INTEGRATING RENEWABLE ENERGY THROUGH CONTRACTS-FOR-DIFFERENCE

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RESEARCH QUESTION RELATED TO CfDs

1) Will CfD Volumes take over the market?

2) Do CfDs distort the day-ahead market?

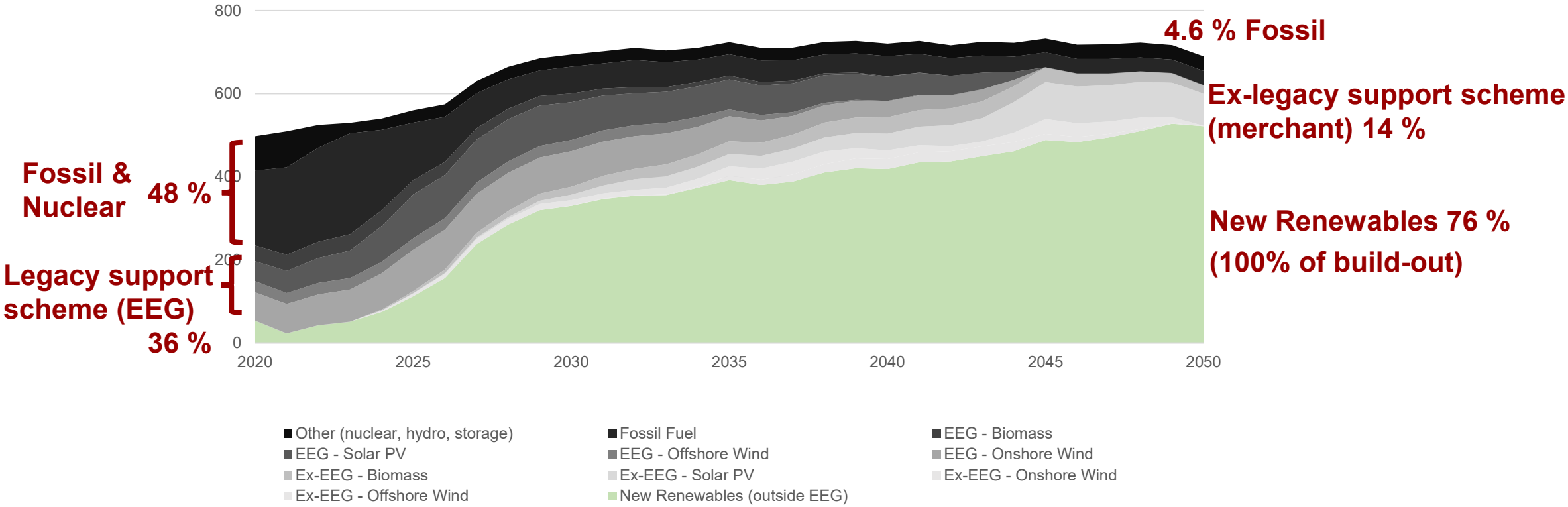
3) Do CfDs distort the intraday market?

1) Will CfD Volumes take over the market?

