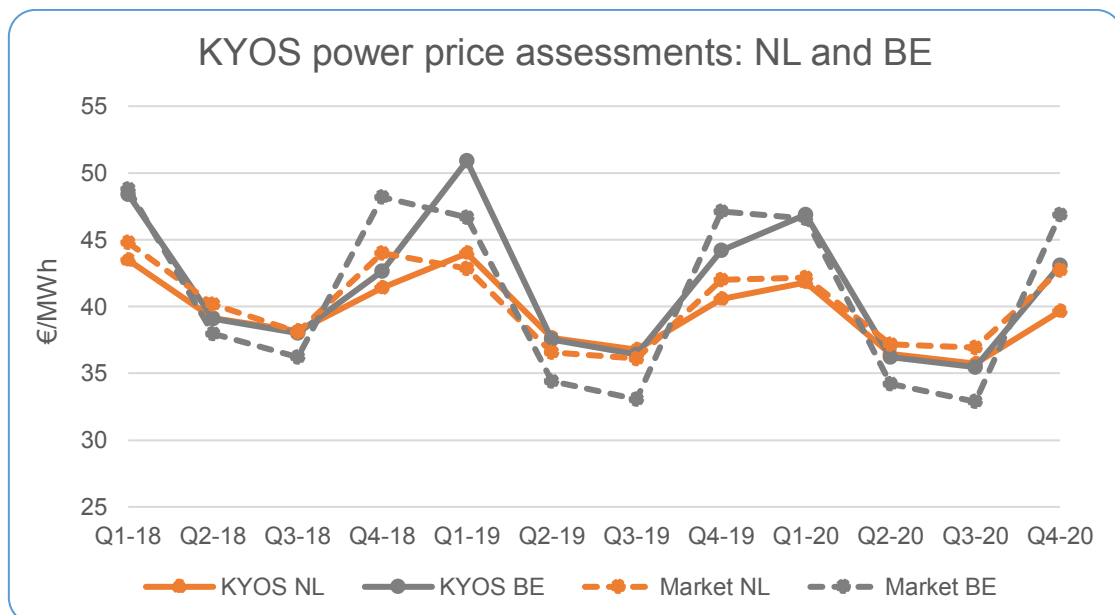
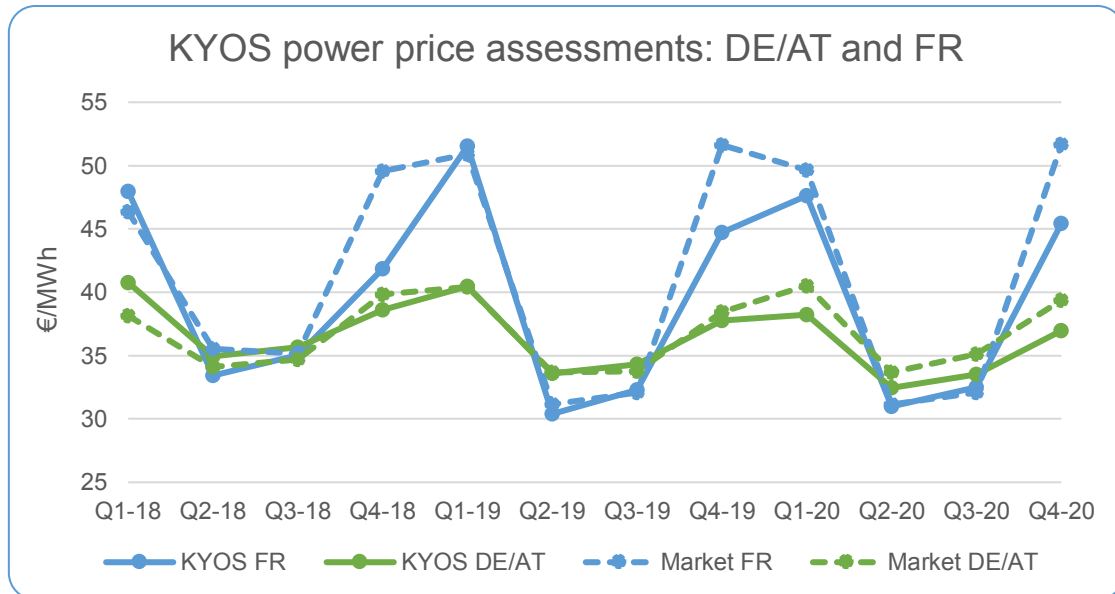


