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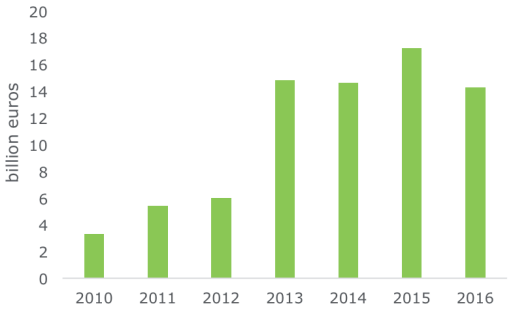
Profitability of gas-fired power plants in Europe: is the storm behind us?

1. Evidence of the recent struggles

The current decade has witnessed a trend of decreasing profitability of many European gas-fired power plants. Several utilities decided to shutdown, either definitely (decommissioning) or temporarily (mothballing), a number of gas-fired plants. This trend was especially pronounced over the years 2012 to 2014, where a number of major European utilities announced their decisions to **mothball or shut down more than 50 gas-fired power plants amounting to a cumulative capacity of almost 9 GW**[1]. These decisions came at a significant financial cost, estimated at more than 6 billion euros[2] in 2013 alone.

Following the aforementioned decisions and the poor prospects of profitability for gas-fired generation assets in the concerned period, most European utilities have suffered from write downs as shown in Figure 1 below. Between 2012 and 2015, the average level of impairments related to generation assets was higher than 12 billion euros per year. While these impairments[3] cannot be entirely attributed to the loss of profitability of gas-fired plants, this was certainly a key contributor.

Fig. 1 Generation assets-related impairments of European utilities



Source: based on financial statements released by a panel of 16 European utilities[4]

2. Story of a 'perfect storm'

2.1 Flattening electricity demand

The struggles that European utilities have experienced regarding their thermal generation assets, especially gas-fired plants are the consequence of a combination of events which led to a 'perfect storm'. One of the most noticeable reason behind the loss of profitability of gas-fired plants since 2010 is the levelling off of electricity demand in most European countries. Indeed, the financial and economic crisis of 2008 markedly dampened electricity consumption in Europe. For instance, in France, the UK, Germany, Italy and Spain, which are among the largest electricity consumers in Europe, aggregate electricity consumption has been flat or even decreasing since 2008 (see Figure 2). It is also worth noting that, a few years after the crisis, electricity consumption started to decouple from economic growth[5], which explains the persistent flat trend, even ten years after the crisis.

This situation, was further exacerbated by the rapid development of renewable energy sources (RES) fostered by different support schemes implemented all over Europe. As illustrated in Figure 3, while electricity consumption was flattening (or declining), installed wind (both onshore and offshore) capacity more than tripled between 2006 and 2016. At the same time, solar PV capacity, which was almost inexistent back in 2006, grew to reach more than 100 GW in 2016. Due to their zero marginal cost of production, the penetration of RES directly affects the profitability of thermal plants as it creates the so-called 'merit-order' effect by reducing electricity prices (previously marginal plants become extramarginal and a lower cost technology sets the price).

In addition, from an investor's perspective, these generation assets were also perceived as an attractive investment opportunity in the late 1990's and 2000's[6]. **Between 2000 and 2010, investments in Combined-Cycle Gas Turbines (CCGT) amounted to more than 175 GW[7] in Europe**.

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1 Caldecott et al. (2014).
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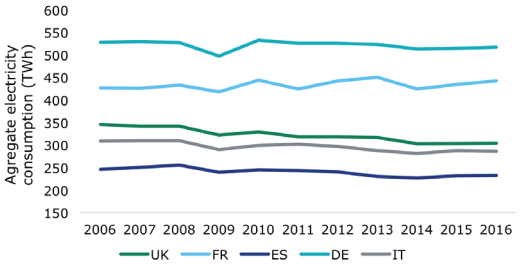
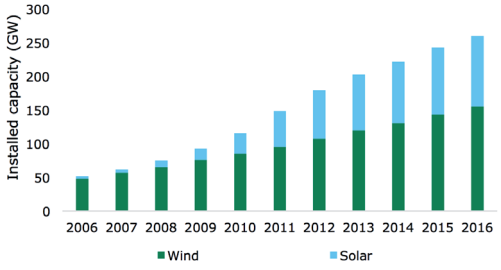
3 The impairments were also driven by other thermal generation assets such as coal which were impacted by some countries willingness to tighten environmental restrictions.
4 The panel includes the following utilities: Centrica, CEZ, E.ON, EDF, Enel, Energias de Portugal, Engie, Fortum, Gas Natural, Iberdrola, RWE, SSE, Suez Environnement, Vattenfall, Veolia and Verbund.
5 For more details, see for instance: https://ec.europa.eu/info/news/new-energy-market-reports-show-surge-wind-energy-2018-mar-26_en
6 Gas prices were low during the 1990s and, in the early 2000s, the announcement of the introduction of the EU-ETS, provided high hopes to investors. These hopes were reinforced in 2002 with Germany's first attempt of nuclear phase-out (as market participants expected power demand to grow).
7 RTE (2014).

