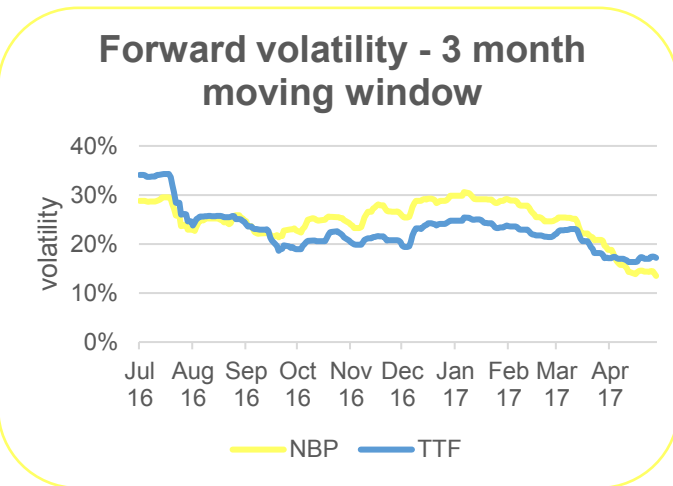
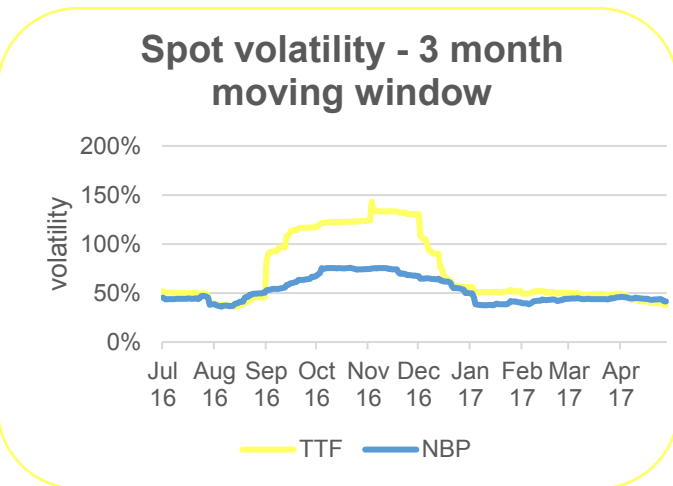
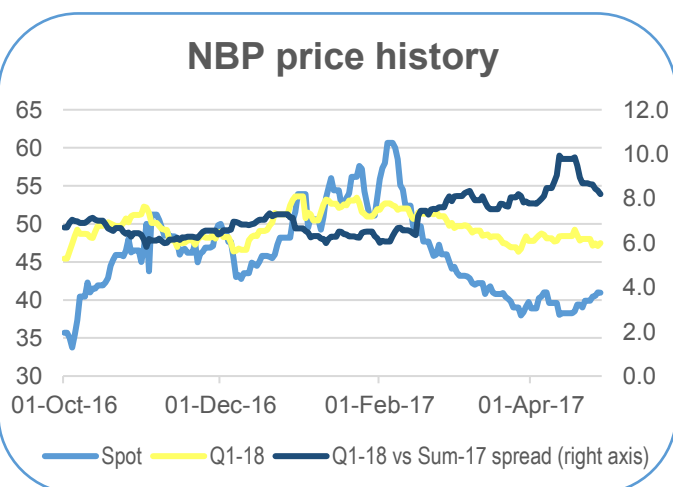
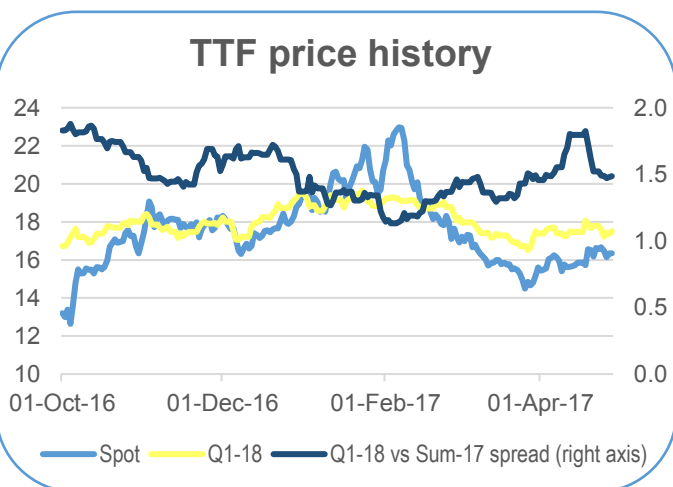


