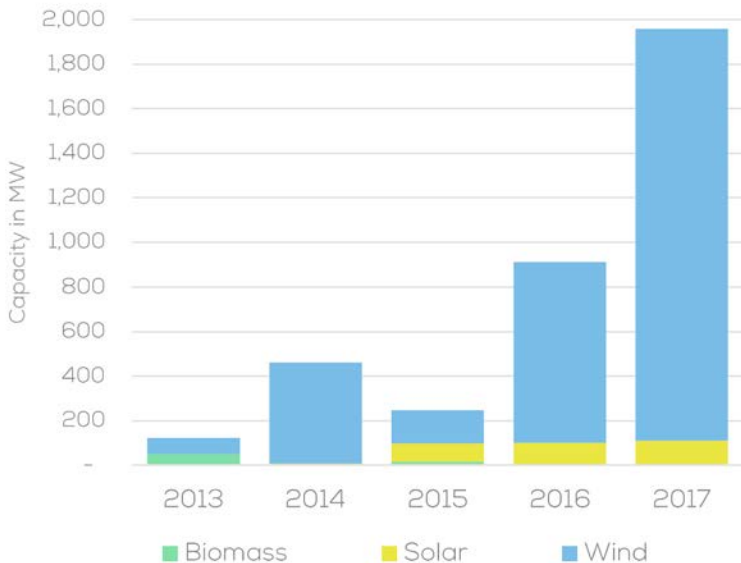


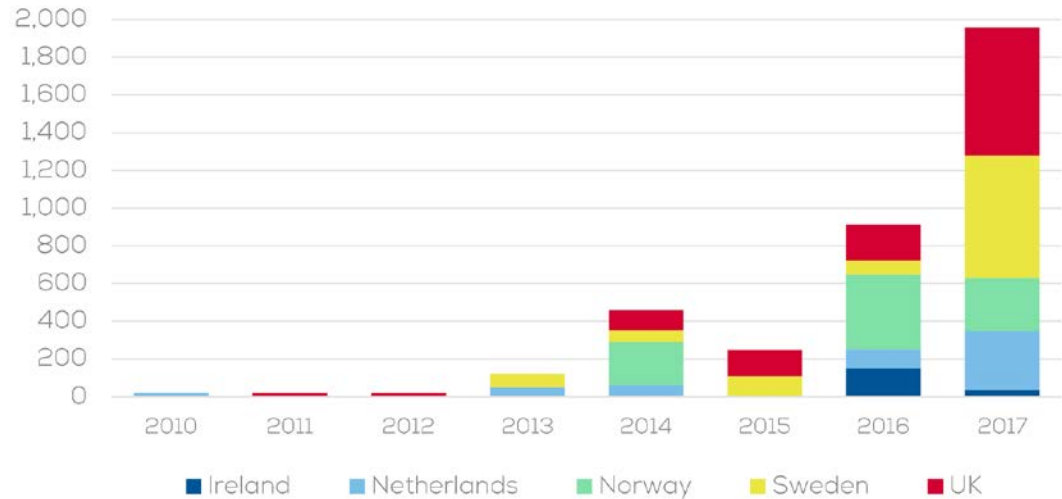
RE Corporate PPAs are quickly gaining in popularity in Europe

Around 6% of new installed wind power capacity in Europe in the last 5 years is under PPAs.

Annual European corporate PPA deals by technology (in MW)



European corporate PPA deals by country (in MW)



In Europe, over 1GW of power was contracted under PPAs in 2017, with **95% of this volume coming from the Netherlands, Norway, Sweden and the UK** due to favourable policy conditions.

More PPAs in Germany and Europe are expected, once **wind and solar assets start coming off of subsidies** in the next few years.

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 PPA

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 are attracted by lower prices and the 'green credentials' in having their power supply come from 100% renewable sources. **RE Corporate PPAs are often fixed for long periods, up to 15 years, to ensure revenue security for the developer.**

PPAs are negotiated based on different variables

Price Formation

- **Contractual terms on price can differ in each PPA:** fixed price, upper/lower limits, floating index-based are all possibilities.
- **Most PPAs are “synthetic” or financial,** essentially a contract for difference (CfD) between the generator and offtaker

Time Period

- **Prices can be fixed** for shorter terms (ie. 6 years) and then renegotiated, or fixed for a long term (out to 15 years)

