Contracts for Difference to promote renewable-based generation

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The future role of CfDs in the EU market design (1)

- Two-way contracts for difference shall be used for direct price support schemes for new investments for the generation of electricity from:
  - wind energy
  - solar energy
  - geothermal energy
  - hydropower without reservoir
  - nuclear energy

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The future role of CfDs in the EU market design (2)

- Direct price support schemes in the form of two-way contracts for difference shall:
  - be designed so that the revenues collected when the market price is above the strike price are distributed to all final electricity customers based on their share of consumption (same cost / refund per MWh consumed)
  - ensure that the distribution of the revenues to final electricity customers is designed so as not to
    - remove the incentives of consumers to reduce their consumption or shift it to periods when electricity prices are low
    - undermine competition between electricity suppliers

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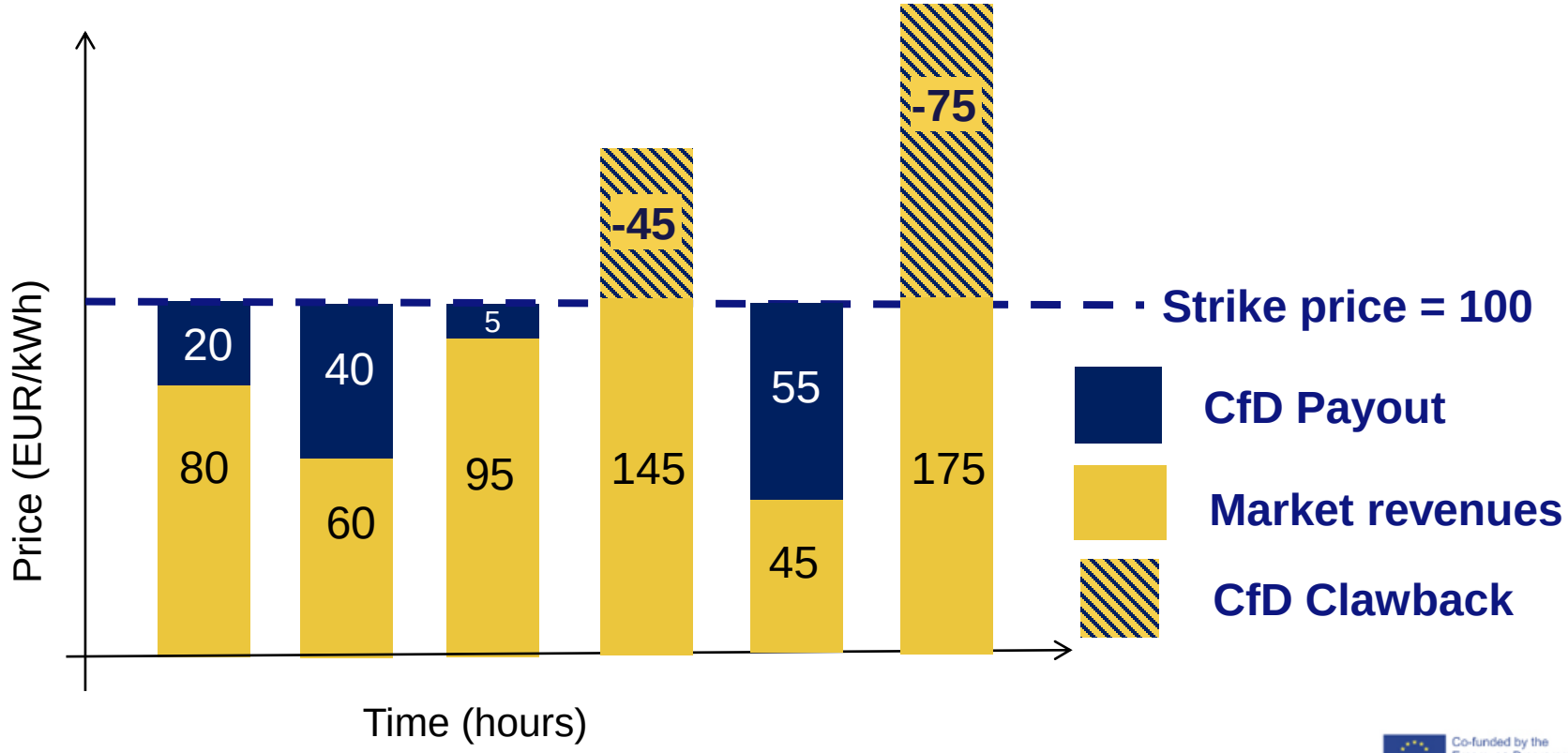
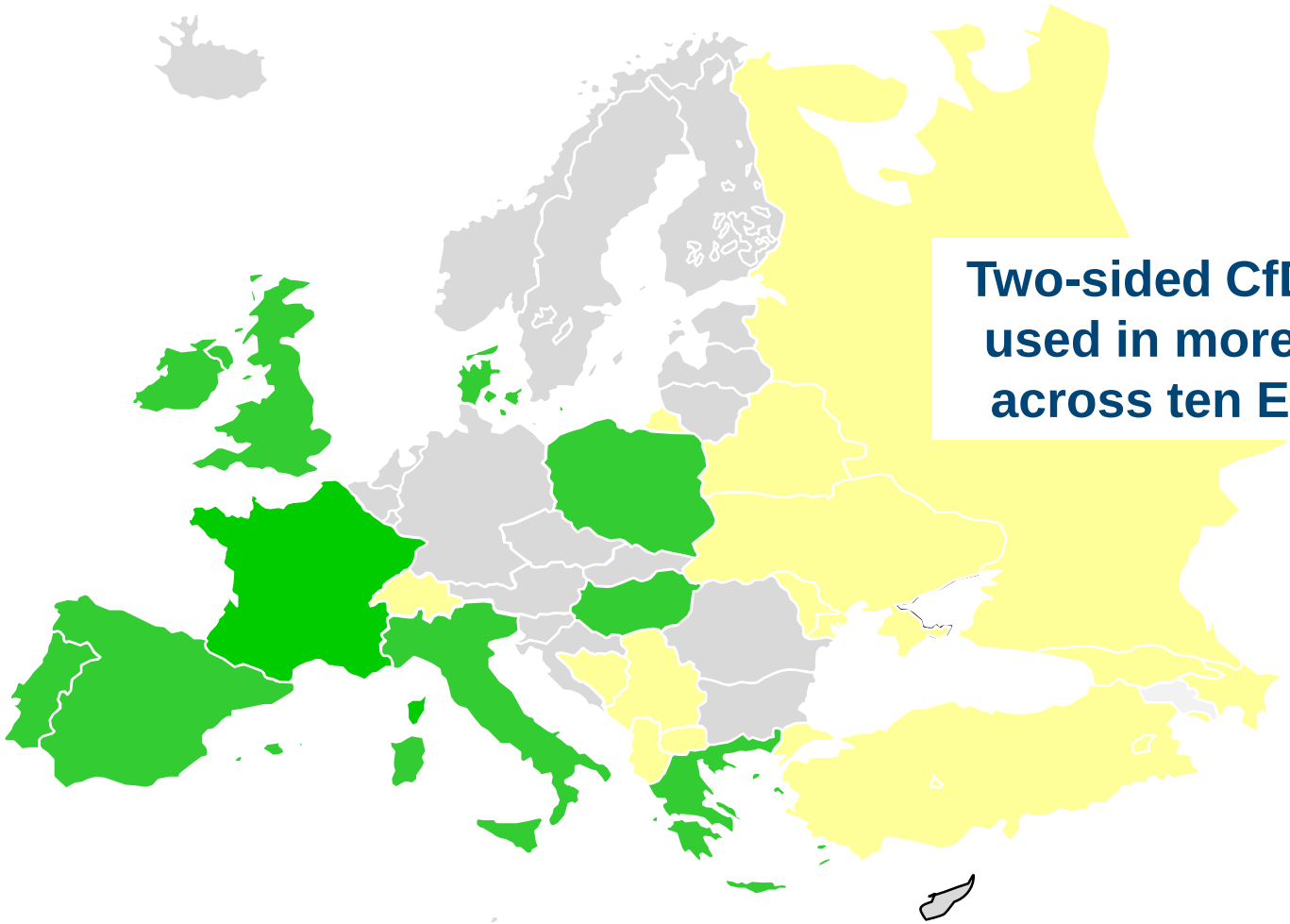
Contracts for Difference (CfDs)