## Gas Storage and Swing Report

Storage	Market	Product	Period	Cycle Cost	Intrinsic	Rolling Intrinsic		Option	
						Avg	10%	Avg	10%
	TTF	30/30	SY2017	0.75	0.77 ↓	1.67 ↓	1.38 ↓	2.05 ↓	1.52 ↓
	TTF	60/60	SY2017	0.75	0.69 ↓	1.25 ↓	1.06 ↓	1.40 ↓	1.06 ↓
	TTF	60/120	SY2017	0.75	0.61 ↓	0.97 ↓	0.82 ↓	1.09 ↓	0.82 ↓
	NBP	30/30	SY2017	1.50	7.90 ↑	12.03 ↓	10.17 ↓	13.10 ↓	10.83 ↓
	NBP	60/60	SY2017	1.50	7.45 ↑	9.67 ↓	8.73 ↓	10.12 ↓	8.82 ↓
	NBP	60/120	SY2017	1.50	7.02 ↑	8.48 ↓	7.83 ↓	8.80 ↓	7.77 ↓

Swing	Market	Max/day	Min/Max	Period	Price	Intrinsic	Rolling Intrinsic		Option	
							Avg	10%	Avg	10%
	TTF	4	360/360	2018	17.50 ⇔	0.05 ↑	0.16 ↓	0.04 ↑	0.27 ⇔	-0.15 ↓
	TTF	1	0/365	2018	17.50 ⇔	0.02 ↑	0.97 ↓	0.16 ↑	1.08 ↓	0.23 ↓
	TTF	4	360/360	2018	MA	-0.02 ⇔	0.53 ↓	0.27 ↑	1.06 ↓	0.65 ↓
	NBP	4	360/360	2018	46.00 ⇔	1.43 ↓	1.73 ↓	1.43 ↓	2.06 ↓	0.89 ↓
	NBP	1	0/365	2018	46.00 ⇔	0.35 ↓	2.74 ↓	0.94 ↓	2.94 ↓	0.80 ↓
	NBP	4	360/360	2018	MA	-0.02 ⇔	2.19 ↓	1.25 ↓	3.46 ↓	2.16 ↓



Market	Spot Volatility					Year-ahead Forward volatility				
	1m	3m	6m	12m	KYOS sugg.	1m	3m	6m	12m	KYOS sugg.
TTF	37% ↑	42% ↓	42% ↓	54% ↓	45% ↓	21% ↑	17% ↔	21% ↓	23% ↓	20% ↔
NBP	30% ↔	38% ↓	46% ↓	79% ↓	50% ↓	16% ↑	13% ↓	23% ↓	24% ↓	22% ↔
GPL	41% ↑	41% ↓	45% ↓	56% ↔	45% ↓	18% ↑	16% ↓	20% ↓	24% ↓	20% ↔
NCG	34% ↓	43% ↓	44% ↓	57% ↔	45% ↓	18% ↑	16% ↔	20% ↓	24% ↔	20% ↔
PEG-N	34% ↓	40% ↓	51% ↓	59% ↓	48% ↓	19% ↑	16% ↔	20% ↓	24% ↓	20% ↔

## Price Forward Curves

Month					5-17	6-17	7-17	8-17	9-17	10-17	11-17	12-17
TTF					16.22	16.18	16.03	15.97	16.03	16.41	17.06	17.36
NBP					39.94	38.16	38.79	39.35	39.68	41.13	44.90	46.80

Month	1-18	2-18	3-18	4-18	5-18	6-18	7-18	8-18	9-18	10-18	11-18	12-18
TTF	17.68	17.57	17.25	16.41	16.07	15.89	15.80	15.81	15.89	16.50	17.15	17.44
NBP	47.88	48.27	46.34	42.29	39.50	38.09	38.90	39.03	38.80	42.11	44.51	45.58

## Market Trend

### Gas storage

The storage products have now been valued with 1 month less, starting 1 May instead of 1 April 2017. This did not influence the intrinsic values though, because April is generally not the cheapest month. Actually, on both markets, the intrinsic values moved very little: a bit down on TTF and up on NBP. Again, volatilities dropped month-on-month and pushed all option and rolling intrinsic values down: about 25 EURct/MWh on TTF and 1 p/th on NBP. These option values would have been slightly higher if April were included, but still the value drop is mainly a result of lower volatilities.

### Swing:

The strike prices for the fixed-price contracts were the same as last month. Because the Cal-18 price was a bit higher on TTF, the intrinsic swing values were higher. This helped the option and rolling intrinsic values to stay roughly the same, despite lower market volatilities. The NBP market did not benefit from a higher market price level, and hence all values were lower 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 30 April 2017
- A discount rate of 2% has been applied.
- Intrinsic values are derived from the monthly forward curve.
- 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.

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