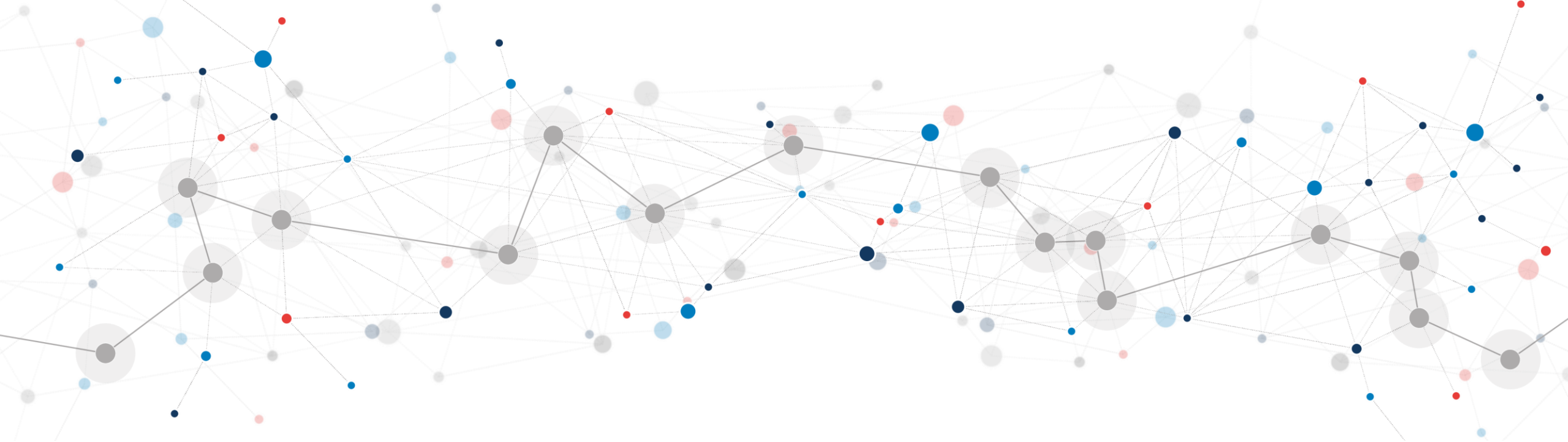

Key issues and best practices for the design of two-sided contracts for difference (CfDs)

Chair European Electricity Markets conference

Charles Verhaeghe – Vice President Energy – Compass Lexecon

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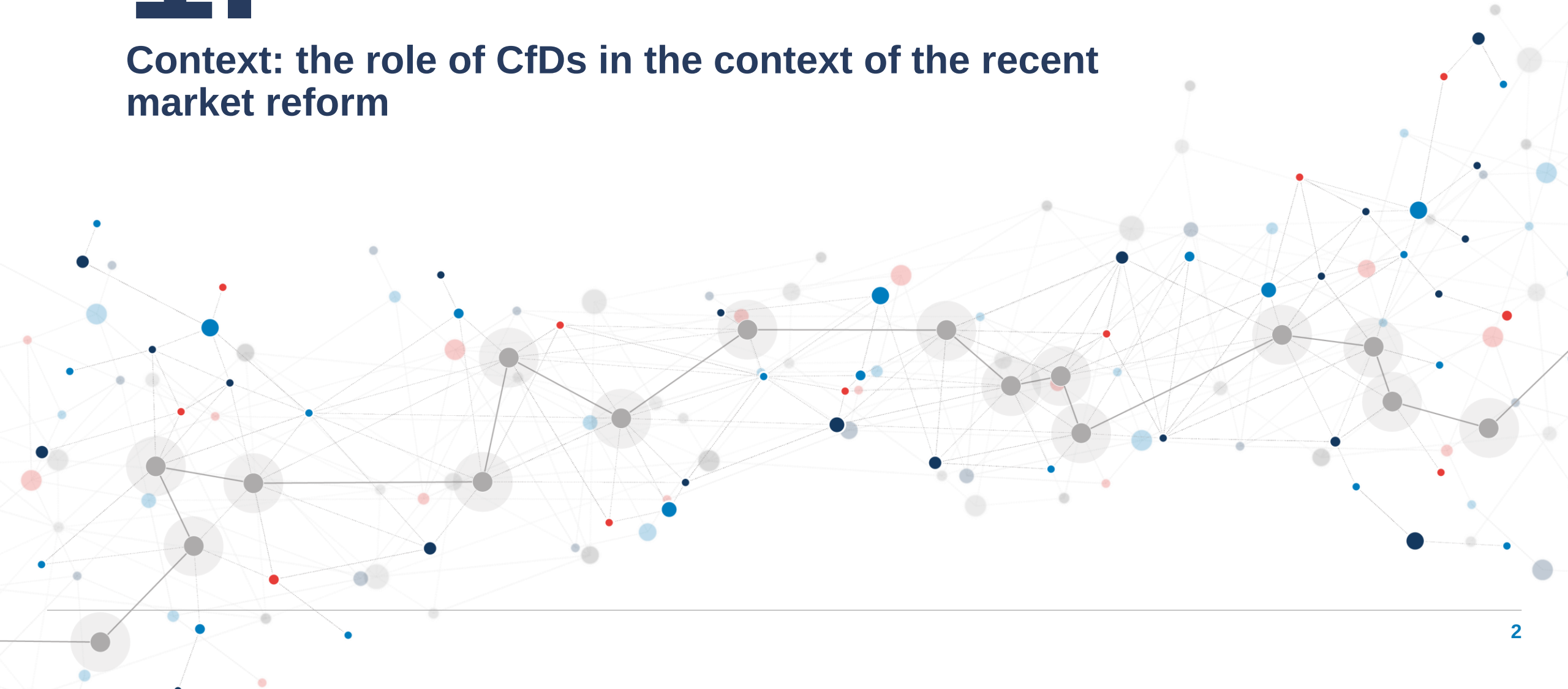
BASED ON A REPORT FOR EURELECTRIC