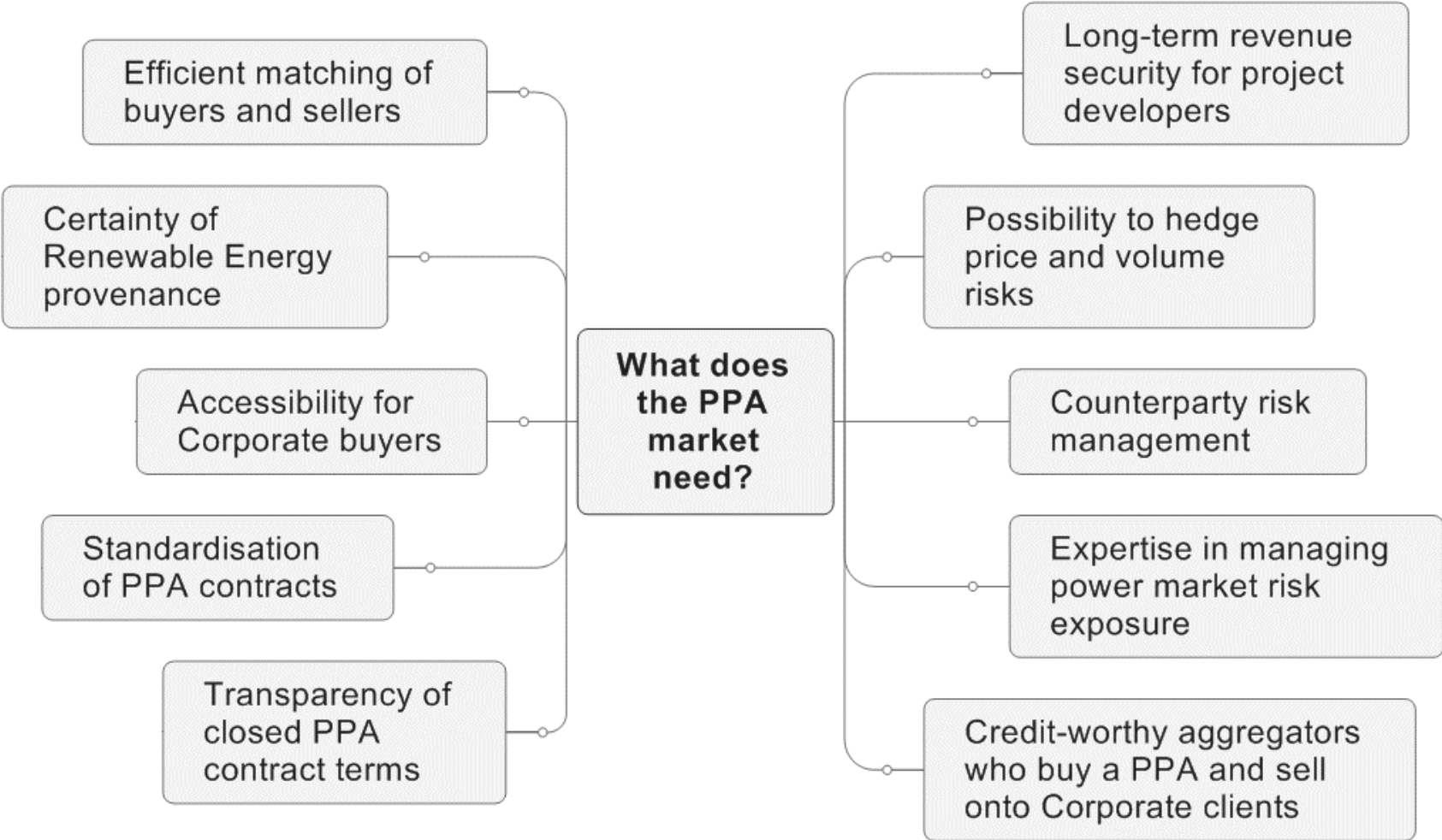
Volume / Capacity

- **Delivery volume is usually fixed,** based on the corporations' electricity demand/forecasted demand

