Changing dynamics in the UK renewable energy market

An investor's perspective

Since 1857
Gresham House
Specialist asset management

April 2021

Executive summary

The UK's renewable energy sector has provided investors with stable financial returns and positive environmental credentials.

This paper shows the path to continuing and enhancing these benefits, in an era where Government subsidy support is no longer needed.

We will highlight that:

- Increased renewable energy capacity is essential to meet 'net zero' by 2050[1]
- Unsubsidised renewable energy investment is viable
- Increased renewable capacity will have some effect on power prices
- Power price risk can be mitigated using long-term contracts to facilitate stable, inflation-linked revenues
- Returns can be enhanced by asset managers with expertise in UK power markets and battery storage solutions

The views expressed herein are at the time of publishing (April 2021) and are subject to change.

1. Net zero carbon emissions by 2050 is targeted in the hope of limiting global warming to 1.5C

01 Meeting net zero by 2050

It is well documented that a substantial change to both electricity supply and demand dynamics is needed for the UK and EU countries to meet their net zero targets by 2050.

Behavioural shifts, such as the electrification of transport and heating, mean that UK electricity demand will likely double from current levels by 2050[2].

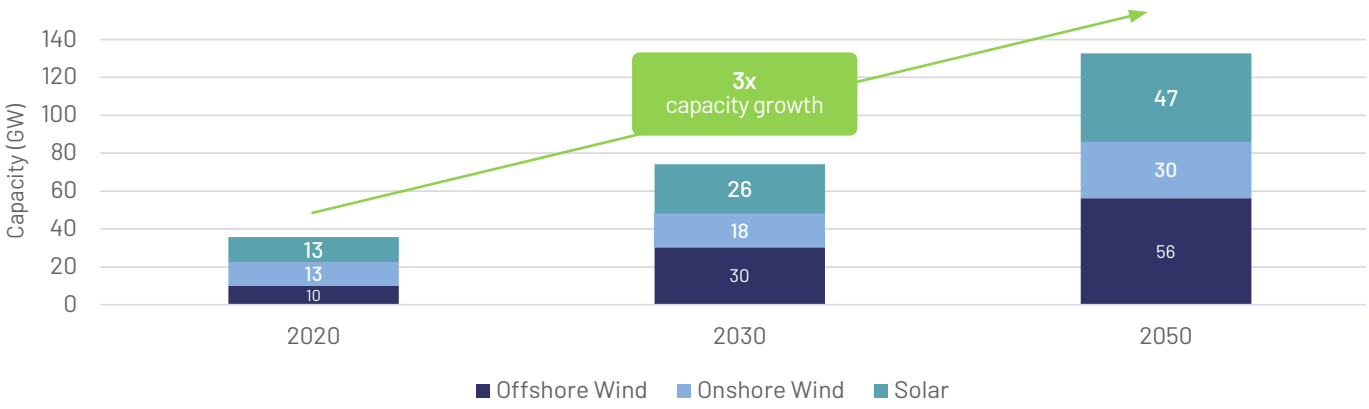
Renewable technologies will need to meet over two-thirds of total demand to achieve net zero targets (from c.40% today).[3] Consequently, renewable energy capacity from solar and wind must triple by 2050.

Funding this capacity represents an investment requirement in excess of £80bn.[5] Project developers have responded by acquiring potential sites to host renewable assets – there is c.10GW of new solar in the UK's planning application system[6] and c.16GW of onshore wind in development.[7]

Key takeaway for investors

The need for increased renewable energy capacity presents a clear investment opportunity. This scale of build-out will require funding of unsubsidised assets.

Figure 1: UK total installed capacity *(Gigawatts, GW)*[4]



2. *From c.300TWh per annum to c.600TWh per annum (UK Energy White Paper, 2020)*
3. *Baringa; Aurora*
4. *Aurora analysis*
5. *Gresham House analysis*
6. *Solar Power Portal, September 2020*
7. *Renewable UK, November 2020*

02 Unsubsidised investment viability

Fighting to acquire existing, operating renewable assets causes investors to achieve 'bottom of market' returns without any positive contribution to new renewables capacity. The 'additionality' provided from greenfield renewable assets supports net zero targets and can deliver attractive returns without reliance upon subsidies.

Subsidised

The majority of UK renewable capacity was built from 2010 to 2017, at which point the ROC[8] subsidy regime ended. Numerous investment managers raised funds during this time, with restricted mandates now requiring them to compete fiercely on the rare occasion that subsidised assets are sold. Successful acquisitions only occur by accepting the lowest returns or applying bullish valuation assumptions. These assets are typically purchased by investors with long-term investment horizons, so will become increasingly scarce.

Investors requiring subsidised revenue streams will also compete strongly for future subsidy support mechanisms. The UK expects a fourth round of its CfD[9] mechanism in 2021, but competition means that pricing is likely to represent a discount to forecast power prices – no longer a subsidy, but more a "floor price". This is supported by recent declines in the CfD level, with the February 2015 offshore wind subsidy level falling by over 65% by the third CfD auction in May 2019.

Even subsidised projects contain pricing risk, with retroactive changes being made to subsidies applied in Spain, Italy and France in recent years (as recently as November 2020 in the case of France).

