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THE EUROPEAN CARBON MARKET: THE IMPACT OF HIGHER CARBON PRICES ON UTILITIES AND INDUSTRIES



By Philipp Ruf and Matteo Mazzoni

MARKET INSIGHT

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OVERVIEW

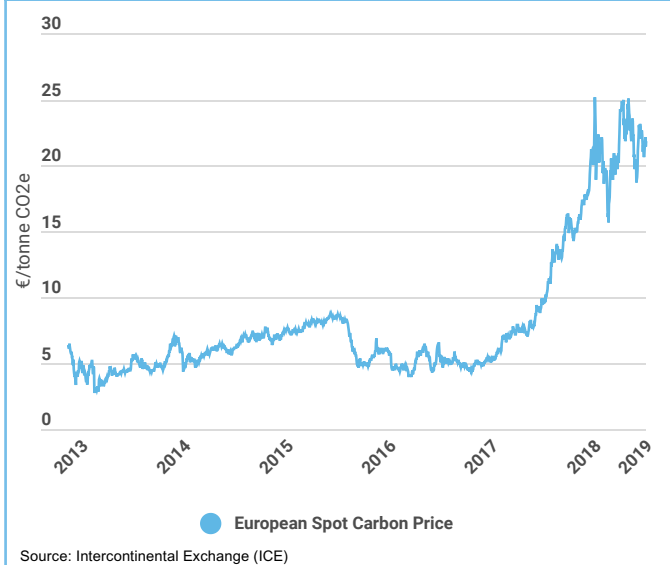
As the EU ETS has experienced double-digit prices for the first time since 2011, this Market Insight explores whether the increasing carbon prices have been high enough to reduce emissions in 2018 compared with 2017 levels. Furthermore, starting from 2018 developments, the Insight outlines the likely developments of carbon prices in the next five years, presenting the ICIS long-term forecast for European carbon prices and the effects these developments would have on the compliance sectors. In detail, we will speak about the effect on power markets in Germany, France, the United Kingdom, Italy, Spain and Poland.

At the time of writing, it was still unclear whether the UK would be part of the EU ETS for the compliance year 2019 and beyond. This report assumes that the UK will remain a participant of the EU ETS in Phase 3 (2013-2020) and will leave the EU ETS thereafter.

With two major reforms being passed by European legislators in 2015 (Market Stability Reserve, or MSR) and 2018 (post-2020 reform), carbon prices have experienced significant increases since mid-2017. Price developments are depicted in Figure 1, and further explanation of the reforms can be found in two Infoboxes in this Market Insight. These price increases materialised even though the MSR did not come into effect until January 2019 and the post-2020 reform will not take effect until 2021.

Nevertheless, market participants anticipated increased scarcity in the EU ETS and changed their strategies accordingly to mitigate potential risks or to speculate on likely price increases. The financial market also has

FIG 1: PRICE DEVELOPMENT IN THE EU ETS SINCE JANUARY 2013



become active in the EU ETS since mid-2017. With the financial sector anticipating fundamentals developments, additional demand entered the system.

2018 EMISSIONS: EUROPE IS DECARBONISING

While the pace of growth of global energy consumption and CO₂ emissions does not seem to have stopped yet, the European Union recorded a decline in emissions in 2018 in sectors covered by the EU ETS. After the 2017 plateau, the downward trend that began in 2013 got back on track last year: emissions in the EU ETS fell by 3.5% in 2018 from 2017 levels.

This emission decline occurred even though the economy kept growing in 2018 – the EU28 GDP was up by 1.8% that

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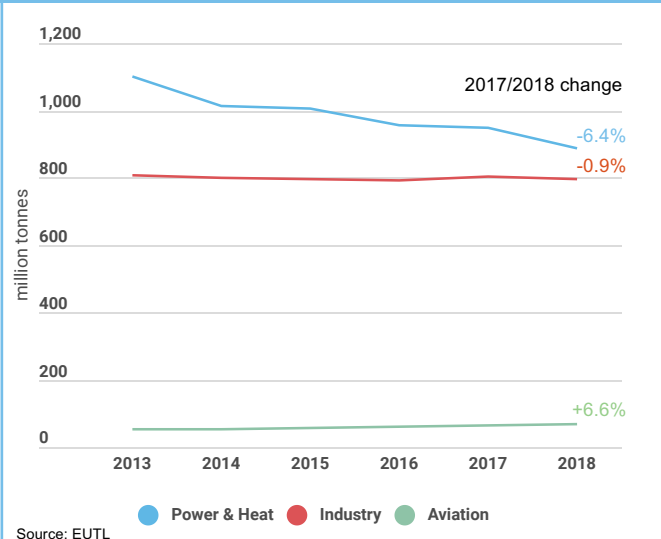
year, according to the latest figures provided by the European Commission in February 2019. Once again, economic activity and CO₂ emissions in energy-intensive sectors in Europe decoupled, as had happened in 2012-2014.

If only considering stationary installations, thus excluding aviation, the decline is even more pronounced: emissions from energy-intensive industry and power generators fell by 3.9%, while aviation does not show any sign of a slowdown.

By looking at the dynamic of the three macro sectors – power generation, industries and aviation – it becomes evident that the emission declines in the power sector are the decisive factor behind the overall reduction. Last year alone, emissions from power generation fell by 6.4%, extending a downward trend that began in 2010. Preliminary data indicate that industrial sectors also recorded a fall in emissions last year. Compared to the power sector the decline was marginal, at 0.9%.

In the next paragraphs we will elaborate on whether the considerably increasing carbon price – from €7.00/tonne of CO₂ equivalent (tCO₂e) in January 2018 to €25.50/tCO₂e at the end of December 2018 – was the driving factor behind the emission declines.