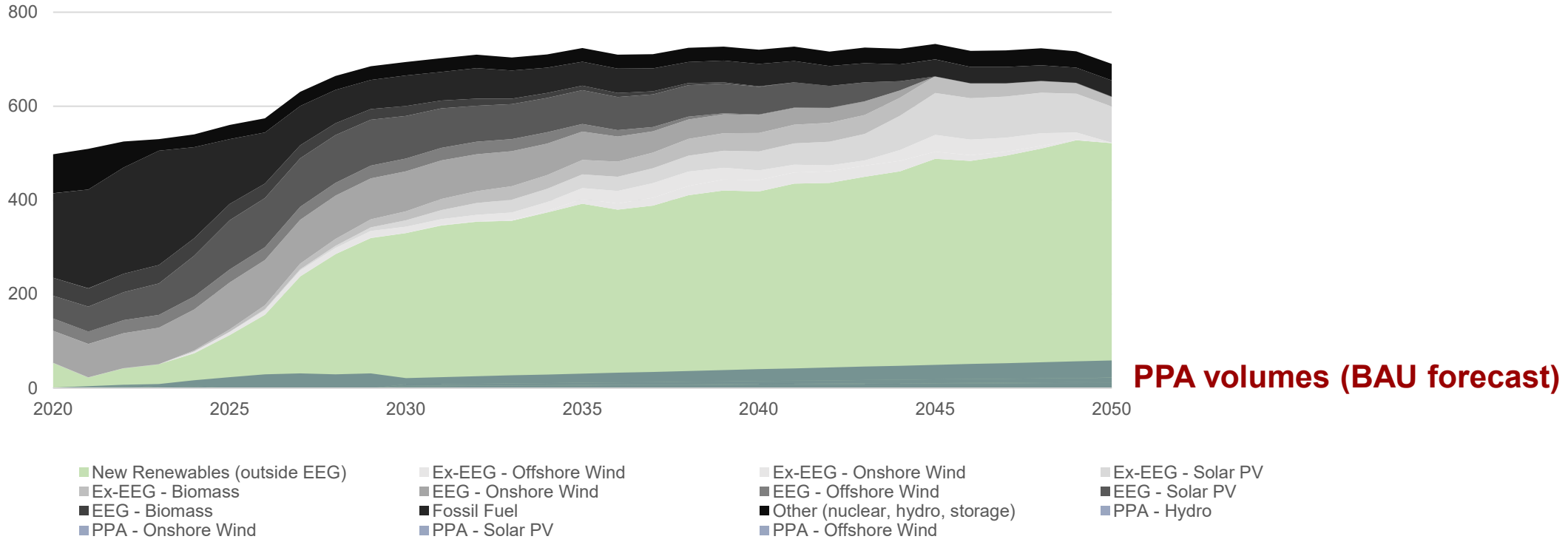
Volume dominance of CfD in full market roll-out?

Study by Fabian Wagner, Malte Jansen & Lena Kitzing, *work in progress*

Case study: German market, production forecast from the politically decided ‘Easter package’, scenario by Bloomberg (2023)

