Baringa

The Future of European CfDs

November 2023

Executive summary

The European Commission has proposed to reform key electricity market regulations, with continued focus on Contracts for Difference (CfDs), a support mechanism already widely used in several European countries. CfDs have been very effective at delivering **increased competition**, **accelerated deployment** and **price stabilisation** for both renewable assets and consumers.

However, **as renewable penetration increases, the economic inefficiencies associated with the CfD also increase**. This raises questions over the future appropriateness of this low carbon support policy.

There are lessons from more mature CfD markets that can guide **a reformed CfD**, such as including locational incentives, non-price factors and pre-commitment with indexation. A reform of the CfD, in order to extend its appropriateness, is preferred in the medium term to its decommissioning.

In the long term, **a post-CfD future is possible as technologies mature** and are able to withstand greater levels of risks, allowing government to reduce support for maturing technologies. However, even then, some form of continued support is likely to be needed for less mature technologies to deliver net zero commitments.

When **designing a resilient low carbon support regime for the long term**, progressively increasing risk or standardisation can form the basis of a sustainable future model.

CfDs – an instrument that has delivered great results but needs to evolve

European Contracts for Difference: a turning point?

The European Commission has proposed major revisions to several pieces of EU legislation, such as key 2019 Electricity Regulations and Directives[1] and the REMIT Regulation. In this context, it has signaled that long-term contracts, such as Contracts for Difference (CfDs), will continue to play a crucial role, with initial agreements going as far as requiring EU members to distribute state support for renewable energy projects only through CfDs (with some exceptions).

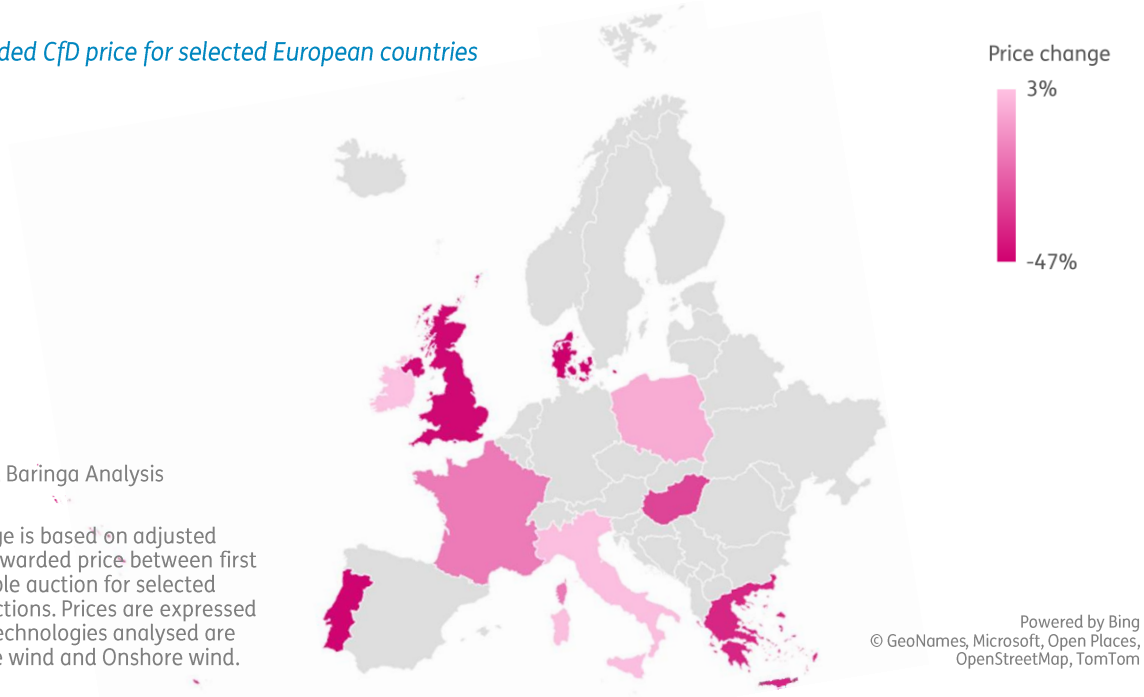
CfDs were able to incentivise **the development of low carbon generation** capacity in many European countries by mitigating price risk for developers through revenue certainty, while allowing for **a competitive environment**. Competition incentivises developers to seek out the best projects and most efficient technologies, which can put downward pressure on awarded prices. CfDs are also able to **stabilise prices**: securing revenue for assets and protecting consumers.