COMPASS LEXECON

1.

Context: the role of CfDs in the context of the recent market reform



Context: An appropriate investment framework is needed to support capital-intensive large-scale investment in clean and flexible resources

The EU decarbonisation ambition requires a step-up in power sector investments

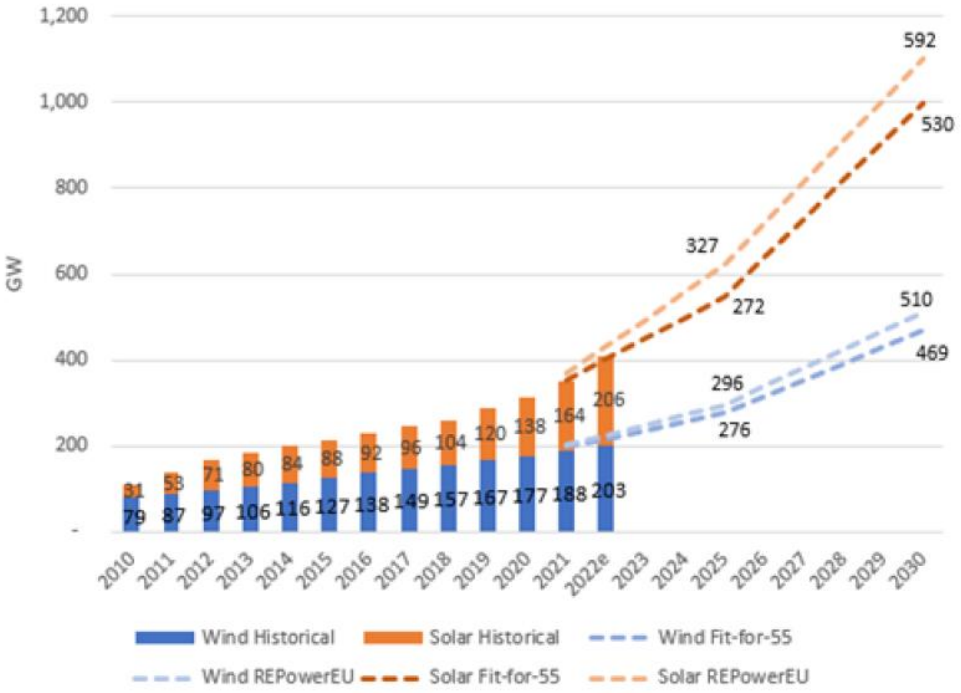
- REPowerEU alone requires €300bn of investments by 2030, in addition to the Fit-for-55 investments*
- The European Commission estimates that a total of €583.8bn investment in the electricity grid will be necessary by 2030*
- REPowerEU increased investment needs by €29.4bn in power networks, and €10bn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

Market-based de-risking schemes will be needed to achieve EU ambitions

- Growing shares of publicly supported assets with variable generation and low variable costs will increase market risks (cannibalisation, low 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

The ambitious targets for developing clean and flexible technologies in Europe call for the efficient design of public de-risking schemes, in particular CfDs, where and when needed

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 Electricity Market Design.

*European Commission (2022) Implementing the repower EU action plan: investment needs, hydrogen accelerator and achieving the bio-methane targets

Context: The current European framework for designing CfDs leaves a number of key design issues open

The Climate, Energy and Environmental Aid Guidelines (CEEAG) provide the ground on state aid rules for RES support schemes in Europe

- The CEEAG enable Member States to fund projects for environmental protection in a cost-effective and non-distortive way.
- CEEAG set 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. Also, 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 Contracts for Difference (CfDs) as an appropriate model to support the further expansion of renewable energy sources.