FIG 2: EU ETS EMISSIONS, 2013-2018

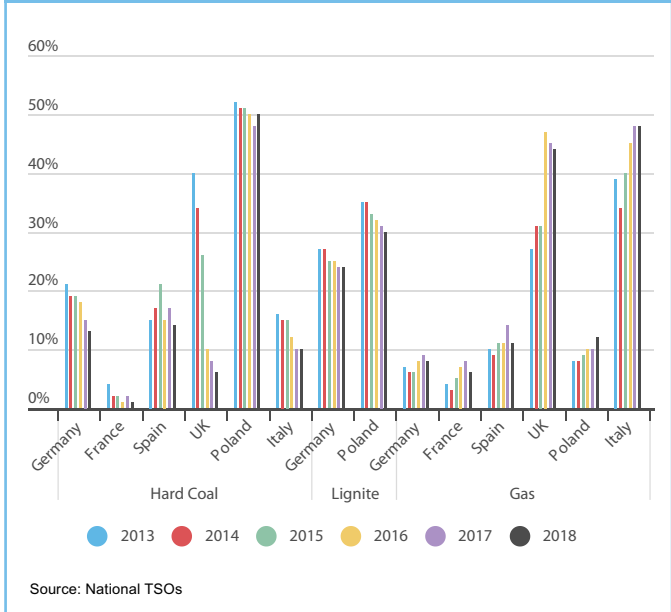


IS THE EU ETS DECARBONISING THE EUROPEAN POWER SECTOR?

When diving more into the details of the power sector, it becomes apparent that the carbon price played only a small role in the emission declines. Looking at the fossil power generation in Figure 3, we can spot three major trends since 2013:

- **Lignite generation:** lignite production in both Germany and Poland has progressively fallen during the past six years

FIG 3: SHARE OF CONVENTIONAL THERMAL GENERATION IN THE SIX BIGGEST EU POWER MARKETS



- **Hard coal generation:** similar downward trend for hard coal, with the exception of Poland in 2018, across all six power markets analysed

- **Gas generation:** a rise in gas generation in all markets between 2015 and 2016 which stopped in Germany, the UK, France and Spain in 2018

It becomes apparent that the trend of reduced fossil power generation, down by 6% in the six largest power markets in Europe, has not been triggered or intensified by higher CO₂ prices, but rather is a continuation of existing, longer-lasting dynamics. Also, if higher carbon prices had driven the reduction of lignite or hard coal generation, the analysed power markets would have seen a resulting rapid increase in natural gas generation. With the exception of the UK, which has a considerably higher carbon price due to the introduction of a carbon support price in 2013, there is no clear evidence of a coal-to-gas switch in power generation across the main European power markets.

The trends on the six power markets are, however, triggered by a continued increase in power generation from renewable sources, as seen in Figure 4. In 2018, the rise of renewables was especially significant in Germany and the UK, countries that have witnessed a massive deployment of wind capacity in recent years. This trend is due to continue in the coming years, thanks to renewables auctions planned in several member states. Italy seems to be the only exception, but this is due to the significant share of hydropower in the Italian electricity mix, which experienced a record high in 2014 but then saw a record low in 2017.

FIG 4: SHARE OF RENEWABLE GENERATION IN THE SIX BIGGEST EU POWER MARKETS

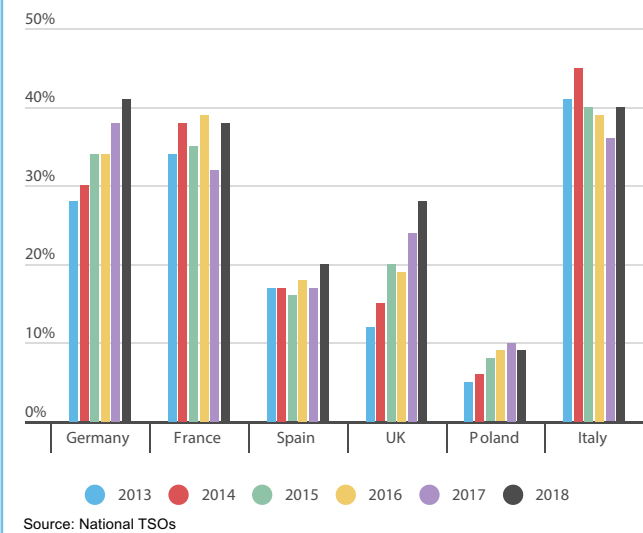
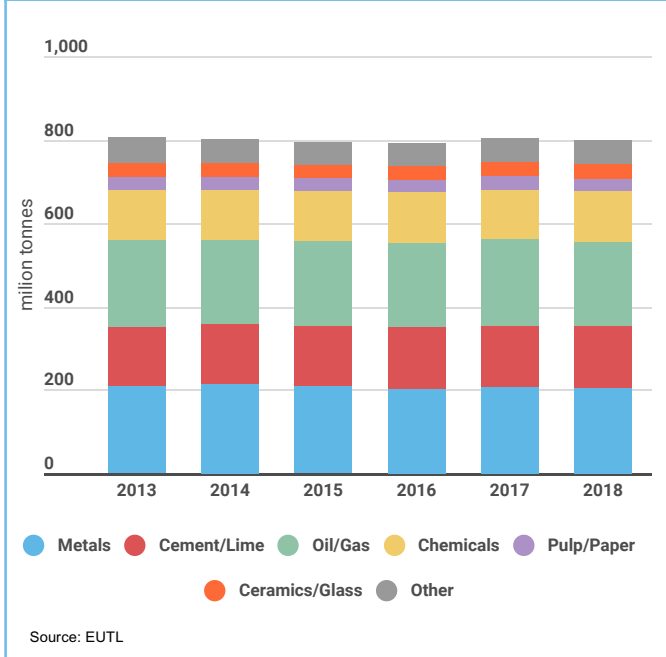


FIG 5: EMISSIONS IN MANUFACTURING SECTORS, 2013-2018



ARE INDUSTRIES DELIVERING EMISSION REDUCTIONS?

