

# Mixing it up: How Developers and Investors can Capitalise on the Benefits of Renewable Energy Portfolio Aggregation

**The world of renewables is getting bigger. Not only are we seeing 12 MW wind turbines coming to the market and gigawatt-scale solar auctions taking place, but developers and investors are announcing their plans to rapidly expand into new markets.**

But our world is also getting smaller. A few major players are increasingly securing development pipelines and assets, and they are active across the globe and across all technologies.

In this article, we will explore what these market dynamics mean for developers and owners of renewable energy portfolios.

## GEOGRAPHICAL DIVERSITY

Increasing awareness of climate change and the pressure on governments to reduce carbon emissions is opening up new markets for wind and solar energy. While it is a challenge to secure a foothold in a new location, there are benefits that come with a portfolio that is spread across different geographies. These are:

### 1. A REDUCTION IN WEATHER RISK

Unsurprisingly, two wind farms or solar farms in different places, such as the UK and Poland, will see completely different weather trends. For portfolio owners and shareholders, this means more stable annual returns. For example, a low wind or solar resource year in the UK can be balanced out by an average or above average performance in Poland. This “portfolio benefit” is measured as an uplift in the portfolio’s P90 (the energy yield that the portfolio will produce in a year at 90% confidence).

There can even be material variations in weather patterns within a single country. For example, the Mistral and Tramontane cause wind farms in southern France to behave very differently from those in the central and northern regions. This effect is generally less pronounced for solar farms.

Looking ahead, there is increasing interest in how climate change will affect the wind and solar resource in the long-term. While these effects are very difficult to predict, most researchers agree that climate change is likely to increase wind and solar conditions in some areas. However, it may result in less favourable conditions elsewhere.



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Figure 1 below and Figure 2 (overleaf) illustrate the variability of the wind and solar resource in a given year compared to the long-term average.

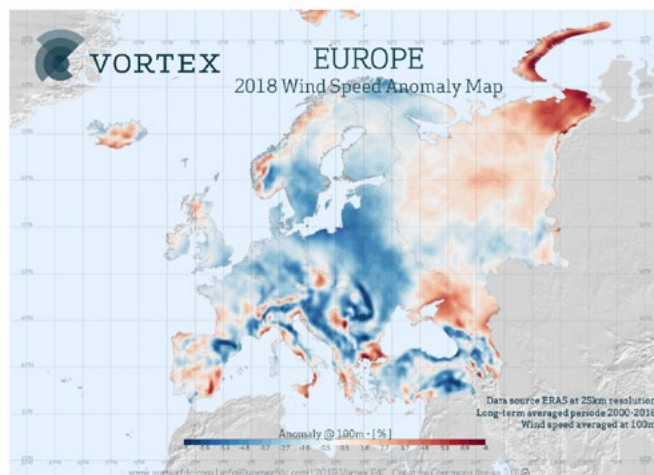


Figure 1: 2018 wind speed anomaly map, Europe. Source: Vortex <https://vortexfdc.com/knowledge/2018-wind-anomaly-map-europe/>

