



# Renewables + BESS colocation in Europe: Best practices





**62 PPAs**

closed in 2024

**50+**

Energy advisors and  
retailers who source  
PPAs for their clients

**1300+**

Developers

**35+**

Active Markets in  
North America and  
Europe



# Agenda

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Hybrid Market Overview

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Hybrid Structures

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Hybrid Structure Valuation

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# Hybrid PPA Market Overview: Context and Necessity



# Why PPAs are Evolving

Market, regulatory, and buyer-driven pressures are pushing toward more **sophisticated structures**

## Price Cannibalisation

Simultaneous renewable generation causes price cannibalisation, eroding the value of pay-as-produced PPAs



## Hourly Matching Mandates

Regulations will require hourly matching for some hydrogen and data center energy use



## Voluntary Commitments

Google

Microsoft

+ OTHERS

New rules, new expectations, it's time for smarter, more **flexible** PPAs



# What Buyers and Sellers are Telling Us



## BUYERS

### Lack of protection & clarity

“I need to comply with my environmental goals and protect myself from pricing volatility!”

“PPAs (Solar PaP) are no longer providing me with this protection.”

### Understand and value BESS products

“I know BESS can help but don’t know what products are available.”

“Even if I see products out there, I don’t know how to value them!”

### No offtakers, no project finance

“We are not being able to find offtakers for our projects!”

“Low captured prices and negative prices do not allow me to go finance merchant projects”

### Revenue predictability and buyer alignment

“BESS would help, but I need to secure some revenue to finance my projects”

“Depending on the market I can come up with 5 or more products but what do buyers need?”



## SELLERS



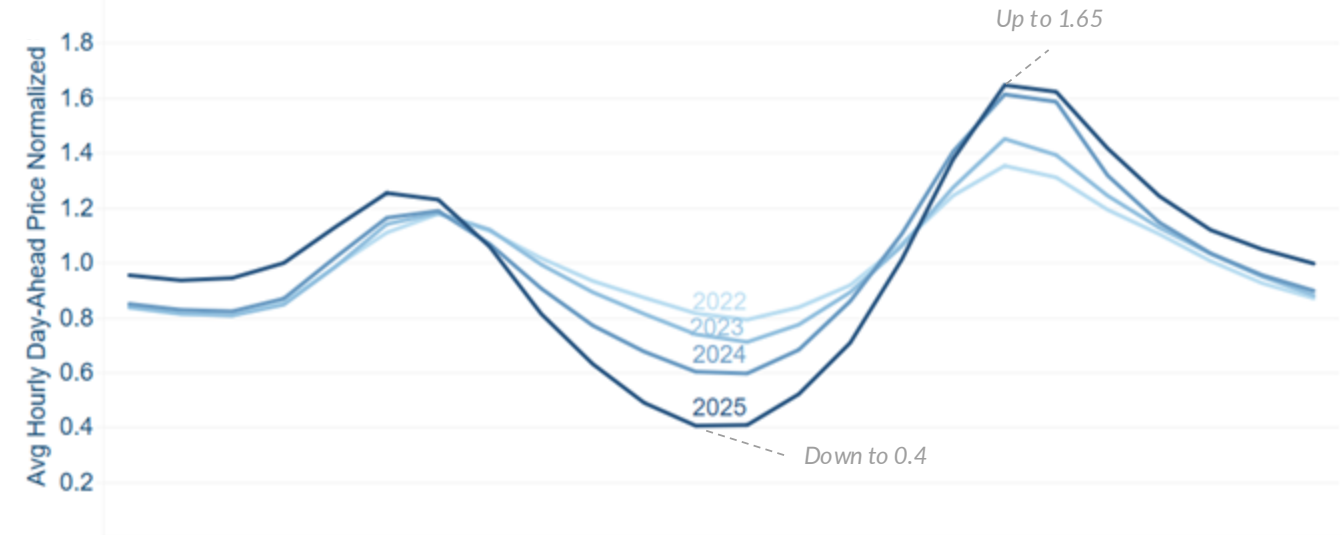
# Hourly Price Curve Evolution

- Duck shape of the price curve gets more accentuated along the years mainly due to price cannibalisation caused by Solar PV technology penetration.
- Wider price spreads and lower capture prices during the central hours of the day.

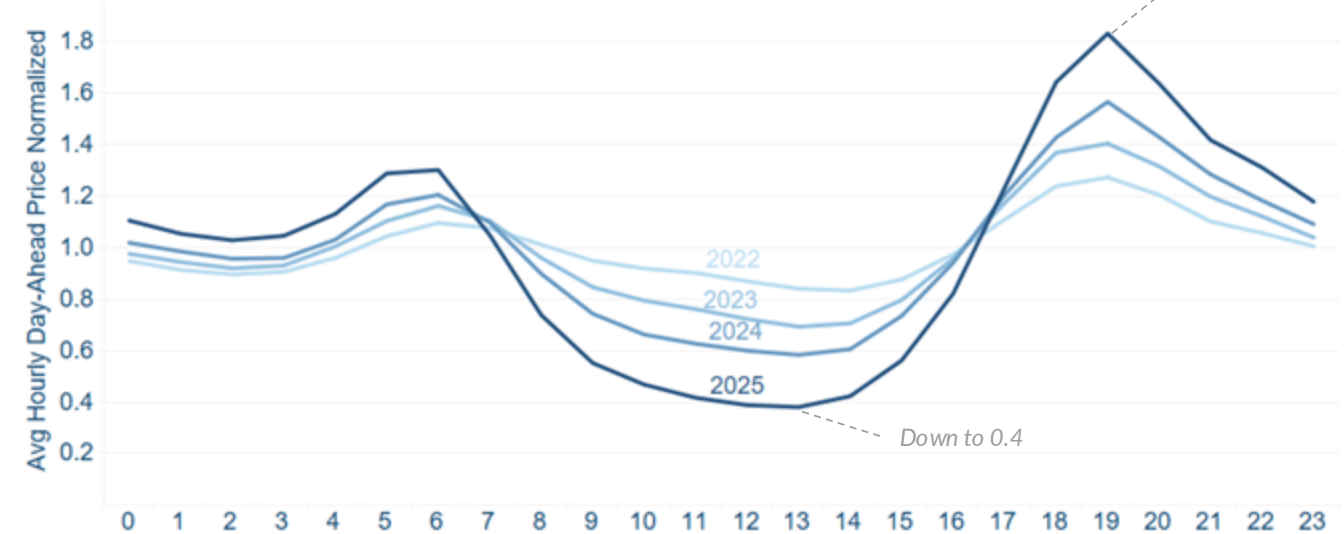
Two main consequences:

- PV pay-as-produced PPA agreements are resulting in negative settlements for offtakers due to having an agreed PPA price higher than the PV capture price.
- Arbitrage market strategies are becoming an increasingly profitable opportunity for BESS projects.

Germany



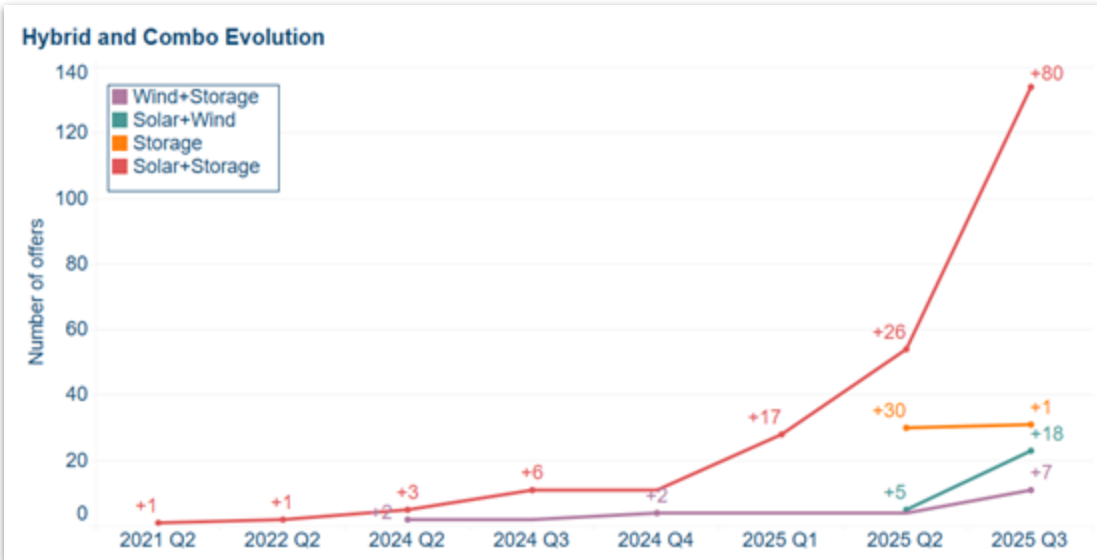
Spain



Source: LevelTen Energy



# Hybrid PPAs gain momentum across Europe as developers diversify portfolios



**70%**

of Hybrid offers in 2025 Q3 in **Germany** were **Green BESS**

**65€/MWh**

P25 PPA Price in 2025 Q3 of **Green BESS** in **Germany**





After a record 2024, Europe's PPA market is evolving toward faster and more flexible solutions



### **From Uncertainty to Opportunity**

The market is stabilizing after 2024's surge — clear mechanisms now exist to mitigate price volatility and capture value more efficiently.



### **Hybrid & Storage Momentum**

Hybrid and storage-linked PPAs are becoming the preferred structures, driving flexibility and supporting long-term price stability.



### **Evolving Market Dynamics**

While price cannibalization and PSV pressure remain challenges, overall buyer value continues to strengthen across most European markets.

