

What business models to sell solar PV energy? The PPA case





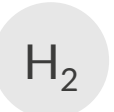


OFATE/DFBEW presentation

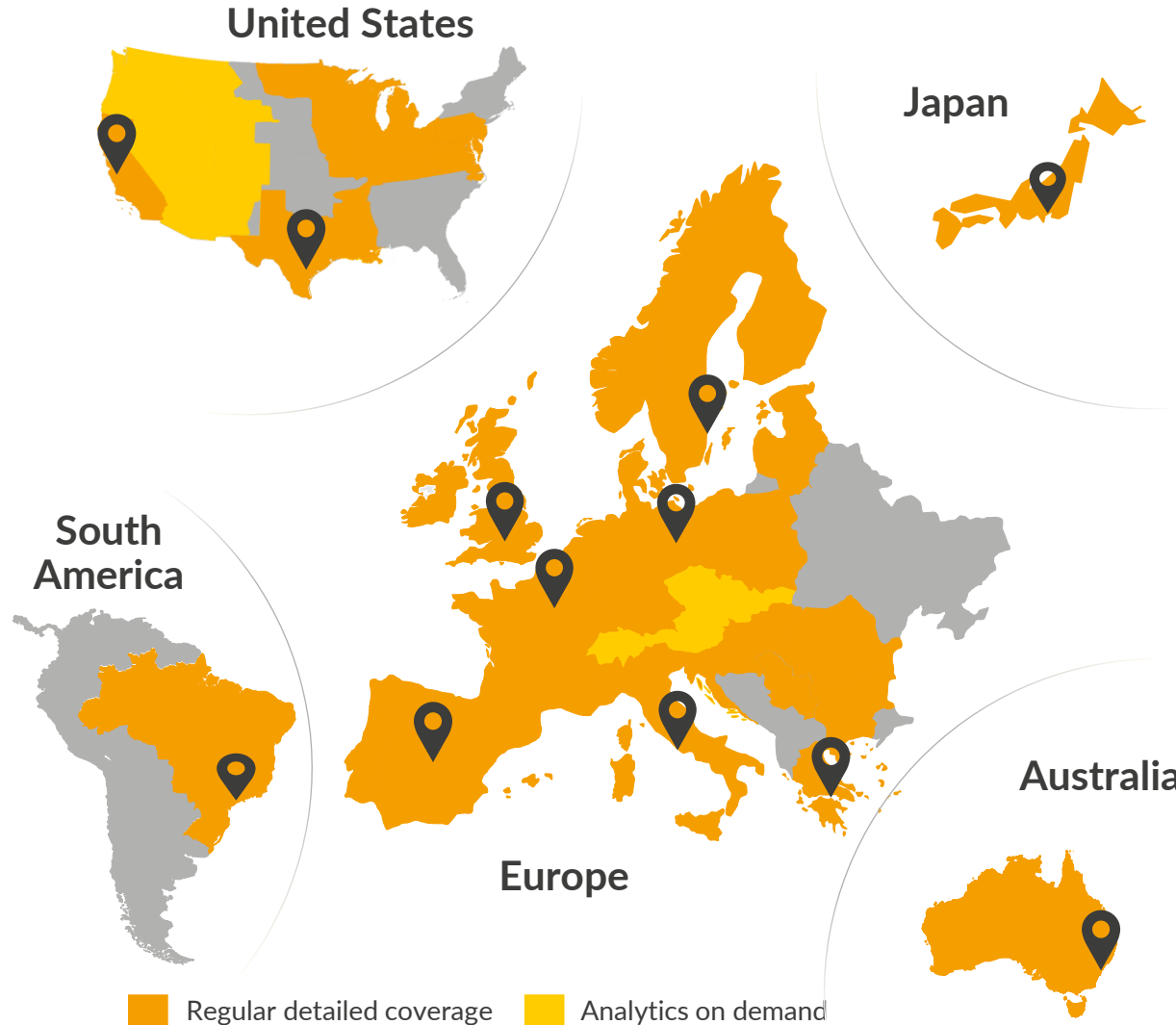
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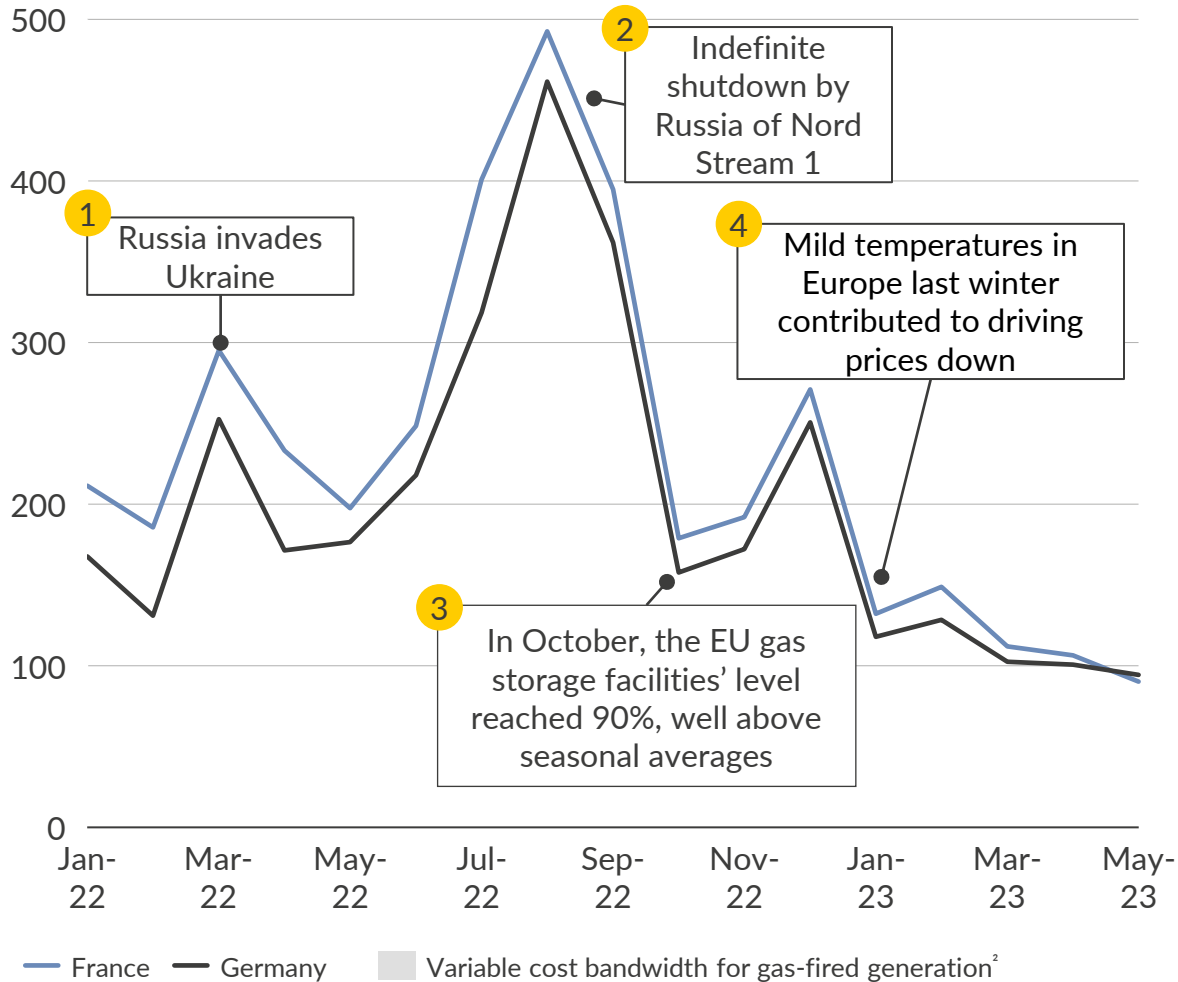


