Unlocking the power of contracts for difference (CfDs) to accelerate the energy transition

EXECUTIVE SUMMARY

Knowledge partner

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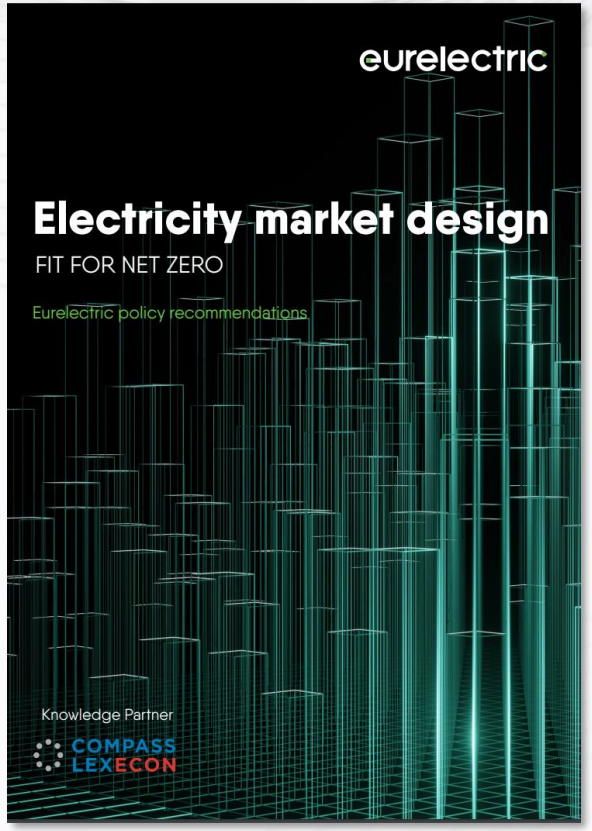
Introduction: The importance of guidance for the design of two-way CfDs and equivalent schemes

The Electricity Market Design reform highlighted the need for an appropriate investment framework to support capital-intensive, large-scale investment in clean and flexible resources

- In the flagship study *Electricity market design, Fit for Net Zero*, Eurelectric and its economic consultancy partner Compass Lexecon defined high-level recommendations on CfDs and other types of long-term contracts, stressing that guidance for the design of public de-risking schemes should be developed on best practices.
- The recent reform of the electricity market design puts forward two-sided CfDs (and equivalent schemes) as the main support mechanism for direct price support to new capacity. However, the reform leaves a range of design issues open.



Against this backdrop, this study *Unlocking the power of CfDs to accelerate the energy transition*:

1. **Highlights key challenges and trade-offs associated with design and implementation of two-way CfDs for renewable energy sources (RES) and low-carbon technologies**
2. **Includes a range of alternative options for the key design features of CfDs addressing these key challenges**
3. **Identifies key trade-offs and provides guidance on best practices to design efficient CfDs**

This document is the executive summary of an extensive report available upon request*

Sources: Eurelectric (2023) Electricity Market Design Fit for Net Zero Accessible here; European Council (2023). Reform of electricity market design: Council and Parliament reach deal. Accessible here

*Please contact cgruber@eurelectric.org & elbedford@eurelectric.org if you would like to receive a copy of the complete study

Outline of the Executive Summary

1. Context: The role of CfDs within the energy transition
2. Challenges with ‘traditional’ two-way CfDs design
3. Overcoming the challenges
4. Conclusions and recommendations

1.

Context: The role of CfDs within the energy transition

Appropriate framework needed to support investment in clean and flexible resources

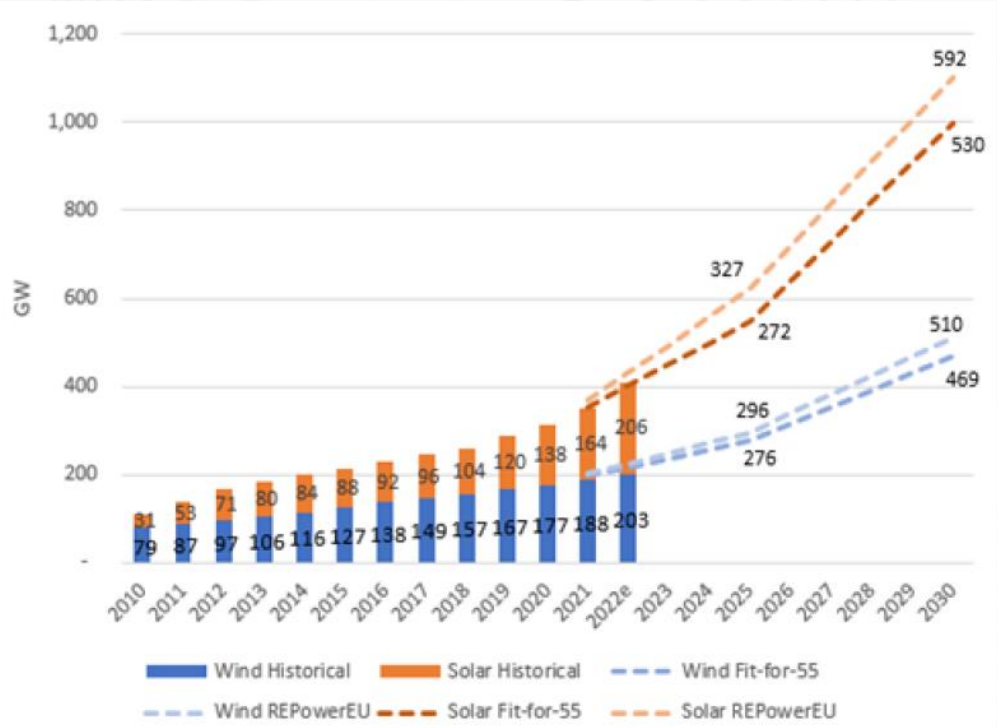
Europe's decarbonisation ambition requires a step-up in power sector investments