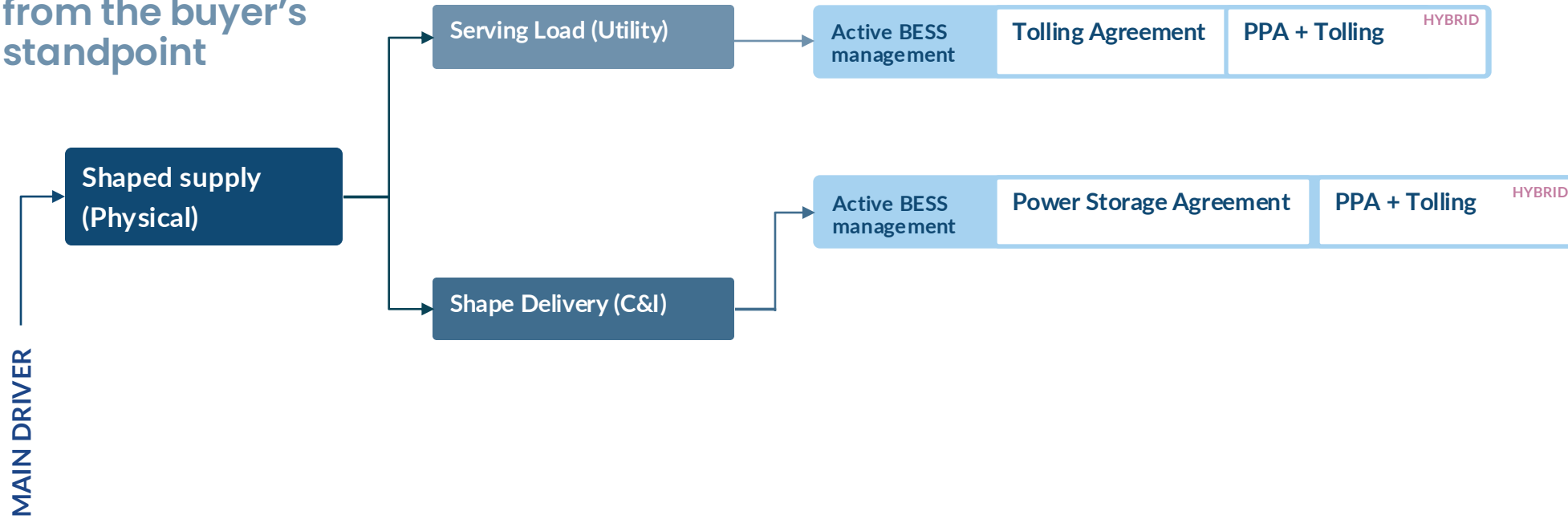




Products available in the  
market

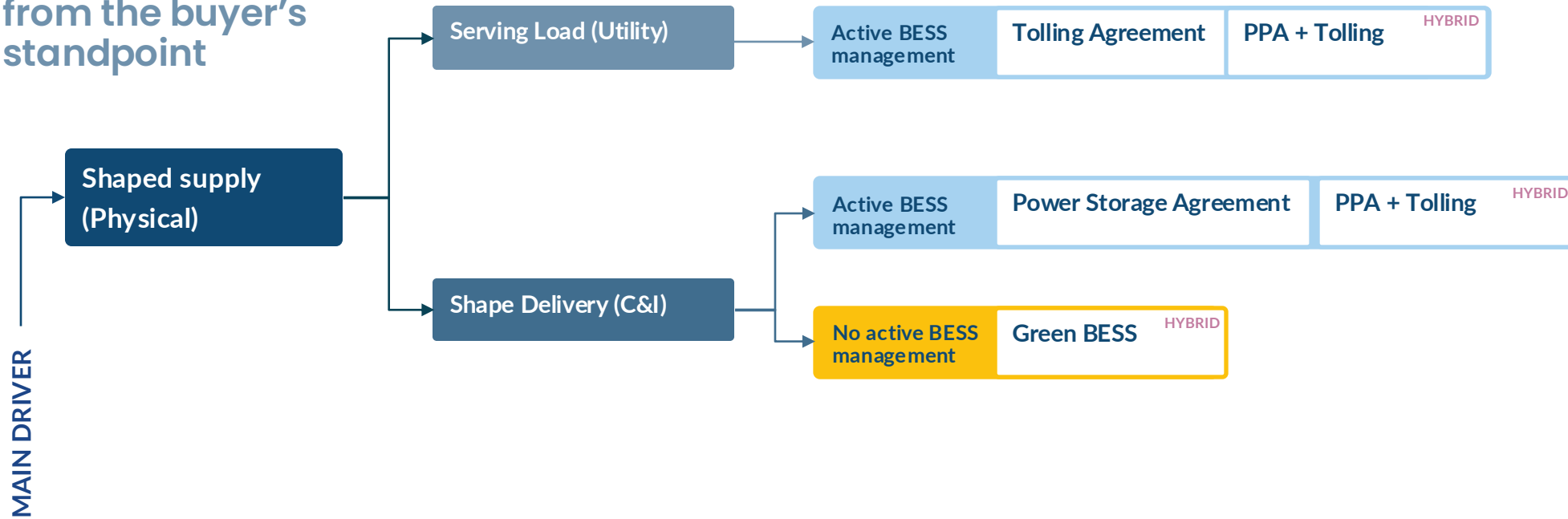
# Contracting Options

from the buyer's  
standpoint



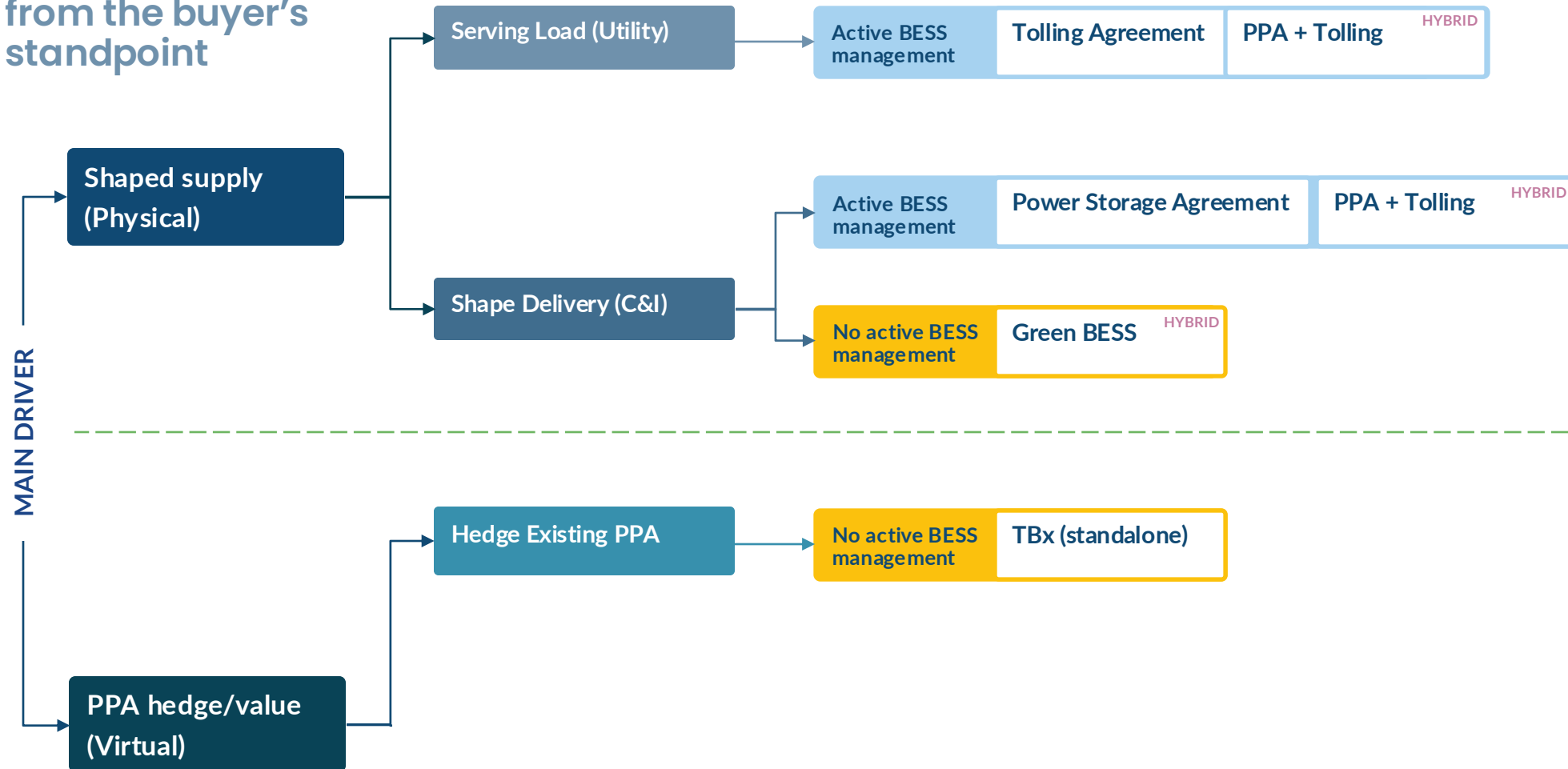
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# Contracting Options