120+

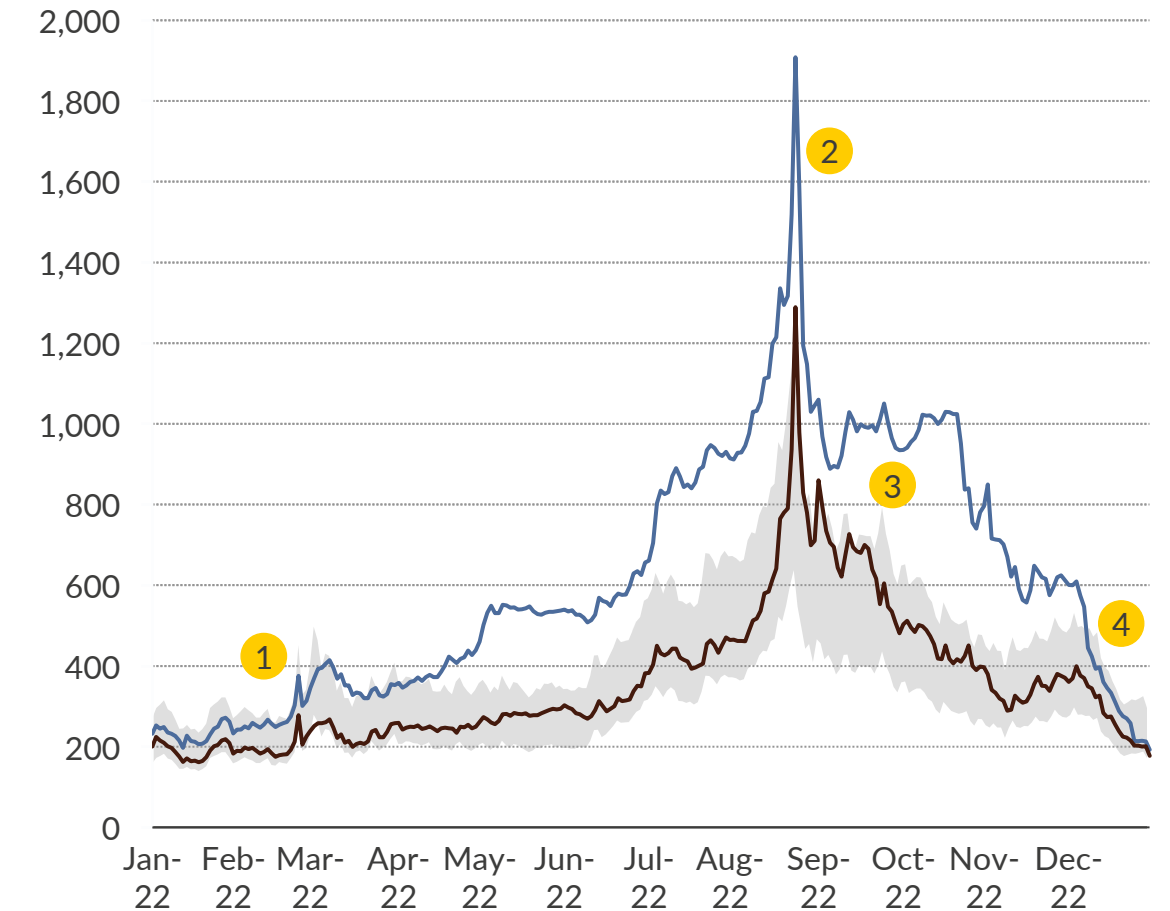
transactions supported in 2021

Power prices in Europe have decreased significantly from their peak in 2022 and are currently below the level prior to Russian invasion

Average monthly electricity prices for France and Germany¹
 €/MWh-e (nominal)



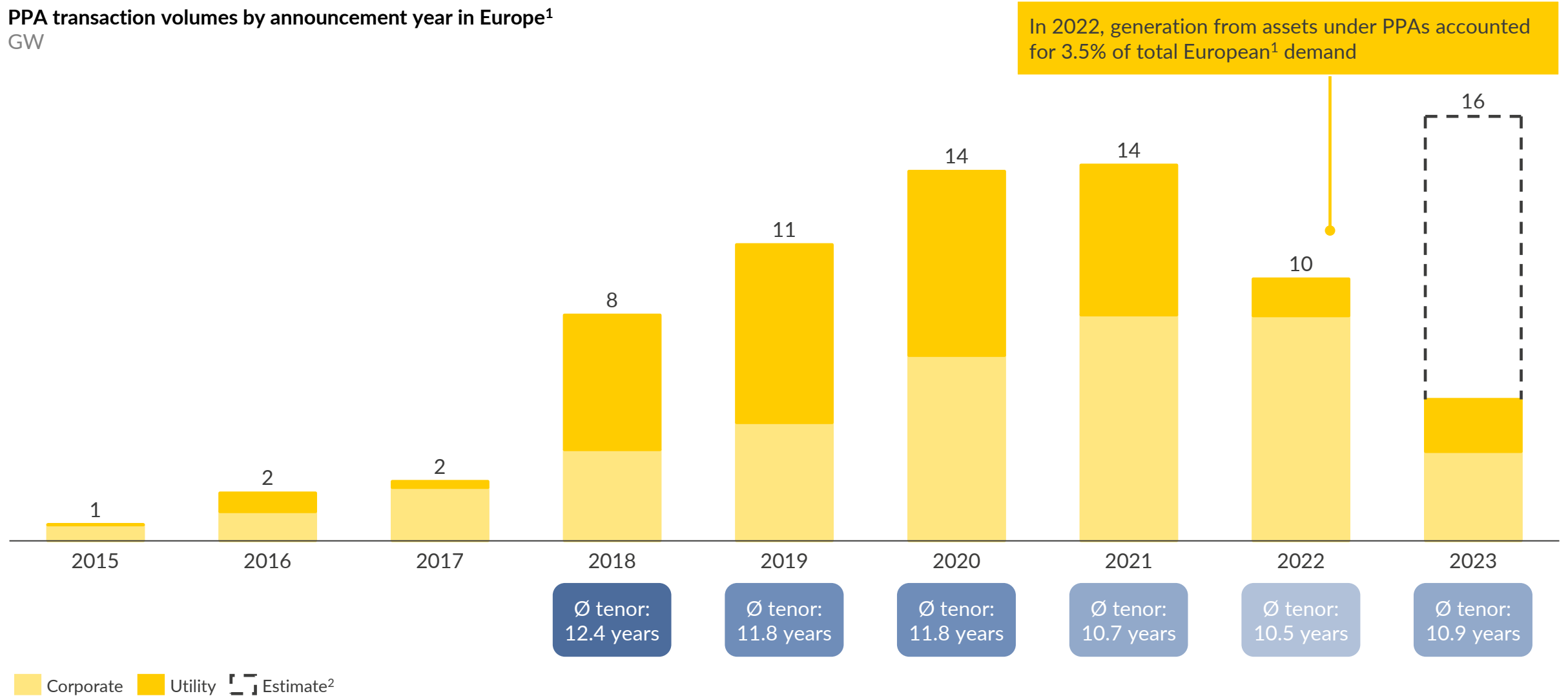
Futures prices for Q1 2023
 EUR/MWh (nominal)



1) Monthly average of daily day-ahead prices as of 16 May 2023. 2) Calculated based on the Q1 Dutch TTF future prices based on an efficiency ranging from 30% to 56%, emission intensity of 0.4 tCO₂/MWh and average carbon price of 80 EUR/tCO₂

