



KYOS Energy Analytics

PPA Insights

Price developments in Europe



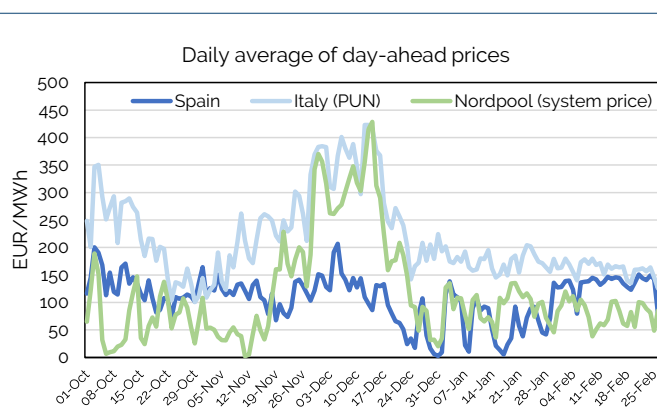
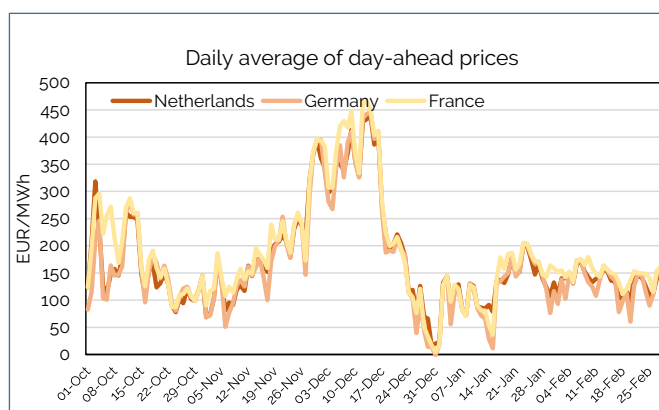
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Developments in the European power markets

A mild winter and healthy LNG supplies continued to push European gas and power prices downward. On the other hand, the hydro balance deficit in the Alps is becoming a clear upward risk factor to prices.

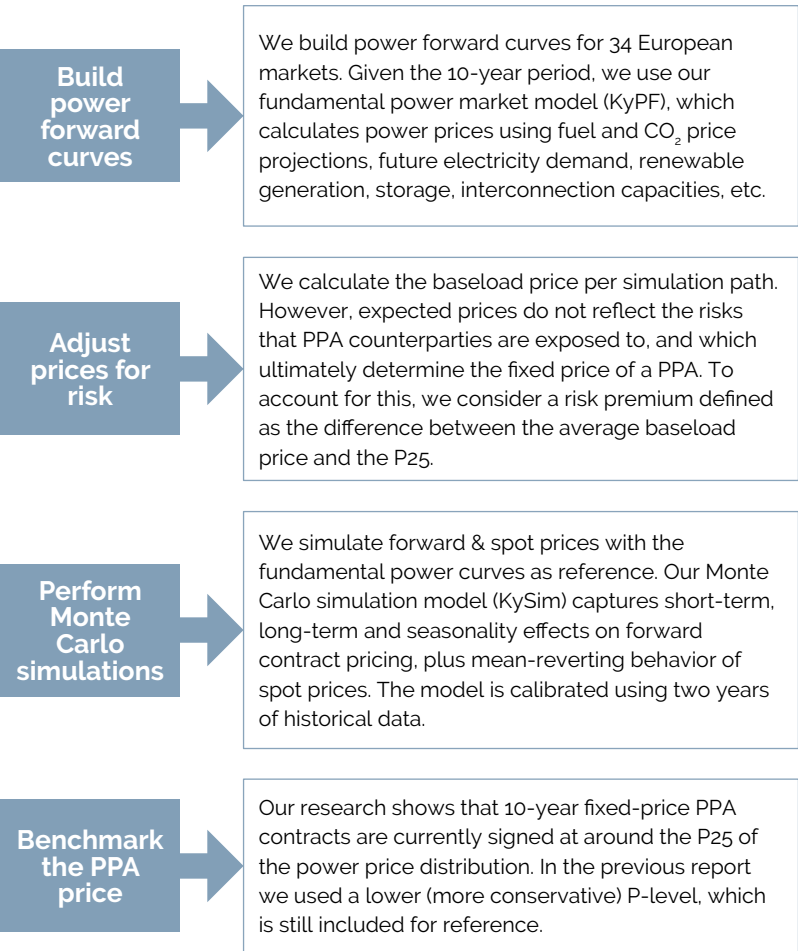
Since our last update in December, 2022:

- Gas and power prices have dropped significantly both on the spot and forward markets in the past two months, thanks to a mild winter and continuous generous LNG supply. The LNG competition with Asia was not as strong as anticipated because Asian demand did not strongly pick up so far. In addition, we observe a structural demand reduction for gas and power in Europe, from both industrial and residential sectors. These behaviour changes remain important. By the end of the winter, the gas injection season will start. Currently, EU storages are still half-full, compared to 26% last year, which limits the risk of having gas supply issues next winter.
- On the other hand, carbon prices gained 12% since our last release driven mainly by compliance buying ahead of the April deadline for accounting of 2022 emissions as well as a deal reached on the CBAM implementation. EUAs broke the 100 EUR/t threshold in February.
- On the nuclear front, several French reactors successfully restarted in December and January, lifting the production by roughly 8 GW and making the country less reliant on power imports. Germany and Belgium however permanently closed three reactors at the start of the year, supporting coal and gas generation.
- A supportive factor to prices can be found on the hydrological front. In the past three months, precipitation has been dramatically missing, particularly in the Alpine region. This leads to a substantial deficit in the snow reserves and very low groundwater levels, currently in a worse situation than last year which was already an extreme dry year.

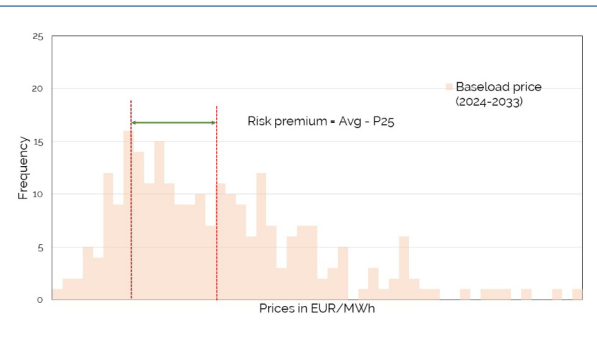


KYOS methodology to assess
10-year PPA prices

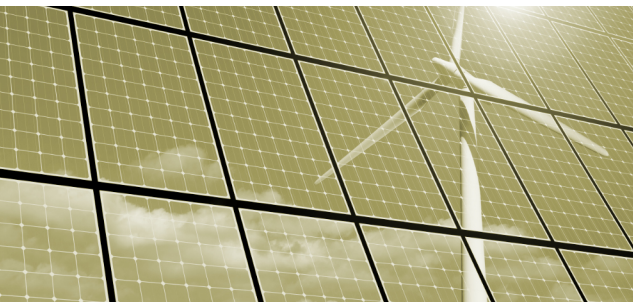
The diagram below shows the methodology employed by KYOS to assess the development of PPA prices in Europe.



Risk premium



The *risk premium* reflects the discount for a fixed price guarantee on a 10-year PPA. It offers compensation for managing fixed-price PPA exposures in the market, leading to credit risk, liquidity (margin) risk, trading costs and other costs.



KYOS Price assessments 2024 - 2033

KYOS baseload and PPA price assessments (EUR/MWh)



Northern Europe

	Baseload	Solar	Wind onshore
Great Britain	102.3	72.0	65.8
Denmark DK1	123.4	75.0	82.5
Denmark DK2	118.9	74.2	76.9
Norway NO1	125.0	72.9 (2026)	88.1
Norway NO2	115.6	67.0 (2026)	82.6
Norway NO3	112.7	73.4 (2026)	77.7
Norway NO4	100.3	69.5 (2026)	71.0
Norway NO5	116.2	71.4 (2026)	88.4
Sweden SE1	85.5	59.8	51.0
Sweden SE2	86.7	58.7	52.4
Sweden SE3	117.3	68.4	80.7
Sweden SE4	120.1	69.5	81.4
Finland	108.0	78.0	63.3
Ireland	102.9	75.4	65.8