- REPowerEU alone requires €300bn of investments by 2030, in addition to the Fit for 55 investments
- The European Commission estimates that a total investment of €583.8 billion in the electricity grid will be necessary by 2030
- REPowerEU increased investment needs by €29.4 billion in power networks, and €10 billion for storage over the decade

Market-based de-risking schemes like CfDs are key to achieve EU ambitions where and when they are needed

- Growing shares of publicly supported assets with variable generation and low variable costs will increase market risks (including price cannibalisation, and lower liquidity in forward markets)
- Public de-risking schemes awarded through competitive processes should be designed to have the least distortions possible on the short-term markets, investment and operation decisions, as well as forward contracting
- At the same time, the design of de-risking schemes should not cannibalise the interest in merchant investments either for developers or consumers

Volume of RES installed capacity in the EU, and projection of RES to reach 'Fit-for-55' and 'REPowerEU' targets



Source: European Commission (2023) Commission staff working document - Reform of the Electricity Market Design.

Introduction (2/2)

Current European framework for designing contracts for differences (CfDs)

The Climate, Energy and Environmental Aid Guidelines (CEEAG) set the foundation for state aid rules for RES support schemes across Europe

- The CEEAG enables Member States to fund projects for environmental protection in a cost-effective and non-distortive way
- CEEAG sets the parameters for designing the key elements of national RES support schemes (revised in December 2021)
- All the technologies that can contribute to the reduction or removal of greenhouse gases are eligible
- Additionally, the aid must be necessary, proportionate and granted on the basis of objective, non-discriminatory and transparent criteria defined *ex ante*
- The Guidelines already identify two-sided CfDs as an appropriate model to support the further expansion of renewable energy sources.

Market reform EU Council deal of 14 December 2023 covers CfDs

- **Two-way CfDs** or equivalent schemes with the same effects **will be mandatory** when public funding is involved in direct price support
- They apply to investments in new power-generating facilities based on **wind, solar, geothermal, hydropower without reservoir and nuclear energy**
- Two-way CfDs will be subject to the Commission's **assessment under existing state aid rules**, independent of technology, to avoid any distortions to competition
- **Guidance on design principles:**
  - Preserve the incentives for the generating facility to operate and participate efficiently in short-term and long-term electricity markets
  - Does not lead to distortions to competition
  - Distribution of revenues to undertakings does not distort the level playing field in the internal market

The recent reform of the Electricity Market Design puts forward two-sided CfDs and equivalent schemes as the main support mechanism for direct price support to new capacity, but several design issues remain unresolved.

2.

Challenges with ‘traditional’ two-way CfDs design

'Traditional' CfDs stabilise market revenues in accordance with a set strike price based on the actual production of the plant

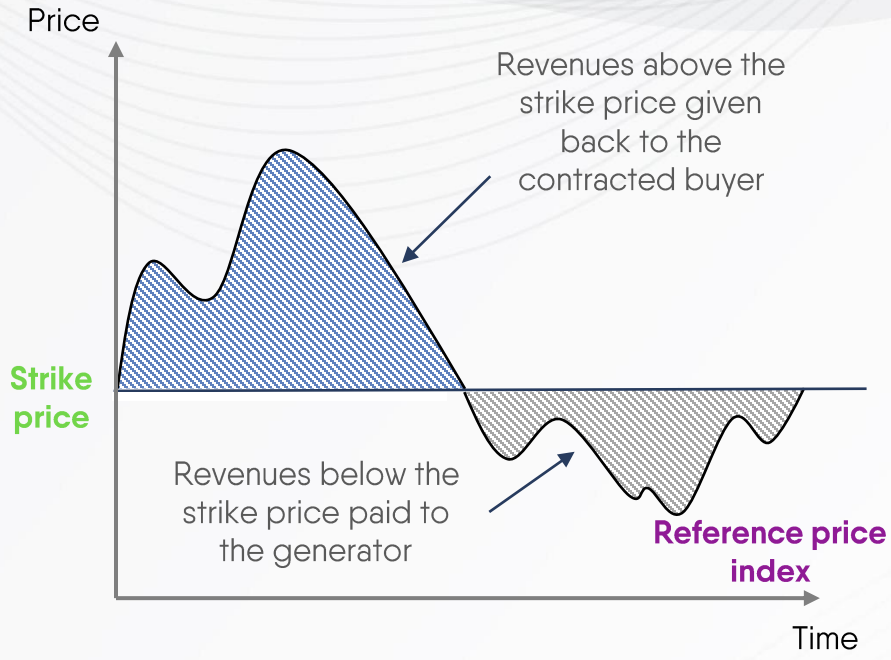
Contracts for difference (CfDs) are long-term contracts between an electricity generator and a public counterpart