After a slowdown in 2022, we expect PPA transaction volumes to reach new a new high in 2023

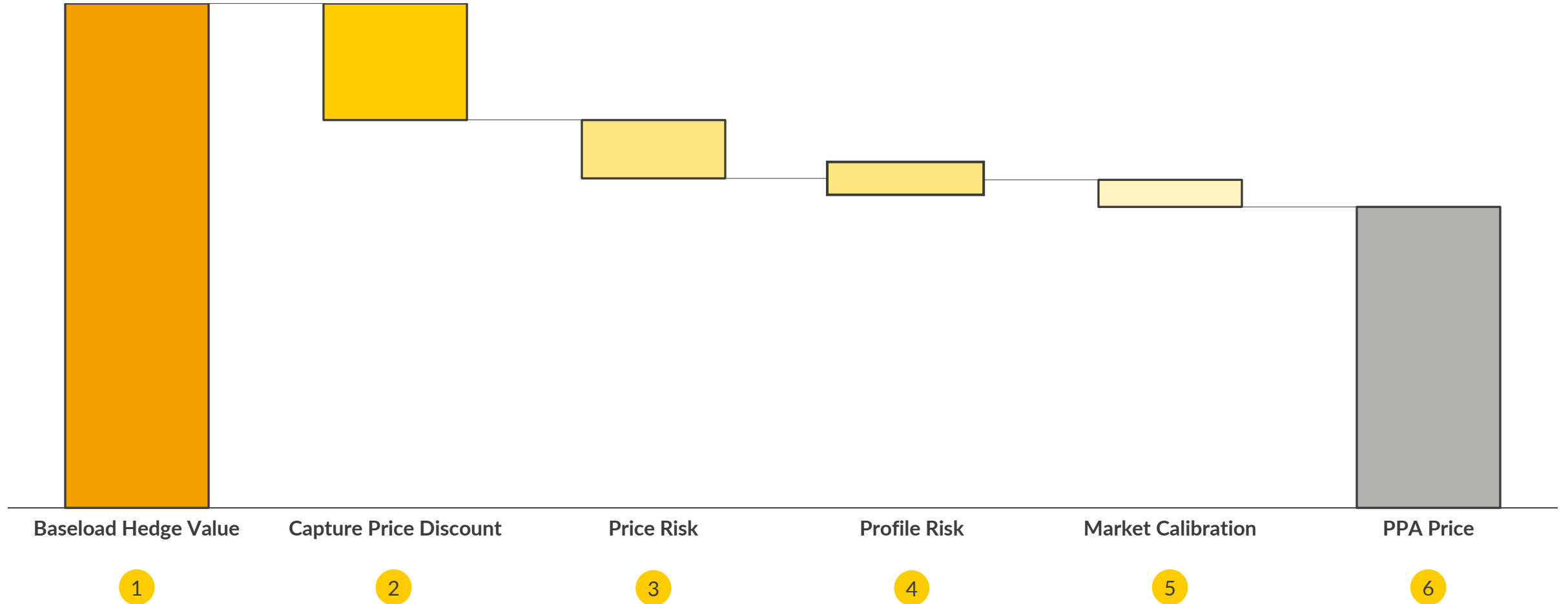
PPA transaction volumes by announcement year in Europe¹
GW



1) Includes EU-27 countries, UK, Norway and Switzerland. Undisclosed data points were calculated based on internal assumptions in line with Aurora's central scenarios from April 2023. 2) Estimate based on extrapolation from Q1 2023.

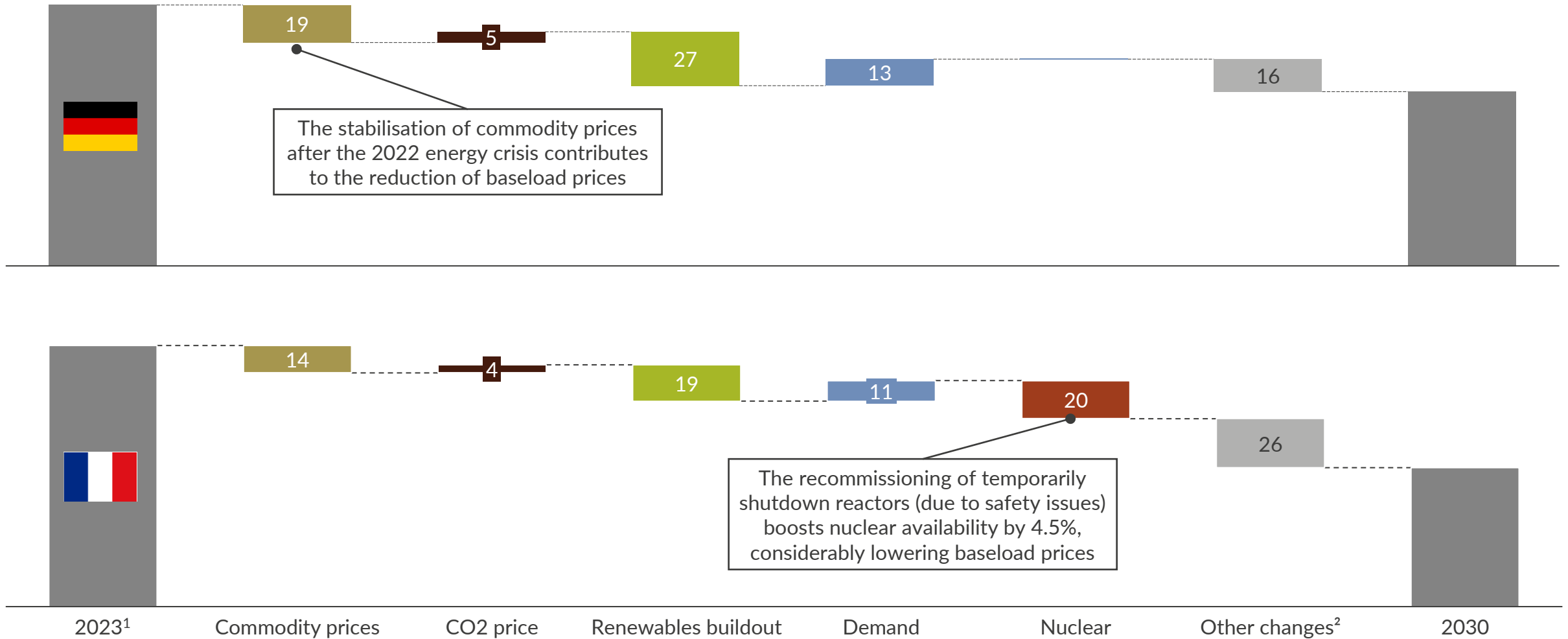
Starting point of a PPA valuation is the value of the baseload hedge, adjusted by different risk and cost components

