

THE RENEWABLE ENERGY INFRASTRUCTURE INVESTMENT OPPORTUNITY FOR UK PENSION FUNDS

Proceedings of a workshop held at the Guildhall, London, with the support of the Green Finance Initiative, June 19 2018



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and Financial Analysis**
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Acknowledgements

This document records the proceedings of a workshop, entitled, "The renewable energy infrastructure investment opportunity for UK pension funds", organised by the Institute for Energy Economics and Financial Analysis (IEEFA), and hosted by the Green Finance Initiative of the City of London Corporation on June 19 2018. The workshop was planned as an informal opportunity for asset owners including Local Authority and UK corporate pension funds to discuss the investment opportunities in renewable energy infrastructure – both in Britain and overseas – with leading specialist fund managers.

Four asset managers participated: Aquila Capital; Greencoat Capital; Impax Asset Management; and Liontrust. The ten participating asset owners were: Lloyds Banking Group Pensions; the London Pensions Fund Authority (LPFA); LPP Investments; L&G; Lewisham Council Pensions Investment Committee; Border to Coast Pensions Partnership (BCPP); Brunel; Camden Pension Fund; LGPS Central; and Merseyside Pension Fund.

The full list of participants is listed in the Appendix.

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Executive Summary

These proceedings are based on a workshop held in London's Guildhall on June 19 2018, organised by the Institute for Energy Economics and Financial Analysis (IEEFA), and hosted by the Green Finance Initiative (GFI) of the City of London Corporation. The aim of the workshop was to increase understanding around barriers to the financing of renewables, and to identify opportunities. The workshop built on an earlier event in October 2017, which introduced UK local government and corporate pension funds to renewable energy infrastructure, and a related research report which reviewed the characteristics of unlisted renewable energy infrastructure, published in November 2017 by IEEFA, HSBC Global Asset Management and GFI.¹

This workshop was structured in a way to allow potential investors in renewable infrastructure assets to discuss four key areas of interest with specialist asset managers. These four themes were: the attractions of renewable energy as an asset class; how to address deal flow challenges; expected risk-adjusted returns; and renewables markets beyond the UK and beyond subsidies. This briefing is structured according to the same themes, and summarises the outcome of the discussion. The event was held under "Chatham House rules", meaning that all comments were on an unattributed basis, with the exception of the brief, initial presentations by the four asset managers.

¹ <http://greenfinanceinitiative.org/renewable-energy-infrastructure/>

1. The attractions of renewable energy as an asset class

Renewable energy infrastructure has distinct characteristics, including contracted, long-term cash flows which can match the maturing liabilities of defined benefit pension funds, as well as being aligned with a low-carbon transition. These cash flows can be inflation-linked. When a pension fund includes an allocation to renewable energy infrastructure as part of its strategic asset allocation, this can provide a dependable dividend which enhances overall yield. Investors can enhance income stability by prioritising renewable energy infrastructure with long-term contracted cash flows, typically with quasi-government bodies, as opposed to merchant sales into wholesale power markets. Similarly, they may prioritise low-risk, low-volatility jurisdictions, notably Britain, some other European countries, and Japan. For example, UK renewable energy policy has been steady and predictable since the founding of the renewable obligation certificate (ROC) scheme in 2002, despite the passage of multiple governments.

Cost reduction has been a dominant feature of the renewables market to date, and in particular in solar power, where costs have fallen around 90% in the past decade. Including long-run equity returns, costs of onshore wind and solar PV are around €50-75/MWh today,

which is broadly competitive with conventional generation. Present renewable energy market trends include the emergence of new technologies, a shift beyond subsidies and electrification of the energy sector. The market outlook for renewables varies by technology. Emerging technologies include battery storage, demand-response and smart home data and metering. It is still unclear whether these highly distributed technologies will become infrastructure assets, and where the opportunities, business models and incentives lie. One key question is whether critical mass and scale will be achieved to create an industry which supports the investor.

2. How to address deal flow challenges

The biggest investment segment in global renewable energy finance in 2017 was project finance, at \$216 billion, or 47% of the total. Institutional investors contributed around \$10 billion of this, divided between direct investment, project bonds and investment in specialist infrastructure and private equity funds. Opportunities will differ by country, and between the primary and secondary market for renewable energy projects. In the secondary market, bidders for renewable energy assets include utilities, yieldcos, asset owners such as insurance companies, and asset managers such as Blackrock and Brookfield. Many pension funds still invest indirectly, via asset managers, as they may not have the specialist infrastructure teams capable of keeping pace with the bidding process in the secondary market.

