



Electricity market design

Mitigating the impact of high gas prices on electricity bills, protecting consumers and boosting RES investment

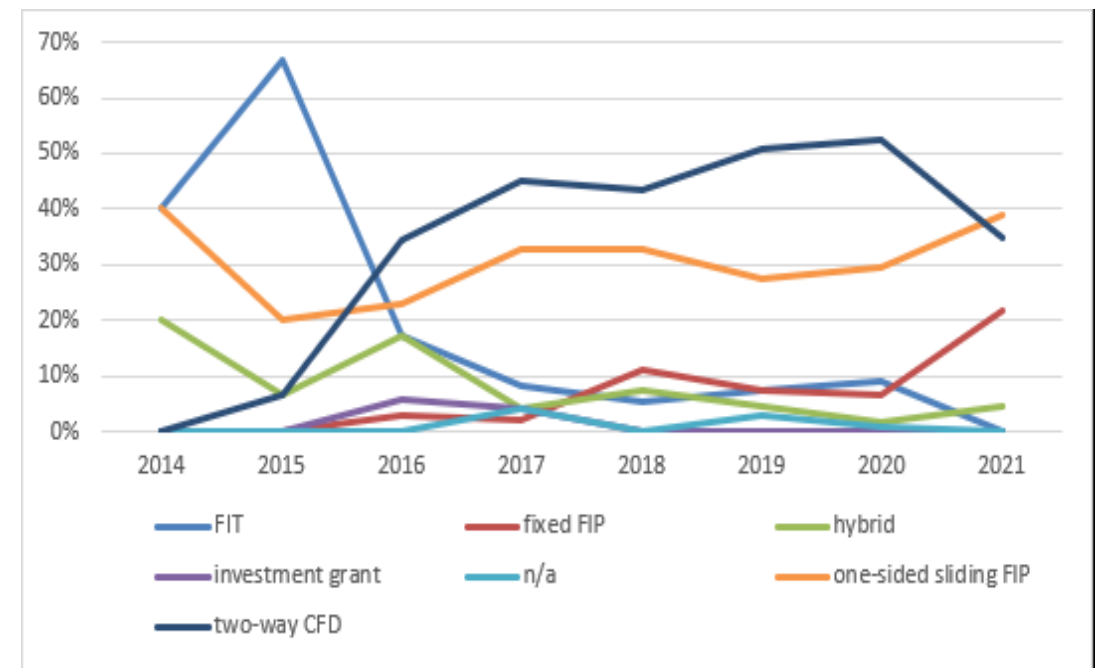
Objectives of the reform

- 1. Better protect and empower consumers**
- 2. Enhance stability and predictability of the cost of energy contributing to the competitiveness of the EU economy**
- 3. Accelerate the integration of renewables with flexibility services**
- 4. Better market monitoring and surveillance (REMIT)**

CfD (Art. 2 and Art 19b Reg): State of play

- Public funding remains necessary for a large share of renewables and for most nuclear investments
- Different forms of public support used, in particular as regards renewables
- Not all forms of public support ensure that the relevant capacity operates independently from the short-term marginal price (decoupling)
- Smart design of two-way CfDs essential to avoid market distortions.
- Move towards two-way CfDs

Distribution of renewables auction per support scheme (2014-2021)



Source: European Commission analysis based on Aures2 dataset for 17 EU countries

CfD (Art. 2 and Art 19b Reg): EU Framework

- REDII in Art. 4 to 6: includes the main design principles for support schemes for renewables. Notably they must:
 - Provide incentives for the integration of electricity
 - Ensure that renewable energy producers respond to market price signals
 - Support granted through open, transparent, competitive, non-discriminatory and cost-effective procedures
 - Support schemes using a **sliding** or a **fixed** market premium
 - Member States cannot modify existing support schemes to the detriment of the beneficiary
- Additional set of principles established in State Aid Guidelines (CEEAG and TCTF)
- Currently no comparable legal principles applicable to nuclear investments

CfD (Art. 2 and Art 19b Reg): Proposals

2-way CfD (new definition in Art 2 and new Art 19b in Electricity Regulation)

Art. 2

- ‘two-way contract for difference’: contract between a generator and usually a public entity, that:
 - provides both minimum remuneration protection and a limit to excess remuneration. (not necessarily 1 strike price)
 - contract is designed to preserve incentives for the generating facility to operate and participate efficiently in the electricity markets and complies with the principles set out in Article 4(2) and Article 4(3), first and third subparagraphs, of Directive (EU) 2018/2001

Art.
19b

- Direct price support schemes for new investments in wind, solar, geothermal, hydro without reservoir and nuclear shall be in the form of 2-way CfD.
- The revenues collected by the State shall be redistributed equally to all consumers (same refund per MWh of consumption).
- Avoid that redistribution removes incentives to decrease consumption when prices are high and avoid that it undermines suppliers' competition.

CfD(Art. 2 and Art 19b Reg): interaction with REDII, NZIA and Wind Action Power Plan (WPAP)

- Art 19b on EMD complements renewable support scheme design principles under REDII (Art 4 & 6)
- EMD also modifies Art 4(3) to make direct support schemes under the list of Art 19b to be in the form of 2-way CfD
- Commission proposal on the Net Zero Industry Act includes other sustainability and resilience criteria for renewable tendering procedures.
- Action 4 of the WPAP: to provide Guidelines and Recommendation on auction design

Thank you

Brussels, 5. December 2023

Shaping EU climate and energy policy: Insights from and questions for the Ariadne project

ELECTRICITY MARKET DESIGN OF THE FUTURE – HOW CAN CFDS ADDRESS THE PROMOTION NEEDS OF RES?