PPA Price Calculation: waterfall components
€/MWh (real 2022)



French and German 2030 baseload prices are impacted by key factors with different magnitude, nuclear recovery pushes prices significantly down in France

Decomposition of drivers of power price 2023 to 2060
€/MWh (real 2022)

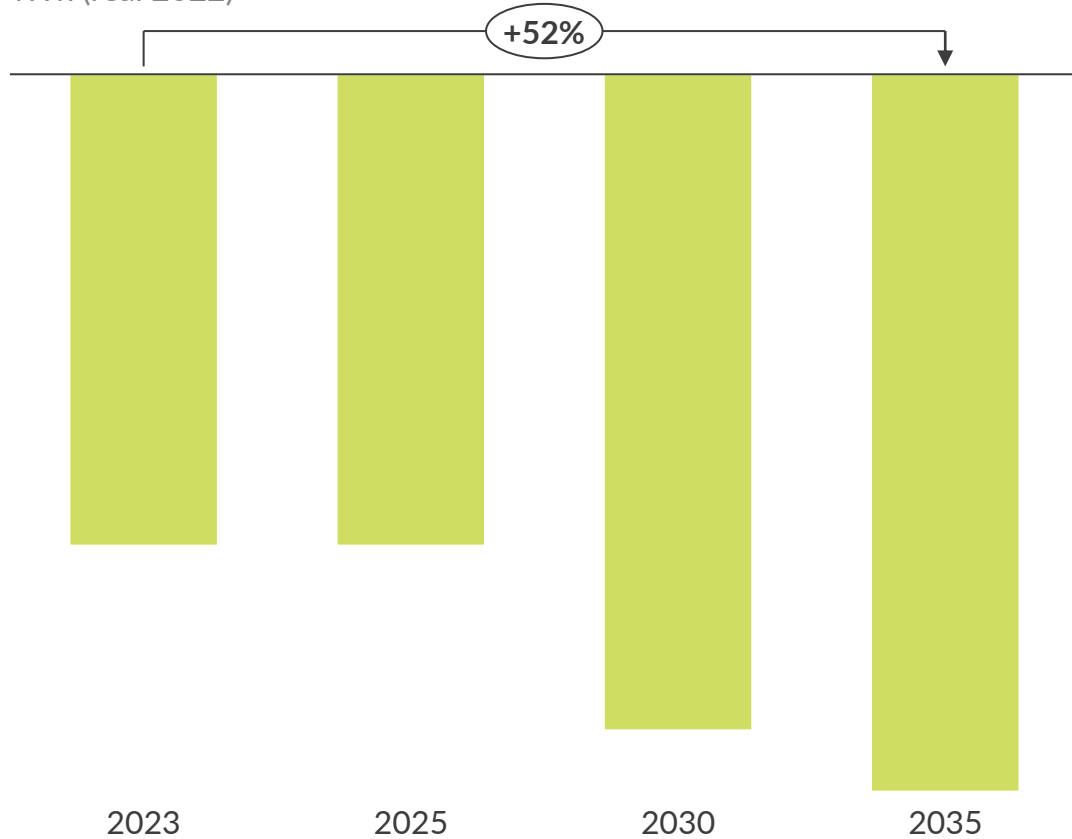


1) Prices for 2023 and 2030 are from model results of Aurora's Central scenario; 2) The 'Other' category includes changes to all other variables as well as interaction effects between the variables displayed here. Notable other variables in this category include interconnection capacity and changes in neighbouring countries.