Fig. 2 Historic electricity consumption in a selection of European countries



Source: Eurostat (2018)

Fig. 3 Evolution of RES installed capacity (Wind and Solar) in Europe



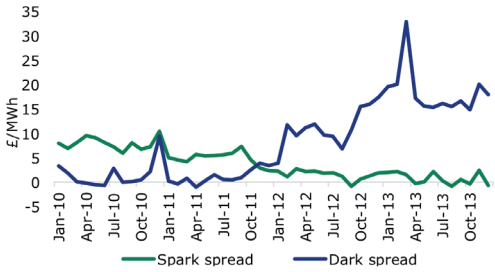
Source: IRENA (2018)

European utilities (as did most market observers) falsely anticipated the magnitude of these factors at the time of their investment decisions. This combination of these factors alone, would have created difficult economic conditions but some other trends worsened the situation even further.

2.2 Switch of competitiveness between gas-fired and coal-fired plants

While the stagnant trend of aggregate electricity demand and the massive integration of RES impacted all thermal plants, another factor contributed to degrade even more the profitability of gas-fired plants in particular. Around 2011, the merit-order between gas and coal-fired plants switched to the advantage of the latter. The example of the UK is particularly telling in this regard. Figure 4 below illustrates the clean spark and dark spreads[8] in the UK over the years 2010 to 2013. The switch in competitiveness between the two technologies occurred in the third quarter of 2011 driven by a plummeting global coal prices and low carbon prices in the EU-ETS (emissions trading scheme).

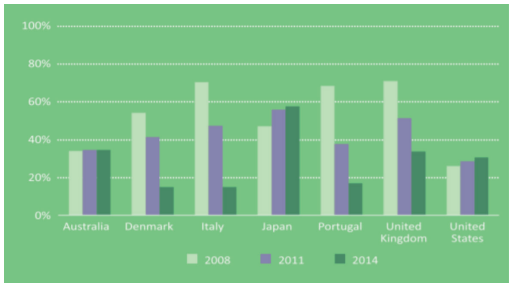
Fig. 4 Clean Spark and Dark Spreads in UK



Source: OFGEM (2018)

To better illustrate the precarious situation of gas-fired plants from 2010 to 2014 in Europe, a relevant indicator is the capacity factor of these assets. Figure 5 shows the evolution of the capacity factors for gas-fired plants in a selection of countries including Italy, the UK and Portugal. In these three countries, **the average capacity factor for gas dropped from about 70% in 2008 to less than 40% in 2014 in the UK, and less than 20% in Italy and Portugal**.

Figure 5. Evolution of capacity factors of gas-fired power plants



Source: IAE (2017)

3. Is the storm over?

While it is undisputable that gas-fired generation assets have suffered from a particularly difficult combination of factors between 2010 and 2016, **the most recent developments in electricity generation and global gas markets may suggest hope of a brighter future.** Indeed, because of the transition towards a more aggressive carbon pricing strategy[9] and a significant increase in coal prices[10], natural gas is starting to regain its competitiveness vis-à-vis coal. As a result, electricity generation in Europe from gas increased by almost 30%[11] between 2015 and 2017.

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8 The clean spark spread is defined as the margin of a gas plant from selling one MWh of electricity (difference between the price of electricity and variable generation costs, including CO_2 price). Respectively, the clean dark spread corresponds to the margin of a coal plant form selling one MWh of electricity.

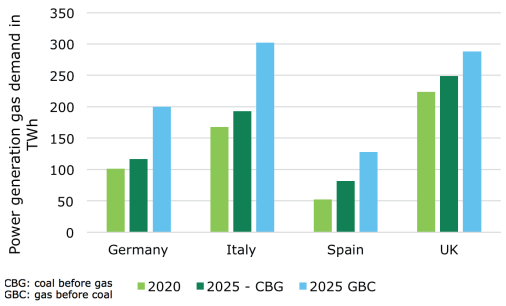
9 For instance in France, the carbon taxed decided to increase the carbon tax to 100 €/tCO_2 by 2030 (compared to 7 €/tCO_2 back in 2014). Similarly, the UK introduced a carbon price floor in 2013 to provide a stronger incentive for investments in low carbon technologies.
For more details, see: ***https://www.ecologique-solidaire.gouv.fr/fiscalite-carbone, http://researchbriefings.parliament.uk/ResearchBriefing/Summary/SN05927***

10 International coal prices almost doubled around July 2016, reaching a 4-year high of 100 $/t. For more details, see: ***https://knoema.fr/xfakeuc/coal-prices-forecast-long-term-2017-to-2030-data-and-charts***

11 Agora and Sandbag (2018).

In addition, gas demand for power generation is expected to grow in Europe in the medium term as highlighted by the EU gas and power TSO bodies (ENTSO-G[12] an ENTSO-E[13] respectively). In their most recent Ten Year Development Network Plan (TYNDP) report, ENTSO-G and ENTSO-E indicate that **power generation demand for gas could rise by more than 70% between 2020 and 2025**[14] **if the merit-order between gas and coal switches back to the advantage of gas**. Figure 6 shows gas demand forecast for power generation for different scenarios of coal/gas merit-order. Even in the coal before gas scenario, demand for gas is still expected to grow by 2025, especially in Italy Spain and the UK. This expected trend of increased gas demand for electricity generation in Europe is also stressed in the latest World Energy Outlook[15] (WEO).