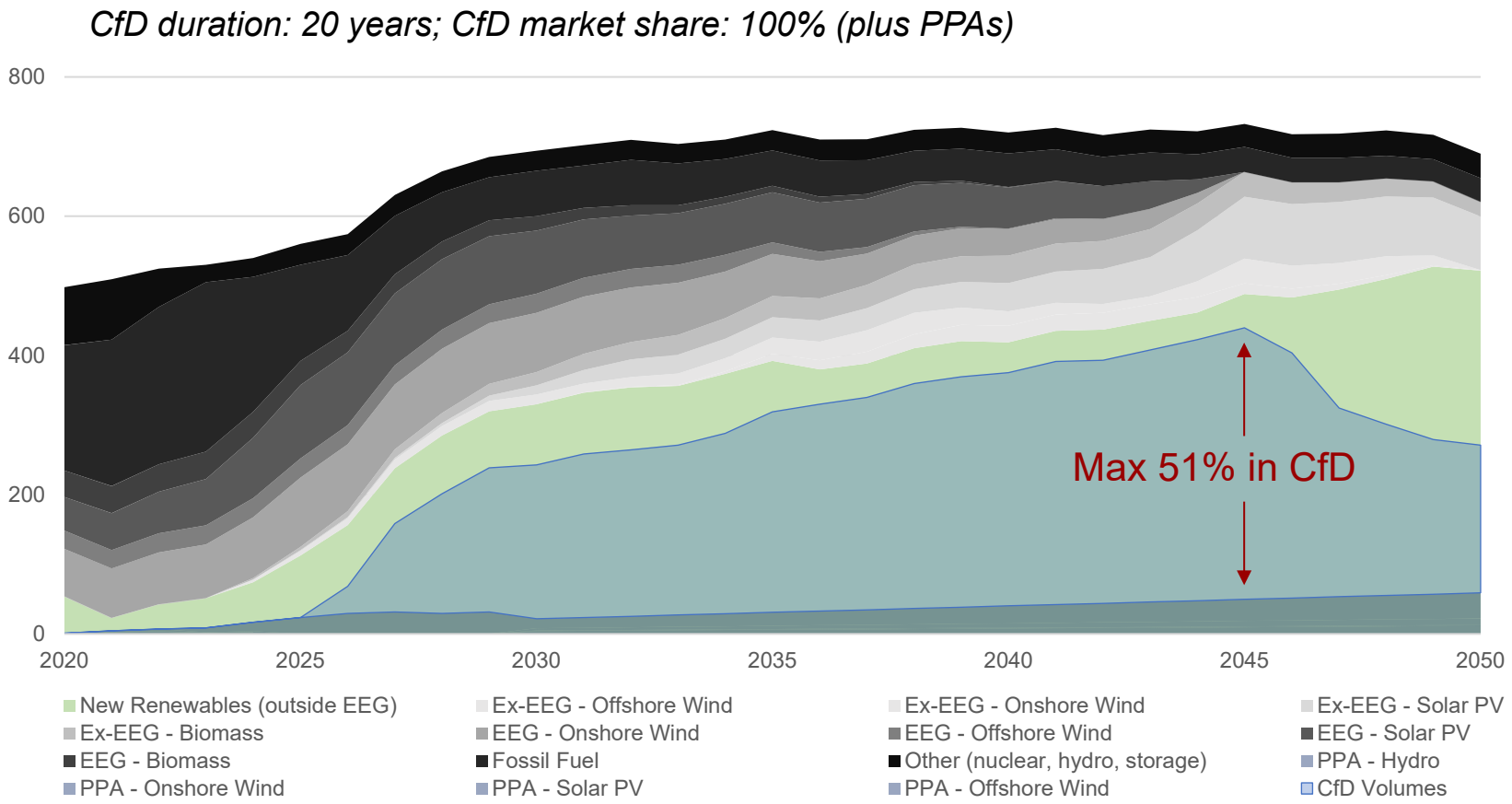


Volume dominance of CfD in full market roll-out?



PPA volumes (BAU forecast)

Volume dominance of CfD in full market roll-out?