Regarding the primary market, France has been the "place for profit", because of a large gap to 2023 renewables targets established by the Macron government. Britain has fewer primary market opportunities, not least because new onshore wind and solar are presently ineligible for support, but has an active secondary market worth approximately £70-80 billion. Investors can mitigate deal flow challenges through diversification, for example by technology (including wind, solar and hydro), country (and different support policies) and resource (according to generation profile).

3. Expected risk-adjusted returns

The main drivers of deal value, in discounted present value terms, are resource volume and price. It is therefore important to be confident of the quality of the resource, especially in the case of wind farms, where resource volumes are volatile, site-specific and harder to predict. Risk mitigation is achieved through prudent asset management optimisation.

Competition has increased in the secondary market. Returns remain attractive, however. For example, in the UK secondary market, returns reflect risk, and range from an unlevered 6-7% gross for solar, with few moving parts and straightforward maintenance, to 8-10% gross for biomass, where risks include fuel price and supply. Offshore wind risk is offset by higher subsidies and a scale attractive to large sovereign wealth funds. Asset managers argue that market competition does not pose a serious problem, for a number of reasons, including: lower return expectations of pension funds; recent stabilisation of returns tracking interest rates which are now expected to rise; lower risks as institutional investors became comfortable with the asset class; upside opportunities such as

repowering; and characteristics of renewable energy infrastructure assets that remain attractive for pension fund investors, and in particular stable, long-term cashflows.

4. Renewables markets beyond the UK, and beyond subsidies

Europe will remain a key focus for many asset managers and asset owners because of its political stability. Other stable growth markets include certain U.S. states such as California and Texas, as large markets with attractive local policies, such as California's new mandate for every new home to have roof-top solar power. By contrast, Russia has some of the world's best hydropower resources but very low power prices which fail to incentivise new projects. Regarding low-income countries, one potential handicap is the lack of local investor expertise: it is essential that asset managers have boots on the ground in the countries they invest in.

A major renewables market trend going forward will be a shift beyond subsidies. As the market moves beyond subsidies, investment will increasingly target location by resource rather than support regime, such as hydropower in Norway, and solar power in Spain and Portugal. Opportunities remain for renewables, even beyond subsidies. First, renewables may be able to bid for reliability payments in capacity markets, in combination with battery storage. Combining with storage may also allow variable renewables to compete better in energy-only markets. Second, project developers may be able to contract long-term

power purchase agreements with corporates and local governments, to fill the gap left by central government support. Third, there may be greater demand for renewable electricity, if electrification of transport, heating and industry progresses as expected. Fourth, ambitious climate action targets across Europe and further afield will continue to underpin growth. For example, the European Union has a "roadmap" target to cut greenhouse gas emissions by 80-95% by 2050. These targets may also support carbon prices, which directly benefit renewables generators per megawatt hour of sales into energy-only markets. And fifth, renewable energy costs are expected to continue to fall, in line with growing scale.

1. The attractions of renewable energy as an asset class

Liontrust Overview

- o **Renewable energy can be a low-risk, low-carbon, defensive investment**
Liontrust has an equities product where it has allocated 5% of assets under management to listed renewable energy infrastructure, to achieve a dividend which enhances overall yield. Its renewables infrastructure investments are in assets called “yieldcos”: listed companies which issue regular dividends, based on long-term power purchase agreements contracted by the underlying renewable energy assets.
- o **Focus on contracted cash flows**
Liontrust only invests in renewables yieldcos where more than half the revenue of the underlying asset arises from a long-term fixed contract, as opposed to sales in the wholesale power market. These contracts might include renewable energy obligation certificates (ROC) or feed-in tariffs (FIT) in Britain or Japan.
- o **Low-risk, low-volatility jurisdictions**
The geographical focus of the Liontrust fund is Britain and Japan, to minimise risk and volatility. Liontrust reports around 20 listed renewable energy yieldcos, worldwide, mostly in Britain and Japan, which exhibit these characteristics of stable dividends and liquidity. These securities have a market capitalisation starting at several hundred million euros each.
- o **Higher yield can offset higher tracking error**
Liontrust allocated 5% of the fund to renewables by reducing cash holdings to 10% from 15%. The firm found that implementing this renewables infrastructure allocation increased the tracking error of the fund by 20 basis points, to 3.9% from 3.7%, while increasing yield by 30 basis points.