Contract Structure

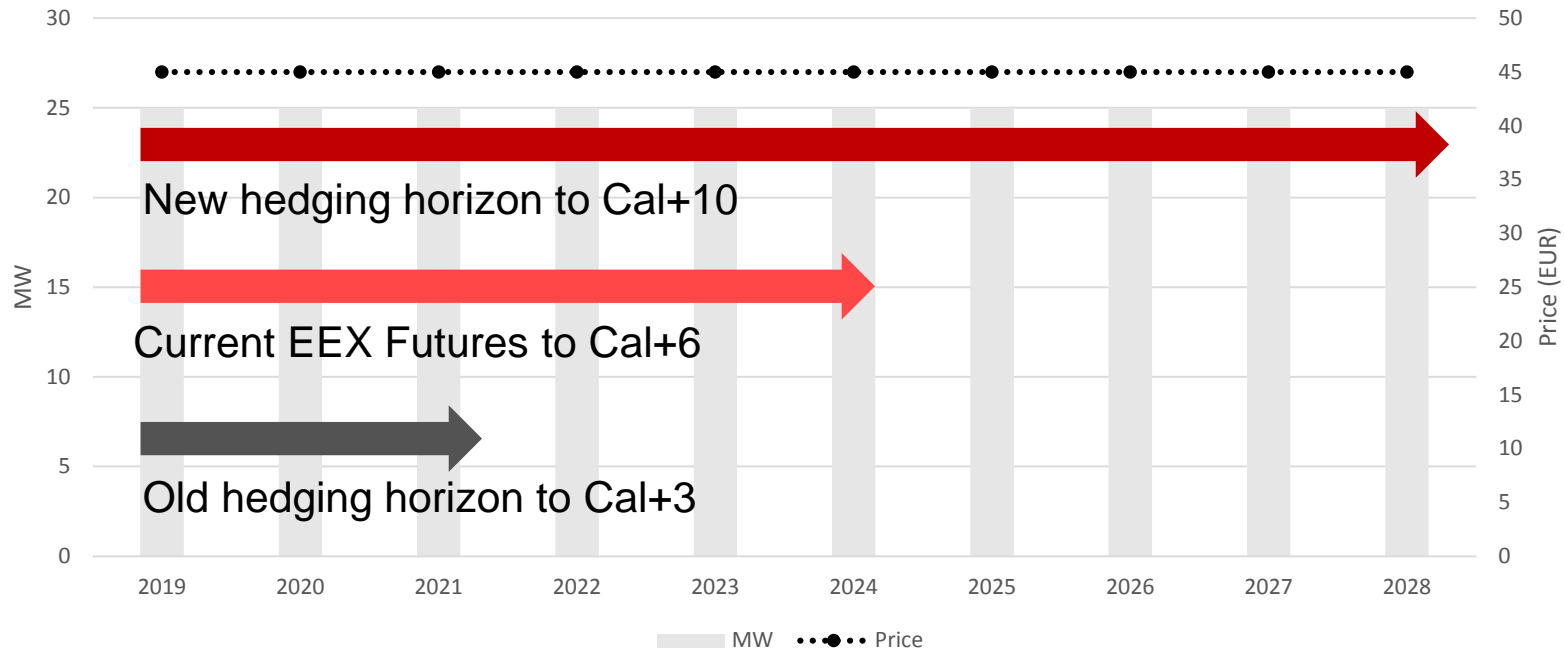
- PPA terms are negotiated bilaterally and there is no standard contract template – **market participants may welcome more standardisation and transparency of PPAs**
- Furthermore, **counterparty risk is currently not secure** – PPA contracts entail lengthy risk negotiations and counterparties must post collateral (usually the buyer to the seller)

What are the main needs of PPA buyers and sellers?



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

10-Year PPA Fixed Price and Volume Profile



- EEX Members and other PPA counterparties could **use Power Futures to hedge their long-term price risk**
- EEX will investigate **listing further calendar expiries** to facilitate this

How to hedge Long-Term PPA merchant risk with standard EEX Products?

- In order to mitigate counterparty risk and secure long-term cash flows, **EEX already offers cleared cash-settled futures contracts up to 6 years ahead** in all major European power markets.
- This constitutes an important value-added service for PPA counterparties.
- Market participants who enter into long-term PPAs can **register a strip of cash-settled calendar futures of up to 6 years in advance** for clearing with EEX, in order to hedge the merchant risk exposure of a PPA
- Strips are multiple trades of sequential expiries at a single price
- This combines the need for long-term price hedging with the **security of the counterparty risk mitigation through the ECC** clearing house, as well as the deep liquidity pool of EEX's power derivatives markets.

Are Long-Term PPA hedges with EEX products already happening ?

- EEX has noticed a strong increase in demand for such cleared long-term contracts recently.
- Since 29th May 2018, strips of calendar contracts up to calendar year 2024 have been registered in Spain and Germany with a total volume of **8.06 TWh**.
- On the 27th of June 2018, the EEX Exchange Council encouraged EEX to further extend the existing offering by listing additional yearly expiries.

