

ENWEX solar

financial solar swaps

ENWEX solar

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 funds

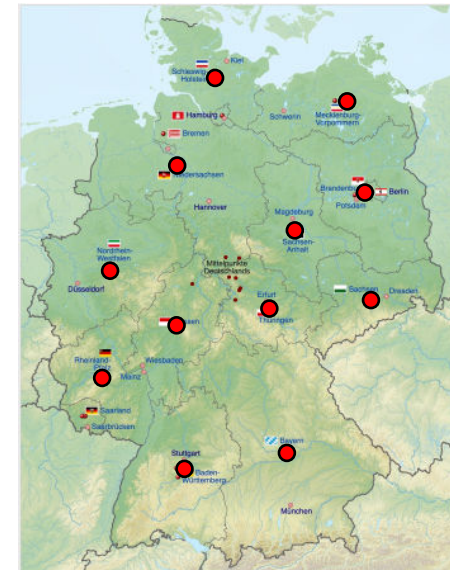
Improvement vs. recent weather derivatives

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

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

- Base utilisation in % of solar corresponds to price in €, e.g. 15,32% means 15,32€
- 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	12,6
Bayern	49,00	11,50	27,1
Brandenburg & Berlin	52,50	13,50	8,3
Hessen	50,50	9,00	4,5
Mecklenburg-Vorpommern	53,75	12,50	5,1
Niedersachsen & Bremen	52,50	9,00	8,6
Nordrhein-Westfalen	51,50	7,50	11,1
Rheinland-Pfalz	50,00	7,25	5,7
Sachsen	51,00	13,50	4,3
Sachsen-Anhalt	52,00	11,75	5,8
Schleswig-Holstein & Hamburg	54,25	9,75	3,5
Thüringen	51,00	11,00	3,4



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

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

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

$$\text{utilisation in \%} = 1,00 * (0,71 * (x / 1000)) * 100$$

with x = solar radiation in W/qm

Step 2: Spatial weighting along installed capacities delivers countrywide utilisation

=> Hourly index values for ENWEX solar

- 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)

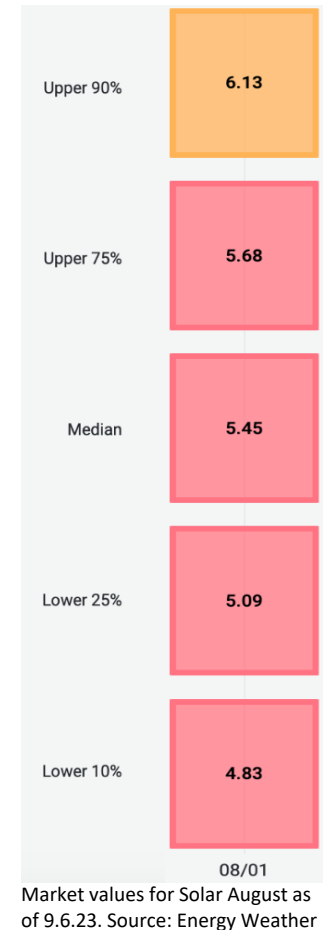
Use case: Hedge of 1 MW solar against low solar production

Direct marketer with risk to earn less than expected money in cloudy conditions

- 10 year climate solar base utilisation for August: 13,00%
Along market values for solar (as of 9.6.23, right side), in August a median solar scenario would allow earnings of 54,50€ per MWh => $13,00\% * 54,50€ * 744h = 5.271,24 \text{ €/MW}$
- A low solar scenario with 10% likelihood has a base utilisation of 10,50% and a market price of 61,30€ => $10,50\% * 61,30€ * 744h = 4.788,76 \text{ €/MW}$
=> reduced earnings by -482,48 €/MW

Hedging ratio: $482,48€ / (744 * (13,00\% - 10,50\%)) = 0,259 \text{ lots / MW}$

=> A solar portfolio would currently be hedged against cloudy August by selling 0,26 lots ENWEX solar per MW solar capacity



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 hedge

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