General Discussion

Unique characteristics of renewables

Renewable energy infrastructure has distinct characteristics, including contracted, often inflation-linked, long-term cash flows, which match the maturing liabilities of defined benefit pension funds, as well as being aligned with a low-carbon transition. These assets can be less suited to providing capital gains for the purpose of closing pension scheme funding gaps. Awareness-raising is still needed to understand the asset class, where investors may take many years from their first site visit to their first investment.

Perceived risks and disadvantages

These include: the risk of retroactive policy changes as seen in Spain in the wake of the financial crisis; yieldco net asset value (NAV) volatility as seen in the United States; and expectations among some institutional investors of higher yields. UK renewable energy policy has been steady and predictable since the founding of the renewable obligation certificate (ROC) scheme in 2002, despite the passage of multiple governments. Spain is the standout example of retrospective regulatory change, after feed-in tariffs were cut following the global financial crisis. One way to manage such risk was to avoid highly levered transactions. Low leverage removes one source of income volatility, reducing the impact of a tariff cut.

Cost reduction as a market driver

New projects are more competitive than old projects, but may not have the benefit of long-term, subsidised tariffs. Excluding equity returns, the cost of onshore wind and solar PV is around €30-50/MWh in Europe. Including long-run equity returns, costs of onshore wind and solar PV are around €50-75/MWh. Such costs are broadly competitive with conventional generation. Solar power has become a mature renewable energy technology in just 15 years. Emerging technologies now include battery storage, gas-engine demand-response and smart home data and metering.

Technology-specific risks

Renewable energy technologies might be divided between "exotic" and mature technologies. Among exotic technologies, tidal is expensive, while battery business models are not yet cost-effective. The question is whether critical mass and scale will be achieved in these emerging technologies, to create an industry which supports the investor. It is still unclear whether these technologies will become infrastructure assets, and where the opportunities are for interested investors. Battery storage will be a gamechanger for the renewable energy industry, including solar power. However, in the near term it may be difficult to gain investment exposure because of the expected pace of price reductions. For example, if battery storage follows the same trajectory as solar power, the challenge today is to find business models which cover the amortised cost plus residual value which remains unchallenged by new, lower cost products. A practical example would be investing today in a network of 20-minute, electric vehicle charging stations, which are overtaken by a new technology which can charge much faster. Among proven technologies, such as wind and solar power, risk mitigation is more about achieving asset management optimisation.