Unsubsidised

Unsubsidised renewable assets can target a 1%+ IRR[10,11] premium when compared to the acquisition of existing, operating subsidised assets. Fig. 2 shows the 'levelized cost of electricity' (LCOE) of a range of renewable technologies, indicating the electricity sales price that must be achieved for a particular renewable technology to justify investment. This shows that:

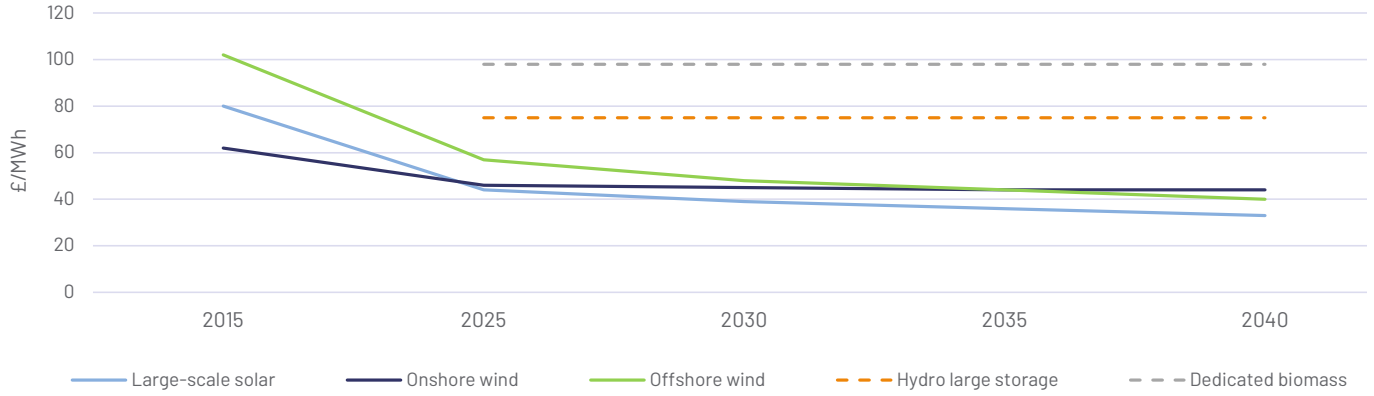
1. Solar and onshore wind have the lowest LCOE, i.e. they are the most economically advantageous renewable energy technologies to invest in

2. That solar, onshore wind and offshore wind technologies have seen a falling cost base since the "subsidy era", with their LCOEs declining over the last decade (supported by reduced input material costs and increased generation via technological enhancements).

Key takeaway for investors

Unsubsidised renewables have attractive returns due to cost and efficiency improvements. The technologies are well-established, therefore the primary risk to recognise and mitigate is power price exposure (which we explore overleaf).

Figure 2: LCOE Forecast *(£/MWh)*[11]



8. Renewable Obligation Certificate
9. Contracts for Difference
10. Internal Rate of Return
11. Gresham House analysis
12. Department for Business, Energy & Industrial Strategy (BEIS)

03 Increased renewables and power prices

Increased renewable energy capacity will cause power price volatility and a below-average power price for renewables ('cannibalisation').

Cannibalisation

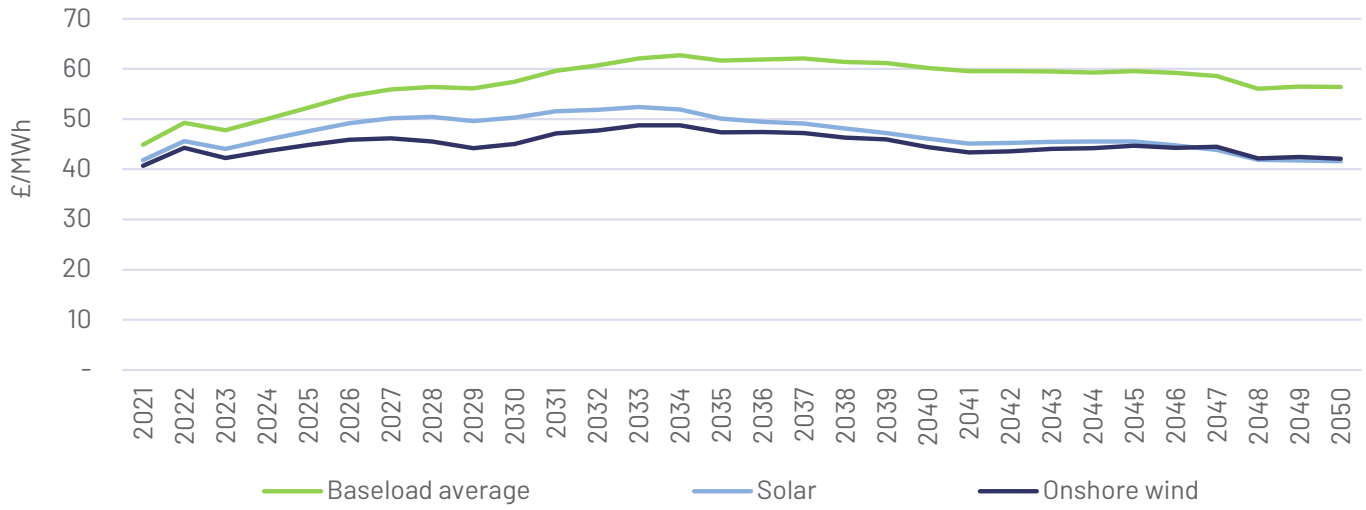
The established renewable energy technologies of solar and wind do not generate electricity consistently 24 hours per day (they are 'intermittent'). When they do generate, they will likely do so at the same time as other similar assets (with renewables accounting for anywhere between 80% and less than 20% of all power generated in a given half-hour period).

This intermittent generation potentially causes mis-alignment between electricity supply and demand. Increased renewable energy capacity will therefore exaggerate existing price slumps during periods of high solar and/or wind generation, leaving power purchasers with the problem of managing supply uncertainty.