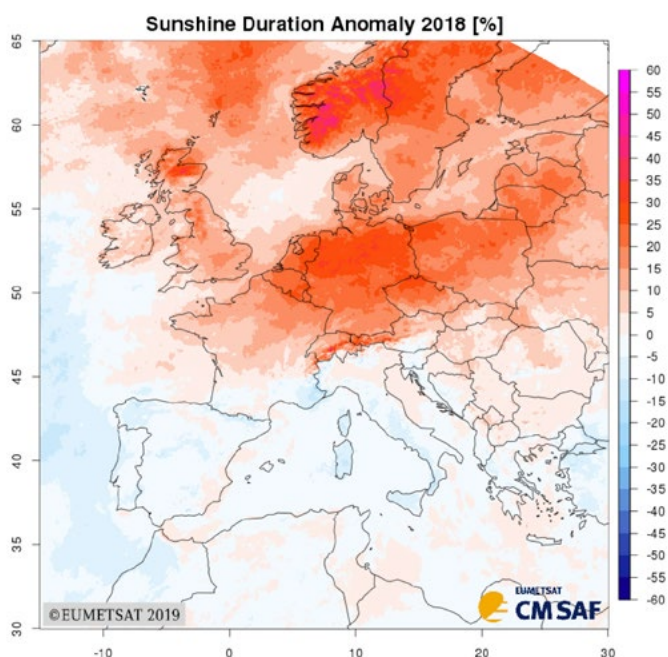


Figure 2: 2018 sunshine duration anomaly map, Europe. Source: Eumetsat <https://climate.copernicus.eu/sunshine-duration>

## 2. REDUCED REGULATORY RISK

As more countries introduce support schemes for renewables, regulatory risk remains a key challenge. There are a few recent examples of the effects of regulatory complexities, such as failed auctions in Colombia, retrospective changes to awarded tariffs in France and a lack of visibility on technology weightings in Ireland. These types of issues could impact those with a narrow geographic focus.

On the other hand, developers and investors with assets in different countries are more resilient to regulatory changes. They may also be able to respond quickly to opportunities opening up in new markets.

## 3. AVOIDING THE CROWDS

Grid constraints and curtailment risk are among the biggest challenges for any renewable energy developer and investor. In mature markets, competition for grid access is fierce. Infrastructure upgrades are also not happening fast enough to keep up with new developments. As more wind and solar assets are connected to the grid, generators are likely to be curtailed during particularly windy or sunny periods. This will typically happen under a “last in, first out” rule that hits new projects the hardest.

The solar industry in particular tends to go through rapid development and investment as players pile into a market at the same time – Spain being a prime example. As Figure 3 shows, the total capacity of renewable projects that are operational or have grid access secured already exceed the country’s 2030 renewables target. This leaves the almost 90 MW of projects that have requested but not yet secured access.

While the risk may be acceptable on an individual project basis, a portfolio of assets competing for grid access in the same area may not present a viable investment case. A more balanced portfolio might include assets in areas with a lower resource, but with a higher chance of securing a grid connection.

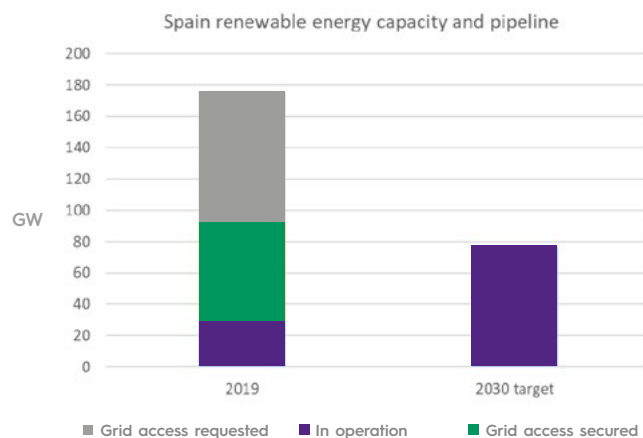


Figure 3: Development bubble? Grid access requests in Spain vastly exceed renewable energy deployment targets. Source: S&P Global, September 2019, <https://www.spglobal.com/platts/en/market-insights/latest-news/electric-power/090319-spain-turns-down-263-gw-of-res-applications>

## TECHNOLOGY DIVERSITY

Wind and solar technology continue to evolve rapidly, and the arrival of large-scale battery storage has thrown another component into the mix. Each of these technologies have different permitting, cost, revenue and bankability considerations. Ultimately, they are all competing to provide cheap power.

In recent years, the number of wind players expanding into solar and battery storage has increased dramatically. There has been less movement in the other direction, as the barrier to entry is generally seen as more difficult to overcome for wind than solar.

