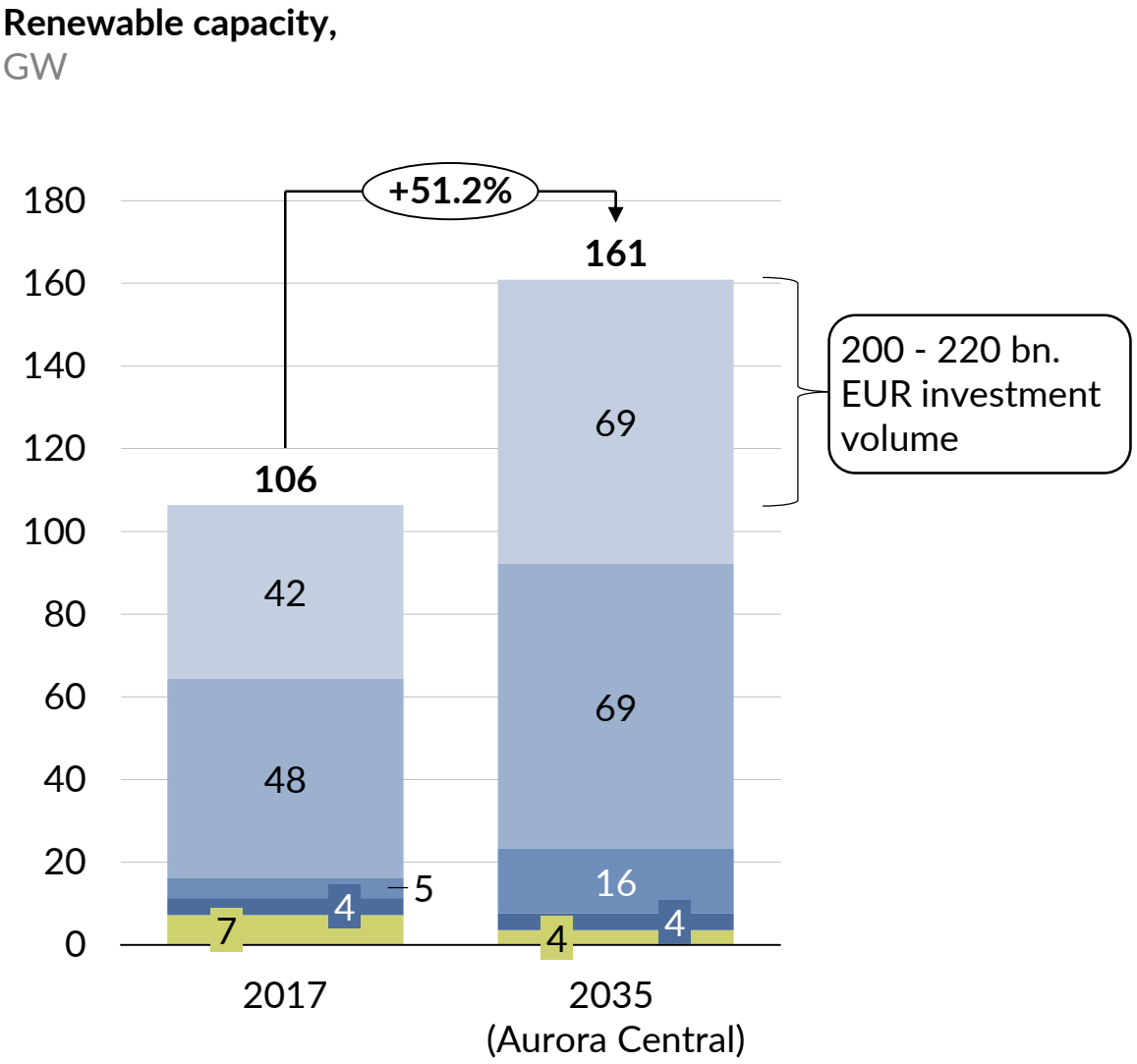
AURORA ENERGY RESEARCH

# Managing merchant risk in renewables

Study extract – March 2018

# For a successful Energiewende, massive investment in renewables is required

**Renewable capacity,**
GW

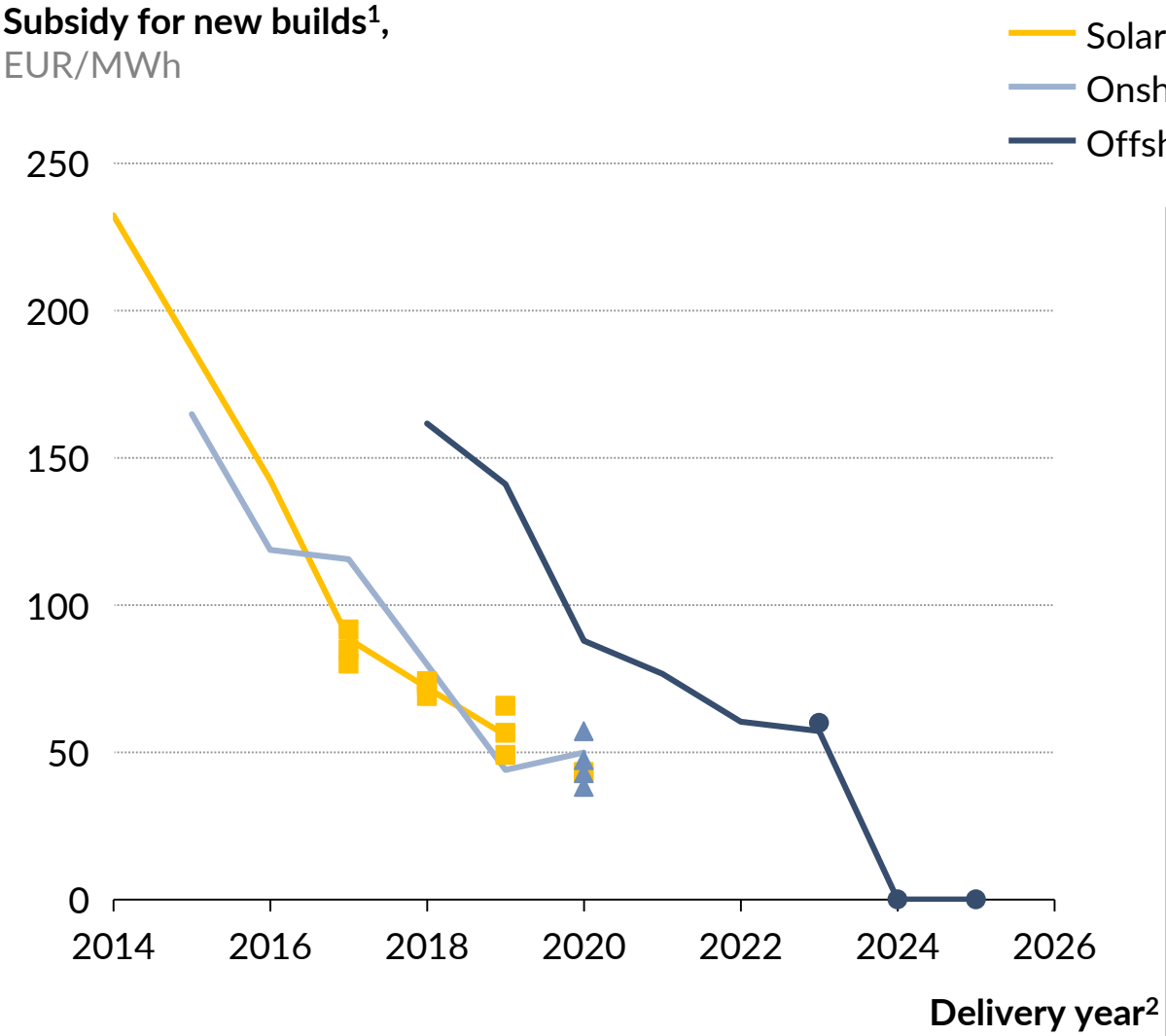



- To reach targets of the Energiewende, 85 GW RES capacity has to be built by 2035
- Besides capacity additions, ageing installations have to be replaced or repowered
- This constitutes the main investment opportunity in German power market