This will result in renewables securing lower prices on average than a plant operating as a "baseload" generator (i.e. 24 hours per day, 7 days a week), with Fig. 3 forecasting that solar and onshore wind prices will fall increasingly below the baseload average over the next 30 years.

Implications: Renewable-specific discounts should be acknowledged and captured within the valuation exercises conducted by asset managers.

Figure 3: Renewable-specific power price forecast vs. baseload average *(real, 2020)*[13]



13. *Aurora analysis*

Volatility

An increase in power price volatility is also forecast due to ongoing mis-matching of electricity demand and supply from intermittent renewable generation.

Volatility was pronounced in the first three months of 2021, when prices commonly spiked to over £600/MWh for half-hour periods due to low wind supply and disruption of the BritNed interconnector (through which Great Britain can import power from the Netherlands - see Fig. 4).

Despite leading electricity market advisors[14] anticipating an increased use of electricity storage (specifically using batteries), the range in minimum and maximum power prices is expected to grow on a daily and annual basis due to increased intermittent renewable energy capacity.

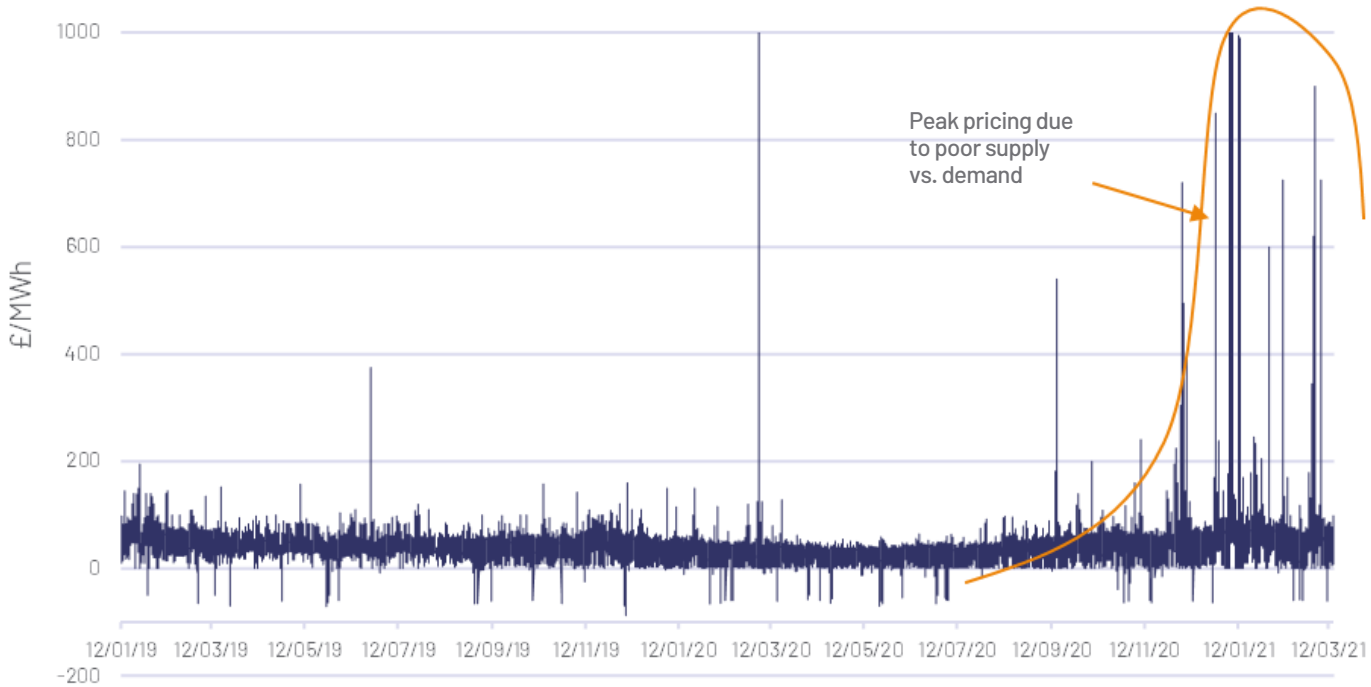
Fig. 5 shows a within-day maximum price that is rarely more than double the minimum in 2020; whereas Fig. 6 frequently shows a greater maximum price, often three times the minimum, particularly in the first quarter of the year.

Implications: Most asset managers only consider power price forecasts on the basis of annual averages. This fails to represent the risk that assets could be exposed to if operated on a 'merchant' basis (without a long-term fixed price contract). It also misses a potential opportunity to maximise revenues by pursuing electricity sales during peak price periods.

Key takeaway for investors

Any investment allocation to renewables should be made based on in-depth analysis of power price trends. Volatility and cannibalisation need to be acknowledged and the risks mitigated as far as possible.