While capture price discount is one of the key reductions to consider in the valuation of a PPA, the profile risk remains low on 10 years of solar production

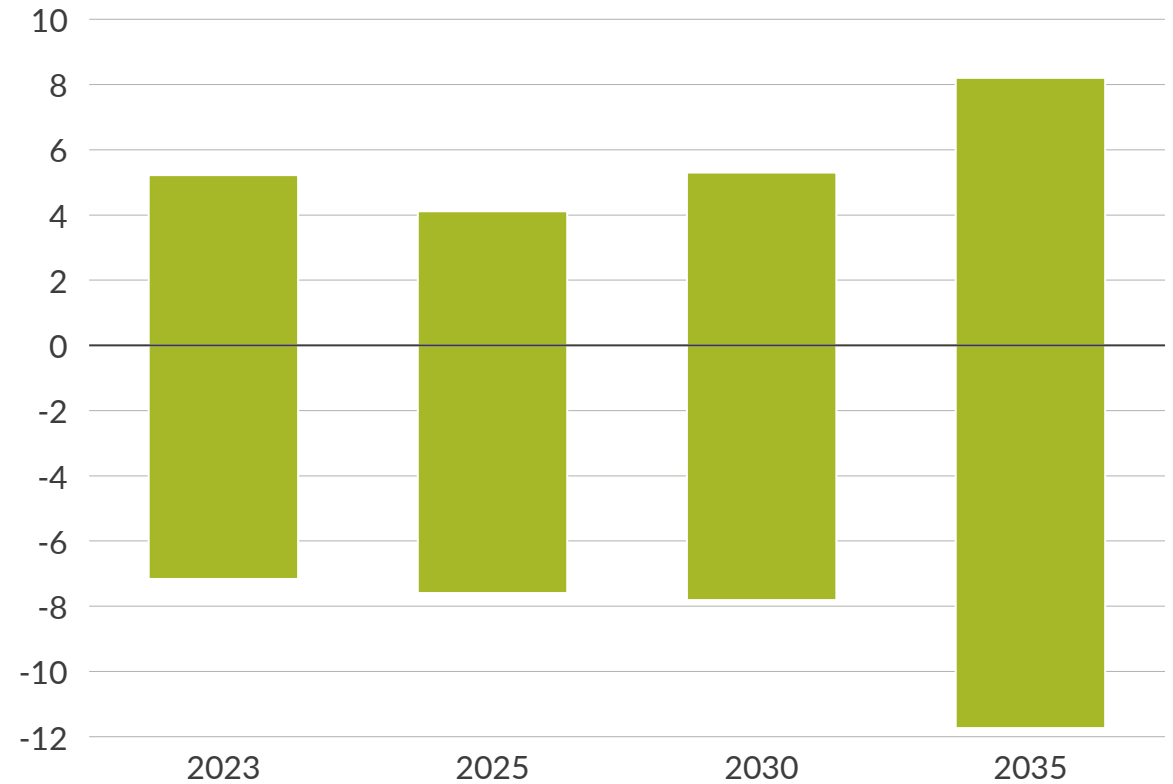
2 Capture price discount

German solar capture price discount to baseload
€/MWh (real 2022)



