Does the rise of renewable energy create new risks for investors?

Insights from 20 years of energy transition in the UK

December 2022

EDHECinfra
Research note

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Executive Summary

This EDHECinfra Research Note examines the impact on the risk profile of wind and solar power investments of the increasing dominance of renewables in the energy mix of a given country.

As green power sources that are intermittent become central to a power system, without commercially viable medium- and long-term storage options, what is the likely impact on the electricity market and system as a whole and do wind and solar investments, which have historically benefited from a safer, privileged position in the power sector, become riskier?

We use the case of the UK as an example of an economy that has made a rapid transition to renewables and away from coal, while relying on very limited hydro and nuclear capacity i.e., the typical transition required of most advanced economies.

More renewables, new problems

The growing share on intermittent renewable in the generation mix brings with it new challenges:

1. Rising development and construction costs
2. Higher volume volatility: As renewables become more present in the energy mix, the volatility of their production increases.
3. Higher market price volatility: Rising exposure to intermittent wind sources adds to the variance of power prices, particularly at peak times.
4. Cannibalisation: The average price captured by renewable installations (which sell power when there is abundant generation available at zero marginal cost) can become lower than the average wholesale price over the year.
5. Balancing and curtailment: The intermittency of renewables makes it more difficult and costly to balance the electric grid creating grid instability.

Thus, renewable energy may be enjoying record profits, but risks are also increasing as a direct result of it becoming more a prevalent source of power. This in turn should ultimately have an impact on the returns required by investors to hold such assets.

Political risk is also increasing: while the growth of renewable benefits from strong political support (as evidenced by the US Inflation Reduction Act and the EU Green Deal), the recent EU and UK announcement on capping renewable profits show that renewables are not exempt from the type of intervention more commonly seen in the oil industry.

Investors' appetite remains strong. But while the equity risk premium required by the market in unlisted wind and solar projects has declined for a decade, it started increasing slightly since the start of 2022.

Risks that need to be managed

Some of the risk can be managed through diversification (between country or technology), investing in energy storage or hedging revenue risk through contracts.

Importantly, because the increase of renewable energy production leads to a more volatile energy system, the *option value* of gas must increase. Hence a key beneficiary of the transition to a higher share of renewable energy generation, until enough low carbon storage capacity is available, is gas power, a readily dispatchable source of power.

Gas may in fact be the best hedge against more volatile green power.

Price stabilisation mechanisms are still needed

Supportive regulation has been a cornerstone of the renewables' success story and we argue that current market challenges cannot be solved by emergency fiscal measures. In effect, regulatory support in the form of price stabilisation for renewable and energy storage could benefit both investors and consumers.

While imposing emergency tax is a deterrent, offering revenue hedging mechanisms such as CfDs (a form of contract fixing the price at a level set at auctions) has proven successful at attracting large capital inflows. While categorised as "subsidies", these contracts are actually securing long term supply of clean power at an affordable and predictable price.

1. Introduction

With over USD2 trillion annual investment in clean electricity needed between 2026 and 2030 to stay on the net zero pathway (International Energy Agency, 2021), an urgent acceleration of renewable investments remain critical to maintaining economic growth while transitioning to a greener, mass-electrified world.

The war in Ukraine has also highlighted the risks of depending on fuel imports, making closer-to-home renewable energy projects both an environmental and a political imperative.

Yet, as the sector's revenues are soaring after two lean years, governments in Europe and the UK are imposing a cap on renewable profits to help fund households and businesses' soaring energy costs – increasing renewable investors' perception of political risk.

Renewable industry is surrounded today by conflicting market signals : the industry is hailed as the solution to environmental and geopolitical concerns, yet its subsidies are being questioned and its profits are being capped. The majority of investment has been directed at intermittent wind and solar power, with electricity storage so far lagging behind. However, renewable producers also compete with each other when the weather is favourable. While currently highly profitable after two years, the sector's volatility (i.e. risk) is progressively rising.

At the same time, the transition to renewable creates new challenges. To date, the vast majority of new investments have been directed at *intermittent* renewable generation, with storage capacity lagging behind – increasing the volatility of power supply.

As a result, the opportunity to invest in renewable energy comes with new questions: Is the risk profile of renewable power investment going to evolve in a world where there are always more renewables but not (yet) enough storage?

Does the rise of intermittency in the power system create new risks for investors and can they manage these? What are the implications for the regulation of renewable energy prices and profits?

In this research note, we argue that a rapid switch to intermittent renewable generation that is not accompanied by a commensurate rise in energy storage, has non-negligible consequences for investors in such assets:

1. First, the instability of the power system and the business risk of renewable power generation are likely to increase.
2. Second, the high option value of gas generation as the primary balancing generation source is preserved and increased – particularly peaking gas plants.

We use the example of the UK, as that of a market that has already undergone a significant transition away from coal and towards renewables, and for which very granular market data is available. According to the UK energy regulator (Ofgem), 90% of electricity production in the UK came from fossil fuels in 2012 but by 2020 that ratio had fallen to 50%.

This rapid change was largely the result of the phasing out of coal and a switch to gas and later to renewable power, especially wind energy. The UK can thus serve as a case study that is relevant to many other countries that have yet to undertake the same transition, and have no significant hydro-electric capacity or nuclear power programme.

New sources of renewable power supply mostly consist of wind and solar generation capacity, typically based in rural and offshore areas, while the demand for power is mostly urban and driven by economic and climatic forces e.g., higher temperatures in cities increases the demand for cooling.

As the proportion of intermittent renewables in the generation mix rises, matching supply and demand can become increasing challenging, as we discuss below. We find that higher intermittency increases the volatility of power prices and therefore the risks faced by investors in the sector.

Without a concurrent increase in storage capacity (or better demand management), such market imbalances create a high option value for the more flexible gas-fired power plants to continue balancing the market. As we argued in a previous research note (see Amenc et al., 2022), natural gas is the generator of last resort, and with a continuous supply constraint, the more volatile/uncertain peak or even baseload power supply demand become, the higher the "option value" of gas i.e. without significant nuclear or hydro capacity gas becomes the guarantor of the continuity of supply.

This may also have implications for investors in energy projects and the management of the new risks found in renewable energy.

The rest of this research note is structured thus: in the next section (2), we briefly review the divergence between the development of intermittent renewable energy sources and that of energy storage technologies and business models. Next, we examine the impact of rising intermittency on the risk profile of energy investments, both renewables and gas-fired (3). Finally, we discuss implications for investors (4) and policy (5).