In the industrial sectors, the picture looks different. Unlike the power sector, manufacturing sectors have not been able to reduce their carbon emissions as rapidly as the power sector. Since the 2013 scope extension – when new sectors and gases were added – EU industries have decreased their emissions by an average 0.2% per year. In 2018, some sectors increased (cement and lime +1.5%, pulp and paper +0.1%, ceramics and glass 1.5%) while other decreased their emissions (metals -1.4%, oil & gas -2.1%, chemicals -1.7%, other -0.7%) compared to 2017.

Analysing the longer-term dynamics at a sectoral level, the chemicals, paper and pulp industries were the ones experiencing the highest reductions, with an average -0.8% per year, followed by the oil and gas industry and the metals industry, respectively -0.6% per year and -0.4% per year. Sectors linked to construction, heavily hit by the 2008 economic crisis, were less able to decouple

emissions from the higher production experienced in the last five years: the cement and lime industry witnessed an average 1.2% per year increase in emissions during the past five years, followed by ceramic and glass, with a 1.1% average yearly increase.

When looking in more detail at three single sectors – cement and lime, chemicals and metals – it emerges that the cement and lime industry has a higher positive correlation between production levels and emissions, while a decoupling between emissions and production in the chemicals and metal industries is visible.

Even though it is still premature to draw any conclusions, the chemicals and metals sector seems to a certain degree to have been able to respond to higher carbon prices in 2018 by lowering emission intensity, while the cement and lime sector was not able to react.

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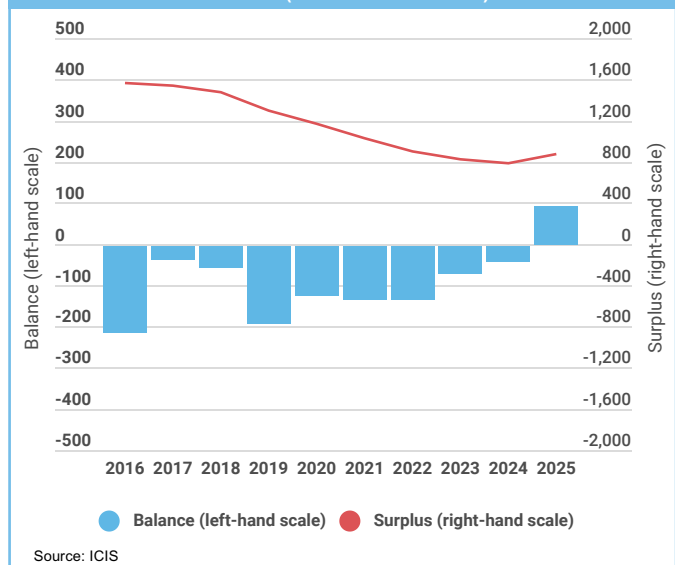
THE LONG-TERM VIEW: HOW CARBON PRICES WILL CHANGE EMISSION LEVELS

In the previous section, we explained how carbon prices affected 2018 emissions levels. In this section, we will outline the effects the two reforms – MSR implementation and post-2020 reform – have on the EU ETS and some European power markets.

The MSR is the key reform of the EU ETS, which introduces a supply-side reaction to the EU ETS. Starting from the current surplus, we expect the MSR to reduce auction volume by roughly 1,700m EUAs during 2019-2025. This means that supply worth one year of emissions from stationary installations will be placed in the MSR in just seven years. On a yearly basis, this means the MSR cuts on average 29% of the auctions, with the biggest effects from 2019-2021. Figure 6 shows the resulting auction volume in the blue bars and the MSR withdrawal in red.

This supply cut increases the scarcity in the EU ETS and will incentivise carbon reductions, as not enough allowances will be available to cover the demand. Based on today's fuel prices and today's regulations, we expect a cumulative negative market balance of 2,600m EUAs (excluding triggered emission abatement) during 2019-2025, which will drag the surplus down to as low as 780m EUAs in 2025 – details can be found in Figure 7. The

FIG 7: MARKET BALANCE (INCL: ABATEMENT) IN THE EU ETS



surplus will not go to zero, as we expect companies to hold allowances for risk management purposes, hedging and speculation. Consequently, even in a very scarce system we expect a surplus to materialise.

In contrast to the past, where low carbon prices were not able to incentivise large-scale emission reductions, we expect the above-described fundamentals will turn this upside down. Part of these necessary reductions will happen independently of the carbon price development as other political instruments like coal phase-out regulation, RES subsidies or energy efficiency policies trigger them. However, carbon prices will determine when and how quickly these new investments take place. The high carbon cost may in fact drive a coal-to-gas fuel switch in the power sector before the deadlines set by the different countries, renewables may reach market parity sooner than expected and investments in energy and carbon efficiency measure in the industrial sectors may show a higher rate of returns. In total, we expect that roughly 1,400m emissions will be reduced from 2019 to 2023, with increased pressure from 2021 onwards.

In the current setting, we expect carbon prices to go up to above €40.00/tCO₂e in 2023. While we have a conservative view on 2019 and 2020, due to currently low gas prices, we expect prices to tick up more quickly as of

FIG 6: MSR VOLUMES

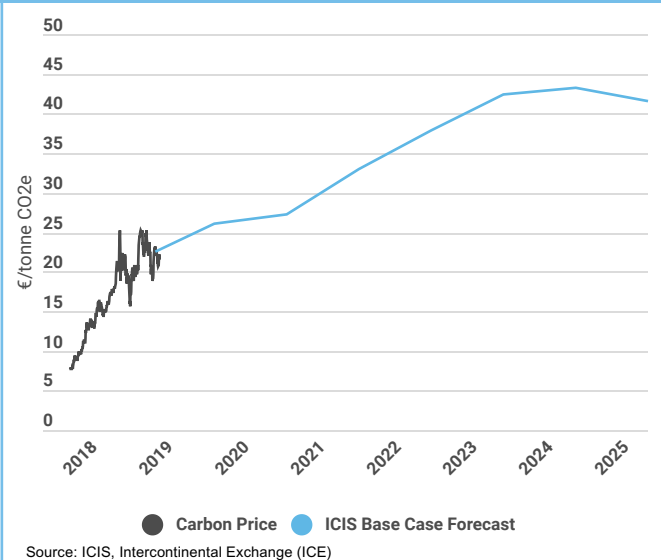


MSR

The MSR is a rule-based supply adjustment mechanism in the EU ETS that is designed to soak up historically built surplus and enhance the resilience of the EU ETS against external demand shocks in the future. The mechanism decreases or increases the auction volume over 12 months based on the quantification of the surplus of the system a year ago, the so-called total number of allowances in circulation (TNAC).