- **A CfD ensures a fixed price – known as the *strike price* – for the electricity generated by a RES or low-carbon energy project. Under this agreement, the buyer (often a public entity) pays the strike price to the seller (generator or asset owner) for the contracted volume. Conversely, the seller compensates the buyer based on the *reference price* index.**
  - In the case of a support mechanism, the public counterparty (CfD buyer) does not necessarily get access to the associated volume/energy, but only pays or receives the difference between the strike and reference prices (symmetrically to the seller).
  - The reference price is typically the price on the day-ahead market and can be a weighted average across a given period (e.g., a month) using a standard profile. The contracted volume may be the actual production of the plant, or a standard production profile.
- Through this presentation, **we refer to this CfD model as the 'traditional CfD', applying to the actual production of the plant**

As a result:

- **When the strike price exceeds the market price, the deficit** (i.e., the revenues below the strike price) **is received by the generator.**
- **Conversely, when the strike price is below market price, the surplus** (i.e. the revenues above the strike price) **is retroceded to the buyer** to reach the strike price.

Illustration of a two-sided CfD



To determine generator revenues in a 'traditional' two-way CfD = **production** x (**market price** + (**strike price – reference index**))

Electricity market

Contract for difference

Trade-offs for an efficient CfD design need to be carefully balanced

Relevant stakeholder

Customers

Generators & investors

Objectives

1. Incentivise investment in RES and low-carbon capacity
2. Minimise total costs
3. Minimise distortions of electricity markets
4. Incentivise optimal design and location of the project
5. Consumer protection

Success criteria for an efficient CfD design

- **Support the build-up of RES and low-carbon assets to meet renewable and decarbonisation targets as well as security of supply requirements** by providing a stable revenue stream over a long period to developer
- **Achieve political objective at a minimal total cost**, considering all costs net of value provided – and contribute to **consumer protection** through cost minimisation and effective balance of risks and rewards in the contract design
- **Ensure that market participants retain sufficient incentives for optimal and system-friendly participation** in wholesale markets (short term and long term) based on price signals
- **Promote efficient power plant design and location to meet the power system's needs** by producing high value electricity (e.g., location or design choice allowing production in evening-peak, winter, etc.), rather than just maximising overall production
- **Bring the benefits of RES/ low-carbon generation more directly to end-consumers,** by contributing to consumer hedging

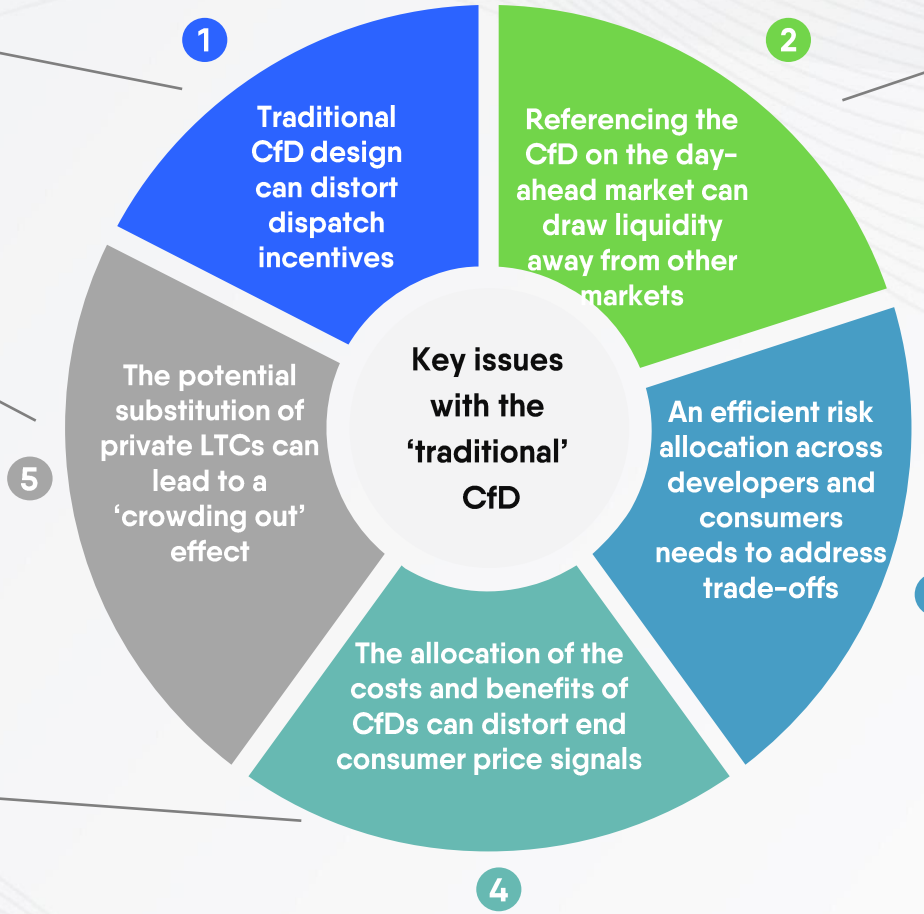
An efficient CfD design should carefully balance various objectives to facilitate investments at the lowest cost for consumers, while also ensuring that market participation remains conducive to the stability and efficiency of the system.