Source: Aurora Energy Research, Bundesnetzagentur

# Merchant exposure to renewables is rising - subsidy free deployment is critical to realise targets

**Subsidy for new builds[1],**
EUR/MWh

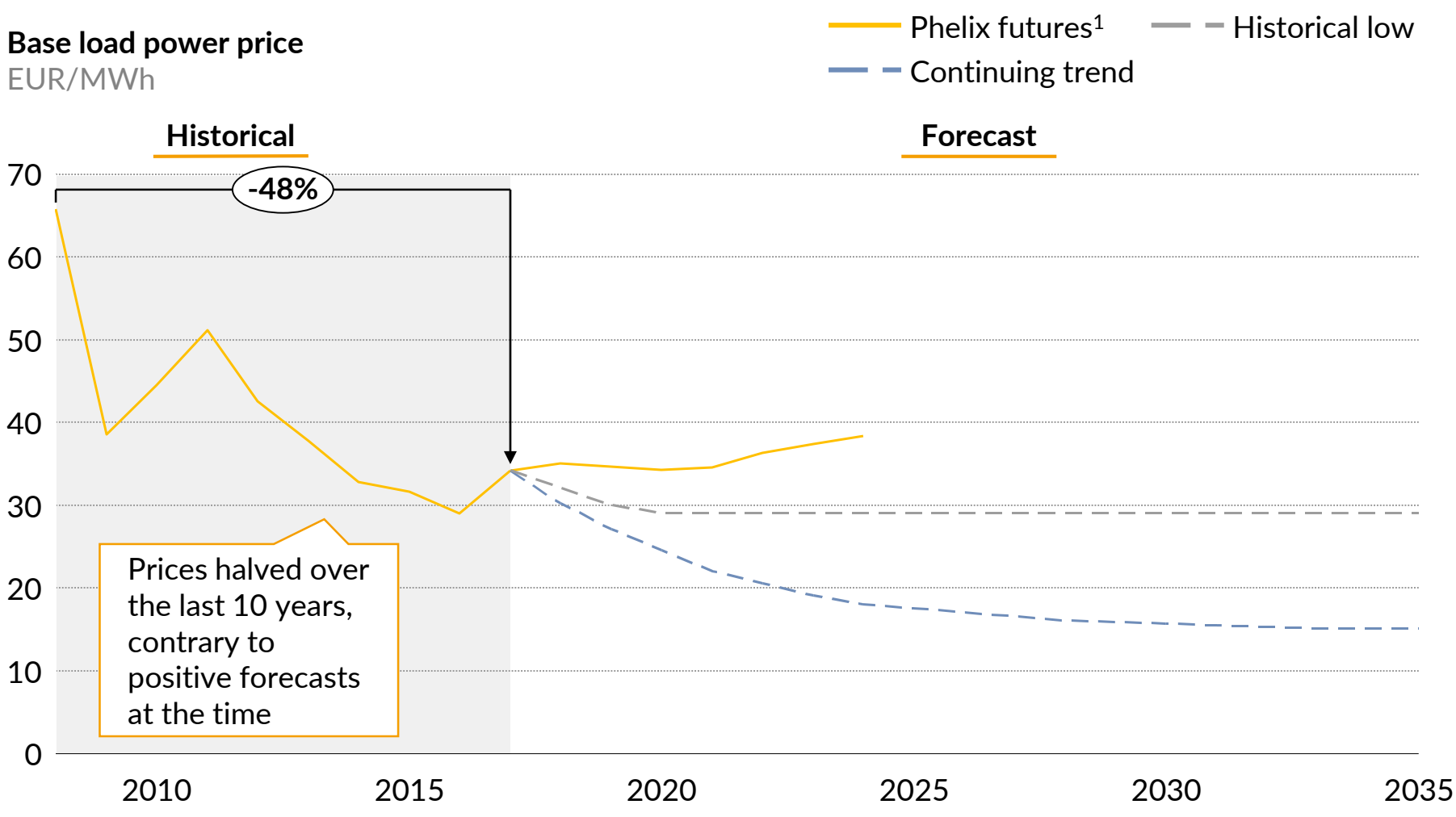



- Recent auction results indicate rising merchant exposure for renewables
- Politicians are also pushing for further reduction of RES subsidies
- Without market-driven renewables buildout and reduction of subsidies,
  - Risk of rising consumer bills rises further
  - Debate on levy and fee exemptions for energy heavy industry intensifies
  - subsidised share of capacity in power sector increases, leading to further market distortions

1) Developers bid for an "average location", paid subsidy is adjusted for local wind yield by correction factor. Most successful bids were at below average locations and will thus receive higher payments. 2) 2017 German onshore auctions gave special provisions to citizen energy projects, including a longer build-out deadline.