Extended Power Futures liquidity could provide more hedging opportunities for PPAs

Exchange-based PPA hedging

- EEX would organise initiatives to **increase liquidity further along the Power Futures curve**, in order to aid hedging long-term price and volume exposure due to PPAs

OTC Trade Registration

- **Encourage trading strips of Calendar Futures via OTC registration**
- Long-term trades have already been cleared in Spanish Power and Phelix DE

Market Making

- **Extend Market Making contracts** to establish order book quotes and market depth in Cal +3 to Cal +6
- Target markets: Italy, Spain, France, Germany

Liquidity Pooling

- Designate **liquidity windows** (ie. 3 - 5pm CET) in order to pool trading interest

Long-term hedges have already been cleared in Spanish Power on 29 May

Trade Date	Product	Expiry Year	Expiry Month	Trade Price	Initial Margin per Contract	Contracts	Total Initial Margin	Trade Volume (in MWh)	Notional Value
29/05/2018	Spanish Power Base Quarter	2018	7	48.75 €	7,900 €	20	158,000 €	43,800	2,135,250 €
	Spanish Power Base Quarter	2018	10	48.75 €	6,300 €	20	126,000 €	43,800	2,135,250 €
	Spanish Power Base Year	2019	12	48.75 €	11,476 €	20	229,512 €	175,200	8,541,000 €
	Spanish Power Base Year	2020	12	48.75 €	9,399 €	20	187,978 €	175,680	8,564,400 €
	Spanish Power Base Year	2021	12	48.75 €	11,125 €	20	222,504 €	175,200	8,541,000 €
	Spanish Power Base Year	2022	12	48.75 €	15,856 €	20	317,112 €	175,200	8,541,000 €
	Spanish Power Base Year	2023	12	48.75 €	15,856 €	20	317,112 €	175,200	8,541,000 €
	Spanish Power Base Year	2024	12	48.75 €	15,899 €	20	317,981 €	175,680	8,564,400 €
								1,876,198 €	1,139,760
Initial Margin in % of Notional Value									3.38%

- A 20 MW strip from Q4 18 to Cal+6 was cleared in Spanish Power on 29 May 2018, with an **initial margin requirement of 1,876,198 EUR**
- The **execution price of each trade was 48.75 EUR**
- The **Initial Margin percentage** of the notional value of the trade was **3.38 %**

A second Long-Term hedge on Spanish Power was cleared on 18 June

Trade Date	Product	Expiry Year	Expiry Month	Trade Price	Initial Margin per Contract	Contracts	Total Initial Margin	Trade Volume (in MWh)	Notional Value	
18/06/2018	Spanish Power Base Year	2020	12	45.50 €	10,980 €	20	219,600 €	175,680	7,993,440 €	
	Spanish Power Base Year	2021	12	45.50 €	11,038 €	20	220,752 €	175,200	7,971,600 €	
	Spanish Power Base Year	2022	12	45.50 €	18,659 €	20	373,176 €	175,200	7,971,600 €	
	Spanish Power Base Year	2023	12	45.50 €	24,703 €	20	494,064 €	175,200	7,971,600 €	
	Spanish Power Base Year	2024	12	45.50 €	26,176 €	20	523,526 €	175,680	7,993,440 €	
								1,831,118 €	876,960	39,901,680 €
									Initial Margin in % of Notional Value	4.59%

- A 20 MW strip from Cal+2 to Cal+6 was cleared in Spanish Power on 18 June 2018, with an **initial margin requirement of 1,831,118 EUR**
- The **execution price of each trade** was **45.50 EUR**
- The **Initial Margin percentage** of the notional value of the trade was **4.59 %**

A third Long-Term hedge on Spanish Power was cleared on 28 June

Trade Date	Product	Expiry Year	Expiry Month	Trade Price	Initial Margin per Contract	Contracts	Total Initial Margin	Trade Volume (in MWh)	Notional Value	
28/06/2018	Spanish Power Base Year	2019	12	47.10 €	12,176 €	10	121,760 €	87,600	4,125,960 €	
	Spanish Power Base Year	2020	12	47.10 €	10,804 €	10	108,040 €	87,840	4,137,264 €	
	Spanish Power Base Year	2021	12	47.10 €	10,950 €	10	109,500 €	87,600	4,125,960 €	
	Spanish Power Base Year	2022	12	47.10 €	18,746 €	10	187,460 €	87,600	4,125,960 €	
	Spanish Power Base Year	2023	12	47.10 €	26,455 €	10	264,550 €	87,600	4,125,960 €	
	Spanish Power Base Year	2024	12	47.10 €	28,811 €	10	288,110 €	87,840	4,137,264 €	
								1,079,420 €	526,080	24,778,368 €
									Initial Margin in % of Notional Value	4.36%

