



Gas Storage and Swing Report

Storage	Market	Product	Period	Cycle Cost	Intrinsic	Rolling Intrinsic		Option	
						Avg	10%	Avg	10%
	TTF	30/30	SY2022	0.50	1.05 ▼	6.10 ▲	3.77 ▲	7.52 ▲	5.98 ▲
	TTF	60/60	SY2022	0.50	1.05 ▼	4.28 ▲	2.64 ▲	5.13 ▲	4.01 ▲
	TTF	60/120	SY2022	0.50	0.68 ▼	3.41 ▲	2.25 ▲	4.08 ▲	3.15 ▲
	NBP	30/30	SY2022	1.00	8.73 ▼	22.50 ▲	16.47 ▲	24.30 ▲	20.33 ▲
	NBP	60/60	SY2022	1.00	8.73 ▼	13.40 ▼	13.40 ▲	18.13 ▲	15.10 ▲
	NBP	60/120	SY2022	1.00	7.72 ▼	14.80 ▲	12.20 ▼	15.67 ▲	13.18 ▲

Swing	Market	Max/day	Min/Max	Period	Price	Intrinsic	Rolling Intrinsic		Option	
							Avg	10%	Avg	10%
	TTF	4	360/360	2022	34.57 ▲	-0.02 ▼	0.00 ▼	-0.02 ▼	-0.01 ▼	-0.16 ▼
	TTF	1	0/365	2022	34.57 ▲	0.16 ▲	0.88 ▼	0.31 ▲	0.92 ▼	0.32 ▲
	TTF	4	360/360	2022	MA	-0.02 ↔	1.51 ▲	0.84 ▲	2.25 ▲	1.60 ▲
	NBP	4	360/360	2022	93.00 ▲	-0.01 ▲	0.02 ▼	-0.01 ▲	0.02 ▼	-0.38 ▼
	NBP	1	0/365	2022	93.00 ▲	0.48 ▲	2.38 ▼	0.98 ▲	2.35 ▼	0.99 ▲
	NBP	4	360/360	2022	MA	-0.02 ↔	4.53 ▲	2.51 ▲	6.01 ▲	3.85 ▲

TTF Price History



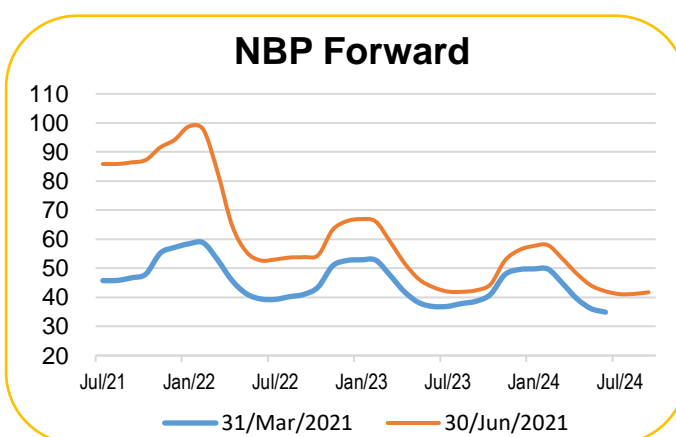
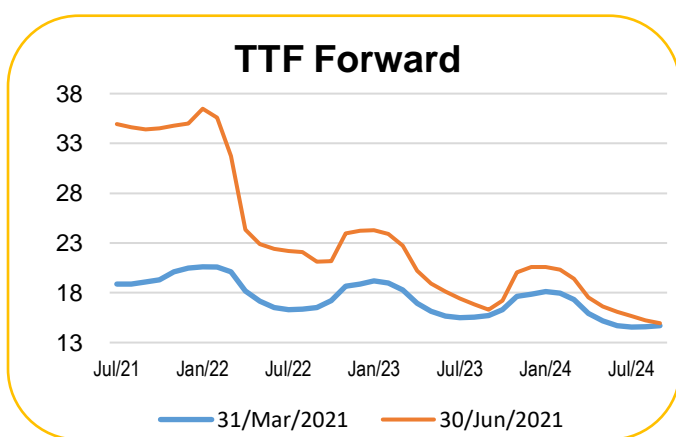
NBP Price History