GEFÖRDERT VOM



OVERVIEW: CFDS IN THE ELECTRICITY MARKET DESIGN REFORM

COM-Proposal on the electricity market design reform



New chapter IIIa: Specific investment incentives to achieve the Union's decarbonisation objectives

- › New Art. 19b: Direct price support schemes for new investments in generation shall take the form of a two-way contract for differences for
 - › Wind, solar, geothermal energy, hydropower without reservoir and nuclear energy
 - › Rec. 32: Special rules for renewable energy communities, small-scale and demonstration projects

14.03.2023

- COM proposal on reform of electricity market design

19.07./14.09.2023

- ITRE agrees on trilogue position and proposes simplified procedure
- Confirmation of ITRE decision by EP

19.06./17.10.2023

- Council can only agree on REMIT Regulation
- General approach for the rest of the reform

Ongoing trilogue

- Goal: Finalisation this year or at the latest in time before the EU elections

PROMOTION OF RES NOW AND IN THE FUTURE

Current rules for RES promotion in the RED

- › Support schemes [...] shall be designed so as to maximise the integration of electricity from renewable sources in the electricity market and to ensure that renewable energy producers are responding to market price signals and **maximise their market revenues**.
- › To that end, with regard to direct price support schemes, support **shall be granted in the form of a market premium**, which could be, inter alia, sliding or fixed (Art. 4 (3) RED II)

Future provisions by the EMD regarding CfD

- › Proposal (COM/Council): Funding only via two-way contracts for difference (EP: **or equivalent measures**)
- › Art. 2 No. 76 (new): 'two-way contract for difference' means a contract signed between a power generating facility operator and a counterpart, **usually a public entity, that provides both minimum remuneration protection and a limit to excess remuneration**; the contract is designed to preserve incentives for the generating facility to operate and participate efficiently in the electricity markets and complies with the principles set out in Article 4(2) and Article 4(3), first and third subparagraphs, of Directive (EU) 2018/2001;

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DISCUSSION POINTS IN THE TRILOGUE

Commission	European Parliament	Council
What type of investments fall under Art. 19b?		
<ul style="list-style-type: none"> • New investments (shall include investments in new power-generating facilities, investments aimed at repowering, extending or prolonging existing facilities)) 	<ul style="list-style-type: none"> • More safety guards intended: extension only if the increase of power generation capacity is substantial, funding only for the new share) 	<ul style="list-style-type: none"> • Deletion of the definition of new investments (investments in new-power-generating facilities)
Entry into force: Transition periods?		
<ul style="list-style-type: none"> • Entry into force on the [xxx] day following that of its publication (Art. 5 of reform package) 	<ul style="list-style-type: none"> • New investments: 1 year after the date of entry into force 	<ul style="list-style-type: none"> • Investments in new generation: 3 years • Offshore connected to min. 2 bidding zones: 5 years
Requirements for CfD awarding		
<ul style="list-style-type: none"> • Competition between electricity suppliers shall not be undermined (agreement by EP and Council) 	<ul style="list-style-type: none"> • Maintaining rule/exception ratio for auction schemes • Consideration of locational criteria 	<ul style="list-style-type: none"> • Referral to State Aid law (Art. 19b 1b)
Provisions for CfD design, i.e.		
	<ul style="list-style-type: none"> • Retaining incentives to operate and participate efficiently in the electricity markets • Penalty clauses in case of unilateral early termination • Minimization of the possible negative impact on the liquidity of the forward market and on competition between suppliers 	<ul style="list-style-type: none"> • Retaining incentives to operate and participate efficiently in the electricity markets • Prevention of distortive effects (bidding behaviour, dispatch, maintenance decisions) • Minimum remuneration protection and upward limit must be aligned with costs of new investment
Use of revenue?		
<ul style="list-style-type: none"> • Distribution to final electricity consumers (Rec 34: to all final customers based on their consumption) 	Special consideration for: <ul style="list-style-type: none"> • Vulnerable customers • Compensating the costs of the support scheme • Investments for the energy transition • Energy-intensive industries 	Special consideration for: <ul style="list-style-type: none"> • Probably: vulnerable customers (Rec 34) • Compensating the costs of the support scheme • Investments to reduce electricity costs

CONCLUSIONS

- › The promotion for many renewable technologies will very likely only be possible via CfDs in the future
- › Regardless of any transition period, Member States may have to propose new rules sooner (depending on their state aid commitment, i.e. Germany must limit profitability and/or implement clawbacks by 30.06.2024)
- › The proposals contain various additional targets and criteria for CfDs which will lead to a trade-off
- › Nevertheless, Member States will (presumably) have a large margin of discretion in the specific design of CfDs
 - › The reform proposal does not stipulate that the CfDs must be standardised for all technologies
 - › Technology-specific funding is therefore still possible if the requirements of state aid law are observed
- › It is therefore particularly worthwhile looking at different use cases with different design options

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Improving economic policy



'The Design of the European Electricity Market':

A study for the ITRE committee of the European Parliament

05/12/23

Conall Heussaff
Research Analyst, Bruegel

Presenting work jointly developed with **Georg Zachmann, Lion Hirth, Ingmar Schlecht, Jonathan Muhlenpfordt and Anselm Eicke**

bruegel.org

Assessment of design instruments

Long-term contracts

- CfDs
- PPAs
- Virtual trading hubs
- **Long-term contracts should preserve short-term incentives.**

Demand-side flexibility

- Peak shaving product
- Flexibility target and support scheme
- **Introducing additional submarkets for flexibility should be avoided.**

Protecting consumers

- Use of CfD revenues
- Supplier hedging obligation
- Fixed-price vs. smart retail tariffs
- Electricity price crisis (Art. 66a)
- **Consumer protection and retail tariffs should preserve short-term incentives.**

Absence of quantitative tools

Many electricity **system** models, no electricity **market design** model.

