pension scheme, USS, has an infrastructure allocation of 6% across unlisted equity and debt.

New motivations for pension schemes to assess long term sustainability

A growing focus on climate risk and opportunities in portfolios provides a new, additional driver for pension funds to increase allocations to renewables infrastructure, alongside the infrastructure characteristics described above. This focus on climate risk is coming both from domestic and European regulators, and from stakeholders such as pension fund beneficiaries.

In 2017, the Task-Force on Climate-related Financial Disclosures (TCFD), supported by the Financial Stability Board, made recommendations for disclosure on climate risk and opportunity both by companies and investors. The voluntary recommendations of the TCFD were an effort to improve transparency of reporting at the global level. The TCFD follows other initiatives at a national level with Article 173 of France’s Energy Transition Law – passed in 2016 – standing out. The law is mandatory, requiring investors to report how their investment policies incorporate environmental, social and governance issues and in particular, how they align with the national strategy of energy transition. Whilst there may be reluctance amongst UK pension schemes for a mandatory reporting requirement on climate, guidance from The Pension Regulator on the disclosure of climate risks and opportunities could encourage awareness.

We note that pension fund beneficiaries of defined contribution (DC) pension schemes themselves may increasingly vote with their feet, given their ability to choose their manager in stark comparison with DB where transfers are low. A younger cohort of members may take a closer interest in climate risk considerations.

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47 The pension regulators DB Code cites the need to assess long term sustainability risks such as climate in their investment strategy. http://www.thepensionsregulator.gov.uk/trustees/db-investment-strategy.aspx

48 Institutions for Occupational Retirement Provision (IORP) II Directive due Jan 2019

49 https://www.fsb-tcfd.org/


Further illustrating this growing focus on climate risks, Christiana Figueres in 2017 challenged signatory members of the Principle of Responsible Investment to invest 1% of AuM in clean technologies and renewable energy by 2020.\textsuperscript{52}

**New incentives for the UK to attract private capital**

The UK has a globally competitive infrastructure market which has successfully attracted significant foreign investment, driven by a strong credit rating, stable political system and clear property rights. Foreign investors currently own some 40% of infrastructure.\textsuperscript{55} However, there are now new incentives to attract domestic investment.

The think tank E3G have highlighted that Brexit is leading to greater policy uncertainty for overseas investors\textsuperscript{54}, and large FX movements are dominating returns in the current low-yield environment, and domestic ownership of critical infrastructure is being encouraged. Over the last five years, the UK has benefited from £8 billion investment from the EIB and Green Investment Bank. Investment from both entities is likely to slow, highlighting a need to attract new sources of private funding. UK DB and DC pension schemes have combined assets of more than £2.2 trillion, similar level to the country’s annual GDP\textsuperscript{55}. These funds have no FX risks when investing domestically. Additionally, they are actively seeking UK inflation exposure (to hedge liabilities) rather than viewing it as an investment risk, and may have a greater understanding of UK policy risk.

The devolved government in Wales illustrates this opportunity for local pension fund ownership in renewables infrastructure. The Welsh Government recently set renewables electricity targets which included targets for generating 70% of the country’s electricity consumption from renewable energy by 2030, and a local ownership target for one gigawatt of renewable electricity capacity.\textsuperscript{56}

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\textsuperscript{52} Christiana Figueres is the former Executive Secretary of the United Nations Framework on Climate Change and Mission 2020 convener; \url{http://www.mission2020.global/}; \url{https://www.unpri.org/download_report/43008}

\textsuperscript{53} \url{https://mpra.ub.uni-muenchen.de/79621/1/MPRA_paper_79621.pdf}

\textsuperscript{54} \url{https://www.e3g.org/news/e3g-updates/political-instability-and-brexit-threaten-uk-energy-sector-and-decarbonisat}

\textsuperscript{55} \url{https://www.oecd.org/pensions/pensionfundinfrastructureaustraliacanada2013.pdf}

\textsuperscript{56} \url{http://www.iwa.wales/news/2016/04/re-energying-wales/}

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**UK LGPS pooling: A unique opportunity**

**LGPS pooling initiative**

We have noted that infrastructure investments are easier for larger funds, because of the greater complexities and scale of such deals. This is borne out empirically by evidence from the OECD, as we have seen, which shows larger infrastructure allocations by larger pension funds and sovereign wealth funds. Large infrastructure allocations in Australia and Canada reinforce this message that large pension schemes have the scale and resources to directly invest in infrastructure assets.\textsuperscript{57} A major UK government initiative to aggregate local government pension schemes (LGPS) may be about to reap this benefit of scale.