Key design issues of ‘traditional’ two-way CfDs

As the price captured is equivalent to the strike price, **generating units may not have dispatch incentives** to maximise production in high-price hours or to minimise in below-cost hours

CfDs can, in some circumstances, be **substitutes for other private long-term contracts (LTCs)**. As a result, the relative attractiveness of CfDs and other LTCs **could impact total costs and redistributive outcomes** for consumers

Depending on the CfD’s cost and benefit allocation method downstream, distortions could be created for consumer prices, affecting consumers and suppliers



The day-ahead market is typically used as reference in ‘traditional’ CfDs, which **may draw liquidity away from other market timeframes** (e.g., forward markets). Including other timeframes (forward markets) in the reference price may enhance liquidity but may also increase **generators price risk exposure**.

Setting the strike price entails some trade-offs in allocating costs and risks across investors and consumers.

In addition, **other design elements of the CfD are important to define the risks** borne by the counterparties (reference price, time horizon of the contract, clawback clauses, etc.)

Addressing these design issues is key for developing an efficient CfD framework.

3.

Overcoming the challenges with ‘traditional’ two-way CfDs

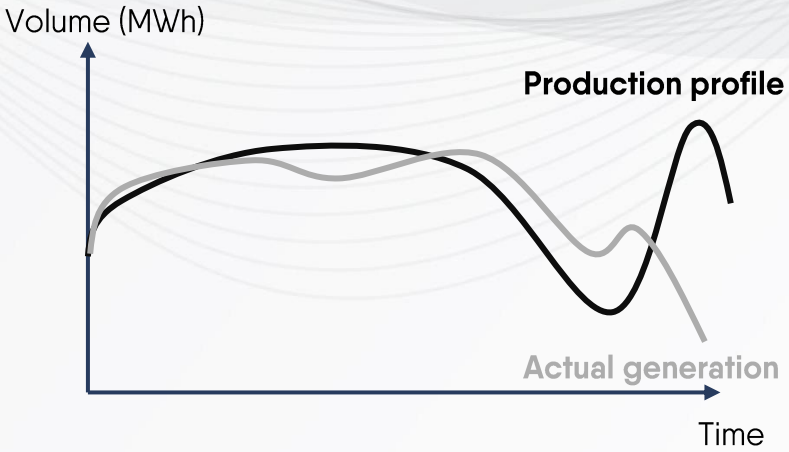
Decoupling settlements from actual generation can enhance dispatch incentives

Different approaches are possible to decouple generators revenues from the actual production of the contracted unit, which is the root cause of dispatch distortions

- **CfDs can base remuneration on different attributes**, such as 'actual' electricity generation, capability, and/or standard profiles (provided these adhere to state aid rules)

Volume-share CfD	CfD where only a share of the production of a generating unit is covered by a two-way CfD
Profile-based CfD	the asset is given a payment based on the CfD strike price applied to a reference production profile
Capability-based CfD	the CfD is settled on the asset 'maximum possible' rather than 'actual' injection (subtype of profile-based CfDs)

Illustration of a profile-based CfD mechanism



This decoupling creates incentives for efficient dispatch, but exposes investors and generators to market risks which can raise strike prices and lower investment incentives

- **Profile and capability-based CfDs create incentives for efficient operation** as generators are exposed to price signals for their actual production
- The inclusion of a carve-out introduces an element where a portion of the volume is subject to market prices, potentially undermining dispatch incentives to produce during periods of low market prices
- Nevertheless, the increased risk exposure faced by generators and investors **may lead to higher CfD strike prices or dampen incentives to invest. This risk increases as the profile used in settlement diverges from actual production**
- In cases of low generation compared to profile and high prices in particular, **generators could be exposed to a CfD payback on energy volumes they did not sell on the market**[1]

Note: a reverse situation, combining for instance higher generation and high prices, so in favour of the generators, is also possible but it is less likely as RES generation and prices tend to move in opposite directions.

