Financial CfD

Ingmar Schlecht, with Christoph Maurer, Lion Hirth · IAEE · 26 July 2023

Contracts for Differences

Long-term contracts to support generation investment

- Removing price risk to reduce capital costs
- Difference payments: Support at low prices, clawback at high
- There are many different CfD specifications (conventional & tweaks)

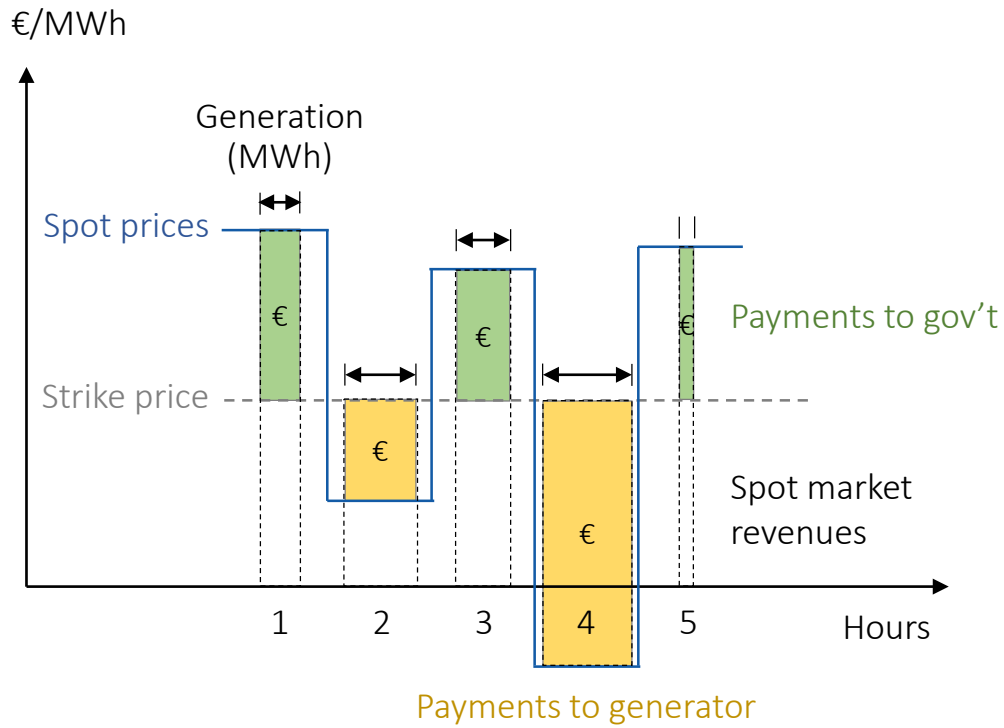
The simplest, UK-style "conventional" CfD

1. Fixed strike price, e.g. based on an initial auction
2. Underlying: hourly day-ahead price
3. Linked to a specific physical asset, "as produced"

The hour-by-hour payment

- Payment (€) = price difference (€/MWh) x quantity (MWh)
- Payment = (strike price – day ahead price) x produced volume

Strike price | Underlying | Weights (physical production of an individual asset)



Spot market revenues and CfD payments result in a stable net price earned that is equal to the strike price.

Three problems of the conventional CfD

1. Produce-and-forget

- Simple incentive to produce as much as possible (regardless of value)
- Investment: system-friendly renewables (high capacity factors, west-facing solar)
- Repowering: replace old turbines
- Maintenance scheduling: during seasons of low demand
- Dispatch: curtail if price < variable cost

2. Intraday / balancing distortion

- Adjust bids in market stages that follow the day-ahead auction
- Inflate bids at clawback times; lower bids at subsidy times

3. Volume risk unhedged

- The price hedge deletes the negative price/volume correlation of power markets

Tweaking CfDs

1. Longer reference period

- E.g. yearly or monthly capture prices
- New problem: Distorted day-ahead bids
- Fixing this causes further problems

2. Contracts for part of a difference

- Such as 80% rather than 100%
- Bad trade-off: Risk mitigation vs. incentives

3. Upper and lower strike price

- Introducing a “dead band”
- Bad trade-off as well
- Price risk inside collar difficult to hedge

Financial CfD

A financial contract

- A contract that specifies financial payments btw gov't and generator
- No delivery of MWh – physical sales through the spot market

Payment from gov't to generator

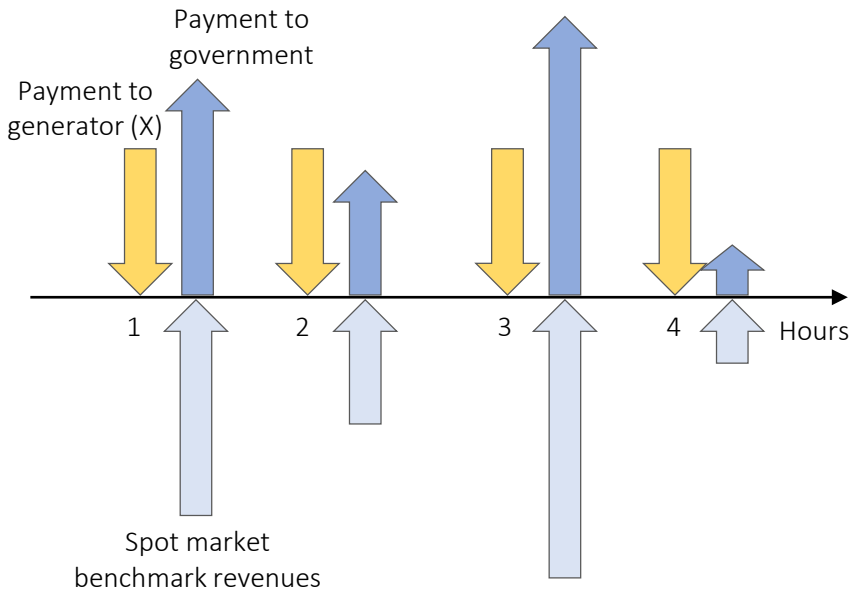
- Fixed hourly payment of X €/MW for 20 years
- X determined through competitive auction

