

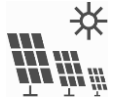


Strompreise und Marktwerte: Was braucht man für PPA?

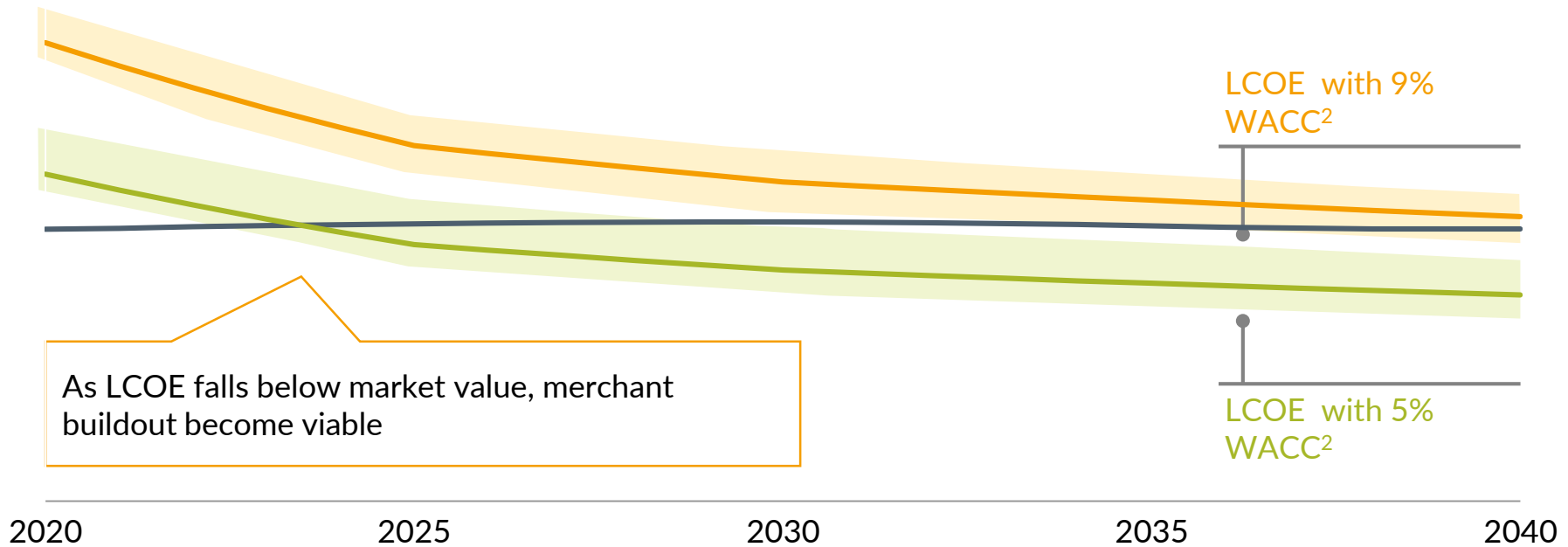
Spreewindtage, 6 November 2019

As technology cost fall and price increase, renewables can be build without direct subsidies

— Market value



Levelized cost of electricity (LCOE) and average market value¹, for utility-scale solar PV in Germany, EUR/MWh, real 2018