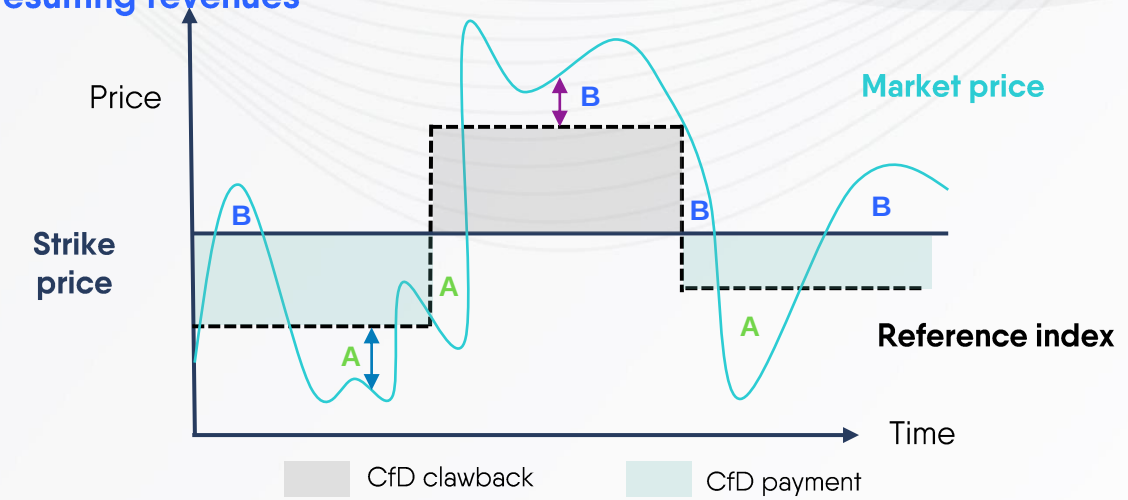
When considering CfD design choices enhancing incentives for efficient short-term dispatch, balance the volume and price risk exposure to what is efficiently manageable by generators and investors, which may differ across technologies.

Price exposure in reference index/strike price can enhance dispatch incentives

Other approaches in CfD design focusing on the reference index or the strike price could also enhance dispatch incentives for generators

- **Averaging the reference index price** over time can introduce a gap between the average index value over the period and the actual price
  - Under this approach, CfDs would be settled on an average reference index basis, for example average monthly captured prices, instead of prices for each market time units
  - This enhances dispatch incentives, as producers could aim to produce during higher price periods compared to the reference average
- **Introducing a 'floating' variable strike price** depending on market prices based on a mechanism defined *ex ante* could also send incentives to dispatch at times of higher prices for CfD generators
  - The strike price auctioned would be weighted with a small share of market prices, enhancing dispatch incentives
- While sending signals for dispatch, the **increased price risk exposure faced by generators and investors** could potentially lead to higher CfD strike prices and/or dampen incentives to invest
  - For instance, if considered, the averaging period should be proportionate to avoid excessive risks left on generators and investors
  - Mitigation measures (e.g. floor…) could also be envisaged if needed

Illustration of a reference index based on average prices and resulting revenues



A – market price is below the reference average price (generator revenue = strike price – A)

B – market price is above the reference price (generator revenue = strike price + B)

When determining the average reference index period, it should be proportionate to prevent excessive risk exposure for generators. Additionally, careful consideration should be given to the complexity and requirements for monitoring and control.

Conclusion: optimal design balances dispatch incentives with risk exposure

Moving towards volume-share, capability-based and/or profile-based CfDs could enhance incentives for efficient short-term dispatch:

- Such incentives **can also be introduced through other design elements** (e.g. through average price reference index, or with variable strike prices)
- Depending on the CfD design**, incentives for efficient dispatch could also provide incentives to efficiently design and/or locate the project** at the investment stage

However, such enhanced dispatch incentives also entail greater price and/or volume risk exposure for generators and investors:

- Such increased risk exposure could **impact strike prices requested by the generators, affect incentives to invest** and potentially increase costs borne by consumers
- The **efficient degree of risk exposure** depends on the **ability of generators and investors to manage risks, and thus differs across technologies**

CfD design can improve dispatch incentives in different ways but needs to recognise the impact on generators and investors' volume and price risk exposure

- Policymakers should carefully **balance the incentives associated with the CfD design** with the **risks borne by generators and investors**, as it could alter incentives to invest and potentially increase consumer costs

Trade-offs with CfD design options regarding dispatch incentives

Striking a balance between volume and price risk exposure to improve incentives while keeping it efficiently manageable by generators and investors is key. This entails careful consideration of key parameters such as profile definition. Additionally, the allocation of risks may also vary among technologies.