CfDs were also able to deliver widespread price reductions for renewable electricity in many European countries (with other external factors such as learning curves, innovation and low cost of capital also contributing to downward pressure on prices). **Greece**, **Portugal** and the **UK** are particularly successful examples.

However, recent sharp increases in development costs have left governments struggling to adapt and raise questions on how CfDs should evolve going forward. Not least because CfDs also risk bringing increasing system costs if they do not evolve with technology maturity as renewable penetration increases.

	Accelerated deployment	Competition	Price stabilisation
Contracts for Difference	✓	✓	✓

Change in awarded CfD price for selected European countries



Source: AURES II, Baringa Analysis

Note: price change is based on adjusted annual average awarded price between first and latest available auction for selected countries and auctions. Prices are expressed in ct2019/kWh. Technologies analysed are Solar PV, Offshore wind and Onshore wind.

[1] Including Regulations EU/2019/943 and EU/2019/942, Directives EU/2018/2001 and EU/2019/944

Accelerated deployment, competition and price stabilisation are possible thanks to specific CfD designs.

Contracts for Difference have been effective at increasing competition, delivering price stabilisation and enabling or accelerating renewable deployment owing to specific policy attributes.

Attribute	Competition	Price stabilisation[2]	Accelerated deployment	
Fixed budget/ capacity with competitive allocation	✓			Projects compete for a fixed budget or targeted capacity with **only the lowest cost projects able to secure a contract**. This encourages developers to innovate and seek out cost efficiencies (e.g., economies of scale, effective supply chain strategies) and by developing projects in favourable locations with high load factors and low network charges. It also caps spending per auction round, protecting consumers against overspending.
Two-sided price stabilisation		✓	✓	CfDs moderate the impact of excessively high wholesale prices on **consumers**, as generators return any positive difference between the wholesale and strike price. Similarly, they also protect **developers** from periods of low prices. The stable revenue stream also helps to secure financing for capital intensive projects, and reduces cost of capital, enabling development costs to fall and facilitating accelerated deployment of renewables.
Support emerging technologies	✓		✓	CfDs incentivise **fair competition** by allowing nascent technologies to receive higher levels of support and protects them from competition from more mature technologies by holding separate or split auctions. This incentivises deployment and allows for learnings and cost reductions.
Wholesale market participation	✓			Participation in wholesale markets is essential to maintain healthy wholesale market **competition** and high levels of **market liquidity**. It also ensures that developers face market incentives, increasing economic efficiency (e.g., non-compensation of negative prices in some markets).

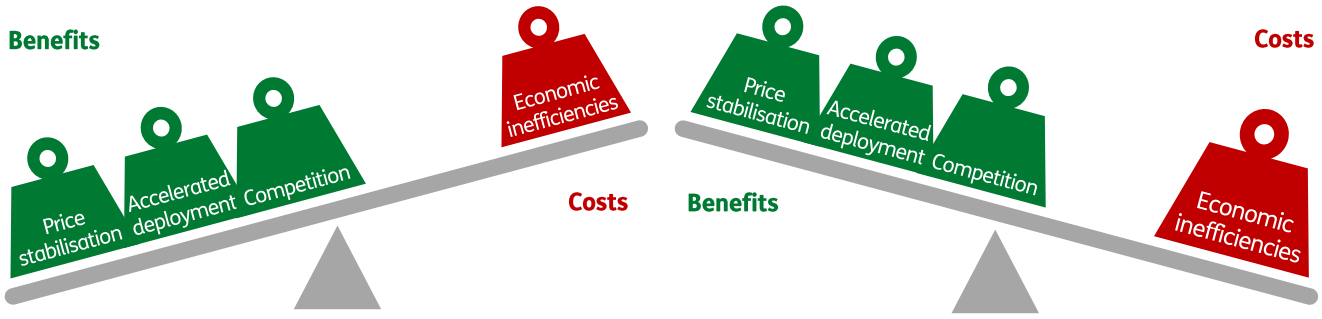
However, as renewable penetration increases, economic inefficiencies increase.