As LCOE falls below market value, merchant buildout become viable

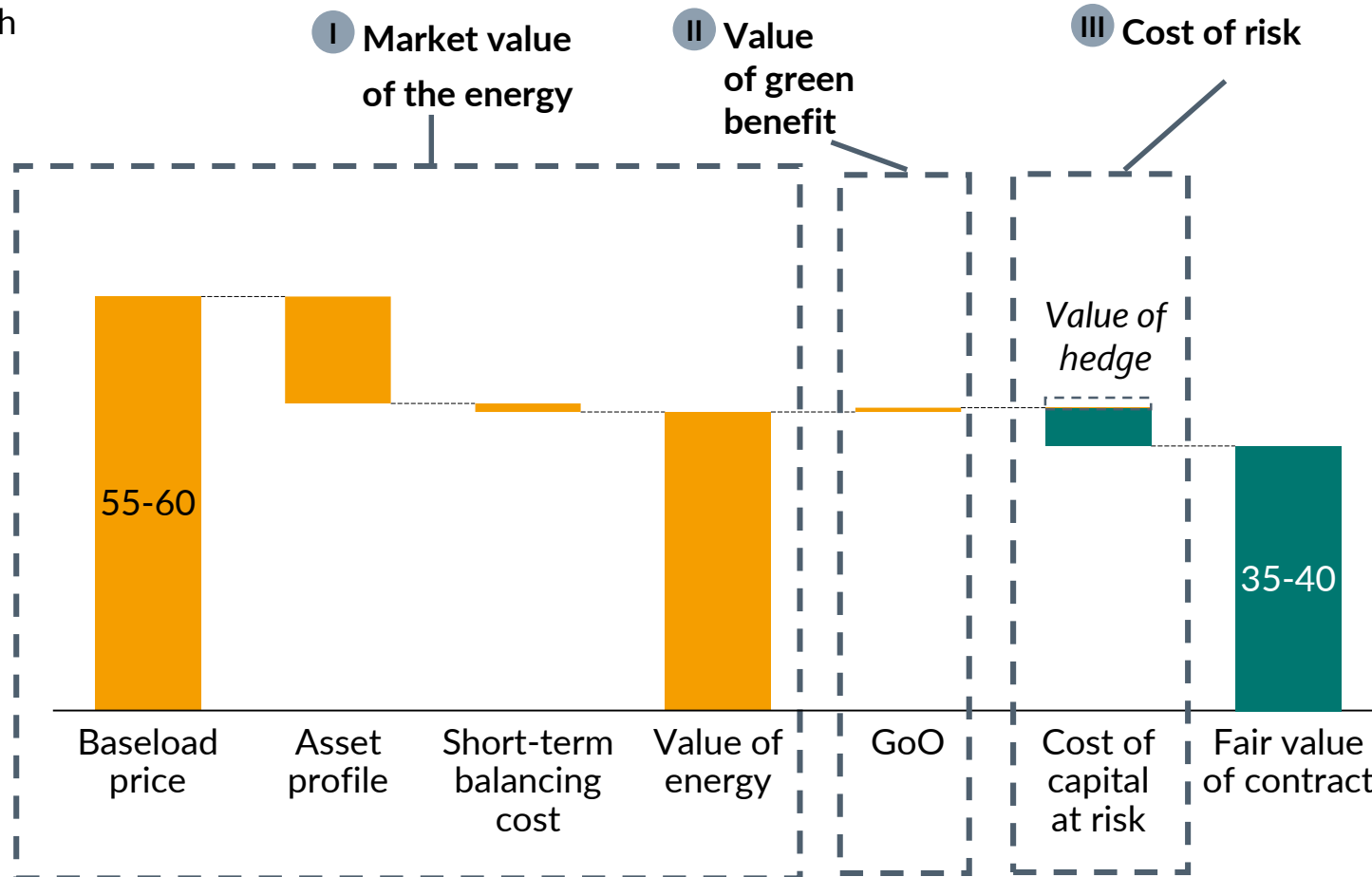
1) Rolling average over lifetime of a PV park. The lifetime is assumed to be 30 years. 2) Weighted average cost of capital

The fair value of a PPA is driven market value of power, the green benefit and the cost of capital at risk