The UK government in 2015 launched a programme to aggregate asset management by some 89 local government pension schemes (LGPS) into a handful of “pools”. The main goals were to boost allocations to infrastructure, and achieve cost savings, for example driving down management fees by giving the new pools more clout and economies of scale.\textsuperscript{58} Eight pools have resulted from the initiative, with collective assets worth some £216 billion as of 2016. The pools should be operational from April 2018, but less liquid investments, such as in property and infrastructure, may take years to complete their transition. At the time of publication, most of the pools were in the process of planning, recruitment and securing regulatory approvals.

In general, the underlying pension fund assets will be transferred to collective investment vehicles (CIVs), managed by a regulated pool operator, or “investment management company”. The pool operator typically will be incorporated as a private company, with shares exclusively owned by the participating pension schemes. The pension schemes would be clients of the pool operator. The pension scheme would retain beneficial ownership, and generally will continue to decide strategic asset allocation. The pool operator’s task will be to execute that asset allocation, by managing the pension scheme assets, whether internally or by recruiting external asset managers.

\textsuperscript{57} \url{http://www.oecd.org/pensions/pensionfundinfrastructureaustraliacanada2013.pdf}

\textsuperscript{58} \url{http://www.gbm.hsbc.com/insights/managing-risk-regulation/lgps-pooling}
As noted, one of the main UK government goals of pooling was to increase allocations to infrastructure. The LGPS Advisory Board, an oversight body, has compiled data for allocations collectively by these pension funds from 2013-2016, including to infrastructure. They show that while infrastructure allocations have doubled over the period, they are still only at 0.6%.  

Going forwards, the eight pools have more than doubled the headline infrastructure allocation target, to an average 7.5% allocation, from 3.7% (Table 4 below). Assuming the new and old targets were met, the new target implies a doubling of allocations to infrastructure, to £16 billion from £8 billion.

### Table 4.
Proposed LGPS Pools, including AuM and enhanced targets for infrastructure allocation

<table>
<thead>
<tr>
<th>Pool name</th>
<th>AuM, £ mln (after full transfer)</th>
<th>Number of participating pension funds</th>
<th>Infrastructure allocation, %</th>
<th>New target</th>
<th>Present target</th>
<th>Present committed capital</th>
</tr>
</thead>
<tbody>
<tr>
<td>Border to Coast</td>
<td>35,900</td>
<td>12</td>
<td>up to 10%</td>
<td>4.1%</td>
<td>3.9%</td>
<td></td>
</tr>
<tr>
<td>Northern Pool</td>
<td>35,416</td>
<td>3</td>
<td>10%</td>
<td>4.5%</td>
<td>3.5%</td>
<td></td>
</tr>
<tr>
<td>LGPS Central</td>
<td>34,000</td>
<td>9</td>
<td>5-7%</td>
<td>3.8%</td>
<td>1.8%</td>
<td></td>
</tr>
<tr>
<td>Access</td>
<td>33,000</td>
<td>11</td>
<td>n/a</td>
<td>1-6%</td>
<td>0-3%</td>
<td></td>
</tr>
<tr>
<td>London CIV</td>
<td>28,400</td>
<td>33</td>
<td>3-10%</td>
<td>1.0%</td>
<td>0.7%</td>
<td></td>
</tr>
<tr>
<td>Brunel Pensions Partnership</td>
<td>23,200</td>
<td>10</td>
<td>5-10%</td>
<td>3.3%</td>
<td>2.4%</td>
<td></td>
</tr>
<tr>
<td>Wales Pool</td>
<td>12,798</td>
<td>8</td>
<td>5-10%</td>
<td>1.0%</td>
<td>0.3%</td>
<td></td>
</tr>
<tr>
<td>Local Pensions Partnership (LPP)</td>
<td>13,000</td>
<td>3</td>
<td>&gt; 10%</td>
<td>10.0%</td>
<td>8.3%</td>
<td></td>
</tr>
<tr>
<td>Weighted Average</td>
<td>215,714</td>
<td>89</td>
<td>7.5%</td>
<td>3.7%</td>
<td>2.6%</td>
<td></td>
</tr>
</tbody>
</table>