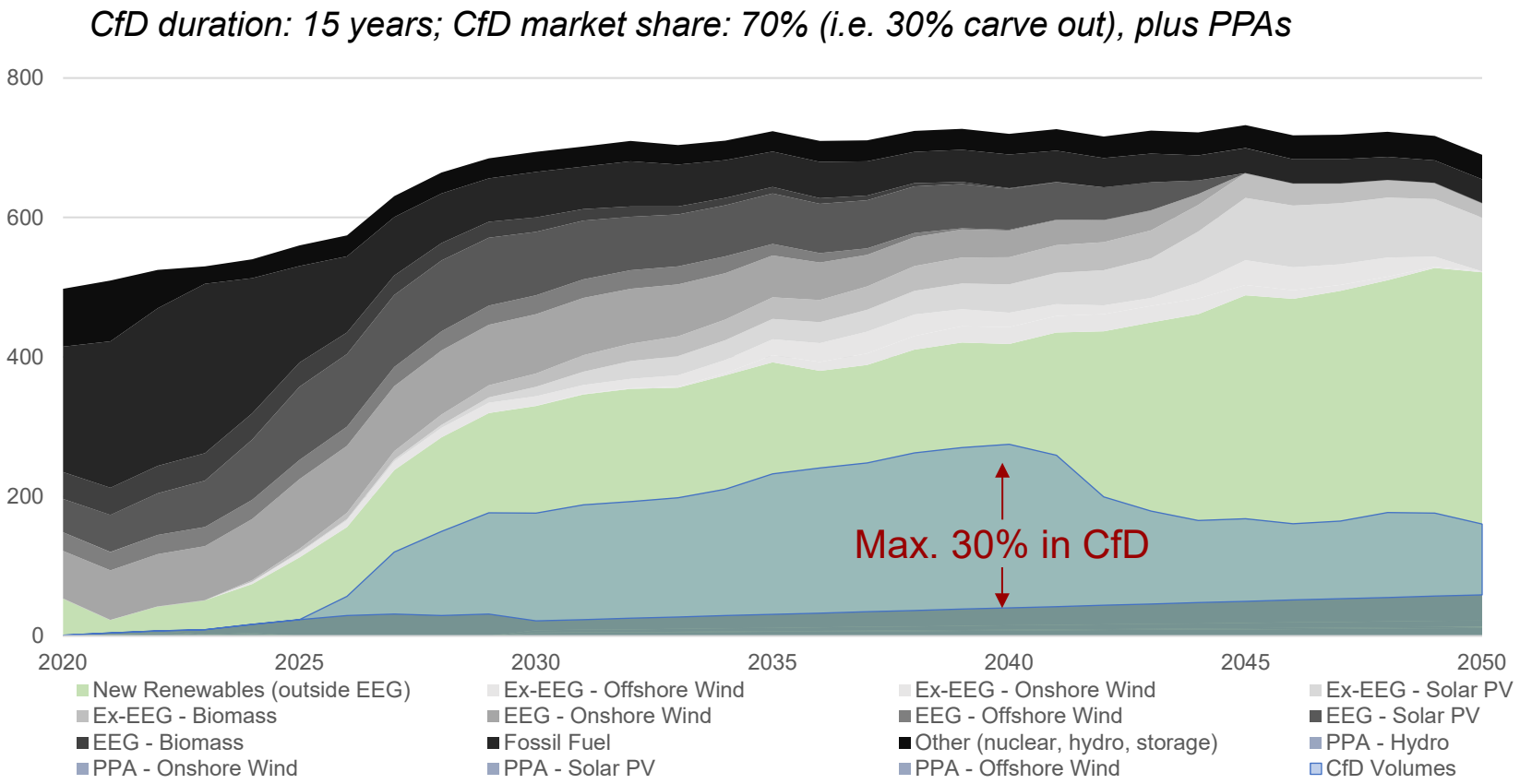


100% of supported RES in CfD =

On average 36% of market in CfD

(2020: 36% of market in EEG)

Volume dominance of CfD in full market roll-out?



70% of supported RES in CfD =

On average 20% of market in CfD

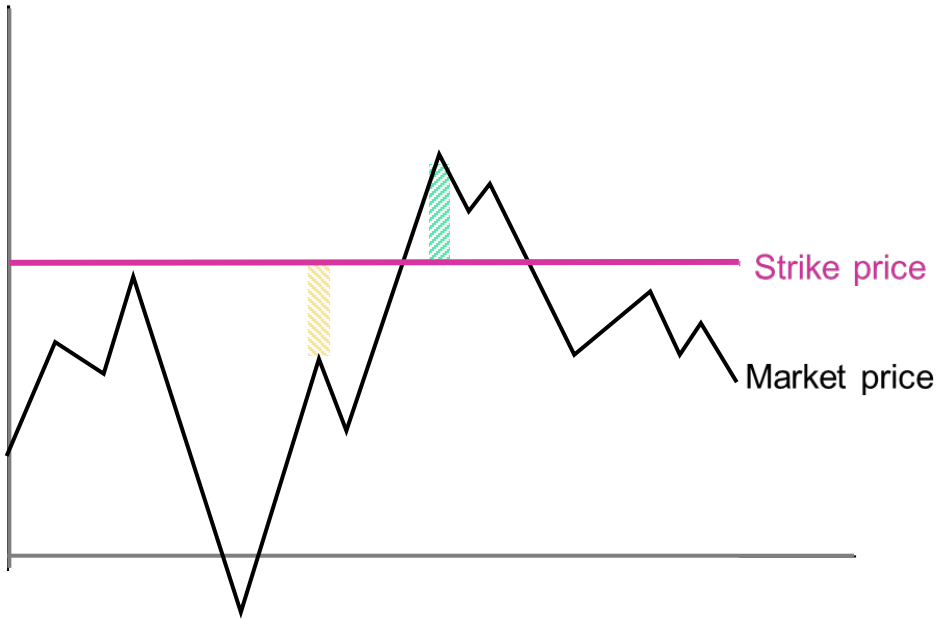
(2020: 36% of market in EEG)

CfDs will not necessarily dominate the market more than legacy schemes already do.