A mixed technology portfolio may offer the following benefits:

### 1. FIRMER OUTPUT

The wind and solar resource tends to be complementary in many markets, with less sunny periods coinciding with high wind speeds, and vice versa. A mixed-technology portfolio will be able to achieve more predictable output on a quarterly and annual basis. This can reduce financing costs and attract more risk-averse investors. Even on a daily and hourly basis, an aggregated bundle of wind and solar assets will provide firmer output than if each project is viewed in isolation. Adding battery storage into the mix can allow peaks and troughs in generation to be smoothed out even further.

While direct revenue opportunities associated with this short-term capacity firming are currently limited, the concept of a “Virtual Power Plant” consisting of aggregated assets is growing in popularity. For example, in 2019 Statkraft announced that it was bundling its UK assets to optimise day-ahead and intra-day trading.

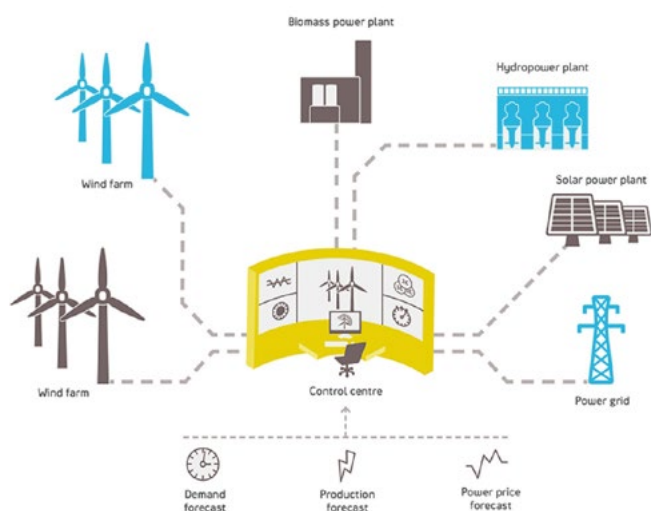


Figure 4: Virtual power plant illustration. Source: <https://www.solarpowerworldonline.com/2017/09/virtual-power-plant/>

## 2. AVOIDING EXPOSURE TO SINGLE SUPPLIERS

Both the wind and solar sector have seen their share of high-profile bankruptcies, with Senvion being the most recent example. While partnerships and frameworks with key suppliers can allow developers to achieve lower costs, there are large risks associated with binding a portfolio to a single technology, especially if warranties are no longer honoured.

## MANAGING MERCHANT RISK

Over the coming years, the number of renewable projects deployed on a corporate PPA or fully merchant basis is expected to grow. The majority of these projects will be exposed not only to electricity price curves, but also the risk of price cannibalisation. This refers to the increasing likelihood of renewable generators simultaneously dumping electricity onto the grid during windy and sunny conditions – which may lead to very low or even negative prices, if demand is lower than supply. As investors grapple with these risks, there are clear benefits associated with owning and operating large portfolios. These are:

### 1. DATA

Gaining an in-depth understanding of project performance and developing more sophisticated forecasting and optimisation algorithms is key to thriving in a merchant world. Real-world data is fundamental to validating and improving these models, and it can give players a meaningful advantage when participating in trading and balancing markets.

Natural Power is involved in Wind Energy Benchmarking Services (WEBS), a benchmarking tool that collects, anonymises and benchmarks operational performance and reliability data from more than 4GW of operational wind farms across eight countries. Benchmarking operational data provides an independent platform for the industry to increase production and reduce the costs of operations. This ensures that wind remains competitive in a merchant market. As shown below in Figure 5, data can show where to focus operational investment to reduce downtime, and thereby increasing output and maximising revenue.