2. Energy transition and rising intermittency: the case of the UK

For most countries, the first stages of a transition away from fossil fuel energy generation consist of reducing coal dependency and developing a mix of gas, nuclear and renewable generation. The UK provides a good example of just such a transition, as illustrated by Figure 1.

While individual countries differ in their energy mix and demand profile, the UK is an instructive case because it represents a relatively insulated market, with a high potential for renewables (on- and off-shore wind power), limited nuclear capacity and decades of track record of operating a deregulated energy market.

Two major sets of incentives exist that make UK renewables a seemingly low risk investment: a) priority of dispatch of green power to the grid ensures a 'sellers' market' for producers, and b) a guaranteed or enhanced purchase price. Several types of price support mechanisms have evolved as the market matured from Renewable Obligation Certificates (RoC) and Feed-in Tariffs (FiT) to Contract for Differences (CfD). [1]

- With Renewable Obligation Certificates (RoC) electricity suppliers earn additional revenues by selling green power certificates i.e., proof that the equivalent energy was generated by a renewable power source;
- Feed-in Tariffs (FiT) are a fixed tariff earned per MWh generated and are available to smaller installations; and
- With Contracts for Difference (CfD) a public counterparty enters into a swap contract with the renewable power generator, effectively fixing the purchase price of electricity for the producer over a long period e.g., 15 years. The contract price is determined through an auction and, in the UK, indexed against inflation.

1 - Similar types of incentives can be found in many other countries, including for example Germany, France or Spain.

As a result of this attractive risk profile, c.USD120bn was invested in UK renewables in the last decade, multiplying installed wind power capacity by a factor of more than 60 (Community Energy, 2022).

This volume of new investments along with the historical reduction of the cost of solar and wind technologies, allowed UK renewable power generation to become cost competitive with gas in most price scenarios, as shown in Figure 2.

A recent EDHEC*infra* Research Note highlighted the that return on assets in European Renewables reached 16% in 2020, increasing from 10% in 2015 (see Amenc and Blanc-Brude, 2022, for a detailed analysis) and the 2022 surge in power price made the industry so profitable that the UK government, like the EU, proposed a cap on profits of alternative power producers.

This situation also led some to argue for several years that the UK renewable power market is sufficiently mature that to be viable without subsidies (see for example The Guardian, 2018). Importantly, these developments have also led investors to be less risk-averse, with greater appetite for merchant risk. Lenders have been following suit, with lighter covenant structures not fully protected against commodity price risk (Energy Rev, 2022).

Thus, UK renewable generation has grown into a viable and profitable business proposition, resulting in high demand for such assets by institutional investors accompanied by high realised returns. Renewables have also become omnipresent in the portfolios of investors in infrastructure: in a recent survey of infrastructure asset allocation by TICCS industrial activity segment, it was found that the average UK investors has 27% of their infrastructure portfolio invested in renewable power generation (EDHECinfra and BCG, 2022).

However, in the UK and elsewhere, the rise of intermittent renewable generation has not been matched by equivalent storage capacity. Despite being one of the leading centres for battery storage investment, UK storage has so far failed to keep pace with wind and solar capacity.

In 2021, only GW1.7 of storage was installed across 127 sites in the UK (ESN, 2022). While there is more than GW20 of storage projects in the pipeline in 2022, the development of energy storage as a viable investment proposition has lagged behind wind and solar project for several reasons:

- Environmental concerns related to sourcing the metals in lithium ions batteries, as well as end of life recycling (IER, 2022);
- Complex business models which requires investors to arbitrage between several markets (capacity market, wholesale market, balancing market, frequency response) to build multiple revenue streams, with limited long-term visibility;
- Technology limitations, including high degradation and short discharge time. The market has been dominated by batteries with up to one hour discharge time – shorter than needed to cover peak demand. Still, technology continues to evolve, with an increasing proportion of longer duration storage becoming available[2].

As shown on Figure 3, the pace of investment in storage has picked up as technology improves, costs fall, and higher power prices attract investors.

2 - 60% of the 1GW storage accepted at capacity market auctions for 2025/26 had a duration of two hours or more (ESN, 2022)

Yet, a large gap remains. Some estimates put the required capacity to manage the intermittency and seasonality of renewables at GW46 of installed electricity storage in the UK by 2035, including up to GW24 of Long Duration Electricity Storage able to discharge for more than four hours (Aurora Energy Research, 2022).

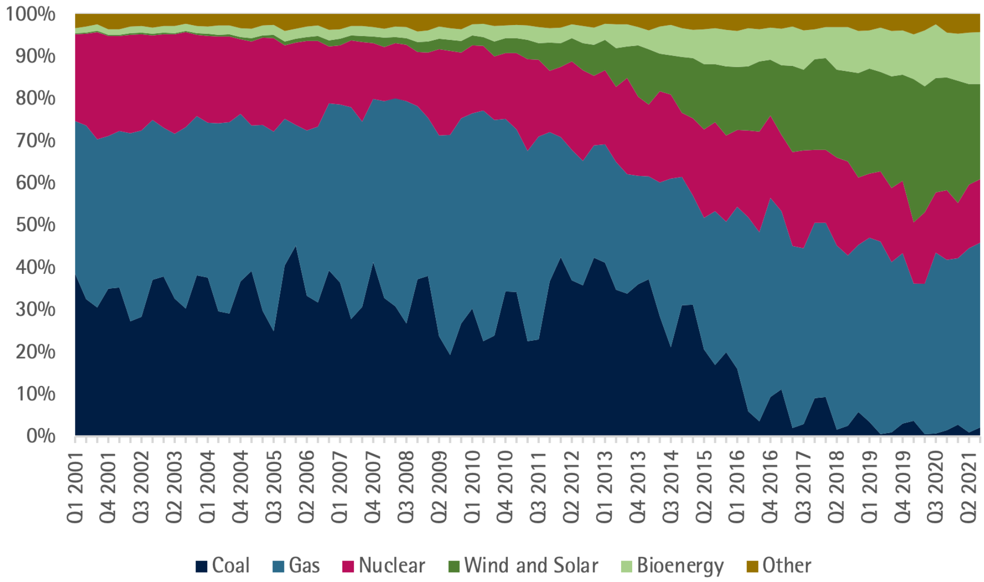
Beside batteries, other storage technologies exist, from pumped hydro to compressed air, molten salt and green hydrogen. This last sector has been given fresh impetus by higher oil prices, but the market remains very immature.

Thus, the UK provides an almost textbook case of a rapid shift from an energy system inherited from the industrial revolution (based on coal) and later supported by domestic oil and gas development (North Sea) to one that is increasingly reliant on intermittent renewables, especially wind power, but without concomitant access to system-wide energy storage technologies.