2021 and the start of phase 4. This view may change in case of significant front-running of compliance companies or higher gas prices, lifting our forecast in the early years. On the other hand, a “no-deal” Brexit would likely affect carbon prices in the short term, depressing our forecast for the years 2019 and 2020. The yearly forecast can be found in Figure 8.

FIG 8: EUA PRICE FORECAST



THE POWER SECTOR: THE EFFECT OF HIGHER CARBON AND THE EXPECTED FUEL SWITCH

Such carbon price increases will have an effect on the sectors regulated under the EU ETS. The power sector, which does not receive any free allocation, will feel the effects directly. The next section of this Market Insight will discuss in detail the effects on the six biggest markets in Europe.

Depending on fuel price developments, the sector will likely be suffering from deteriorating margins for lignite- and coal-fired generation, while gas-fired generation will gain a competitive advantage to coal- and lignite-fired generations. This is because gas-fired generation emits less CO₂ per MWh than coal- and lignite-fired generation.

In the past 10 years, a low carbon price did not have a direct effect on the relative variable cost of gas and coal, thus almost never being a driving factor for power generators. The realised and expected increases of CO₂ prices now call into question how much emissions utilities and conventional generators can actually abate by switching their generation from coal to gas.

In order to assess the switching rate between coal and

POST-2020 REFORM

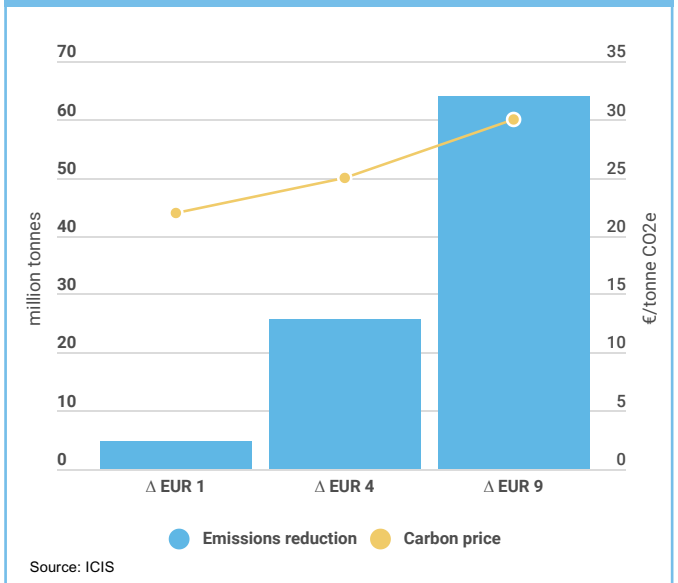
In the post-2020 reform, the legislators decided on the basic rules of the EU ETS in the fourth trading period (2021-2030). The system was adjusted to reflect the overall target to reach 43% emissions reductions in 2030 compared to 2005 in the EU ETS sectors, protect European industrials from carbon leakage, increase the ambition of the system and support the member states in their low carbon transition.

On ambition, the legislator increased the firepower of the MSR by doubling its intake rate for the first five years of its operation (2019-2023). On top, the legislator decided that as of 2023, a share of the allowances in the MSR are invalidated. On free allocation, the reforms was built to continue in general with free allocation, but the benchmark values, carbon leakage list and the production baselines are adjusted in order to reflect technological progress and economic development of the last years.

gas in Europe, we run different sensitivities using our pan-European power model, ICIS Power Horizon*, testing the response of generators. With this methodology, it is possible to simulate the response of carbon price changes across Europe. For this Market Insight, four sensitivities were calculated, keeping the price of gas and coal constant while considering four carbon prices: €21.00/tCO₂e, €22.00/tCO₂e, €25.00/tCO₂e and €30.00/tCO₂e.

The results show that a €1.00/tCO₂e increase in the price of carbon, from €21.00/tCO₂e to €22.00/tCO₂e,

FIG 9: EMISSION REDUCTIONS FROM A COAL-TO-GAS SWITCH IN THE SIX BIGGEST EU POWER MARKETS



*ICIS Power Horizon is a pan-European power price-forecasting tool that calculates power prices on an hourly basis taking into account regulatory and market developments. Learn more about [ICIS Power Horizon](#)

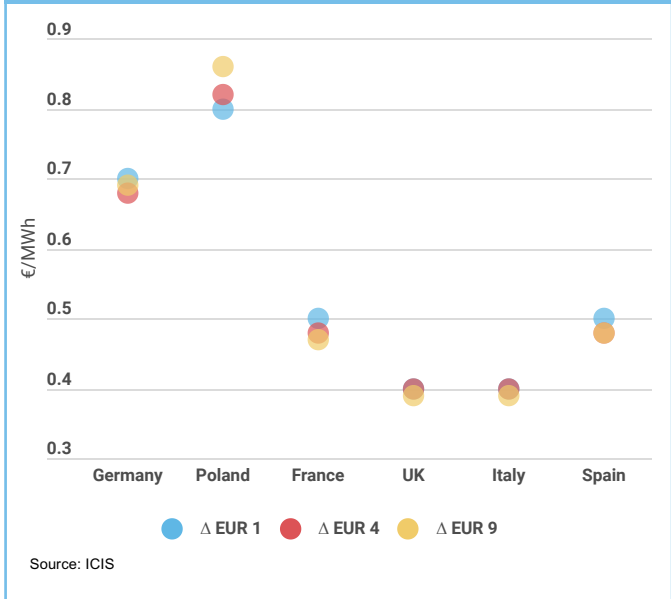
translates to a reduction of roughly 4.7m tonnes emissions in the main six European countries – Germany, France, UK, Italy, Spain and Poland. This equals 0.8% of the overall emissions coming from the power sector in these countries. The results of the sensitivity analysis can be found in Figure 9.