Source: Aurora Energy Research, Bundesnetzagentur

# After 10 years of falling power prices it is hard to build confidence in a realistic Worst Case Scenario

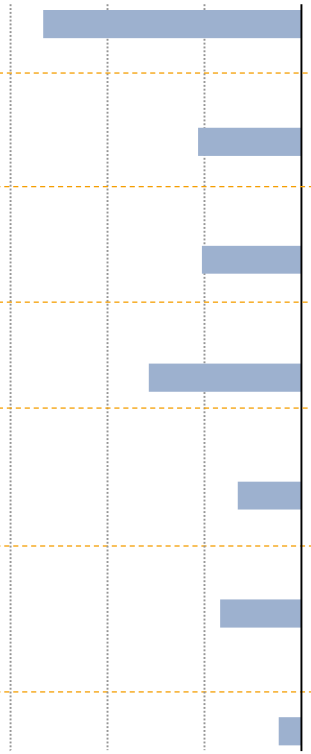



1) Prices from 23.02.2018, for 2018 average of quarter futures

Sources: Aurora Energy Research, EXAA

# Faster subsidised renewables buildout and low commodity prices are the two key risks to capture prices

| Risk | Potential driver | Likelihood | Impact on Onshore Wind capture prices in 2030[1)] EUR/MWh | Considered going forward |
|---|---|---|---|---|
| High gov. RES targets | Higher government renewable targets | ◑ | | ✓ |
| Fast Innovation | Faster cost decline of established solar & wind technologies | ◑ | | ✓ |
| Low $CO_2$ prices | Failure of EU ETS Phase 4 reform | ◔ | | ✓ |
| Low gas price | Due to continued underwhelming global demand | ◑ | | ✓ |
| Low coal prices | Decline of demand due to faster global decarbonisation | ◑ | | ✓ |
| Demand decline | Long term financial crisis or no electrification of transport and heat | ◔ | | Low likelihood |
| Future of coal | No mandated coal exit until 2040 | ◔ | | Low likelihood |