Issue 2: Referencing the CfD on the day-ahead market can draw liquidity away from other markets

Forward markets with spot market reference prices could support market liquidity, but could increase volume and price risks

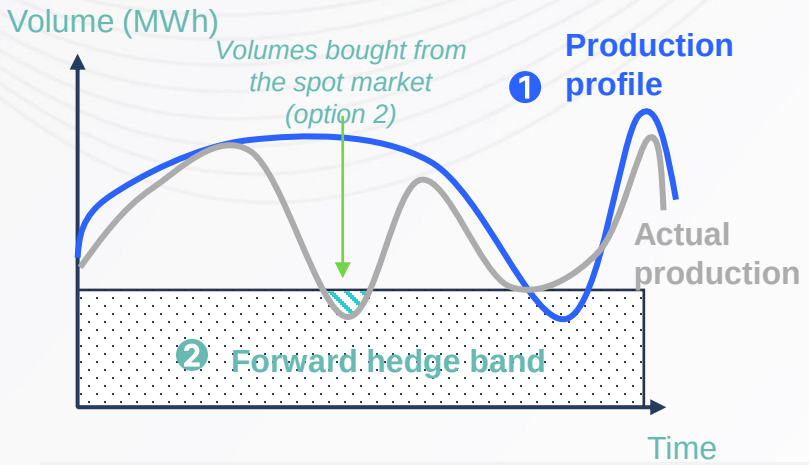
Using a reference price index for CfDs encompassing forward markets alongside the spot market could support liquidity by driving more volumes on these (forward) timeframes

- Generators with a CfD still need to manage their remaining basis risk in the reference market(s), and so **are incentivised to hedge in this/these market(s)**
- Including forward markets alongside the spot market as a reference market could **support liquidity on these timeframes, and the development of suitable products** to hedge specific risks (e.g., associated with RES profiles and variable production)
- **This could be implemented in different ways,** such as selecting specific forward products or creating a composite index made of prices from different markets (Day-Ahead, forward, etc.). This requires selecting the timeframes/contracts/prices of forward products and needs to be tailored to the specificities of the different markets
- In any case, the reference index should **carefully consider the complexity and risks** for generators

However, incorporating forward market prices within the reference price index could increase both the volume and price risks faced by generators

- **Volume risk:** selling RES and low-carbon volumes in advance on forward markets induces a risk, as the predictability of volumes can be lower. This can result in disparities between volumes sold and actual production
- **Price risk:** generators face the risk of selling incorrect volumes on forward markets, necessitating the balancing of portfolios in shorter-term markets. This exposes them to the price differential between forward prices and those of shorter-term markets

Illustration of two possible options for incorporating forward prices in the CfD reference price index



1. **Option 1:** Incorporating forward product prices in the reference index following a specific production profile
2. **Option 2:** Incorporating forward product prices based on a flat production band, with differences with actual production valued on the spot market

For the reference price of the CfD, investigate composite indices with some reference to forward markets, with a share of forward markets proportionate given the risks induced and adapted to the profile of the technology class or asset profile.

Competitive allocation process can include 'non-price' factors to reveal efficient costs and award contracts

An effective competitive process is the default allocation process for CfDs in Europe, but exemptions to the market-based process can be justified under special circumstances when the conditions for effective competition in the allocation processes are not met.

Competitive allocation

- **A competitive allocation mechanism,** as opposed to administratively setting the strike price, **is the optimal approach to reveal costs and their dynamic evolution**. Thus, potentially bringing down support costs for consumers when costs fall, but conversely adapting to potential cost increases for developers.
- **Making the participation in CfD schemes voluntary** allows to leave space for investment in RES/ low carbon resources hedged with private contracts (such as PPAs).
- **Multi-criteria tenders allow to include a range of externalities in the assessment of CfD allocation**, e.g. to ensure that projects are assessed in the light of their contribution to public policy objectives:
  - Key issue with non-price criteria is to provide **objective, measurable and quantifiable metrics known ex ante**, as well as the relative weight of the different criteria in the auction award process and penalty clauses for non-compliance.
  - Some selection criteria can be directly embedded in the auction, for instance in the eligibility criteria to participate.

Administrative allocation

- **Allocation of CfDs outside of competitive processes should be limited to circumstances when the conditions for effective competition are not met, e.g.:** a lack of participants, limiting competition across bidders, or high transaction costs limiting participation for some actors – for example in the case of small installations
- **Caution should be used when setting the strike price administratively:** ensure that they are based on costs using a clear transparent ex ante process, referring to the EC guidance.

- **CfDs must be allocated through a voluntary competitive market-based process.**
- **If applied, non-price criteria should be objective, measurable and quantifiable, and the tender evaluation methodology should be established ex-ante to reduce uncertainty and risks of discretionary auction results.**
- **Exemptions from the market-based allocation process must be considered exclusively for specific capacities (e.g. small-scale distributed resources or in the absence of potential competition)**

Beyond the strike price, other elements in the CfD framework affect the risk allocation across counterparties

Risk of retroactive changes

- **Investments are very sensitive to regulatory uncertainties**, especially with the high capital intensity required for financing RES and low-carbon projects. Retroactive changes undermine investors' confidence and should be avoided.
- The Government or the regulator can reduce this risk by designing a RES and low-carbon public de-risking scheme which includes explicit commitments against retroactive changes.