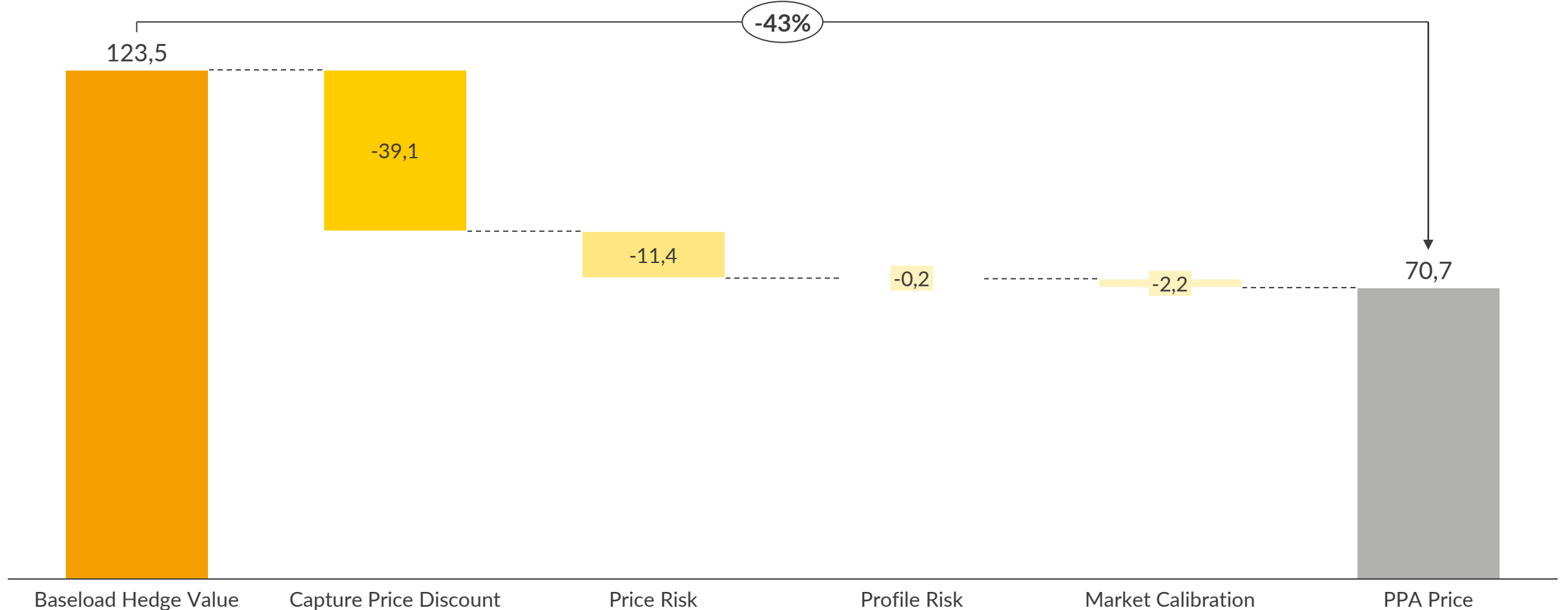
4 Profile risk

German solar capture price variance due to volume risk
%



A German solar pay as produced PPA commencing in 2024 is priced at a 43% discount from the baseload hedge value

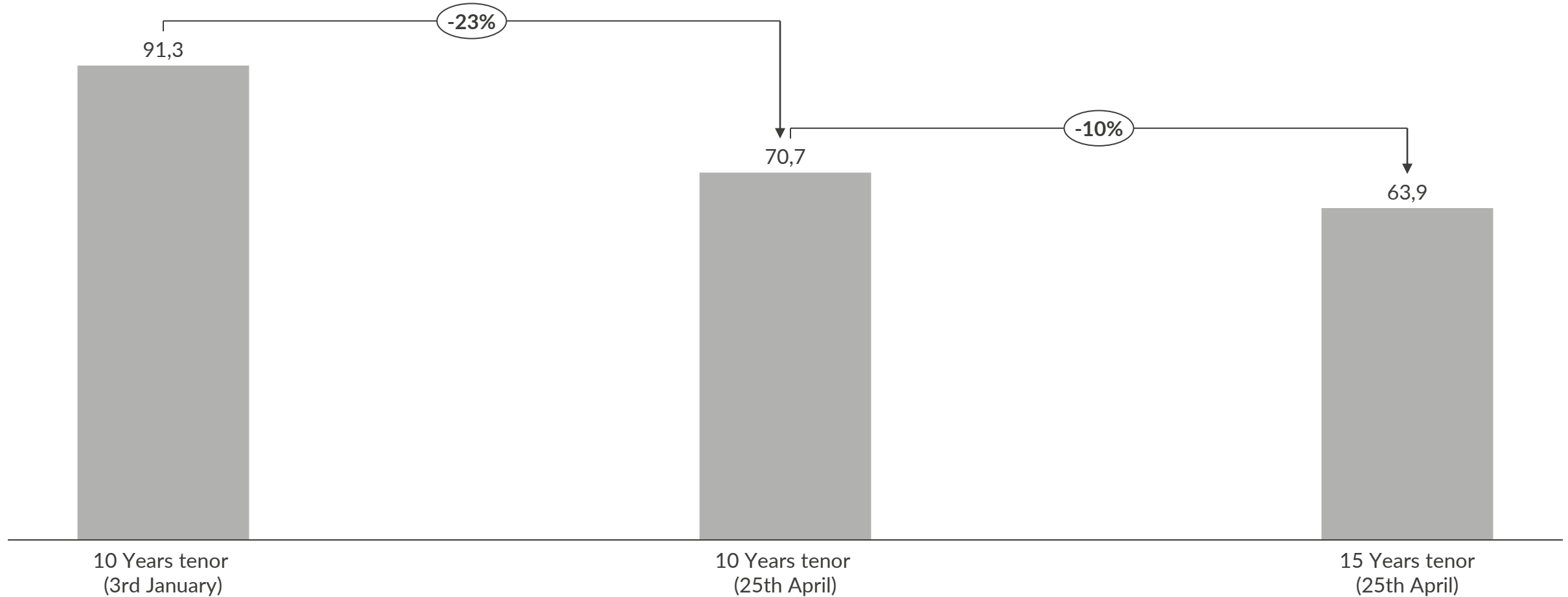
German 10 year solar pay-as-produced PPA commencing January 1 2024¹
€/MWh (nominal)



1) Trading day as of 25 April 2022.