No impact assessment with the European Commission reform proposal.

➤ Only *public consultation* and *staff working document*

Tools & models needed to quantify impacts of policy choices.

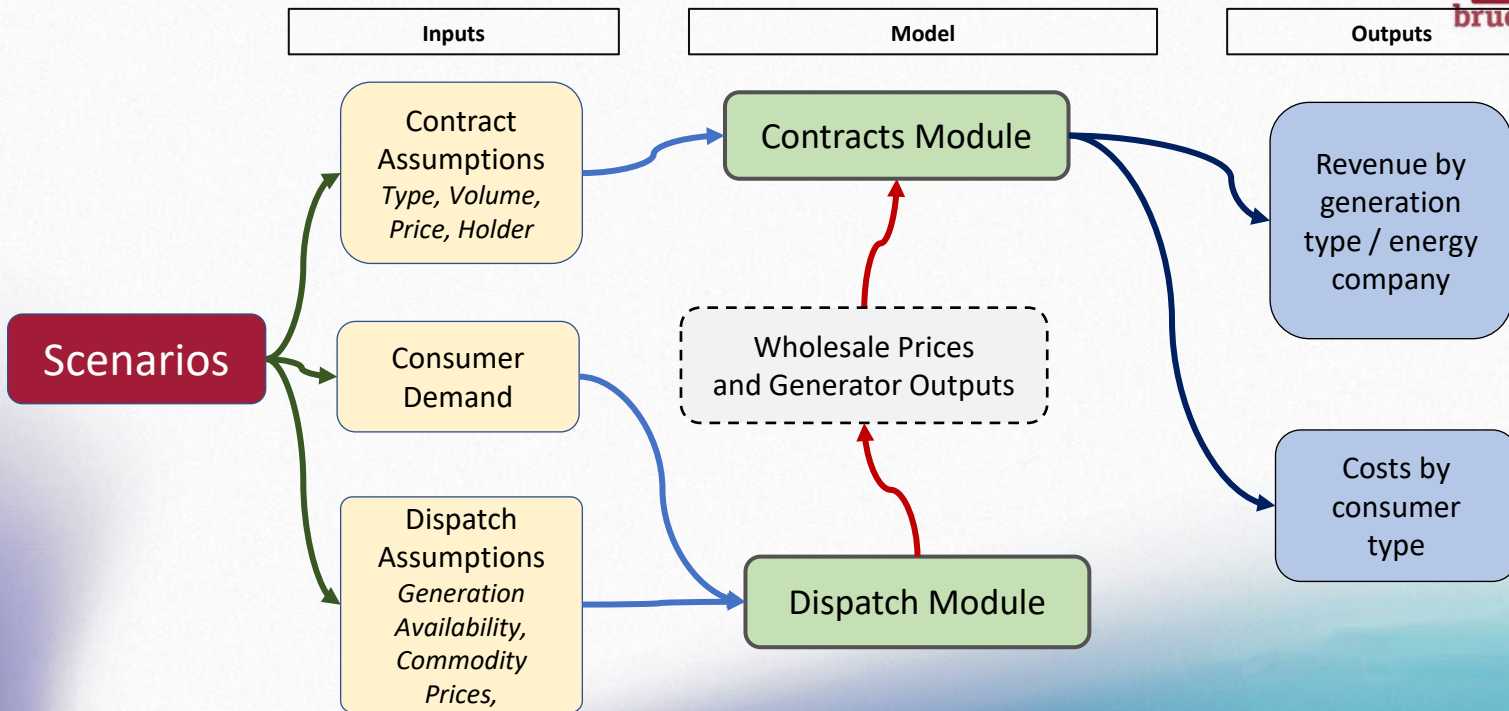
ITRE study was an opportunity **fill methodological gap.**

MODEL AIMS:

1. Illustrative tool.
2. Highlight winners and losers.
3. Reveal new insights.



Dispatch and Contracts Model (DISC)



Thank you!

