

The background of the slide is a composite image. The top half shows a close-up of blue solar panels with white grid lines. The bottom half shows a white wind turbine blade against a clear blue sky. A semi-transparent grey box is overlaid on the bottom half of the image, containing the webinar title and speakers' names.

## **Webinar: Managing long-term price risks in PPAs**

Viviana Ciancibello, EEX & Cyriel de Jong, KYOS

# Agenda

15:00 – Ewout Eijkelenboom (KYOS), **Introduction to the webinar**

15:05 – Viviana Ciancibello (EEX), **Hedging with long-term power futures**

- Using the standard Base Futures to hedge long-term price risk
- The finer details: initial margin and variation margin
- A look at long-term hedging activity in EEX Spanish Power
- What's next for hedging renewable energy price risk on exchange?

15:20 – Cyriel de Jong (KYOS), **Forecasting power prices and capture rates**

- Financial exposures of renewable energy projects
- What will be the power price in 2030?
- The cannibalization effect and capture rates
- Forecasting long-term power prices and capture rates

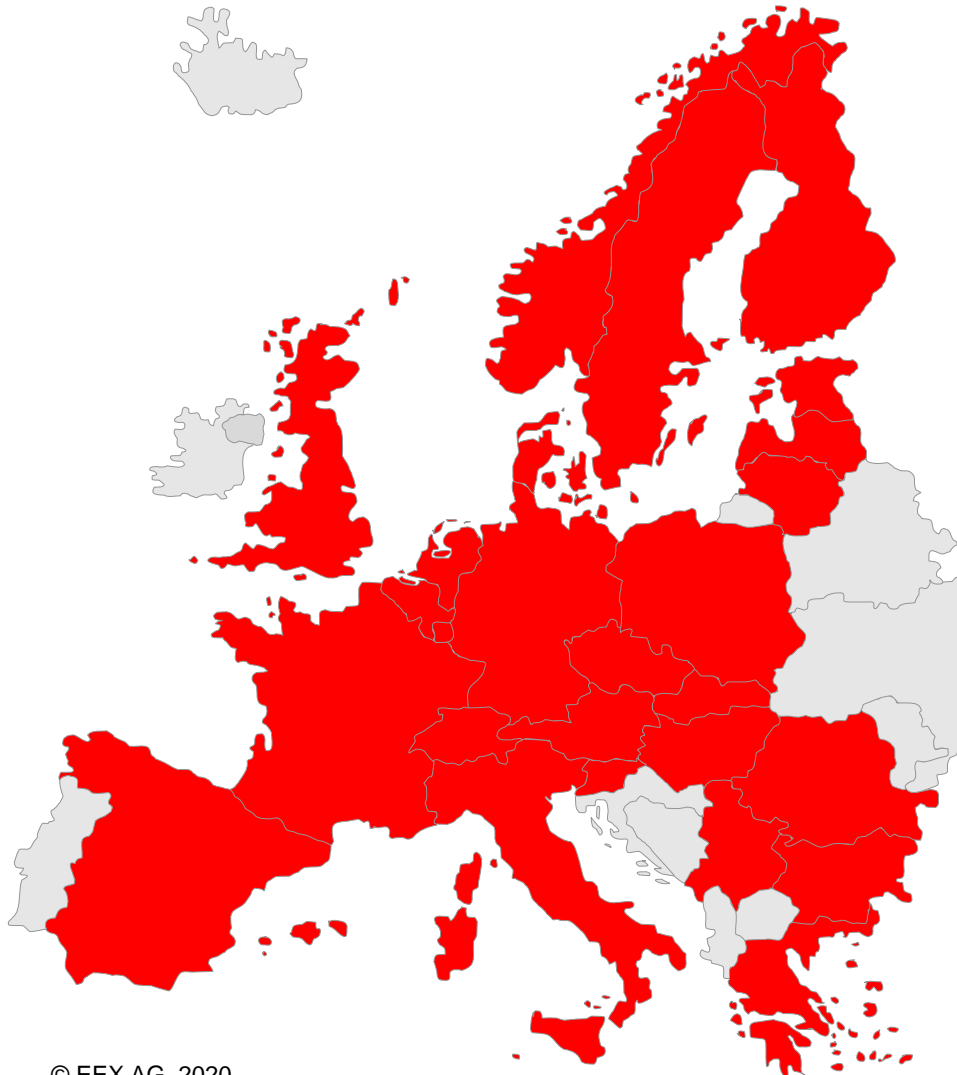
15:35 – Q&A and discussion

15:45 – End of the webinar

# Hedging with Long-Term Power Futures

KYOS Webinar  
30 June 2020

# EEX Power Derivatives are listed in 20 EU market areas and benefit from a wide network of traders



## Power Futures

- Belgian Future (PXE)
- Czech Future
- Dutch Future
- EEX GB Power Future
- French Future
- German Intraday Cap/Floor Future
- Greek Base Future
- Hungarian Future (PXE)
- Italian Future
- Nordic-Future

- Bulgarian Futures
- Phelix-AT Future
- Phelix-DE Future
- Phelix-DE/AT Future
- Polish Future
- Romanian Future (PXE)
- Serbian Future
- Slovakian Future (PXE)
- Slovenian (PXE)
- Spanish-Future
- Swiss-Future

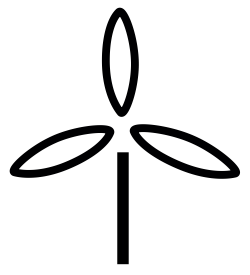
## Power Options

- Phelix-DE Options
- Phelix-DE/AT Options
- French Base Options
- Italian Base Options
- Spanish Base Options