Western Europe

	Baseload	Solar	Wind onshore
Netherlands	118.4	65.2	79.5
Belgium	120.8	71.4	87.9
Germany	131.4	74.1	90.2
France	114.9	68.7	81.4
Switzerland	129.9	79.8	96.8
Austria	133.4	81.0	98.1



Southern Europe

	Baseload	Solar	Wind onshore
Italy (excl. Sicily)	127.7	84.8	96.1
Sicily	129.4	84.2	89.7
Portugal	112.3	69.6	78.0
Greece	129.9	81.9	95.3
Spain	110.3	60.3	77.0



Central-Eastern Europe

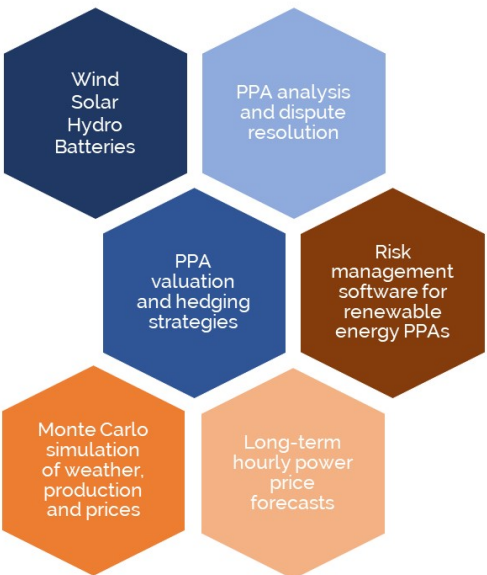
	Baseload	Solar	Wind onshore
Czechia	136.0	80.6	100.0
Slovakia	131.1	77.9	93.6
Hungary	128.4	75.0	91.0
Poland	149.7	97.6	108.0
Romania	131.3	78.7	92.2
Bulgaria	137.0	87.4	102.3
Serbia	108.1	68.4	78.2
Croatia	125.5	75.0	87.4
N. Macedonia	135.1	81.4	100.5

Risk discount for solar and wind: 25%

KYOS PPA Valuation

PPAs often include complex pricing structures, e.g. price floors, risk sharing elements and specific reconciliation mechanisms. To capture all of this, KYOS offers:

- A fundamental power market model (KyPF) to create long-term electricity price forward curves. This is important given the long duration of many PPAs.
- Software modules to simulate price and volume risks. These are necessary to assess future earnings and hedging strategies.
- The ability to calculate capture rates using historical data, long-term fundamental curves, or user-defined.
- A flexible tool that breaks down PPA valuations into different components (e.g. price risk, cannibalization risk, etc.) With this tool, it is also possible 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.



Since our last update in December, 2022:

- PPA prices have been decreasing over the past three months, to a higher extent in the North Western Europe than Nordics markets, following the trend of the forward markets and driven by lower volatility on the markets. With that, PPAs transactions and volumes are expected to increase again. Note, in our price assessments (left) as per trading date **2023-02-24**, forecasted capture prices for renewables do not take into account the revenue cap, although this cap actually affects realized prices in the first half of 2023.

- We gained clarity on the EU revenue cap on renewables since our last release, with Member States stating their own cap levels and effective time periods. However, talks about potential additional changes to these measures continue to provide uncertainty among developers. Moreover, the impact of the inflation is a tricky discussion topic in the negotiation rooms, on top of the rising balancing costs.
- The interest for cross-border PPAs seems to be on the rise, with buyers looking at the possibility of closing deals in cheaper markets.

Note: All baseload prices start from 2024. PPA prices too, unless otherwise stated next to the price



KYOS Renewable risk management

The KYOS renewable risk management system is part of the KYOS Analytical Platform, a cloud-based software solution. This system provides a complete picture of a renewable power portfolio with PPA contracts and hedges. Reporting includes: volumetric position, mark-to-market value, value-at-risk and earnings-at-risk.

The system also allows users to analyze the effect of applying different hedging strategies to lock-in value of e.g. a specific renewable project.

Strategies range from basic static hedges to advanced stack and roll strategies. If the project is in a market with limited liquidity, our system will show the effectiveness of proxy hedging the exposure in other markets, even by using other commodities than electricity.

We offer five different modules/packages to assess renewable power portfolios:

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.

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