Purposes of CfDs

- Closing the **profitability** gap
- **Capping** revenues and **redistributing** extra revenues to final consumers
- Allocating **risks: operational and non-oprational (price, volume and basis) risks**



Contracts for Difference (CfDs) are nothing new



Two-sided CfDs have so far been used in more than 200 auctions across ten European countries

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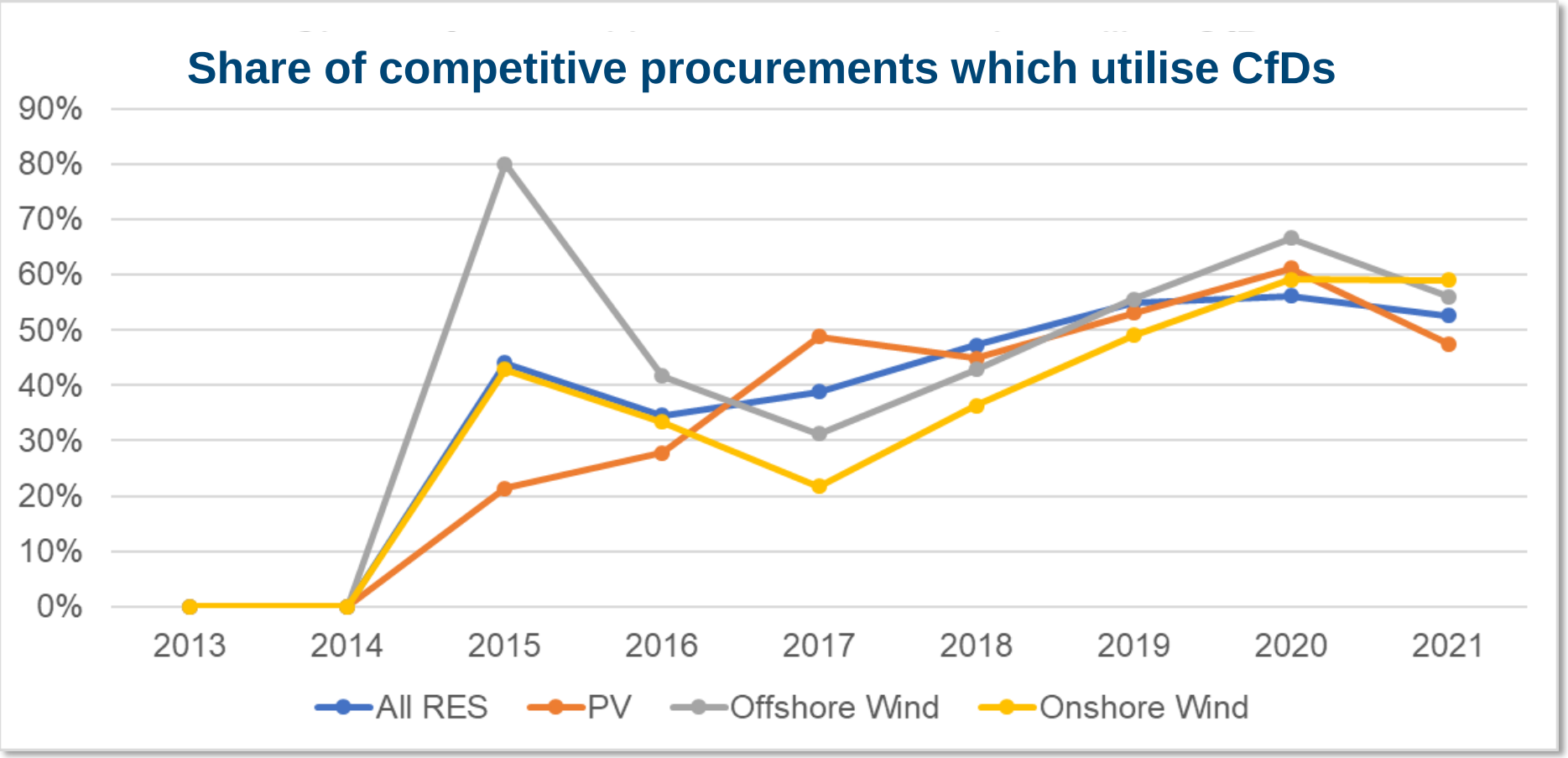
How common are CfDs in Europe?