Figure 4: GB half-hour power prices[15]



14. For example Aurora, Baringa and AFRY
15. Elexon; Gresham House

Figure 5: 2020 daily wholesale price range *(£/MWh, real 2019)*[16]

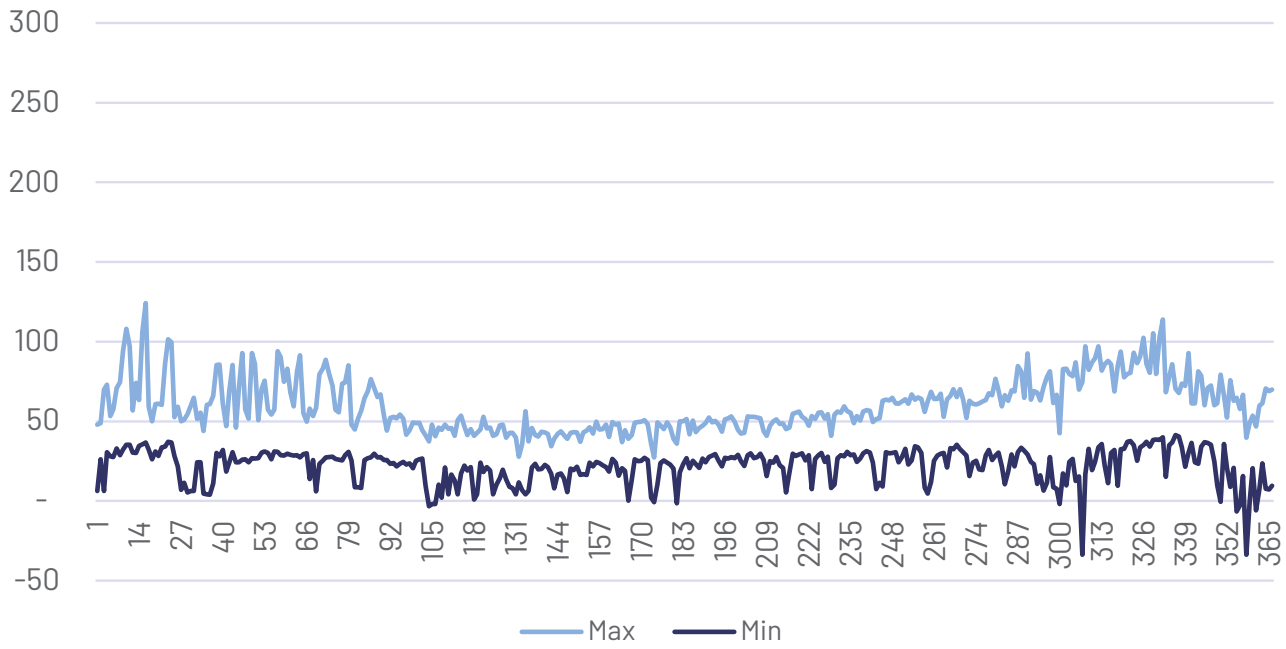
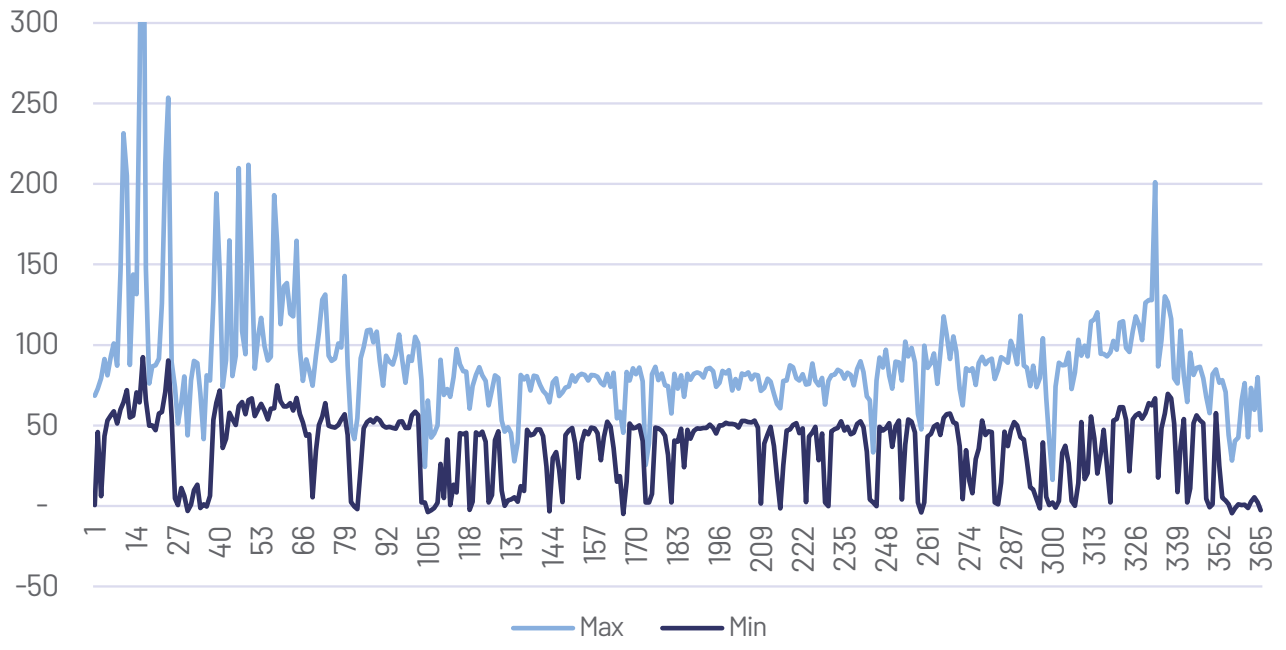


Figure 6: 2030 daily wholesale price range *(£/MWh, real 2019)*[17]



16. Aurora
17. Aurora

04 Power price risk mitigation to facilitate stable revenues

Merchant power price risk can be mitigated using long-term contracts, creating greater certainty over revenue streams versus those of many subsidised assets.

Power purchase agreements (PPAs)

Most renewable assets funded during the 'subsidy era' adopted simplistic contractual structures to govern the sale of their power.