Payment from generator to government

- Revenues of a reference generator
- Volume: reference profile (e.g., a weather model)

Resulting payments

- Low-price or low-wind hours: net payment from gov't to generator
- High-price or windy hours: net payment from generator to gov't



Reference profile

Payments to government are not the *actual* revenues

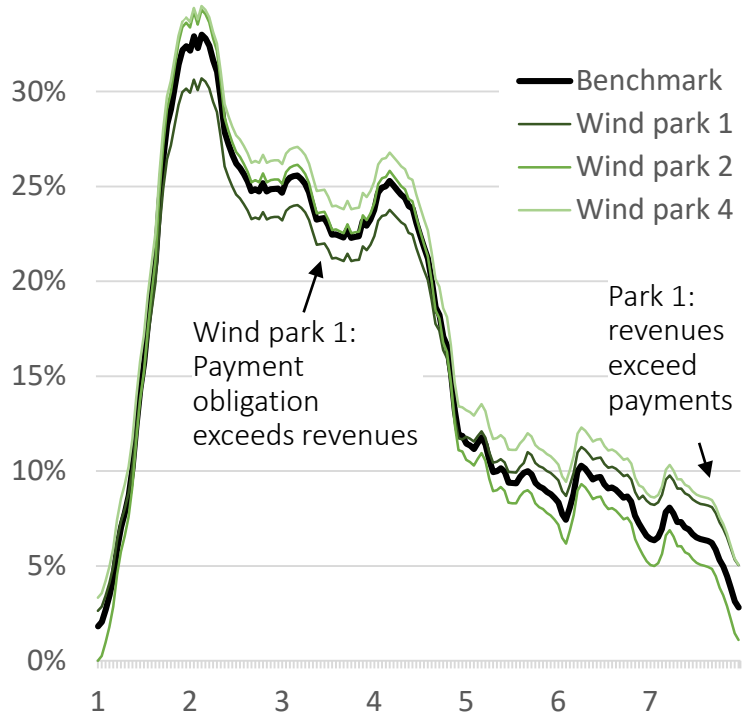
- Benchmark / yardstick revenues derived from a reference production profile
- Payments are decoupled from asset
- Imperfect match results in (minor) basis risk

Reference profiles for wind and solar

- A mathematical model that derives reference output from weather data
- A sample of actual physical wind / solar farms
- The aggregate wind / solar generation of a bidding zone

Reference profile for nuclear

- Base
- Essentially, a long-term base forward contract



Benchmark profile vs. individual wind parks (illustration).

Desirable properties of the financial CfD

Revenue risk hedged

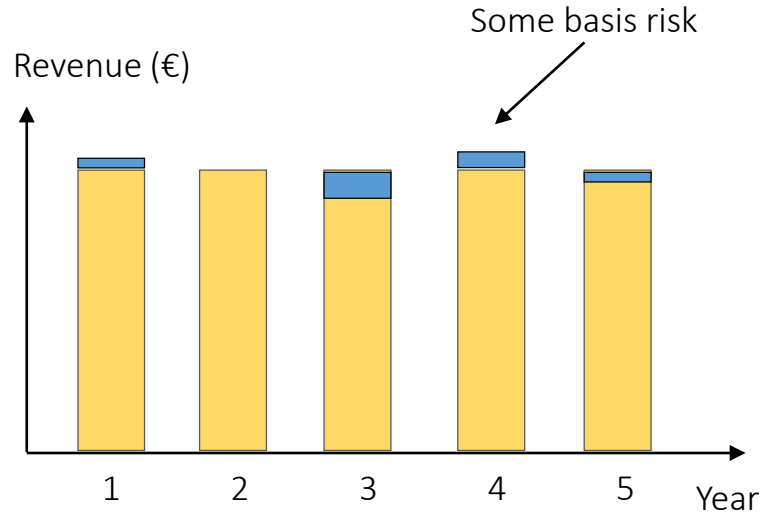
- Not only price risk, but also volume risk mitigated
- The same income every hour (+/- basis)

All distortions avoided

- Produce and forget → full spot price incentives
- Intraday / balancing distortion → undistorted bids
- Suboptimal maintenance → full maintenance & availability incentives
- Day-ahead distortion → undistorted bids

No tweaks needed

- No complicated rules to suspend payments under certain conditions
- No need to know the production cost of generators



Very stable total revenues

Collateral

Collateral is required

- Otherwise generators have an incentive to default on the contract at times of high prices
- Like in futures / forwards

No cash margin calls

- Instead: new built physical turbine

The four parents of the financial CfD