Low RES penetration

In the nascent renewable energy sources (RES) market, there was little focus on market distortions as priorities lay in incentivising initial capacity buildout and driving costs down; not least because volumes were not high enough to significantly impact overall system efficiency.

High RES penetration

However, as volumes of renewable energy become significant, and other sources of flexibility come off the system, the need for renewables to act in ways that minimise system cost becomes crucial. Hence, aligning incentives to market and system conditions is now far more important than in the early days of deployment.



[2] Price stabilisation defined as for both assets (stable revenue stream) and consumer (protection against excessive wholesale prices).

Most economic inefficiencies in CfDs derive from increased balancing costs, foregone capacity build and inefficient allocations.

Contracts for Difference can create negative externalities when the consequences of private decisions are not fully internalised. Such externalities may come in the form of increased system balancing costs, capacity which does not get built or inefficient allocation of capital and resources.

Attribute	Increased balancing costs	Foregone capacity	Inefficient allocation	✕ Strong effect ✕ Moderate effect
Balancing distortions are not fully mitigated	✕			Higher levels of renewable deployment lead to increased balancing costs due to **increased production volatility**. These additional balancing costs are paid by the system as a whole and not directly faced by the renewable generators. Moreover, CfDs do not always incentivise renewable generators to **behave efficiently** (e.g., incentives to bid into balancing services may be distorted) as awarded strike prices are fixed and set ahead of real-time market needs. Restrictions on support in negative price periods are only partly helpful, particularly if generators are in constrained locations without zonal pricing.
Locational incentives may be limited	✕		✕	Not all CfDs incentivise developers to locate their assets where it is best for consumers, although some mitigations exist in some markets. In the **UK**, locational signals are given through TNUoS charges (a charge to recover the cost of installing and maintaining the transmission system), which is a strong but imperfect signal for investment locations. Specifically, generators located in high TNUoS zones are at the back end of the merit order (all else equal) and less likely to clear, and they are penalised in the CfD scheme through competitive allocation. In **Ireland**, the government is set to pre-select offshore wind sites (ORESS 2), inherently delivering strong locational incentives. In **France**, projects are compensated against a national average price, meaning that projects in low capture price areas are penalised. This delivers strong but imperfect locational signals to assets.
Innovative business models may not be captured		✕	✕	The design of CfD support regimes may be inflexible, hindering adaptation for **innovative business models** such as battery co-location or multi-purpose interconnector projects.
BID-FID lag		✕		Developers bid in the auction but take the final investment decision (FID) months later. This means that their **bids may not be reflective of the true costs** which they will face. For example, developers have been caught out (particularly in GB and US) by sudden escalations in capex costs and financing costs that were not locked in at time of contract award, resulting in certain projects becoming undeliverable.
Price focus			✕	Overall, price-based allocations focus competition on capex and financing costs and do not necessarily consider other social and environmental outcomes, such as supply chain development. **Excessive focus on cost minimisation** has the potential to hinder the development of a local supply chain to favour relatively cheaper imports, where available.
Exogenous capacity mix	✕		✕	The CfD scheme **exogenously determines the capacity mix** to some extent, unless it is fully technology neutral. Whilst there may be efforts to optimise budget allocations, system benefits may be distorted for example, by investing more generously into certain technologies than others. Additional balancing costs may arise as a result of the sub-optimal allocation.