2. How to address deal flow challenges

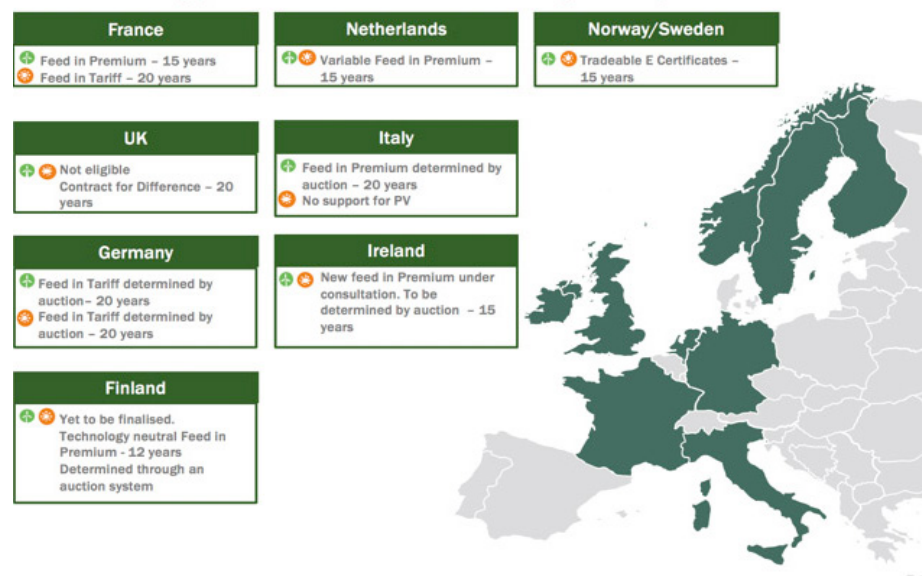


FIGURE 1. Current support schemes within key European markets

Source: Impax

Impax Asset Management Overview

- A diversified upstream focus**
 Impax focuses on originating, developing, re-developing and repowering upstream assets, for subsequent sale to institutional investors or asset managers in secondary markets. The firm is AIM-listed (IPX.L) and has both listed specialist funds investing in a range of listed securities, as well as three unlisted infrastructure funds specialised in renewable energy only. Infrastructure fund investments are diversified by technology, country and resource. Technology diversification includes exposure to a range of renewable technologies, including wind, solar and hydro; country diversification to a range of regulatory support regimes; and resource diversification to different generation profiles, for example wind power in northern versus southern France.
- Geographical focus**
 Impax focuses on European jurisdictions with more reliable, predictable policies. Countries have a variety of support regimes, including fixed feed-in tariffs (France and the Netherlands), tradeable certificates (Norway and Sweden) and auctions for long-term offtake contracts (Britain, Italy, Germany, Ireland and Finland). France has been the “place for profit”, because of a large gap to 2023 renewables targets established by the Macron government, which are expected to be extended later this year. Britain has fewer primary market opportunities, not least because new onshore wind and solar are presently ineligible for support, but has an active secondary market. Greencoat Capital describes existing UK renewables assets as a huge market worth approximately £70-80 billion.

1 Bloomberg New Energy Finance data

General Discussion

Categories of secondary market buyer

Bidders for renewable energy assets in the secondary market include utilities, yieldcos, asset owners such as insurance companies, and asset managers such as BlackRock and Brookfield. Most pension funds still invest indirectly, via asset managers. They may not have the specialist infrastructure teams capable of keeping pace with the bidding process in the secondary market. Buyers may conduct in-house asset management, or hire third party managers, the latter including the original developers. This decision will depend on buyer expertise and ability to scale. Yieldcos often conduct their own asset management, while insurance companies hire third party providers.

What has been the impact of competition for deals?

The primary renewables infrastructure market is primarily about relationships, local and technical knowledge, and first-mover advantage. This market has become tighter, but price competition is tighter in the secondary market. Impax reports that they have maintained exit margins of 250-350 basis points, referring to the difference in return achieved by the build and hold investor in the primary market, versus the long-term buy and hold investor in the secondary market.

3. Expected risk-adjusted returns

Greencoat Capital Overview

- o **Maximising revenues:**
the importance of resource volume
Greencoat Capital's focus is large, scalable, mature renewable infrastructure, and specifically wind and solar power in Britain and Europe. The main drivers of deal value, in discounted present value terms, are resource volume and price. While technology development and optimisation over time is important, it will have less impact on the present value of cash flows discounted at a rate of 4%-5% or more. Regarding volume, Greencoat Capital targets wind farms with a minimum age of two years on average, with a proven resource, given that wind resource volumes are volatile and site-specific, and therefore harder to predict. Solar volumes are more transparent, given proven, historical satellite data. Greencoat Capital outsources volume estimates to third parties.
- o **Minimising cost**
Two of the three biggest costs are largely outside the asset manager's control: the land lease agreement with the land owner, fixed for 25 years, and business rates, set by the government. This places a focus for cost minimisation on operating and maintenance optimisation.
- o **Competition for assets**
One concern over renewables infrastructure yields has been the impact of competition. However, Greencoat Capital describes a large secondary market for existing UK renewables assets. Returns across these assets will reflect risk, from an unlevered 6-7% gross for solar, with few moving parts and straightforward maintenance, to 8-10% gross for biomass, where risks include fuel price and supply. Offshore wind risk is offset by higher subsidies and a scale attractive to large sovereign wealth funds.

General Discussion

What drives renewable energy infrastructure yields?

Yield will depend on the purchase price, project lifespan and other factors underpinning net asset value (NAV), as well as share price in the case of listed yieldco products. Regarding lifespan: hydro is a 40-year asset, solar 30-year and onshore wind 25-year. In the case of wind, it may make sense to optimise the asset halfway through this lifespan, for example to improve the gear box or blades. NAV also depends on the reliability of cash flows, and specifically the balance of merchant versus contracted income. Typically, wind and solar assets derive revenues both from support regimes, per megawatt hour of generation, and from electricity sales on wholesale power markets. Regarding merchant cash flows, NAV will vary according to changes in projected wholesale power prices.

Inflation-protected?

In Britain, support regimes that apply to existing assets but which are no longer available for new assets include the renewable obligation certificates (ROC) scheme and recent feed-in tariffs, both of which are index-linked. Regarding electricity sales, the main UK power market is the N2EX. Since wholesale power prices are related to economic activity, which in turn drives inflation, these prices also have some, more theoretical, inflation protection.