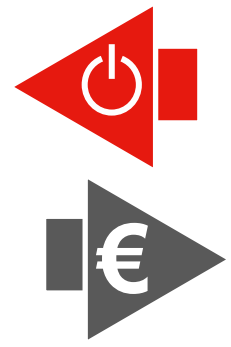
**EEX connects  
287 trading  
participants  
from 30  
countries**

# How are EEX Members active in PPAs?

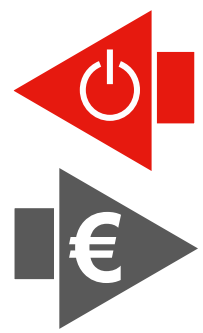
RE Developers sell Power via Long-Term PPAs



EEX Members buy Power via Long-Term PPAs and build RE assets



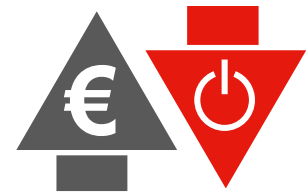
EEX Members provide balancing services on Spot & hedge via Futures



Banks provide financing once PPA is in place



EEX Members sell Power via LT Corporate PPAs

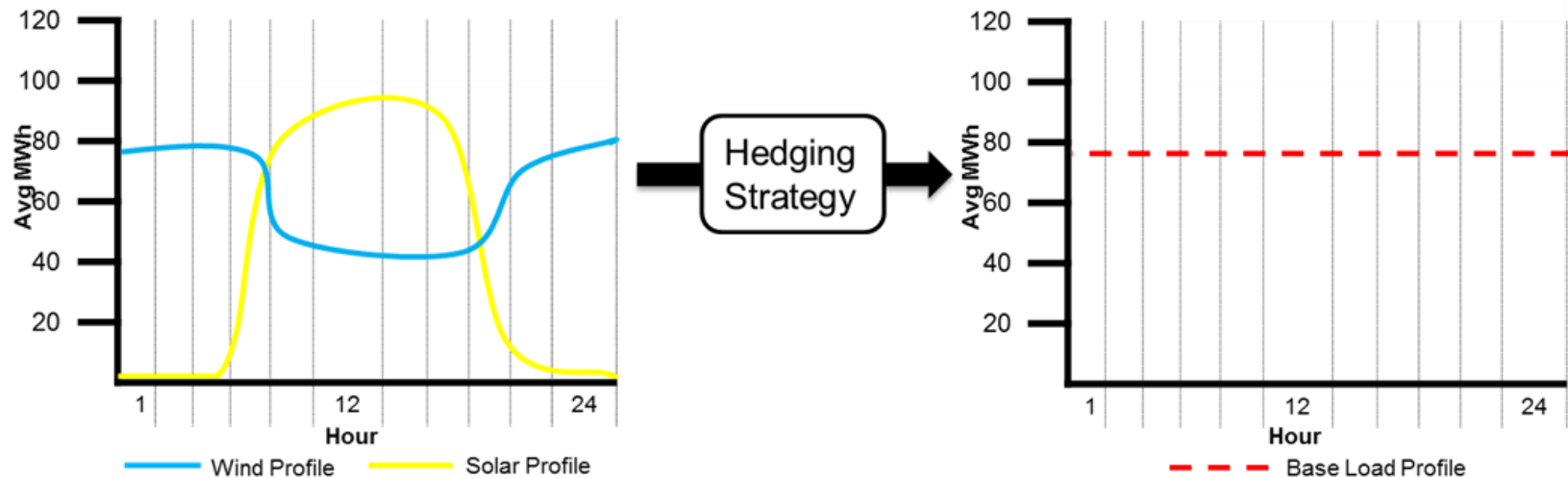


# EEX Power Derivatives Curves

	Base							Peak						
	Day	WkEnd	Week	Month	Quarter	Season	Year	Day	WkEnd	Week	Month	Quarter	Season	Year
DE/AT (Phelix)	14	2	5	10	11		6	14	2	5	10	11		6
DE (Phelix)	14	2	5	10	11		6	14	2	5	10	11		6
AT (Phelix)	14	2	5	10	11		6	14	2	5	10	11		6
FR	14	2	5	7	7		6	14	2	5	7	7		6
IT	14	2	5	7	7		6	14	2	5	7	7		6
ES	14	2	5	7	7		6							
NL	14	2	5	7	7		6	14	2	5	7	7		6
BE				7	7		6							
CH	14	2	5	7	7		6							
Nordic			5	7	7		6							
UK	14	2	5	4	4	4	2			5	4	4	4	2
GR				7	7		6							
CZ	14	2	5	7	7		6	14	2	5	7	7		6
PL				7	7		6				7	7		6
SK				7	7		6				7	7		6
HU	14	2	5	7	7		6	14	2	5	7	7		6
RO			5	7	7		6			5	7	7		6
SI			5	7	7		6			5	7	7		6
RS			5	7	7		6			5	7	7		6
BG			5	7	7		6							

It is already possible to **hedge up to 6 years in advance** in most EEX Power Derivatives Markets.

