

# PEXAPARK

## IEA – Power Market Design PPAs and Managing Risk

Paris

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## Gain Unparalleled Market Insight



### Extensive PPA Price Polls

Up to 1,000 monthly price points collected for PPAs and GoOs – full market visibility.



### Market Intelligence

Expert & timely analysis of key market activity, regulatory changes, trends & price drivers.



### Trusted Benchmark Prices

Calibrated against extensive data: price polls & observed PPA transactions (35+GW).



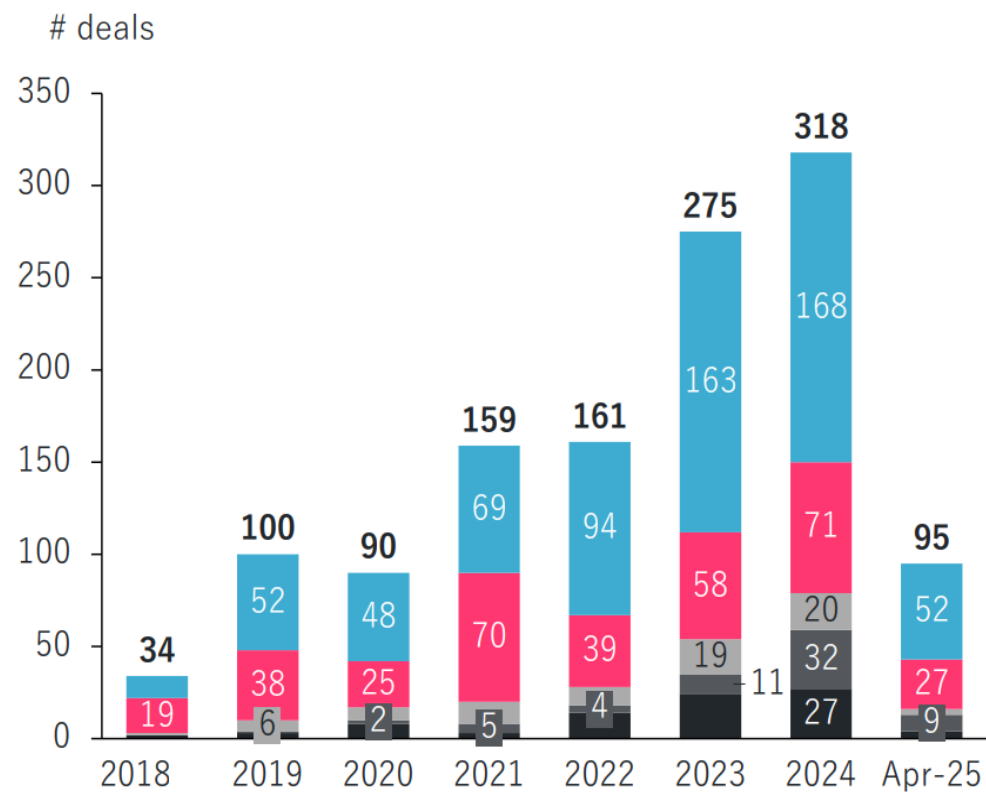
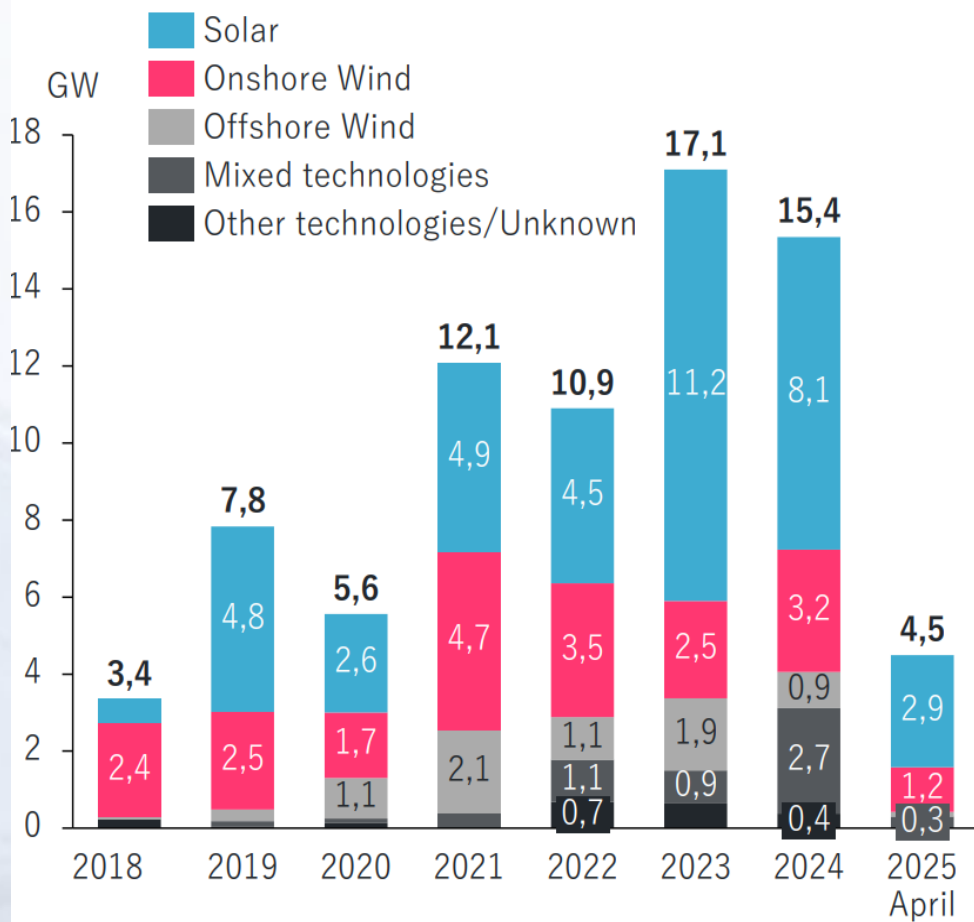
### Holistic, Integrated Services

