ENWEX wind

financial wind swaps

ENWEX wind

What will be traded?

Highly standardized index to trade volumes, transferring weather data into tradable structure

Why was it developed?

Reduced correlation between price and volume risks causing need for new hedging instruments

Participants

Direct marketers, Utilities, Retailer, Municipals, Insurance companies, Hedge fonds

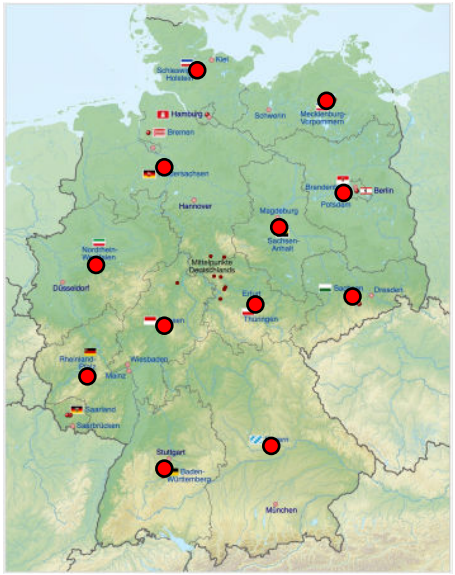
Improvement vs. recent weather derivatives

Complete standardisation to energy market‘s needs (MWh logics, day ahead settlement, transparent)

How to calculate ENWEX wind, e.g. for Germany

- Base utilisation in % of windpower corresponds to price in €, e.g. 25,65% means 25,65€
- Reference locations per market weighted with installed capacities e.g. for Germany per Bundesland

Region	Latitude	Longitude	weight in %
Baden-Württemberg	48,50	9,00	3,1
Bayern	49,00	11,50	4,6
Brandenburg & Berlin	52,50	13,50	14
Hessen	50,50	9,00	4,1
Mecklenburg-Vorpommern	53,75	12,50	6,4
Niedersachsen & Bremen	52,50	9,00	21,1
Nordrhein-Westfalen	51,50	7,50	11,4
Rheinland-Pfalz	50,00	7,25	7,7
Sachsen	51,00	13,50	2,3
Sachsen-Anhalt	52,00	11,75	9,5
Schleswig-Holstein & Hamburg	54,25	9,75	12,7
Thüringen	51,00	11,00	3,1



- Price calculated out of hourly grid point forecasts for day ahead (local time) 100m windspeed
- Weather Model for grid points: ECMWF operational model, 00z update, 0.25° spatial resolution

How to calculate ENWEX wind, e.g. for Germany

Step 1: Calculate utilisation per hour and gridpoint along the formula

utilisation in % = 1,00 * ((0.92 + 0.05) / (1.0 + exp(3.2 - 0.529 * (x - 2.5) - 0.0074)) - 0.05) * 100

with x = windspeed in 100m (m/s)

Step 2: Spatial weighting along installed capacities delivers countrywide utilisation

=> Hourly index values for ENWEX wind

- Index will also be calculated by the service provider Energy Weather
- Publishing of day ahead hourly and base index at www.enwex.com (12:00 CET)

Use case: PPA provider with obligation to deliver base power

PPA provider with need to buy power at the market in case of less production

=> Risk for costs when power prices are higher in low wind situations

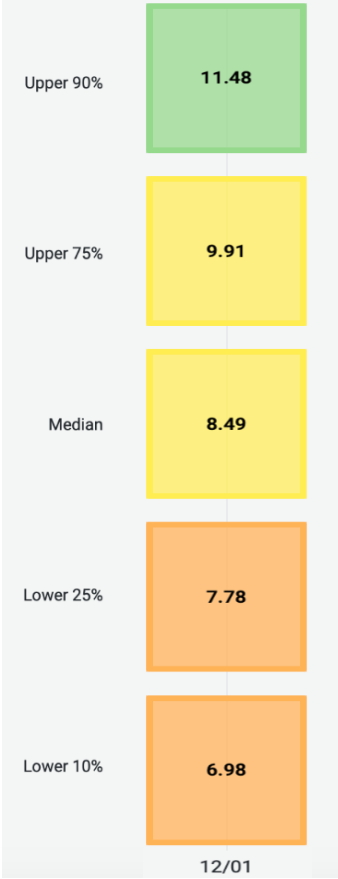
- 10 year climate wind utilisation for December: 30,80%
  Along market values for wind (as of 9.6.23, right side), in December a median wind scenario would allow earnings of 84,90€ per MWh => 30,80% * 84,90€ * 744h = 19.455 €/MW

- A low wind scenario with 10% likelihood has a base utilisation of 21,10%
  and a market price of 114,80€ => 21,10% * 114,80€ * 744h = 18.021,76 €/MW

⇒ reduced earnings by -1.433,24 €/MW

Hedging ratio: 1.433,24€ / (744 * (30,80% - 21,10%)) = 0,199 lots / MW

⇒ A wind portfolio would currently be hedged against calm December wind by selling roughtly 0,2 lots ENWEX wind per MW wind capacity



Market values for Wind December as of 9.6.23. Source: Energy Weather

Note: The hedge efficiency also depends on the preciseness of the model for market price deltas. This is the downside compared to a (much more expensive!) quanto hegde

Summary

- Consequent standardisation of weather towards structures of energy markets

- Allows to hedge PPAs, market values and power positions

- Optimal transparency on calculation and publication of data (incl. free download)

- Usage of weather data only from well credited and independent ECMWF

- In case of acceptance / liquidity, highly scalable concept

=> Instrument to hedge Power volumes without additional costs