2) Do CfDs distort the day-ahead market?

Contracts-for-Difference in electricity markets

Study for IEA TCP WIND TASK 53, by Anastasia Ioannou & Lena Kitzing, *work in progress*



'UK' CfD

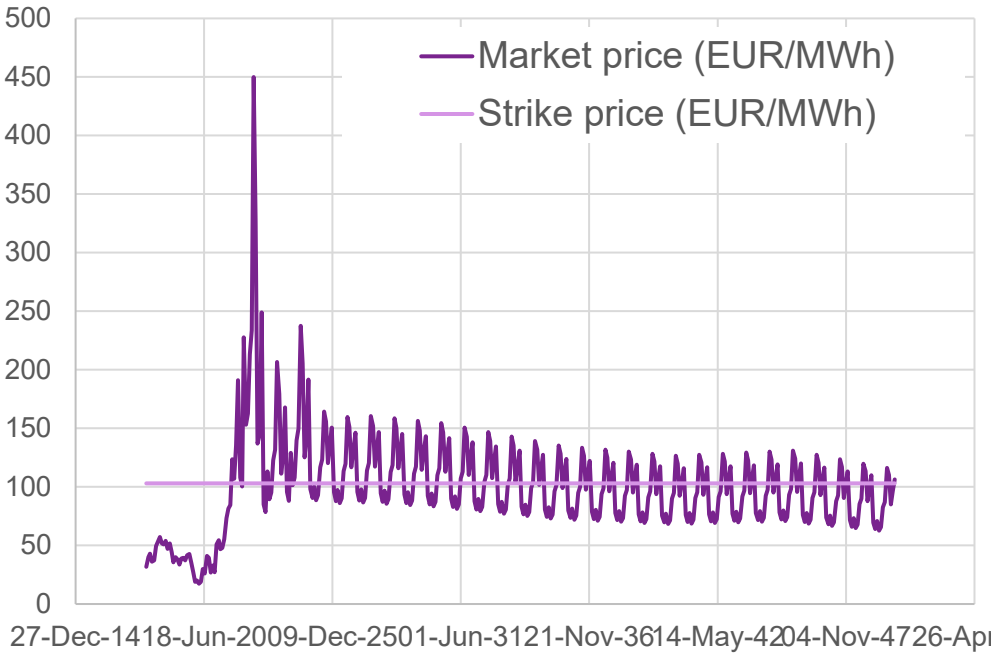
- **Early CfD Model (no averaging of prices):**
  - Premium calculated based on the difference between hourly captured spot-price and CfD strike price.
  - No incentive for increasing market value of production as lower captured prices offset by higher subsidy ('produce-and-forget')