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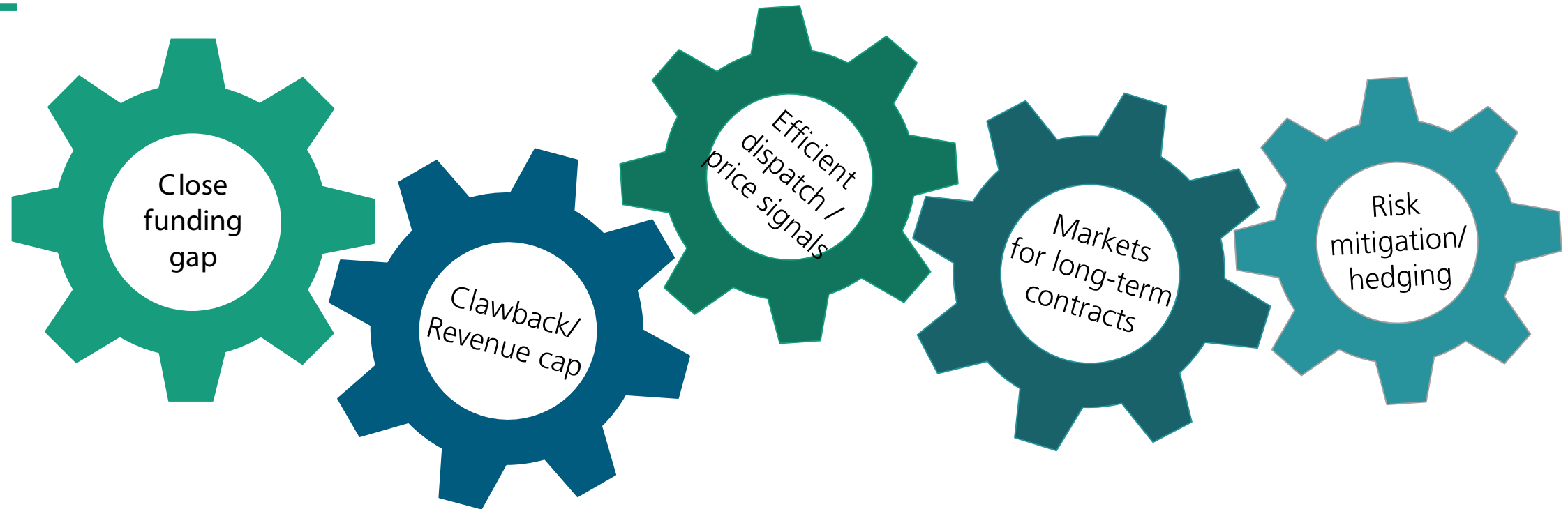
Workshop: Electricity market design of the future – how can CfDs address the promotion needs of RES?
05 December 2023 @Brussels

The future of renewable energy support – an overview of current design proposals for CfDs

Dr. Vasilios Anatolitis, Fraunhofer ISI

How should renewable energy support be designed?

Main objectives and functions of renewable energy support



- **Contracts -for -Difference (CfDs)** address most of the main **objectives and functions** of renewable energy support → CfDs in the focus of **current discussion**
- “One CfD to rule them all” ?! → many **different design elements and options** exist with different effects

Design elements of CfDs

Design element	Category	Design options
(Reference-) Volume for remuneration	<ul style="list-style-type: none"> Reference volume 	<ul style="list-style-type: none"> Production-based Capacity-based Production potential-based
Setting of reference market value	<ul style="list-style-type: none"> Reference market 	<ul style="list-style-type: none"> Day-ahead Combination of Day-ahead and Intraday
	<ul style="list-style-type: none"> Reference technology 	<ul style="list-style-type: none"> No weighing/arithmetic average Technology-specific Multi-technology
Further design elements	<ul style="list-style-type: none"> Reference period 	<ul style="list-style-type: none"> Hourly Monthly Daily Yearly
	<ul style="list-style-type: none"> Setting of the strike price 	<ul style="list-style-type: none"> Administratively-set Auction-based
	<ul style="list-style-type: none"> Design of the strike price 	<ul style="list-style-type: none"> Cap-and-floor Indexation (e.g., inflation, labour costs, etc.) Bonus/malus Technological/regional factors (e.g., reference yield model)
	<ul style="list-style-type: none"> Ensuring efficient dispatch/price signals 	<ul style="list-style-type: none"> Limiting support payments in case of negative market prices Limiting paybacks in case of low market prices
	<ul style="list-style-type: none"> Contract design 	<ul style="list-style-type: none"> Support duration defined by support volume or time period Exit options for producers

Production-based CfDs

Production-based CfDs

Overview

CfD with hourly reference period

- Fluctuations in market prices are offset on an hourly basis
- Low price risk exposure (short, medium, and long-term)
- Few incentives for market integration (either dispatch or investment)

CfD with yearly reference period

- Fluctuations in market prices during a year are not offset
- No hedging of short-term/seasonal price risks, only long-term price risks
- Incentives for short and medium-term market integration

CfD with dynamic payback

- Misincentives under CfDs with long reference period if market price $<$ payback, and $>$ 0
- ➔ Limitation of the payback in these hours

CfD with Cap-and-Floor

- Strike price as a corridor with a cap (above which paybacks occur) and a floor (below which support is paid out)
- ➔ Increased exposure to market price risk (short, medium, and long-term) within the corridor

But:

- No hedging against **volume risks**
- Potential **distortions** between Day-ahead and subsequent market segments (e.g., Intraday)

Production-independent CfD

Production-independent CfDs

Brief overview

Capability-based CfD (Elia)

- Subsidy payments and paybacks are determined by the **production potential** of a power plant, not by the actual production/feed-in
- **Deviations** between **potential and actual production** reflect **curtailment, maintenance**, etc.
- The **challenge** lies in **determining** the production potential (e.g., technically complex, possible manipulation, etc.)

Financial-based CfD (Schlecht et al.)

- Government provides a **fixed hourly capacity payment**, while producer pays **hourly spot market revenues** based on the **production** of a **reference power plant** to the **government**
- **Paybacks** correspond to the **hourly DA spot market prices** multiplied by the **production of the reference power plant**
- **Net revenues** correspond in principle to the capacity payment minus the payback to the government
- **Deviations** from the **reference power plant** can lead to **additional or reduced revenues** for producers
- **Definition** of the **reference power plant** is still under discussion, yet crucial for the **deviation risk** → degree of specificity important

→ Assessment of both CfD models

- Both models are capable of addressing and hedging the **price and** (to a certain extent the) **volume risk**, but new "**deviation risk**" from the reference is introduced
- Avoidance of **dispatch misincentives**
- **Challenge** in **implementing and defining** the reference

Conclusions

1

Large variety of CfD design elements exist with distinct impacts → in general, trade-off between risk mitigation/hedging and market integration.