The EU electricity market design reform puts forward two-sided CfDs (or other equivalent schemes) as the single support mechanism for direct price support to new capacity but leaves a range of design issues open.

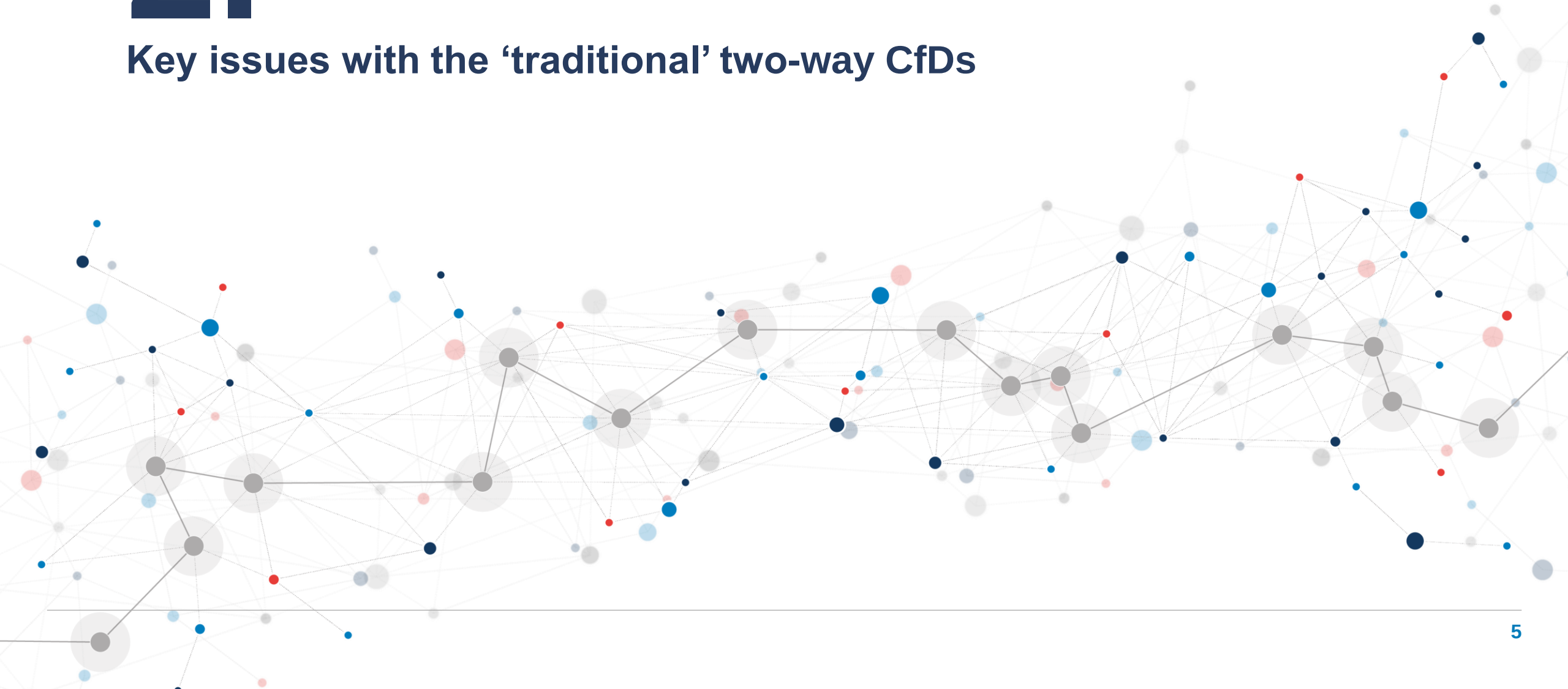
Market reform EU Council deal of 14 December 2023 covers CfDs

- **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

Source: European Commission (2022) Guidelines on State aid for climate, environmental protection and energy 2022. Accessible here. European Council (2023) Reform of electricity market design: Council and Parliament reach deal. Accessible here.

2.

Key issues with the ‘traditional’ two-way CfDs



‘Traditional’ CfDs stabilise market revenues according to a set strike price based on the actual production of the plant

