

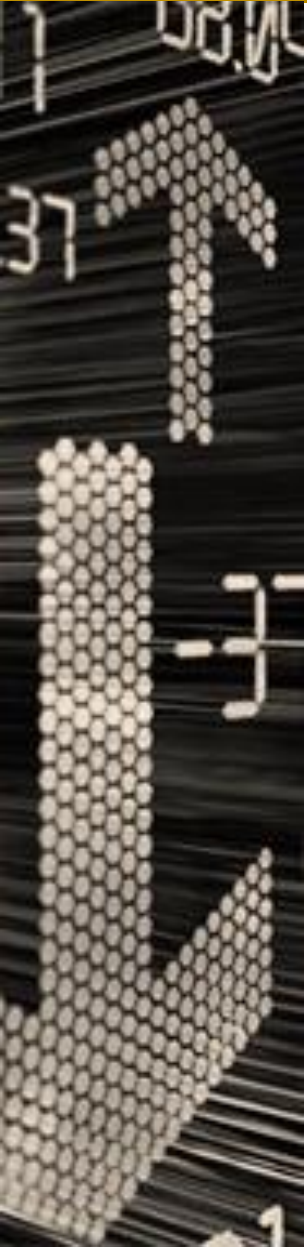
PPA Insights

Pricing developments in Europe

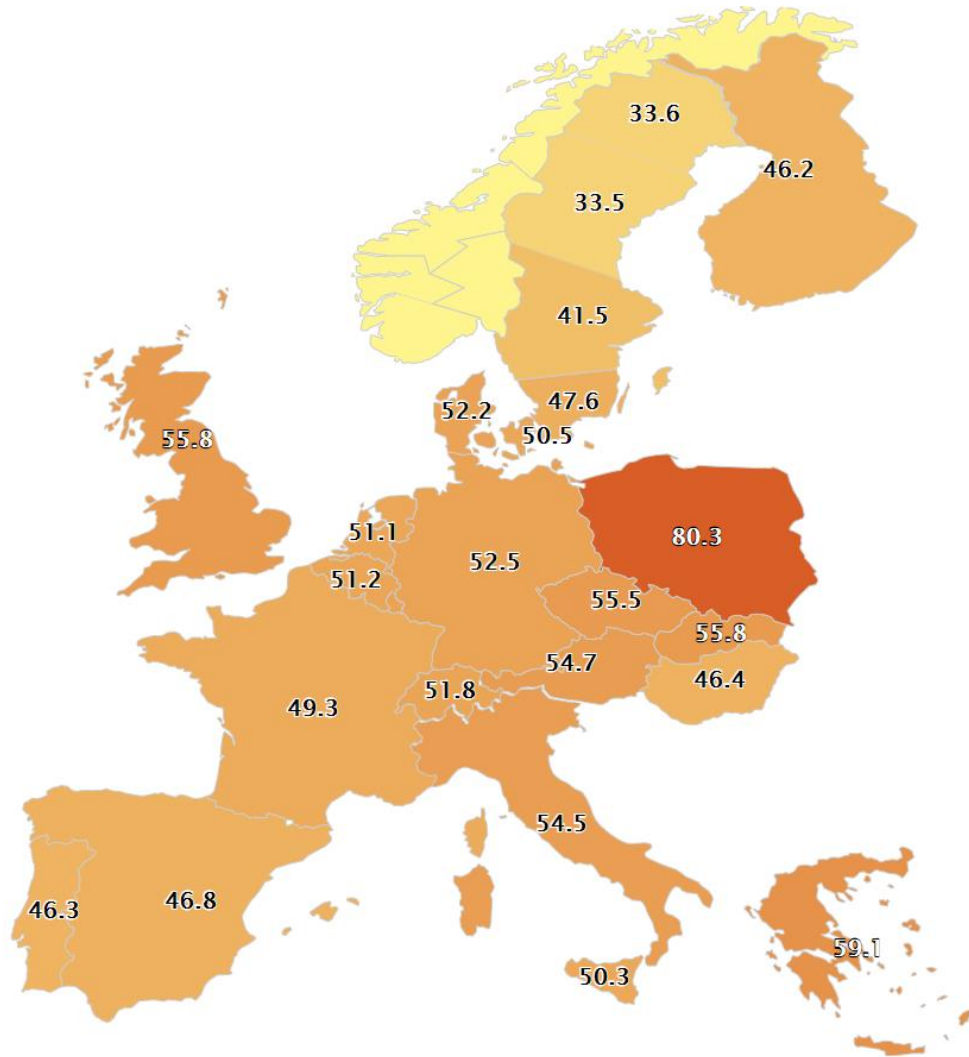
No 1 - July 2021



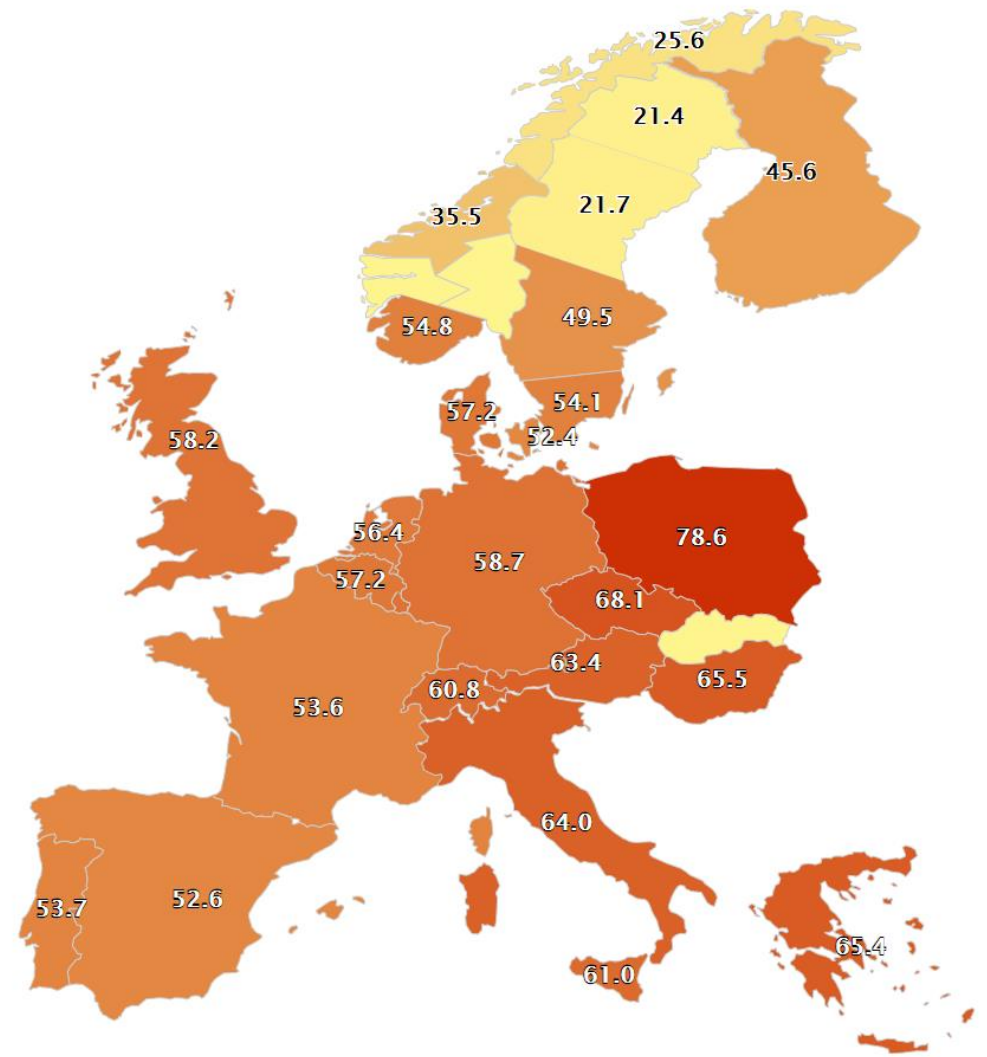
Pricing Developments Solar & Wind in Europe



Solar



Wind (onshore)



KYOS 10 year PPA price assessments 2022 - 2031

Methodology

The PPA price assessments are derived from a careful process of data collection, model calculations and expert judgement. In this process KYOS' fundamental power market model KyPF plays a primary role. It generates hourly forecasts of power prices in all of the European markets that we cover in this PPA report. KyPF is an advanced optimization and market scenario model. It derives the equilibrium hourly power prices in each market by optimizing all flexible generation assets, energy storage assets and interconnection capacities until all residual demand is met. Residual demand is demand minus the intermittent (solar, wind, hydro) power generation.

The power price forecasts are for each individual hour in the future and are consistent with a specific historical weather year (currently 2018). We take the actual solar and wind generation, as well as electricity consumption from this weather year (main source: ENTSO-E), and extrapolate these into future years. The growth rates of renewable generation capacities and demand determine by how much the historical numbers are extrapolated. The National Policy Plans of the different countries are the main source for the capacity growth rates.

Because the model generates hourly power price forecasts consistent with hourly wind and solar generation, we can also derive the capture prices for wind and solar. These capture prices are the weighted average prices that an average renewable generator would earn when selling in the spot market. The capture prices do not consider imbalance costs, sales of GOs or any asset related costs.