# Managing Renewable Energy Price Risk with Base Futures requires a Hedging Strategy



- Base Futures are a **best-fit product** and attract the most liquidity, creating a **strong price signal** and opportunities for trading at fair market prices
- To use the Base Futures to manage the risk of a wind or solar profile, a **Hedging Strategy needs to be designed** to translate the variable generation profile into a constant Base load profile
- Different Hedging Strategies can be employed, such as a **value-neutral hedge**

# Example 1: 23<sup>rd</sup> Long-Term hedge on Spanish Power cleared on 10.01.19

Trade Date	Product	Expiry Year	Expiry Month	Trade Price	Initial Margin per Contract	Lots (MW)	Initial Margin (in EUR)	Trade Volume (in MWh)	Notional Value
10/01/2019	Spanish Power Base Month	2019	2	52.54 €	2,903 €	2	5,806 €	1,344	70,614 €
	Spanish Power Base Month	2019	3	52.54 €	2,608 €	2	5,216 €	1,488	78,180 €
	Spanish Power Base Quarter	2019	4	52.54 €	6,880 €	2	13,759 €	4,368	229,495 €
	Spanish Power Base Quarter	2019	7	52.54 €	7,264 €	2	14,529 €	4,416	232,017 €
	Spanish Power Base Quarter	2019	10	52.54 €	6,163 €	2	12,326 €	4,416	232,017 €
	Spanish Power Base Year	2020	12	52.54 €	15,196 €	2	30,393 €	17,568	923,023 €
	Spanish Power Base Year	2021	12	52.54 €	13,140 €	2	26,280 €	17,520	920,501 €
	Spanish Power Base Year	2022	12	52.54 €	11,826 €	2	23,652 €	17,520	920,501 €
	Spanish Power Base Year	2023	12	52.54 €	17,958 €	2	35,916 €	17,520	920,501 €
								<b>167,877 €</b>	<b>86,160</b>
<b>Initial Margin in % of Notional Value</b>									<b>3.71%</b>

- A 2 MW long-term hedge was cleared in Spanish Power on 10 January 2019, with an initial margin requirement of **167,877 EUR**
- The initial margin percentage of the notional value of the trade was **3.71%**
- The execution price of each trade was **52.54 EUR**

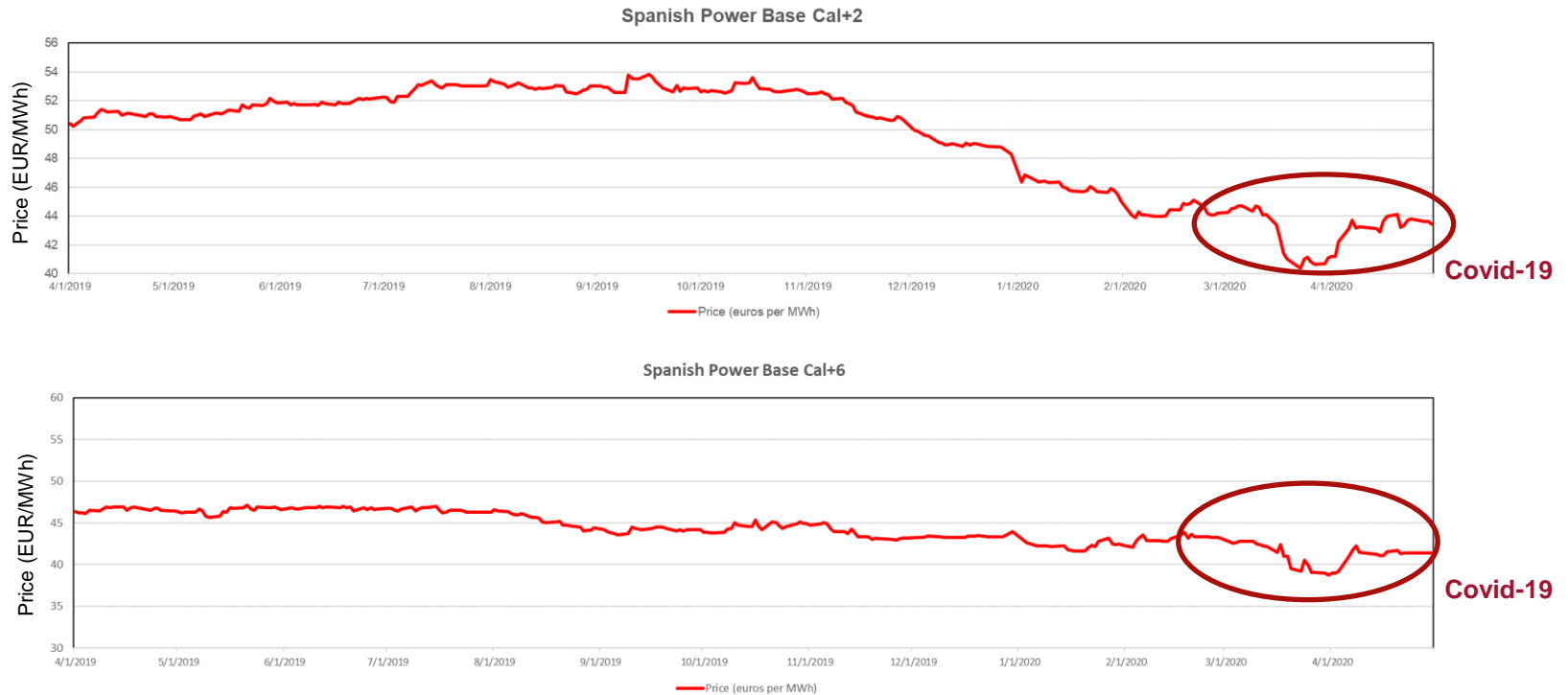


# Example 2: 33<sup>rd</sup> Long-Term Hedge on Spanish Power cleared on 03.26.2020

Trade Date	Product	Expiry Year	Expiry Month	Trade Price	Initial Margin per Contract	Lots (MW)	Initial Margin (in EUR)	Trade Volume (in MWh)	Notional Value	
03/26/2020	Spanish Power Base Year	2021	12	39.50 €	20,674 €	5	103,368 €	43,800	1,730,100 €	
	Spanish Power Base Year	2022	12	39.50 €	13,753 €	5	68,766 €	43,800	1,730,100 €	
	Spanish Power Base Year	2023	12	39.50 €	13,315 €	5	66,576 €	43,800	1,730,100 €	
	Spanish Power Base Year	2024	12	39.50 €	12,825 €	5	64,123 €	43,920	1,734,840 €	
								<b>302,833 €</b>	<b>175,320</b>	<b>6,925,140 €</b>
	<b>Initial Margin in % of Notional Value</b>									<b>4.37%</b>