If secondary market prices are tightening, is it rational for pension funds to keep buying?

Asset managers at the workshop argued that market competition did not necessarily pose a problem, for a number of reasons. First, institutional investors had some of the lowest return expectations, and therefore may be especially competitive in a low-yield market. Second, returns were stabilising, tracking interest rates which were now expected to rise. Third, tighter yields also reflected falling risk, as institutional investors become more comfortable with the asset class. For example, it was unsurprising that secondary market projects with 100% contracted income and little or no merchant risk should see no more than 4.5% to 5.5% unlevered returns. Fourth, secondary market projects may have upside potential later in life, for example as a result of repowering, or other subsequent improvement such as the addition of battery storage. Finally, even in a low-yield environment, there were characteristics of renewable energy infrastructure assets that remained attractive for pension fund investors, including non-correlation and stable, long-term, quasi-government-backed cashflows.

4. Renewables markets beyond the UK and beyond subsidies

Aquila Capital Overview

- **Geographical diversity in a post-subsidy era**

Aquila Capital invests across Europe and further afield, and especially in Scandinavia, Germany, France and Japan, in wind, solar and hydropower. As the market moves beyond subsidies, investment will increasingly target location by resource rather than support regime, such as hydropower in Norway, and solar power in Spain and Portugal. Green certificates already contribute a maximum of 10% of revenues in Swedish hydropower, with the balance being unsubsidised payment for power.

- **New investment approaches, as the market share of renewables grows**

As variable renewables reach a higher market share, the impact on security of supply and grid balancing will become increasingly relevant. As market shares rise, it will become difficult to make investments purely financially. It may be necessary to invest in and operate assets in combination as one product, for example renewables with batteries. Combining technologies in this way may also help offset an expected declining share of contracted income and subsidies, by increasing the flexibility of renewables to sell into regular wholesale power markets. Additional revenues, for example via capacity markets, may also support such investments.

- **New electricity demand sources will mitigate the deflationary impact of cost competition and renewables on power prices**

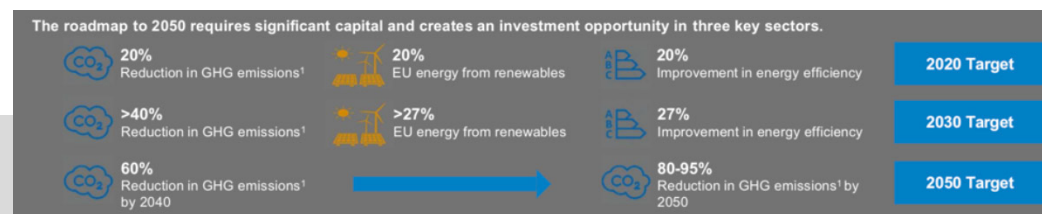
New demand sources will include transport, not only in electric vehicles but also more surprising sources such as shipping, as well as heating; and industry. Regarding industrial demand, for example, in Sweden there is a pilot to replace coal with hydrogen in steel production.

- **Ambitious climate action across Europe and further afield**

Targets to cut greenhouse gas (GHG) emissions will drive continued strong growth and investment opportunities for the indefinite future in the low-carbon energy sector. For example, the European

Union has a roadmap target to cut GHGs by 80-95% by 2050. These targets may also underpin carbon prices, which directly benefit renewables producers per megawatt hour of generation. Britain already has a carbon price floor, which has lifted carbon prices above wider EU levels in recent years, and at present is equivalent to about £8 of the approximately £45/MWh power price, which directly benefits zero-carbon generation. In Sweden, a doubling of carbon prices would be expected to allow the scrapping of the entire green certificate scheme, by providing equivalent income to renewable generators.

FIGURE 2. EU climate action targets will drive new energy infrastructure investment



General Discussion

Emerging markets for renewables beyond Europe

Europe will remain a key focus for many asset managers and asset owners because of its political stability. U.S. states including California and Texas are similar, large markets which are attractive partly as a result of supportive policies. By contrast, Russia has some of the world's best hydropower resources but very low power prices which fail to incentivise new projects. Regarding developing countries, one potential handicap is the lack of local expertise: it is essential that asset managers have boots on the ground in the countries they invest in.