Unless and until the pace of storage construction accelerates markedly, the rise of renewable inevitably results in an increasing reliance on intermittent power sources.

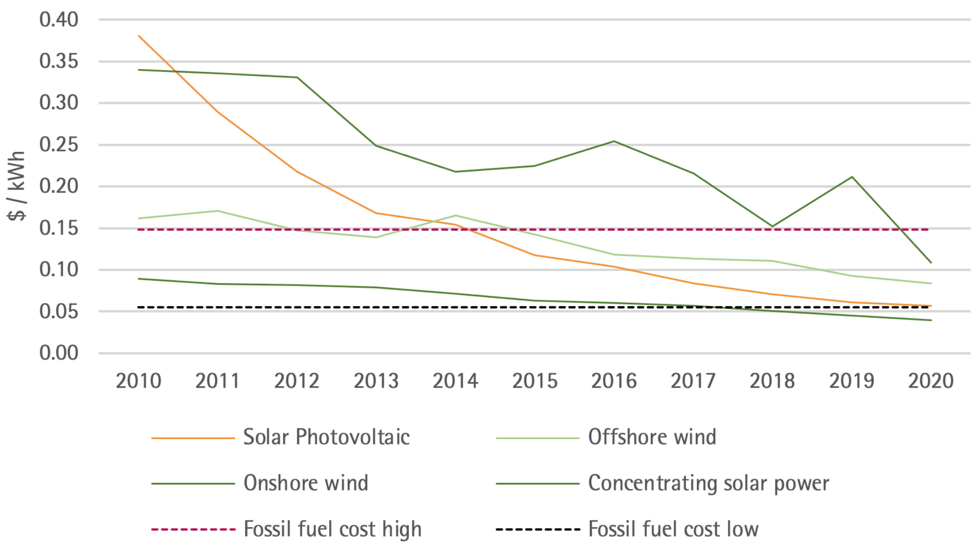
Next, we look at the impact of the increasing proportion of intermittent generation on the risk profile renewable investments and the associated effect on the value of gas-fired power.

Figure 1: Energy generation mix in the UK



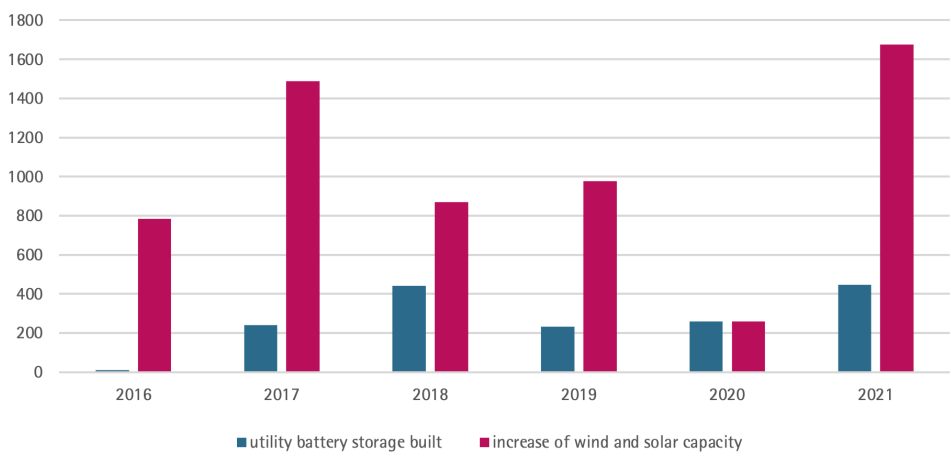
Source: Ofgem

Figure 2: Weighted average levelised cost of electricity - World



Source: Irena renewable cost database

Figure 3: Battery storage and renewable power capacity in the UK (MW)



Source: Solar Media quoted by Energy Storage News, BEIS

3. The Changing Risk Profile of Renewable Energy Investments

As discussed above, the risk profile of individual investments in wind farms in the UK is low, with typically guaranteed sales at a fixed price i.e., a *contracted* business model under the TICCS® classification of infrastructure investments. However, as power sources like wind and solar become more important, their intermittency also has system-wide effects that can increase the risks of individual investments.

3.1 New risks in a more intermittent power system

The development of wind power on large scale in the UK has revealed several issues for investors in renewables:

1. **Rising development costs:** After years of decline, the cost of wind turbine and solar panels has been rising fast in the past two years, on the back of higher material costs and power prices. This can lower the profitability of new build projects that have contracted revenues pre-construction. (Bloomberg NEF, 2022)
2. **Higher volume volatility:** As renewables become more present in the energy mix, the volatility of their production increases. As shown on Figure 4, there is a very high correlation between the volume in MWh of wind and solar energy consumed by the UK grid and the volatility (standard deviation) of this output. For example, between 2013 and 2020, the volume of wind power produced and dispatched in the UK grid has increased 4-fold from 1.5GWh to more than 6GWh, while the volatility of power supplied i.e., sold, has increased 3.5 fold.
3. **Higher market price volatility:** Power prices also become more volatile as they increase. While some of this volatility comes from the natural gas market, rising exposure to intermittent wind sources adds to the variance of power prices, particularly at peak times: Figure 5 shows that the price volatility of peak-load power, has increased faster than that of gas.
4. **Cannibalisation:** In a system with more intermittent renewables, electricity prices can fall to (or below) zero for an increasing proportion of the time – when renewable generation is more abundant than demand – and conversely peak when renewable generation is low. As a result, the average price captured by renewable installations (which sell power when there is abundant generation available at zero marginal cost) is lower than the average wholesale price over the year. This 'cannibalisation' effect brought by increasing competition between renewables is set to increase as renewables supply a larger share of the whole market for more days in the year. This exposes asset owners to lower, as well as more volatile, revenues. (Jones and Rothenberg, 2019)
5. **Balancing and curtailment:** Grid operators manage supply and demand on the *balancing market* immediately before each generation period to ensure all demand is met and that the grid frequency remains within acceptable parameters, thus avoiding blackouts (Vahidinasab and Habibi, 2021). The intermittency of renewables makes it more difficult and costly to balance the electric grid, not only because of their generation profile, but also their location – usually far from the main urban and industrial centres. This can create grid instability and frequency variation (Feller, 2019).[1]

1 - Systems reforms are being considered in the UK to address such issues by varying the power price by location to better reflect

In this context, UK renewable power generators can bid to reduce supply on the balancing market – capturing a positive price for *not* generating, which can be higher than if they were selling power. Figure 6 illustrates the point: in April 2022, long prices (prices for generators increasing their supply) were generally below GBP160/MWh while short prices (prices available to reduce power generation) were generally above this level.