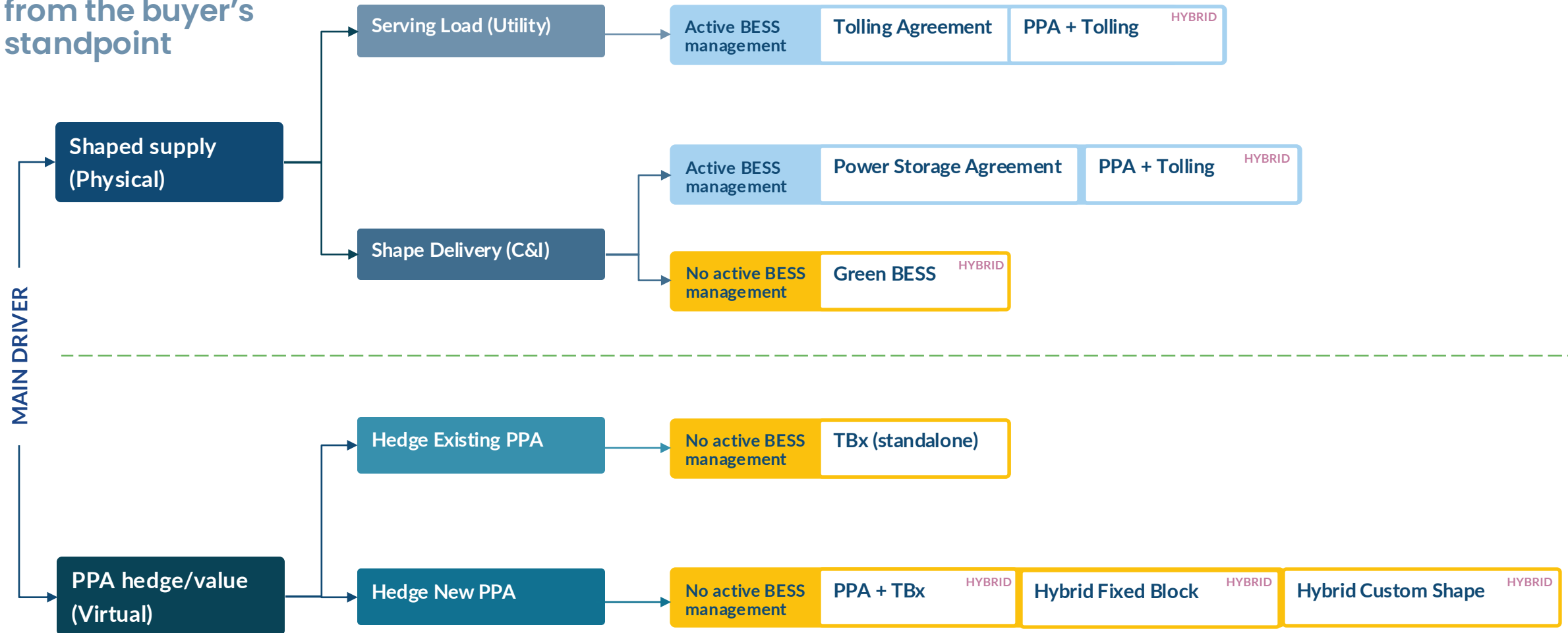
from the buyer's  
standpoint





# Contracting Options

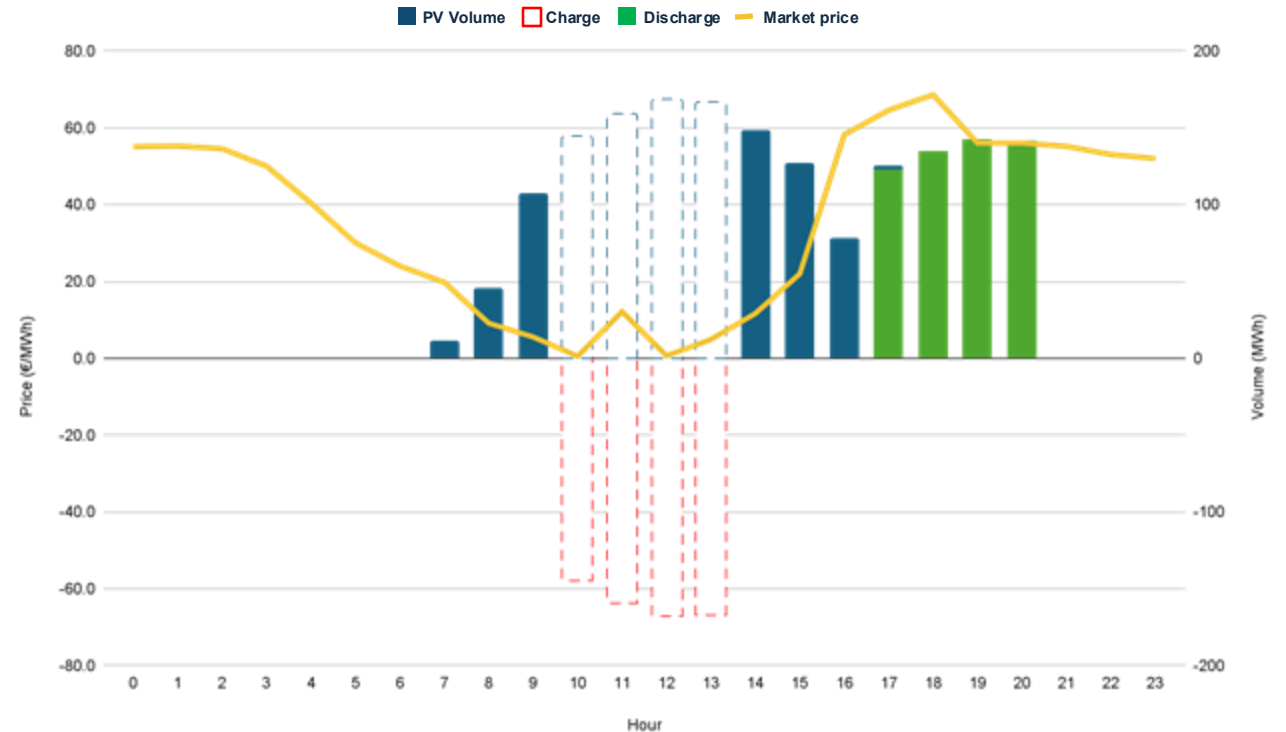
from the buyer's  
standpoint



# Hybrid Green BESS

- Physical or virtual contract.
- Volume determined by generation asset, as BESS cannot charge from the grid.
- Guarantees 100% renewable generation and thus GOs tracking.

Example for a Custom Green Shape at a PPA Fixed Price



