Gas Storage and Swing Report

	Market	Product	Period	Cycle Cost	Intrinsic	Rolling Intrinsic		Option	
						Avg	10%	Avg	10%
Storage	TTF	30/30	SY2020	0.50	1.61	3.39	2.63	4.18	3.11
	TTF	60/60	SY2020	0.50	1.61	2.85	2.34	3.57	2.65
	TTF	60/120	SY2020	0.50	1.61	2.60	2.00	3.09	2.43
	NBP	30/30	SY2020	1.00	9.60	19.23	15.83	20.60	17.83
	NBP	60/60	SY2020	1.00	9.60	16.17	14.15	17.07	15.03
	NBP	60/120	SY2020	1.00	9.38	14.83	13.40	13.40	13.55

	Market	Max/day	Min/Max	Period	Price	Intrinsic	Rolling Intrinsic		Option	
							Avg	10%	Avg	10%
Swing	TTF	4	360/360	2020	19.32 ↓	-0.02 ⇔	0.45 ↑	0.18 ↑	0.75 ↑	0.75 ↑
	TTF	1	0/365	2020	19.32 ↓	0.00 ⇔	1.21 ↑	0.30 ↑	1.43 ↑	0.38 ↑
	TTF	4	360/360	2020	MA	-0.02 ⇔	0.63 ↓	0.30 ↓	1.25 ↓	0.70 ↓
	NBP	4	360/360	2020	58.38 ↓	-0.02 ⇔	1.65 ↑	0.51 ↑	2.15 ↑	0.20 ↑
	NBP	1	0/365	2020	58.38 ↓	0.00 ⇔	2.98 ↓	0.45 ↑	3.10 ↑	0.79 ↑
	NBP	4	360/360	2020	MA	-0.02 ⇔	2.38 ↓	1.22 ↓	3.76 ↓	2.29 ↓

TTF Price History

Zoom 1m 3m 6m YTD 1y All   From Feb 23, 2018 To Apr 1, 2019

— TTF Q1–21 minus Q3–20 spread

NBP Price History

Zoom 1m 3m 6m YTD 1y All   From Jan 1, 2018 To Apr 1, 2019

— NBP Q1–21 minus Q3–20 spread
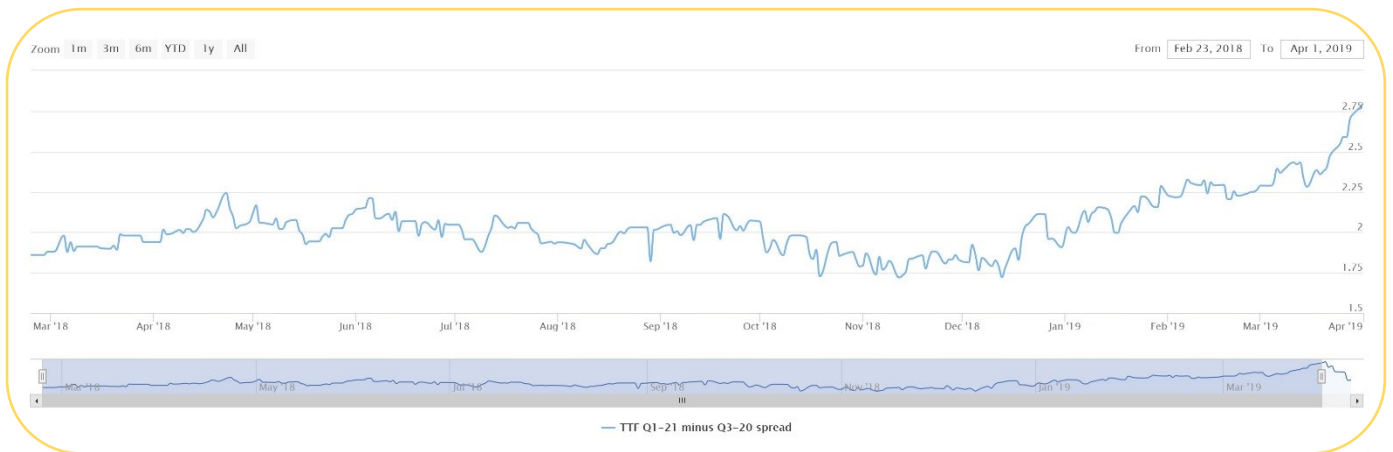
Volatility