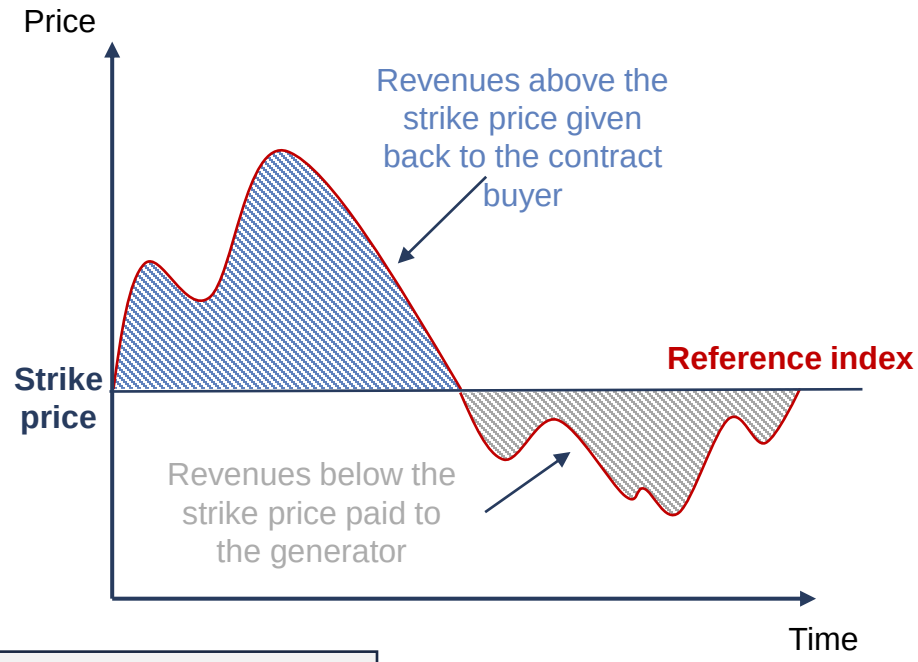
Contracts-for-difference (CfDs) are long-term contracts with an electricity generator

- **A CfD is a contract where the buyer (usually a public counterparty) pays the contractual ‘strike’ price to the seller (in practice, RES or low carbon generator) for the contracted volume, and the seller pays the reference index to the buyer**.
- The reference price is typically the price on the day-ahead market and can be weighted averaged 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:

- At times **where the strike price exceeds the market price, the deficit** (revenues below the strike price) **is received by the generator** and
- At times **where the strike price is below market price, the surplus** (revenues above the strike price) **is retroceded to the buyer** to reach the strike price.

Illustration of a two-sided contract for difference mechanism



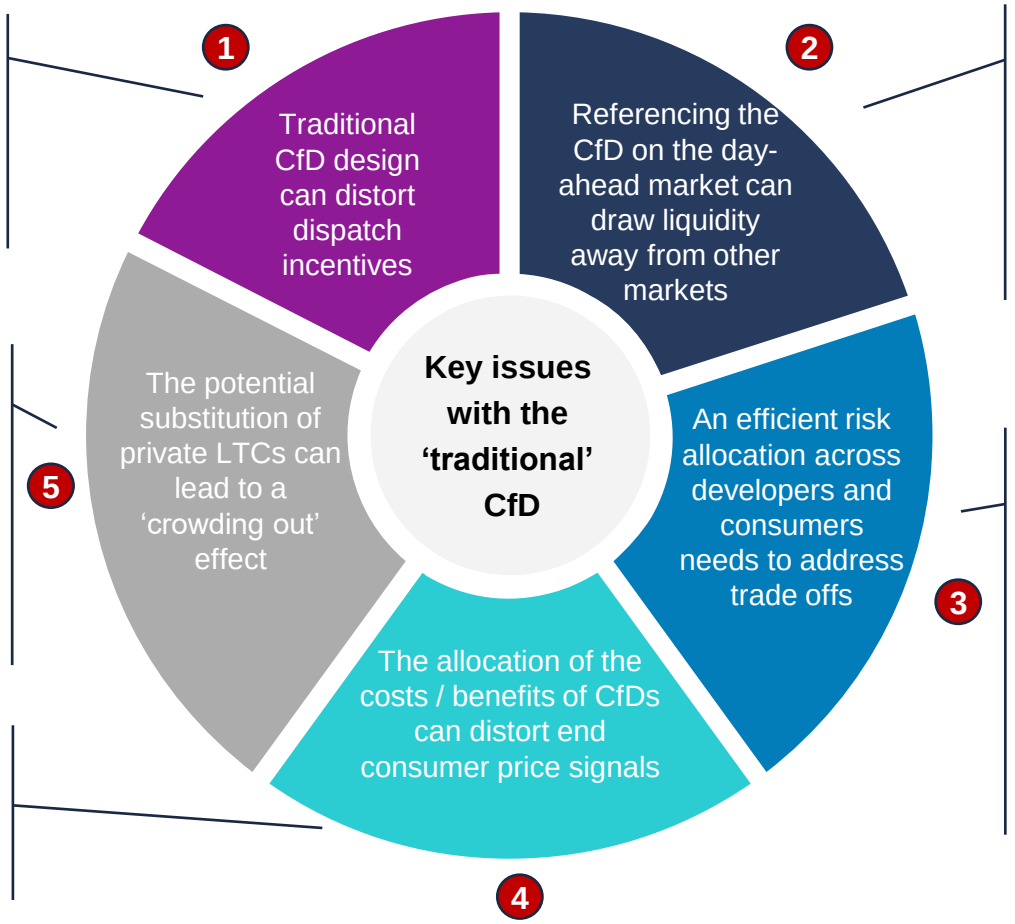
Generator revenues for a traditional two-way contract for differences:

Generator revenue = **production** x (**market price** + (**strike price** – **reference index**))

Electricity market *Contract for difference*

The ‘traditional’ CfD design: key design issues

- 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 (LT) contracts.** As a result, the relative attractiveness of CfDs with other LT contracts **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…)

3.