Beside the balancing market, the only option to keep the grid stable when there is more wind than power demand is to curtail i.e., interrupt excess renewable capacity. In the UK in 2020, TWh3.5 of wind generation was curtailed, about 4% of total wind and solar generation capacity. As intermittent generation increases so does excess capacity at time of low demand, and the risk of curtailment for renewable energy generators. This phenomenon is not limited to the UK.[2]

Thus, renewable energy may be enjoying record profits, but risks are also increasing as a direct result of it becoming more a prevalent source of power. This in turn should ultimately have an impact on the returns required by investors to hold such assets.

Political risk is also increasing: while the growth of renewable benefits from strong political support (as evidenced by the US Inflation Reduction Act and the EU Green Deal), the recent EU and UK announcement on capping renewable profits show that renewables are not exempt from the type of intervention more commonly seen in the oil industry.

3.2 Expected returns for investors in UK renewables

Over the past decade, investors have gradually changed their preferences in favour of investing more in renewable energy generation and relatively less, sometimes not at all in fossil-fuel power infrastructure. This growth in demand for wind and solar projects has led to periods of yield compression i.e., the expected returns required by investors for holding such assets.

The phenomenon has been documented in the literature for both greener stocks (Pastor et al., 2021) and greener power infrastructure (Amenc and Blanc-Brude, 2022): during a period, excess demand for green assets leads to both capital gains (higher realised returns) and lower yield (lower expected returns).

In this context, it can be difficult to detect the impacts of any changes in the risk profile of UK renewables on their cost of capital. According to infraMetrics®, the equity risk premium applied to such investments dropped from 750bp in 2010 to the 450-550bp range in 2017 and remained stable until the end of 2021. Delays in adjusting bid prices for assets to higher interest rates also moderate the risk premium.

Despite their modest risk premium, appetite for renewable remains high. Yet, as the power sector decarbonises, the volume of carbon avoided [3] by the marginal renewable investment slowly declines, as illustrated by Figure 7, excess demand for renewable energy investments and the resulting yield compression can be expected to tail off.

In other words, the positive impact and climate alignment that investors seek by investing in renewables decreases as they invest more and more in the sector, bringing the risk-adjusted financial performance of these investments to the fore.

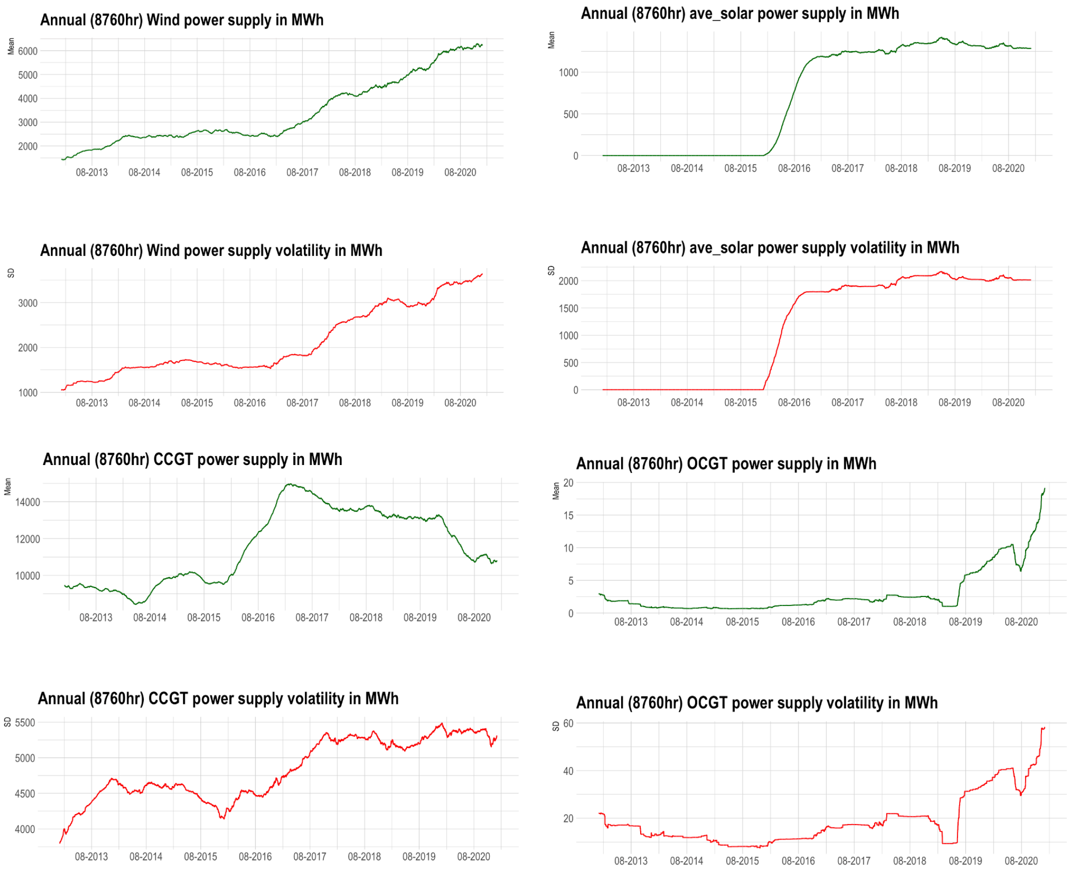
As new risks become more apparent, investors can be expected to demand a higher investment

supply and demand and encourage behaviour change by generators and consumers.

2 - In China, the national average for wind curtailment was around 7% in 2018, with much higher levels in certain provinces (IEA). In Texas, 4% of wind generation was curtailed between 2017 and 2021 (BTU Analytics).

