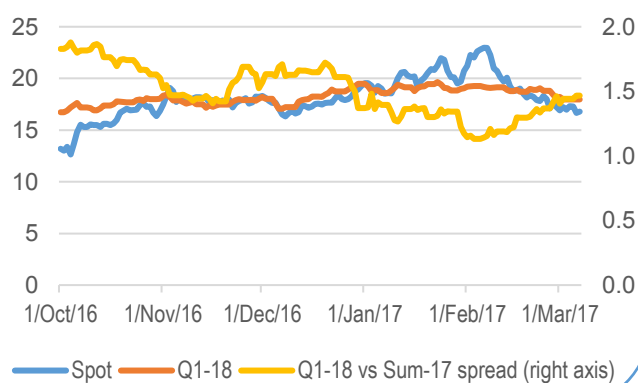


Gas Storage and Swing Report

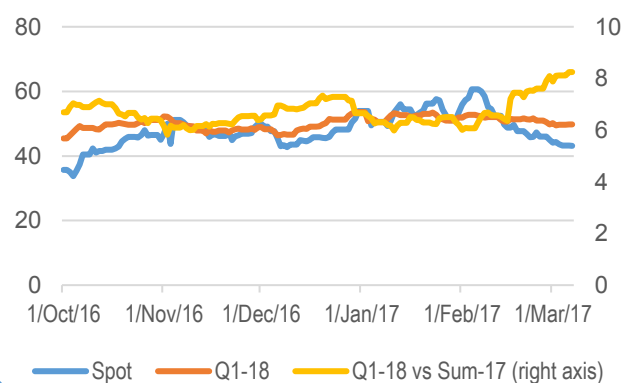
Storage	Market	Product	Period	Cycle Cost	Intrinsic	Rolling Intrinsic Avg 10%		Option Avg 10%	
	TTF	30/30	SY2017	0.75	0.76 ↓	2.34 ↓	1.71	3.00 ↓	2.30
TTF	60/60	SY2017	0.75	0.68 ↓	1.64 ↓	1.27	1.92 ↓	1.46	
TTF	60/120	SY2017	0.75	0.65 ↓	1.29 ↓	1.03	1.47 ↓	1.11	
NBP	30/30	SY2017	1.50	7.77 ↑	16.57 ↑	12.17	18.27 ↑	14.83	
NBP	60/60	SY2017	1.50	7.42 ↑	12.07 ↑	9.93	12.90 ↑	10.92	
NBP	60/120	SY2017	1.50	7.15 ↑	10.00 ↑	8.67	10.72 ↑	9.12	

Swing	Market	Max/day	Min/Max	Period	Price	Intrinsic	Rolling Intrinsic Avg 10%		Option Avg 10%	
	TTF	4	360/360	2018	18.00 ⇔	0.00 ↓	0.20 ↓	0.06	0.33 ↓	-0.08
TTF	1	0/365	2018	18.00 ⇔	0.01 ↓	1.20 ↓	0.21	1.34 ↓	0.29	
TTF	4	360/360	2018	MA	-0.02 ⇔	0.64 ↓	0.26	1.24 ↓	0.75	
NBP	4	360/360	2018	48.00 ⇔	1.76 ↓	2.47 ↓	1.83	2.87 ↓	1.34	
NBP	1	0/365	2018	48.00 ⇔	0.44 ↓	3.96 ↓	1.27	4.10 ↓	1.23	
NBP	4	360/360	2018	MA	-0.02 ⇔	2.94 ↓	2.93	4.45 ↓	1.78	

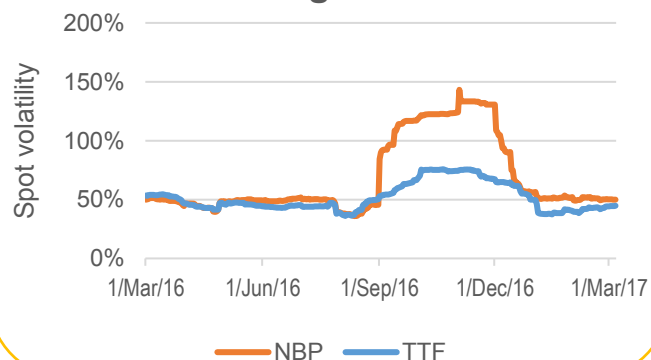
TTF price history



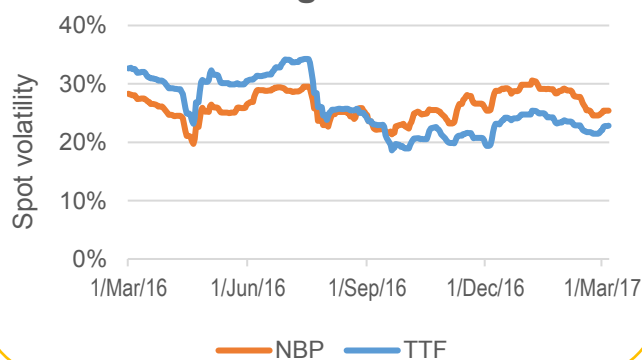
NBP price history



Spot volatility - 3 month moving window



Forward volatility - 3 month moving window



Market	Spot Volatility					Year-ahead Forward volatility				
	1m	3m	6m	12m	KYOS sugg.	1m	3m	6m	12m	KYOS sugg.
TTF	51% ↑	45% ↑	59% ↓	55% ↑	55% ⇔	14% ↓	23% ↓	22% ↓	25% ↓	22% ↓
NBP	46% ↓	50% ↓	101% ↓	80% ⇔	65% ⇔	13% ↓	25% ↓	26% ↓	26% ⇔	25% ⇔
GPL	41% ↓	45% ↓	60% ↓	56% ⇔	55% ⇔	13% ↓	22% ↓	21% ↓	24% ↓	22% ↓
NCG	47% ↑	49% ↓	61% ↓	57% ⇔	55% ⇔	12% ↓	22% ↓	21% ↓	24% ↓	22% ↓
PEG-N	44% ↑	60% ⇔	64% ↓	61% ↑	60% ⇔	13% ↓	22% ↓	21% ↓	24% ↓	22% ↓

Price Forward Curves

Month			3-17	4-17	5-17	6-17	7-17	8-17	9-17	10-17	11-17	12-17
TTF			16.71	16.61	16.45	16.47	16.43	16.44	16.58	16.89	17.55	17.86
NBP			43.04	42.98	41.92	40.49	41.08	41.36	41.60	43.47	47.36	49.48

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	18.15	18.04	17.71	16.92	16.59	16.40	16.20	16.21	16.30	17.02	17.61	17.86
NBP	50.25	50.52	48.75	45.34	41.79	40.29	40.87	40.95	40.83	44.45	46.94	48.00

Market Trend

Gas storage

Compared to the previous report there was a slight increase of the TTF and NBP winter-summer spreads. With unchanged parameters, the TTF values would actually have increased (as did the NBP values). However, for the first time we included a 2% discount rate, which reduces values somewhat.

Swing:

The Cal-18 prices went down on both markets (-0.75 €/MWh on TTF and -1.60 p/th on NBP), resulting in lower values for the fixed price contracts. On both markets the MA indexed contract values decreased slightly due to the inclusion of the 2% discount rate.

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).

The storage values are expressed per MWh of working volume.

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 6 March '17.
- A discount rate of 2% has been applied (previous reports: 0%).
- 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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