Design options to address the issues with ‘traditional’ two-way CfDs

Issue 1 – Traditional two-way CfDs can distort dispatch incentives, as plants no longer face incentives to increase production in high-price hours

Generating plants under traditional two-ways CfDs do not get adequate incentives for efficient dispatch

- One of the key drawbacks of traditional two-way CfDs is e.g. generators **are not encouraged to optimise the production of their plants** as according to the signals provided by market prices
- Setting the reference price based on physical generation **biases the intertemporal behaviour and bidding strategy in the market sequence**: e.g. a negative premium based on day-ahead will be factored in in intraday or balancing markets' bids.

The dispatch distortion issue could be particularly problematic at times of negative prices, which was partly addressed in the latest state aid guidelines

- Under the traditional **CfD, generators still received a market price compensation up to the strike price in times of negative prices** – incentivising renewables to produce even though there is excess energy on the system
- As a result, the **CEEAG regulation suspended renewable support granted in times of negative prices, apart from small-scale installations which may be exempted**

Illustration of dispatch incentives under a two-sided contract for difference mechanism

Let's consider a generating plant A under a CfD, using the day-ahead price as reference. Strike price is 60 €/MWh.

Consider that, at a given time, spot prices are:

- P(DA) = 150 €/MWh
- P(ID) = 80 €/MWh

If plant A had sold 100 MWh on the DA market :

- Market revenues: 150 €/MWh x 100 MWh = 15,000 €
- CfD : (Strike price - P(DA)) x 100 MWh = -9,000€

So, following the CfD, final revenues are 6,000 €

However, the plant A could also choose to buy-back its electricity on the ID rather than producing electricity.

- Market ID buying cost: 80 €/MWh x -100 MWh = -8,000€

So, following the ID buy-back, final revenues are 7,000 €

The CfD settlement can distort dispatch incentives through the market sequence.

Traditional two-way CfDs introduce dispatch distortions, and so should be designed to minimise such impacts on other markets

Source: European Commission (2022) Guidelines on State aid for climate, environmental protection and energy 2022. Page 38. Accessible here.

1 The CfD design can improve dispatch incentives by de-correlating CfD settlement from actual generation

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

- **CfDs can base remuneration on different attributes**, such as 'actual' electricity generation, capability, and/or based on standard profiles - provided that these mechanisms are legally compliant with state aid rules

Volume-share CfD	The two-way CfD covers only a share of the production of a generating unit
Profile-based CfDs	The asset is given a payment based on the CfD strike price applied to a reference production profile.
Capability-based CfDs	The asset CfD volume is settled on the asset 'maximum possible' rather than 'actual' injection (sub-type of profile-based CfDs)

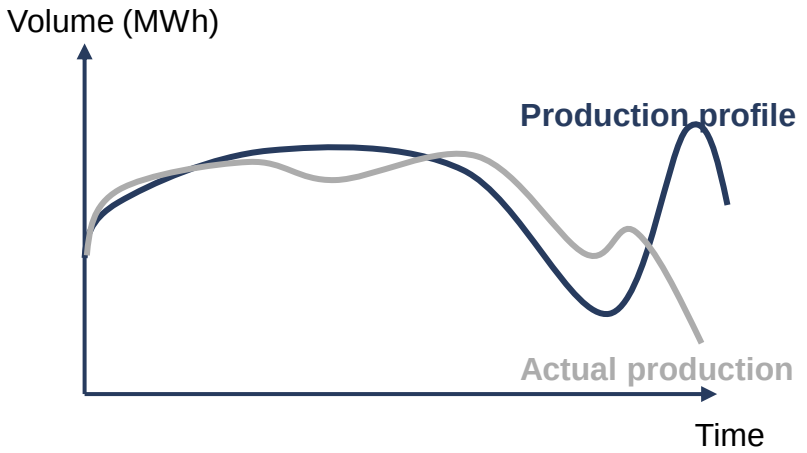
This de-correlation creates incentives for efficient dispatch, but exposes operators/ investors to market risks which can raise strike prices and/or lower investment incentives

Other approaches in CfD design focusing on the reference index or the strike price could also enhance dispatch incentives for generators, such as 'floating' variable strike prices