Fair PPA value for a 15 year contract starting 2022,

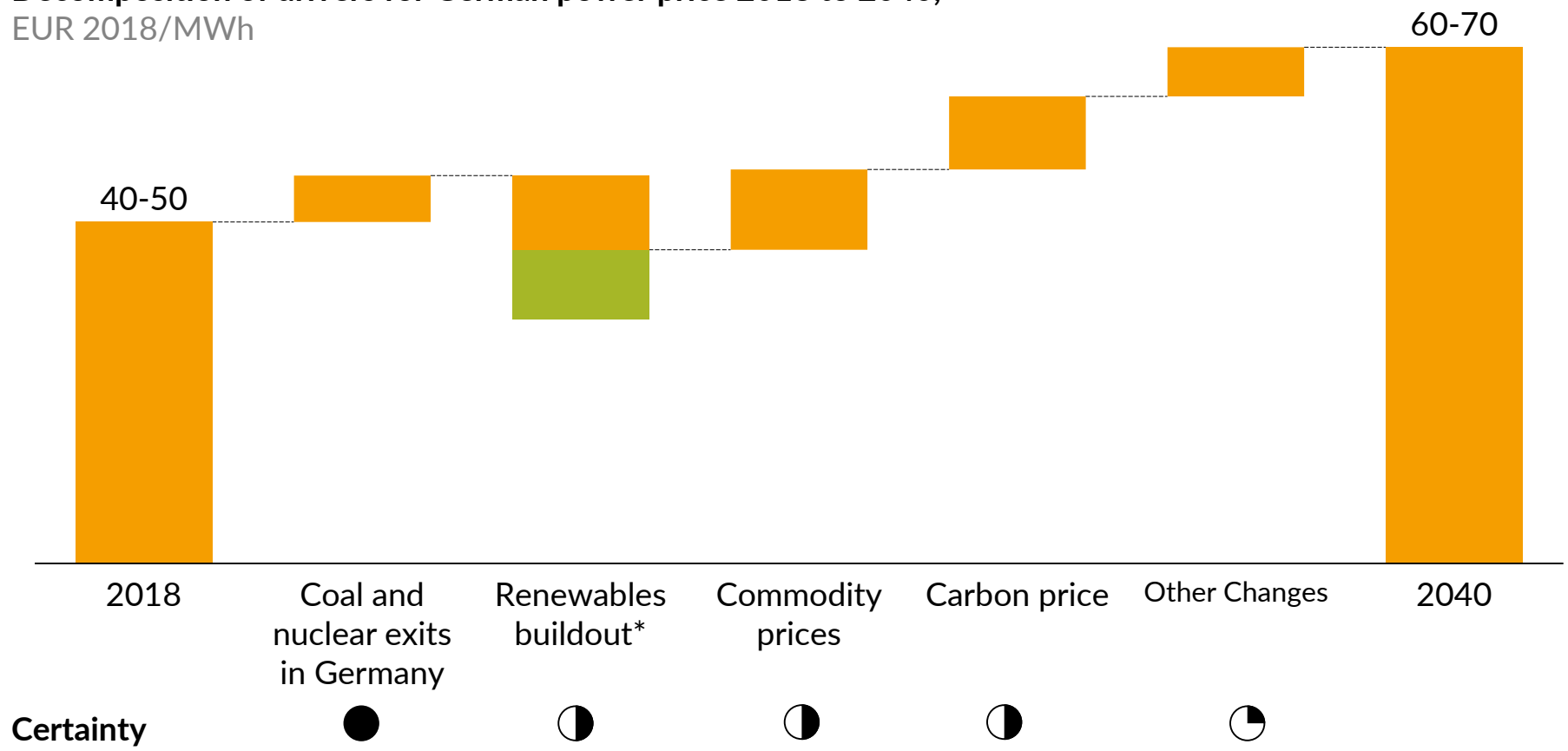
EUR/MWh



As the impact of exiting thermal capacity is cancelled out by RES buildout, fuel prices are pushing power prices up