'European' CfD

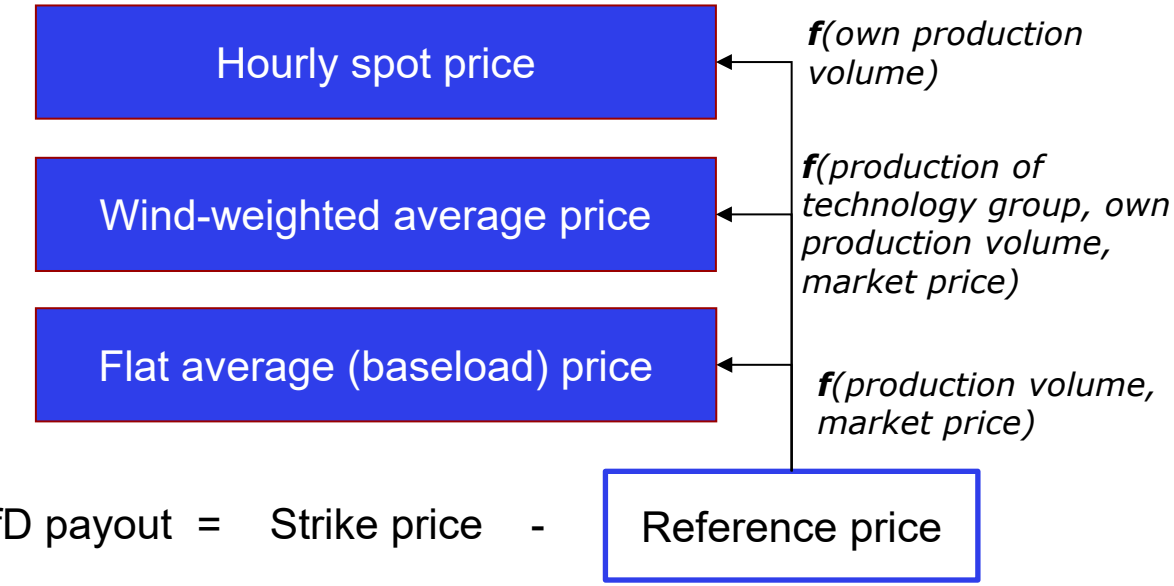
- **Hybrid CfD Model (averaged reference prices):**
  - Premium calculated based on difference between average spot price and CfD strike price over defined period – average price can be determined technology-weighted or flat (baseload)
  - **Stabilisation of long-term revenues while exposure to short-term price volatility**
  - Increased price and volume risk for developer due to political decisions affecting market values and negative prices

Case Study: Reference price design

- Offshore wind farm Horns Rev 3, 400 MW, commissioned 2019, capacity factor 49%
- Electricity Market prices: Nordpool Elspot DK1 / PRIMES projections
- Market value projections: Jansen et al., (2020); Đukan & Kitzing (2023)



Modelling of revenues

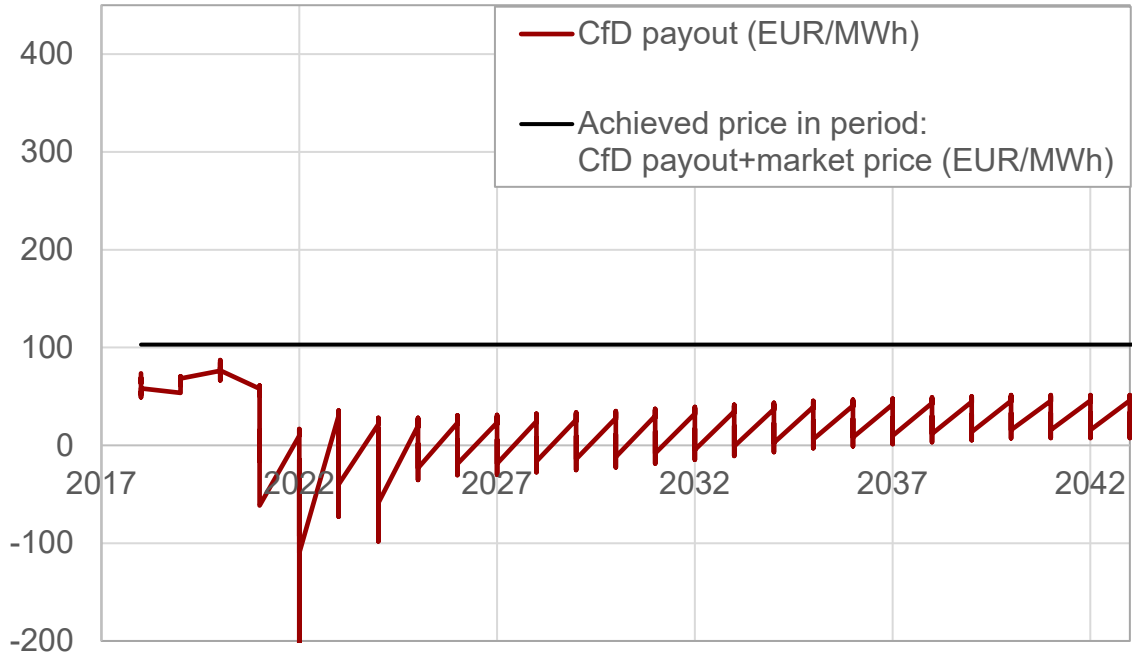


$$\text{Revenues} = \underbrace{(\text{CfD payout}}_{\text{Revenues from support}} + \underbrace{\text{Market Price})}_{\text{Revenues from market}} \times \text{Production Volume}$$