Volatility

Market	Spot Volatility					Year-ahead Forward volatility				
	1m	3m	6m	12m	KYOS sugg.	1m	3m	6m	12m	KYOS sugg.
TTF	21% ▼	25% ▼	58% ▼	33% ▼	44% ▼	29% ▲	34% ▲	30% ▲	30% ▲	23% ▼
NBP	28% ▼	42% ▼	62% ▼	53% ▼	44% ▼	29% ▲	33% ▲	28% ▼	30% ▲	22% ▼
GPL	13% ▼	25% ▼	70% ▼	34% ▼	45% ▼	28% ▲	34% ▲	29% ▲	29% ▲	21% ▼
NCG	11% ▼	24% ▼	70% ▼	35% ▼	45% ▼	28% ▲	34% ▲	29% ▲	29% ▲	21% ▼
PEG	22% ▲	25% ▼	58% ▼	31% ▼	44% ▼	29% ▲	35% ▲	30% ▲	30% ▲	22% ▼

Price Forward Curves



Market Trend

European gas prices moved in the second quarter of 2021 in the same way as the first quarter: up. While one year ago people were discussing the potential to see negative gas prices, this quarter saw record high prices! The TTF month-ahead contract ended the quarter at 34.6€/MWh, the highest price level since September 2008! The forward curve changed as a result massively, where especially the very pronounced Q1-22 x Q2-22 spread draws a lot of attention. Many different reasons contributed to the high prices. On the supply side there were reduced Russian flows. European gas demand was high especially in the beginning of the quarter due to a cold start. And Asian gas demand picked up after the Covid-dip leading to a strong increase in LNG demand, which had a bullish effect on the TTF.

As a result, European gas storages have very low inventory levels. Some storage sites showed even almost no net injection during Q2-21. At some days prompt prices were lower than Q4-21 prices, leading to very little incentive to inject gas. The total inventory level for all European storage combined was at the end of Q2-2021 at 47.5%. Last year the fill level was at 80%. This means that 360TWh of gas is injected less as compared to last year. It will be interesting to watch how inventory levels will develop until the start of the winter. Starting the winter with relatively low storage levels may result in an increase in price volatility. More details about EU gas storage and LNG terminal levels and utilization can be found at our website: <https://gas.kyos.com>.

Our assessment of volatility went slightly down. The intrinsic value of the storages went down as well. The strong increase in gas prices lead to a stronger backwardation of the curve, leading to a decrease in storage spread. Nevertheless, overall storage value went up on the back of higher overall price level. Value for the fixed price swing contracts went down in general. This is mainly a result of the more pronounced shape of the forward curve, reducing the value of optionality of our contracts. With a stronger shaped curve it is less likely that values can be moved from Q1-22 (which sets the strike price of the contracts) to other periods. This is not relevant for our month-ahead indexed contracts. Here the value increased, as for the storages, on the back of higher absolute price level.

Explanation

Storage

- Product: 60/120 means 60 days of withdrawal and 120 days of injection capacity.
- The storage values are expressed per MWh (or therms) of working volume.

Swing

Product:

- Max/day is the maximum daily take
- Min/Max are the minimum and maximum annual take

Price

- A fixed price put at Q1-level or
- Month-ahead indexed price (MA)

The swing values are per MWh or therms of contract volume, which is 365 for the daily callable options (max 1 per day) and 360 for other contracts (max 4 per day).

Volatilities

The volatilities are derived from the end-of-day settlement prices of gas spot and futures exchanges. They are calculated with a history of 1, 3, 6 and 12 months. The 'KYOS suggested' volatilities are our expert view, considering the historical estimates as well as recent market developments. These estimates are used for the valuations.

Valuation Methodologies

- All valuations have been performed with KYOS software and models, KyStore and KySwing. They are expressed in €/MWh (TTF) or p/th (NBP). Inputs include the spot and forward volatilities from the table in this report, as well as forward curves and some other settings.
- The trading date for all values is 1 July 2021.
- A discount rate of 2% has been applied.
- Intrinsic values are derived from the tradable products in the market.
- Rolling intrinsic and option values are derived from Monte Carlo simulations of spot and forward prices:
 - Rolling intrinsic: the intrinsic value is locked in initially with tradable products; then this position, including spot, may be adjusted daily to capture extra value.
 - Option value: the spot trades are optimized, taking into account the optionality of the asset, based on the least-squares Monte Carlo method. In addition, the position is delta hedged in the forward market to minimize the risk.
 - Of the rolling intrinsic and option value, the table shows the average across the simulations and the 10th percentile, which is a more conservative value estimate.
 - In all trading strategies, the model takes into account transaction costs of 0.02 €/MWh (TTF) or 0.02 p/th (NBP).

Contact us for more information about the models and assumptions underlying this report, or to request a demonstration of the KYOS software.

Contact information: www.kyos.com/contact

KYOS energy asset optimization and valuation: www.kyos.com/energy-asset-optimization

E-mail: info@kyos.com