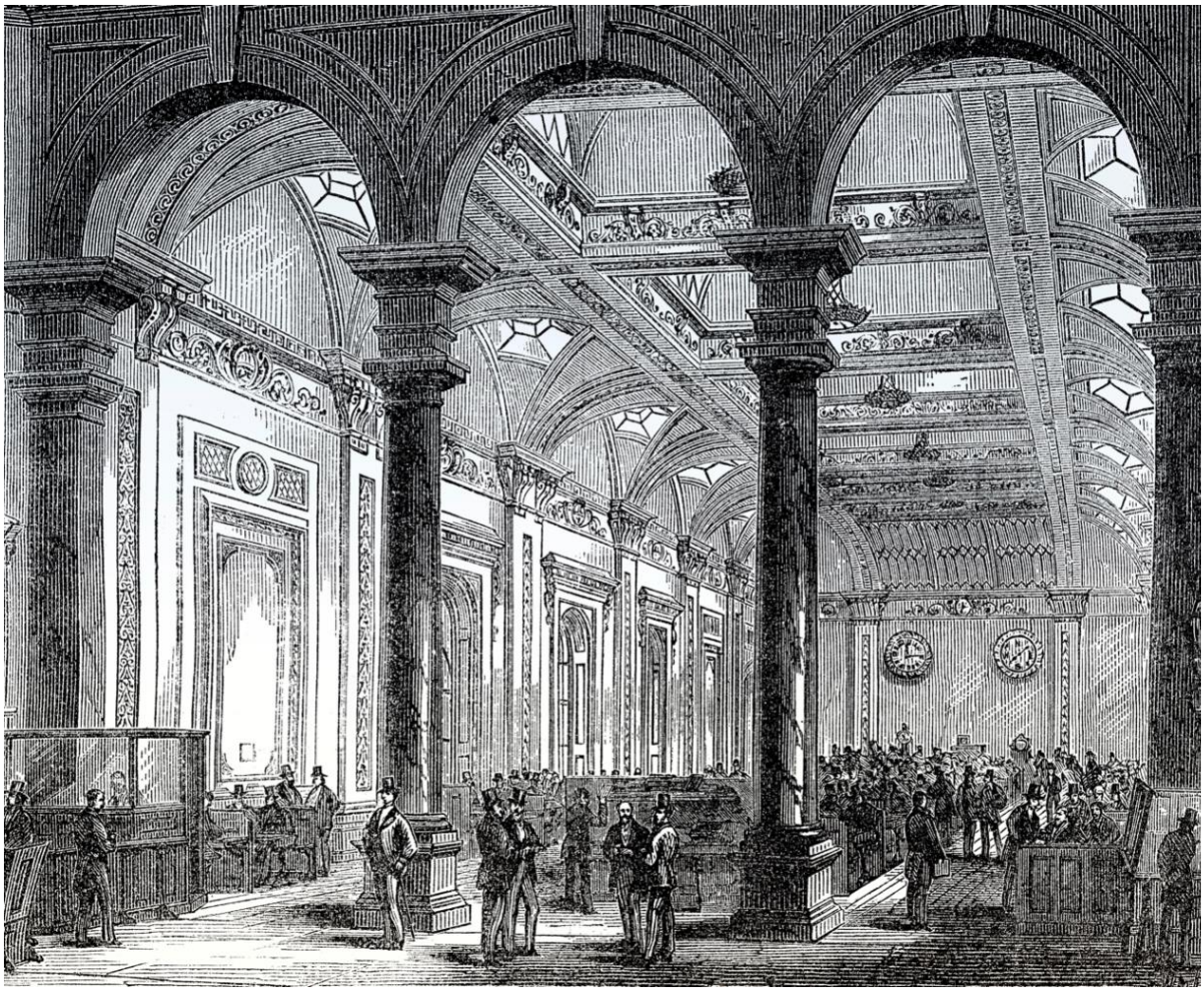
2019 State of the EU ETS Report



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This Paper has been the subject of stakeholder consultations, including a workshop convened by the authors with stakeholders including NGOs, think tanks, academia, policy makers, market participants and representatives of industry.

The European Roundtable on Climate Change and Sustainable Transition (ERCST) is an independent non-profit association based in Brussels, Belgium. It aims to provide a neutral space where policy-makers and regulators can meet stakeholders to discuss climate change policy and how to manage the transition to a low GHG-economy in a sustainable way. While focused on European climate policy, ERCST fully recognizes, and incorporates in its activities and thinking, the global dimension of climate change policy. Besides providing a place to meet, ERCST provides rigorous intellectual analysis in step with the EU and international political agenda, by using the experience and research input of its staff, and the input of the stakeholders who join its activities.