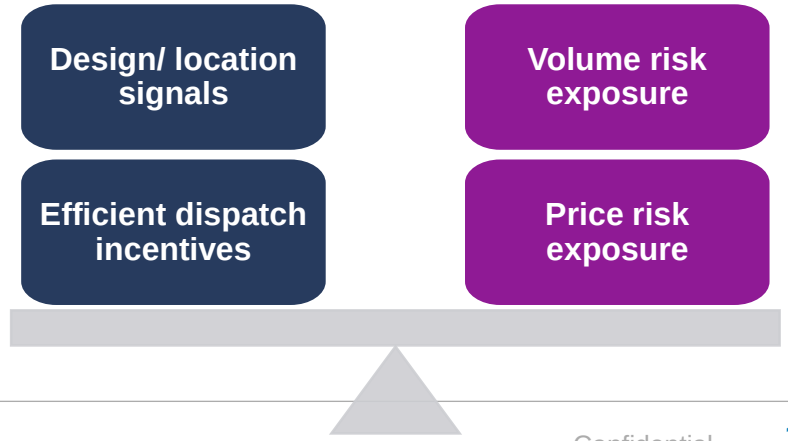
A range of CfD design features can improve dispatch incentives by de-correlating CfD settlement from actual generation with profile-/ capability-based CfDs or applied on a share of the volume only.

However, the standardised profile should not expose operators/ investors to excessive risk. In particular, the profiles should not be inconsistently different from actual generation.

Illustration of a profile-based CfD mechanism



Trade-offs with CfD design options regarding dispatch incentives



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.

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

Setting the reference market as the day-ahead market may dampen liquidity on other market timeframes

- Selling on markets **other than the reference market exposes generators** potential losses if the price for which they have sold on other markets turn out to be lower, or if volumes sold on other timeframes are higher than actual production
  - In order to limit their risk exposure, and ensure that they earn the strike price, **generators under CfDs tend to sell and hedge the CfD volumes in the reference market**
- The day-ahead market is typically used as reference in 'traditional' CfDs. To limit their exposure, RES providers under CfDs participate in the DA market.
- This may **draw liquidity away from other market timeframes**, which can create barriers to trading for other participants and affect competition on these markets.
- This could become increasingly substantial as RES / low-carbon generation are deployed under such schemes and replace other forms of generation.

Increasing forward market liquidity is key to protect consumers and industrials by developing forward hedging opportunities.

Case Study – comparison of a wind farm under a two-way CfD selling electricity in the reference market and another market

CfD Reference market: Day ahead

CfD Strike price: 50 €/MWh

Day ahead market price: 60 €/MWh

Forward market price : 40 €/MWh

- **Case 1 – selling energy on the reference market guarantees revenues equals to the strike price**

Sell 1 MWh on DA market → **+ 60 €**

CfD → **- 10 €**

Final revenue → **50 € = strike price**

- **Case 2 – selling energy on markets other than the reference markets induces a risk of getting revenues below the strike price**

Sell 1 MWh on forward market → **+ 40 €**

CfD → **- 10 €**

Final revenue → **30 € < strike price**

The impact of the CfD on liquidity needs to be carefully assessed as the lack of liquidity in the forward timeframe can undermine the ability of consumers and producers to hedge.

2 Using forward markets alongside the spot market in reference prices could support market liquidity, but could increase volume and price risks

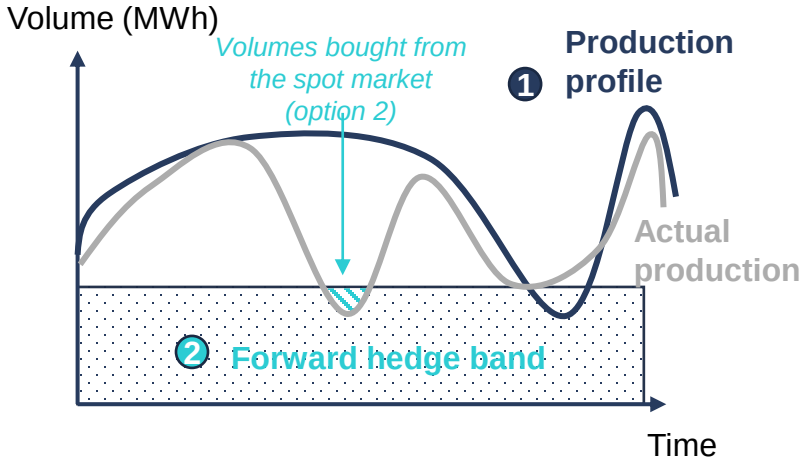
Using a reference price index for CfDs including forward markets alongside the spot market could support liquidity or avoid negative impact on liquidity by driving more volumes on these timeframes

- Including forward markets alongside the spot market as 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 (DA, forward, etc.). This requires selecting the timeframes/ contracts/ prices of forward products and needs to be tailored to the specificities of the different markets.

However, incorporating forward market prices within the reference price index could increase both the volume and price risks faced by generators – We should carefully consider the complexity and risks associated to the upgraded design

For the reference price of the CfD, investigate composite indices with some reference to forward markets to incentivise RES/ low carbon capacity to participate in forward markets for the volumes they are expecting to produce in advance.
The share of forward markets in the composite index should be proportionate and adapted to the profile of the technology class / asset.

