

Power Purchase Agreements: Hedging via EEX Power Futures

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A few key figures

17%

2016 estimated share of renewable energy in the EU's gross final energy consumption

€62bn

Feb 2018: IRENA report of estimated average investment in renewable energy per year to reach 34% capacity in the EU

32%

June 2018: new binding 2030 renewable energy target for the EU

One PPA is not like the other

Power Purchase Agreement (PPA)

Long term contract between a party generating and selling electricity and a party purchasing electricity. Have existed for decades.

Corporate PPA

Corporate PPAs enable businesses to source electricity from generators at an agreed price, while giving producers a reliable, guaranteed buyer at a stable price.

Renewable & Corporate PPAs

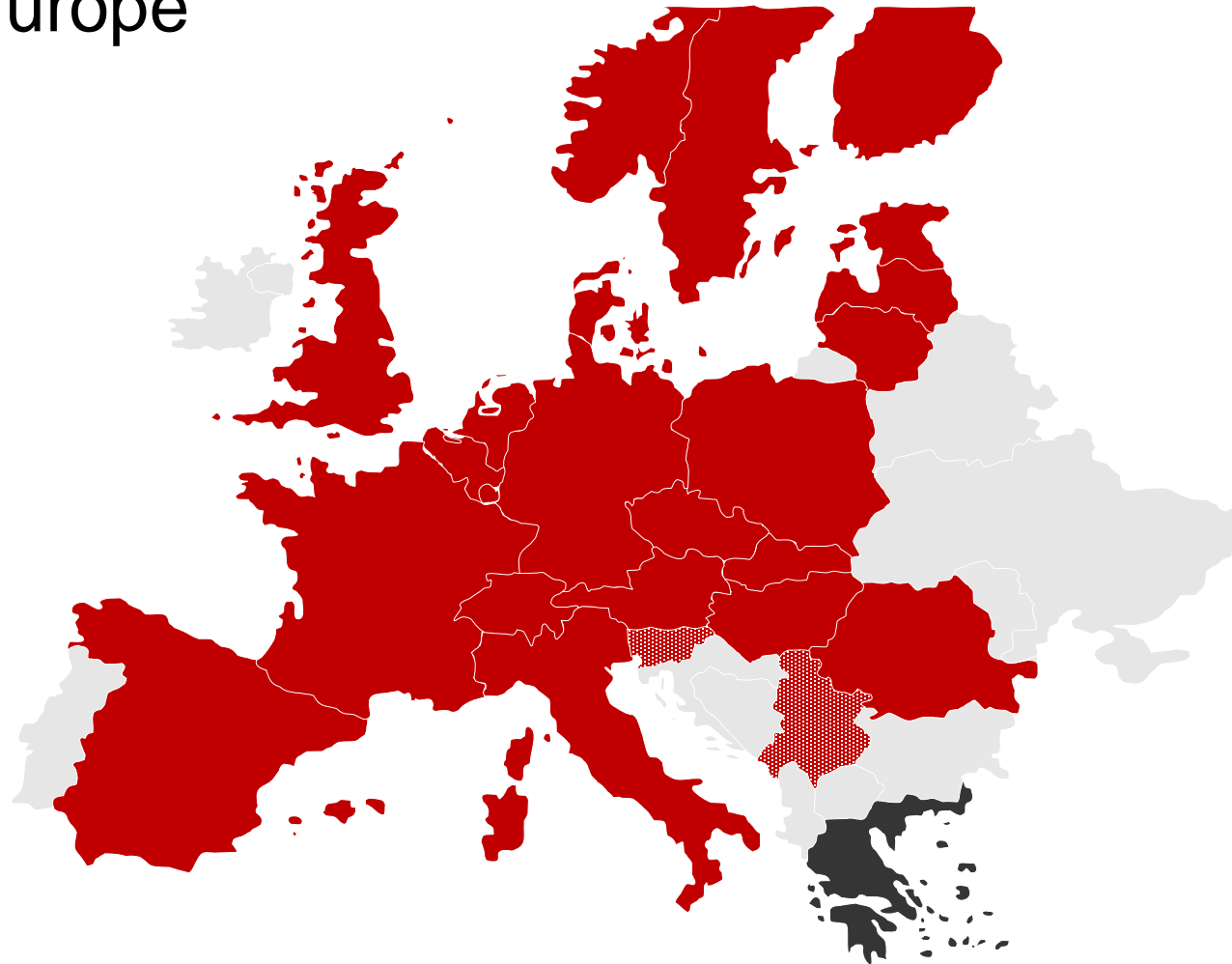
Electricity traded between the two parties comes from a Renewable Energy power plant. **PPAs are necessary to be in place prior to a RE asset developer securing financing from a bank for their project.** Purchasers can be wholesale buyers/Utilities or Corporates, and are attracted by lower prices and the 'green credentials' in having their power supply come from 100% renewable sources. **RE PPAs are often fixed for long periods, up to 15 years, to ensure revenue security for the developer.**