EU Member States that have procured (two-sided) Renewable CfDs via auction / tender:

1 Denmark
2 France
3 Greece
4 Hungary
5 Ireland
6 Italy
7 Poland
8 Portugal
9 Spain
[United Kingdom]

Source: Analysis based on the AURESII Auction Database

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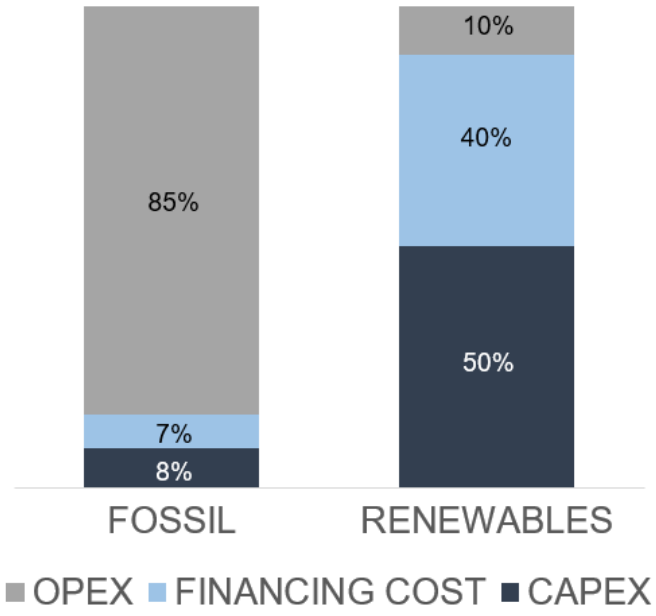
Why are CfDs so relevant for renewable generation?

Renewable energies have a much higher share of Capital expenditure (CAPEX) and Financing cost (CoC)



(rough example, representative for a solar PV / wind plant at 6% CoC)
Source: Adapted from Egli, Steffen and Schmidt (2021)

- Renewable-based generation benefits greatly from price stabilisation, as it is more exposed to financial risk in periods of low power prices (due to high financing needs)
- Long-term price stabilisation
  - enhances bankability
  - lowers cost of capital

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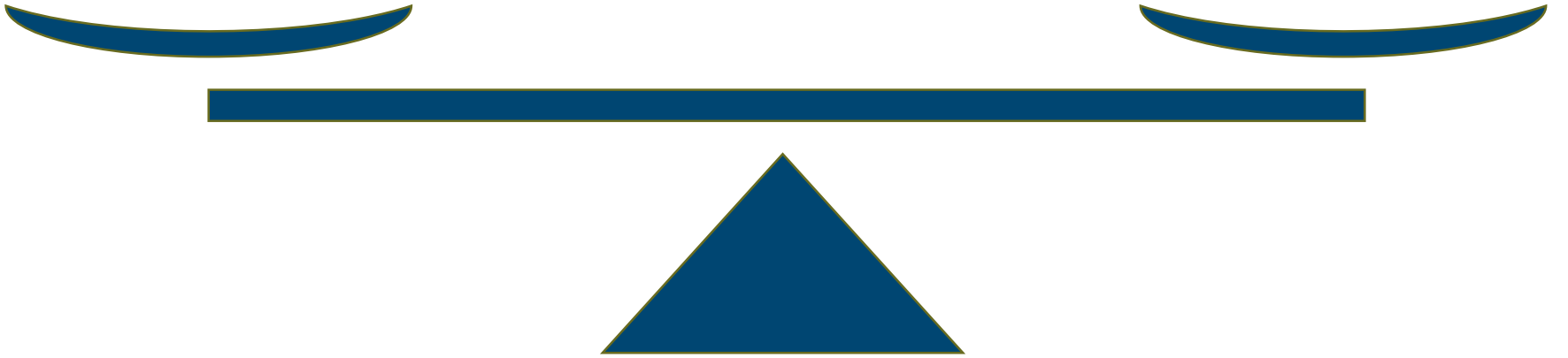
A trade-off in designing CfDs