For more information, see our series of articles published on: <https://www.kyos.com/ppa-insights-overview-articles/>

€/MWh	Per trading date 2021-06-30			3-month change		
	Baseload	Solar	Wind onshore	Baseload	Solar	Wind onshore
Average	57.2	50.7	53.4	↑ 8.5	↑ 7.8	↑ 8.2
Spain	56.2	46.8	52.6	↑ 8.3	↑ 7.1	↑ 7.8
Portugal	56.4	46.3	53.7	↑ 8.3	↑ 7.0	↑ 8.0
Italy (ex Sicily)	63.5	54.5	64.0	↑ 9.6	↑ 8.3	↑ 9.8
Sicily	68.8	50.3	61.0	↑ 11.2	↑ 8.9	↑ 10.1
Greece	65.9	59.1	65.4	↑ 9.9	↑ 9.0	↑ 9.9
France	56.4	49.3	53.6	↑ 8.5	↑ 7.3	↑ 8.0
Switzerland	61.7	51.8	60.8	↑ 9.5	↑ 7.9	↑ 9.4
Austria	64.1	54.7	63.4	↑ 10.2	↑ 8.6	↑ 10.0
Hungary	65.0	46.4	65.5	↑ 10.8	↑ 7.7	↑ 10.9
Great Britain	61.0	55.8	58.2	↑ 9.5	↑ 9.0	↑ 8.9
Netherlands	60.1	51.1	56.4	↑ 9.4	↑ 8.0	↑ 8.8
Belgium	60.3	51.2	57.2	↑ 9.4	↑ 7.9	↑ 8.9
Germany	62.3	52.5	58.7	↑ 9.9	↑ 8.3	↑ 9.2
Poland	80.6	80.3	78.6	↑ 15.6	↑ 15.6	↑ 15.2
Czechia	67.1	55.5	68.1	↑ 11.3	↑ 9.0	↑ 11.5
Slovakia	67.1	55.8		↑ 11.3	↑ 9.0	
Denmark DK1	61.0	52.2	57.2	↑ 9.5	↑ 8.1	↑ 8.5
Denmark DK2	57.8	50.5	52.4	↑ 8.8	↑ 7.6	↑ 7.5
Norway NO1	53.8			↑ 3.6		
Norway NO2	56.2		54.8	↑ 6.8		↑ 6.4
Norway NO3	42.6		35.5	↑ 5.3		↑ 5.1
Norway NO4	31.1		25.6	↑ 5.2		↑ 4.9
Norway NO5	48.0			↑ 4.9		
Sweden SE1	34.2	33.6	21.4	↑ 4.9	↑ 3.9	↑ 3.7
Sweden SE2	34.6	33.5	21.7	↑ 4.9	↑ 4.2	↑ 3.6
Sweden SE3	54.1	41.5	49.5	↑ 6.6	↑ 4.1	↑ 5.9
Sweden SE4	57.9	47.6	54.1	↑ 8.3	↑ 6.7	↑ 7.5
Finland	52.5	46.2	45.6	↑ 6.9	↑ 5.2	↑ 5.7

