



Since 1857

Gresham House

Specialist asset management

UK SOLAR

INVESTMENT FUNDAMENTALS



Solar is a proven mainstream asset class for both private and institutional investors. UK solar provides investors with a low risk investment. It is 100% asset backed and provides robust revenues with a strong degree of inflation protection.



Introduction

Investors across the globe have embraced Solar Photovoltaics (PV) as the real ‘game changer’ in low carbon generation. In 2017 alone over 79 gigawatts (GW) was constructed globally, buoyed by advances in technology and increasing cost competitiveness. The surge in solar PV investment is being driven in part by the imperative to close fossil fuel power stations and align investment portfolios to the zero carbon economy.

BP’s Energy Outlook analysis sees solar as likely to generate a third of the world’s total renewable energy and up to 10% of global power by 2035. Indeed, BP has recently taken a 43% stake in Europe’s largest solar development company, as it seeks to offset its exposure to oil and diversify into renewables.

The leaders of the largest oil companies now accept that solar PV will fundamentally change how power is generated. This is exemplified by the CEO of Shell, Ben van Beurden, who stated that: “I have no hesitation to predict that in years to come solar will be the dominant backbone of our energy system, certainly of the electricity system”.

Solar PV is already an established power generation source in the UK and still growing. Peak generation of 9.42GW was recorded during May 2018. Currently there are periods where solar is delivering in excess of 20% of the UK’s total electricity demands, it is expected this figure will rise further during the summer months and potentially set a new peak generation figure. Solar offers investors the opportunity to hold a mainstream real asset with an attractive return and low financial risk in today’s uncertain economic environment.

Contents

Section 1: UK Solar - The Opportunity

Section 2: Return Fundamentals

Section 3: Solar Park Fundamentals

Section 4: Attractive and Reliable Distribution Profile

Section 5: The Manager



Section 1: UK Solar - The Opportunity



The rationale for long term investments in UK solar remains very compelling:

- **Index-linked, highly cash generative asset with a 25 year+ economic life;**
- **Proven technology, with low performance risk and reducing capital prices;**
- **Low volatility in annual output, ensuring predictable cash distributions; and**
- **Direct exposure to the substantial potential upside from UK power prices, which are forecast to rise over the long term.**

Gresham House believe now is an opportune time to invest in solar assets and benefit from future increases in power prices.

Gresham House continue to receive sales particulars on solar assets and has a pipeline of potential acquisition opportunities that it is assessing.



Section 1: UK Solar - The Opportunity



Total UK installed capacity is nearly 13GW, and solar is capable of being located right across the country, with minimal environmental impact and quick construction times.

UK operational solar PV comprises utility scale ground mounted installations built under the Renewable Obligation Certificate (ROC) scheme (7GW), rooftop/small scale ground mounted solar assets supported by the Feed-in Tariff (FIT) regime (4.6GW) and a further 0.9GW which is unaccredited. A number of the large scale solar parks were built using tax incentives (i.e. the Enterprise Investment Scheme) and these schemes are now maturing, providing a good supply of secondary assets for sale.

Solar PV has now firmly established itself as a proven mainstream asset class delivering attractive returns for investors, with the combination of low operational risk and high levels of annuity style cash flow.

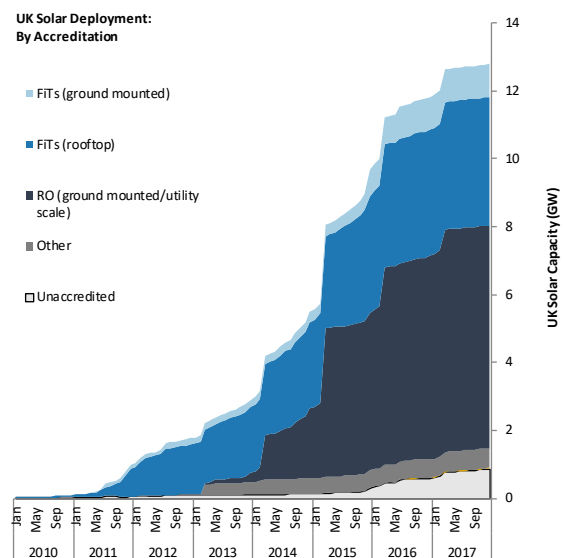
The reductions in asset capital costs is expected to enable solar to be the first renewable energy source to reach grid parity, competing directly with the fossil fuel power plants, without government support. There are a number of large scale projects being developed in a subsidy free environment which will come to market once built.