KYOS Fundamental Power Market Analysis

Power price assessments:



Remarks

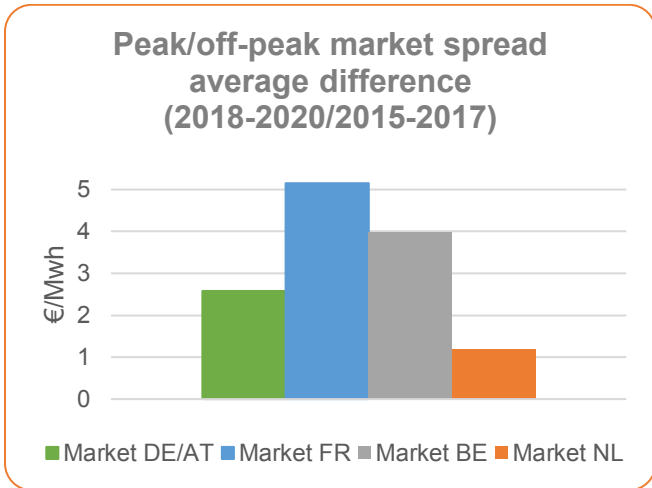
The trading date of the analysis is 5 January 2018. End-of-day closing prices from the relevant exchanges were used for all market prices.

The KYOS power price assessments have been calculated with the fundamental power market model, [KyPF](#). This model allows for a very detailed hourly optimization of all individual power plants in the market, including gas, coal, lignite, nuclear and hydro power stations. The true flexibility of the assets is captured, optimizing between minimum and maximum load, using efficiency curves, and taking into account start costs. This leads to a very realistic behavior of the individual power plants, very close to real market behavior. The model also optimizes the interconnection flows between the countries.

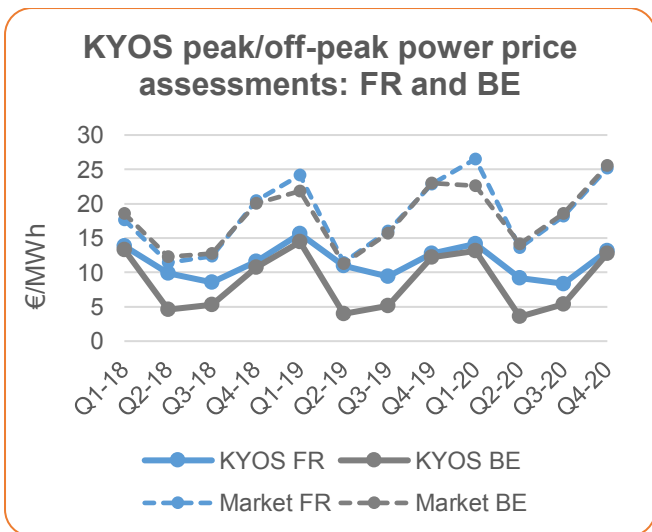
Case Study: France

Is winter coming in France?