An increase in the price of carbon, keeping coal and gas prices constant, translates into higher costs for power generators. This inevitably affects the price of electricity on the wholesale market if fossil generation is the price setting generation type. Finally, the degree to which the price of electricity changes is related to the level of competition each power plant is facing in a particular hour (or quarter-hour in some cases).

As can be seen in Figure 10, the model results show that Poland, from the six examined countries, would see the highest increase in the price of electricity, with a pass-through cost of up to €0.86/MWh per €1.00/tCO₂e increase in the case carbon prices reached €30.00/tCO₂e. The UK and Italy would experience the least power price increases stemming from higher carbon prices, with a pass-through cost of €0.40/MWh per €1.00/tonne CO₂ increase.

As 2018 figures show, the fuel switch from coal- to gas-fired generation has yet to materialise, but this will ultimately happen in order to deliver the necessary abatement outlined before. According to our analysis, the power sector

FIG 10: CARBON PASS-THROUGH COSTS IN THE SIX BIGGEST EU POWER MARKETS



has currently only 130m tonnes of CO₂ abatement potential when fully utilising all idle or only partly running gas capacity in Europe to replace coal. This means that without additional investment in renewable power generation capacity or gas-fired power capacity, the power sector is not able to deliver the necessary CO₂ reductions. Below we summarise the effects of the higher carbon price on the six largest power markets in Europe.

Carbon prices have quadrupled.

What influence will this have on European power prices?

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Germany: Carbon to increase pressure on coal in the short run

In Germany, we expect power prices to increase from the current spot price levels around €35.00/MWh (early April 2019) to reach an average price of €45.00/MWh in 2019. This is only partly driven by carbon price increases, but also by other developments. Towards 2025, the model suggests that power prices will further increase to over €60.00/MWh alongside carbon price increases. Next to the carbon price, key drivers for this in Germany are the nuclear phase-out in 2023 as well as the likely reductions of lignite and hard coal capacity due to the Germany coal phase-out. Overall, we expect a reduction of lignite power generation by 34% and hard coal by 6%, while gas generation would pick up by 17% due to the increased competitiveness from higher carbon prices. At the same

time, power generation from renewable sources will strongly increase by over 35%.

France: The power lung in central western Europe

With its large portfolio of nuclear power plants, one might expect the French power market to not be significantly affected by carbon price developments. However, French power prices are closely linked with those of the partly fossil-based German power market. This means that we expect for the French market prices above €60.00/MWh as of 2023. We furthermore expect France to cement its status as a net exporter of electricity, exporting over 100TWh of electricity net as of 2023. On the fossil generation side, we do see gas-fired generation reducing by 20% from 2019 compared to 2025 while power generation from renewables will increase by roughly 45% in the same time period.