- A 5 MW long-term hedge was cleared in Spanish Power on 26 March 2020, with an initial margin requirement of **302,833 EUR**
- The initial margin percentage of the notional value of the trade was **4.37%**
- The execution price of each trade was **39.50 EUR**
- This deal brings the total volume of long-term hedges in Spanish Power to **15.8 TWh**

# Variation Margin depends on Daily Price Volatility



- It is reasonable to expect volatile price movements in near-term contracts; however **long-term prices historically remain quite flat**
- Even a market shock such as **Covid-19** had a more subdued effect on the long end of the curve

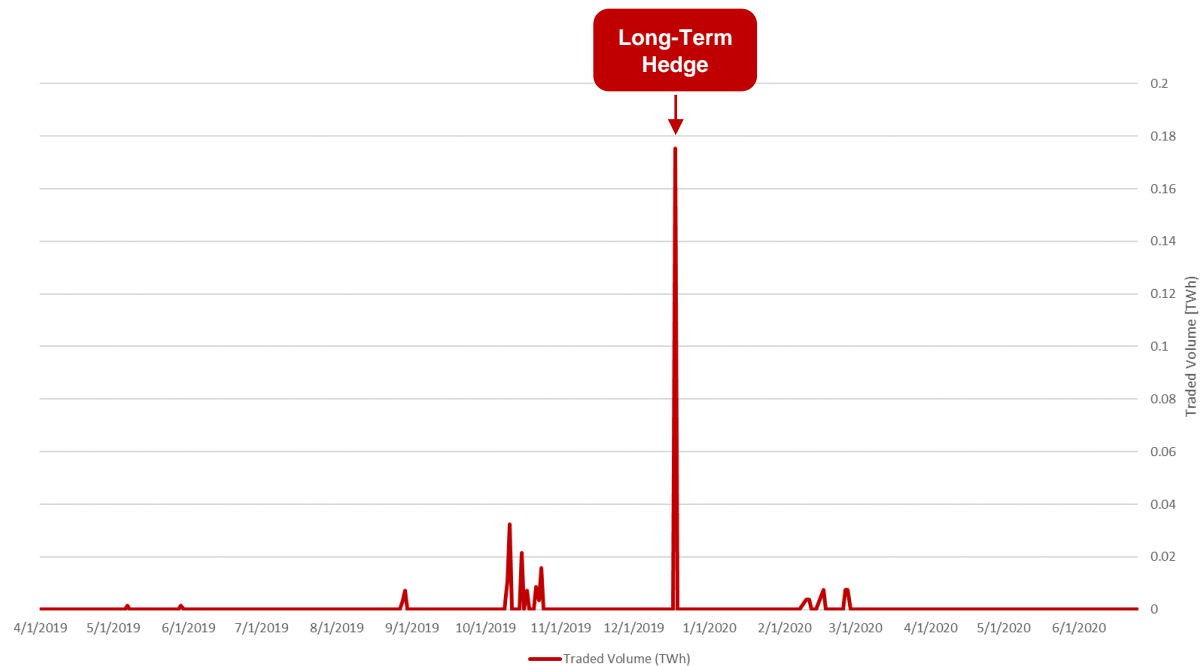
# First ever Long-Term Hedge in Polish Power cleared on 18 December 2019

Trade Date	Product	Expiry Year	Expiry Month	Trade Price	Initial Margin per Contract	Lots (MW)	Initial Margin (in EUR)	Trade Volume (in MWh)	Notional Value
18/12/2019	Polish Power Base Year	2022	12	52.19 €	12,264 €	5	61,320 €	43,800	2,285,922 €
	Polish Power Base Year	2023	12	52.19 €	58,078 €	5	290,390 €	43,800	2,285,922 €
	Polish Power Base Year	2024	12	52.19 €	58,238 €	5	291,190 €	43,800	2,285,922 €
	Polish Power Base Year	2025	12	52.19 €	58,079 €	5	290,394 €	43,920	2,292,185 €
								<b>933,294 €</b>	<b>175,320</b>
<b>Initial Margin in % of Notional Value</b>									<b>10.2%</b>

- A 5 MW long-term hedge was cleared in Polish Power on 18 December 2019, with an initial margin requirement of **933,294 EUR**
- The initial margin percentage of the notional value of the trade was **10.2%**