Figure 6. Forecast scenarios for power generation gas demand



Source: Platts (2018)

Relative fuel price movements depend on a large number of drivers and uncertainties. **The global gas market is currently undergoing a significant shift towards LNG with a large-scale expansion in LNG export capacity underway in the United States and Australia (and a few others)**. The first wave of new facilities has already come online with further additions due to become operational in the next five years. **This development has tended to depress gas prices but in 2017 Chinese LNG imports skyrocketed and other Asian countries also showed growing appetite for LNG – whether the global gas market will be long or short in the next few years thus depends ultimately on how quickly Asian gas imports increase**. Coal prices are currently at levels above marginal costs in the international market mostly due to Chinese coal production control policies (which have increased Chinese coal imports and lifted international prices). Chinese policy makers have repeatedly stated their discontent of the effect their policies have with respect to creating windfall profits outside China. **A policy change to disadvantage imported coal vis-à-vis domestic coal is on the cards and that could trigger a downward correction in coal prices.**

4. Conclusion

In conclusion, the struggles experienced by gas-fired generation assets during the years 2010 to 2016 were the consequences of a conjectural combination of unanticipated events. The stagnation of electricity demand following the economic crisis of 2008, the rapid penetration of RES, a drop in coal prices alongside a weak carbon price all contributed to creating particularly difficult economic conditions for gas-fired plants. As a result, many utilities decided to decommission their plants or to shut them down temporarily. However, **in light of the most recent forecasts regarding gas demand for power generation and the dynamics in global gas markets, the future seems to look brighter for these generation assets**.

Furthermore, regardless of pure economic considerations, gas is a relatively clean and flexible source of power generation and can thus play an important role in decarbonizing power generation. Europe still relies to a large degree on CO_2 intensive coal and lignite plants. If the targets of the 2030 Framework[16] for Energy and Climate of the EU is to be achieved, these plants will certainly need to be gradually decommissioned[17]. Renewables though increasing rapidly are unlikely to fully fill the gap.

Finally, while it is clear that gas-fired generation will play an important role in the ongoing energy transition, many stakeholders have questioned the ability of energy-only markets[18] to properly remunerate generation capacity (especially gas plants) and provide efficient long-term incentives for investments[19]. This concern has led some countries to adapt their market designs consequently by implementing so called 'capacity mechanisms', which are an additional source of income for generation assets.

Power generation demand for gas could rise by more than 70% between 2020 and 2025 if the merit-order between gas and coal switches back to the advantage of gas.

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12 European Network of Transmission System Operators for gas.
13 European Network of Transmission System Operators for electricity.
14 Platts (2018).
15 IEA and OECD (2017). World Energy Outlook 2017.
16 For more details, see: ***https://ec.europa.eu/clima/policies/strategies/2030_en***
17 In that same logic, another positive stimulus for gas-fired plants could come from ageing nuclear fleet in Europe. Indeed, gas could play an important role when nuclear plants will be decommissioned.
18 In reference to markets in which generation capacity is remunerated solely based on the energy it produces and sell (and other ancillary services).
19 See for instance:
https://www.sciencedirect.com/science/article/pii/S0301421515302500
https://www.sciencedirect.com/science/article/pii/S0301421517306316

5. References

Agora and Sanddag (2018). The European Power Sector in 2017. Available at:
https://sandbag.org.uk/wp-content/uploads/2018/01/EU-power-sector-report-2017.pdf

Caldecott, B., Tilbury, J., Carey, C., (2014). Stranded generation assets: Implications for European capacity mechanisms, energy markets and climate policy. Available at:
http://www.smithschool.ox.ac.uk/research/sustainable-finance/publications/Stranded-Generation-Assets.pdf

Eurostat (2018). Electricity and heat statistics in Europe. Available at:
http://ec.europa.eu/eurostat/statistics-explained/index.php/Electricity_and_heat_statistics

IAE (2017). Tracking Clean Energy progress. Available at:
https://www.iea.org/publications/freepublications/publication/TrackingCleanEnergyProgress2017.pdf

IEA and OECD (2017). World Energy Outlook 2017. Available at:
https://www.iea.org/weo2017/

IRENA (2018). IRENA's data and statistics website. Available at:
http://resourceirena.irena.org/gateway/dashboard/

OFGEM (2018). OFGEM's website. Available at:
https://www.ofgem.gov.uk/data-portal/spark-and-dark-spreads-gb

Platts (2018). Power in Europe, Issue 771.

RTE (2014). Mécanisme de capacité : rapport d'accompagnement de la proposition de règles. Available at:
http://www.rte-france.com/sites/default/files/20140410-mecanisme-capacite.pdf