EEX Power Markets house the benchmark price references for Europe

EEX connects **264** trading participants from **28** countries:

- | | |
|--------------------------|--------------------------|
| 8 Austria | 1 Luxembourg |
| 1 Belgium | 10 Netherlands |
| 1 Bulgaria | 6 Norway |
| 1 Croatia | 10 Poland |
| 20 Czech Republic | 1 Portugal |
| 7 Denmark | 3 Romania |
| 2 Finland | 4 Slovakia |
| 13 France | 4 Slovenia |
| 57 Germany | 14 Spain |
| 2 Greece | 3 Sweden |
| 3 Hungary | 20 Switzerland |
| 1 Ireland | 33 United Kingdom |
| 34 Italy | |

5 non-European participants
Canada, Cayman Islands, USA



- Exchange traded EEX Power Futures
- EEX Trade Registration Services for Power Futures
- (dotted) New Market Area

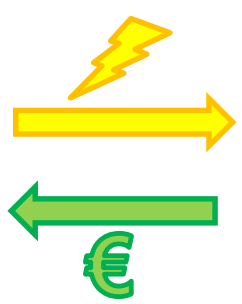
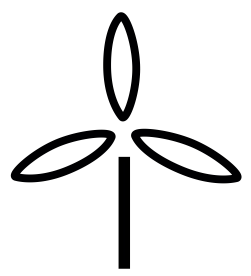
* As of 31 May 2018

EEX lists Power Derivatives in 17 EU Markets

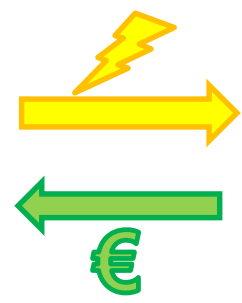
	Base							Peak						
	Day	WkEnd	Week	Month	Quarter	Season	Year	Day	WkEnd	Week	Month	Quarter	Season	Year
DE/AT (Phelix)	14	2	5	10	11		6	14	2	5	10	11		6
DE (Phelix)	14	2	5	10	11		6	14	2	5	10	11		6
AT (Phelix)				10	11		6				10	11		6
FR	14	2	5	7	7		6	14	2	5	7	7		6
IT	14	2	5	7	7		6	14	2	5	7	7		6
ES	14	2	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 (TR only)				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		7
RS			5	7	7		6			5	7	7		7