In-house Advisory support for portfolio management, PPAs & BESS optimization agreements.



# European PPA Deal Flow By Technology

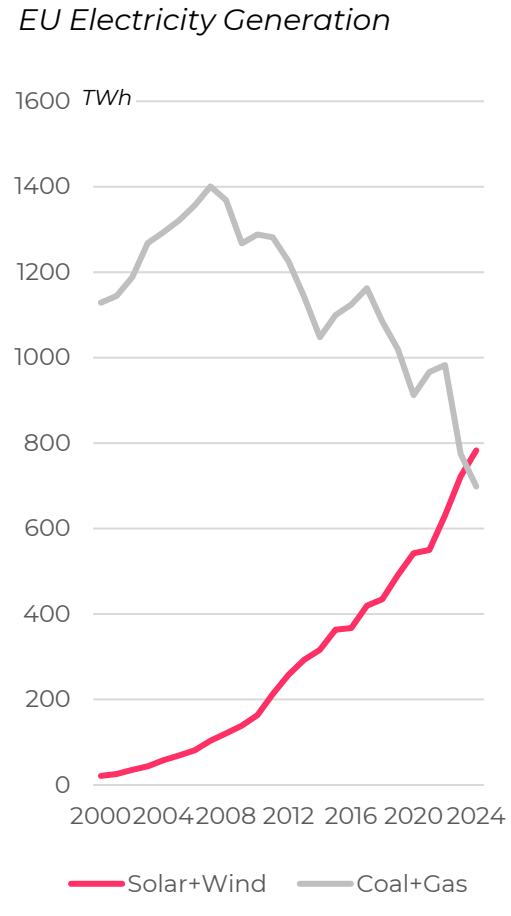
(Disclosed contracted capacity and deal count | 2018-April 2015)