Results of the case study: Achieved prices under different reference price designs

'UK' CfD

Design 1 Hourly spot price (Produce-and-forget)



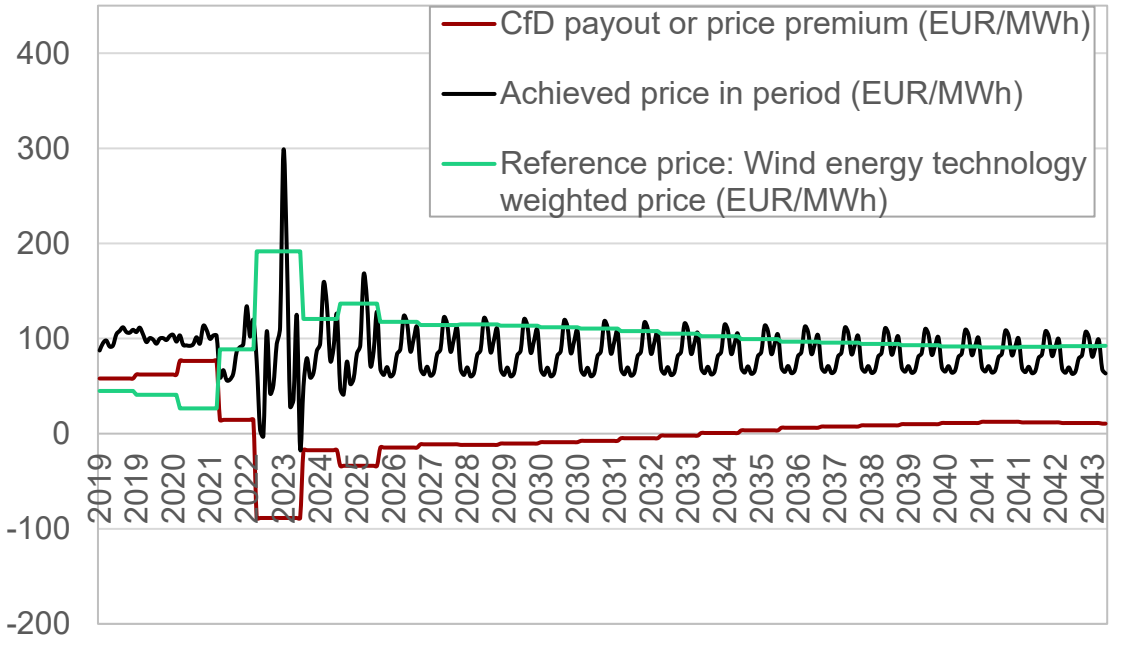
CfD payout = Strike price – Hourly Spot price

Reference price = Strike price

Achieved price = CfD payout + capture prices

'European' CfD

Design 2 Wind-weighted average price



CfD payout = Strike price – Reference price

$$\text{Reference price}_t = \frac{\sum_{t=month_i}(PV_{techngroup} \times market\ price)_t}{\sum_{t=month_i}(PV_{techngroup})_t}$$