# Long-Term Hedging in Polish Power demonstrates trust in EEX and ECC as its clearing house

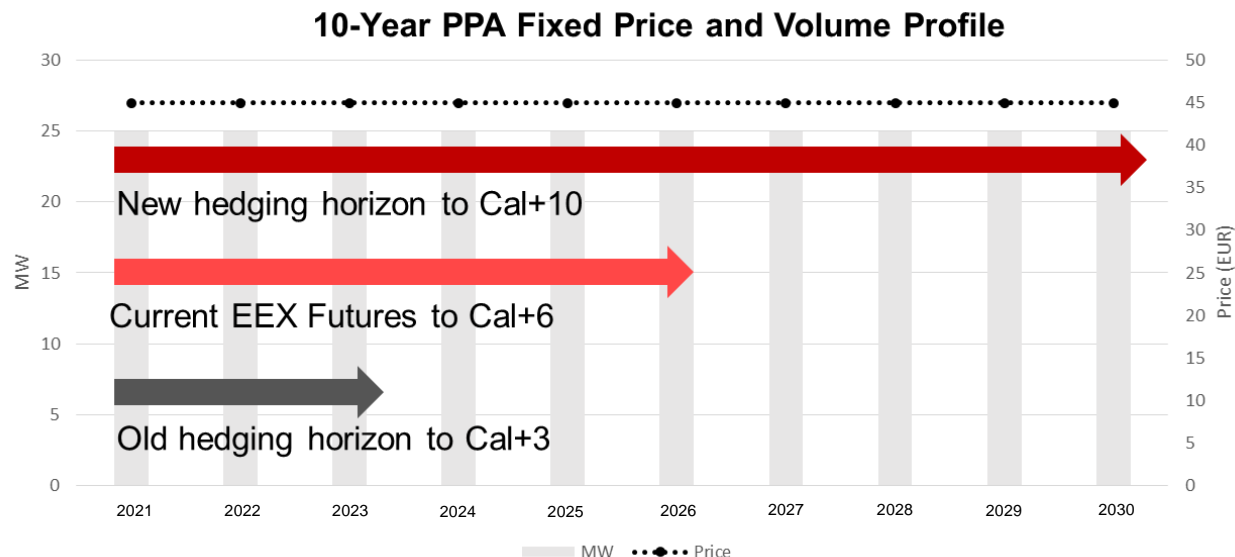
## EEX Polish Power Traded Volume



- EEX provides a **secure marketplace** for multinational players to easily access long-term hedging for their assets across Europe

# New Renewables investments are driving demand for long-term risk management

- EEX members have been increasingly demanding long-term hedging capability in order to manage risk from long-term contracts such as PPAs, primarily used to fund the construction of new Renewable Energy assets
- EEX is working towards **extending to Cal+10** in markets with high potential of PPA activity: **Spain, Germany and Italy**, to facilitate long-term hedging and more PPA development
- PPAs, combined with hedging price risk on exchange, provides a **market-based solution to achieving EU renewable energy targets** instead of Member States relying on onerous subsidies (e.g. CfDs)



# Merchant Renewables are the Next Phase in the Energy Transition



PPAs are one enabler of new Renewable Energy investments....



...but the market is in need of more standardisation and better risk management products in order to grow and meet the EU's ambitious targets.



Major energy players are already hedging their long-term price risk with standard EEX products.



EEX will ensure we remain part of our Members' long-term hedging strategy, and explore opportunities to build new products for risk management of Renewable Energy.

Please get in touch with any questions:

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EEX

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30 June 2020

Managing long-term price risks in PPAs

# Forecasting power prices and capture rates



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# Agenda

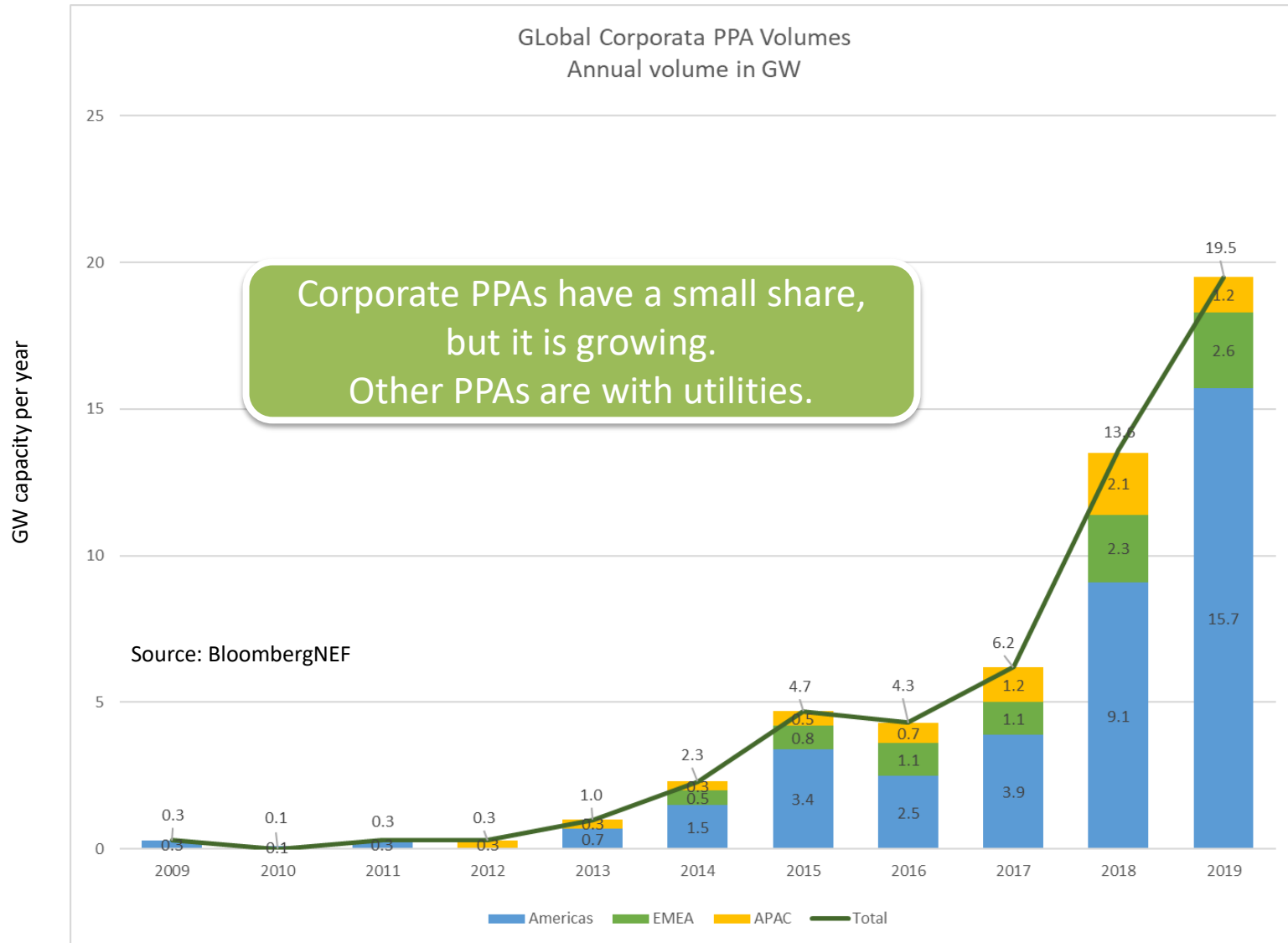
## 15:20 Presentation

- Financial exposures of renewable energy projects
- What will be the power price in 2030?
- The cannibalisation effect and capture rates
- Forecasting long-term power prices and capture rates

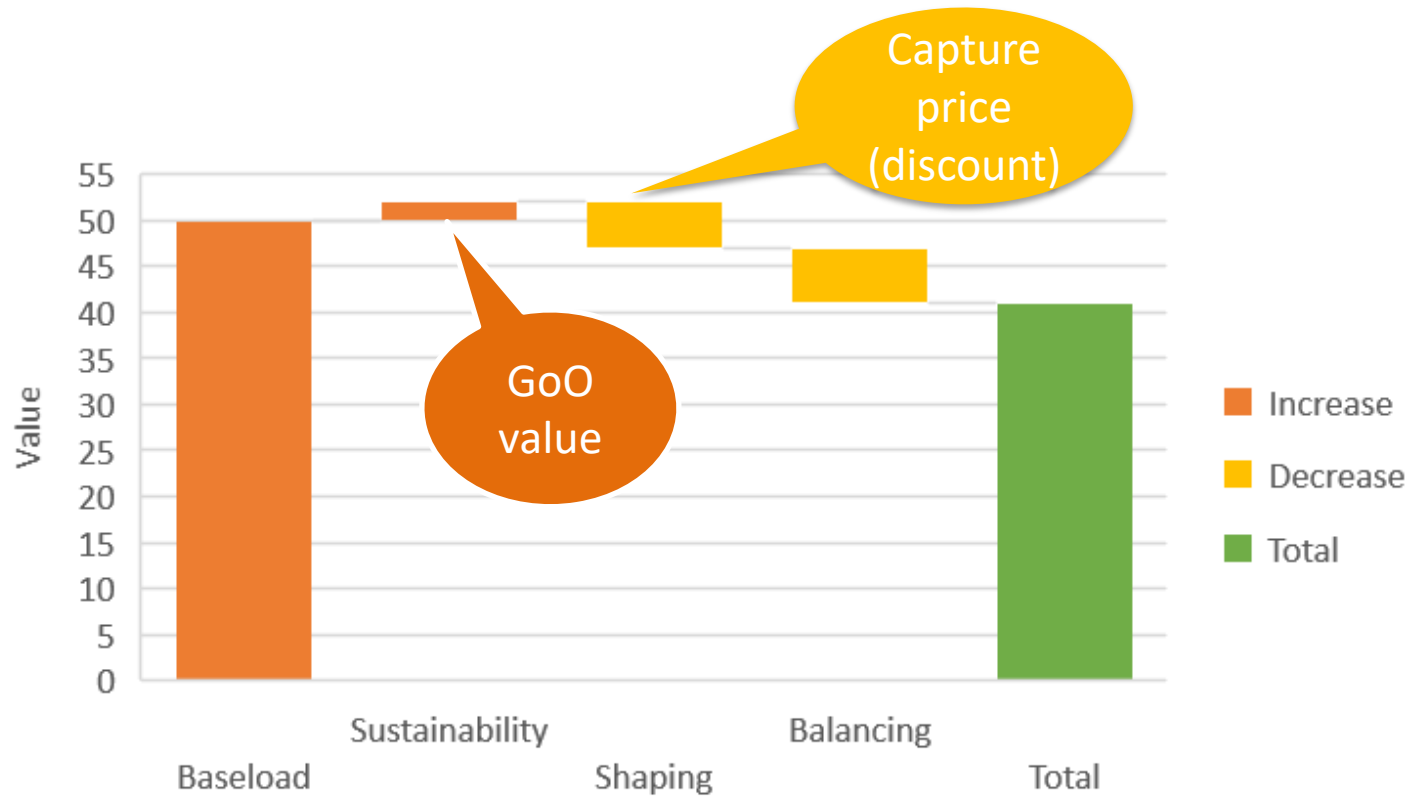
## 15:35 – Q&A and discussion

## 15:45 – End of the webinar

# Corporate PPAs



# Value components of renewable power



Each PPA may distribute the value components differently, but ultimately they have to land in someone's pocket.

# What will be the power price in 2030? Or 2035?

Why worry about power price in 2030? Or 2035?