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

Issue 3 – An efficient risk allocation across developers and consumers needs to address trade offs

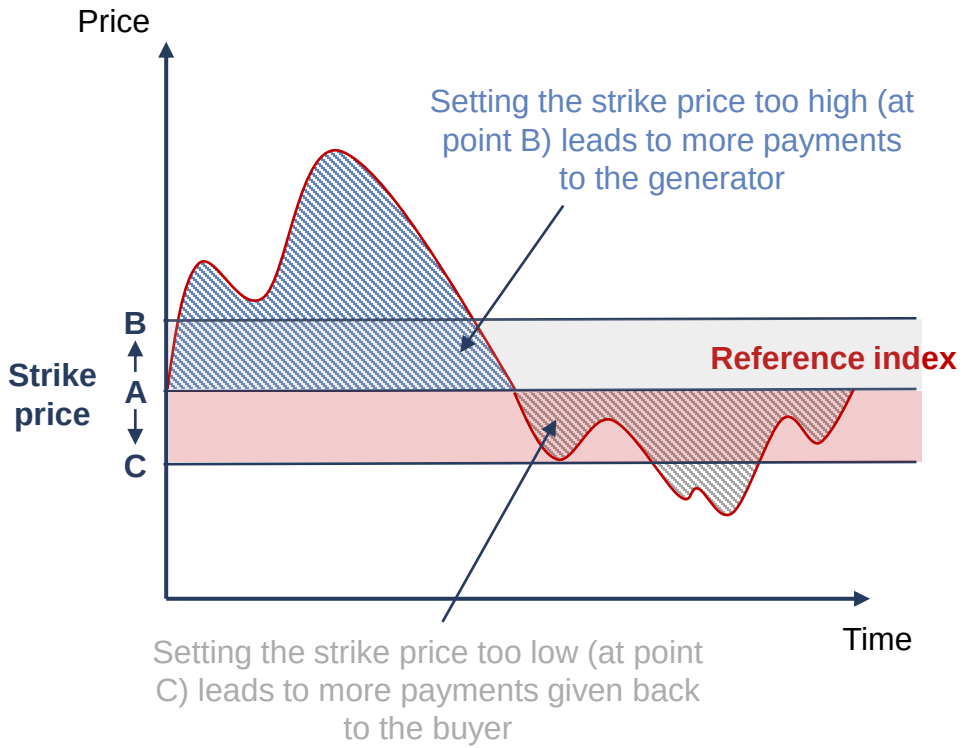
Setting the strike price entails some trade-offs in allocating costs and risks across investors and consumers

- When the strike price is higher than what is necessary to cover the costs, the risks and reasonable remuneration of producers leads to the **CfD buyer complementing market revenues more often, and at a higher level than the efficient strike price**
- Equally, a strike price lower than the optimal strike price level leads to **lower revenues than what is necessary to attract RES, low carbon and flexible assets** in order to meet decarbonisation of security of supply objectives.
- The strike price is either set through a competitive process or through an administrative process exceptionally depending on the allocation method. **In the competitive allocation process, the 'reserve price' of the contracting party still influences the resulting risk allocation across developers/ consumers.**

Allocating risks across generators and the buyer goes beyond the strike price

- **Other design elements** of the CfD are important to define **the risks borne by the counterparties**
  - Choice of reference price
  - Time horizon of the contract
  - Termination clauses
  - Regulatory uncertainty/ risks of clawback

Illustration of a two-sided contract for difference mechanism in times of negative prices



The definition of the strike price is key for the design of CfD, and a competitive allocation process can be used to reveal its optimal level

3 A competitive allocation process can help reveal efficient costs, and can include wider 'non-price' factors to 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.

1 **Competitive allocation**

- **A competitive allocation mechanism** (compared to setting the strike price level administratively) **is best suited 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:
  - A 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.

2 **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.

