



Gas Storage and Swing Report

Storage	Market	Product	Period	Cycle Cost	Intrinsic	Rolling Intrinsic		Option	
						Avg	10%	Avg	10%
	TTF	30/30	SY2019	0.50	1.07 ↓	4.36 ↑	2.96 ↑	5.88 ↑	4.81 ↑
	TTF	60/60	SY2019	0.50	1.07 ↓	2.99 ↓	2.14 ↓	3.77 ↑	3.04 ↑
	TTF	60/120	SY2019	0.50	0.92 ↓	2.33 ↓	1.81 ↓	2.96 ↓	2.41 ↓
	NBP	30/30	SY2019	1.00	9.57 ↑	23.17 ↑	17.17 ↓	25.43 ↑	22.10 ↑
	NBP	60/60	SY2019	1.00	9.57 ↑	17.05 ↑	13.32 ↓	18.25 ↑	15.93 ↑
	NBP	60/120	SY2019	1.00	8.85 ↑	14.32 ↑	12.13 ⇔	15.30 ↑	13.37 ↑

Swing	Market	Max/day	Min/Max	Period	Price	Intrinsic	Rolling Intrinsic		Option	
							Avg	10%	Avg	10%
	TTF	4	360/360	2019	21.45 ↓	-0.02 ⇔	0.07 ↑	-0.02 ⇔	0.23 ↑	-0.21 ↓
	TTF	1	0/365	2019	22.89 ↓	0.00 ↓	0.60 ↑	0.09 ↑	0.70 ↑	0.10 ↑
	TTF	4	360/360	2019	MA	-0.02 ⇔	0.78 ↓	0.47 ↓	1.45 ↑	0.98 ⇔
	NBP	4	360/360	2019	65.74 ↓	-0.02 ⇔	0.18 ↑	-0.02 ⇔	0.55 ↑	-0.67 ↓
	NBP	1	0/365	2019	65.74 ↓	0.02 ↓	1.46 ↑	0.33 ↑	1.53 ↑	0.37 ↓
	NBP	4	360/360	2019	MA	-0.02 ⇔	3.38 ↓	2.24 ↓	4.94 ↓	3.42 ↓

TTF Price History



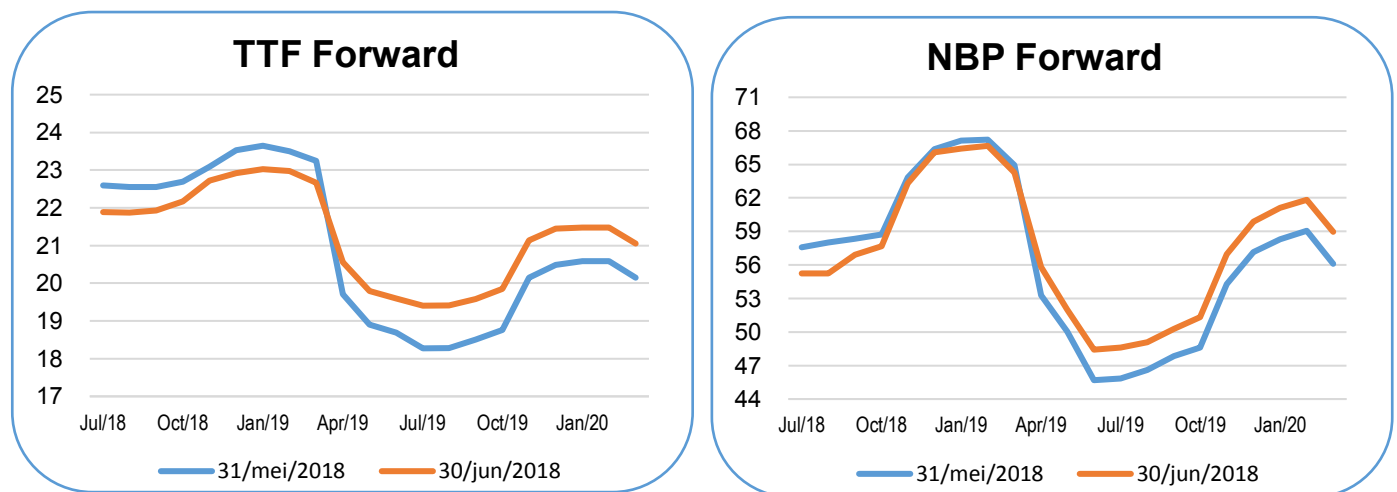
NBP Price History



Volatility

Market	Spot Volatility					Year-ahead Forward volatility				
	1m	3m	6m	12m	KYOS sugg.	1m	3m	6m	12m	KYOS sugg.
TTF	32% ↓	37% ↓	73% ↓	59% ↑	56% ↔	18% ↓	21% ↑	19% ↑	16% ↔	16% ↔
NBP	56% ↑	49% ↓	71% ↓	65% ↓	65% ↓	18% ↓	21% ↑	19% ↑	16% ↔	16% ↔
GPL	30% ↓	33% ↓	73% ↓	59% ↔	56% ↔	22% ↓	22% ↑	19% ↑	16% ↑	16% ↔
NCG	32% ↓	34% ↓	69% ↓	57% ↔	56% ↔	22% ↓	21% ↑	19% ↑	16% ↑	16% ↔
PEG-N	44% ↑	42% ↓	65% ↓	58% ↔	56% ↔	21% ↓	22% ↑	19% ↑	16% ↑	16% ↔

Price Forward Curves



Market Trend

Since our last report the backwardation of the TTF forward curve decreased. The frontend of the curve (up to Q1-19) decreased by approximately 1 €/MWh, whereas the backend increased by approximately 1 €/MWh. Furthermore, the relevant spread for our storage contracts, the Q3-19 x Q1-20 spread decreased with about 0.1 €/MWh. Overall, this flatter forward curve led to a lower intrinsic value of our Dutch storages.

The backwardation on the NBP decreased as well. However, contrary to the TTF, the relevant Q3-19 x Q1-20 spread actually increased by approximately 0.3 p/th since our last report. This resulted in a gain in the intrinsic value of our UK storages.

On the back of a rather eventless trading month, our assessments of the market volatilities did basically not change during June. Only on the NBP we slightly decreased our spot volatility assessment by two percent points.

For the assessment of the option value of our swing and storage contracts this resulted in only minor changes compared to last month.

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 30 June 2018.
- 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