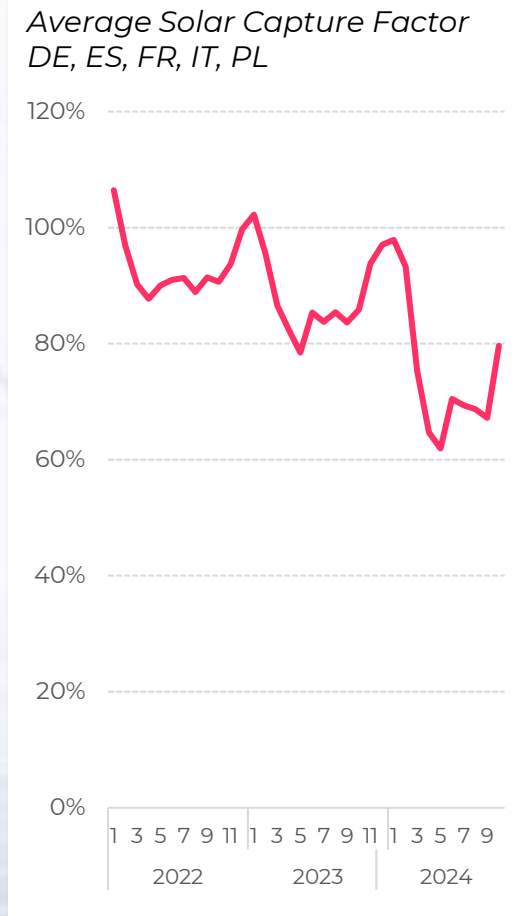


# It's a Renewables World Now

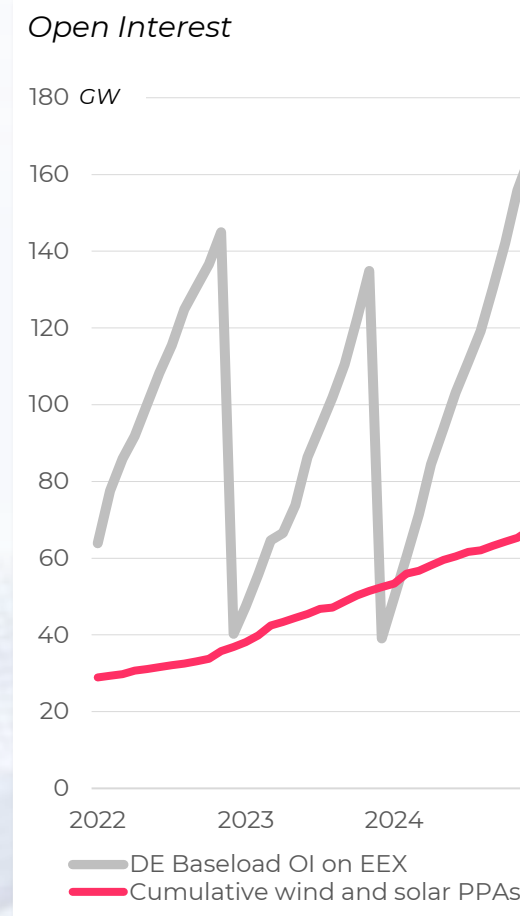
## Renewables Dominance



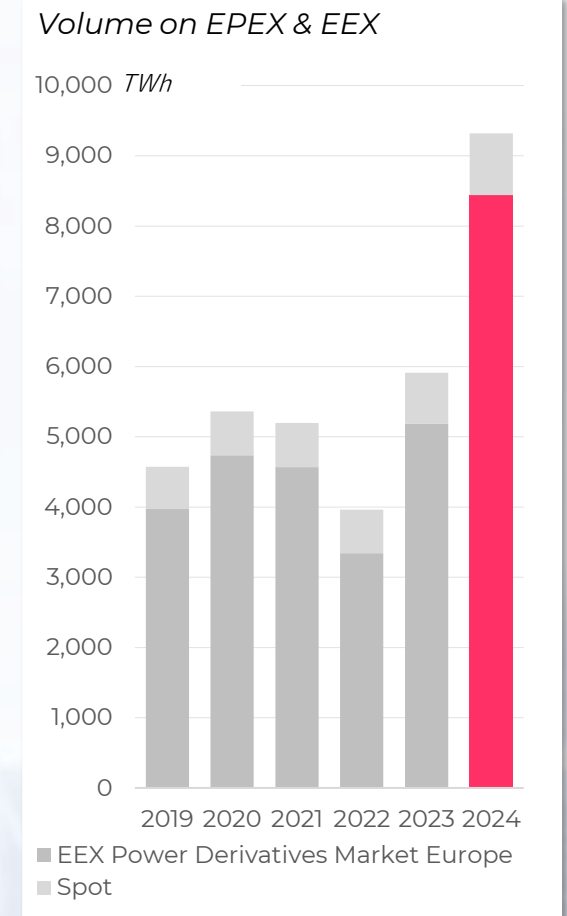
## Solar Value Has Decoupled from Baseload