Short-term PPAs were typically favoured, often with fully 'floating' merchant power prices, with the investor relying on the 20-year subsidy to demonstrate certainty of cashflows.

This approach means that the renewable asset is exposed to power price movements throughout its life (including during its initial subsidy period, as shown in Fig. 7).

It is now possible to secure long-term PPAs from utility and corporate offtakers under contracts of up to 15 years' duration.

As corporates increasingly look to decarbonise their supply chains, offtakers are particularly attracted by the possibility of their long-term contract being the key to unlocking investment in new renewable assets ('additionality').

This approach means that unsubsidised assets often fix a greater proportion of their expected lifetime cashflows (comparing the navy blue bars between Fig. 7 and Fig. 8).

Figure 7: Subsidised asset (illustrative cashflows based on a solar project with ROC subsidy)

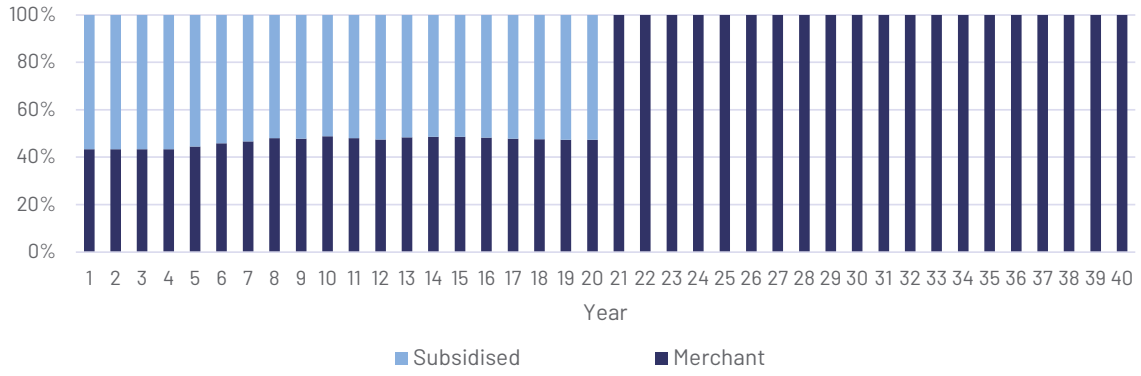
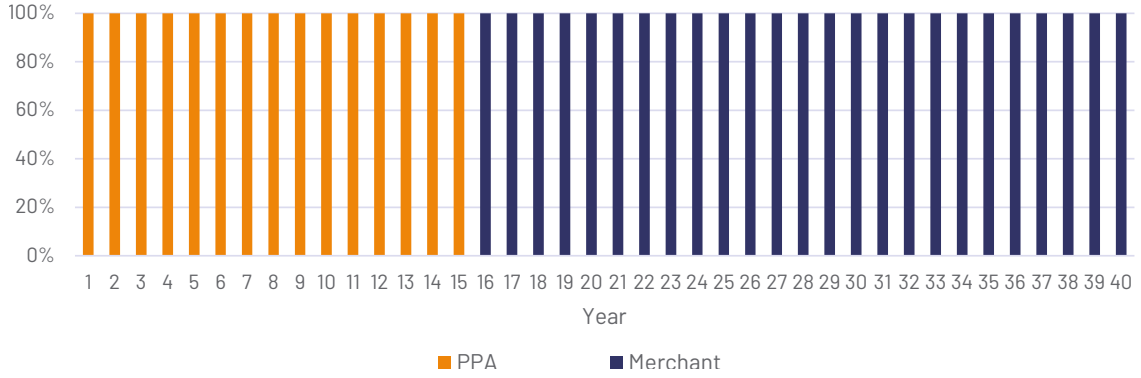


Figure 8: Unsubsidised asset (illustrative cashflows based on a solar asset with 15-year PPA)



Source: Gresham House

Corporate PPAs (cPPAs)

Large corporates have recently shown a strong interest in offering long-term fixed prices to purchase electricity and renewable energy certificates from power generators.

This usually provides corporates with a saving against forecast power prices and supports the net zero goals increasingly being announced by large businesses.

In turn, the renewable generator mitigates risk by securing long-term revenue certainty, underpinned by a creditworthy purchaser (recent cPPA purchasers include Tesco, John Lewis, Amazon, City of London and Northumbrian Water).

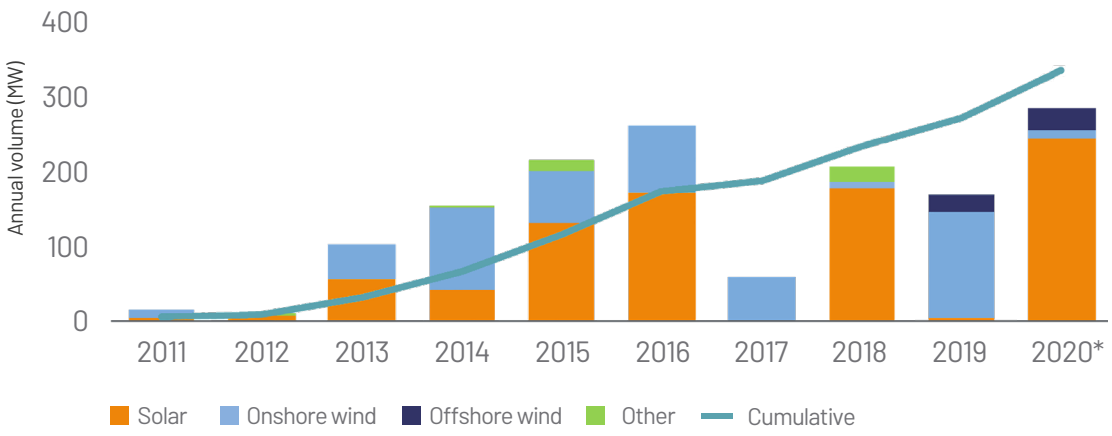
cPPA volumes have grown substantially since 2009, with contracts signed in 15 European countries and UK cPPA capacity now exceeding 1.5GW.