Fixed Price Payment =  $\sum \text{Hourly Energy Volume} \times \text{PPA Fixed Price}$   
Floating Price Payment =  $\sum \text{Hourly Energy Volume} \times \text{Hourly Market Price}$

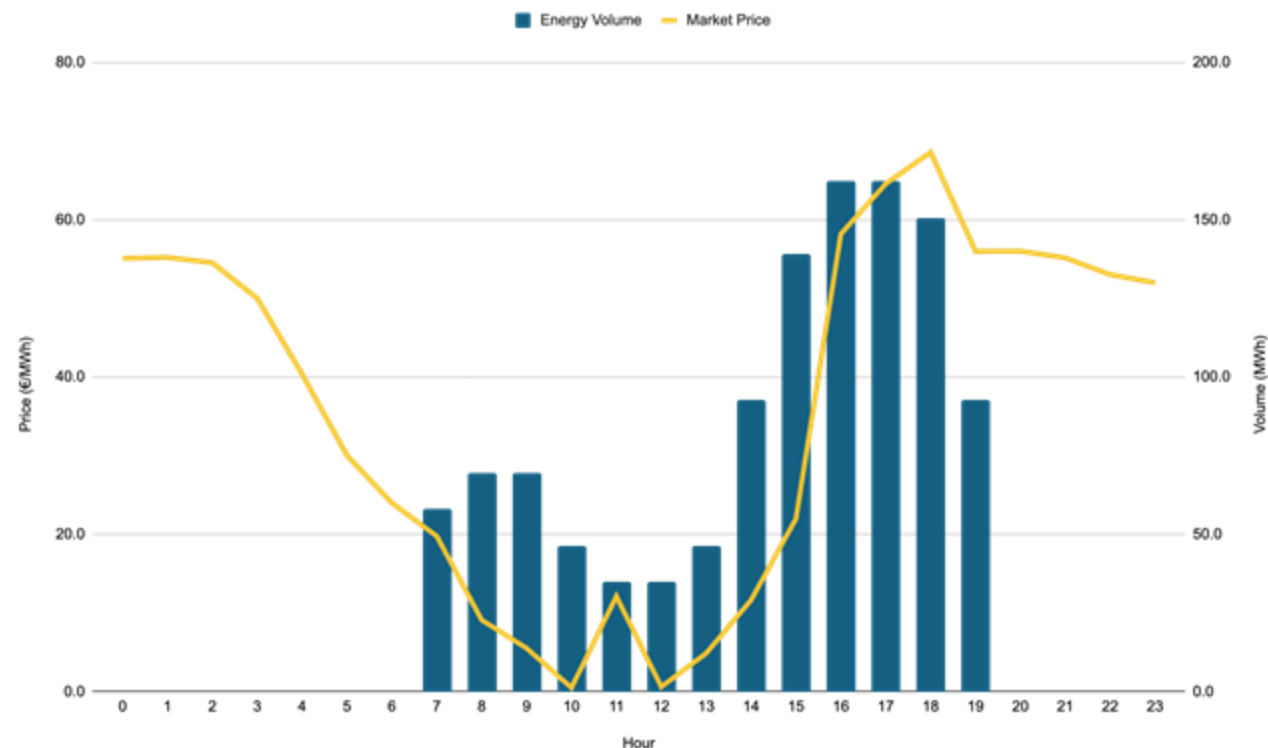
Settlement = Floating Price Payment - Fixed Price Payment



# Hybrid Custom Shape

- Virtual contract (simple/flexible).
- Energy shifting to capture better price.
- Seller to assume shape delivery risk.

