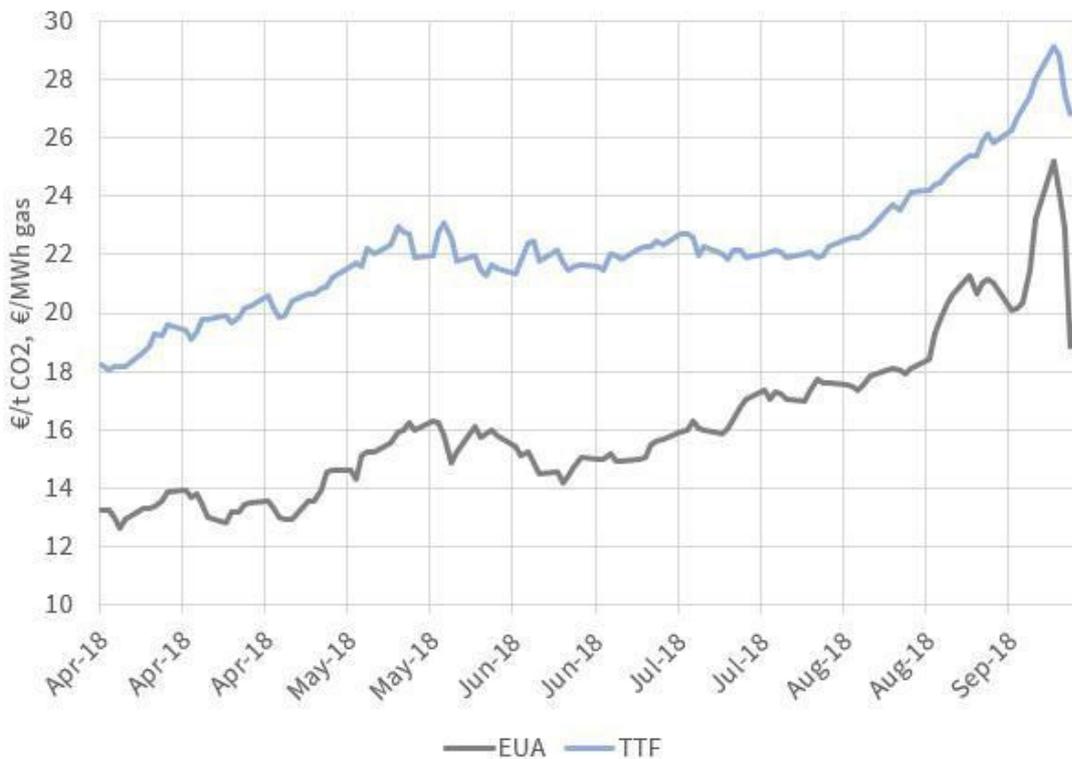
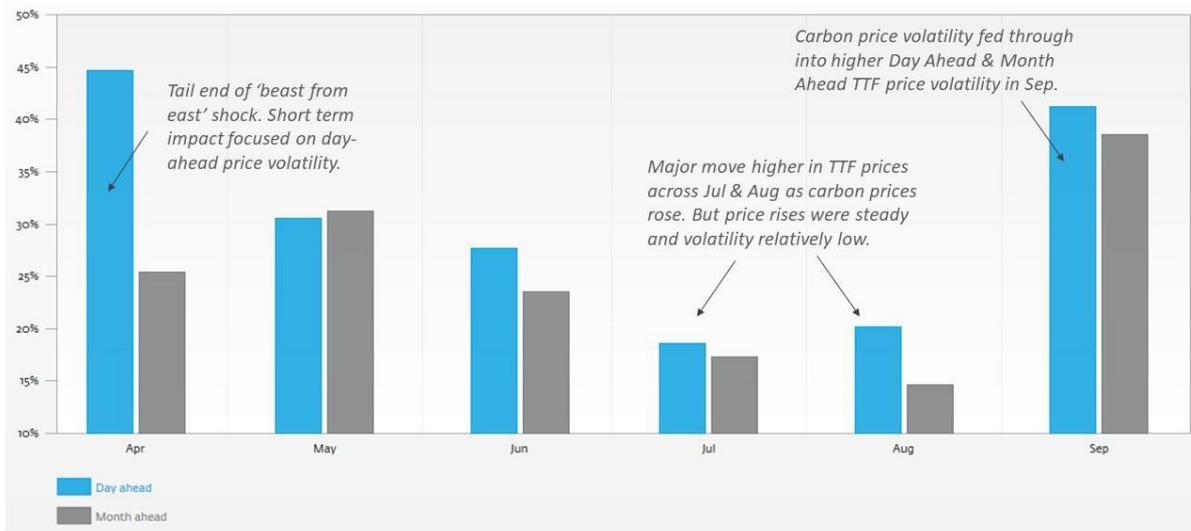


### Q3 2018: TTF volatility commentary

Prices have surged at TTF since our Q2 commentary in June. After a relatively stable May and Jun period around 22 €/MWh, TTF month-ahead prices rose more than 30% between Jul and Sep, reaching levels above 29 €/MWh.

The charts below illustrate the relationship between this price rise and TTF volatility. The top panel below shows the evolution of the Energystock TTF Monthly Volatility Index (Apr – Sep). The panel below shows the evolution of carbon EUA prices and TTF over the same period.



## **Carbon driving TTF higher via power sector switching**

Carbon prices have rallied this year as a result of implementation of the Market Stability Reserve (MSR) measures. The MSR is a policy mechanism that reduces the surplus of carbon credits that has built since the financial crisis. Under the MSR, surplus carbon inventory will be removed at the rate of 24% a year across 2019-23. Culling of EUAs will then continue beyond this at a 12% rate.