There is strong potential for further cPPA contracting, with specialist platforms emerging to match suppliers with offtakers (e.g. Zeigo and LevelTen) and an increasing number of corporates making strong commitments to procure renewable energy (e.g. the RE100 group). This momentum has meant that the traditional purchasers of power (the utilities) are now also offering long-term prices, thus ensuring that new renewable assets are not purely reliant upon the cPPA market.

Key takeaway for investors

Increased availability of long-term fixed price contracts mitigates power price risk and provides cashflow certainty. These contracts are typically signed at levels below merchant prices. Investors should look for managers who can mitigate these lower prices through additional revenue enhancement opportunities.

Figure 9: UK cPPA volume *(MW, to November 2020)*[18]



18. BloombergNEF 2H 2020 European Solar and Wind Corporate PPA Price Survey.
**Data to end of November 2020.*

05 The importance of expertise to enhance returns

Power price volatility also represents an opportunity for sophisticated and experienced asset managers. Further revenue streams can be secured using enhanced PPA strategies and the addition of collocated battery storage assets.

Enhanced PPA strategy

Renewable assets can now be managed more intelligently to access revenue streams beyond the simple sale of electricity. Investment managers who are used to assessing power markets on a half-hourly (rather than annual) granularity can capitalise on these opportunities. For example, in addition to the sale of renewable power, generators can receive further revenues from National Grid via the Balancing Mechanism and Capacity Market.

These schemes reward generators for turning generation off or on at short notice, in order to help National Grid balance electricity supply and demand. Certain PPA structures will allow for a temporary pause in generation, meaning that enhanced revenue streams can be accessed without interfering with long-term fixed price PPAs (illustrated by the top cashflow item in Fig. 10).

Battery collocation

The addition of battery storage assets adjacent to renewable generators ('collocated') provides a further opportunity for enhanced returns. Batteries secure profit by importing power during periods of low price and exporting power at periods of high price. In addition, batteries play a vital role in helping National Grid balance supply and demand, and so receive the same revenue streams mentioned in the previous section (and others).

Investing in batteries is becoming increasingly popular, with investors now understanding their necessity and cashflows. Collocated batteries enjoy an additional benefit, as their capital and operating costs can be shared with the renewable asset.

There are various operating strategies available to well-informed asset managers and traders. For simplicity, two structures are outlined in Fig. 11 showing that enhanced battery revenues are possible even if a long-term fixed price PPA is in place.

The revenues highlighted in light green illustrate the benefit of storing electricity at times of low price and dispatching during high prices. The bottom chart in Fig. 11 shows further revenue potential, also including grid-specific revenue incentives.[19]

Whilst an increasing number of renewable asset managers are now seeking assets with collocated battery potential, very few have sufficient expertise to design, construct and monetise the battery component in an appropriate manner.

An expert asset manager therefore has a competitive advantage when targeting acquisitions of collocated projects (which are becoming increasingly common in the UK market).

Key takeaway for investors

Power market experts can monetise renewable assets in a more sophisticated way. Additional revenue streams and returns can be secured without diluting the benefits of long-term fixed price contracts by using advanced PPAs and battery collocation.

19. *Including Dynamic Containment; Fast Frequency Response; Capacity Market and Triads*

Figure 10: Enhanced PPA strategy with long-term fixed PPA *(illustrative)*

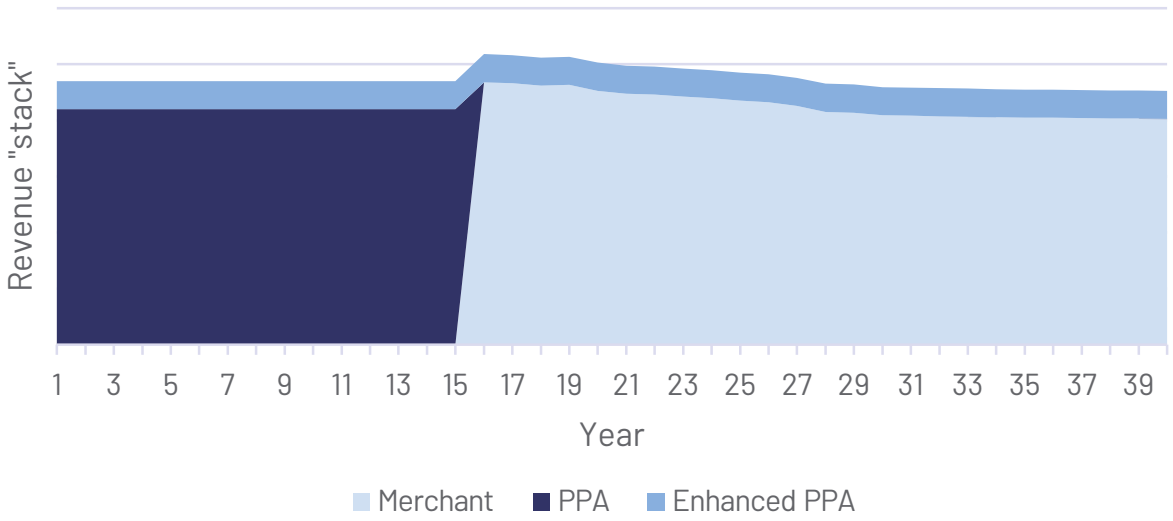
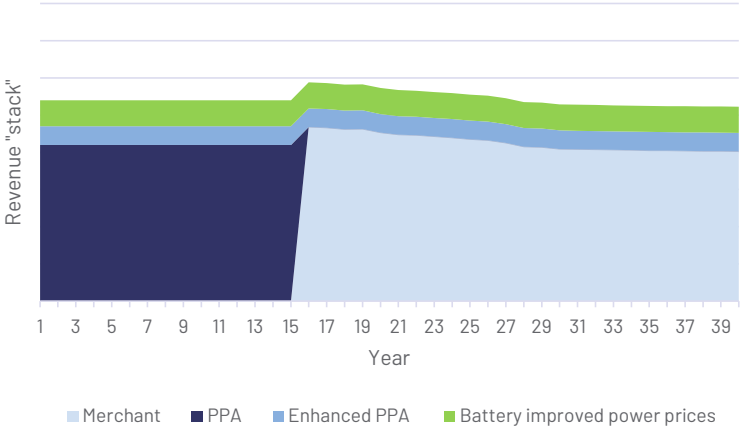