1) Absolute change in capture prices for 10% change in input assumption

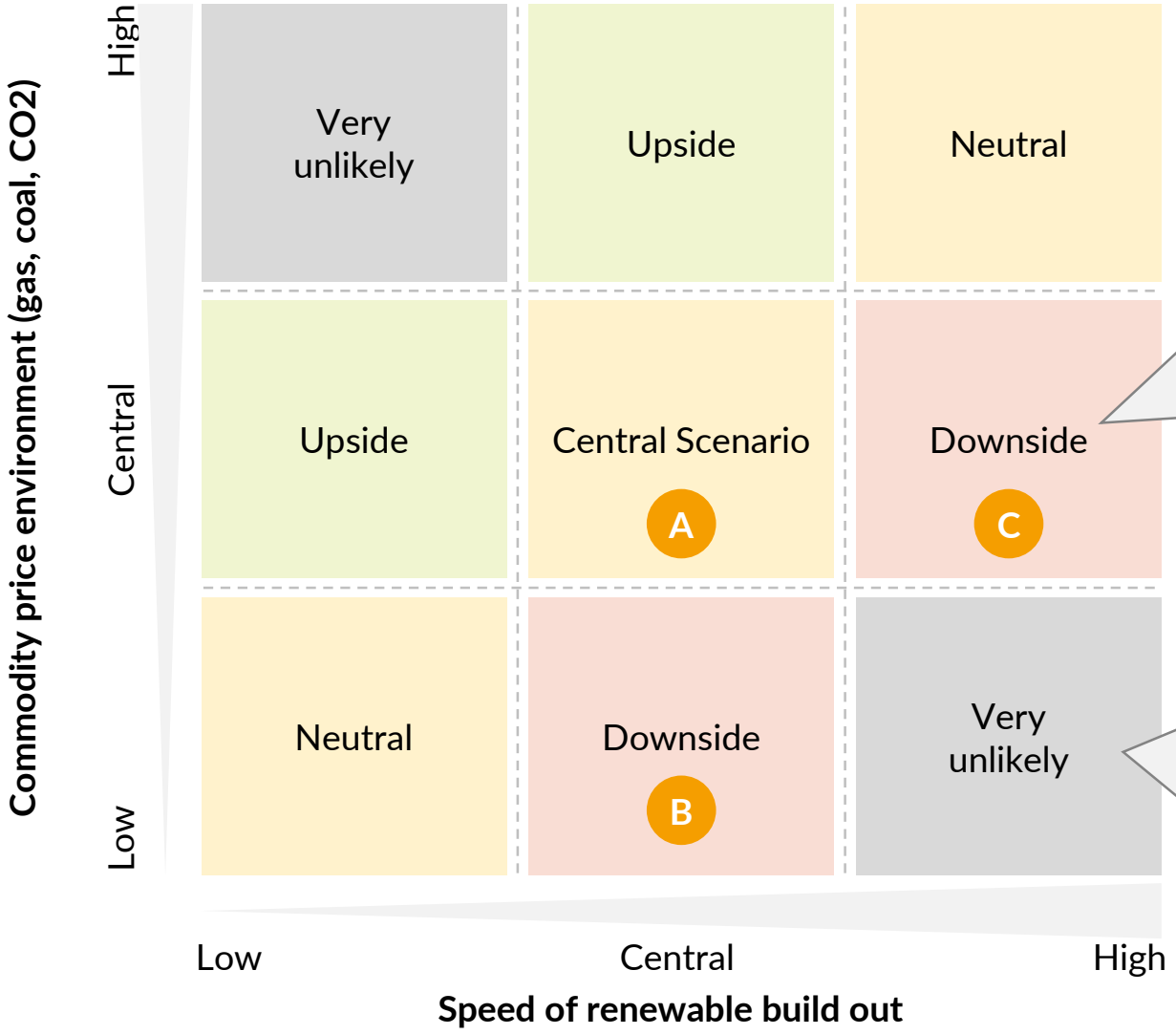
# Most combinations of risks are either unlikely to occur or have minimal incremental impact

Unlikely | No/Low Incremental impact | realistic Worst Case

| Combination of risks | Implication |
|---|---|
| 1 Low RES Cost + High RES Targets | ▪ No subsidy free RES buildout beyond high targets due to cannibalisation |
| 2 Low $CO_2$ Prices + Low Gas prices + Low Coal prices | ▪ The combined effect is smaller than the sum of each individual effect |
| 3 Low $CO_2$ Prices + Low Gas prices + Low Coal prices + Low RES Cost | ▪ No additional subsidy free buildout due to low power prices |
| 4 Low $CO_2$ Prices + Low Gas prices + Low Coal prices + High RES Targets | ▪ Prohibitively high cost for very limited incremental benefits |