- A 10 MW strip from Cal+1 to Cal+6 was cleared in Spanish Power on 28 June 2018, with an **initial margin requirement of 1,079,420 EUR**
- The **execution price of each trade** was **47.10 EUR**
- The **Initial Margin percentage** of the notional value of the trade was **4.36%**

A fourth Long-Term hedge on Spanish Power was cleared on 5 July

Trade Date	Product	Expiry Year	Expiry Month	Trade Price	Initial Margin per Contract	Contracts	Total Initial Margin	Trade Volume (in MWh)	Notional Value	
05/07/2018	Spanish Power Base Month	2018	8	48.90 €	3,266 €	20	65,320 €	14,880	727,632 €	
	Spanish Power Base Month	2018	9	48.90 €	3,266 €	20	65,320 €	14,880	727,632 €	
	Spanish Power Base Quarter	2018	10	48.90 €	6,300 €	20	126,000 €	43,800	2,141,820 €	
	Spanish Power Base Year	2019	12	48.90 €	12,439 €	20	248,780 €	175,200	8,567,280 €	
	Spanish Power Base Year	2020	12	48.90 €	10,716 €	20	214,320 €	175,680	8,590,752 €	
	Spanish Power Base Year	2021	12	48.90 €	10,862 €	20	217,240 €	175,200	8,567,280 €	
	Spanish Power Base Year	2022	12	48.90 €	20,323 €	20	406,460 €	175,200	8,567,280 €	
	Spanish Power Base Year	2023	12	48.90 €	30,134 €	20	602,680 €	175,200	8,567,280 €	
	Spanish Power Base Year	2024	12	48.90 €	32,412 €	20	648,240 €	175,680	8,590,752 €	
								2,594,360 €	1,125,720	55,047,708 €
									Initial Margin in % of Notional Value	4.71%

- A 20 MW strip from Aug 18 to Cal+6 was cleared in Spanish Power on 5 July 2018, with an **initial margin requirement of 2,594,360 EUR**
- The **execution price of each trade was 48.90 EUR**
- The **Initial Margin percentage** of the notional value of the trade was **4.71%**

A fifth Long-Term hedge on Spanish Power was cleared on 12 July

Trade Date	Product	Expiry Year	Expiry Month	Trade Price	Initial Margin per Contract	Contracts	Total Initial Margin	Trade Volume (in MWh)	Notional Value	
12/07/2018	Spanish Power Base Month	2018	8	49.85 €	3,266 €	50	163,300 €	37,200	37,088 €	
	Spanish Power Base Month	2018	9	49.85 €	3,153 €	50	157,650 €	37,200	35,892 €	
	Spanish Power Base Quarter	2018	10	49.85 €	7,908 €	50	395,400 €	109,500	5,458,575 €	
	Spanish Power Base Year	2019	12	49.85 €	12,527 €	50	626,340 €	438,000	21,834,300 €	
	Spanish Power Base Year	2020	12	49.85 €	10,716 €	50	535,824 €	439,200	21,894,120 €	
	Spanish Power Base Year	2021	12	49.85 €	10,862 €	50	543,120 €	438,000	21,834,300 €	
	Spanish Power Base Year	2022	12	49.85 €	19,885 €	50	994,260 €	438,000	21,834,300 €	
	Spanish Power Base Year	2023	12	49.85 €	29,959 €	50	1,497,960 €	438,000	21,834,300 €	
	Spanish Power Base Year	2024	12	49.85 €	32,589 €	50	1,629,432 €	439,200	21,894,120 €	
								6,543,286 €	2,814,300	140,292,855 €
									Initial Margin in % of Notional Value	4.66%

- A 50 MW strip from July 18 to Cal+6 was cleared in Spanish Power on 12 July 2018, with an **initial margin requirement of 6,543,286 EUR**
- The **execution price of each trade was 49.85 EUR**
- The **Initial Margin percentage** of the notional value of the trade was **4.66%**