Figure 11: Operating strategy structures/concepts *(collocated battery storage)*

Buffering

Higher power prices secured by storing renewable generation and dispatching to grid during oeriods of low solar/wind supply.

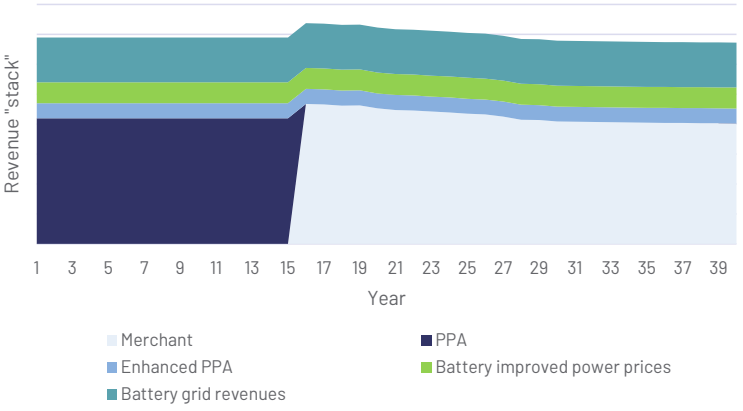
Renewable asset used to charge battery?	✅
Renewable asset generation altered	✅
Works with renewable PPA?	?
Increased grid import capacity needed?	❌