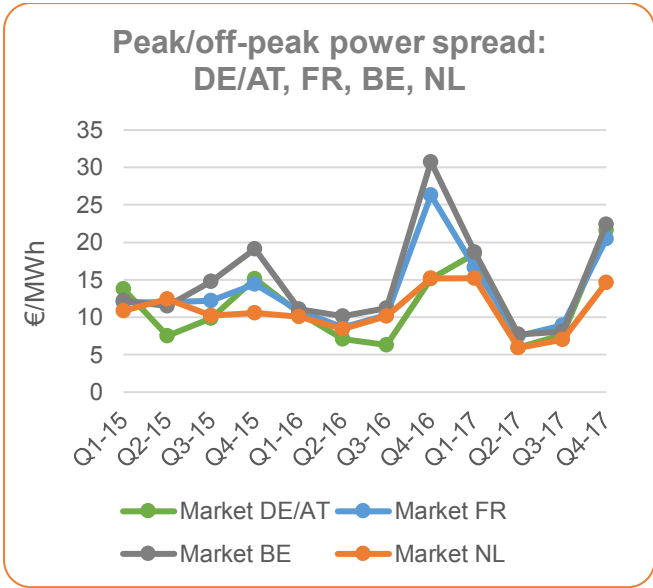
After comparing historical and forward curves in the market, we noticed a considerable change from France's past (2015-2017) and its potentially grimmer future (2018-2020). Peak prices are undeniably higher in the coming years and measuring the price gap between peak and off-peak hours shows this crystal-clearly.



The KYOS fundamental model also helps to predict the future and it finds a much lower peak/off-peak spread for France than what the market expects. In fact, the fundamental model is showing future spreads similar to France's less volatile past.

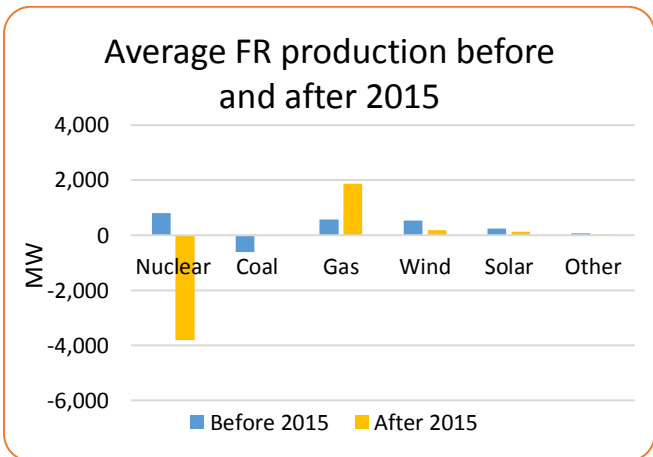


After examining historical and future market data, against our fundamental model, the French and Belgium markets seem to be overestimating the peak/off-peak spread for the near term, causing noticeable differences.



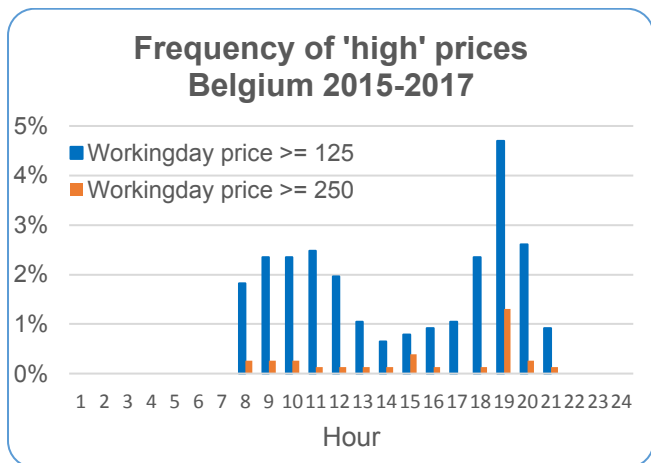
The evidently larger spreads in the future beg the question of why and when exactly peak prices increase and possibly become extreme? Historic peak/off-peak spreads in the market show spikes in France towards the ends of 2016 and on to 2017, comparable to levels seen in the future.

However, one winter quarter is seemingly dictating trends for the next three years.

