Gas Storage and Swing Report
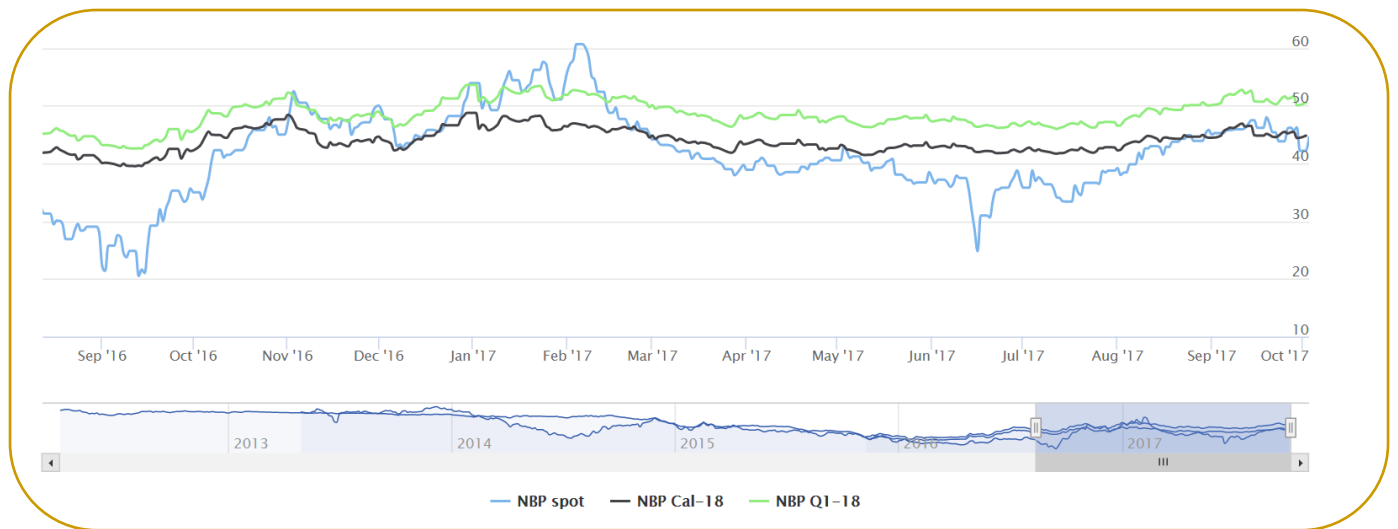
	Market	Product	Period	Cycle Cost	Intrinsic	Rolling Intrinsic		Option	
						Avg	10%	Avg	10%
Storage	TTF	30/30	SY2018	0.75	0.79 ↑	1.02 ↑	0.95 ↑	2.04 ↑	1.67 ↑
	TTF	60/60	SY2018	0.75	0.79 ↑	0.98 ↑	0.88 ↑	1.52 ↑	1.28 ↑
	TTF	60/120	SY2018	0.75	0.70 ↑	0.87 ↑	0.83 ↑	1.27 ↑	1.06 ↑
	NBP	30/30	SY2018	1.50	7.77 ↓	10.30 ↑	9.67 ↑	17.77 ↓	15.53 ↓
	NBP	60/60	SY2018	1.50	7.77 ↓	9.57 ↑	9.33 ↑	13.15 ↓	12.00 ↓
	NBP	60/120	SY2018	1.50	7.37 ↓	9.02 ↓	8.73 ↓	11.22 ↓	10.33 ↓

	Market	Max/day	Min/Max	Period	Price	Intrinsic	Rolling Intrinsic		Option	
							Avg	10%	Avg	10%
Swing	TTF	4	360/360	2018	17.69 ↑	-0.01 ↓	0.09 ⇔	0.02 ⇔	0.20 ↑	-0.02 ↓
	TTF	1	0/365	2018	17.69 ↑	0.01 ↓	0.43 ↓	0.07 ↓	0.55 ↓	0.12 ⇔
	TTF	4	360/360	2018	MA	0.00 ⇔	0.38 ↑	0.21 ⇔	0.85 ↑	0.52 ↑
	NBP	4	360/360	2018	50.05 ↓	0.08 ↓	0.50 ↓	0.02 ↓	1.00 ↓	0.28 ↓
	NBP	1	0/365	2018	50.05 ↓	0.10 ↓	1.08 ↓	0.36 ↓	1.11 ↓	0.41 ↓
	NBP	4	360/360	2018	MA	-0.02 ⇔	2.30 ↓	1.65 ↓	3.55 ↓	2.50 ↓