## Affecting Substantial Contract Volumes



## And Leading to More Trading



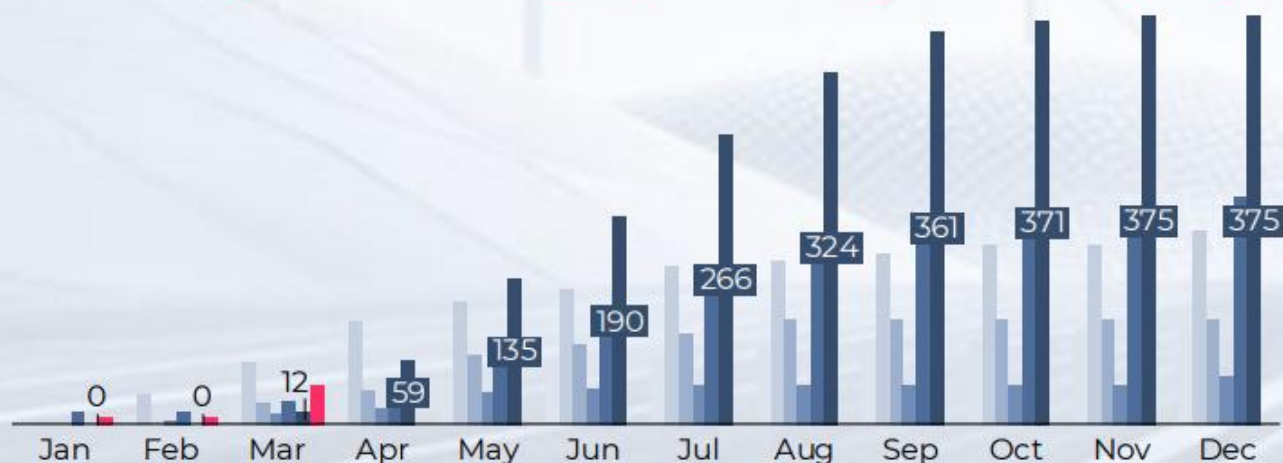


# Negative Hours Are Increasing Across European Markets

Number of negative hours in Germany, cumulative per year



Share of negative hours for solar in Germany, cumulative per year



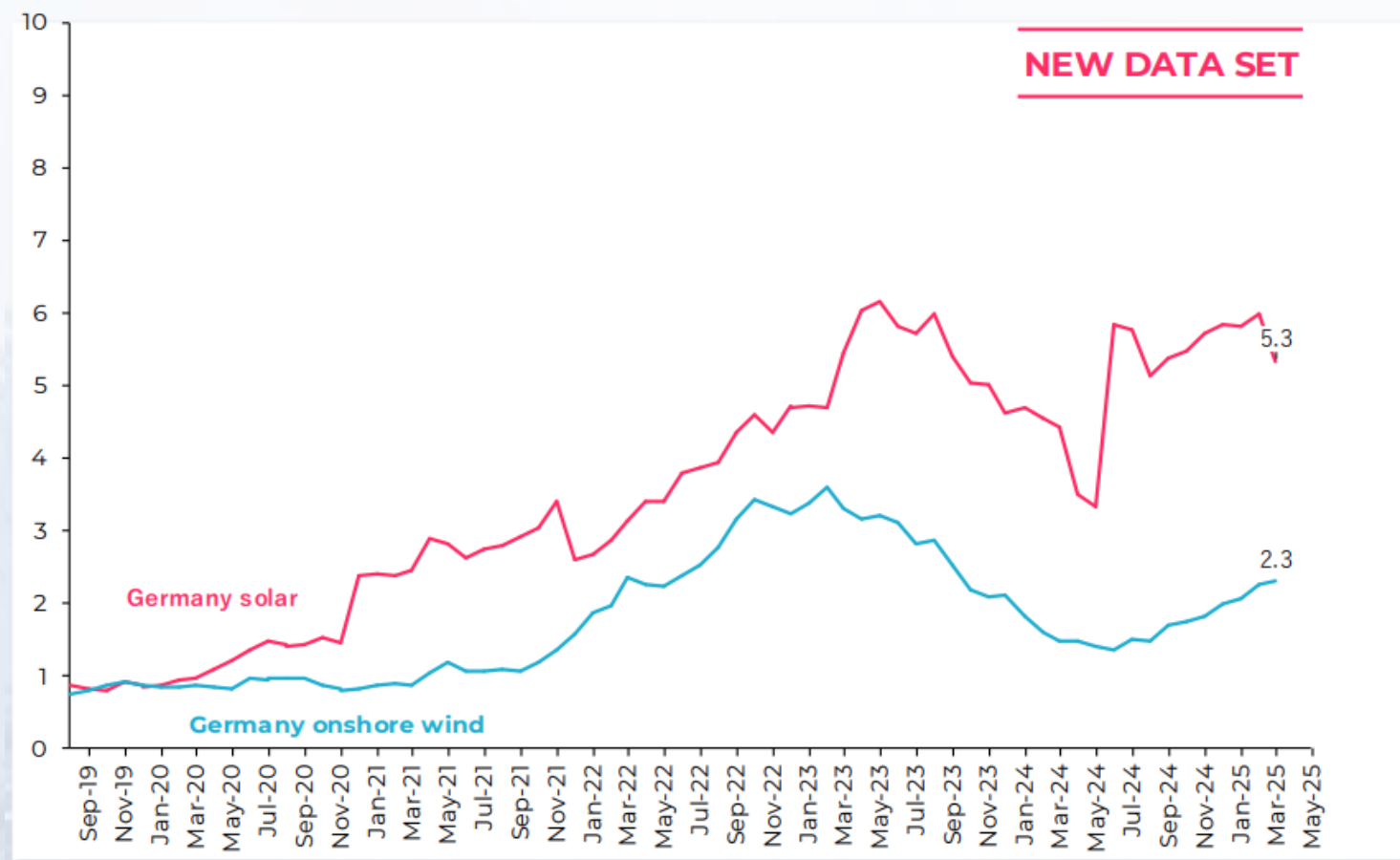
## Recap of Challenge No. 2

- Germany was in the top 3 for number of negative DA prices in 2024.
- In 2024, **up to 82% of the negative hours occurred during solar generation**. Curtailing during these hours would impact about **18% of their total annual production**<sup>3</sup>.
- PPA offtakers have difficulties to estimate **how long** it will take for the market to adapt, and therefore **price in the cannibalization risk** conservatively for the entire tenor.



# Imbalance Costs for Solar Are On the Rise

Realized imbalance costs – 12-month rolling averages (volume-weighted)  
(EUR/MWh)