Decomposition of drivers for German power price 2018 to 2040, EUR 2018/MWh

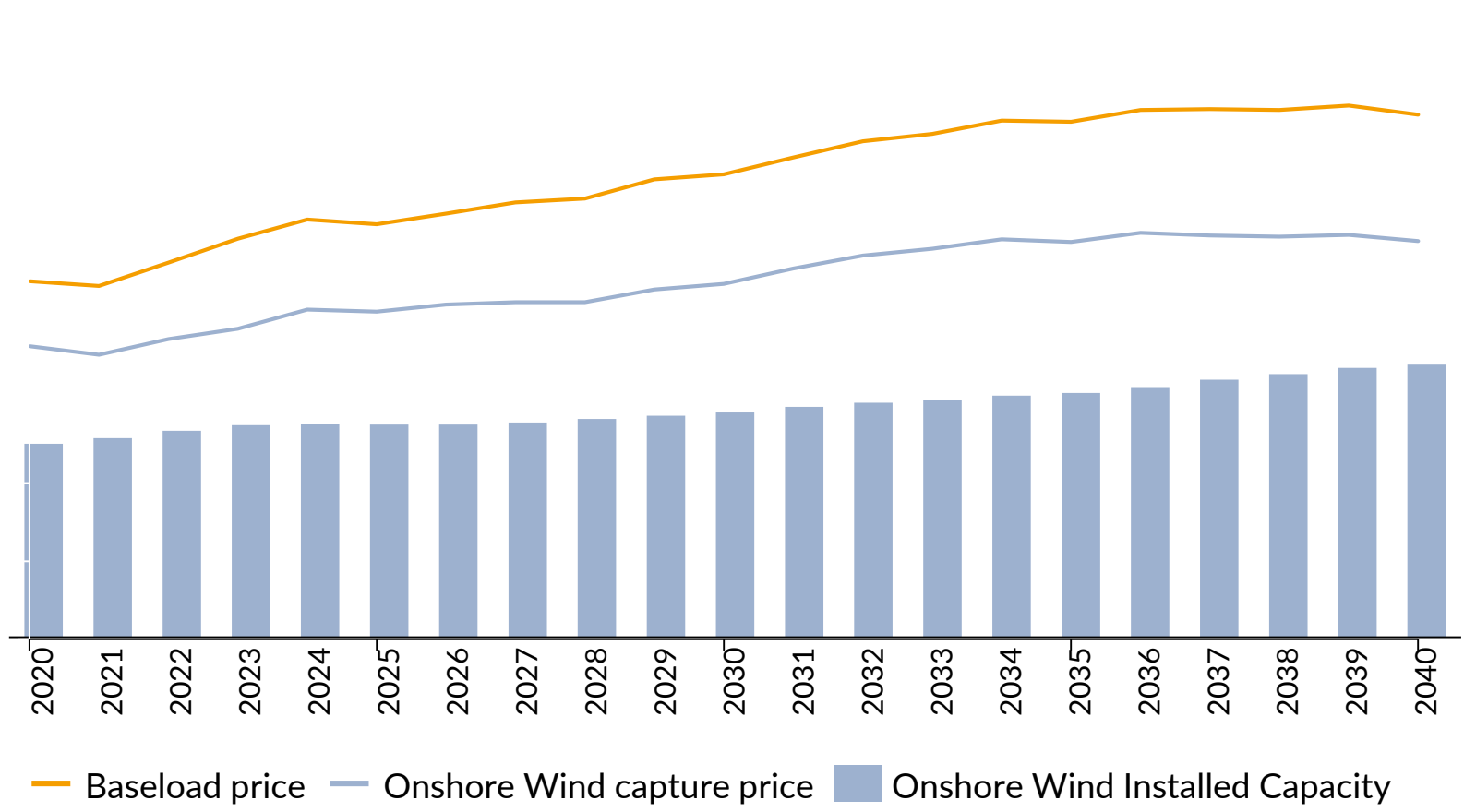


* We assume that neither subsidized nor merchant-risk renewables enter the market after 2018.

The onshore wind capture price discount is expected to increase from 18% in 2020 to 24% in 2040

Power and capture price,
EUR/MWh (real 2018)

Installed onshore wind capacity
GW

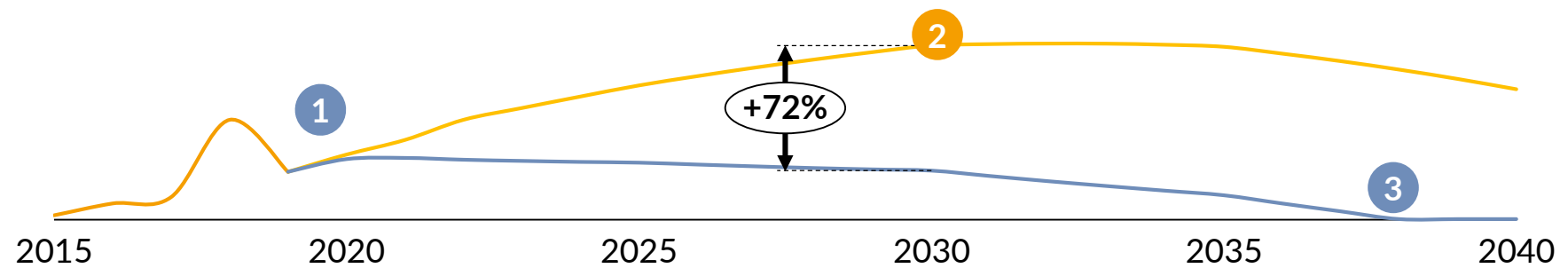


Guarantees of Origin (GoOs) could increase the value of renewable electricity substantially in 2030



GoO price scenarios¹
Average EUR/MWh/yr
(real, 2018)