The net impact of the MSR has been to reignite the requirement for market driven emissions abatement from the power sector. In other words, the EUA market anticipates a shortage of emissions allowances, which needs to be cleared via higher prices.

The linkage between rising carbon and TTF prices flows through the European power sector. Rising carbon prices reduce coal plant competitiveness versus CCGTs. The carbon intensity of coal-fired units is more than double that of CCGTs (e.g. 0.85 vs 0.35 t/MWh of power produced). This means the variable cost of coal plants rises faster than CCGTs in response to a carbon price increase.

At a given gas price, this carbon induced increase in competitiveness of gas plants results in higher CCGT load factors. This in turn causes higher gas demand – think of this as a shift in the aggregate European gas demand curve to the right. The result is an increase in European gas hub prices.

Front month carbon & EUA prices have been 94% correlated from the start of Q2 to the end of Sep. This correlation has become an increasingly important driver of TTF prompt volatility. The carbon and TTF price rises across Jul and Aug were relatively smooth, causing % TTF volatility levels to decline. But carbon prices became much more volatile in Sep as carbon broke above 20 €/t (with a 20% price swing across one week in Sep). This has fed through into higher TTF Day-Ahead and Month-Ahead TTF volatility as well (as can be seen in the top chart panel).

Interestingly, higher carbon prices have not resulted in significant switching of coal for gas plant. TTF has surged to ensure that switching levels in the power sector are maintained, with the competitive balance even shifting in favour of coal as we head into the winter. That is an indication of how tight the European gas market is.

## **A tight supply situation aggravated by LNG diversion**

Carbon prices are shifting the aggregate European gas demand curve to the right. There are also several factors impacting the aggregate European supply curve.

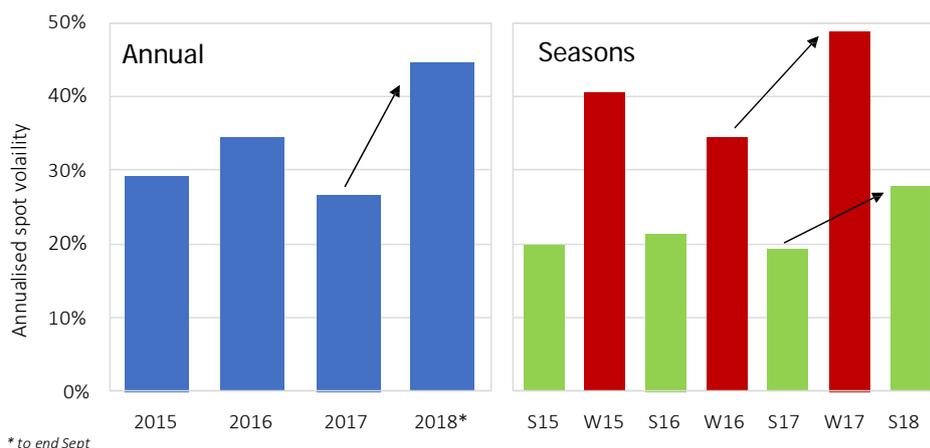
Firstly, Dutch gas production has declined rapidly across the last two years as a result of policy restrictions stemming from Groningen earthquake risks.

Secondly, strong Asian LNG demand has continued to pull flexible LNG supply away from Europe to Asia. This is a dynamic that has featured across the last 3 European winters. But in

2018 Asia has continued to pull LNG away from Europe across the summer, exacerbating the carbon price effect described above.

The linkage between the European gas market and the LNG market is becoming increasingly important in impacting TTF price dynamics. Across the coming winter, a tight gas market means that Europe may need to compete with Asia for available LNG cargoes. That may be a factor contributing to higher TTF spot price volatility in the months to come.

The chart below shows an analysis of annual and seasonal volatility of the SGX Singapore Sling LNG price.



The chart shows structurally higher LNG spot price volatility in winter than summer. It also shows volatility on the rise in 2018 (across both Win 17/18 and Sum 18). This may have a knock-on impact on TTF volatility across Win 18/19.

### Russian supply and volatility

The other important factor impacting European gas supply is Russian gas flows. Russian imports have been rising steadily since 2015. As imports have continued to rise in 2018, capacity constraints are binding on key pipeline routes that ship gas into Europe. Of the 3 'trunk' supply routes:

- Nordstream (via the Baltic) and Yamal (via Belarus) have been at max flow levels across 2018
- The Ukraine route has some available capacity but has also hit max flow constraints on some days across the summer.

In response to the summer price surge, Gazprom has started auctioning incremental volumes of gas for delivery into Europe. But there are strategic, commercial and logistical factors constraining the ramp up of additional Russian gas flows in the short term. We set these out in more detail in a related [blog article](#). These conditions are contributing to what could be a volatile winter and we also summarise 5 factors to watch coming into Winter 18/19 in the blog article.

## Higher % volatility acting on higher TTF price

The impact of volatility in driving the value of gas supply flexibility (e.g. gas storage capacity) can be thought of in two parts:

1. The % level of volatility (e.g. measured as historical volatility in the Energystock indices).
2. The absolute level of prices that this % acts on.

What is interesting with the recent rise in volatility across September is that both these are rising. In other words Day-Ahead volatility jumped from 20% to 40% from Aug to Sep, but that % volatility level is now acting on significantly higher gas prices since the summer. This dynamic is something to watch when comparing % volatility levels.