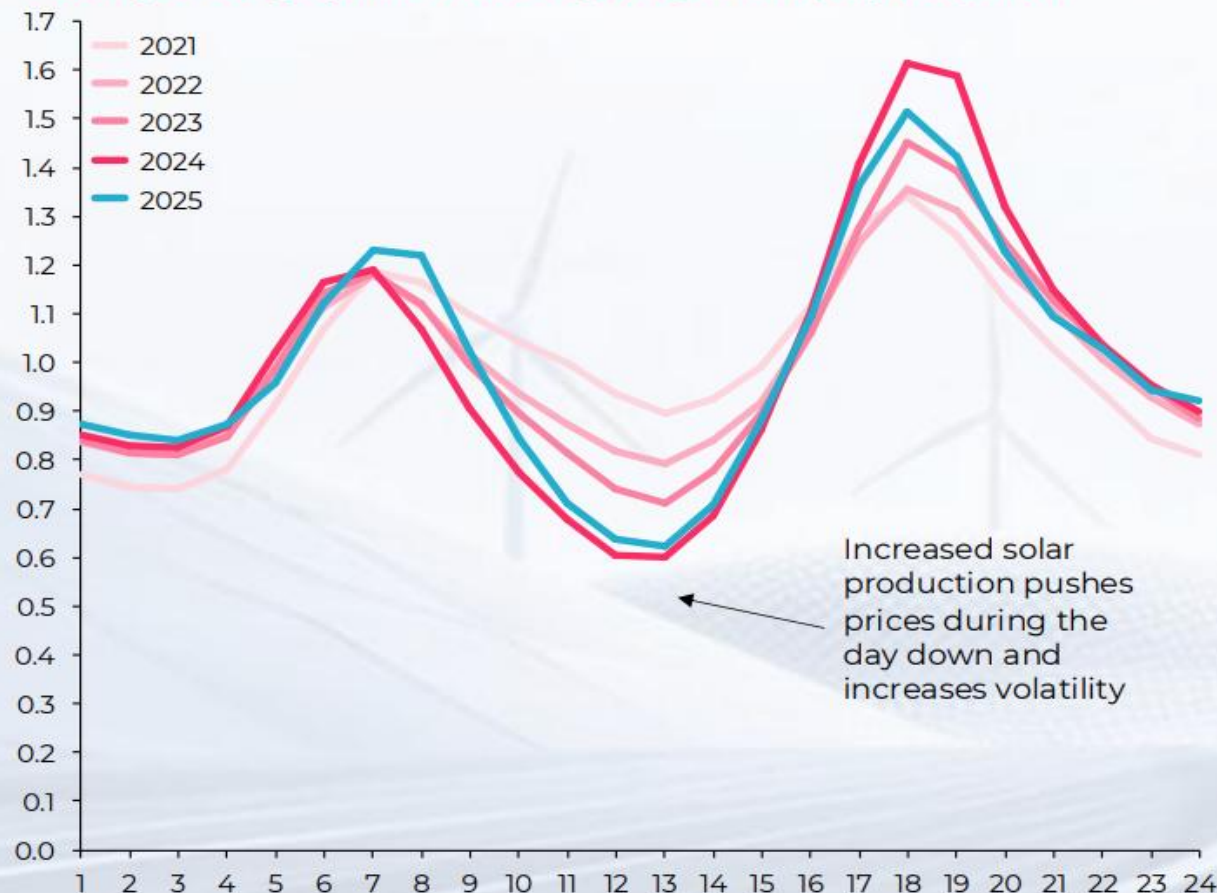


- The increasing renewable penetration is causing increased system imbalances, with weather forecasts unable to fully predict fluctuations across the German solar fleet.
- Solar imbalance costs **have been trending upwards** since May 2024, with more negative price hours in the German market, impacting solar more than onshore wind.
- For asset owners and investors, higher balancing costs and price cannibalization for solar assets lead to a double squeeze: decreasing merchant revenues and increasing costs.



# Spreads Between Hourly Prices Are Increasing

Hourly average price ratio to yearly average price, in %

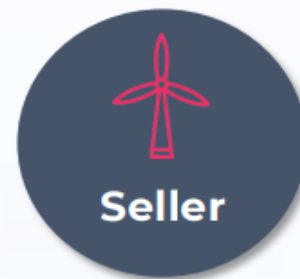


## Challenge no. 3

- **Rising solar penetration** depresses the relative value of midday hours while making shoulder hours comparatively more expensive. This widening price spread signals a **structural shift in market dynamics**.
- The strong oversubscription in the latest EEG auction (3.8 GW submitted vs. 2.6 GW awarded) suggests that **capacity build-out and price pressure will not slow down**.
- These evolving patterns underscore the importance of **structuring bankable PPAs** and optimizing **dispatch** strategies.