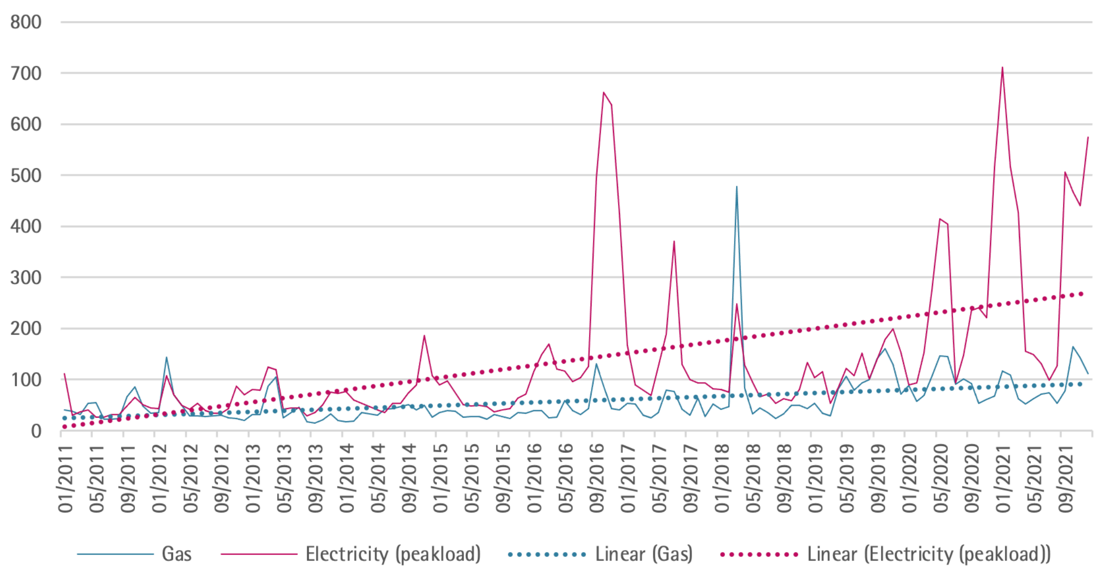
3 - The avoided carbon is the difference between carbon emitted by the new installation and the carbon that would be emitted for the same amount of power using the sector carbon intensity.

Figure 4: Production and volatility of wind, solar and gas (CCGT and OCGT) in the UK



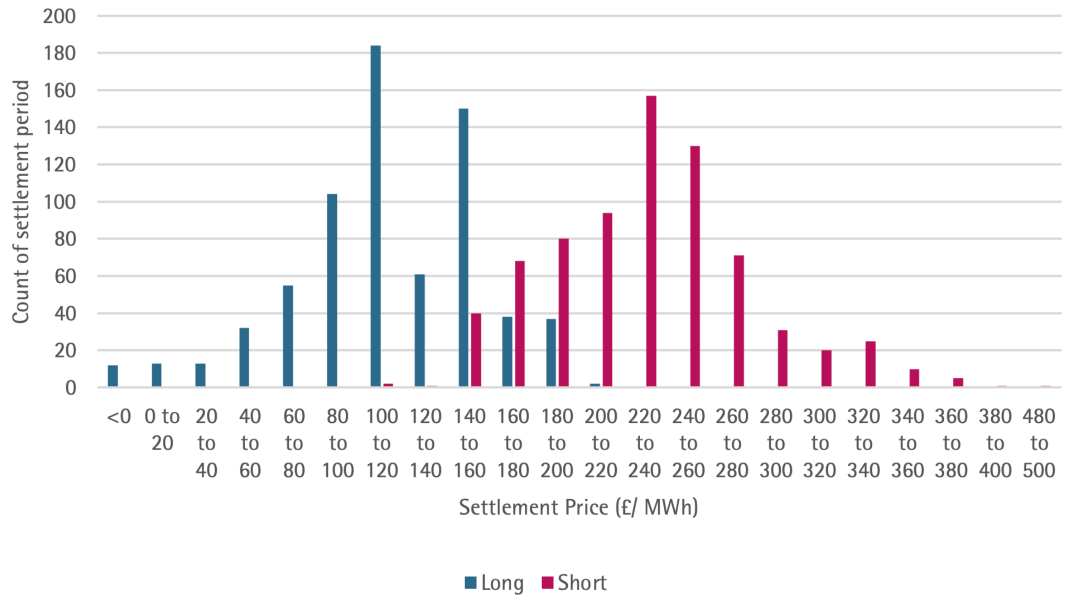
Source: Elexon

Figure 5: Volatility trends for electricity and gas day ahead price in the UK



Source: Ofgem

Figure 6: Frequency of UK long and short system price, April 2022 (£/MWh)



Source: Elexon

return to compensate for the risk they take on, and may even reduce their exposure to the sector.

We note that since the start of 2022, infraMetrics shows a slight increase in the equity risk premium of wind projects. This trend, which is based on estimated values for 2022Q1 and Q2 needs to be confirmed as the data becomes available.

Next, we consider what the evolution of power system towards more intermittency means for the other key technology in the move away from coal: natural gas.

3.3 The high option value of gas power

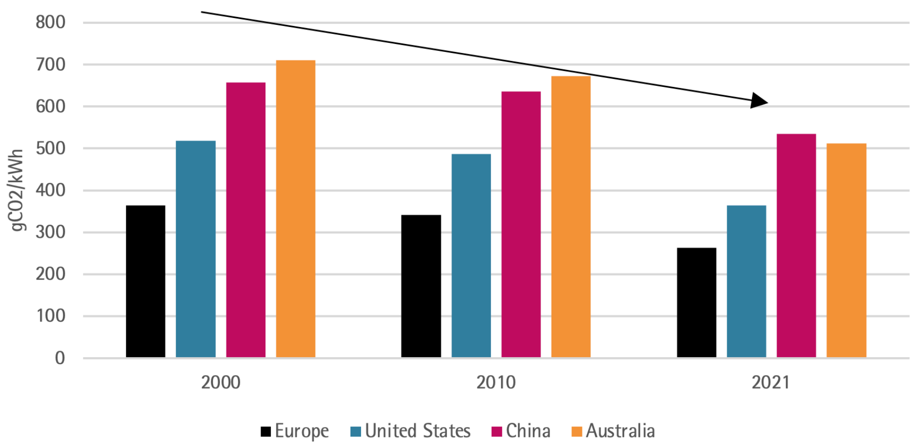
In the UK and elsewhere, continuity of supply is the grid operator's ultimate objective, i.e. brownouts are not socially acceptable even though they are possible.

As the UK power mix includes more and more intermittent wind and solar projects, and assuming limited storage and nuclear or hydro baseload capacity – which is also the case of most economies with a few exceptions – phasing out coal puts natural gas in the position of producer of last resort, especially so-called 'peaker' power plants that can balance the grid on demand.

As the increase of renewable energy production leads to a more volatile energy system, the *option value* of gas must increase, assuming that continuity of supply remains the main objective of the power grid. Hence a key beneficiary of the transition to a higher share of renewable energy generation, until enough low carbon storage capacity is available, is gas power, a readily dispatchable source of power.