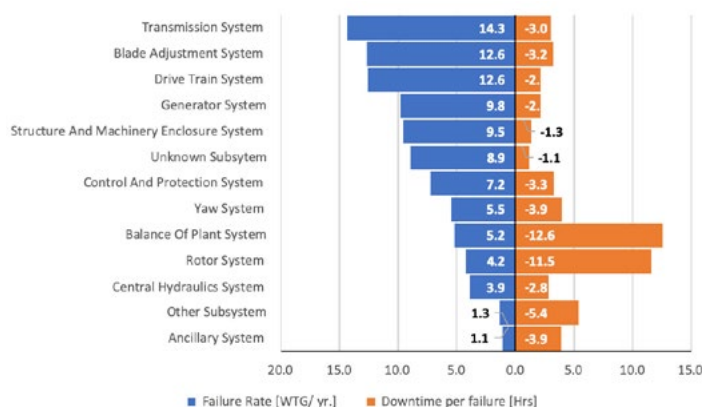


Figure 5: Forced outages (per turbine) by system. Annual averages: April 2016 – April 2019. Source: WEBS

## 2. REDUCING SHAPE RISK

Corporate power purchase agreements (PPAs) offer a route to market for subsidy-free projects, but corporate offtakers frequently require PPA offerings with a degree of firm or shaped power output, rather than being fully exposed to a wind or solar farm's variable generation profile. Additional hedging and sleeving arrangements are typically needed to make sure the corporate buyer can meet their demand, the cost of which is passed on to the generator.

Signing a PPA for a portfolio of projects, rather than individual assets, could significantly reduce the shape risk. As discussed above, technological and geographic diversity generally result in a firmer and more predictable power output. A portfolio PPA may also mitigate balancing and volume risk.

While portfolio PPAs are still uncommon, solar/storage hybrids are increasingly attractive in island markets or remote mining regions. For some corporates, procuring electricity from a virtually aggregated portfolio of projects rather than physically co-located assets may be a logical next step.

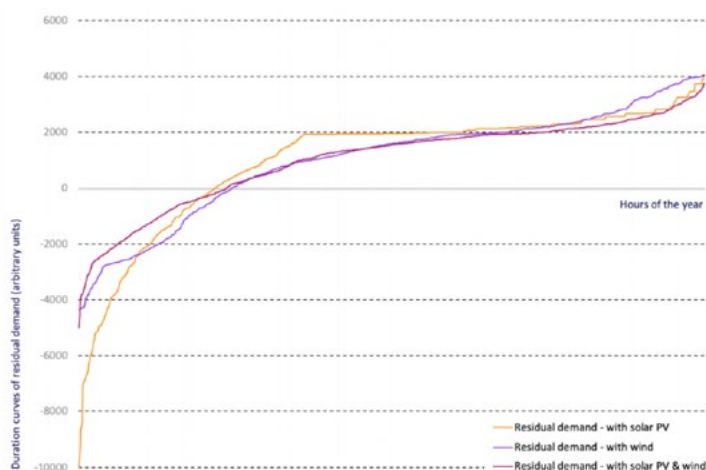


Figure 6: Illustration of residual demand for a corporate offtaker for a wind-only, solar-only and combined PPA. Source: <https://docs.wbcsd.org/2019/03/How-multi-technology-PPAs-could-help-companies-reduce-risk.pdf>

## 3. IN-HOUSING

There is already a trend towards large-portfolio owners bringing services in-house, including asset management and O&M. Apart from utilities who run their own trading desks, trading is typically still outsourced to third parties. This may change as asset owners become more familiar with market dynamics and see chances to improve portfolio returns themselves.

## CONCLUSIONS

At the start of the decade, it's fun to speculate how the renewables landscape will look like in 10- or 20-years' time. Will we continue to see consolidation of development firepower and asset ownership in the hands of a few big players? Will heavy hitters in established renewables markets successfully transition to become truly global players? And how will competition for grid and subsidies, as well as merchant dynamics, influence strategic decision making?

In this article, we explored a series of opportunities that benefit developers and owners of large, diverse portfolios of assets. These include:

- reducing exposure to technology risk;
- capitalising on a range of weather patterns and production profiles;
- mitigating the risk of prohibitive grid curtailment and price cannibalisation;
- accessing new forms of PPAs and revenue streams;
- bringing services in-house and learning from operational data.

Together with a panel of experts drawn from the industry, we will explore this topic in more detail at Solar Finance & Investment Europe 2020. Please get in touch with Hannah Staab for more details: [hannahs@naturalpower.com](mailto:hannahs@naturalpower.com).