Source: Individual pool submissions to UK government’s DCLG, 2016  

In their submissions to the UK government, in mid-2016, the LGPS pools explained some of the circumstances needed to fulfil their target allocations to infrastructure. The pools identified challenges in achieving appropriate risk-adjusted returns. Several pools stated that challenges included the growing volume of capital seeking similar assets. Any over-supply of capital drives up pricing, as many investors chase the same assets and seek to outbid one another. Such an effect may reduce expected returns, pension fund pools stated. Pools were also concerned about the availability of suitable expertise, at a reasonable price, given the particular requirements of infrastructure investment for deal sourcing and due diligence, and to undertake future asset management. Several pools also wanted time to build out the teams and source deals. They cited research that large international funds currently investing directly in infrastructure had taken 10-15 years to reach current investment levels.

**Growing infrastructure investment collaboration**

Some LGPS funds had already made infrastructure investments, including unlisted renewable energy, before the pooling process. The pooling process appears to have accelerated such investments, in particular through greater cross-pool collaboration.

In one example of early renewables investments, Lancashire pension fund (now managed by the LPP pool) made direct renewable energy infrastructure investments in 2011, via a holding vehicle called Red Rose Infrastructure. The LPP participating funds have since made several investments, either directly as sole equity provider, or in partnership with other asset owners or asset managers including a 50% stake in EDF’s wind farms in Portugal. The LPP pool states that it is prepared to invest in greenfield/development risk where this is properly rewarded.

In an example of cross-pool collaboration, two LGPS pools have joined forces to co-invest directly in unlisted renewable energy infrastructure assets. In 2015, the London Pensions Fund Authority (LPFA) and the Greater Manchester Pension Fund (GMPF) formed the infrastructure fund, GMPF LPFA Infrastructure LLP (GLIL). The two pension funds are now in the LPP and Northern pools respectively. Their collaboration has now extended, with other funds participating in these two pools also joining GLIL: LPP pool’s Lancashire pension fund, and the Northern pool’s Merseyside and West Yorkshire pension funds.
GLIL prefers to invest directly in infrastructure, rather than via asset managers, to reduce management costs and increase transparency and governance. The fund is structured so any LGPS pool or pension fund can join, and it states that it actively welcomes new LGPS pools, to leverage LGPS knowledge, deal sourcing and capital. To date, GLIL’s committed capital has risen to £1.3 billion. The fund has made two renewable energy investments, in waste-to-energy projects, and in the Clyde onshore wind farm in Scotland.65

At an early stage in the LGPS pooling process, the UK government established the Cross-Pool Collaboration Infrastructure Sub-Group (CPCIG), to foster collaboration between the LGPS pools. The CPCIG includes representatives from the eight pools and has an ongoing dialogue. The CPCIG has since developed momentum in an effort to collaborate across pools. Such collaboration could boost bargaining power, as a bigger group of investors, thus reducing management fees, and so cut costs and boost returns. More bargaining power may also allow better governance rights; more appropriate structures (e.g. longer term vehicles); and priority access to co-investment. And collaboration may facilitate direct investing, by pooling internal resources and through knowledge sharing. Reducing intermediation and delivering greater control and transparency on portfolio construction in this way may also help achieve better returns.

5. Case studies: Success stories of investment in UK-renewable energy infrastructure

These two case studies show the importance of gaining early experience in direct infrastructure. Investment objectives at both pension schemes were based on obtaining long-term, inflation-linked cashflows, while reducing management costs and improving governance.