TTF Price History

— TTF spot   — TTF Cal-18   — TTF Q1-18

— TTF Q1-19 minus Q3-18 spread

NBP Price History

Legend: NBP spot — NBP Cal-18 — NBP Q1-18

Legend: NBP Q1-19 minus Q3-18 spread
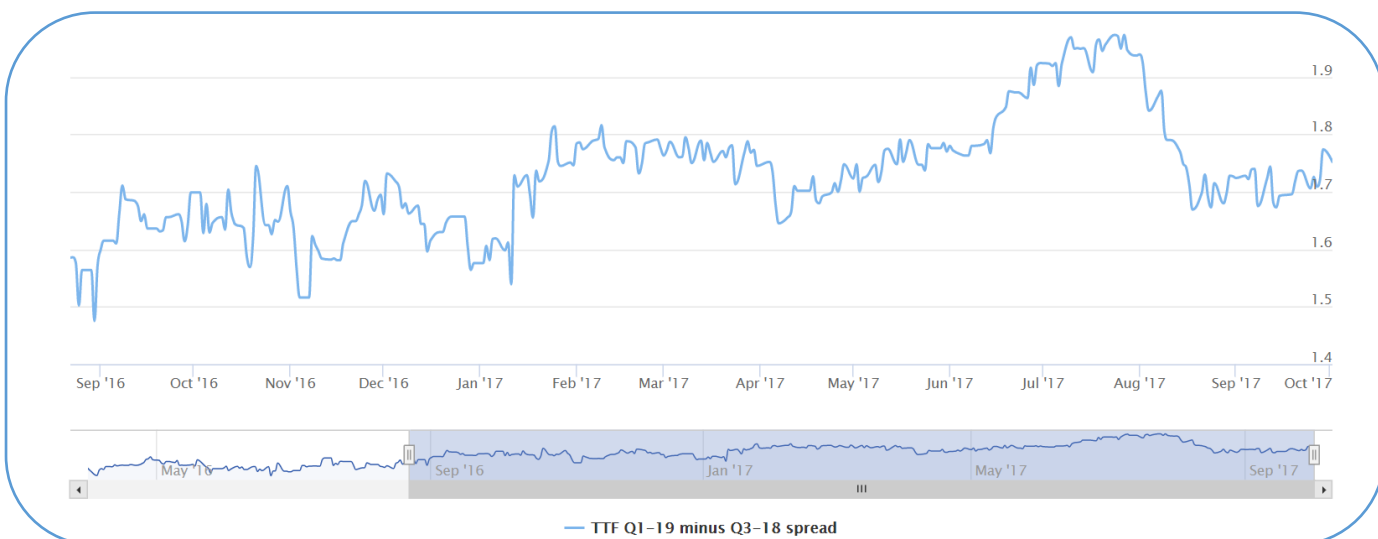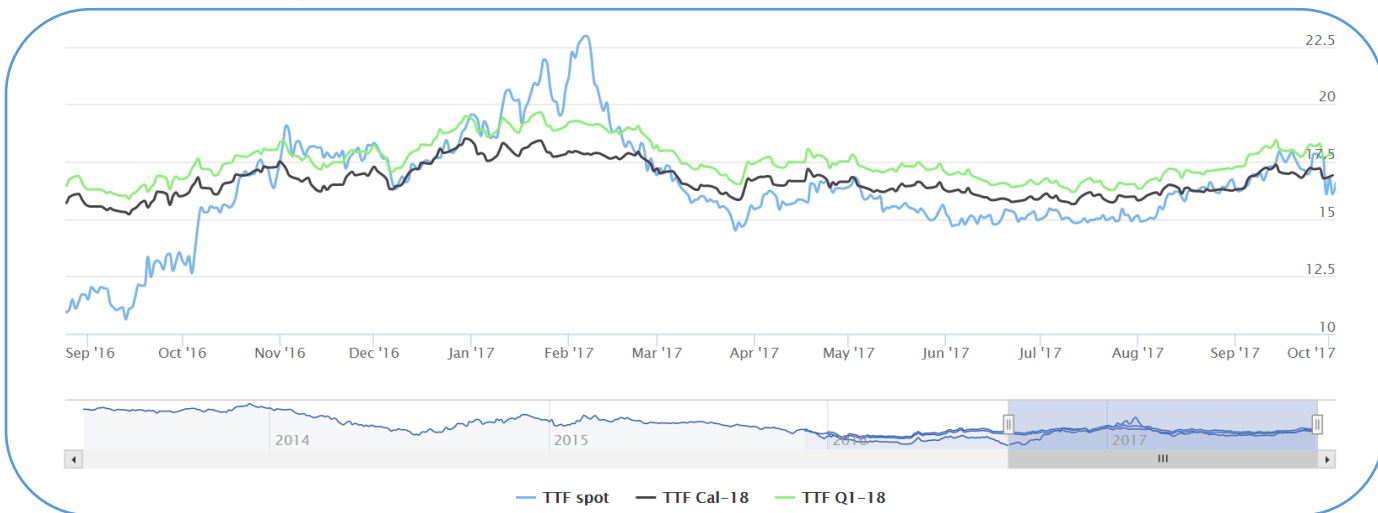
Volatility