— Historic
— Optimistic
— Conservative



1
Prices peaked in 2018 and continue to fall as supply far exceeds demand

2
Prices peak in 2030, driven by environmental awareness and corporate ambitions

3
Increasing renewables build surpasses demand beyond 2038, leading to near-zero prices

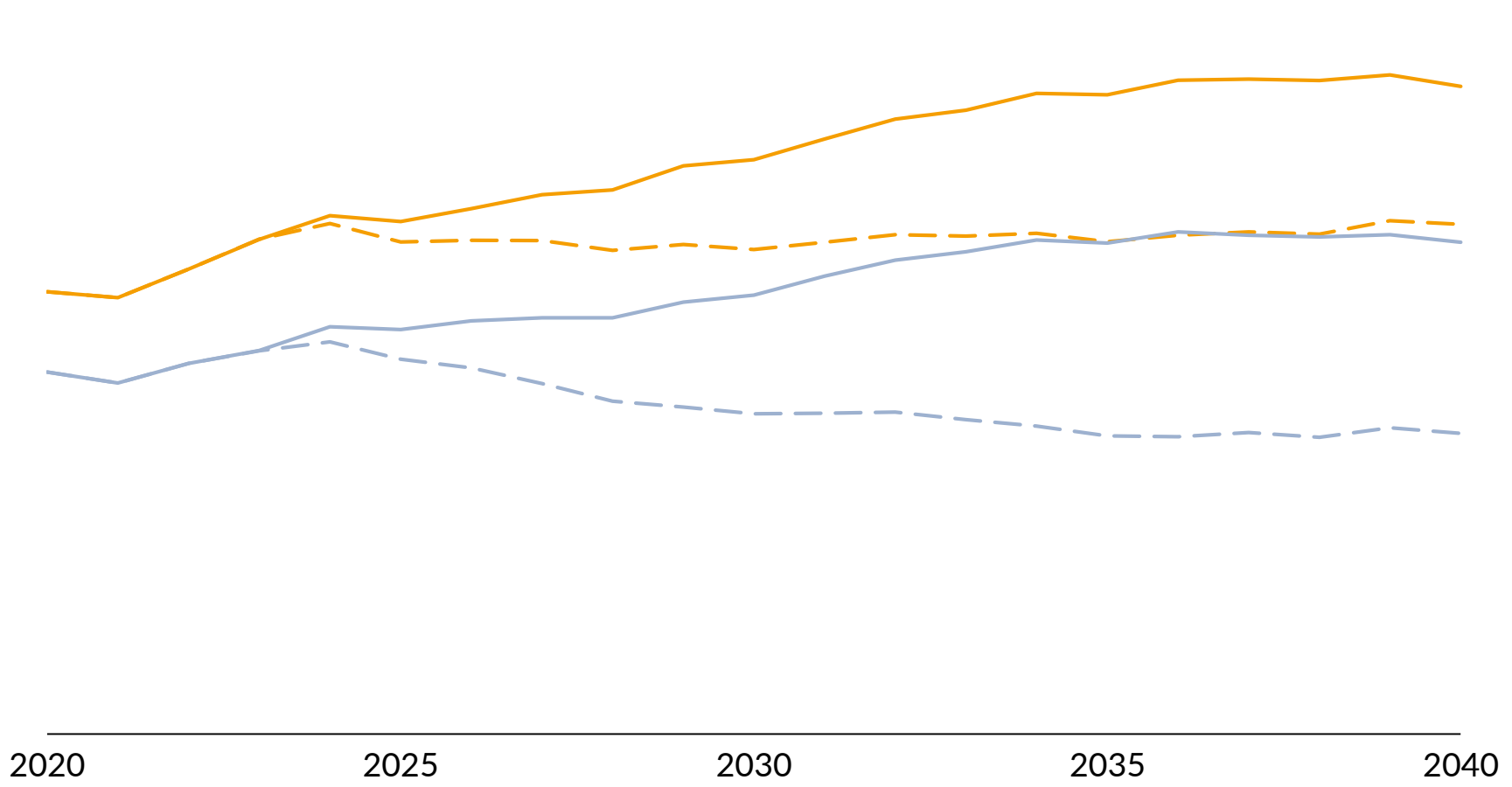
1) The forecasted price represents an EU wide benchmark price for GoOs which is currently represented by Nordic hydro GoOs.