In both case studies, competitive advantage was achieved by efficient decision-making and cash-based bids. Although both case studies are based on onshore wind, both investors have other renewable energy investments in their portfolios.
The BT Pension Scheme (BTPS) started its journey to invest in direct infrastructure assets in 2010 following an unsuccessful bid for the rail link, High Speed One. This experience led the scheme to set up an infrastructure allocation in 2012, with the objective to allocate to low risk, mature, inflation-linked UK infrastructure. The purpose was to provide liability matching assets for the pension scheme, as it followed a de-risking strategy reducing equity exposure and increasing bond investments. The pension scheme was also attracted to the low correlation of unlisted infrastructure to listed equities.

One of the first investments was a direct equity stake in the Fallago Rig, 144 MW onshore wind farm in 2014. BTPS also has exposure to Braes of Doune wind farm (72MW) and 2 rooftop solar investments (24.5 MW) via Hermes Infrastructure.

Turning to Fallago Rig in more detail, this acquisition used a relationship with Hermes Infrastructure team, a part of Hermes Group, owned by the BT Pension Scheme. Hermes managed a segregated mandate, effectively acting as in-house infrastructure manager. The Hermes Infrastructure team have extensive experience in sourcing, analysing and executing infrastructure deals. According to the Hermes website, onshore wind assets such as Fallago Rig have "predictable inflation linked cashflows generated in a stable, transparent and supportive regulatory environment through its participation in Renewables Obligation Certificate regime. The investment has been made without the use of third party leverage, materially reducing the potential dispersion of investment returns and volatility for our clients whilst still delivering attractive risk adjusted returns". Hermes also highlights the importance of strong governance, long-term partnerships and active policy engagement for successful infrastructure investing. And it emphasised the importance of a strong focus on responsible investment, given the public service nature of infrastructure assets, including the need for "sustainability, quality of service, value for money and ensuring affordability for customers".

EDF Energy is one of Fallago Rig’s primary customers. Under a long-term power purchase agreement, the electricity retailer will purchase half or more of the wind farm’s output over 15 years. The balance of the offtake has been purchased by BT plc under a long term PPA.

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BTPS

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67 See BT Pension Scheme annual reports at https://www.btpensions.net/information/useful-documents
GLIL Infrastructure LLP was set up in April 2015 as an infrastructure investment vehicle jointly owned by Greater Manchester Pension Fund and the London Pension Fund Authority. Both funds had infrastructure fund investments, alongside a handful of direct infrastructure assets. In addition, GMPF’s sponsor held direct infrastructure exposure via Manchester Airport. Both funds had ambitions to invest further into direct UK infrastructure, and a dialogue between their chairmen facilitated the joint venture. Both funds initially committed £250 million and staff resources. Today, GLIL has committed capital of £1.3 billion, thanks to the addition of three pension fund partners: Lancashire, Merseyside and West Yorkshire. The inclusion of additional partners covers five UK cities, helping GLIL meet a key ambition of keeping its local investment base.

The fund has two renewable energy deals in the portfolio Iona Capital (bioenergy) and Clyde Wind farm.

GLIL acquired in 2016 a 22.7% stake in Clyde, one of the largest wind farms in the UK at 520 MW, from operator SSE. The unique structure of GLIL facilitated the transaction, including its own empowered investment committee and significant resources which allowed it to make a cash-only bid. The transaction completed in two months. GLIL invested alongside Greencoat, the listed YieldCo. Clyde posed an attractive proposition for GLIL, meeting many of its investment criteria, including:

- Predictable and positive cashflows from day one, substantially backed by the UK Renewable Obligation subsidy regime which provides substantial proportion of government backed and inflation linked revenues
- No ongoing management fees
- Strong governance in the form of a director seat and shareholder rights

The benefits of a long-term asset, at 25 years GLIL took up the option to invest in an extension of the wind farm in September 2017. GLIL has made further acquisitions within the transportations sector, funding new rolling stock on the East Anglian and South West rail franchises, and states that it is currently working on a number of further direct opportunities, both greenfield and brownfield.

THE RENEWABLE ENERGY INFRASTRUCTURE INVESTMENT OPPORTUNITY FOR UK PENSION FUNDS