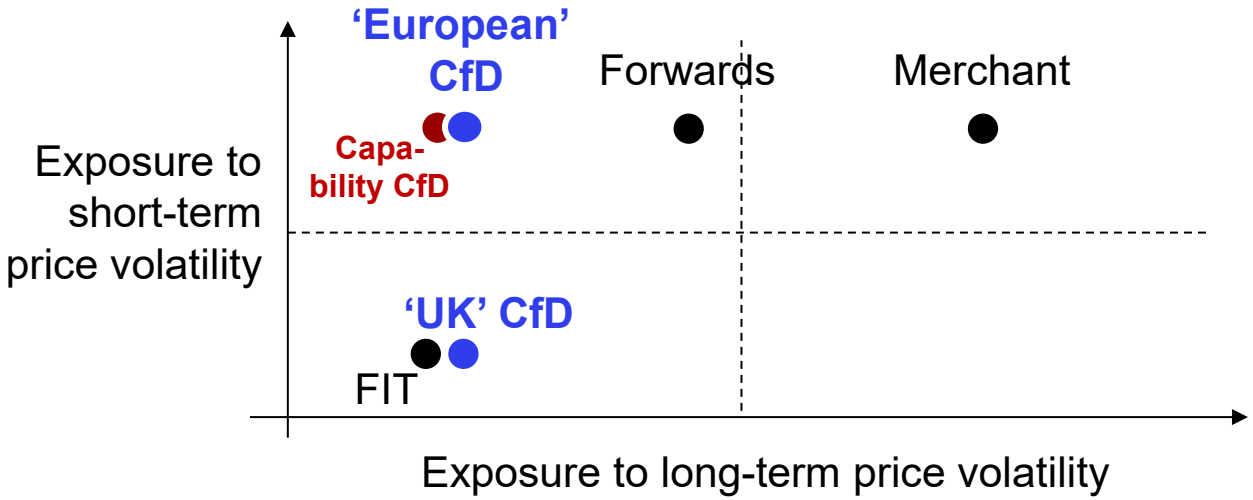
$PV_{techngroup}$: Prodution volume of technology group

Achieved price = CfD payout + capture price

Conclusions regarding different reference price designs

- The more recent “European CfD” show very different characteristics as compared to the earlier “UK CfD” model in which produce-and-forget situations occur

- Main differentiating characteristic: exposure to short-term price volatility in combination with long-term price stabilisation, aligning short-term signalling needs with long-term financial needs



Production-based CfDs can be designed in a way to not distort day-ahead market operation.

3) Do CfDs distort the intraday market?

Distortions on the intraday market: Production incentives

Considerations by Fabian Wagner & Lena Kitzing, *work in progress*

We assume zero marginal cost

	CfD Premium (DP) < 0 (clawback)		CfD Premium (DP) > 0 (payout)	
	Market Need:	Producer Incentive:	Market Need:	Producer Incentive:
Intraday Price (ID) > 0	production	production if –DP < ID no production if –DP > ID	production	production
Intraday Price (ID) < 0	no production	no production	no production	no production if DP < –ID production if DP > –ID

Two main conditions have to hold:

- ID and DP are misaligned [ID > 0 & DP < 0]
- DP outweighs ID [-DP > ID]

Issue: down-regulation despite short system, aggravating low RES

ENTSO-E study: 15% of time in NL market 2020-23 under 'UK' CfD design, but only 5% under 'European' CfD design – *likely less in other markets & less volatile times?*

ENTSO-E study: 2% of time in NL market 2020-23 under 'UK' CfD design, 0% under 'European' CfD design

Production incentive distortions on the intraday market occur in two particular market situations – the severity of the issue depends on CfD design & market structure.

SOME CONCLUSIONS RELATED TO CfDs

1) Will CfD Volumes take over the market?

NOT LIKELY

2) Do CfDs distort the day-ahead market?

NOT NECESSARILY

3) Do CfDs distort the intraday market?

YES, SOMEWHAT (no more than today?)

References

Lena Kitzing, Anne Held, Malte Gephart, Fabian Wagner, Vasilios Anatolitis, Corinna Klessmann, Contracts-for-Difference to support renewable energy technologies: Considerations for design and implementation, Research Report, RSC/FSR March 2024, Robert Schuman Centre, Florence School of Regulation, European University Institute, https://fsr.eui.eu/publications/?handle=1814/76700

Jansen, M., Staffell, I., Kitzing, L. et al., Offshore wind competitiveness in mature markets without subsidy. Nat Energy 5, 614–622 (2020). https://doi.org/10.1038/s41560-020-0661-2

Đukan & Kitzing (2023). A bigger bang for the buck: The impact of risk reduction on renewable energy support payments in Europe, Energy Policy, Volume 173, 113395, https://doi.org/10.1016/j.enpol.2022.113395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