Capture prices for wind onshore fall by 41% in 2040 relative to the baseload in a P90 65% RES scenario

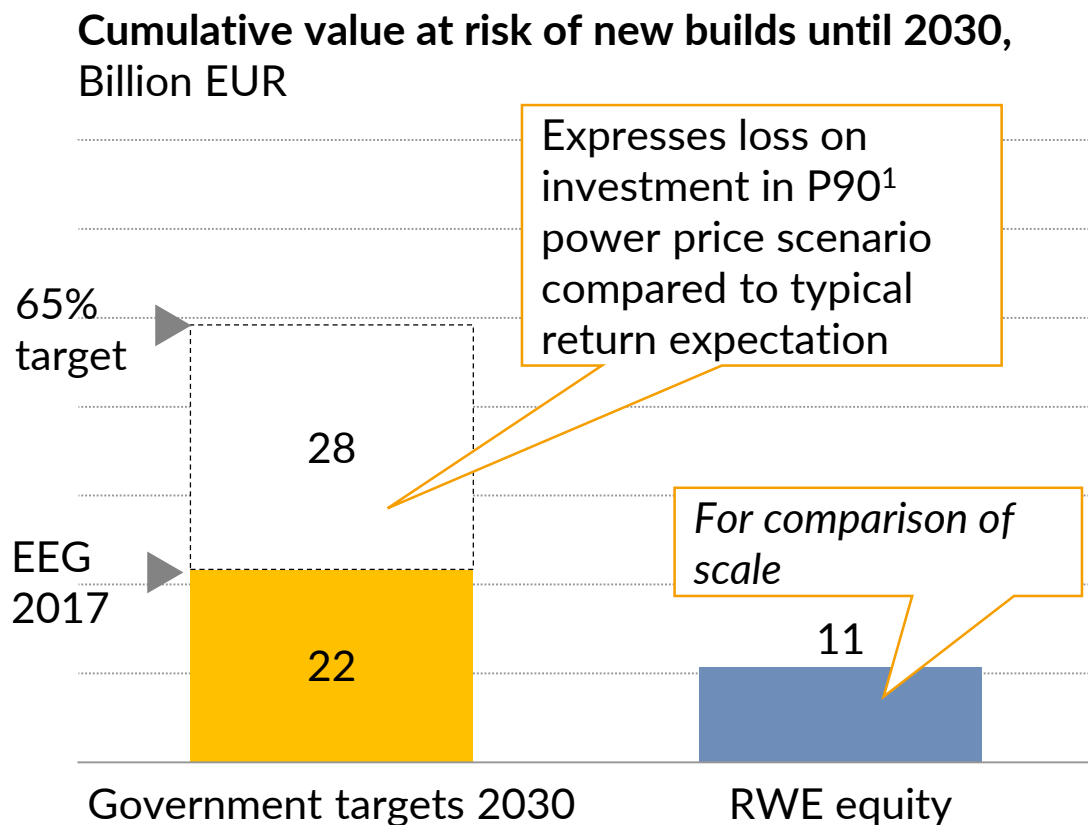


Evolution of power & capture prices 2020-2040
EUR/MWh (real 2018)

- Central baseload
- P90 baseload
- Central wind onshore
- P90 wind onshore



Who is best suited to carry the investment risk?



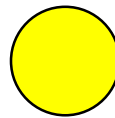
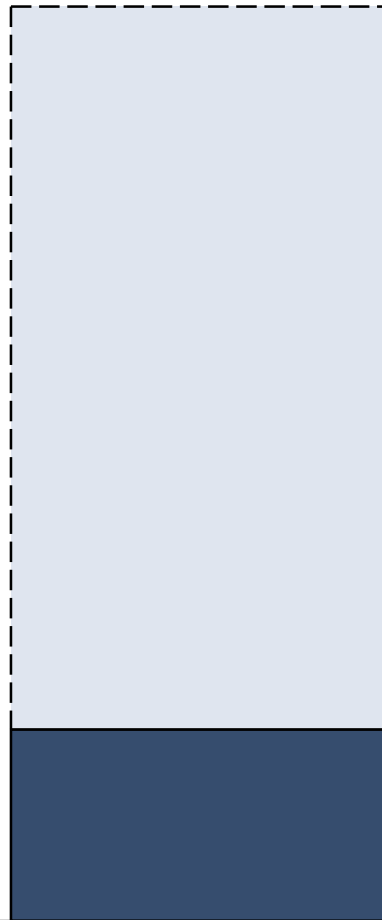
Potential parties able to carry risk	indicative WACC ²
▶ EEG – State guaranteed	3-5%
▶ Corporate PPA	6-8%
▶ Utility PPA	6-8%
▶ Pure equity asset (full merchant risk)	9-12%