FIG 11: GERMAN POWER PRICE FORECAST

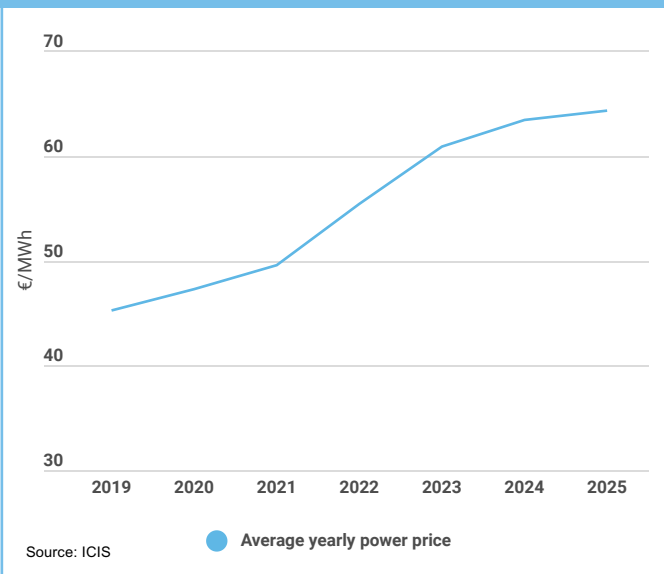


FIG 13: FRENCH POWER PRICE FORECAST

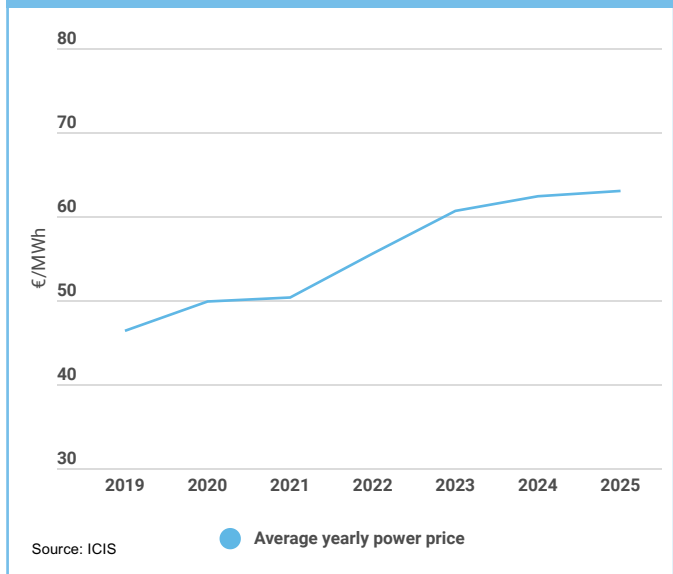


FIG 12: GERMAN POWER GENERATION

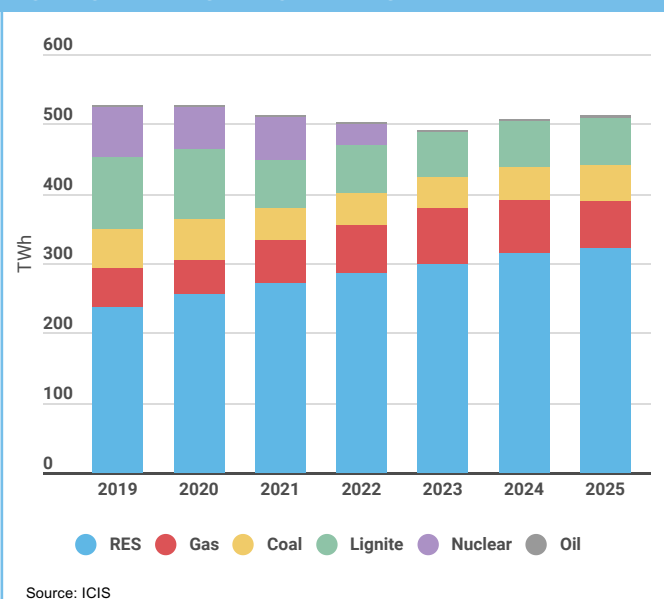
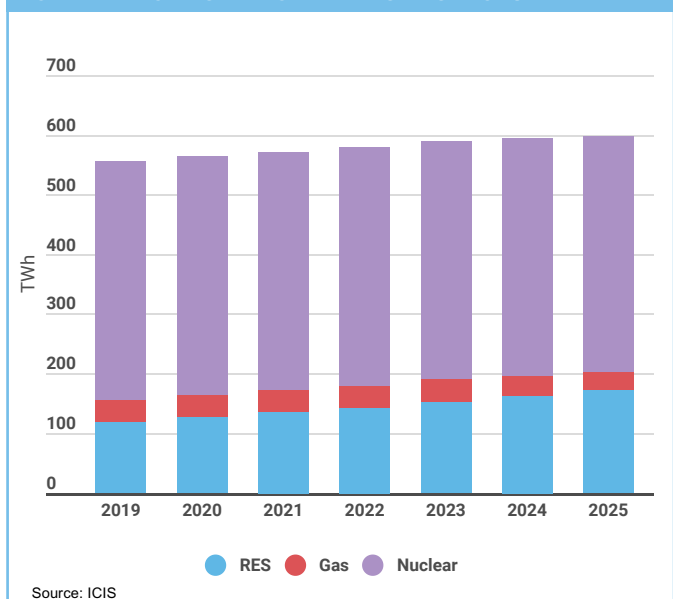


FIG 14: FRENCH POWER GENERATION FORECAST



UK: After Brexit, more electricity imported from Europe

In our analysis, we disregarded the short-term effects of a potential “no-deal” Brexit on the carbon and the power markets. For this analysis, we assumed a soft exit of the UK by leaving the European carbon market in 2021 and extending the carbon price by a system mirroring the European carbon prices. Overall, this would lead to higher power prices in the UK reaching levels above €70.00/MWh as of 2023. Most interestingly, our model results show that gas-fired generation in the UK would decrease, by roughly 61% from 2019 to 2025, even under high carbon prices. This is due to the additional carbon price floor in the UK. This means the UK would rather import power from the mainland than produce it domestically with gas-fired power plants. Although generation from renewable sources surges

from 2019 to 2025 by over 37%, overall UK domestic power generation would decrease by over 21% from 2019 to 2025, with imports increasing by over 200%.

Italy: Gas-fired capacity gains market share in mid-term

With more than half of its domestic electricity generation being gas-fired, Italian power prices are sensitive to carbon price changes. Consequently, we expect Italian power prices to reach levels above €70.00/MWh as of 2024, as gas-fired generation will become more expensive under a higher carbon price regime. While we expect Italy to produce overall nearly the same amount of electricity in 2025 compared with 2019, we expect an increase of imports from 45TWh in 2019 to more than 65TWh in 2025 thanks to the expansion of the interconnection capacity