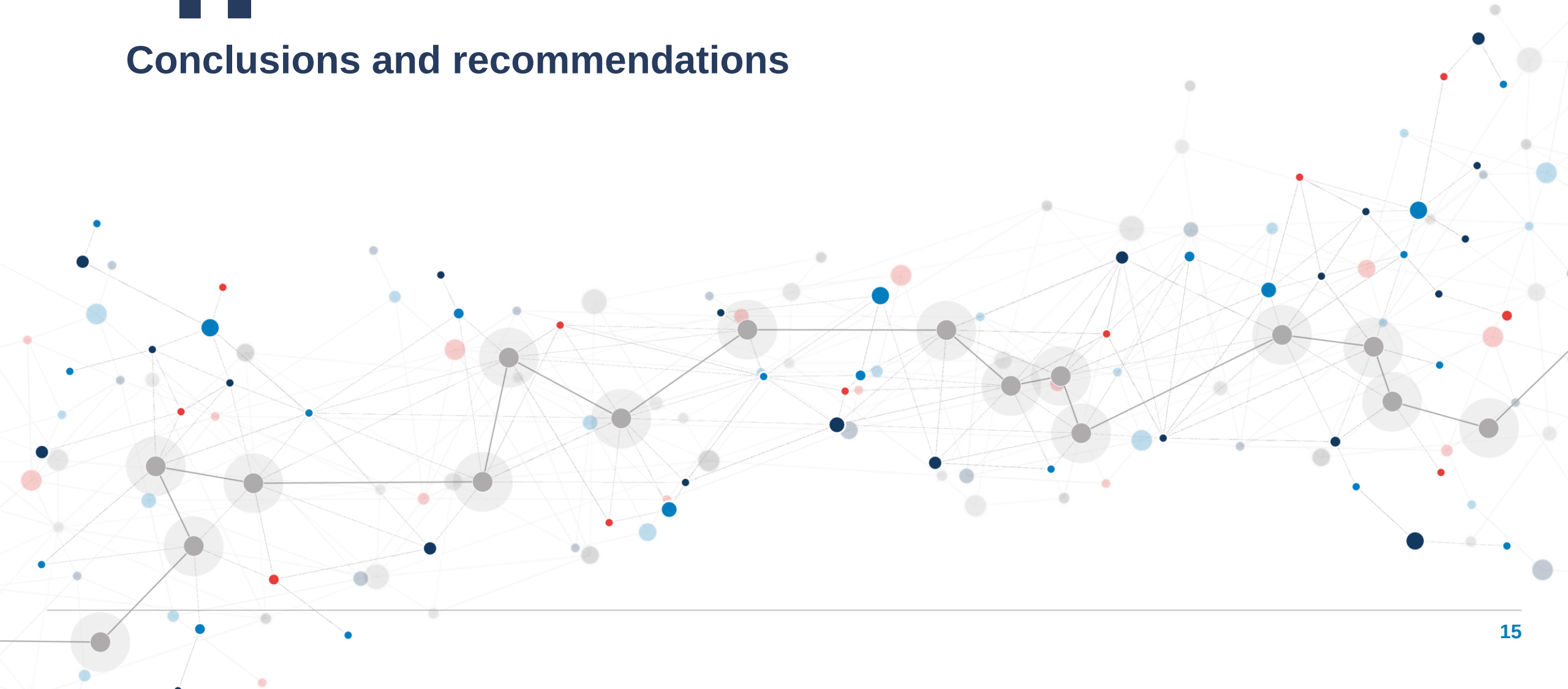
✓ **Allocate two-way CfDs through a voluntary competitive market-based process.**

✓ **If used, non-price criteria should be objective, measurable and quantifiable. The tender evaluation methodology should be set ex-ante to reduce uncertainty and risks of discretionary auction results.**

✓ **Consider exemptions from the market-based allocation process for specific capacities, such as small-scale distributed resources or in the absence of potential competition.**

4.

Conclusions and recommendations



Key take-aways

- **Two-sided CfDs is a relevant tool to de-risk investments in low-carbon technologies**. It is its main goal. The massification of CfDs however requires an upgraded design to overcome some of the issues of “traditional” CfDs.

- To align dispatch incentives as much as possible to the market, one approach would be to **“de-couple” CfD settlement from actual generation, using profiles (capability-based or standard profiles)**. The adequate definition of these profiles is key to balance incentives and risks on generators and investors, in order not to be against the initial objective of de-risking investments.

- The impact on forward market liquidity should also be assessed. **Using forward markets alongside the spot market in reference prices could help mitigate this risk**. Complexity and risks for generators and investors should be carefully considered.

- **Where possible, competitive tenders should be privileged** to allocate CfDs efficiently. **Non-price criteria** can be included but need to be **based on objective, measurable and quantifiable metrics known ex ante.**

CONTACT DETAILS

Charles Verhaeghe
Vice President - Energy Practice
cverhaeghe@compasslexecon.com
Mobile : +33 6 10 88 73 84

Berlin
Kurfürstendamm 217
Berlin, 10719

Brussels
23 Square de Meeûs
Brussels, 1000

Copenhagen
Bredgade 6
Copenhagen, 1260

Düsseldorf
Kö-Bogen
Königsallee 2B
Düsseldorf, 40212

Helsinki
Unioninkatu 30
Helsinki, 00100

London
5 Aldermanbury Square
London, EC2V 7HR

Madrid
Paseo de la Castellana 7
Madrid, 28046

Milan
Via San Raffaele 1
Milan, 20121

Paris
22 Place de la Madeleine
Paris, 75008

Singapore
8 Marina View
Asia Square Tower 1
Singapore, 018960

Tel Aviv
Yigal Alon Street 114
Toha Building
Tel Aviv, 6744320