Contract timeframe

- **The risks mitigation effect of the CfD also depends on the timeframe** covered by the contract. Shorter contract timeframes could increase risks and the associated cost of financing.
- **The asset lifetime varies depending on the technology type** – as a result, the CfD framework should account for technology specificities.

Visibility and stability on auctions

- **Providing predictability and stability on auction parameters and volumes** can help reduce risks and costs for investors

Strike price indexation

- **Indexing the strike price to inflation can help address some of the risks borne by generators and investors** over long contractual periods (15-20 years), particularly OPEX costs inflation.
- **Indexation of CAPEX costs**, at least, during the construction period can also reduce **construction risks for generators.**
  - Although the absence of such indexation could create incentives for prompt project commissioning, generators may be unable to control external delays such as in the supply chain.

- **Define ex-ante the contractual framework to address cost evolution throughout the contract's duration**
- **Avoid any ex-post changes by including explicit commitments to refrain from retroactive changes.**
- **Determine the contract duration consistently with the lifetime of the assets, considering their capital intensity and bankability issues.**
- **Explore the possibility of indexing the strike price to accommodate inflation on investment and operating costs, particularly up to the plant's commissioning date.**

Issue 4: The allocation of costs and benefits of CfDs can distort end consumer price signals

A range of approaches are available for allocating CfD costs and benefits to consumers, with key policy choices on the channel and redistribution effects

There are several key policy issues associated with the choice of approach for allocating costs and benefits, for instance:

- Whether these are channelled through energy bills or the wider state budget/ tax system; as well as
- The redistributive effects across consumers, such as the allocation of costs/ benefits across different types of consumers (e.g. residentials/ industrials…)

Different approaches are possible to allocate costs/ benefits of CfDs contracted on behalf of consumers by central entities:

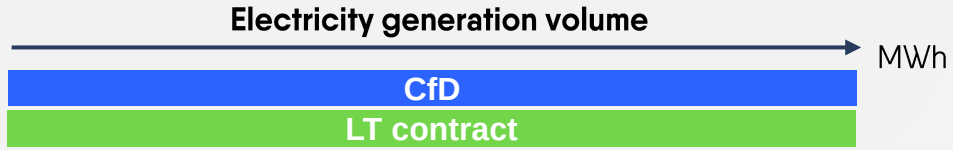
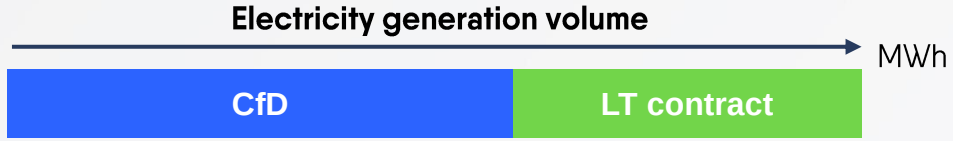
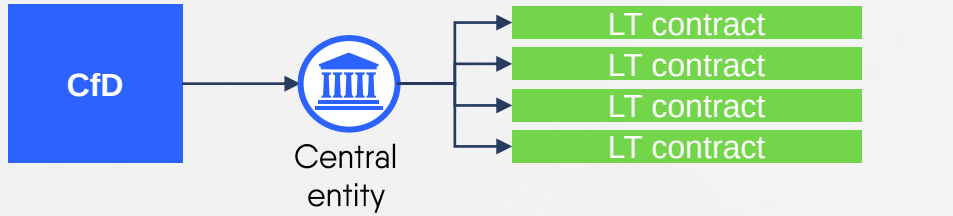
1. Levies or charges embedded in grid tariff
2. Supplier charges, passed on to consumers
3. Resale of electricity to suppliers/consumers via centralised auctions of long-term contract slices
4. General tax system (State budget)

Careful consideration should be given to the impact on consumer price signals as well as their exposure to market price volatility:

- **Redistributing costs and benefits of CfDs through a separate entity:** suppliers or a central entity reselling CfD contracts could manage risks and pass some of the remaining risks through to consumers. For instance, a single entity could pool energy volumes under CfDs and mutualise risks.
  - However, such approach raises the issue of the suppliers or central entity ability to bear these risks and efficiently manage them.
  - In addition, there is a potential risk of non-cost recovery and of the incentives /regulation in case of a central entity.
  - Allocating CfD costs benefits through suppliers also bears an additional risk of discretionary cross-subsidies across consumers.
- **The redistribution of costs and benefits of CfDs in a timely manner is important.** If not allocated at sufficiently granular intervals, the CfDs costs / benefits could distort price signals as these would not reflect the current market conditions.
  - Conversely, an allocation at excessively granular intervals could distort incentives for consumers to engage in the market (i.e., incentives to energy efficiency and/or to hedge).
  - The timing of redistribution is also important for consumers, such as industrials, who require a forward-view on their total sourcing costs.

