

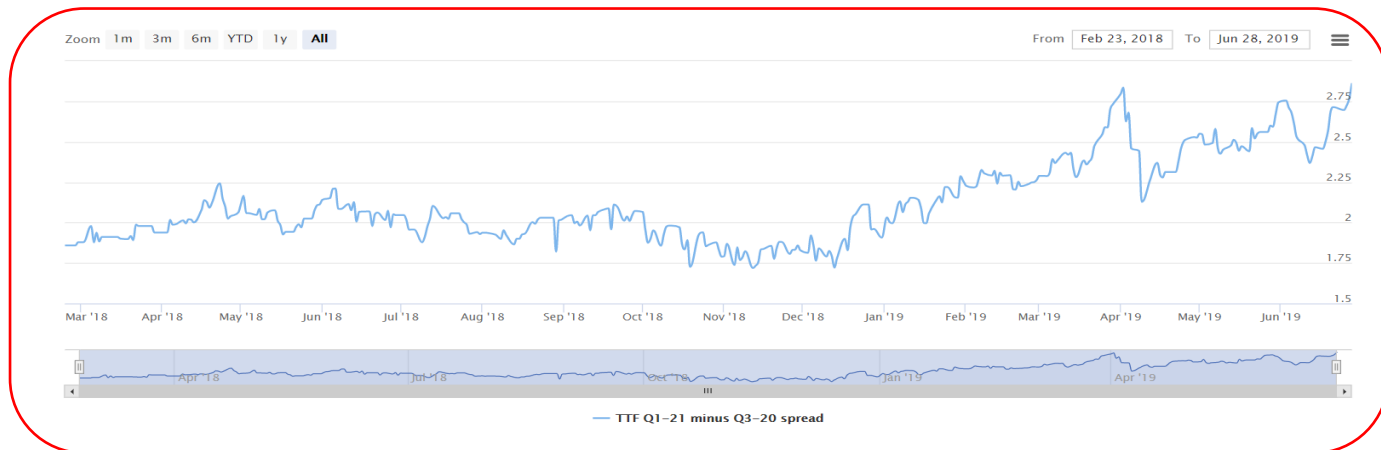


Gas Storage and Swing Report

Storage	Market	Product	Period	Cycle Cost	Intrinsic	Rolling Intrinsic Avg		Option	
							10%	Avg	10%
	TTF	30/30	SY2020	0.50	2.07↑	4.04↑	3.09↑	4.97↑	3.62↑
	TTF	60/60	SY2020	0.50	2.07↑	3.40↑	2.72↑	3.85↑	2.74↑
	TTF	60/120	SY2020	0.50	2.00↑	3.04↑	2.52↑	3.42↑	2.46↑
	NBP	30/30	SY2020	1.00	11.07↑	21.97↑	17.00↑	24.07↑	20.10↑
	NBP	60/60	SY2020	1.00	11.07↑	17.63↑	14.75↑	18.65↑	15.60↑
	NBP	60/120	SY2020	1.00	10.82↑	15.87↑	15.87↑	16.33↑	13.67↑

Swing	Market	Max/day	Min/Max	Period	Price	Intrinsic	Rolling Intrinsic Avg		Option	
								10%	Avg	10%
	TTF	4	360/360	2020	18.71↓	0.28↑	0.77↑	0.42↑	0.99↑	-0.09↓
	TTF	1	0/365	2020	18.71↓	0.07↑	1.26↑	0.35↓	1.44↑	0.38↑
	TTF	4	360/360	2020	MA	-0.02↔	0.71↑	0.36↑	0.47↓	0.77↑
	NBP	4	360/360	2020	53.95↓	-0.02↔	1.90↑	0.34↓	2.41↑	-0.25↓
	NBP	1	0/365	2020	53.95↓	0.00↔	2.96↓	0.49↑	3.14↑	0.85↑
	NBP	4	360/360	2020	MA	-0.02↔	2.91↑	1.71↑	4.49↑	2.83↑