Germany offers > 34 GW of new build PPA supply potential

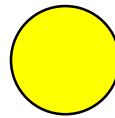
Germany PPA supply potential in 2030

■ Post EEG ■ Other new build

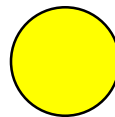
● <40% ● Roughly 40%-60% ● >60%



Mainly post 2024 as competition has driven down auction results



Mainly large scale >10 MW parks



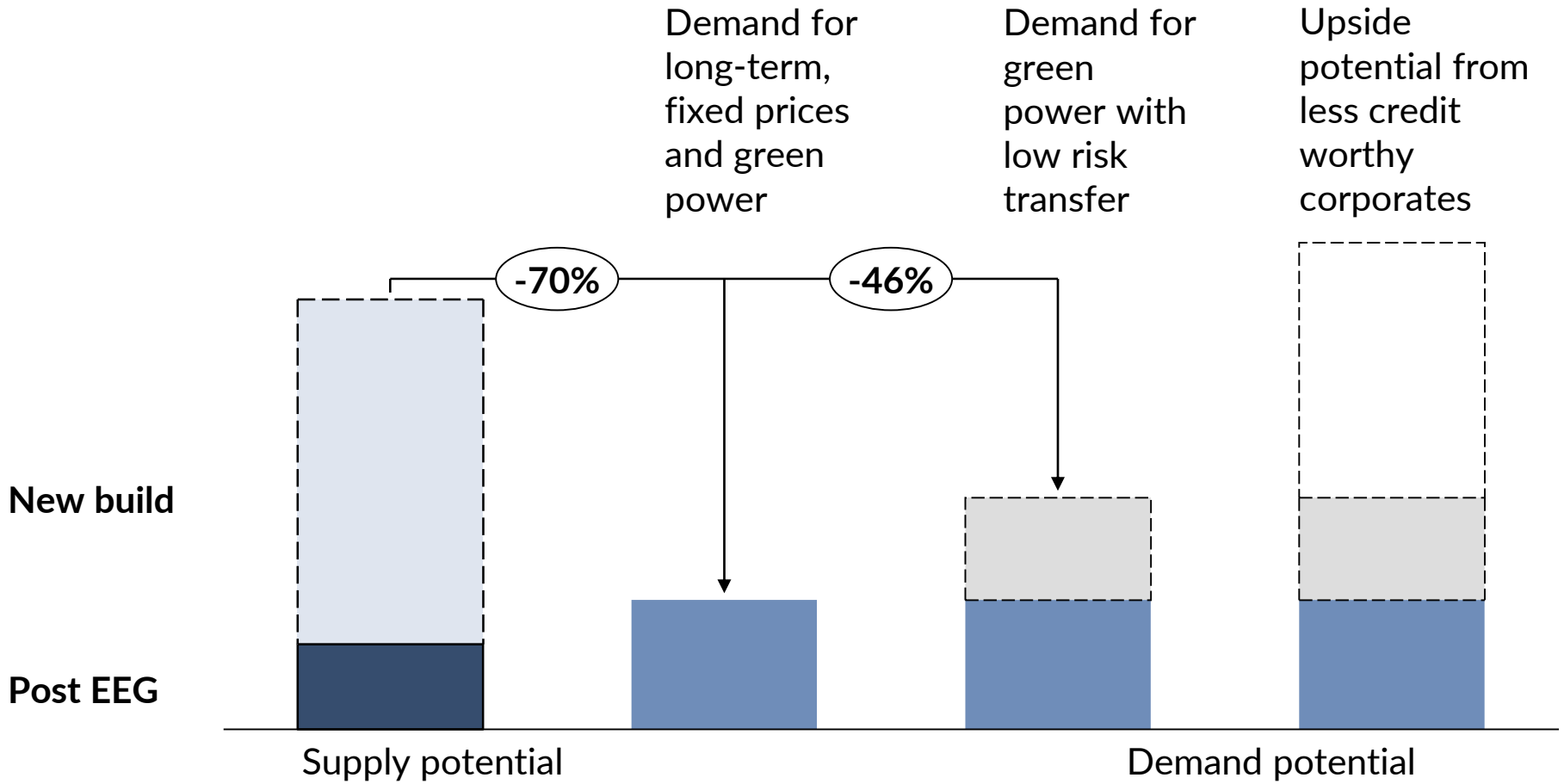
Mainly post EEG assets

- 12 GW until 2025
- 9 GW until 2030

Auction under subscribed due to licencing / area constraints

The German PPA market is likely to remain a buyers market

2030 snapshot comparison of demand and supply potential, TWh



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