- Liquid power trading just 3 years ahead (hopefully increasing)
- Projects will not earn back investment in 3 years, nor in 5 years
- In the next 10-20 years, market will undergo transformation

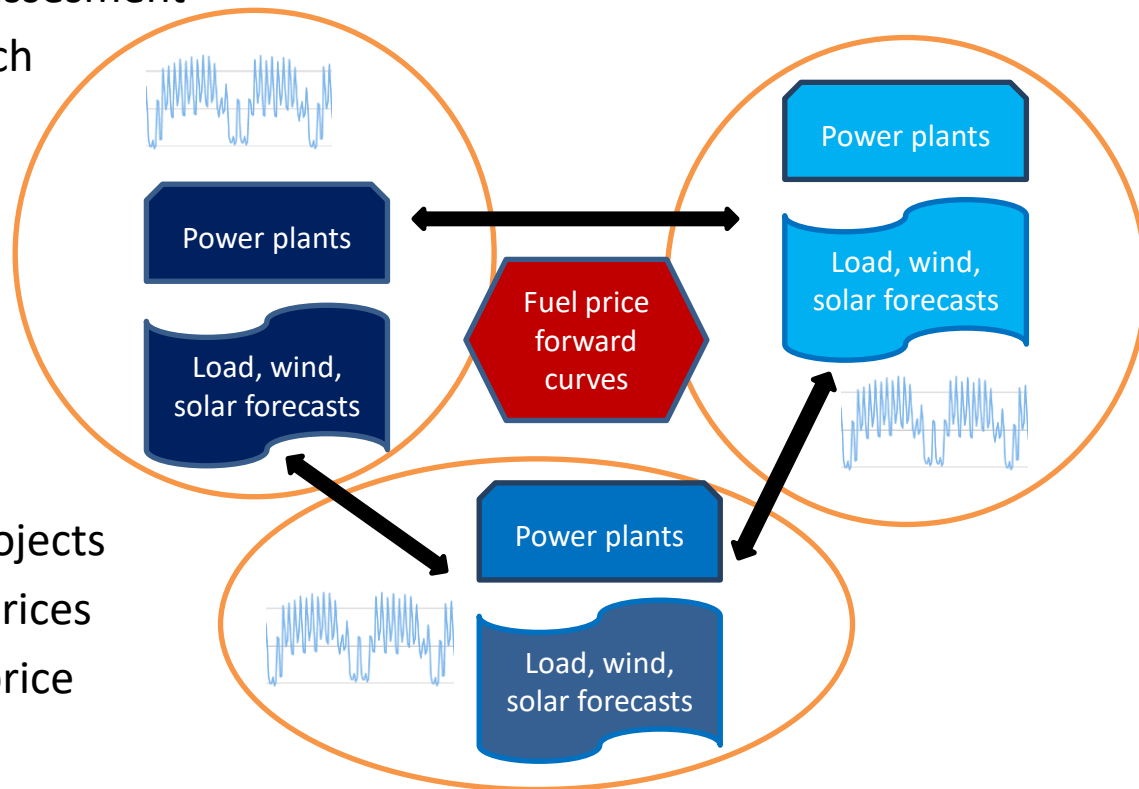


# Long-term power price forecast

- **Fundamental power market model**
  - Medium- to long-term price assesment
  - Power plants optimise dispatch
  - And energy storage too



- **Main applications**
  - For investors: value deals, projects
  - For power traders: forecast prices
  - For consumers: buy at good price
- **Kyos base case:**
  - 14 countries
  - Using historical scenarios to forecast load and renewable production



# KYOS Base Case – 14 European countries

KYOS Base Case BY2018 : 2020-06-26

[Export to Excel](#)
[Download plant statistics](#)
[Back to results](#)

KyPF ID: 1	KyPF Name: KYOS Base Case BY2018	Iterations: 15
Job ID: 4046	Created: 2020-06-29 09:27:13	

[Price summary](#)
[Interconnections](#)
[Hourly prices](#)
[Production](#)
[Hourly imbalance](#)
[Capacities](#)
[Emissions](#)
[Fuel consumption](#)

Period

- Month  
 Year

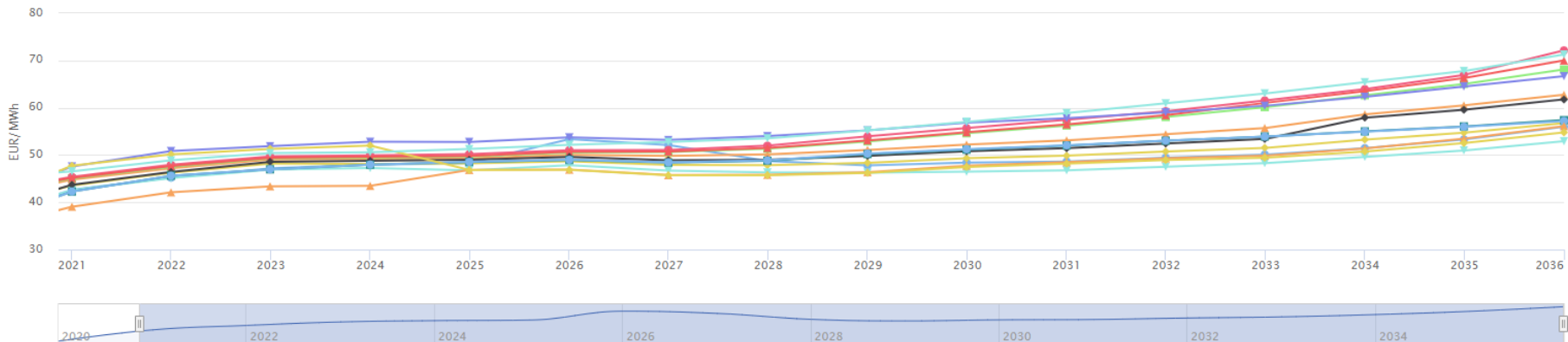
Type

- Intrinsic  
 Simulation

Delivery type(s):