Thus, at a time when the total supply of gas power must be reduced to decarbonise the power system, the value of gas to the system has become critical. In fact, new peaking gas plants have been built in the past five years in Europe to fill this need. The importance of gas is also evident in the outcome of the last capacity-market auction for delivery in 2025/26: gas power accounted for 65% of awarded capacity, 3.5x more than all the other technologies (excluding interconnector) put together. The rising share of intermittent renewable in the energy mix continues to sustain the value of gas generators.

Figure 7: Carbon avoided by new wind generation in year one



Source: Our World in data, authors' calculations

4. Implications for Investors

Amidst wavering regulatory support, more volatile price and increasing competition, renewable energy investors have to consider how to better manage their risks through various forms of diversification, hedging or insurance.

4.1 Diversification

A first source of diversification within the renewable portfolio is generation technology. The correlation between wind speed and solar irradiation is very weak or even negative, both intraday and between seasons as illustrated by Figure 8. Combining wind and solar into a portfolio can therefore reduce risks and, in suitable sites, co-location of wind and solar can also provide economies of scales – although it may constrain an investor's ability to optimise each component independently.

Next, investing in different locations may help reduce exposure to a single weather system. Table 1 also shows that the growth and volatility of revenues in wind farms differs significantly by region.

Robust geographic diversification probably require a truly global portfolio, however. Research on wind synchronicity in Europe shows that a portfolio combining UK, French and German assets would remain quite strongly correlated in terms of wind speeds, as shown on Figure 9. Critically for investors, revenue growth have also been highly correlated between certain markets as shown on Figure 10, including between certain distant markets such as Germany and the Philippines.

4.2 Hedging

Country diversification also gives exposure to different regulations and power price markets. While gas prices are driven by global forces, the different sources of electricity demand and supply drives price variation between countries. In Europe, increasing connectivity and common market rules may, overtime, drive greater price convergence. In more distant markets, prices are more likely to remain quite decorrelated as shown by Figure 11 for Australia and the US.

But power prices can be hedged either through CfDs or by contracting a power purchase agreement (PPA) with a creditworthy counterparty. The PPA market is expanding rapidly, and almost tripled in volume in Europe between 2017-2021 to GW11 as shown on figure 12.

Initially dominated by utilities, market demand has shifted to corporate users such as cloud providers and heavy industry that are keen to demonstrate net zero alignment. Yet the PPA market has not yet reached the stage of maturity that would make CfDs obsolete: volumes remain relatively small compared with the GW950 capacity of the European power market. Tenors are often shorter than CfDs (typically up to 10 years) and they are mostly available only to large installations. Critically, the power price may not be indexed to inflation.

Still, corporate PPAs offer more flexibility and diversity than CfDs. As the market matures, the long-term "purchased as produced" contracts are increasingly replaced by shorter term contracts, "baseload" contracts (where volumes are contracted per period), or even route-to-market contracts (where the price is variable).

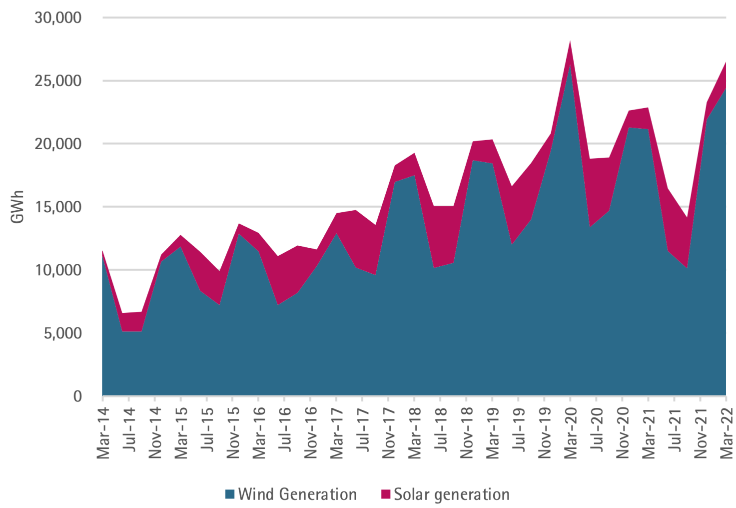
For investors, this means that "contracted renewable" – a category including CfDs and PPAs – spans a wide range of risk and returns and retains considerable exposure to commodity

Table 1: Average volatility of wind farm revenues in different regions (2010-2022)

	Europe	Americas	Australia	Asia
Mean Revenue Growth	7.5%	4.3%	3.7%	5.8%
Median Volatility of Revenues*	7.6%	10%	4.9%	6.9%

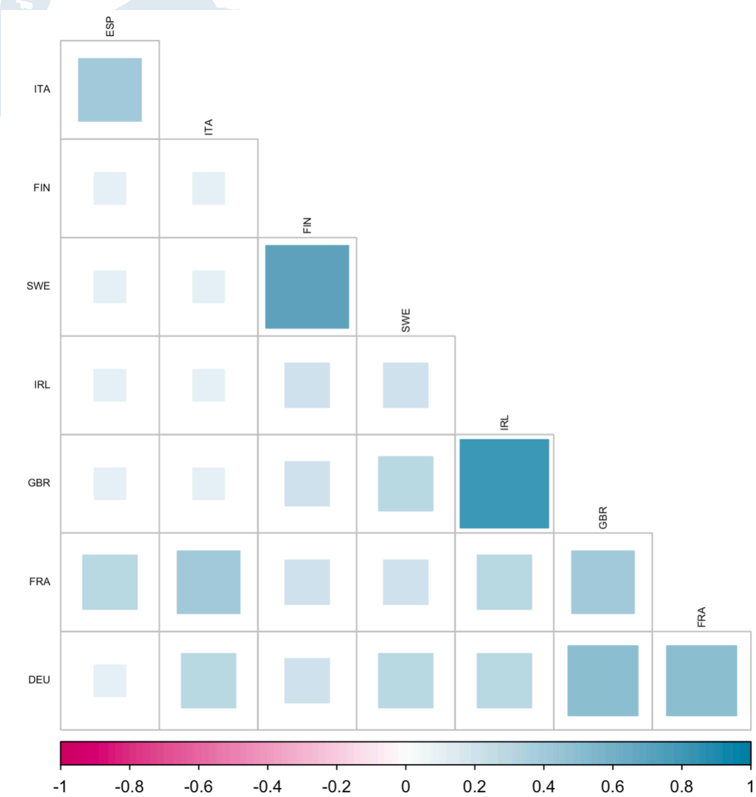
* constant dollars per unit of size (total assets)