# Allocating Negative Price Risk in PPAs



Allocation of negative price risk influences PPA pricing

<b>Full Compensation (Risk on Buyer)</b>	<ul style="list-style-type: none"><li>▪ The buyer pays the <b>full PPA price for all hours</b>, even when spot prices drop into negative territory.</li><li>▪ This structure ensures the seller's revenues remain unaffected.</li><li>▪ Although this was once standard practice in Germany, offtakers are now increasingly challenging this model.</li></ul>
<b>Partial Compensation</b>	<ul style="list-style-type: none"><li>▪ The buyer agrees to compensate for a <b>limited, pre-defined number of hours</b> with negative prices. Beyond this threshold, compensation ceases, and the seller assumes the price risk.</li><li>▪ Another example is to introduce a <b>zero-price floor</b> in a virtual PPA, where the contract-for-difference settles only down to 0, or when the <b>spot price gets deducted</b> from the PPA price.</li></ul>
<b>No Compensation (Risk on Seller)</b>	<ul style="list-style-type: none"><li>▪ The buyer <b>does not pay</b> for electricity produced during negative price hours</li><li>▪ The seller will likely curtail during negative price periods to limit its losses.</li><li>▪ Currently the standard in Spain. However, significant missed revenues jeopardize bankability</li></ul>

# Market Solutions are Emerging, But Will They Improve Transparency?



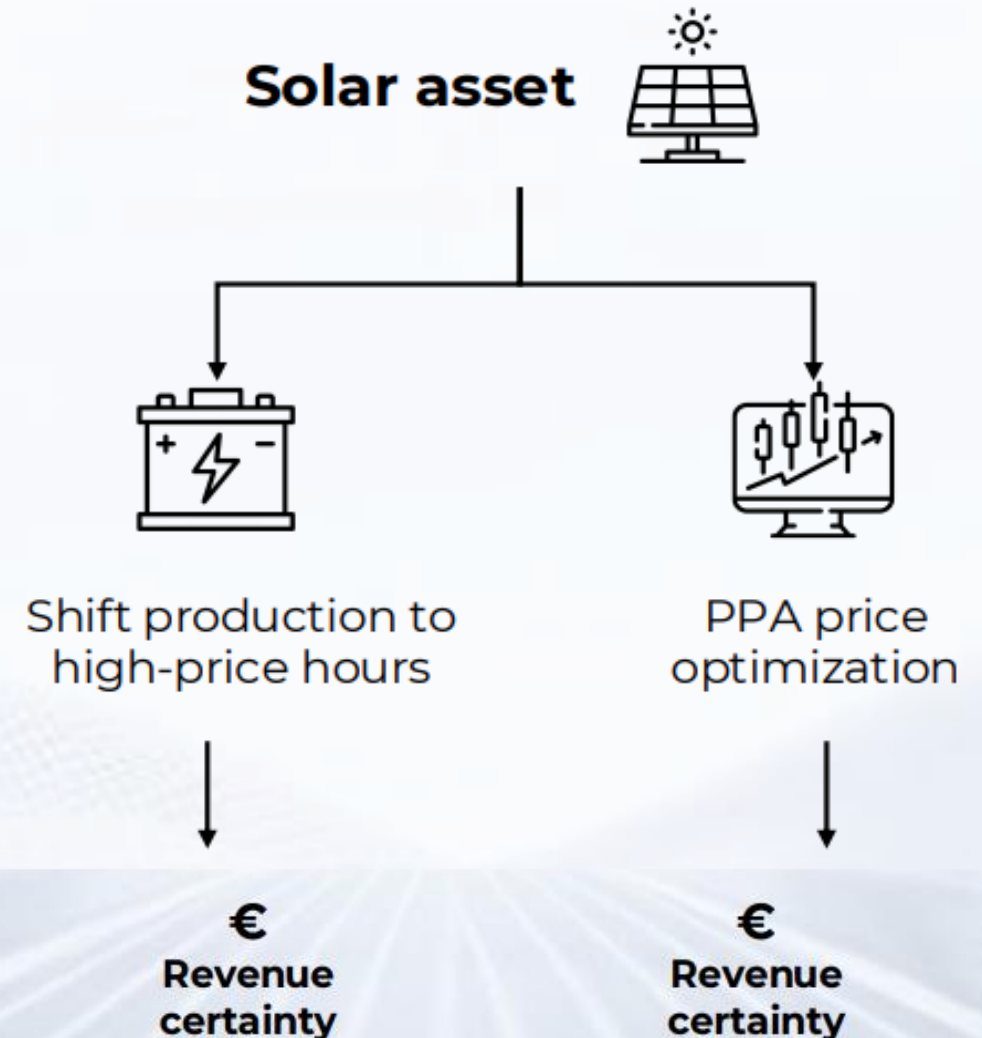
You **don't need a battery** to benefit from storage flexibility or to reduce uncertainty on the revenue streams.