Base

Prices yearly



- ◆ Belgian Power Base
 ◆ Belgian Power Peak
 ◆ Belgian Power Offpeak
 ◆ Austrian Power Base
 ◆ Austrian Power Peak
 ◆ Austrian Power Offpeak
 ◆ German Power Base
 ◆ German Power Peak
 ◆ German Power Offpeak
- ◆ Dutch Power Base
 ◆ Dutch Power Peak
 ◆ Dutch Power Offpeak
 ◆ Czech Power Base
 ◆ Czech Power Peak
 ◆ Czech Power Offpeak
 ◆ Hungarian Power Base
 ◆ Hungarian Power Peak
 ◆ Hungarian Power Offpeak
- ◆ Slovak Power Base
 ◆ Slovak Power Peak
 ◆ Slovak Power Offpeak
 ◆ Swiss Power Base
 ◆ Swiss Power Peak
 ◆ Swiss Power Offpeak
 ◆ Italian Power Base
 ◆ Italian Power Peak
 ◆ Italian Power Offpeak
- ◆ Spanish Power Base
 ◆ Spanish Power Peak
 ◆ Spanish Power Offpeak
 ◆ Portugese Power Base
 ◆ Portugese Power Peak
 ◆ Portugese Power Offpeak
 ◆ French power Base
 ◆ French power Peak
 ◆ French power Offpeak
- ◆ French power Offpeak
 ◆ UK Power (EUR CET) Base
 ◆ UK Power (EUR CET) Peak
 ◆ UK Power (EUR CET) Offpeak
 ◆ Polish Power Base
 ◆ Polish Power Peak
 ◆ Polish Power Offpeak

Actual forecasts are per hour

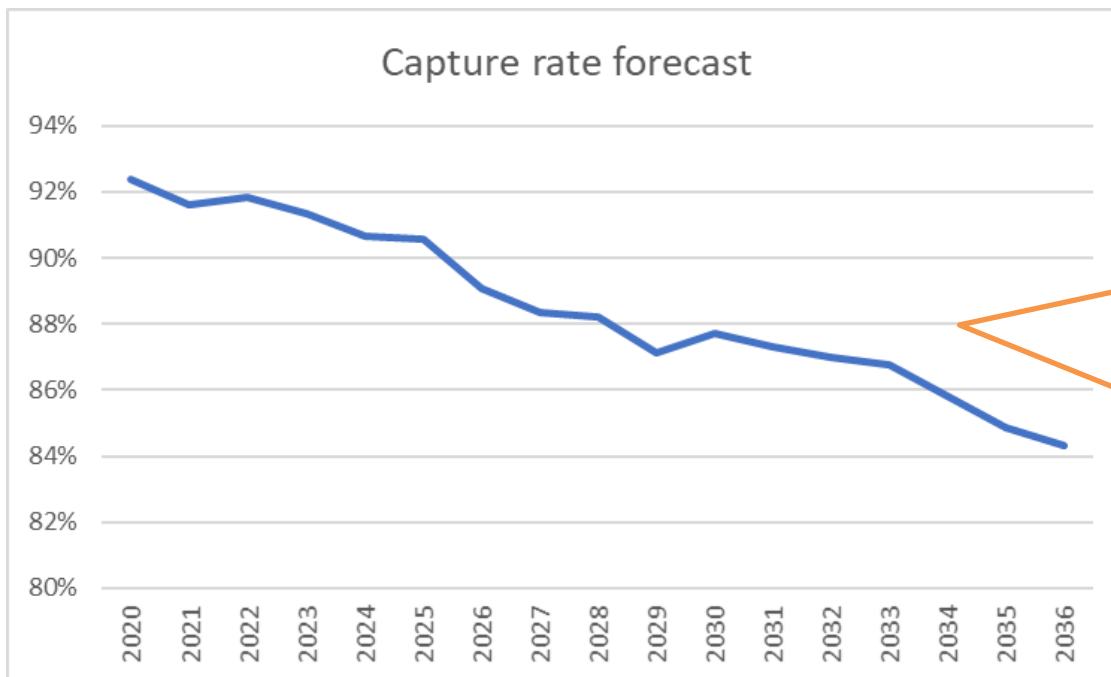
# Cannibalisation effect

- More renewable capacities:
  - Produce a lot when prices are low
  - Produce very little when prices are high
- Capture rate will go down if more renewables enter the market
- However, do not underestimate the market:
  - Improved control over renewables → no negative prices
  - Energy storage, demand response → dampen fluctuations

Spanish power market First half of 2020		
Asset	Capture price	Capture rate
Baseload	28.97	100%
Wind on-shore	27.09	93%
Solar	27.24	94%

# Forecast future capture price

- Use fundamental model: hourly prices
- Use actual weather data from a particular year to simulate:
  - Renewable production in the market → market price
  - Renewable production of the asset → capture price



This is an example  
(German solar).

KYOS can generate  
capture rate forecast  
for any asset.



# KYOS Energy Analytics

What are the challenges?

- Long-term power price risk for renewable projects / PPAs
- No security from FiTs, limited from market (though improving)
- Fundamental model to make forecast and calculate sensitivities of base price plus capture rates

What do we provide?

- Easy-to-use software: KYOS Analytical Platform
- Insightful data and reports
- Expertise of dedicated team

**More than 100 corporate clients using KYOS software and services**



# Thank you

## Q&A session

For more info:

[www.kyos.com/renewables](http://www.kyos.com/renewables)

Our PPA Insight papers:

<https://www.kyos.com/ppa-insights-overview-articles>