2

Production-based CfDs can be designed in such a way as that misincentives regarding efficient dispatch/price signals are sufficiently prevented.

3

Production-independent (capability-based and financial CfDs) have specific advantages regarding hedging the volume risk and market integration.

4

Removing misincentives in dispatch through production-independent CfD options can lead to higher deviation risk.



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CfDs in renewable energy auctions in Spain

Pablo del Río

Spanish National Research Council (CSIC)

Workshop **"Electricity market design of the future - how can CfDs address the promotion needs of RES?"**

NECP

Parque de generación del Escenario Objetivo (MW)				
Año	2015	2020*	2025*	2030*
Eólica (terrestre y marítima)	22.925	28.033	40.633	50.333
Solar fotovoltaica	4.854	9.071	21.713	39.181
Solar termoeléctrica	2.300	2.303	4.803	7.303
Hidráulica	14.104	14.109	14.359	14.609
Bombeo Mixto	2.687	2.687	2.687	2.687
Bombeo Puro	3.337	3.337	4.212	6.837
Biogás	223	211	241	241
Otras renovables	0	0	40	80
Biomasa	677	613	815	1.408
Carbón	11.311	7.897	2.165	0
Ciclo combinado	26.612	26.612	26.612	26.612
Cogeneración	6.143	5.239	4.373	3.670
Fuel y Fuel/Gas (Territorios No Peninsulares)	3.708	3.708	2.781	1.854
Residuos y otros	893	610	470	341
Nuclear	7.399	7.399	7.399	3.181
Almacenamiento	0	0	500	2.500
Total	107.173	111.829	133.802	160.837

REER AUCTIONS

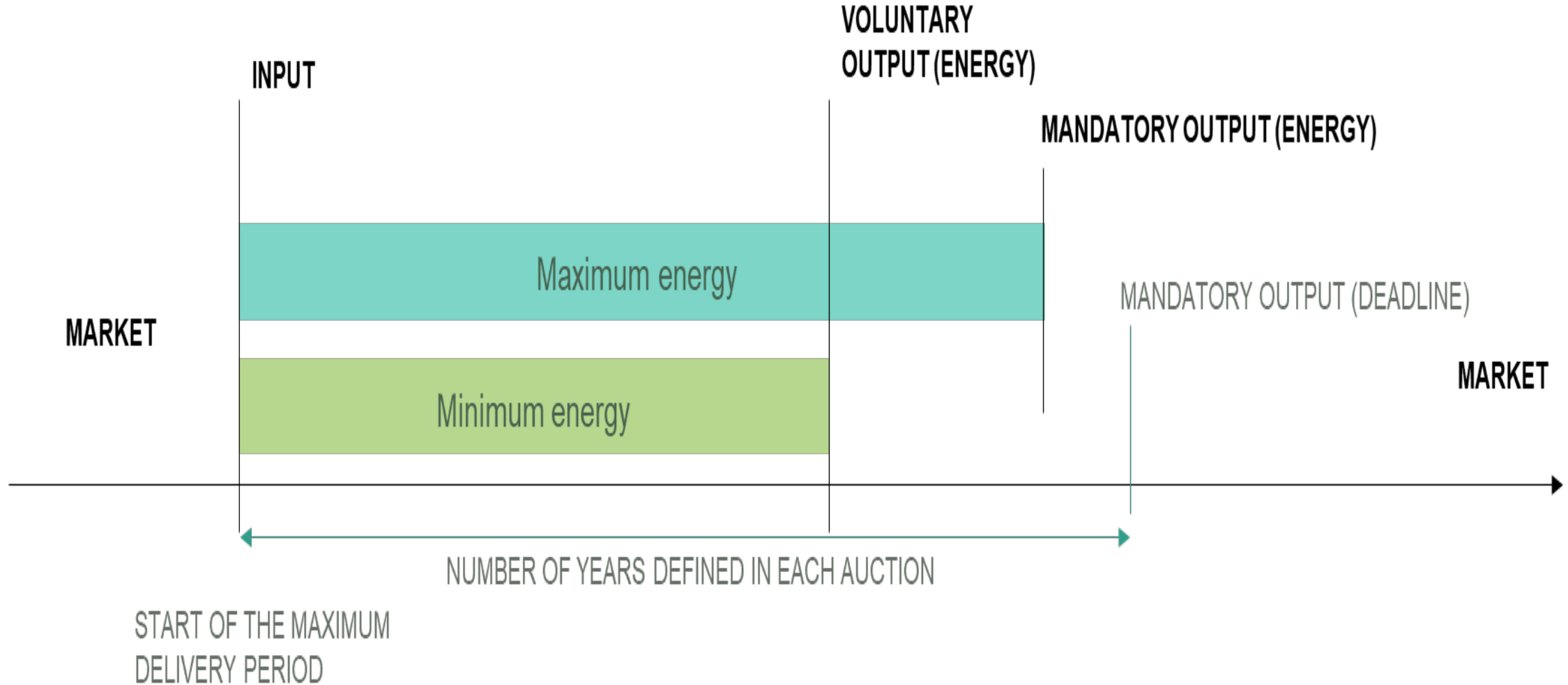
REER=Economic Regime for Renewable Energies

REER AUCTIONS

KEY DESIGN ELEMENTS

- Auctioned product: capacity (MW)
- Static, PAB, price-only (generation €/MWh), multi-item auction
- Geographically neutral.
- Hybrid design: technology-specific reserves and multi-technology reserves.
- Indicative schedule with minimum capacity volumes per year.
- Minimum competition level (1.2 rule).
- Concentration rule: 50%
- Reserve price (confidential).
- Minimum price 0 (€/MWh).
- Support period: 12 years.
- CfD.
- A commitment to generate an accumulated amount of electricity (*minimum energy of the auction*).