UK demand for clean energy is expected to increase substantially as the economy continues to decarbonise through the ongoing electrification of transport, heat and other carbon intensive industries. In contrast, electricity supply capacity will also become increasingly constrained due to the retirement of ageing fossil fuel power plants. Further, the construction of additional nuclear capacity and the timing of its commissioning is still highly uncertain.

Gresham House expect that UK power prices will continue to rise in real terms over the medium to long term due to uncertainty in the balance of electricity supply and demand and global political instability which affects oil and gas markets. Gresham House believe that now is an opportune time to acquire operational UK solar parks and benefit from these future price increases.

The UK has experienced rapid growth in solar PV since 2011, as shown in the chart below, benefitting from falling module prices and attractive 20 year index-linked subsidies.

Solar PV Deployment



Source: Department of Business Energy and Industrial Strategy (January 2018)

Section 1: UK Solar - The Opportunity

Proven Technology

Solar PV technology employs thin layers of micro crystalline silicon (or equivalent semi-conducting material) to convert sunlight into an electrical charge, which is conducted away by metal contacts as Direct Current (DC).

In order to maximise energy collection and conversion, single cells are connected together in a panel. These panels are the building blocks of the solar PV system and are, in turn, connected together to generate wholesale volumes of electricity to be sold onto the grid.

There are few moving parts in a solar park and they have proven highly reliable in both performance and efficiency. As an infrastructure asset, this provides a high quality source of long term income generation.

The majority of operational solar PV assets have 25 year leases and planning terms. It is now generally accepted that the economic life is far greater than 25 years, as underpinned by manufacturer confidence in providing warranties that panels will still deliver 80% of their design rated output after a full 25 years of operation.

Gresham House look to improve asset values by seeking to extend the project life where possible, beyond 25 years through lease and planning extensions. Gresham House has been successful in extending both.

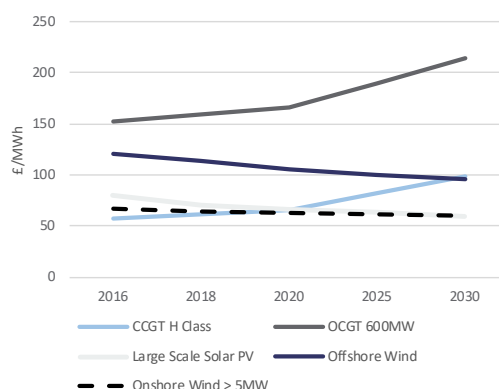
A Bright Future For UK Solar

Solar's principal subsidy, the ROC, closed to all new generating capacity from 31 March 2017 and solar is expected to continue to be excluded from future Contracts for Difference auctions. Lower capital and operating costs are expected to enable new solar parks to be economic without subsidy support. Clayhill is one such site, a 10MW solar park with 6MW of co-located battery storage that became operational in 2017.

The most recent report by the Department for Business, Energy and Industrial Strategy (BEIS) show that the government believes solar will be significantly cheaper to develop by 2020 than it predicted four years ago, with a forecast Levelised Cost of Energy (LCOE) of £67 per Megawatt hour (MWh), compared to the £92 per MWh it predicted in 2013. BEIS expect these costs will continue to fall out to 2030, when solar is forecast to be the cheapest form of energy with an LCOE of £60 per MWh along with onshore wind. Similarly, National Grid forecast that installed solar capacity in the UK will increase significantly over the next 10 years, by on average 11GW (80%) over their four forecast scenarios.

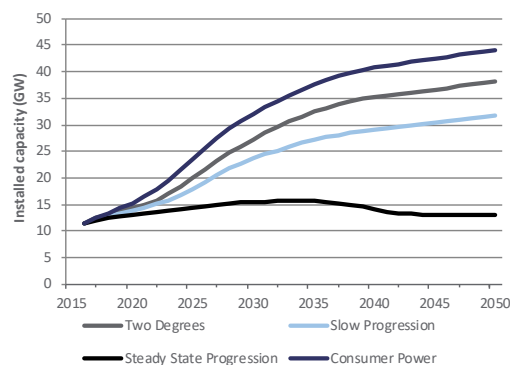
Solar PV has quickly become one of the most popular forms of renewable energy in the UK, from a virtual standing start in 2011.

