

## Q3 2017: TTF volatility commentary

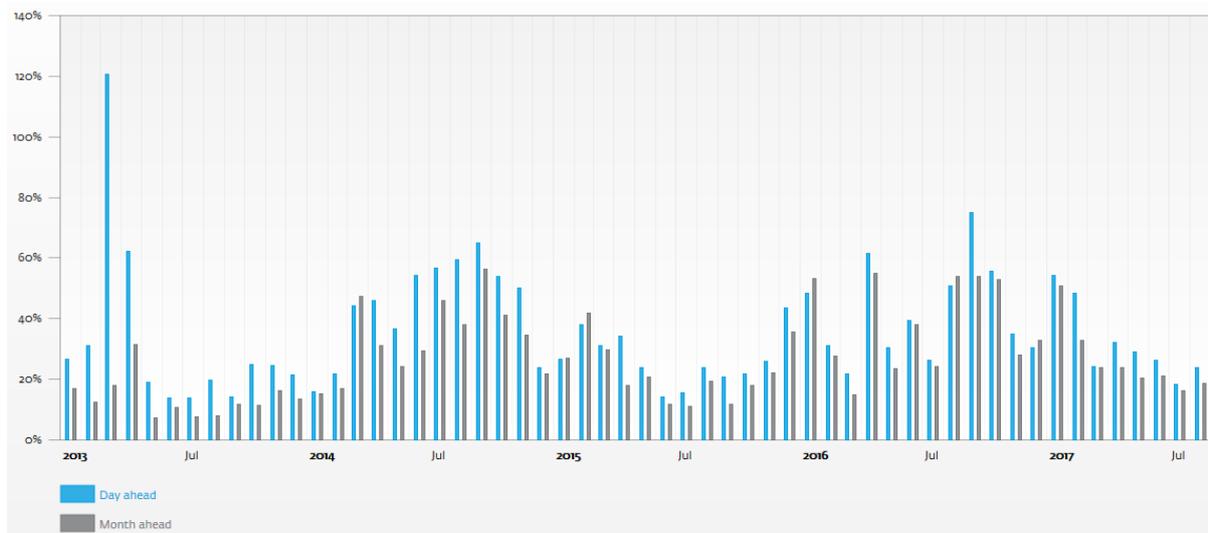
### Subdued summer volatility

In the absence of any specific market shocks, gas price volatility tends to display a seasonal behaviour. This is primarily driven by seasonal demand dynamics where lower winter temperatures drive higher winter gas demand. This in turn means a tighter gas market and higher spot price volatility in winter (and vice versa in summer).

A loose seasonal pattern of lower summer volatility can be observed in Chart 1, taken from the [Energystock Volatility Dashboard](#). However this underlying seasonal pattern can be interrupted by specific market events e.g. (i) the sharp gas & oil price declines in 2014 that saw a jump in TTF volatility and (ii) the power sector gas demand dynamics associated with French nuclear outages in Q3 2016.

The volatility behaviour in Q2 and Q3 of 2017 looks to be more closely following the seasonal behaviour of 2013 and 2015. That said volatility has settled at a somewhat higher level across summer 2017 than these two previous years. But it is interesting to note that pricing dynamics at TTF have started to diverge from those at NBP.

**Chart 1: Evolution of the Energystock volatility indices over the last 12 months**



### NBP vs TTF pricing dynamics

There is no doubt that TTF is now the main gas hub in Europe. Liquidity has been transitioning from NBP over the last five years. And Brexit has ensured that this will continue to happen.

NBP will always remain an important satellite hub to TTF given the size of the UK gas market and its relatively unique set of market characteristics. But TTF is the hub that is now driving pricing across the well interconnected European hub network.

While TTF and NBP prices are structurally converged, there are some interesting changes in flow and pricing dynamics since the outages and now retirement of Rough storage. The absence of Rough flexibility is predominantly being backfilled by Norwegian upstream flex. This has meant more seasonal shape in Norwegian flow patterns:

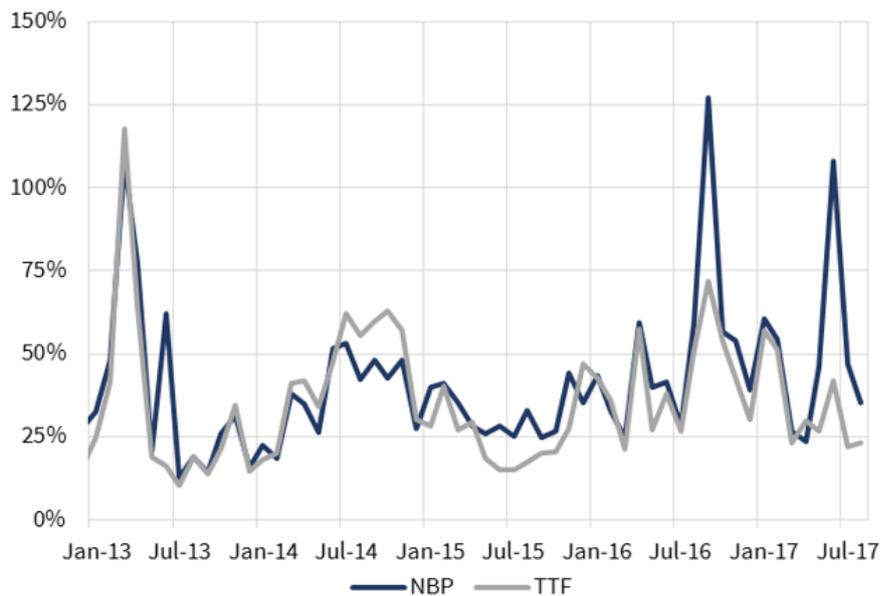
- Higher winter volumes to replace Rough withdrawal capability

- Lower summer volumes to compensate for the absence of Rough injection demand.

Interconnector flows have also changed in a consistent manner, with a more pronounced summer export and winter import pattern.

But most interesting from a gas storage capacity value perspective is that NBP spot volatility levels have started to diverge from TTF as shown in Chart 2.

**Chart 2: Evolution of TTF vs NBP month-ahead volatility**



Rough accounted for around 25% of UK daily gas deliverability. It was also key in absorbing UKCS production volumes across the summer (via injection). Norwegian flexibility is still acting to arbitrage a substantial portion of pricing differences between NBP and TTF. But the absence of Rough is translating into a greater number of price separation events due to UK vs Continental constraints.

An additional factor supporting an NBP volatility premium over TTF is exchange rate fluctuations. GBP has become more volatile since Brexit and this is feeding through into a more volatile pence per therm NBP gas price.

However NBP pricing dynamics are unlikely to structurally diverge from TTF over the longer term. In other words the UK is likely to export volatility to TTF as factors such as a tighter storage balance and higher power sector demand require the UK to depend more on imports as a source of supply flexibility.

#### Implications for Continental storage owners

Another factor that may impact levels of TTF spot price volatility is the closure or mothballing of storage capacity on the Continent.

Seasonal storage assets are facing the double hit of a prolonged period of low seasonal price spreads and low spot price volatility. In this environment a number of seasonal storage owners are facing tough strategic decisions about whether their business model continues to be viable under current market conditions.

Owners of fast cycle storage assets on the Continent are facing similar challenges, given the continuation of low spot price volatility at TTF in 2017. Some owners have a degree of protection

from longer term contracts. But it is difficult to cover fixed costs based on shorter term capacity sales revenue given volatility at current levels.

#### Looking forward to the coming into winter

As we enter Q4 it is useful to consider the key factors likely to drive volatility over the coming winter.

1. Gas demand: European gas demand has continued to recover in H1 2017, up approximately 6% vs H1 2016. This has been helped by a recovery in CCGT load factors in the power sector (e.g. in Italy, Netherlands & France).
2. No Rough: The absence of Rough has reduced UK supply flexibility as described above. This means that the UK is more likely to call on Continental flexibility which may have a knock-on impact on TTF price volatility.
3. Storage inventories: European storage facilities have entered the winter with relatively low inventories (8% lower than this time last year). This is the result of a combination of rising coal prices pulling up gas hub prices and production outages both of which have impacted summer injection pricing dynamics.
4. LNG imports: Asian LNG spot prices have started to diverge from European hubs in Q4 with a differential of over 1.50 \$/mmbtu. This points to the potential for lower LNG import volumes into Europe over winter which may tighten the market balance.
5. Weather/outages: As always, European hub price volatility will be sensitive to more prolonged periods of cold weather or major infrastructure outages.

These factors should play an important role in determining the extent to which TTF spot price volatility recovers into the coming winter.