Short-term evolution of the CfD

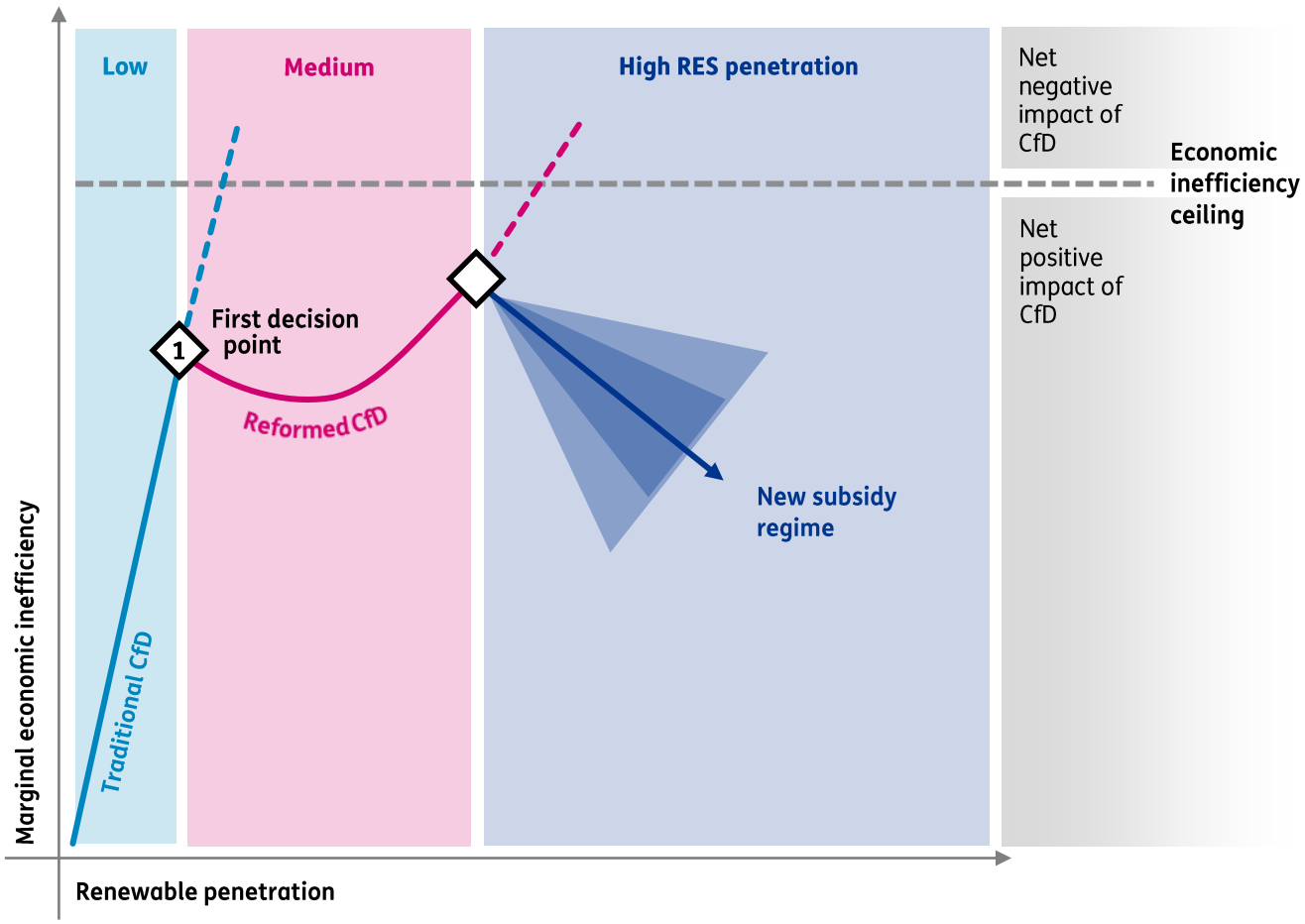
The future of the CfD

As renewable penetration increases, economic inefficiencies originating from the CfD increase. There exists a **turning point** where the costs of shielding assets from risk, without progressive internalisation of negative externalities, reaches an inefficiency ceiling where costs outweigh the benefits of the scheme.

As renewables increase to medium penetration, there are several marginal policy updates which can mitigate some of the emerging economic costs of this support scheme. We refer to this as the **Reformed CfD** (below). This mechanism will reduce the marginal increase in inefficiency for each unit of renewable capacity added, delaying the point when the inefficiency ceiling is hit and thereby extending the appropriateness of the CfD. These lessons should be adopted in countries looking to adopt a CfD scheme or those looking to reform existing schemes.