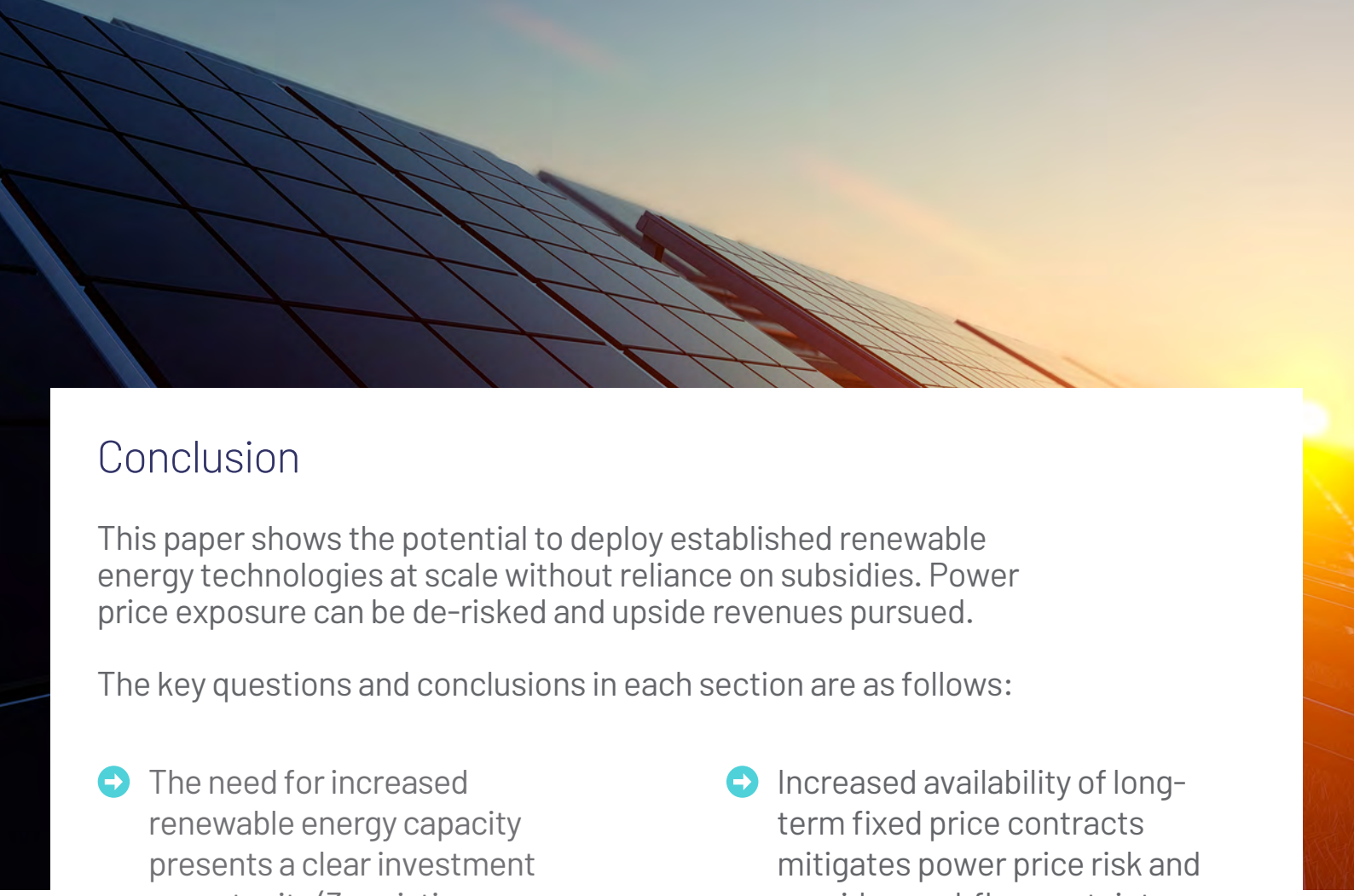
Import/export

No alteration to renewable aset, with battery having its own power import. Enhanced revenues from grid balancing.

Renewable asset used to charge battery?	❌
Renewable asset generation altered	❌
Works with renewable PPA?	✅
Increased grid import capacity needed?	✅



Source: Gresham House



Conclusion

This paper shows the potential to deploy established renewable energy technologies at scale without reliance on subsidies. Power price exposure can be de-risked and upside revenues pursued.

The key questions and conclusions in each section are as follows:

- The need for increased renewable energy capacity presents a clear investment opportunity (3x existing renewable capacity). This scale of build-out will require funding of unsubsidised assets
- Unsubsidised renewables have attractive returns due to cost and efficiency improvements. The technologies are well-established, therefore the primary risk to recognise and mitigate is power price exposure
- Any investment allocation to renewables should be made based on in-depth analysis of power price trends. Volatility and cannibalisation need to be acknowledged and the risks mitigated as far as possible
- Increased availability of long-term fixed price contracts mitigates power price risk and provides cashflow certainty. These contracts are typically signed at levels below merchant prices. Investors should look for managers who can mitigate these lower prices through additional revenue enhancement opportunities
- Power market experts can monetise renewable assets in a more sophisticated way. Additional revenue streams and returns can be secured without diluting the benefits of long-term fixed price contracts using advanced PPAs and battery collocation

Not investment advice. Past performance is not a reliable indicator of future performance. Capital at risk.

Get in touch

Heather Fleming
Managing Director, Institutional Business

M: +44 (0)7872 685 532
E: h.fleming@greshamhouse.com

Catriona Buckley, CFA
Institutional Business Development Director

M: +44 (0)7849 086 565
E: c.buckley@greshamhouse.com

About Gresham House

Gresham House is an LSE-quoted specialist alternative asset management group, dedicated to sustainable investing across a range of strategies, with expertise in forestry, housing, sustainable infrastructure, renewable energy and battery storage, public and private equity.

We actively manage c.£4 billion[1] of assets on behalf of institutions (including pension funds), family offices, charities and endowments, and private individuals.

Gresham House is well-positioned to provide differentiated alternative investment opportunities to pension funds, allowing them to diversify their asset allocation and deliver on income requirements, without exposure to 'traditional' stock market volatility.

As a signatory to the UN-supported Principles for Responsible Investment (PRI), Gresham House is committed to operating responsibly and sustainably, taking the long view in delivering sustainable investment solutions.

GREEN ECONOMY
LONDON STOCK EXCHANGE

Signatory of:
PRI Principles for Responsible Investment

UKSIF
UK Sustainable Investment and Finance Association

1. As at 31 December 2020 - Annual Results

Important information and risks to be aware of

The views expressed in this paper are at the time of publishing (April 2021) and are subject to change. This document is a financial promotion issued by Gresham House Asset Management Limited (Gresham House) as Investment Manager for Gresham House plc under Section 21 of the Financial Services and Markets Act 2000.

Gresham House is authorised and regulated by the Financial Conduct Authority with reference number 682776 and has its registered office at 5 New Street Square, London EC4A 3TW. The information in this document should not be construed as an invitation, offer, solicitation of any offer, or recommendation to buy or sell investments, shares or securities or an invitation to apply for securities in any jurisdiction where such an offer or invitation is unlawful, or in which the person making such an offer is not qualified to do so.

Whilst the information in this document has been published in good faith, Gresham House provides no guarantees, representations, warranties or other assurances (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.

Past performance is not a reliable indicator of how the investment will perform in the future. Your capital is at risk.

The value of investments and/or funds may rise or fall, and investors may not get back the amount invested. This document is provided for the purpose of information only and before investing you should read the Prospectus and the Key Information Document (KID) available from **www.greshamhouse.com** as they contain important information regarding the funds, including charges, tax and fund specific risk warnings.

Prospective investors should seek their own independent financial, tax, legal and other advice before making a decision to invest. This document has not been submitted to or approved by the securities regulatory authority of any state or jurisdiction. This document is intended for distribution in the United Kingdom only.

Any dissemination or unauthorised use of this document by any person or entity is strictly prohibited. Please contact a member of the Gresham House team if you wish to discuss your investment or provide feedback on this document. Gresham House is committed to meeting the needs and expectations of all stakeholders and welcomes any suggestions to improve its service delivery.

UK Head Office
Octagon Point, 5 Cheapside, London EC2V 6AA
(0) 20 3837 6270
info@greshamhouse.com
www.greshamhouse.com

April 2021

Since 1857
Gresham House
Specialist asset management