Instead, markets offer different load-shifting / flex products through which similar effects can be achieved:

1. **Hourly swaps** – hedge between low and high-priced hours, mimicking charge/discharge cycles.
2. **Peak/off-peak spreads** – capture value between day vs. night or weekday vs. weekend pricing.
3. **Load-following hedges** – align cash flows to a fixed profile, independent of actual generation.

These instruments function like a virtual battery, profiting from the same price spreads as a physical equivalent. This gives the seller more revenue stability.

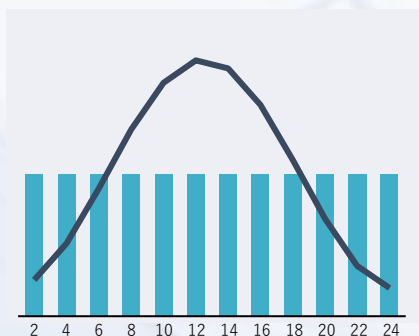
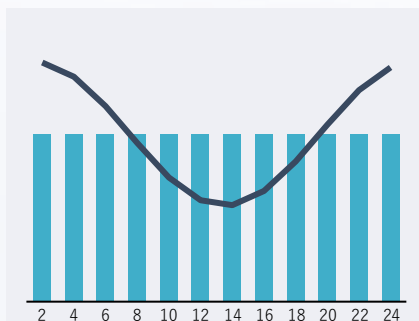
The structure is financial, leaving the physical flex asset owners free to capture upside from **ancillary services or capacity markets**.





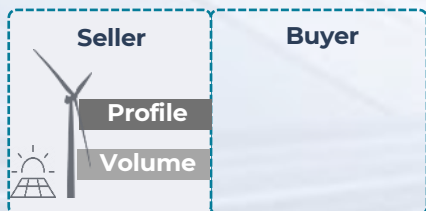
# Current Tools Were Not Designed to Hedge Renewables

## Baseload Hedges



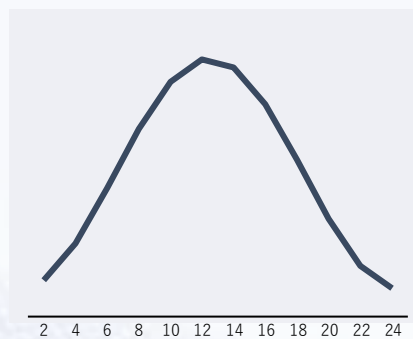
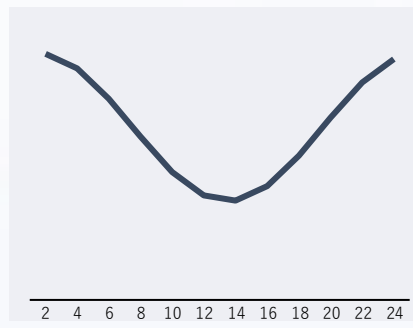
### Risks:

- Profile
- Volume

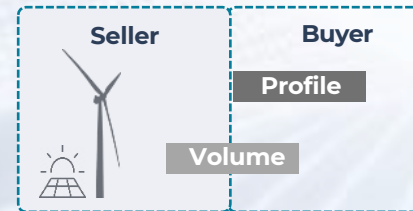


Baseload, Peak and Off-peak contracts **do not** allow for **renewable risk** holders (Sellers) to **manage profile and volume risks**.

## Pay-as-Produced



A pay-as-produced contract allows Seller to transfer **Profile Risk** to the Buyer, and both will share the **Volume Risk**, since the quantity to be settled is unknown by both parties.



- Production profile
- Contract profile



Thank you

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