BEIS LCOE Forecast £/MWh 2016 - 2030



Source: BEIS Electricity Generation Cost (November 2016)

National Grid Forecast Solar Deployment

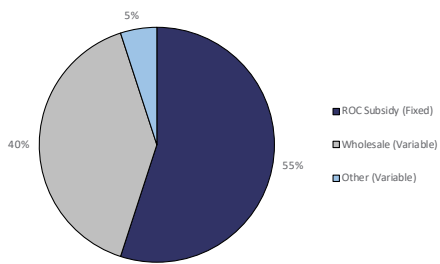


Source: National Grid FES (July 2017)

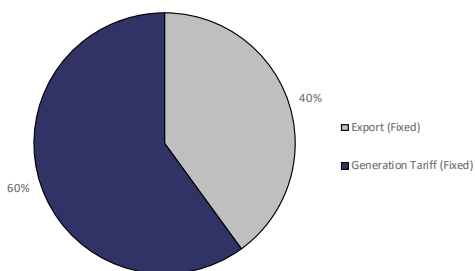
Section 2: Return Fundamentals



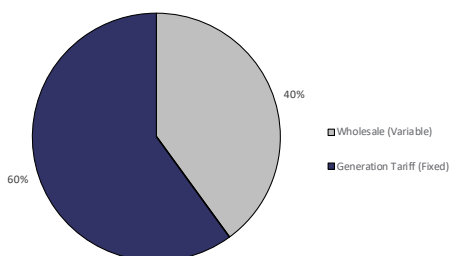
Illustrative Revenue under ROC Scheme



Illustrative Revenue under FiT Scheme (Export Tariff opt in - all revenue fixed)



Illustrative Revenue under FiT Scheme (Export Tariff opt out)



Robust Revenues

Typically a UK solar PV site will receive a significant portion of its revenue from government support schemes which are index-linked for 20 years. This payment is provided to solar PV technology to compensate for its higher initial capital cost per MW compared to fossil fuel power plants. In the UK there are two types of government support scheme, ROC and FiT.

Under the ROC scheme over half the revenue is secured through a fixed subsidy with the remainder having exposure to the variable wholesale electricity price and other benefits. The 'other' revenue shown on the first pie chart represents the 'embedded benefits' that solar assets earn by being located close to electricity demand (e.g. lower losses during distribution of electricity).

FiT schemes allow up to 100% of revenues to be fixed with the additional benefit that you can choose to opt out of the Export Tariff each year. This gives investors interested in annuity type cash flow the ability to fix all the revenue with inflation protection or opt for some upside from wholesale power prices if these are forecast to be higher.

An element of FiT schemes in a portfolio enhances the annuity type cash flows having 100% of the revenues fixed. Whilst ROC schemes allow investors to benefit from potential increases in power prices whilst protecting the downside through fixed subsidies which are inflation-linked.

Historically, power price increases have exceeded inflation over the medium term and it is Gresham House's view that power prices will continue to provide investors with an inflation hedge. As the revenues from the subsidies (typically 55% to 60%) are fixed and index-linked, the potential upside will come directly from the rate of increase in the wholesale power price and rate of inflation.

Section 2: Return Fundamentals



UK electricity demand growth is linked to population growth, GDP growth and increasingly to the decarbonisation of the economy.

The National Grid is the designated System Operator for the UK, responsible for the real time balancing of electricity supply and demand. It devotes significant resources to forecast how it can maintain a reliable and fully functioning electricity system, both now and into the future. In July 2017 it updated its annual report titled 'Future Energy Scenarios' (FES).

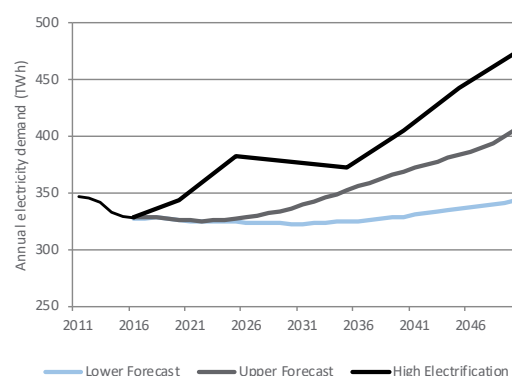
It is evident from the chart on the right, which summarises National Grid's upper and lower demand forecasts, that they consider the lower limit of future demand to be roughly in line with current levels. However, the upper limit is significantly above current levels, driven by population growth and electrification of the heating and transport sectors.

In 2017 the UK government announced ambitious plans to ban the sale of new diesel/petrol engine cars by 2040, to accelerate the uptake of Electric Vehicles (EVs). New EV models are being released with 400+ mile range and the cars themselves are becoming more affordable, principally due to the continual fall in Lithium-ion battery prices, which have decreased by 77% since 2010. Gresham House's view is that solar asset valuations will increase, as demand will likely be closer to the National Grid upper limit, further driving up future electricity prices.