TTF Price History



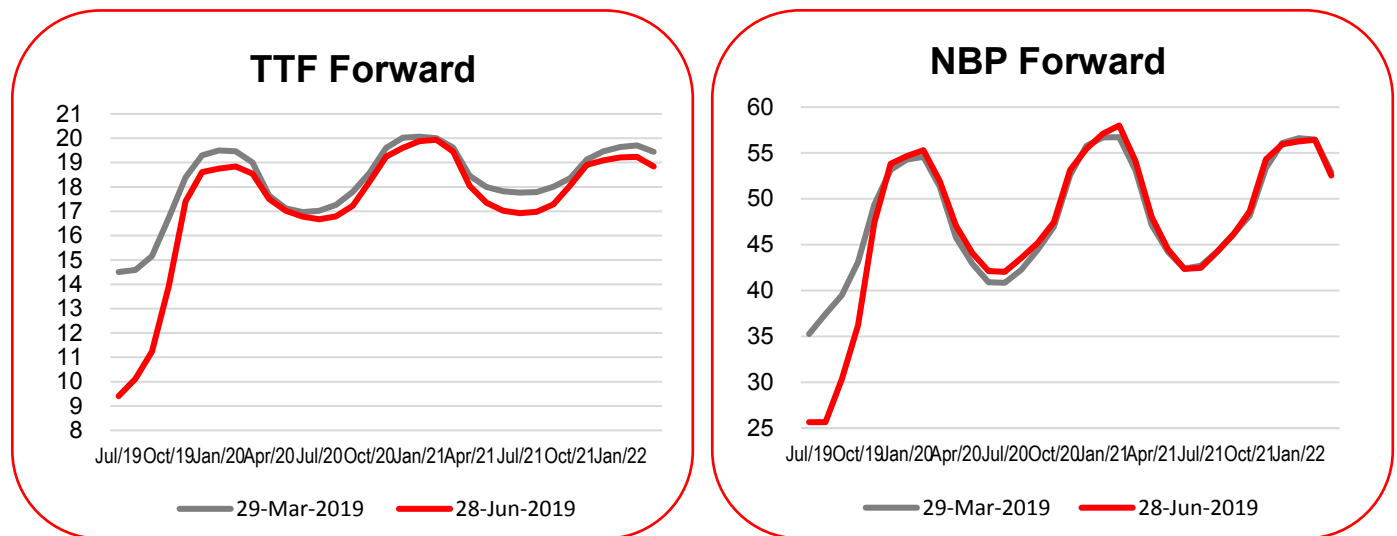
NBP Price History



Volatility

Market	Spot Volatility					Year-ahead Forward volatility				
	1m	3m	6m	12m	KYOS sugg.	1m	3m	6m	12m	KYOS sugg.
TTF	89% ↑	70% ↑	59% ↑	49% ↑	49% ↑	21% ↓	25% ↑	23% ⇔	24% ↑	24% ↑
NBP	74% ↑	89% ↑	73% ↑	63% ↑	62% ↑	22% ⇔	27% ↑	24% ↑	24% ↑	24% ↑
GPL	97% ↑	76% ↑	66% ↑	53% ↑	52% ↑	21% ↓	23% ↑	21% ↑	23% ⇔	23% ↑
NCG	99% ↑	74% ↑	62% ↑	50% ↑	49% ↑	21% ↓	23% ↑	22% ↑	23% ⇔	23% ↑
PEG-N	105% ↑	78% ⇔	65% ↑	53% ↑	51% ↑	19% ↓	23% ↑	22% ⇔	23% ⇔	23% ↑

Price Forward Curves



Market Trend

Short-term trading attracted most attention over the last three months. European storages ended the winter at record high level, removing a big part of traditional summer purchases from the market. At the same time, reduced gas consumption in South-East Asia brought many LNG spot cargoes into Europe, being the only real gas flex taker in the world. These two effects caused the prompt and current season gas prices to plummet. As an example the TTF month-ahead contract lost about one third of its value over the last three months (from 14.4€/MWh to 9.4€/MWh) - the lowest level since 2009.

However, contracts after this summer showed little movement, underpinning the market's belief that current market conditions are an exception. As a result, storage spreads of the current storage contract (SY2019) increased dramatically from approximately 5€/MWh to 9.5€/MWh. The spread for storage contracts that we consider in this report (SY2020) only showed a moderate increase, leading for example to only a 0.45€/MWh increase of the intrinsic value of our fastest TTF storage product.

Volatilities picked up over the quarter as a result of the price movements. With TTF spot volatility showing a 9% point increase to 49%. Forward volatilities increased as well.

All in all, this led to a strong increase in the storage value, especially for the faster storages. The value of the TTF 30/30 storage product went up with almost 20%, whereas the 60/120 storage product grew approximately 7%.

The increase in option value of the TTF swing contracts was mainly driven by the fact the curve went more into contango. This leads to an increase of intrinsic value of the fixed price contracts.

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 28 June 2019.
- 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



Our analytics
Your advantage

KYOS
+31 (0)23 5510 221
www.kyos.com