Market	Spot Volatility						Year-ahead Forward volatility				
	1m	3m	6m	12m	KYOS sugg.		1m	3m	6m	12m	KYOS sugg.
TTF	29% ↑	26% ↓	29% ↓	42% ↓	38% ↓		15% ↑	12% ↑	13% ↓	18% ⇔	15% ⇔
NBP	35% ↑	45% ↓	63% ↑	59% ↓	60% ↓		19% ↑	13% ↓	13% ↑	20% ⇔	15% ⇔
GPL	32% ↑	26% ↑	31% ↓	44% ↓	38% ↓		16% ↑	12% ↑	13% ↓	18% ⇔	15% ⇔
NCG	31% ↑	29% ↓	31% ↓	45% ↓	38% ↓		16% ↑	12% ↑	13% ↓	17% ↓	15% ⇔
PEG-N	34% ↑	31% ↓	34% ⇔	48% ↓	38% ↓		15% ↑	12% ↑	13% ↓	17% ↓	15% ⇔

Price Forward Curves

TTF Forward

Legend: 29/Sep/2017 (blue), 30/Aug/2017 (orange). Y-axis: 15.0 to 18.0. X-axis: Oct 17, Dec 17, Feb 18, Apr 18, Jun 18, Aug 18, Oct 18, Dec 18, Feb 19.

NBP Forward

Legend: 29/Sep/2017 (blue), 30/Aug/2017 (orange). Y-axis: 35.0 to 55.0. X-axis: Oct 17, Dec 17, Feb 18, Apr 18, Jun 18, Aug 18, Oct 18, Dec 18, Feb 19.
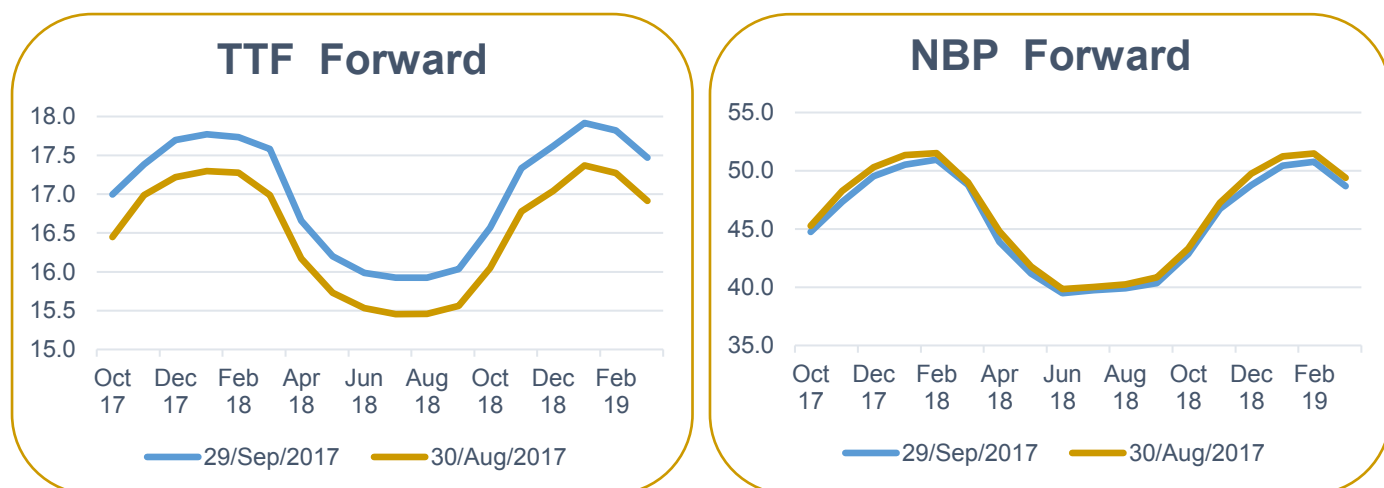
Market Trend

Gas storage

Because in September the winter-summer spread on the TTF market hardly moved, there is virtually no change in storage intrinsic values. On the NBP market, intrinsic values dropped, following the decline in winter-summer spreads.

The last 6 months the spot volatility at the continental European gas hubs was very moderate, just about 30%. On NBP the spot volatility was twice as high over the same 6 month period, but slightly lower than our estimates from last month. For this reason, the spot volatilities used for the valuations (KYOS suggested) were revised downwards, to 38% for TTF (was 40%) and 60% for NBP (was 65%), still taking into account that spot volatility in winter may be higher than in summer. Consequently, all option values on NBP went down compared to last month. At the same time, the storage option values on TTF slightly moved up by about 0.05 EUR/MWh, in line with the same increase in intrinsic values.

Swing

The decline in spot volatility has led to slightly lower swing values than 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
• Either a fixed price (e.g. 18) 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 29 Sep 2017
• 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.