Electrification of the transport sector will cause an ongoing growth in electricity demand.

National Grid's estimates show that with ambitious electrification, demand rises from 330TWh to potentially over 475TWh by 2050.

National Grid Forecast UK Electricity Demand



Source: National Grid (FES report, 2017)

The Future Power Supply Mix

The UK is experiencing a huge change in its power generation mix which will continue over the next decade. In the last five years coal fired electricity generation has fallen by 84%. 2017 saw the first coal-free day of electricity generation since the beginning of the industrial revolution and over the last year solar power generated more electricity than coal on 182 days. All coal capacity (13GW) is due to be decommissioned by 2025 in addition to over 9GW of nuclear capacity forecast to shutdown between 2023 and 2035. Overall, circa 17% of the UK's current generating capacity is due to be decommissioned by 2025. The extent and potential timeline of these closures has long been known and the government had expected new gas builds to maintain the UK's security of supply in the short to medium term.

The significant capital costs required to build new large scale gas plants requires energy prices of £65 to £80 per MWh to justify investment. Therefore the current wholesale price of circa £40 to £50 per MWh is insufficient to incentivise the additional private investment the government desires.

The Capacity Market (CM), was the mechanism set up to secure new capacity during this period of structural change. Over 90% of the capacity market agreements have been secured by existing generators, with limited new capacity entering the market. This is in part due to lower than expected clearing prices on the CM auctions. The 2016 T4 CM auction cleared at £22.50 per kW. The T4 auctions award a one year capacity agreement for delivery in four years, in this case 2020/21. The 2017 results were unveiled at the beginning of February 2018 at £8.40 per kW. With prices at such levels there is a risk that a significant proportion of new capacity will not be built. Carlton Power's 1.9GW Trafford Gas Power Plant, the largest new build project to be awarded a contract under the CM, has failed to meet its financial commitment milestone and Carlton Power have informed BEIS that they will give up the contract. It is expected that other new build projects already awarded CM contracts may follow suit.

The lack of market driven new builds and likely further withdrawals from the capacity market should lead to a tightening of system supply and an increase in energy prices around periods of system stress in the short and medium term. In the longer term these problems are likely to persist, unless there is a significant rise in the wholesale electricity price to facilitate market driven new builds.



Section 2: Return Fundamentals



Electricity Price Outlook

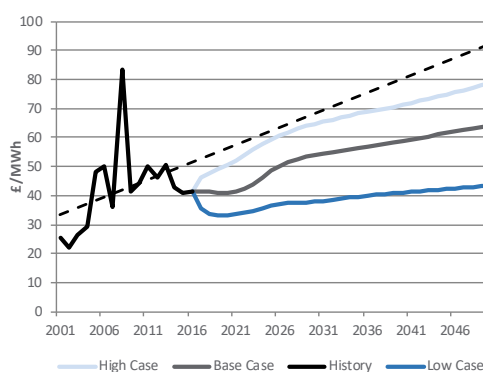
The combination of increased demand for electricity over the long term and a constrained supply, provides the fundamentals for higher electricity prices in the future.

The chart on the right from the most recent FES National Grid study highlights the upside potential for electricity prices. These could rise towards £65 per MWh in the medium term, which is some 30% higher than the current wholesale price. This higher price scenario is notably consistent with the historic linear trend for power prices over the last two decades, indicating the clear potential to enhance investment returns.

The UK's pending exit from the EU causes significant uncertainty regarding the relationship between the UK and the EU's energy markets. Uncertainty is likely to have a short term impact on volatility and in the medium term an impact as developers of new build generation adopt a wait and see approach, which will put further pressure on already tight electricity supply margins.



UK Baseload Electricity Price Projection



Source: National Grid FES report (July 2017) and Gresham House analysis

pre-2016

Section 3: Solar Park Fundamentals



A solar park principally comprises four components (i) PV modules/panels, (ii) inverters, (iii) mounting structure, and (iv) electrical wiring/infrastructure to connect to the grid. Major components have a design life of at least 25 years. PV panels have a 'Performance Guarantee' that covers the full 25 years and in some cases longer. In Gresham House's valuations, provision is made for the replacement cost of new inverters, which convert the Direct Current (DC) generated by the solar panels into Alternating Current (AC) that is supplied to the grid, which should be replaced once during the asset life.