Figure 8: UK wind and solar generation



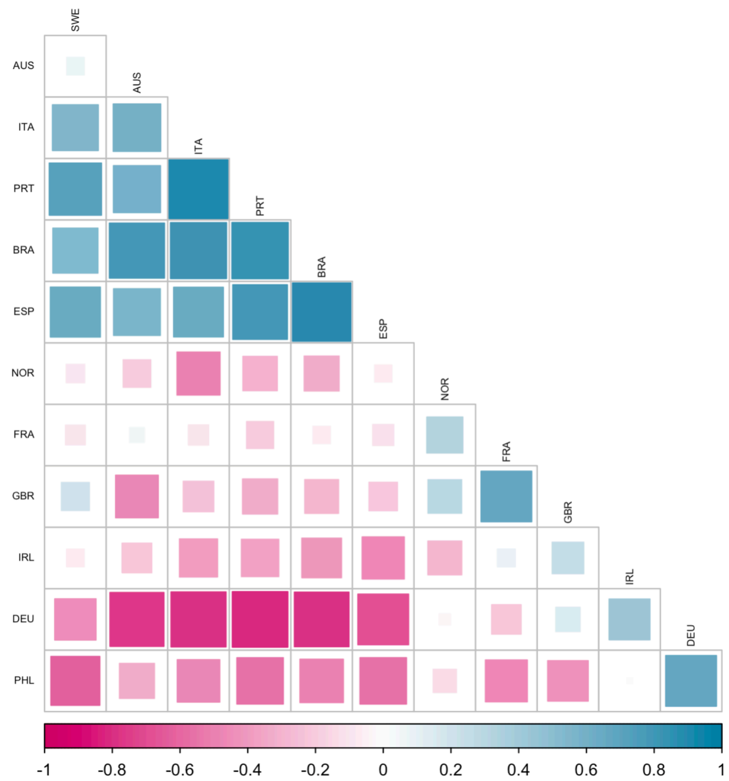
Source: BEIS

Figure 9: Synchronicity of wind energy in Europe



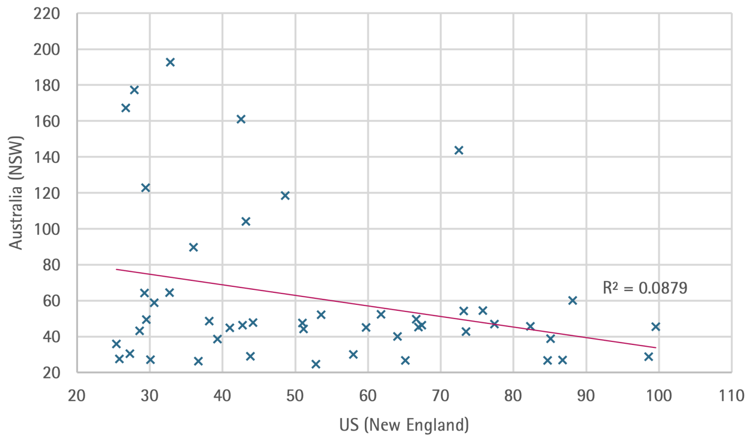
Source: Monforti, Gaetani and Vignati (2016)

Figure 10: Correlation of average revenue growth in wind farms (2010-2022)



Source: infraMetrics, revenues and size expressed in constant dollars

Figure 11: Weekly power price in Australia (New South Wales) and the US (New England) in 2021 (USD/MWh)



Source: Australia Energy Regulator, US Energy Information and Administration. Dots indicate power price pair in Australia and the US on the same day.

prices if the contracts are short. Figure 13 and 14 suggest that PPA-based renewable projects have the most attractive risk-return profile.

4.3 (Self) insurance

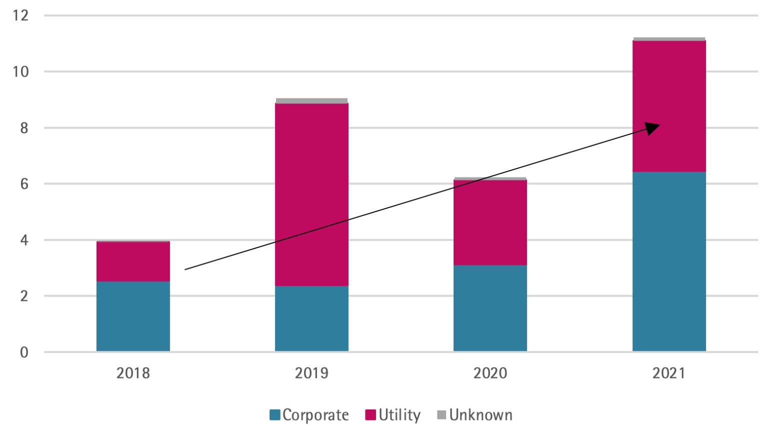
Beyond diversifying and hedging the risks of renewable power projects, investing in storage technologies that can be a form of insurance for investors in renewable generation.

Adding storage capacity to renewables, either in the same site or not – enabling energy to be stored when there is excess capacity available and sold at times when prices are high mitigates the cannibalisation and curtailment risks described above.

This can make battery storage and hydrogen investment attractive to owners of renewable assets.[1] Such initiatives could contribute to managing renewable risks as the green hydrogen market develops and technology costs fall.

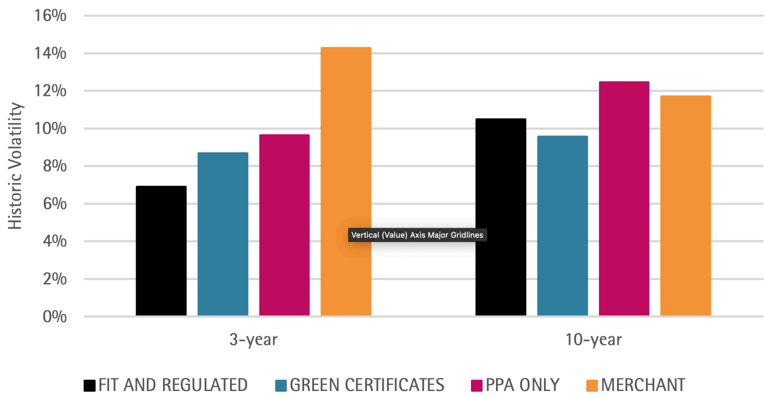
1 - For example, in 2022 Spanish energy group EDP Renovaveis is partnering with green hydrogen group Lhyfe to develop hydrogen projects