Source: Aurora Energy Research

# Consequently, the key risks to consider are low commodity prices or high renewables build-out – but not both



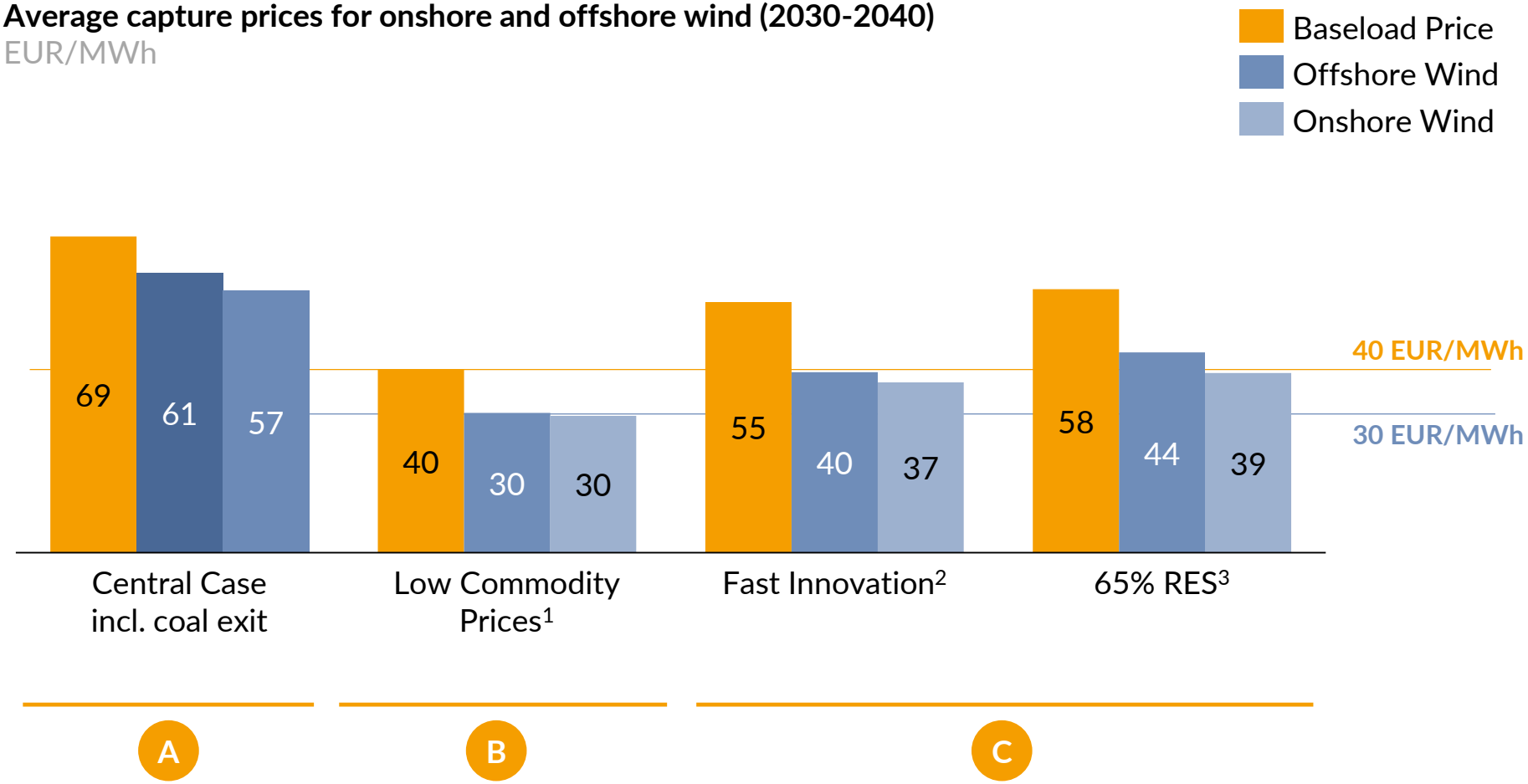

- High RES build-out due to fast innovation leading to very low RES CAPEX
- Alternatively high government targets implemented through subsidised RES buildout

- With low commodity prices, even very low RES CAPEX would not lead to higher RES build-out
- Implementation of High RES target prohibitively costly