Output from a solar park is generally highly predictable during its 25+ year economic life. Solar panels only produce electricity during daylight hours, which means most electricity is exported at peak times (which are Monday to Friday, 7am to 7pm), when demand is greatest and electricity prices are also at their highest.



In summer, UK solar parks can capture both the morning and evening demand periods and therefore the peak price periods. During winter solar PV still captures part of the peak price periods.

One exciting development in this area of balancing supply and demand is the deployment of battery energy storage, which when combined with wind or solar can effectively lead to base load renewable generation.

Wind and solar are intermittent forms of generation (i.e. they only produce energy when the wind blows or the sun shines). Alongside energy storage, it can become more controllable such that generation can be supplied when needed and can capture higher power prices.

Section 4: Attractive and Reliable Distribution Profile



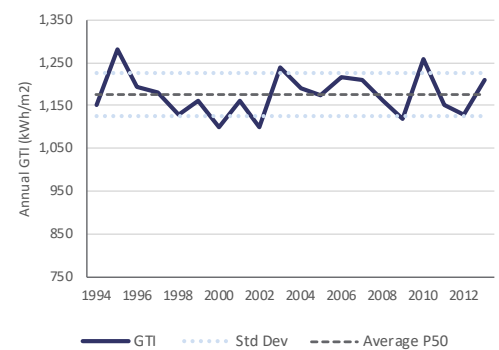
A typical solar park cash distribution profile is expected to rise with inflation and rising energy prices. Due to low fixed operating costs (typically less than 25% of revenues), circa 75% of revenues are expected to be available for distributions. For an asset held in an LLP, tax relief on the capital cost of plant and machinery means that little or no income tax is expected to be paid in the early years of the project.

Cash flows from solar parks are relatively stable as inter-annual variability of output is low. Sites built before 2016 also benefit from one of two subsidies: FIT, which can essentially secure up to 100% of fixed revenues and ROC, which secures around 55% of fixed revenues with the remaining revenue coming from variable wholesale power prices. Both subsidies are index-linked for 20 years.

The first chart shows the solar energy received on a unit area of tilted solar panel (termed Global Tilted Irradiation (GTI)) for a specific site over an 18 year period. Gresham House model a solar park's output on the average expected generation. The variation on a year to year basis is low and typically less than 5%.

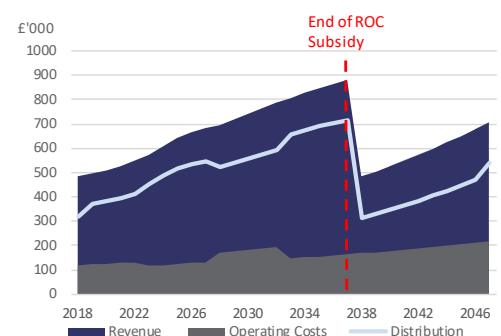
An investor in solar parks can therefore expect a relatively stable output and cash distribution each year.

A Solar Park's Annual Output Over Time



Source: Gresham House Technical Due Diligence Report

5MW Solar Park Indicative Cash Flow



Source: Gresham House Indicative Solar Cash Flow Forecast 2018

Section 5: The Manager



Background to Gresham House

Gresham House plc (Gresham House) is an AIM quoted specialist alternative asset manager, with over £2.3 billion in assets under management. The Group provides funds, direct investments and tailored investment solutions including co-investment, across a range of highly differentiated alternative investment strategies. Gresham House's expertise includes, renewable energy, forestry, housing and infrastructure, strategic public equity and private assets.

Gresham House aims to deliver sustainable financial returns and is committed to building long-term partnerships with clients (institutions, family offices, high-net-worth individuals, charities and endowments), to help them achieve their financial goals.

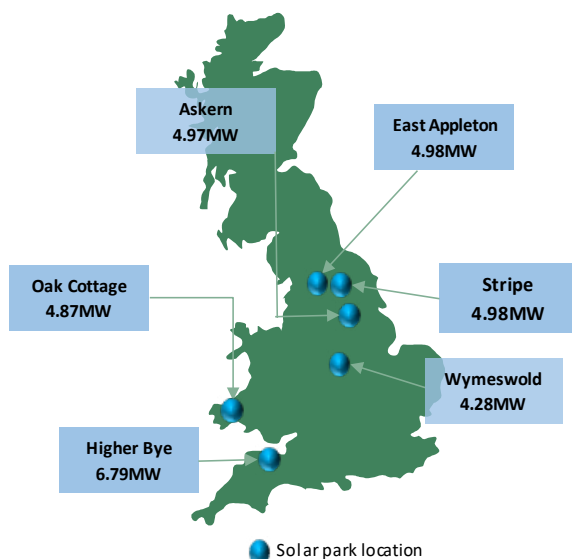
In May 2018, Gresham House acquired 100% of FIM Services Limited, a specialist forestry and renewable energy asset manager in a deal which combined two leading UK specialist asset managers with complementary experience across forestry and renewable energy.