PRICE STABILISATION

MARKET INTEGRATION



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Design criteria for CfDs: Optimising market incentives

Optimal utilisation (operations)

- Always produce when the price is above, and never when the price is below short-term variable costs
- Schedule maintenance in value-optimal times (instead of cost-minimisation)

Optimal design and siting (investments)

- Siting at locations that maximise system value (not project value)
- Choosing technologies with a generation profile that matches system needs (“system-friendly design”)

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CfD design dimensions: reference volume and price

REFERENCE VOLUME DESIGN	**Reference Volume**	- Generation-based - Capacity-based - Generation potential-based
REFERENCE PRICE DESIGN	**Reference market**	- Day-ahead only - Mixed price index (incl. intraday and balancing)
	Reference period	- No aggregation: hourly, half-hourly - Aggregated (monthly, quarterly, seasonal, annual)
	Referencing method	- No averaging - Technology-specific averaging - Technology-neutral averaging - Flat averaging (baseload price)

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CfD design dimensions: other elements

FURTHER DESIGN FEATURES	**Strike price design**	- Cap-and-floor system (rubberband, bufferzone) - Indexation
	Market integration safeguards	- Payout limitation at negative prices - Claw-back limitations at low prices
	Contract design	- Duration - Administrative payment settlement rules - Timing of referencing and payouts - Exit option for producers

CfD design: international experience

Country	Duration (yrs)	Reference period	Referencing method	Other features
DK	20	Annual	Uniform	Limited clawback / Net payment cap
FR	20	Monthly	Volume-weighted	Premium for curtailment during negative prices
GR	20	Monthly	Technology-specific	
HU	Up to 25	Monthly	Technology specific	
IE	20	Hourly	n/a	Compensation for unrealised available energy
IT	Up to 30	Hourly	n/a	
PL	15	Daily	Volume-weighted	
PO	15	Hourly	n/a	
ES	Up to 20	Hourly	n/a	Adjustment factor for remuneration at market price
UK	15	Hourly	n/a	

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CfD design for non-distortive, ‘market-friendly’ behaviour

	Distortive	Non-distortive / ‘system-friendly’	
Market bidding / Production decisions	HOURLY REFERENCE PRICE	PAYOUT STOPPED AT NEGATIVE SPOT PRICES (PRICES BELOW MARGINAL COSTS)	
	FULL PAYOUT & CLAWBACK AT ALL TIMES	CLAWBACK STOPPED AT SPOT PRICES BELOW CLAWBACK LEVEL	
Maintenance scheduling	HOURLY REFERENCE PRICE	MONTHLY, QUARTERLY, SEASONAL , ANNUAL AVERAGE,	
Siting decisions			
Layout decisions	PLANT-SPECIFIC	TECHNOLOGY-WEIGHTED	BASE-LOAD

Lessons learned

Lessons learned

- The notion that CfDs in general provide “produce-and-forget” incentives and mute electricity price variation is a myth – it all depends on the design choices
- It is possible to design incentive-compatible CfDs that do not distort bidding behaviour for low-marginal cost technologies in the day-ahead market, e.g.
  - longer-term flat averaging
  - no payout at negative prices
  - limited clawback

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The future of CfDs

- CfDs will play an increasingly large role in future energy markets
- Still open issues to be solved
  - Interactions with market-based hedging instruments (PPAs, futures, forwards)
  - Incentive spill-overs to intraday/balancing markets
- More different designs for CfDs are possibly becoming relevant
- European coordination can ensure compatibility with market and policy targets

Thank you for your attention!

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