FIG 15: UK POWER PRICE FORECAST

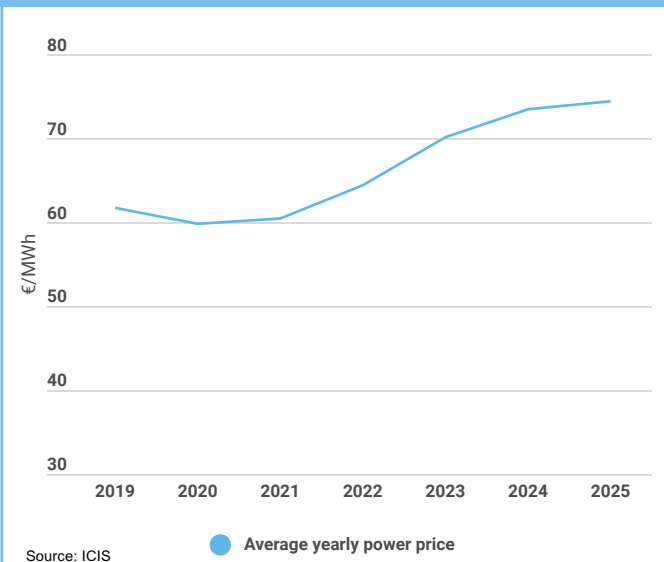


FIG 17: ITALIAN POWER PRICE FORECAST

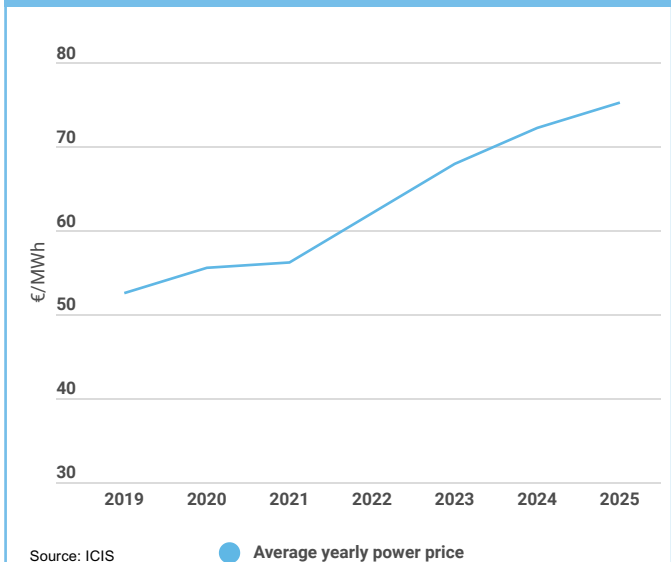


FIG 16: UK POWER GENERATION FORECAST

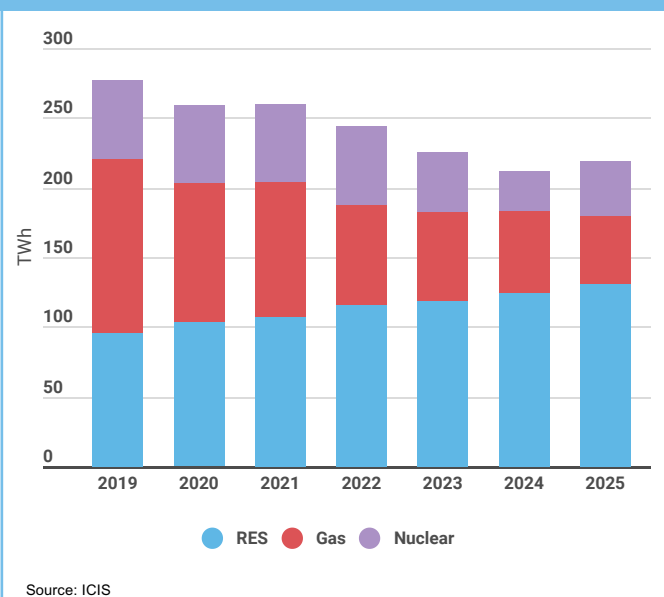
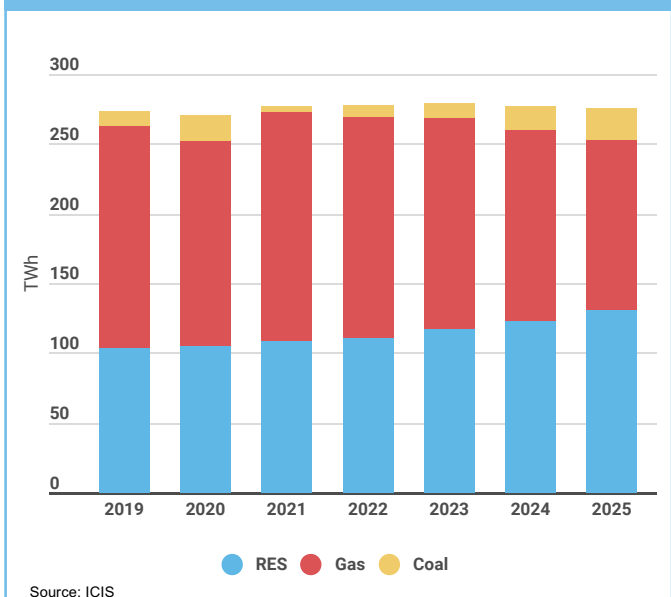


FIG 18: ITALIAN POWER GENERATION FORECAST



with external countries. In the same period, generation from renewable sources will increase by over 26% while gas generation will decrease by 23%.

Spain: Carbon likely anticipates phase-out of coal

With its overall low fossil power generation, Spain is nevertheless affected by higher carbon prices. According to our model results, Spanish power prices would increase to about €60.00/MWh on a yearly average in 2022 before reaching nearly €70.00/MWh as of 2024. On the generation side, we expect a fuel switch from gas to renewables to happen from 2019 to 2025, with gas generation decreasing by 36%, while renewable output increases by 30%. Although gas capacity is shrinking, gas will still be the price-setting technology in most hours in Spain and

consequently power prices increase although gas-fired power generation is decreasing.

Poland: Higher prices increase gas in generation mix

With its very large coal power plant fleet, the Polish power price is very sensitive to changes in the carbon price. During 2019-2025, our analysis suggests that Polish power prices would increase from slightly above €50.00/MWh to roughly €70.00/MWh. Given this carbon price development, Poland is the best example for a coal to gas fuel switch, with gas generation increasing its output by over 120% (15TWh) from 2019 to 2025 while coal reduces by 10% (6.5TWh) and lignite by 2% (1.4TWh). In the same years, renewables would increase their output by over 120% (22.6TWh).