Source: Aurora Energy Research

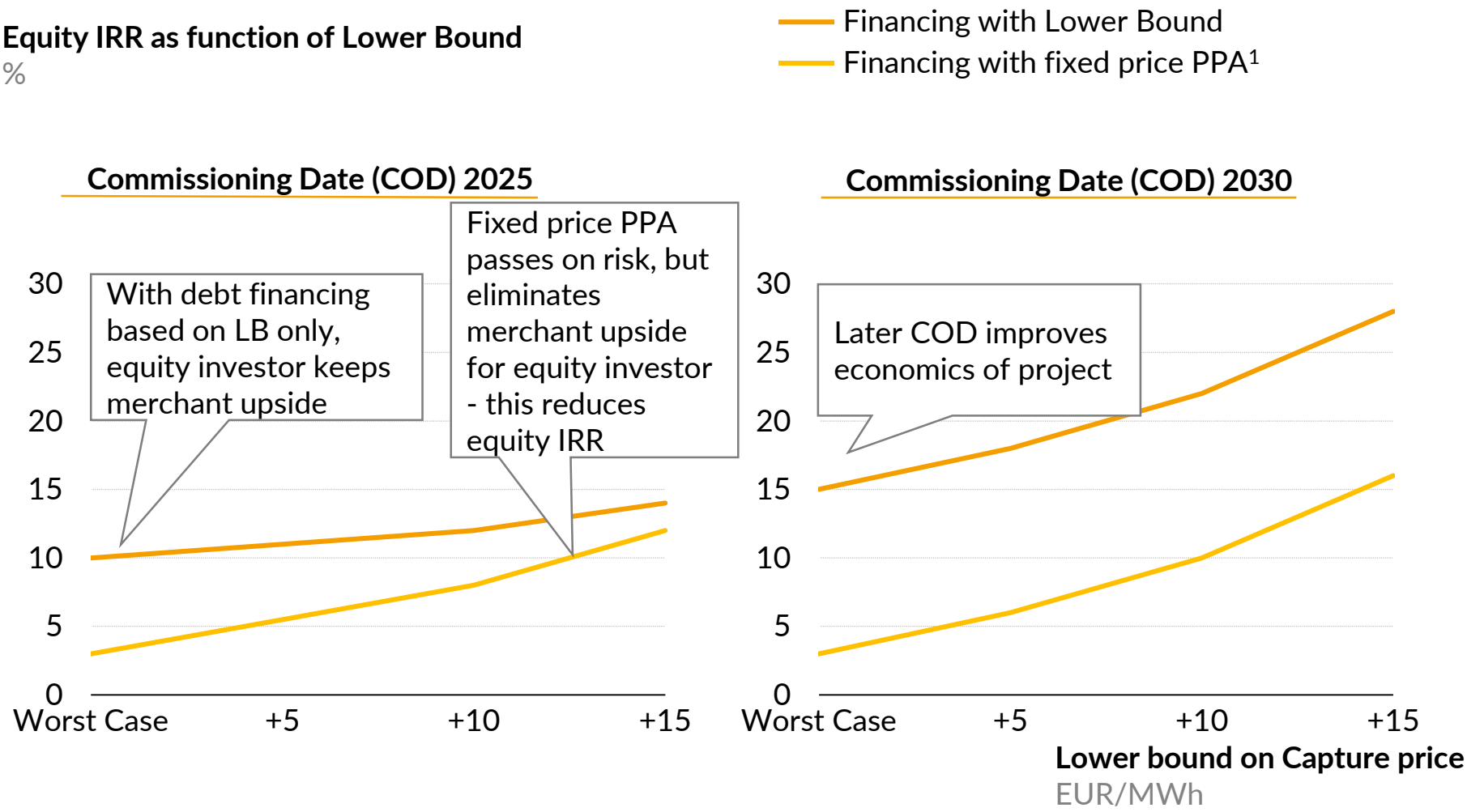
# 40 EUR/MWh is a realistic Worst Case Scenario on baseload prices; with wind capture prices of 30 EUR/MWh

**Average baseload prices (2030-2040)**
**Average capture prices for onshore and offshore wind (2030-2040)**
EUR/MWh



# Securing capture price above worst case or later commissioning date improves leverage capacity and equity IRR

**Equity IRR as function of Lower Bound**
%



# Government developers and banks have options to manage risks for merchant renewables

**Government/ Regulator**

Establish a framework that improves manageability of long-term price risks to reduce cost to society through continuation of (high) subsidies for future renewables

- Introduce instruments to reduce financing cost, e.g.
  - Carbon price floor
  - CFDs or price floor guarantees for renewables capture prices
  - Provide infrastructure finance guarantees/ MLAs (EIB, KfW) co-finance projects
- Create clarity on how and under which conditions 65% RES target will be implemented
- Create clarity on other interventions, e.g. timeline and order of magnitude of coal exit

**Developers**

- Establish trusted approach with financing banks on how to agree on a credible Lower Bound for merchant risk, e.g. by establishing a standard Worst Case price projection or poll-based/probabilistic approach ("P90 for prices")
- Actively source and establish PPAs for new projects to set price floor
- Develop new financing models with higher equity share, e.g. via partnership model with utilities or equity investors with higher risk profile

**Financing banks**

- Acknowledge need to understand and assess merchant risks to avoid drastic decline in lending volumes for renewables
- Establish trusted approach to estimate Lower Bound on power prices

**Managing the merchant exposure means distributing the risk of volatile market prices to suitable counterparties – subsidised offtake, corporate/utility PPAs or Lower Bound prices are all ways to do this**

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