REER AUCTIONS



REER AUCTIONS

Minimum energy
from the auction

=

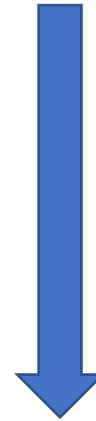
Capacity

x

Minimum number of
annual full-load hours

x

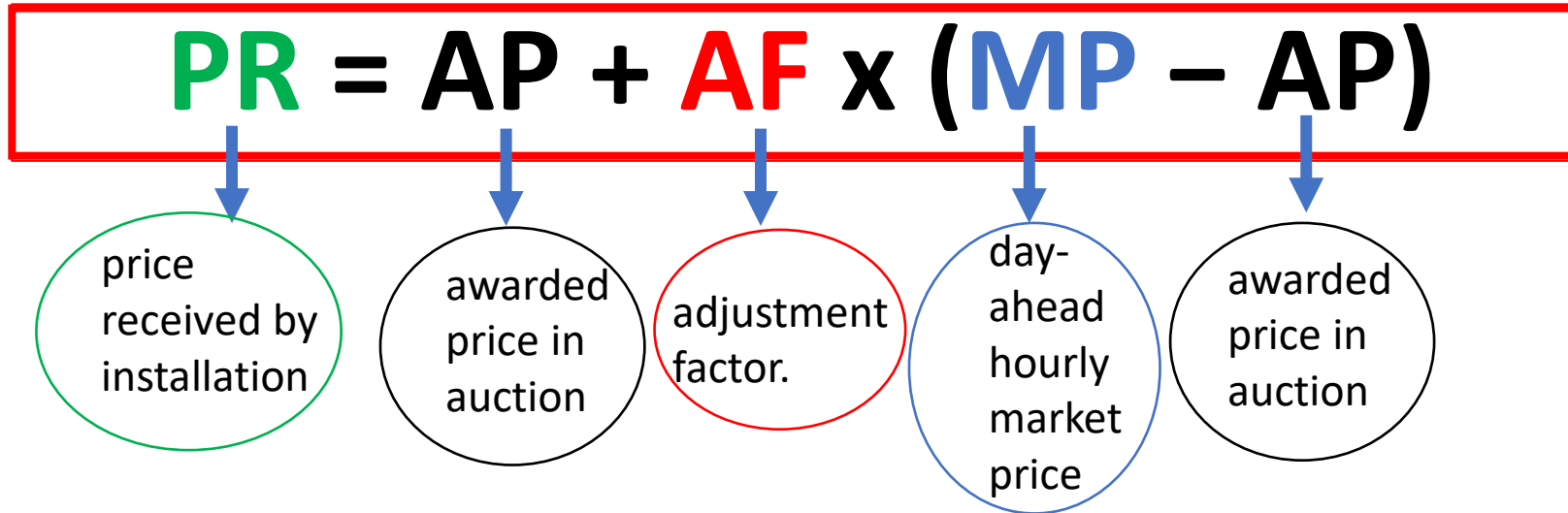
Maximum delivery
period (years)



	Min. hours	Max. hours
PV	1500	2300
CSP	3000	4000
Wind	2200	3500
Hydro<10MW	1600	2500
Biomass	6000	8000
Biogas	6000	8000

REER AUCTIONS

- Retribution of the energy of the auction:



AF (adjustment factor):

- 25% if the installation is dispatchable
- 5% otherwise.



REER AUCTIONS

- 
- Therefore, for non-dispatchable installations:

$$PR = 95\% * AP + (5\% * MP)$$

- For dispatchable installations:

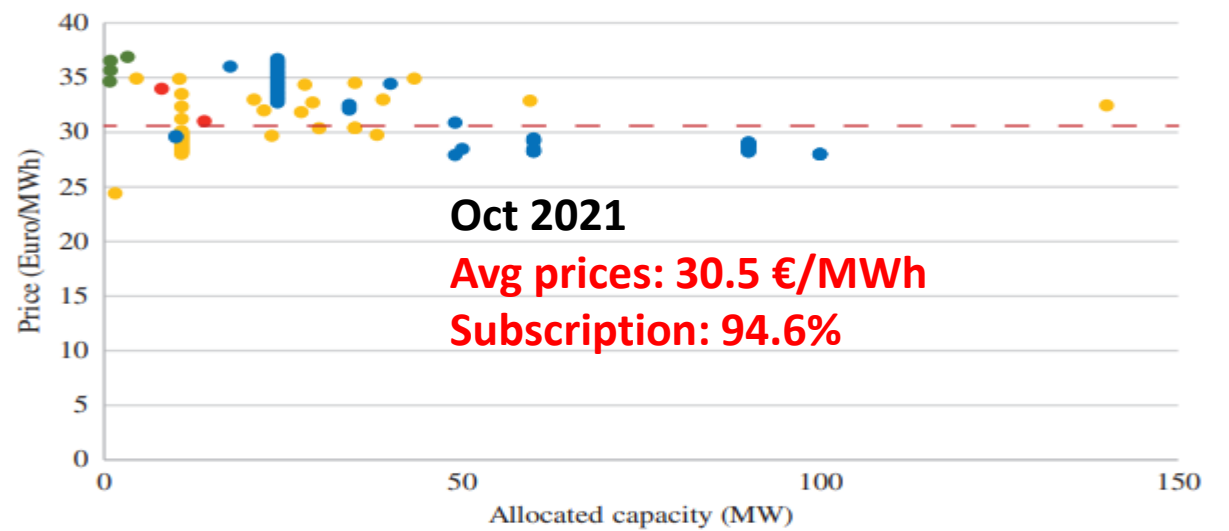
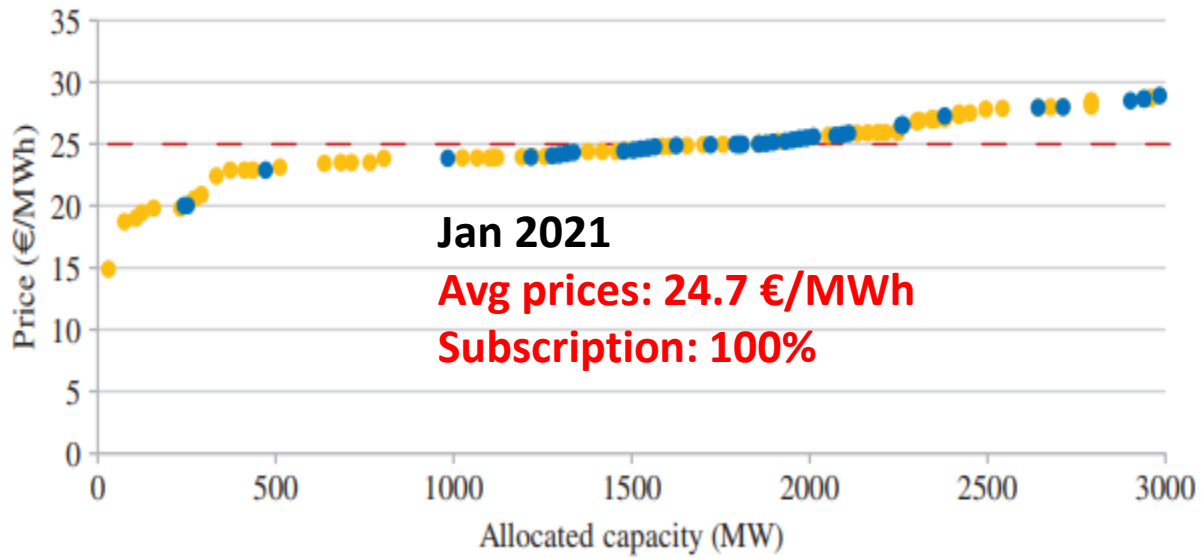
$$PR = 75\% * AP + (25\% * MP)$$

- If $PR > MP \rightarrow$ Payment obligation on the market (payment to the generator).
- If $PR < MP \rightarrow$ Revenue for the market (payment obligation from the generator).

REER AUCTIONS

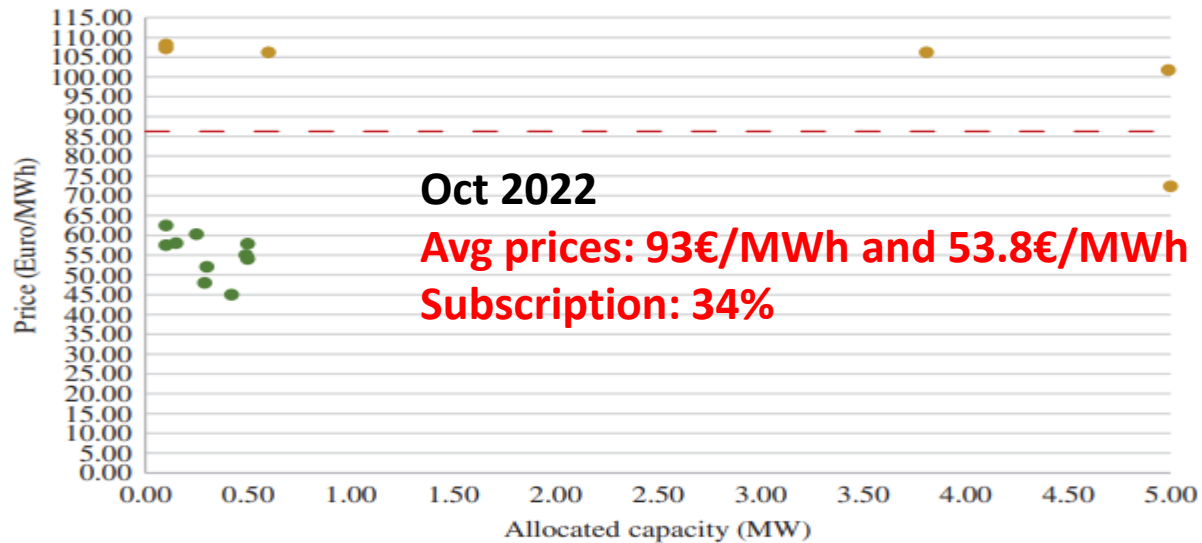
Results...