FIG 19: SPANISH POWER PRICE FORECAST

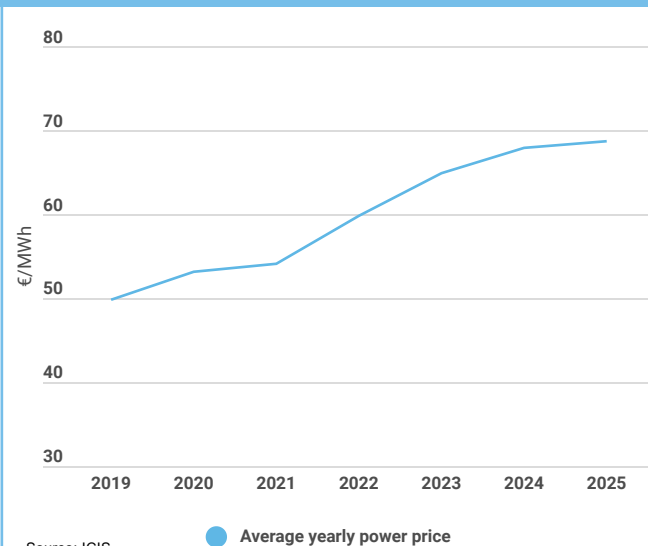


FIG 21: POLISH POWER PRICE FORECAST

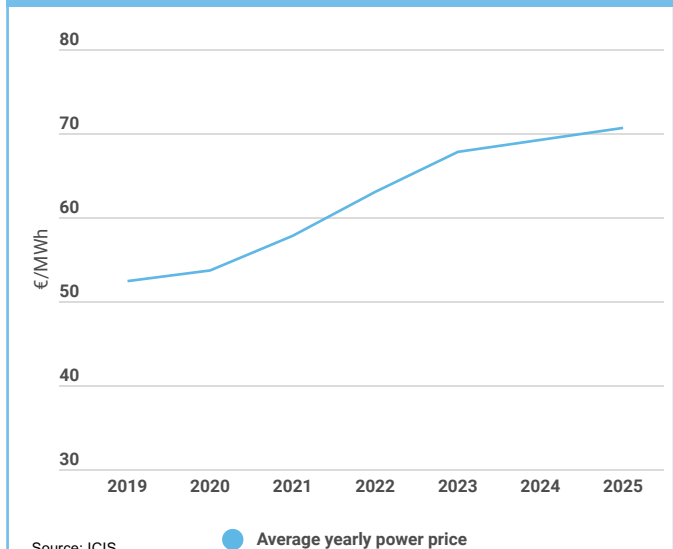


FIG 20: SPANISH POWER GENERATION FORECAST

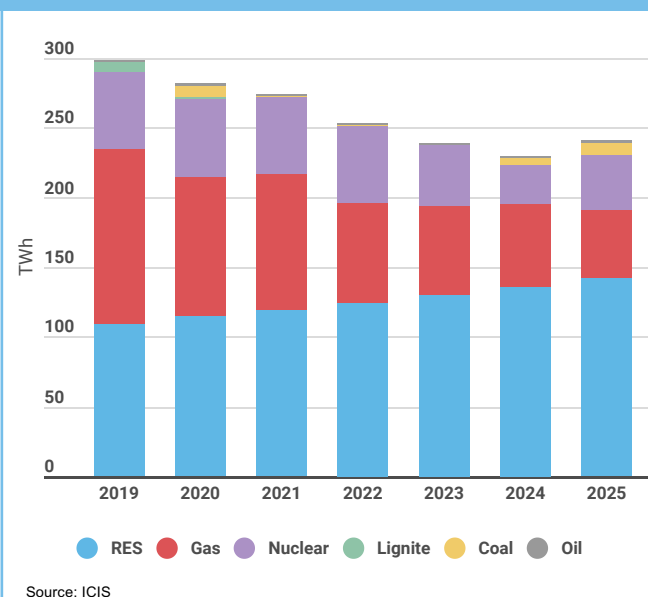
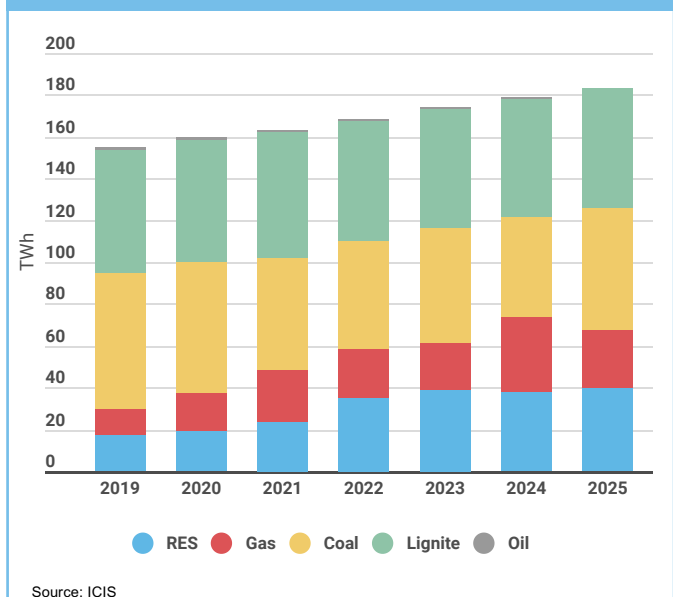


FIG 22: POLISH POWER GENERATION FORECAST



CONCLUSIONS: WHAT'S NEXT?

As outlined, 2018 emission levels have only been marginally influenced by the significantly increasing carbon prices to levels above €20/tCO₂e in 2018. Although fossil-based power generation decreased from 2017 to 2018, this trend has been seen since at least 2013 in the six largest power markets in Europe. The numbers also show that the main driver of this reduction in fossil output is linked to increased renewable generation displacing fossil generation.

However, thanks to the new reforms of the European carbon market, the increased scarcity of CO₂ allowances will make more and quicker carbon reductions necessary. This will lead, according to our analysis, to carbon prices of above €40.00/tCO₂e in the next five years. Consequently, all emitting sectors covered under the EU ETS will be subject to risks, but also opportunities.

Furthermore, the analysis shows that the power sector can only deliver parts of the necessary reduction with the existing and expected power generation capacity. Next to the effects on the carbon price, the utilisation of idle gas capacity and the reduction of lignite and hard coal-fired generation will have an impact on power prices in the whole of Europe. Fossil fuel-dependent countries like Poland or Germany will likely see higher power prices.

Overall, this means that investment in low carbon technologies – in the power and industrial sectors – will become more profitable, and possibly even sooner than expected. Such investments will also be inevitable in order to deliver the necessary reductions to reach the set targets.

We expect the power sector to continue to be the front-runner in this new wave of investments. Thanks to higher carbon prices and the falling cost of technologies, renewables may reach market parity in several markets in the next five years. Additionally, flexible gas-fired generation units will regain market share, with new investments that may be just around the corner.

Next to the developments in the power sector, and despite continuing to receive great parts of the allowances for free, higher prices and more stringent benchmarks will also push the industrial sectors covered under the scheme to look at long-term investments in cleaner production technologies and energy efficiency.

The role of national governments in managing this transition will be crucial. As higher carbon prices result in higher revenues from national carbon allowance auctions, providing additional support to finance the needed investments in the different sectors could be one possibility.

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