- **Ensure the timely distribution of costs and benefits associated with CfDs among consumers to maintain efficient price signals and support efficient hedging strategies.**
- **Ensure that guidelines are set to avoid both risk exposure for retailers and discretionary cross-subsidies across consumers if suppliers are in charge of redistributing costs and benefits.**

There are multiple ways to articulate CfDs with other long-term contracts in a complementary way

Option		Description
1	CfD **OR** LT contract	• **LT contracts and CfDs could coexist** as long-term instruments, and CfDs **could also be direct substitutes with private LT contracts** to hedge market risks. The latter could create a 'crowding out effect'.
2		• **LT contracts can complement CfDs over time,** e.g. to secure revenues at the end of the initial CfD lifetime or to hedge repowering projects.
3		• **Price exposure within the CfD design** could also prompt generators to hedge with LT contracts for the same volume.
4		• If a CfD only covers a share of the generation volume ('carve-out'), **LT contracts can complement production volumes not covered** by the CfD for a given asset. • To be able to issue 'green' LT contracts, Guaranties of Origin should be allocated to generators.
5		• **CfDs could be divided into shorter-term LT contracts** by its counterparty, if the counterparty is entitled to the energy volumes. These **shorter LT contracts can then be sold to consumers/ suppliers.** So, CfDs could be a source of LT contract supply instead of a complement or substitute. • To be split into shorter LT contracts, Guaranties of Origin should be allocated to the counterparty.

CfD design can incorporate features to foster complementarity with other types of long-term contracts

To unlock this complementarity, developers should be able to choose which volumes are covered by CfDs: i.e. by ensuring a voluntary participation in these schemes, and also having the possibility to only cover a share of production through CfDs.

Some CfD design features allow to combine CfDs with other LT contracts for the same capacities

Part of generation exposed to market prices

- **In the case of a CfD based only on a share of the total volume generated,** the plant investor / operator still faces market risks for the volumes produced that are not covered by the CfD. This does incentivise the plant investor / operator to hedge these volumes price and volume risks (or a portion of them) through a LT contract.

CfD design with a degree of residual market risk

- **Some CfD design features expose the generator to residual market risk:**
  - **Profile/capability-based CfDs.** If there is a strong mismatch between the actual production with reference profile, parts of the generation may be unhedged, thus exposed to market risk
  - **Variable strike price**
  - **Average reference price index**
- This **residual risk exposure** could **create incentives for a complementary hedging**, but it should not be disproportionate and deter investment
- However, **finding PPA / forward products to cover the residual risk could be difficult in practice,** depending on the risk to be covered, CfD design and other long-term contracts characteristics. Innovative forward products could be developed to fill in an emerging need.

- Generators and investors should be able:
  - to choose which volumes are covered by CfDs, and
  - to contract via CfDs only a share of they assets production, to foster the complementarity of private and public contracts.

4.

Conclusions and recommendations

Key takeaways to unlock the power of CfDs to accelerate the energy transition

1
Complement investments in renewable and nuclear required to achieve targets

Well-designed CFDs must incentivise additional investments by providing long-term visibility and ensuring an efficient risk allocation and mitigation for investors and operators.

2
Minimise distortions in electricity markets

Well-designed CfDs should offer robust incentives for market participants to engage optimally and system-friendly in wholesale markets. This includes compliance with state aid rules, encouraging efficient dispatch choices, facilitating the use of complementary hedging tools, and fostering cross-border collaboration.

3
Optimise effectiveness for market players and consumers

Well-designed CfDs must ensure cost effectiveness through a competitive market-based allocation, maintaining symmetry in surplus and cost distribution, and a rapid reallocation of costs and benefits to consumers. Thus, achieving political objectives at minimal cost while protecting consumers.

- Other relevant design features and factors – such as settlements redistribution, locational criteria, and grid constraints – have not been addressed within the scope of this report.

Summary of all recommendations

Key issues	Recommendations included in the report
CfD design can distort dispatch incentives	1 - Standardised profiles must be aligned with actual generation and not expose investors & generators to undue risk.
Referencing the CfD on the day-ahead market can draw liquidity away from other markets	2 -Generators and investors should be able to choose which volumes are covered by CfDs. 3 - Ensure that references to forward markets in composite price indexes are proportionate and tailored to the technology or asset profile.
Ensuring an efficient risk allocation across developers and consumers is challenging	4- Utilise objective, measurable and quantifiable non-price criteria, established prior to tender 5- Allocate CfDs through a voluntary competitive market-based process 6- Consider exemptions from market-based allocation only for specific capacities. 7- Align contract duration with asset lifetime, considering capital intensity and bankability. 8- Establish the contractual framework upfront to address cost evolution during the contract period. Including the possibility of indexing the strike price to accommodate inflation on investment and operating costs (particularly up to the plant's commissioning date). 9- Include explicit commitments to avoid retroactive changes post-contract.
The allocation of the costs and benefits of CfDs can lead to inefficient incentives	10- Ensure the timely distribution of costs and benefits associated with CfDs among consumers to maintain efficient price signals and support efficient hedging strategies.

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