Gresham House has a proven capability in originating, acquiring, constructing and managing the operation of UK renewable energy infrastructure assets.

To discuss anything referenced in this paper, please contact us by email at admin@greshamhouse.com. For retail investor queries please contact Wayne Cranstone, Investment Director on 01451 843 900, for institutional investor queries please contact Heather Fleming, Head of Institutional Business on 0203 873 5908.



The Manager will invest only into operational solar PV assets that use top tier manufacturers' equipment and have already secured the 20 year UK Government ROC or FiT index-linked support.



Gresham House is accredited to ISO 9001, ensuring robust operating procedures and effective corporate governance.

Asset Acquisition / Enhancement

Gresham House and Gresham House have a proven track record of maximising returns and minimising risk from renewable energy projects through:

- Acquisitions: securing suitable assets from proven developers and respected construction firms, at the right price

Gresham House has proven its value on acquisitions for investors by:

- Originating a regular supply of attractive investment opportunities.
- The ability to source and deliver opportunistic on and off market transactions.
- Implementing rigorous financial, technical and legal due diligence processes for every purchase.
- Active Management: enhancing returns

Well structured operations and maintenance contracts maximise output from the solar PV park and also minimise life-cycle costs.

Gresham House have a dedicated asset management team for renewable energy assets, ensuring close monitoring of costs and performance optimisation.

Our ongoing tracking of the power price market also informs decisions of how to sell power to secure the best available prices.

- Independent advice on realisation

Gresham House act solely to maximise investors' returns. Our independence allows detailed return driven advice to be provided to investors.



Risk Management

A well selected and well managed portfolio with diversified geographic locations and equipment suppliers, will minimise investment risks.

The Investment Manager also ensures the procurement of a suitable range of manufacturers' warranties and performance guarantees to protect income.

This document does not constitute or form part of any offer for sale or solicitation of any offer to buy or subscribe for any securities nor shall it or any part of it form the basis of or be relied on in connection with, or act as any inducement to enter into, any contract or commitment whatsoever or constitute an invitation or inducement to engage in investment activity under section 21 of the UK Financial Services and Markets Act 2000 nor shall it be deemed to provide investment, tax or accounting advice.

This document has been prepared by Gresham House Plc. By accepting this document, the recipient acknowledges that it will, and it will cause its directors, partners, employees and representatives to use the information contained in this document for information and discussion purposes only and that no reliance may be placed for any purpose whatsoever on the information or opinions contained in this document. Gresham House do not represent or warrant or give any other undertaking that the information or opinions in this document are accurate or complete. Neither Gresham House, nor any affiliate, nor any of their respective directors, partners, officers or employees or any representative accepts any liability whatsoever for any direct or consequential loss arising from any use of this document or its contents.

This document has been prepared and issued by Gresham House Asset Management Ltd ("Gresham House"). Gresham House is authorised and regulated by the Financial Conduct Authority ("FCA"). Its registered office is at 5 New Street Square, London EC4A 3TW.

This document is intended for information purposes only and does not constitute investment advice. Whilst the information in this document has been published in good faith, Gresham House provides no guarantees, representations or warranties (express or implied) regarding the accuracy or completeness of this information. Gresham House and its affiliates assume no liability or responsibility and owe no duty of care for any consequences of any person acting in reliance on the information contained in this document or for any decision based on it. This document does not itself constitute an offer or invitation or any solicitation of any offer to subscribe for or purchase any shares or other securities or recommendation to invest in any shares or other securities and should not be construed as such. Before investing you should satisfy yourselves as to suitability and the risks involved, and you may wish to consult a financial adviser. Investors are reminded that past performance is not indicative of future results. The value of investments may fall as well as rise and investors may not get back the amount invested. Direct investment in wind assets is not regulated by the Financial Conduct Authority.

Gresham House Asset Management Limited

Glebe Barn
Great Barrington
Burford
Oxon
OX18 4US

T: 44 (0)1451 844655

E: admin@greshamhouse.com

Gresham House Asset Management Limited is certified to the ISO 9001 standard