Example for a Custom Fixed Shape at a PPA Fixed Price



Fixed Price Payment =  $\sum$  Hourly Energy Volume x PPA Fixed Price

Floating Price Payment =  $\sum$  Hourly Energy Volume x Hourly Market Price

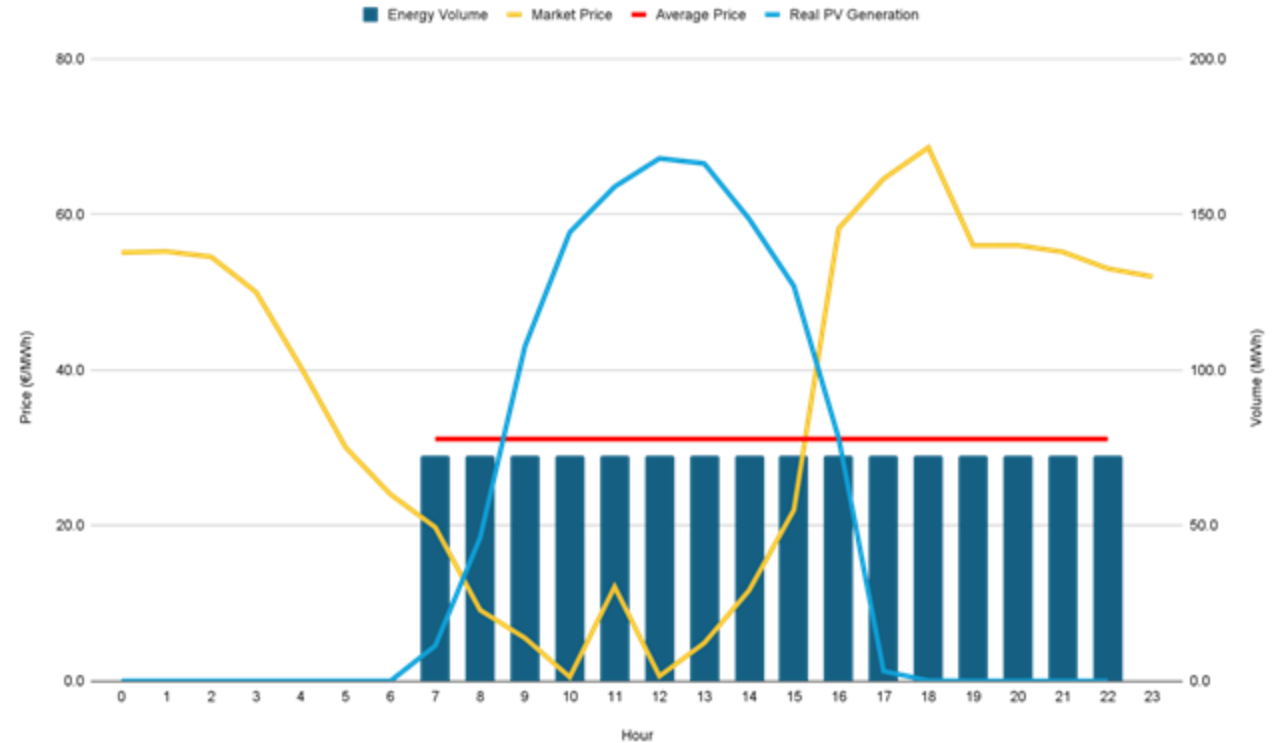
Settlement = Floating Price Payment - Fixed Price Payment



# Hybrid Fixed Block | 7x16

- Virtual contract (simple/flexible) increasing captured value of energy.
- Converts the duck curve into a brick wall.
- Essentially mitigates price volatility within the block, and therefore price cannibalization risk.

Example for 7x16 (7 days x 16 hours) at a PPA Fixed Price



Fixed Price Payment =  $\sum$  Generated Energy Volume x PPA Fixed Price  
Floating Price Payment =  $\sum$  Generated Energy Volume x Hourly Market Price

Settlement = Floating Price Payment - Fixed Price Payment



# Standalone TBx

Stands for: Top-Bottom X (X = duration in hours)

- Virtual contract (simple/flexible) providing buyer access to arbitrage.
- Allows Buyer to hedge existing PPA with negative outcome.
- Allows Seller to carry out desired physical multimarket optimization strategy.

Example for TB4 | 100MW 4h BESS with a Fixed TB4 Strike Price



Fixed Price Payment = BESS Capacity x BESS Duration x Fixed TB4 Strike Price

Floating Price Payment = BESS Capacity x BESS Duration x  $\sum(H16 + H17 + H18 + H20) - \sum(H9 + H10 + H12 + H13)$