The price of a German solar pay-as-produced PPA has decreased by 23% since the beginning of the year

German solar pay-as-produced PPA – COD 2024
€/MWh (nominal)



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As a result of past developments, the European Commission proposes a legislative revision to EU power markets, based on three major areas



Focus of today

Promoting long-term markets

For producers

- Pushing two-way CfDs as direct price support scheme for new renewables

For producers/consumers

- Strengthening PPAs by incentivising the combination with CfDs and providing state backing for PPA offtake
- Strengthening long-term hedging by ensuring appropriate strategies for suppliers and establishing a virtual cross-country trading hub



Promoting flexibility

Improve wholesale markets

- Reducing time between gate closure of intraday markets and power delivery
- Lowering minimum bid size

Flexibility support

- Better incorporating flexibility in capacity markets, or establishing direct flexibility support schemes

Peak shaving

- Subsidising demand response with new peak shaving product



Securing consumer protection

Improve consumer options

- Ensuring that more than one supplier is always available to consumers

Peer-to-peer trading

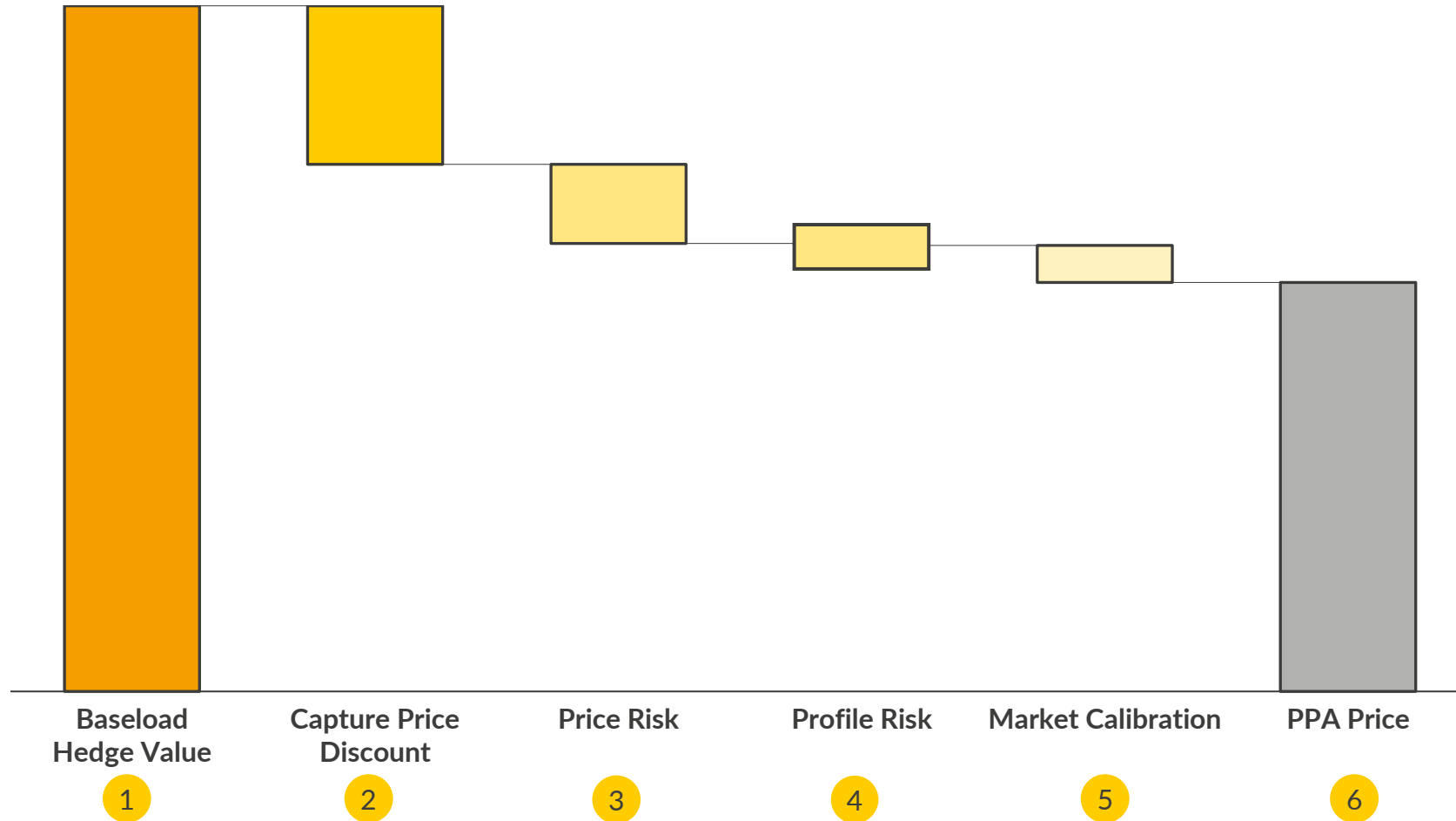
- Ensuring that consumers have the right to share electricity with other consumers

Security of long-term supply

- Ensuring that consumers have the right to multiple tariffs and a right to both a fixed price, a fixed term and a flexible tariff
- Obliging Member States to appoint a supplier of last resort to protect customers against failed suppliers

Starting point of the PPA valuation is the value of the baseload hedge, adjusted by different risk and cost components

PPA Price Calculation: waterfall components
EUR/MWh



Comments

- 1 Expected revenues from selling/ buying baseload futures following stack and roll strategy, incl. rolling losses
- 2 Difference in value of asset specific generation profile vs. baseload profile
- 3 Risk discount reflecting uncertainty in BL price realisation. Offtaker chooses confidence level $P(X) > 50$
- 4 Risk discount reflecting uncertainty in realised production and capture prices
- 5 Risk discount reflecting other risk factors not explicitly priced into risk factors above, calibrated with market price quotes
- 6 PPA Price result

note: balancing and GoO costs may be added dependent on contract specifications