In the long-term, as we design future power markets, low carbon support policy should allow more mature technologies to move towards higher levels of risk exposure with the objective of increasing efficiency. This may demand a more fundamental rethink of the support regime (**new subsidy regime**).

Possible CfD evolution



Note: illustrative only

Policy recommendation: the reformed CfD

In the short to medium-term, marginal adjustments could be considered to reduce inefficiencies. This small list of policy recommendations may apply to countries looking to adopt a CfD scheme or those looking to reform existing schemes. We also highlight where some of these policy recommendations need to be fine-tuned to avoid other distortions.

Objective	Policy recommendation	
 Internalise externalities	**Negative price compensation**	**Excluding negative price compensation** can be considered a potential policy improvement in markets where this is absent, but only deals with some of the potential distortions and does increase the risk level faced by generators.
	Locational incentives	**Including specific locational incentives** in the policy design can improve siting decisions by renewables. However, the flexibility to adapt locational incentives to market conditions (e.g., through locational pricing or dynamic transmission tariffs) will invariably leave generators facing more risk. This may not be appropriate for less mature technologies, and introduction may need to be designed to provide sufficient foresight to developers.
	Non-price factors	**Specific rewards for wider benefits of renewable development** – for example through non-price factors being accounted for in CfD award – can provide incentives for good investment behaviours. They need to be defined carefully to ensure that they are effective at bringing about desired behaviours, are easy to assess, and do not introduce significant additional costs to developers that may be passed on to consumers.
	Delivery incentives	Support schemes can include delivery incentives to ensure **complete and timely execution of the project**. This could take the form of penalty clauses for non-delivery, balanced with price indexation and shorter bid-FID gaps.
 Allow flexibility in risk profiles	**Optionality**	Support schemes can allow that only part of the total generation of the asset is remunerated under a CfD, with remaining output following alternative routes to markets (e.g. PPA, merchant), such as under **partial CfDs**. This is likely to be viable for mature technologies only.
 Balance incentives and protection	**Ex-ante bid price commitment with indexation**	Variations on the traditional CfD that couple revenues directly with costs – such as a hurdle rate CfD – could reduce incentives to minimise costs and lead to gaming of the award. Incentives need to be maintained to **minimise costs via pre-commitment** (submitting a bid prior to finalising all costs), while providing adequate protection through suitable indexation provisions and seeking to limit gap between bid and FID.
	Bid ceiling	Bid ceilings causing **auction undersubscription** may be addressed through regular market engagement and corresponding updates.