A sixth Long-Term hedge on Spanish Power was cleared on 18 July

Trade Date	Product	Expiry Year	Expiry Month	Trade Price	Initial Margin per Contract	Contracts	Total Initial Margin	Trade Volume (in MWh)	Notional Value	
18/07/2018	Spanish Power Base Year	2020	12	46.40 €	10,629 €	20	212,573 €	175,680	8,151,552 €	
	Spanish Power Base Year	2021	12	46.40 €	10,775 €	20	215,496 €	175,200	8,129,280 €	
	Spanish Power Base Year	2022	12	46.40 €	19,447 €	20	388,944 €	175,200	8,129,280 €	
	Spanish Power Base Year	2023	12	46.40 €	28,996 €	20	579,912 €	175,200	8,129,280 €	
	Spanish Power Base Year	2024	12	46.40 €	31,974 €	20	639,475 €	175,680	8,151,552 €	
								2,036,400 €	876,960	40,690,944 €
									Initial Margin in % of Notional Value	5.00%

- A 20 MW strip from Cal+2 to Cal+6 was cleared in Spanish Power on 18 July 2018, with an **initial margin requirement of 2,036,400 EUR**
- The **execution price of each trade** was **46.40 EUR**
- The **Initial Margin percentage** of the notional value of the trade was **5.00%**

7th and 8th Long-Term hedges on Spanish Power were cleared on 19 July

Trade Date	Product	Expiry Year	Expiry Month	Trade Price	Initial Margin per Contract	Contracts	Total Initial Margin	Trade Volume (in MWh)	Notional Value	
19/07/2018	Spanish Power Base Year	2020	12	46.60 €	10,629 €	5	53,143 €	43,920	2,046,672 €	
	Spanish Power Base Year	2021	12	46.60 €	10,775 €	5	53,874 €	43,800	2,041,080 €	
	Spanish Power Base Year	2022	12	46.60 €	19,272 €	5	96,360 €	43,800	2,041,080 €	
	Spanish Power Base Year	2023	12	46.60 €	28,645 €	5	143,226 €	43,800	2,041,080 €	
	Spanish Power Base Year	2024	12	46.60 €	31,712 €	5	158,562 €	43,920	2,046,672 €	
								505,165 €	219,240	10,216,584 €
									Initial Margin in % of Notional Value	4.94%

Trade Date	Product	Expiry Year	Expiry Month	Trade Price	Initial Margin per Contract	Contracts	Total Initial Margin	Trade Volume (in MWh)	Notional Value	
19/07/2018	Spanish Power Base Year	2020	12	46.60 €	10,629 €	5	53,143 €	43,920	2,046,672 €	
	Spanish Power Base Year	2021	12	46.60 €	10,775 €	5	53,874 €	43,800	2,041,080 €	
	Spanish Power Base Year	2022	12	46.60 €	19,447 €	5	96,360 €	43,800	2,041,080 €	
	Spanish Power Base Year	2023	12	46.60 €	28,645 €	5	143,226 €	43,800	2,041,080 €	
	Spanish Power Base Year	2024	12	46.60 €	31,712 €	5	158,562 €	43,920	2,046,672 €	
								505,165 €	219,240	10,216,584 €
									Initial Margin in % of Notional Value	4.94%

A Long-Term hedge was also traded via the EEX order book in June on Phelix DE

Trade Date	Product	Expiry Year	Expiry Month	Trade Price	Initial Margin per Contract	Contracts	Total Initial Margin	Trade Volume (in MWh)	Notional Value
19/06/2018	German Power Base Year	2019	12	41.85 €	18,396 €	5	91,980 €	43,800	1,833,030 €
	German Power Base Year	2020	12	39.70 €	16,865 €	5	84,326 €	43,920	1,743,624 €
	German Power Base Year	2021	12	38.70 €	15,943 €	5	79,716 €	43,800	1,695,060 €
	German Power Base Year	2022	12	40.75 €	15,768 €	5	78,840 €	43,800	1,784,850 €
	German Power Base Year	2023	12	41.75 €	15,680 €	5	78,402 €	43,800	1,828,650 €
	German Power Base Year	2024	12	42.30 €	15,987 €	5	79,934 €	43,920	1,857,816 €
								493,199 €	263,040
Initial Margin in % of Notional Value									4.59%

- A 5 MW series of Cal+1 to Cal+6 was traded via the EEX order book in Phelix DE on 19 June 2018, with an **initial margin requirement of 493,199 EUR**
- The **Initial Margin percentage** of the notional value of the trade was **4.59%**

Daily Settlement of Illiquid Long-Dated Contracts

- 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)

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.



Please get in touch with any questions!

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