Investment in flexible back-up

As the market share of variable renewables grows, the importance of flexible backup will also grow. There are some doubts about the adequacy of present incentives for such backup, especially in the case of exceptionally long-lived assets such as pumped storage hydropower (PSH). At present, complementary long-lived incentives do not exist, except in rare cases such as the 35-year power purchase contract recently agreed for a new nuclear power plant in Britain. One alternative to driving investment in new domestic PSH is for Britain and other countries to invest in interconnection to countries which already have such backup. Norway and Sweden, for example, together have about 60% of Europe's PSH capacity.

Attractiveness of renewables in a post-subsidy era

Investors are concerned that as the renewables market moves beyond subsidies, we may expect lower inflation-linked revenues and more merchant risk, as well as a tendency towards power purchase agreements with higher credit-risk corporates, rather than quasi-government public bodies. In Britain, renewables will have to stand on their own feet in the near term, given the UK government now appears solely focused on supporting offshore wind and nuclear power. Onshore wind and solar may achieve some limited continued support, if allowed to bid to provide firm capacity in combination with battery storage, under the UK's capacity market. Asset managers argued that various factors offset higher risks and lower revenues in a post-subsidy era, including: the increasingly proven nature of renewables projects; increasing scale of the industry at large; and diversification provided by new multi-currency renewables infrastructure offerings.

A trend towards corporate PPAs

One way for onshore wind and solar to grow without subsidies is by contracting long-term power purchase agreements with corporates. To date, there have been fewer than 10 corporate PPAs agreed annually in Britain, compared with around 200 deals agreed annually in the more mature U.S. market, according to participants at the workshop. Workshop participants reported continued growth in the corporate PPA market in Britain this year. Difficulties in the UK corporate PPA market include a lack of standardisation and familiarity, where some corporates may consider the market too complex or poor value for money.

Kick-starting a subsidy-free era

One way to jump-start a subsidy-free market might be for the UK government to guarantee a corporate PPA market, for example via a floor price. Another might be for local government pension schemes to lead the way, by purchasing wind or solar projects and contracting the offtake to their own local government offices, schools and hospitals. That would follow an approach pioneered by the telecom giant BT in 2014. BT pension scheme acquired a stake in the Fallago Rig onshore wind farm, and BT plc purchased a share of the offtake under a long-term PPA.

Appendix

Participants at renewables infrastructure workshop

David Adkins	Head of Investment Strategy	Lloyds Banking Group Pensions Investment
Robert Branagh	Managing Director	London Pensions Fund Authority (LPFA)
Sally Bridgeland	Chair	LPP Investments
John Bromley	Head of Clean Energy	L&G
Nicholas Burlington	Private Equity Investor Relations	Impax Asset Management
Kelly Clark	Director	Finance Dialogue
Mike Clark	Founder Director	Ario Advisory
Simon Clements	Partner and Portfolio Manager, Sustainable Investment Team	Liontrust
Cllr Patrick Codd	Pensions Investment Committee	Lewisham Council
Rachel Elwell	CEO	Border to Coast Pensions Partnership
Richard Fanshawe	Head of Private Markets	Brunel Pension Partnership Ltd
Alison Gowman	Deputy Chair	Green Finance Initiative
Kirsty Hamilton	Associate Fellow, Energy, Environment and Resources	Chatham House
Friederike Hanisch	Network Manager, Europe	ShareAction
Chris Hitchen	Chair	Border to Coast Pensions Partnership
Cllr Mark Ingleby	Chair, Pensions Investment Committee	Lewisham Council
Will Irwin	Policy Analyst, Sustainable Finance	Grantham Research Institute, LSE
Cllr Louise Krupski	Vice Chair of the Pensions Committee	Lewisham Council
Rishi Madlani	Chair of Camden Pension Committee & Sustainable Finance Lead	RBS
Michael Marshall	Director of Responsible Investment & Engagement,	LGPS Central Ltd
Jamie Milne	Institutional sales	Greencoat Capital LLP
Lee Moscovitch	Partner	Greencoat Capital LLP
Peter Rossbach	Co-head of Private Equity Infrastructure,	Impax Asset Management
Felix Soellner	Analyst, Investment Practices	UN PRI
Tor Syverud	Head, Investment Management,	Aquila Capital
Owen Thorne	Portfolio Manager, Responsible Investment,	Merseyside Pension Fund
Sophia Tickell	Co-Founder, Partner	Meteos
Ian Williams	Head of Consultant Relations EMEA,	Aquila Capital
Anne-Marie Williams	Engagement, Global Asset Owners,	ShareAction
Helene Winch	Fixed Income Responsible Investment,	HSBC Global Asset Management
Gerard Wynn	Energy Finance Consultant	IEEFA



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