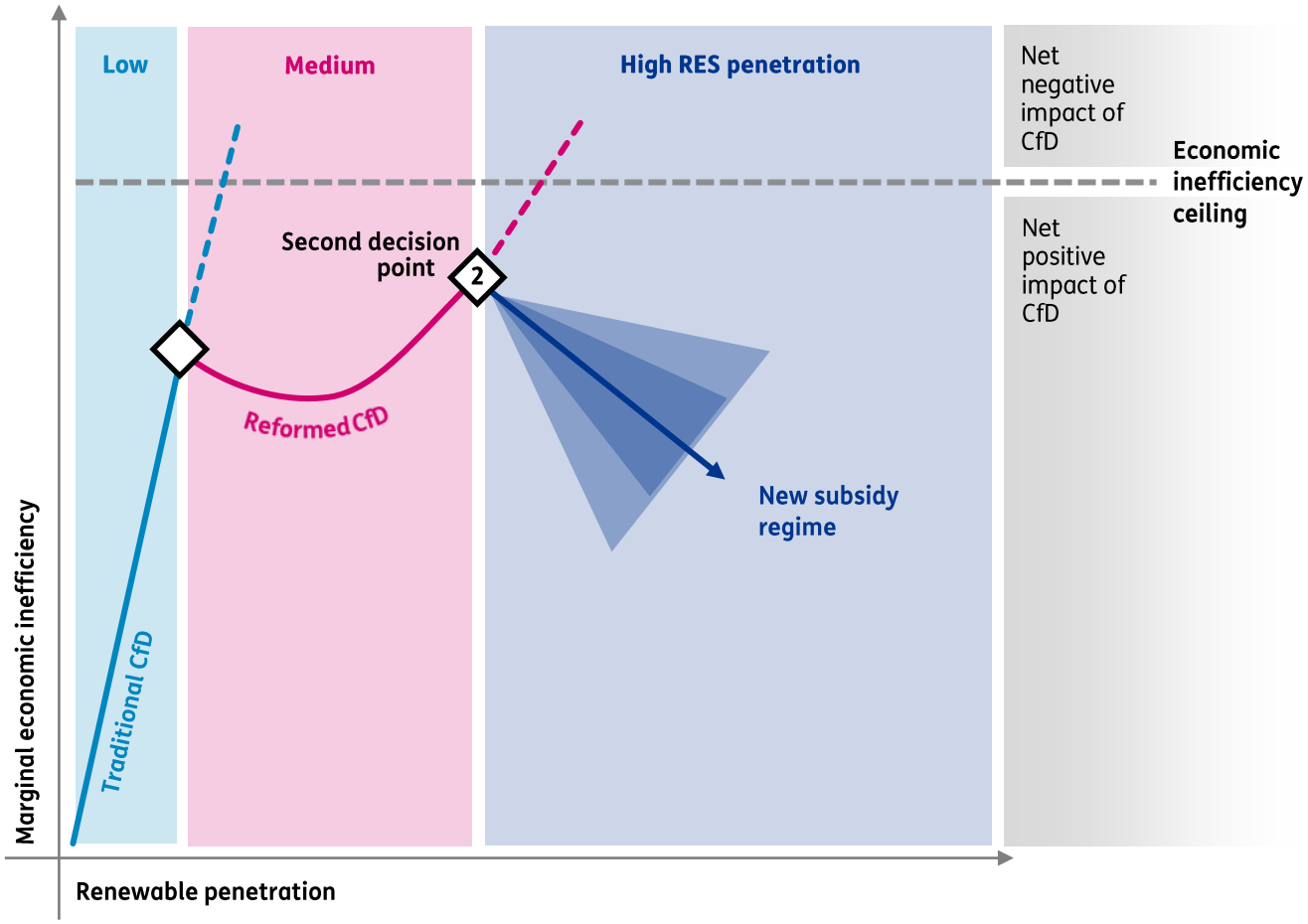
What is after the CfD?

Over the longer term, as we move to high-RES penetration levels, inefficiencies continue to rise under the reformed CfD as the need for support to mature technologies decreases.

This raises questions over the long-term appropriateness of the CfD.

What long-term evolutions should low carbon support policies take as we design for future power markets? What trade-offs do policymakers face?