Settlement = Floating Price Payment - Fixed Price Payment



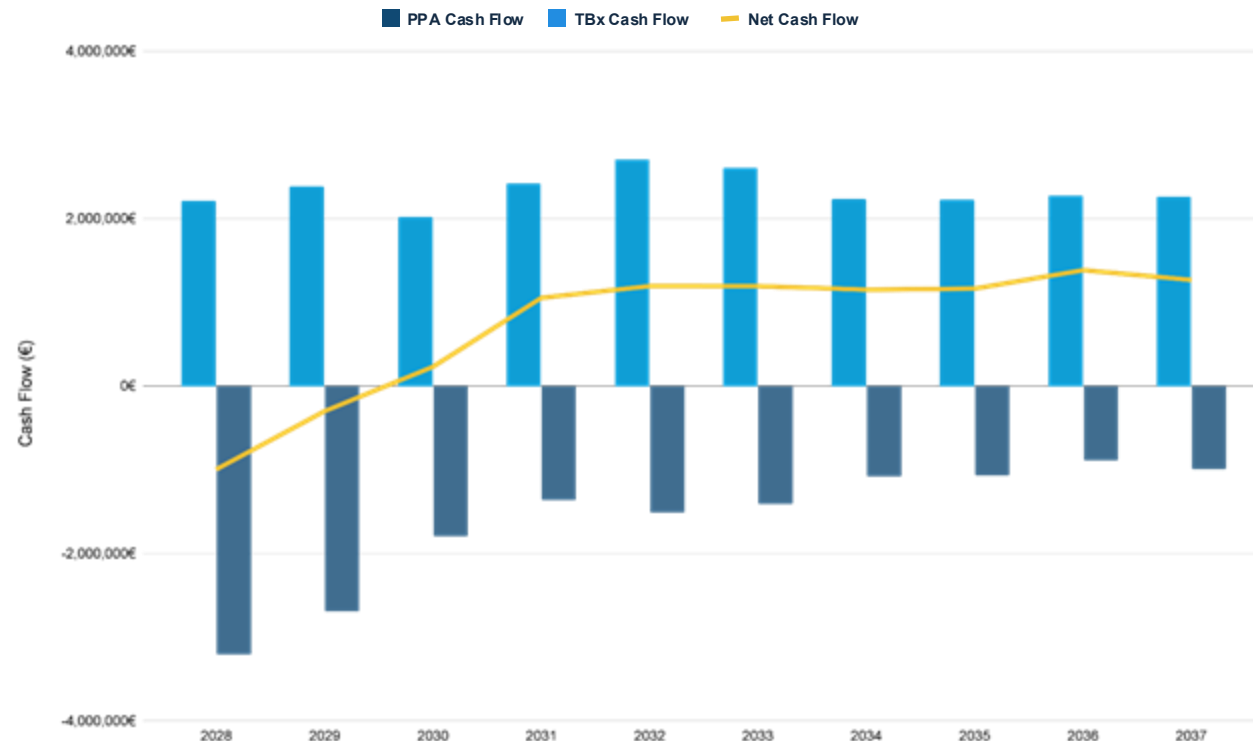


# Hybrid PPA + TBx

Combination of two settlements in one contract

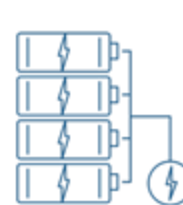
- Virtual contract (simple/flexible) providing buyer access to arbitrage.
- Allows Buyer to capture a higher value for the PPA through the addition of the TBx
- Allows Seller to finance both assets and carry out desired physical multimarket optimization strategy.

Example for PPA + TBx



PPA Settlement

+



TBx Settlement

=



Total  
Settlement



# Different benefits, different risks...

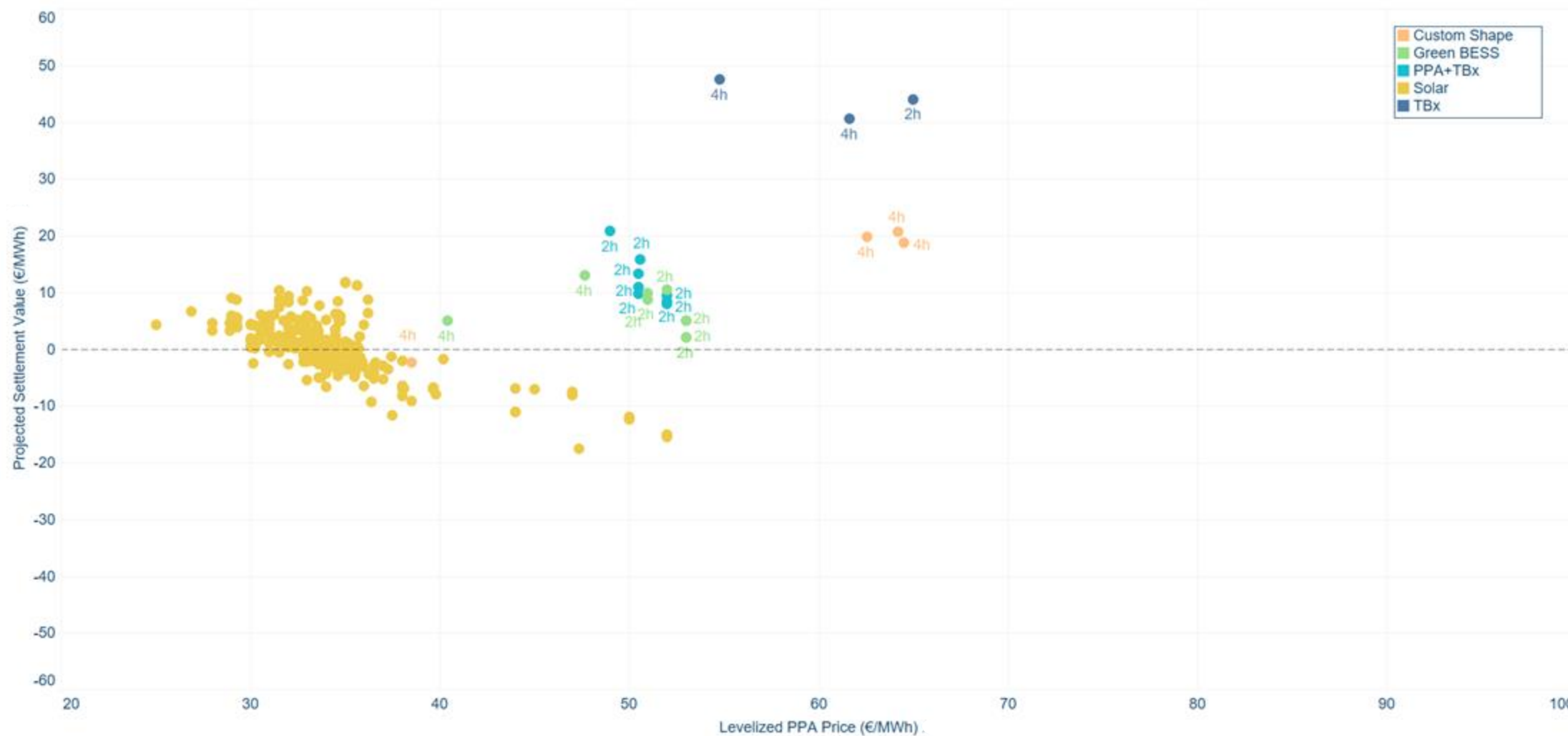
	Hedge Existing PPA		Hedge New PPA		
Asset	Stand-alone	Hybrid			
Product	TBx	Green BESS	Custom Shape	Fixed Block	PPA+TBx
Type (P/V)	Virtual	Physical	Virtual	Virtual	Virtual
BESS Mgmt	On Seller	On Seller	On Seller	On Seller	On Seller
Settlement Volume	BESS Energy capacity	As produced	Pre-agreed by profile	As produced	As produced
Settlement Shape	N/A	Optimized by seller in DA	Pre-agreed by profile	Fixed Block	As produced
Price	Fixed for Spread	Fixed for Energy	Fixed for Energy	Fixed for Energy	Fixed for Energy and Spread
GOs	N/A	Yes - Shaped by BESS	Yes- as generated by PV	Yes- as generated by PV	Yes- as generated by PV
Complexity	Low	Mid	Low	Low	Low
Buyers exposure	To spread compressions	To captured price based on seller's operation	To captured price based on sellers custom shape	To captured price based on fixed block	To Captured price + spread compressions (negatively correlated)
Rationale	Simplified access to arbitrage	Physical delivery in shifted profile (GCs!)	No volume risk, pre-agreed shape	Increase capture rate (midday valley + evening peak)	Benefit from spread, profit from volatility