Figure 12: Growth of the European PPA market



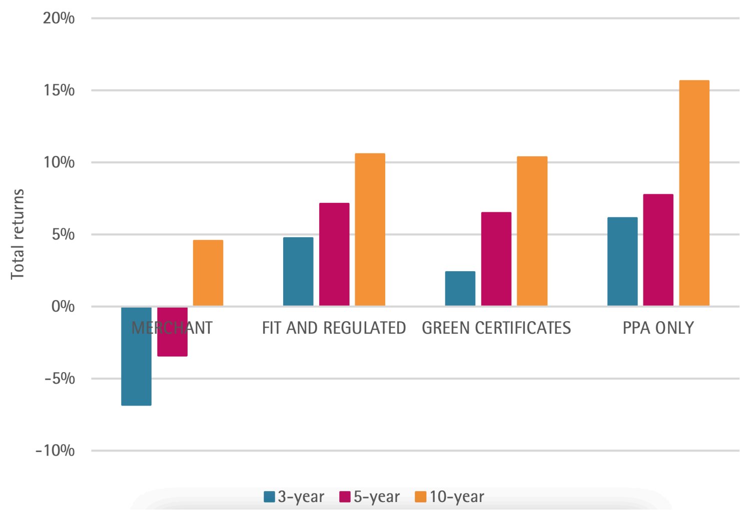
Source: Pexaquote

Figure 13: Total return volatility volatility by type of contract



Source: infraMetrics

Figure 14: Total returns by type of contract



Source: infraMetrics

5. Policy Implications

Intermittent renewables will not alone achieve the net zero ambition and other low carbon solutions including hydrogen, carbon capture and storage, nuclear power or biomass are required. However, solar and wind power are expected to play a central role in the various decarbonisation scenarios.

The future energy mix is uncertain but intermittent renewables are expected to become more dominant in many countries. For example, the Climate Change Committee, an independent expert body advising the UK on emission targets, expects variable renewables to represent more than 64% of the UK generation mix in 2050.[1]

As electricity transitions from a centrally dispatched production model to a distributed intermittent generation model, encouraging the development of environmentally friendly energy generation and storage solutions remains a critical consideration of any market reform in order to reduce dependency on natural gas.

At a time when industry profits are so high as to (maybe) be capped, some challenge the usefulness of renewable subsidies.

Yet, incentives like CfDs are not subsidies : they are a mechanism that stabilizes price at a level fixed through competitive auctions. From a system stand-point, such price stabilization not only encourages investment, but also benefits buyers. For instance, electricity sourced from wind CfD contracts – even some of the older, more expensive, contracts – appears quite attractive for customers today, as shown in Figure 15.

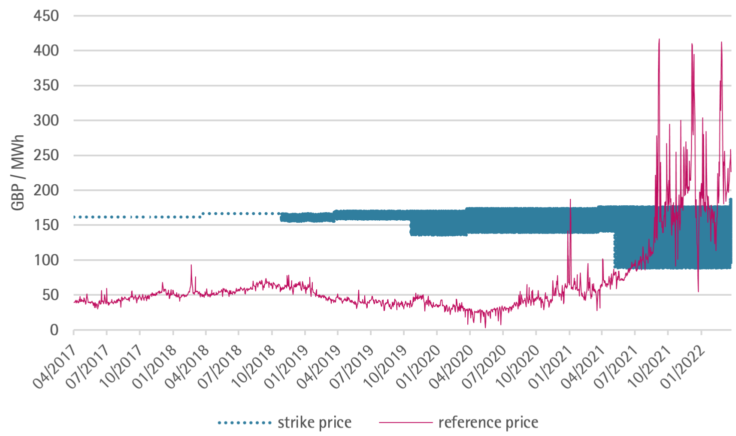
Removing such mechanisms for mature renewable may be premature. The UK experience of 2017, when the loss of CfDs caused the number of new wind and solar installations to decrease, shows the limitations of relying purely on private market mechanisms when an acceleration of investment is needed to meet decarbonisation targets.

Investors appetite and return on capital should ultimately react to their perception of risk. Reacting to the volatility of the market – by imposing emergency tax to shield customers from spiraling costs will likely raise investors perception of political risk, and increase the level of returns they require, i.e. the risk premium. At a time when the market risk of renewables is also set to increase, regulatory reforms that bring instability could even slow down the level of investment, at a time when a tripling of investments is needed to meet the decarbonization targets.

By contrast, providing the right long term incentives can ensure that investors continue to direct the vast capital flow needed at competitive cost to the renewable sector, while ensuring that customers can also share the benefits of low cost renewable generation.

1 - "The numbers behind the budget: Six ways to explore the Sixth Carbon Budget dataset", Climate Change Committee.

Figure 15: Price paid for wind under CfD (strike price) vs market price (reference price)



Source: LCCC

6. Conclusions

At the start of this research note, we asked whether the emerging dominance of intermittent power production creates new risks for investors in renewables, and what are the implications for the regulation of the energy prices.

Without a concurrent increase in energy storage, we have argued that intermittent generation amplifies the volatility of power prices – and that of renewable production. It requires a more complex management of power supply and demand by grid operators.

Amidst huge investor appetite, regulatory support for renewables is under scrutiny – particularly as power prices are soaring to a point where emergency measures have been adopted in many countries to try and shield customers.

Yet, in an increasingly volatile market, prices stabilisation mechanisms such as CfDs may be the best way to supplement the nascent private hedging market and keep the risk premium moderate. Critically they also benefit consumers by stabilising power prices at a reasonable level.

The current energy crisis has shown how much volatility, as well as costs, hurt energy customers. In a fraught political context, the EU agency for the Cooperation of Energy Regulators (ACER) published a report reaffirming the validity of the European power market design, but calling for 13 improvements, including efficient long-term hedging and increasing the flexibility of the system – partially to accommodate intermittent renewables.

The current power market presents huge challenges – but also the opportunity to reconsider the trade-off between the cost of regulatory intervention which stabilises revenues for low carbon technologies (including storage) and the risks of a purely competitive, commodity price-led and volatile market.

The current energy crisis has highlighted the deficiencies of a market where the production is increasingly renewable-based, yet gas remains the price setter. Regulators are aware of the need for reform.

Last summer, the EU Agency for the Cooperation of Energy Regulation (ACER) published a report reaffirming the validity of European market design but calling for improvements including efficient long term hedging and increasing the flexibility of the system. The UK is also consulting on wide ranging market reforms aiming to encourage renewable and flexible generation while decoupling prices from gas.

For investor in renewables, some of these emerging risks can be managed but the range of potential outcome for market reforms is vast and will be long to implement.

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