Possible CfD evolution

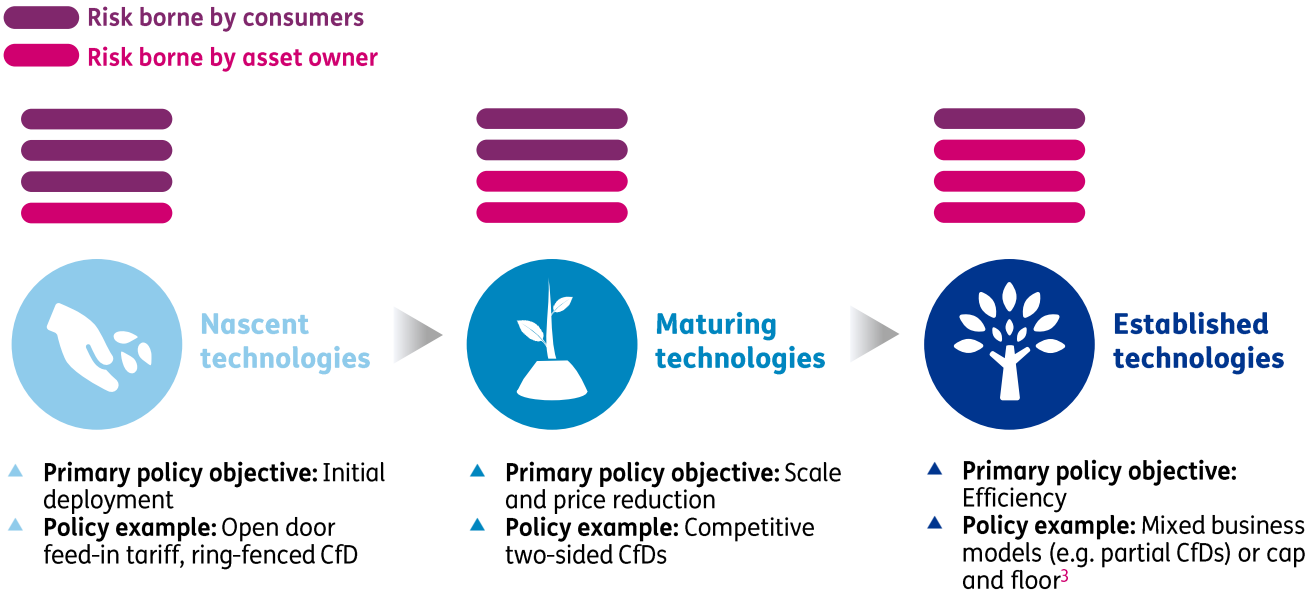


Note: illustrative only

Longer-term market design

Energy support policy and technology maturity: a trend towards less government intervention

As renewable technologies mature, it is common for policymakers to reduce government support in the medium- to longer-term as they seek to limit any inefficiencies associated with their interventions and as assets can withstand greater level of risks. However, sudden movements in capex costs, as well as supply chain challenges, may disrupt this trend.



- **Primary policy objective:** Initial deployment
- **Policy example:** Open door feed-in tariff, ring-fenced CfD

- **Primary policy objective:** Scale and price reduction
- **Policy example:** Competitive two-sided CfDs

- **Primary policy objective:** Efficiency
- **Policy example:** Mixed business models (e.g. partial CfDs) or cap and floor[3]

Nascent technologies

When dealing with nascent technologies, the main policy objective lies in **incentivising initial deployment to allow for learning and cost reduction** by reducing initial risks and supporting supply chain development. Feed-in tariffs were a common policy instrument in Europe in the 2010s but were often allocated uncompetitively and bypassed the wholesale market. This made controlling volumes challenging and worsened the impact on the public purse. Similarly, many modern CfDs can tailor support for nascent technologies, protecting them from competition with established technologies.

Maturing technologies

In the second phase of maturity, **incentivising capacity build out and securing fair prices for consumers** are two key policy aims. Modern CfDs were able to secure price stabilisation and reductions in a wide number of European countries, as well as increased capacity buildout.

Established technologies

In theory, established technologies are able to take on **greater levels of risk and market exposure** compared to nascent ones, including through mixed CfD-merchant business models. However, regardless of the revenue model, viability of project development can still be impacted by significant macroeconomic shocks such as the current rise in CAPEX and cost of capital. Guardrails may still need to exist in such instances.

[3] In the cap and floor mechanism, revenues are subject to set minimum (floor) and maximum levels (cap), with any difference delivered to assets or returned to consumers, respectively. This means only extreme financial upsides and downsides are moderated. This model is currently used for GB interconnectors.

Asset risk exposure varies across support policies

Different policies are suitable for different technology maturity levels. Overall, **risk increasingly shifts to the asset owner** in models that are more consistent with a mature asset type. Appropriately exposing the asset to increasing levels of risk is required to incentivise them to behave efficiently and internalise the effects of their private decisions.

Risk sharing across selected low carbon support policies and merchant

Technology maturity

	Non-competitive feed-in tariffs	Traditional Contracts for Difference[4]	Cap and floor	Merchant
Offtake risk				
Price risk / merchant risk				
Counter party risk				
Balancing risk				
Weather risk				
Overall risk for asset:	**Minimal**	**Moderate**	**Higher (support is for extreme events only)**	**Full exposure**

 Asset  Consumers

[4] Variations of CfDs have different risk sharing profiles.