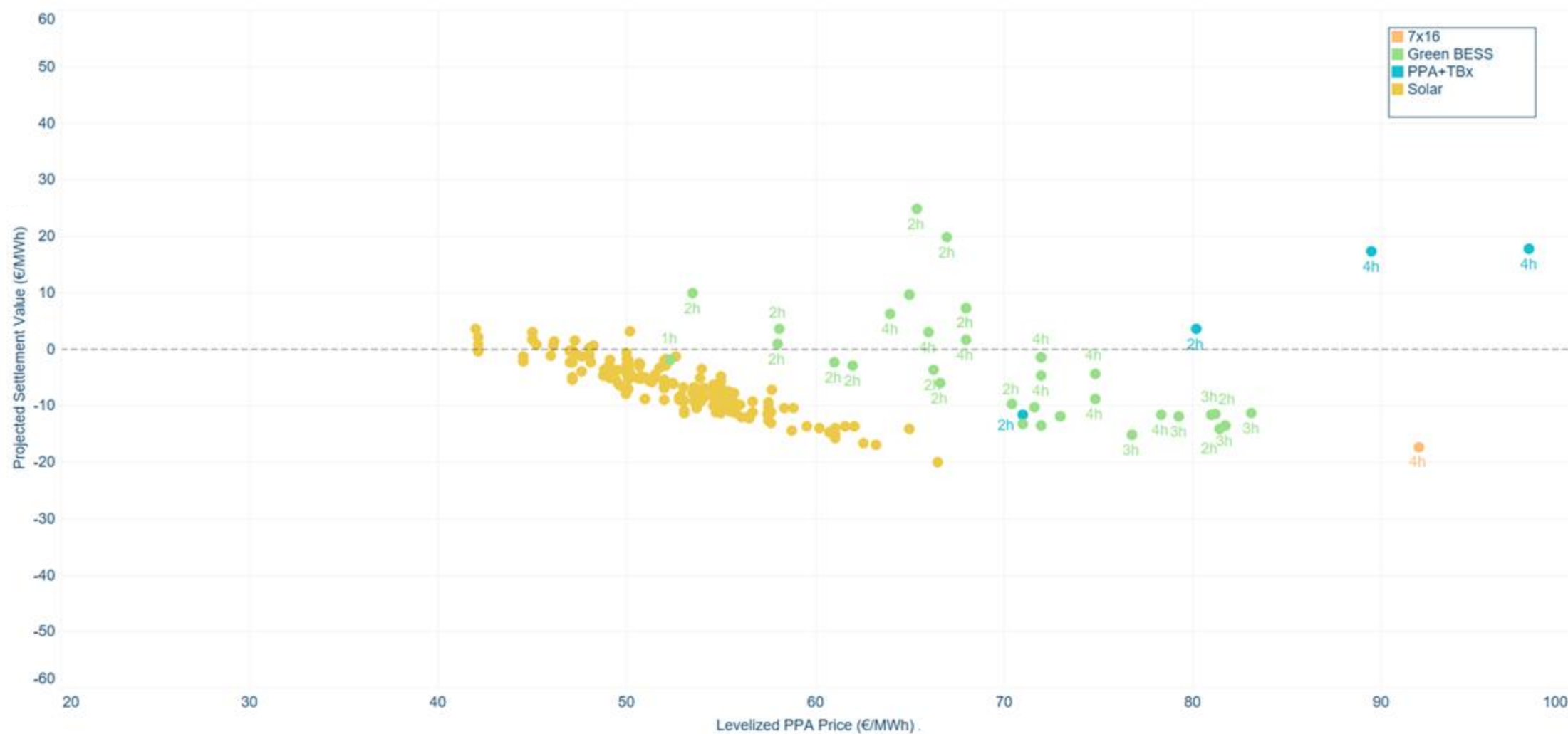


# How to value different settlement structures

# How can buyers value hybrid structures?



# How can buyers value hybrid structures?





# Key takeaways and call for action



**It's a buyers market but it can be scary**  
Price cannibalisation, PSV drops, and negative prices have increased uncertainty



**From Fear to Solutions**  
The market now has clear mechanisms to address negative prices and capture rate risks



**Hybrid & Storage simplified structures**  
Energy storage is becoming the key enabler to stabilise prices and optimise procurement performance



**When you're ready, the market is ready!**  
The supply side is ready, contracting structures are being defined and the marketplace helps you get the best offers





Thank you!



# Contact Us

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