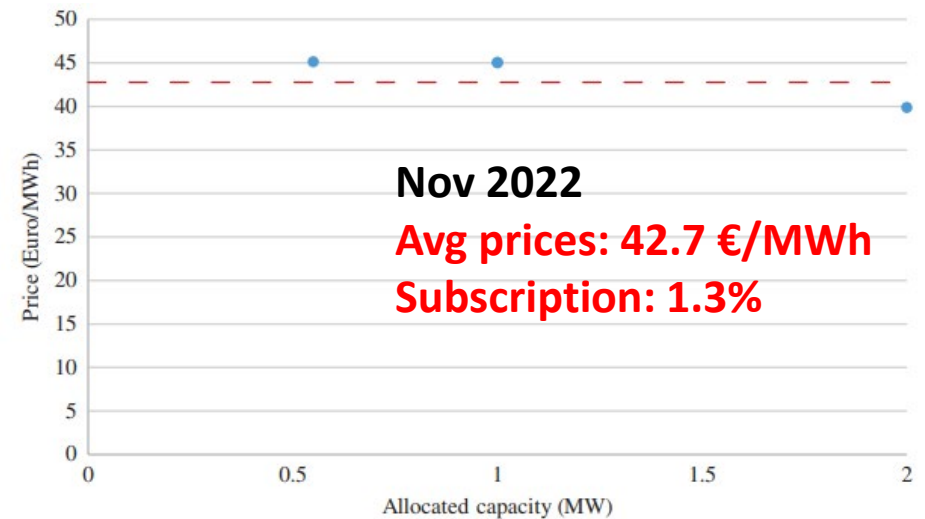


● Solar photovoltaic ● Wind power - - Average price (€/MWh)

● solar PV ● wind on-shore ● local PV installations
 ● "fast-track" installations - - average price (€/MWh)



● local PV installations ● biomass - - average price (€/MWh)



● wind on-shore - - average price (€/MWh)

REER AUCTIONS

	Volume auctioned (MW)	Volume awarded (MW)	% volume awarded/ volume auctioned
1st auction			
Total	3000+6%**	3034	100%
Wind on-shore	(1000)*	998	-
Solar PV	(1000)*	2036	-
2nd auction			
Total	3300	3124	94.6%
Wind on-shore**	1500	2258	-
Solar PV**	700	866	-
Fast-construction PV and wind**	600	21.95	-
Local solar PV**	300	5.75	-
3rd auction			
Total	520	177	34%
Quota 1. Dispatchable technologies.	380	146	38.4%
Minimum reserves			
Biomass	140	146	11
CSP	220	0	0
Other technologies	20	0	0
Quota 2. Local PV	140	31	22.1%
Fourth auction			
Total	3300	45.5	1.3%
Wind-onshore	1800	45.5	1.3%
Solar PV	1500	0	0

THANKS!!



**EXPERIENCE RELATED TO
HUNGARIAN CFD**

Alfa Diallo

Senior Research Associate
REKK

05.12.2023

Overview of the Hungarian auction design (METÁR)



Technology focus	Technology neutral (except onshore wind)
Auction product	Energy & Budget
Size limitations	Two size categories (A: 0.3 MW – 1 MW; B: 1 MW – 20/50 MW, last tender A: 5 MW - 20 MW, B: 20 MW-50 MW)
Remuneration type	Contract for difference (CfD)
Reference prices	<p>Ex ante (for budget limit): The yearly reference price is calculated as the monthly unweighted average of the future peak load (for PV) or baseload (for other technologies) prices for the next three years converted to Ft/kWh</p> <p>Ex post (for support payment): : For every month, the average hourly price of HUPX. In the case of PV power plants, it is adjusted with the production profile of the PV power plants</p>
Support period	15 years
Allowed realisation time for project	36 months + 12 months (losing bond: 5% of CAPEX)
Prequalification criteria	Operation licence (above 0.5 MW), grid connection agreement, building permit, 2-stage financial bonds

Auction rounds in Hungary

	1st round	2nd round	3rd round	4th round	5th round
Date	09/2019	08/2020	04/2021	11/2021	03/2022
Special rules	-	-	-	Refurbishment for projects older than 20 years	10% storage capability of annual generation capacity
Winning technologies	Solar PV + 0.5 MW landfill gas	Solar PV	Solar PV	Biogas and Hydro	Solar PV with battery storage
Awarded capacities (MW)	132	210	183	135	271
Oversubscription rate	2	5	1.9	4.6	0.5
Number of winning bids	72	36	57	4	12
Weighted average strike price (EUR/MWh)	67.91	51.21	47.09	104.56	66.77
Realised capacity (until 06/2023, MW & deadline)	28.6 (03/2023 + 1 year)	1 (02/2024 + 1 year)	1 (11/2024 + 1 year)	0 (12/2024 + 1 year)	0 (06/2025 + 1 year)

Additional issues related to governmental CfD's

- Metár tenders are currently **on hold** in Hungary, because of **grid connection problems**, currently it is not allowed to connect new PV installations into the grid (receive new grid connection licence)
 - In parallel there was a **tailored** (different for each project) **deadline extension** for project completion which decreased the transparency in association with completion rates
 - Completion dates even **after 2028** are plausible according to the legislation
- After project completion currently, the Hungarian **projects do not start their support contract**, many of the completed **projects are PPAs with an option to enter in the support scheme** in a later date
- In Hungary the METAR scheme is financed mainly by **large industrial electricity consumers** who **originally received compensation** in case of „negative support“ because of high prices
 - This compensation payment was erased by the government in 05/2022 since that if negative support occurs it **boost the artificially low gas/electricity tariff of household** consumers