However, climate urgency means effective low carbon support policies are required to meet decarbonisation targets.

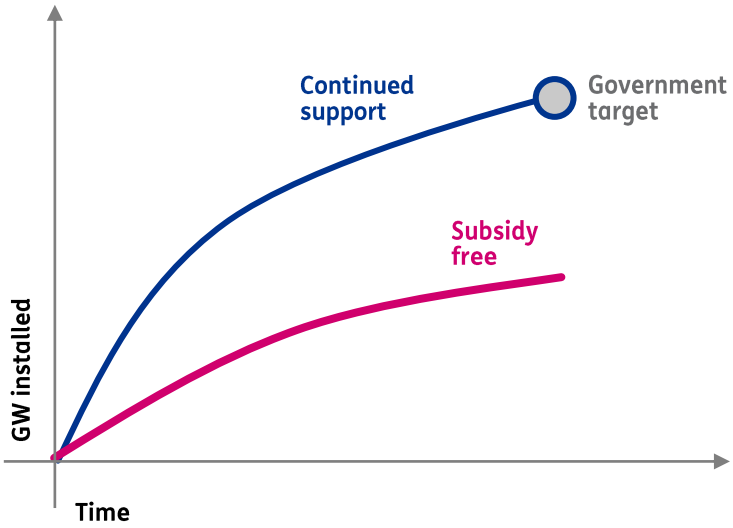
The need for fast decarbonisation to meet climate goals creates a prolonged need for higher levels of low carbon support policies to accelerate deployment.

Subsidy free market evolution

Should subsidies be rolled back too quickly, **deployment is likely to reduce or stall** as risks are no longer shared across developers and consumers. Hence, appropriate pacing of the introduction of merchant risk is key to ensuring that decarbonisation targets are met.

Continued support market evolution

Continuing with current low carbon support policies mitigates overall risk for assets and can accelerate renewable deployment to **reach more ambitious climate goals**. However, careful policy design will be required to avoid introducing new distortions to market functioning, or amplifying any existing distortions, along the way.



Policy pillars: designing a resilient low carbon support policy for the long term

There are two potential options for the evolution of CfDs:

Progressively transfer risk away from consumers

Over time, **a 'cap and floor' revenue support mechanism may be introduced** that puts more risk on supported generators – capping only extreme financial upsides and downsides – but allows generators to use their own information and skills to operate efficiently in wholesale energy markets.

This is likely to be suited to more mature low carbon technologies and it is similar to 'stabilisers on a bike' which can fall away when the technology is deemed to be mature and able to compete with more traditional generation technologies.

Standardise CfDs to integrate them with PPA markets

CfDs currently operate under a single buyer model. While CfD-supported generators are compelled to operate in day-ahead and balancing markets, they do not participate in forward and PPA markets, limiting the opportunities for more sophisticated consumers to secure energy supply through CfDs and taking liquidity out of forward electricity markets.

Potential reforms to CfDs provide an opportunity to make them into **a tradeable product that is open to buyers other than the government-mandated central buyer**. As low carbon technologies mature, and developers are able to take on greater levels of risk, CfDs are likely to become an attractive risk management tool from the perspective of buyers. This would require consideration of contract features that would make CfDs suitable for large energy buyers and development of a two-sided CfD auction where private buyers are able to participate alongside the central buyer.

Contracts for Difference have been successful at increasing competition, accelerating capacity buildout, and stabilising prices in many European states. However, as renewable penetration increases, economic inefficiencies are set to increase, warranting a pause for thought on the further evolution of low carbon support policy. In the short and medium-term, there are various lessons for CfD design that can be learned from more mature markets and recent macroeconomic events. However, in the longer term, as renewable penetration increases and technology matures, market and low carbon support mechanism design should allow for mature technologies to move towards a low or zero subsidy environment. These policies should evolve to alleviate some of the emerging downsides of previous support schemes and integrate themselves fully into competitive energy markets.

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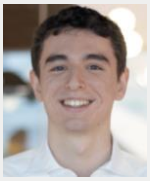

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