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



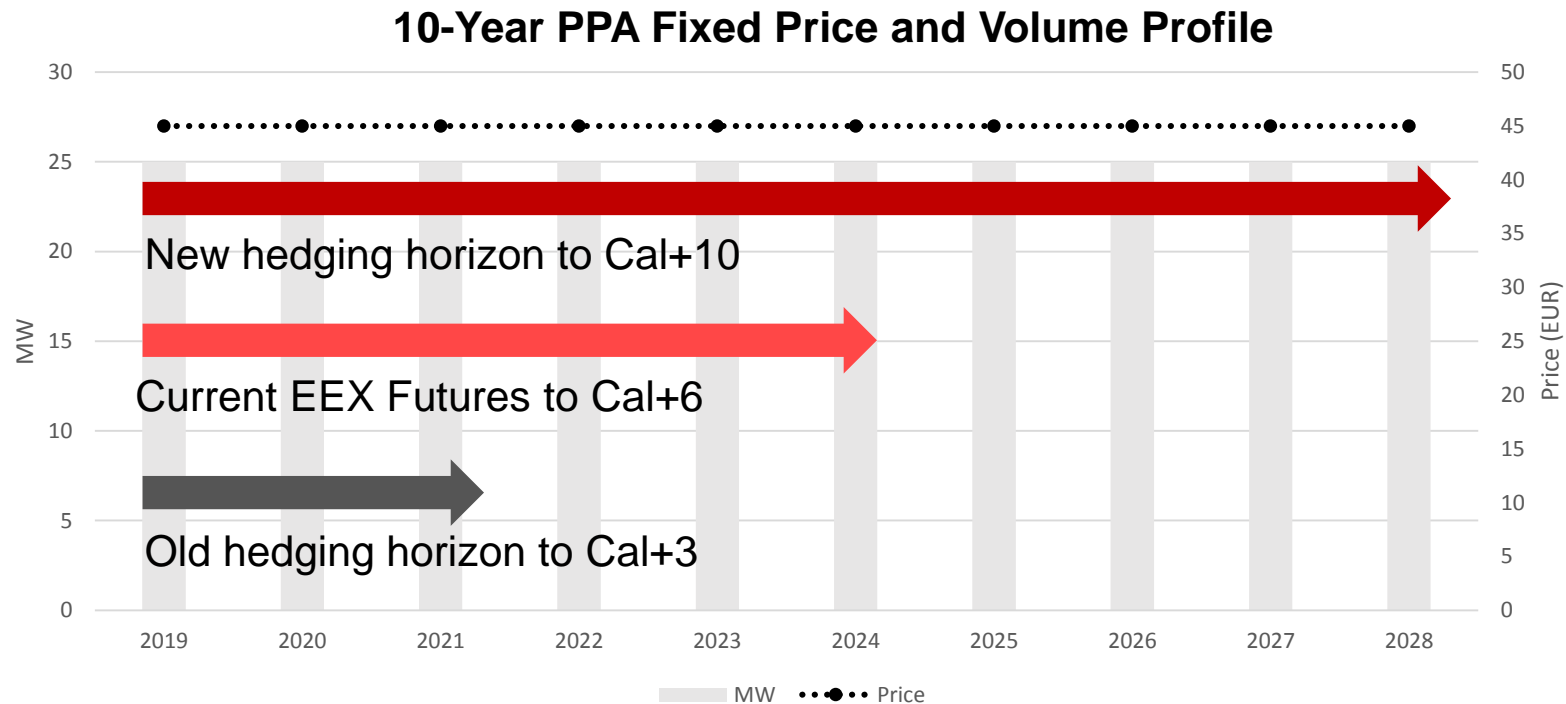
Banks provide financing once PPA is in place



EEX Members sell Power from their own RE assets via LT Corporate PPAs



Synthetic PPAs affect the hedging profile of EEX Members and extends it to the long-term



- EEX members have been using **Power Futures to hedge merchant risk from conventional power plants** for years
- EEX is investigating **listing further calendar expiries to Cal+10** to support long-term hedging of Renewable Energy assets

How do EEX Power Derivatives help to mitigate PPA Price Risk?