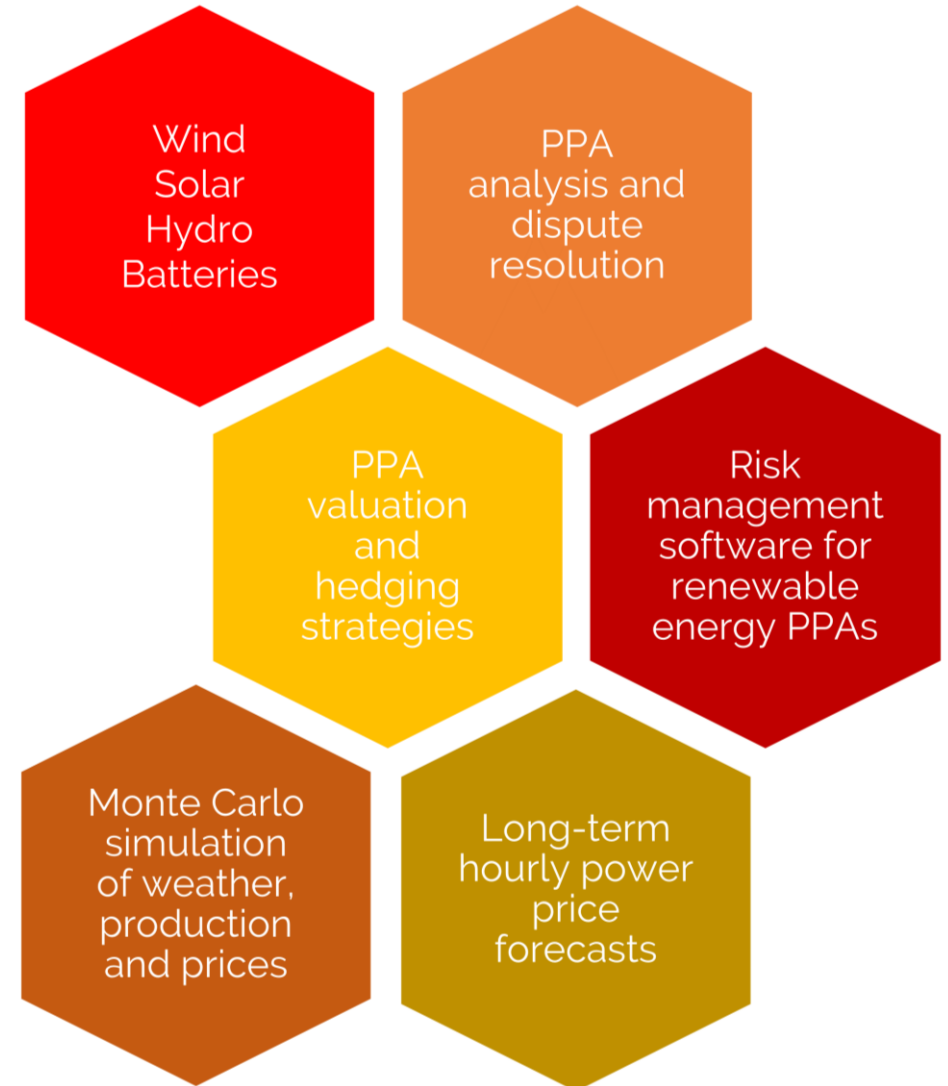
PPA Valuation

(Renewable) PPA Valuation

Power Purchase Agreements, or PPAs often include complex pricing structures. For example, PPA's typically consist of price floors, risk sharing elements and specific reconciliation mechanisms. In order to value your assets, you need a system that is able to capture all this.

Our PPA module offers

- A fundamental power market model to create long-term electricity price forward curves, important given the long duration of many PPAs.
- Software modules to simulate price and volume risks. These are necessary if you wish to assess the future earnings and hedging strategies.
- Furthermore, capture rate is an important parameter for PPA valuations. Our system can calculate this using historical data or using long-term fundamental price forward curves. Alternatively, the user can define its own capture rate.
- A flexible tool for accurate PPA valuations. Breakdown the value in different components. Possibility to define own pricing structures.
- The option to evaluate and monitor the risk of one or more PPAs or as part of a larger portfolio, with or without hedging strategies.



KYOS PPA Modules



The KYOS renewable risk management system provides a complete picture of the electricity portfolio with renewable energy PPAs and related hedges. As an illustration, reporting includes volumetric position, mark-to-market value, value-at-risk and earnings-at-risk. All modules are part of the KYOS Analytical Platform, a cloud-based software platform.

KYOS puts a lot of effort to find the right balance between offering a robust deal capture system and a fully flexible spreadsheet solution. We include standard PPA pricing mechanisms for certain countries and technologies. Additionally we offer you the unique feature to add your own pricing structures to the system. For this purpose, we offer an easy-to-use Python programming interface.

The KYOS renewable risk management system allows the user to analyze the effect of applying different hedging strategies to lock-in value of your renewable project. Strategies range from basic static hedges to advanced stack and roll strategies. If your project is in a market with limited liquidity, our system will show you the effectiveness of proxy hedging the exposure in other markets, even using different commodities than electricity.

We have various options available in our KyPPA renewable power model:

KYOS PPA Modules



Advanced	Module D: Single project / PPA valuation Monte Carlo simulations	Module E: Portfolio management Monte Carlo simulations
	PFC builder KyCurve or KyPF	PFC builder KyCurve or KyPF
	Price data services – market prices	Price data services – market prices
Intermediate	Module B: Forward curves builder KyCurve Market curves	Module C: Forward curves builder KyPF Fundamental power curves
	Price data services – market prices	Price data services – market prices
Basic	Module A: Price data services – market prices	

Our knowledge center is a great resource for the latest news, where we publish interesting articles and reports.

Do not hesitate to contact us for more information, or ask for a short demonstration: info@kyos.com



Head office and European markets:

Nieuwe Gracht 49
2011 ND Haarlem
The Netherlands
E-mail: info@kyos.com
Tel: +31 (0)23 551 02 21
www.kyos.com

Japanese market:

Toranomon Rapo-to bldg. UCF7F
Toranomon 1-16-6, Minato-ku,
Tokyo, 105-0001
Japan
E-mail: info@kyos.jp
Tel: +81(0)3 6869 6646
www.kyos.jp