Market	Spot Volatility					Year-ahead Forward volatility				
	1m	3m	6m	12m	KYOS sugg.	1m	3m	6m	12m	KYOS sugg.
TTF	41% ↑	44% ↑	44% ↑	39% ↓	40% ↓	22% ↓	21% ↓	23% ↓	23% ↑	22% ⇔
NBP	39% ↓	50% ↓	56% ↑	50% ↓	50% ↓	22% ↓	19% ↓	22% ↓	23% ↑	22% ⇔
GPL	53% ↑	49% ↑	49% ↑	39% ↓	40% ↓	22% ↑	19% ↓	19% ↓	23% ↑	22% ⇔
NCG	43% ↑	43% ↑	43% ↑	37% ↓	40% ↓	22% ↑	20% ↓	20% ↓	23% ↑	22% ⇔
PEG-N	37% ↑	44% ⇔	46% ↑	42% ↓	40% ↓	22% ↑	20% ↓	22% ↓	23% ↑	22% ⇔

Price Forward Curves

TTF Forward

29-Mar-2019 — 31-Dec-2018

NBP Forward

29-Mar-2019 — 31-Dec-2018
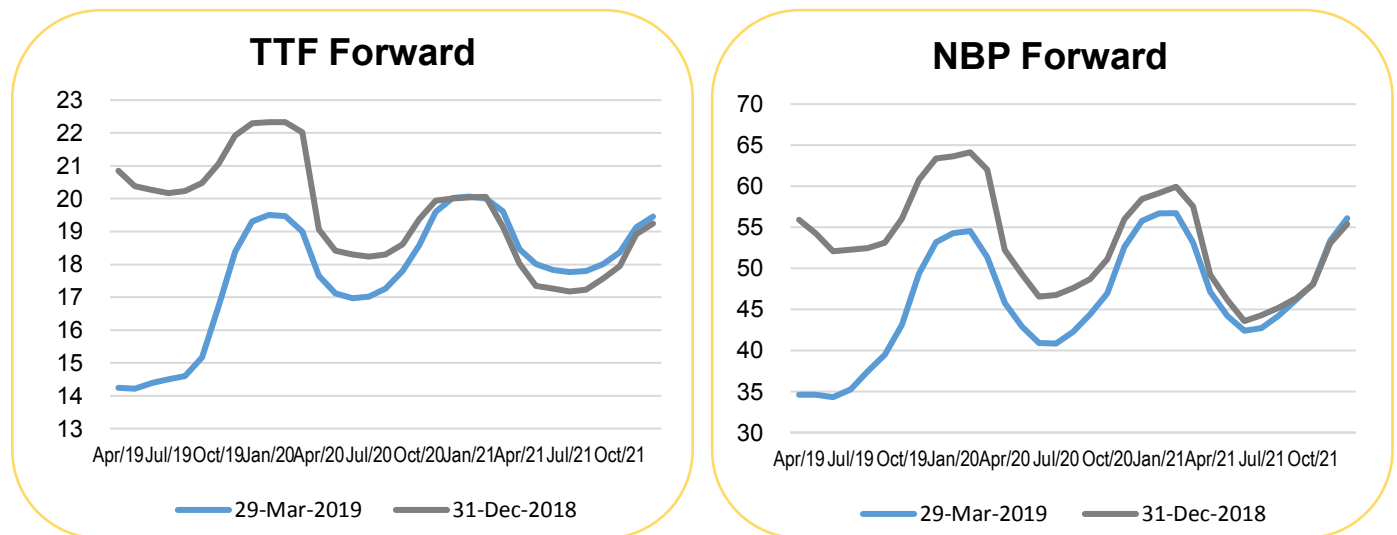
Market Trend

An important value driver of month-ahead indexed swing contracts is the spot volatility. Our spot volatility assessments went down compared to our last report. As a result, lower values of the TTF and NBP month-ahead indexed swing contracts can be observed. For example the assessment of the TTF cal20 full option value went down from 1.58€/MWh to 1.25€/MWh.

For the fixed price swing contract a different picture can be seen. Due to the big change in the shape of the forward curve, the value of these contracts went up. The main driver here is the Q1-20 vs Q4-20 spread. Our swing contracts are priced at the Q1-20 contract. During our previous report, the Q4-20 price was (well) below the Q1-20 price. Currently, with a forward price largely in contango, the Q4-20 is much closer to the Q1-20 price. This leads to a higher option value of the fixed price swing contract.

As of this quarter we consider a new set of storage contracts, for the storage year starting at 1 April 2020. This makes it not possible to compare the values to our previous report. One thing to note however is that the dramatic increase in the "Q1/Q3 storage spread" that can be observed for the current storage year (i.e. Q1-20 versus Q3-19) is not fully echoed into the storage year 2020.

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:	Price
• Max/day is the maximum daily take	• A fixed price put at Q1-level or
• Min/Max are the minimum and maximum annual take	• 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 31 March 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.

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