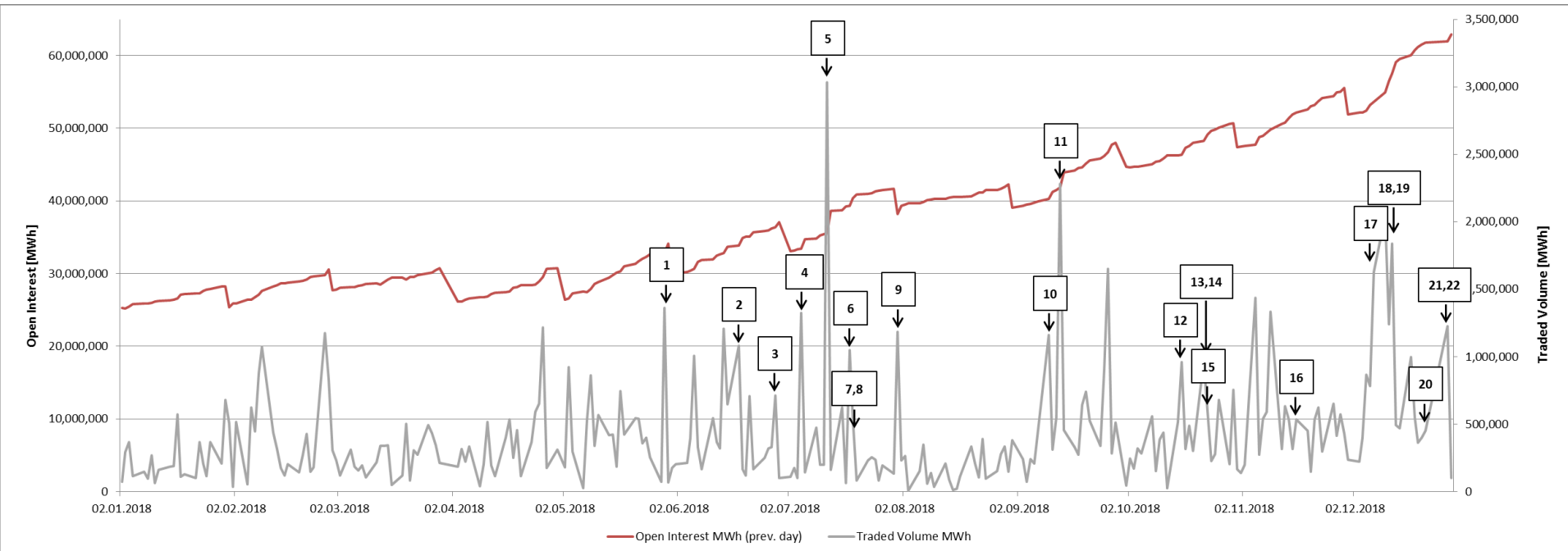
- Market participants who enter into long-term PPAs can **register a strip of cash-settled calendar futures out to Cal+6** for clearing with EEX.
- This means that **sellers can lock in a secure cash flow for up to 6 years**, for the sale of electricity in the respective market area
- Buyers lock in a **guaranteed price of purchase** for up to 6 years, providing **certainty** on their future electricity price and **protecting against upswings**
- Therefore the purchase or sale of electricity derivatives provides **long-term price risk hedging** together with **counterparty risk mitigation** through the ECC clearing house.
- Since 29th May 2018, **23** long-term hedges of **calendar contracts up to 2024** have been registered OTC in Spanish Power, with a total volume of **13.9 TWh**.

Example Long-Term hedge cleared on Spanish Power on 23.10.18

Trade Date	Product	Expiry Year	Expiry Month	Trade Price	Initial Margin per Contract	Lots	Initial Margin (in EUR)	Trade Volume (in MWh)	Notional Value
23/10/2018	Spanish Power Base Year	2019	12	51.65 €	18,133 €	5	90,665 €	43,800	2,262,270 €
	Spanish Power Base Year	2020	12	51.65 €	14,317 €	5	71,585 €	43,800	2,262,270 €
	Spanish Power Base Year	2021	12	51.65 €	12,614 €	5	63,070 €	43,800	2,262,270 €
	Spanish Power Base Year	2022	12	51.65 €	19,535 €	5	97,675 €	43,800	2,262,270 €
	Spanish Power Base Year	2023	12	51.65 €	26,280 €	5	131,400 €	43,920	2,268,468 €
	Spanish Power Base Year	2024	12	51.65 €	30,393 €	5	151,965 €	43,920	2,268,468 €
								606,360 €	263,040
Initial Margin in % of Notional Value									4.46%

- A 5 MW long-term hedge was cleared in Spanish Power on 23 October 2018, with an **initial margin requirement of 606,360 EUR**
- The **execution price of each trade** was **51.65 EUR**
- The **Initial Margin percentage** of the notional value of the trade was **4.46%**

Long-term Hedges contribute to overall Open Interest in Spanish Power



- Long-term hedges cause **volume spikes** and contribute to Open Interest

Daily Settlement in Illiquid Contracts and Legacy Trades

- In illiquid long-dated contracts where there have been no order book trades, EEX uses two methods to determine settlement prices
 - **Fair Value Providers:** ask chief traders from select members what their fair values are for settlement
 - **Market Structure:** take the daily price dynamic of the last liquid expiry and apply it to the illiquid expiries (ex. Cal21 increases by 30 €ct, then Cal22 – Cal24 will increase by 30 €ct)
- **Legacy Trades** are possible at EEX, in order to “roll over” a long-term hedge at the previously traded price, once a new Cal is open
- Prices which are out of range must be approved by the respective General Clearing Member

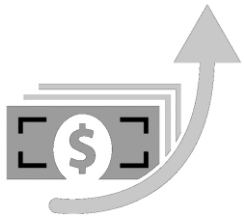
Renewable Corporate PPAs are the dawn of a new era in the Energy Transition



PPAs are an enabler of new Renewable Energy developments....



...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 starting to hedge 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 PPA-related products.

Thank you!

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