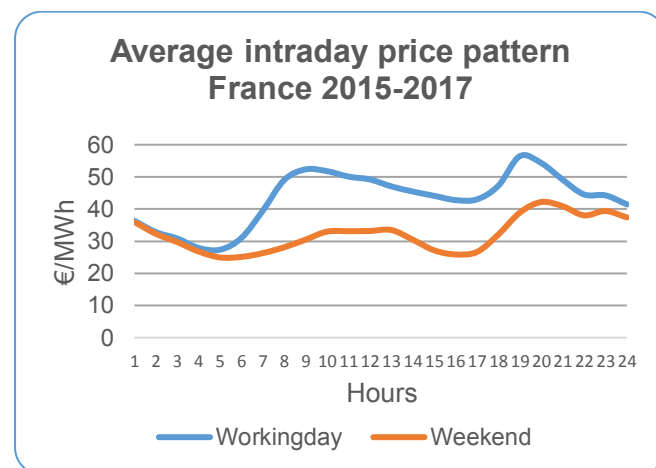
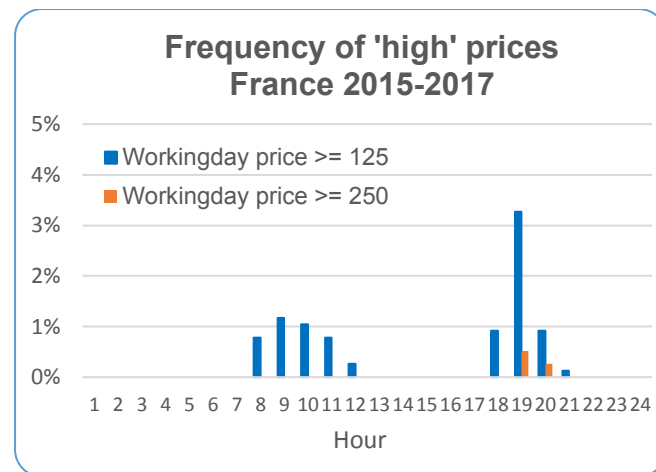
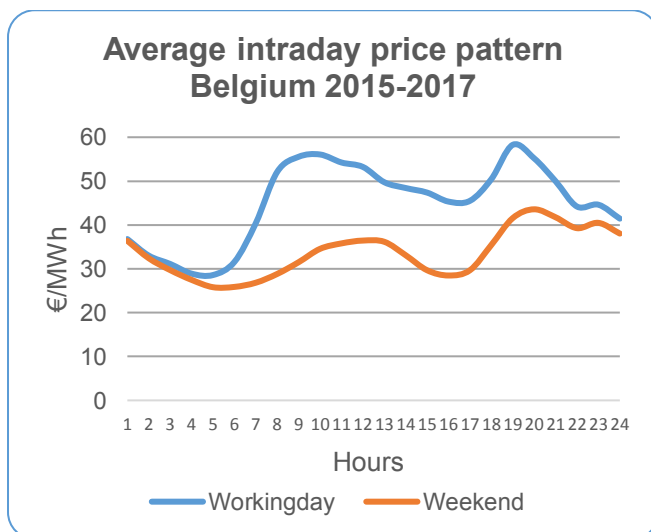


France's nuclear production is one piece of the puzzle. The graph compares average production from two years before 2015 (2013/14) to two years after (2016/17). Peak price spreads in the last quarter of 2016 coincide with obvious French nuclear shortages. Belgium is a particularly sensitive market to France's, and anticipated production constraints could be influencing future price patterns.

Magnified further, a closer look into hourly price and intraday levels further reveals the likelihood of extreme prices. The fundamental model may slightly underestimate the correct level of peak prices (“very” extreme prices are difficult to obtain), but our historical analysis shows if prices are high, they occur virtually always in peak hours.



The graphs for Belgium and France display only the last morning off-peak hour (7:00-8:00) and first evening off-peak hour (20:00-21:00) have a small probability of being very high. But those historical frequencies are much lower than peak hours, especially the hour from 18:00 to 19:00.



Putting your French fears aside...

Compared with historical spot prices, and with fundamentally derived price forecasts, the peak/off-peak forward spread is very high in France and Belgium.

Using 'normal' market conditions with no significant production shortages, the spreads are hard to justify. Instead, they are a result of a risk premium or probability analysis, where market players are afraid that prices in several peak hours spike to levels of 250, 500 or even 1,000 €/MWh.

Apparently, the market is fearfully anticipating high peak prices. We believe it is probably overcompensating for what may come, and as a result, exaggerating future peak prices for an extended period of time.

For more information about the analysis, please contact us on info@kyos.com.