The Wegener Center for Climate and Global Change is an interdisciplinary, internationally oriented institute of the University of Graz, which serves as a core research center for pooling the competences of the University in the areas of climate change and the related issues in climate physics, meteorology, and economics. An evidence based approach to the transformation of energy systems, innovative analytical modeling concepts, and the design of energy and climate policies are focal points of current research activities.

ICIS is the world's largest petrochemical market information provider, with fast-growing energy and fertilizer divisions, delivering trusted pricing data, high-value news, analysis and independent consulting to enable customers to make better-informed trading and planning decisions.

I4CE is an initiative of Caisse des Dépôts and Agence Française de Développement. The Think Tank provides independent expertise and analysis when assessing economic issues relating to climate & energy policies in France and throughout the world. I4CE aims at helping public and private decision-makers to improve the way in which they understand, anticipate, and encourage the use of economic and financial resources aimed at promoting the transition to a low-carbon economy. I4CE benefits from a large network of partners.

The EcoAct Group is an international advisory consultancy and project developer that works with clients to meet the demands of the Paris Agreement. We offer solutions to large and complex multinational organizations for their sustainability challenges. We believe that climate change, energy management and sustainability are drivers of corporate performance and seek to address business or organizational problems and opportunities in an intelligent way. The EcoAct Group includes Alliantis, Carbon Clear and Climate Pal.

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Executive Summary

The EU Emissions Trading System (EU ETS) is important through its role as the "cornerstone" of EU climate change policy, as well as a "role model" and "pioneer" for other carbon markets. It is important that, in addition to the regulatory requirements, it is subjected to a thorough and independent review to discover if it delivers on explicit, and what have become "expected" objectives, as well as discover any issues that need to be better understood.

The EU ETS can be seen as being expected to deliver in a number of different areas: environmental targets in different timeframes, decarbonization in an economically efficient way, including protection against the risk of carbon leakage, and good market functioning and price discovery.

These deliverables should be analyzed in the broader context of global, EU, and EU Member States climate change policy, as the EU ETS does not exist in a vacuum. Indeed, the EU ETS needs to respond to changes in the regulatory environment, as well as to new scientific developments, as they will affect its ability to deliver on its explicit and expected objectives.

The recently adopted 'Clean Energy for All Europeans' package is one case in point, as it has important implications, including new targets for renewable energy sources and energy efficiency, that will contribute to additional CO2 reduction in sectors covered by the EU ETS. The same holds true for coal phase-outs, as discussions gain momentum in many EU Member States. Other EU climate legislation in the pipeline, such as the new EU long-term climate strategy, will also include elements that will leave their mark on the EU ETS, as well as possibly require future reviews and revisions.

Furthermore, 2018 was an important year for the international discussion on climate change, from the Paris Agreement Rulebook agreed at COP 24, to the IPCC Special Report on 1.5°C. As these discussions move forward, the EU ETS will need to respond to the regulatory implications which might follow.

The Report identifies several Key Performance Indicators (KPIs) which are used to assess the performance of the EU ETS in terms of its three deliveries.

With regard to environmental delivery, emissions decreased again in 2018 after a minor increase in 2017. The yearly-to-year decrease was considerable: it was 1.8 times higher than the decrease in the cap and the second highest absolute decrease since the first year of Phase 3. This puts the EU ETS back on track to (over) deliver on its environmental targets for Phase 3 and Phase 4. Moreover, sectors for which data is available showed year-to-year improvements in carbon intensity, an encouraging sign.

However, it is important to note that the post-2020 Linear Reduction Factor (LRF) will not be sufficient to put the EU ETS on track to meets its target outlined in the '2050 Roadmap', and reaching the goal set out

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in the Paris Agreement will surely require additional efforts. Moreover, the distance between the EU ETS long-term environmental delivery and the EU domestic environmental commitments towards 2050 might become even wider if the EU were to embrace the goal of carbon neutrality by 2050, as outlined in the Commission's communication 'A clean planet for all'.

Regarding economic delivery, the data show that the EU ETS has not been the main driver for emission reductions in EU ETS covered sectors. However, 2018 might indicate that a change is happening, as for the first time the EUA price was above the switching price between coal and gas-fired plants, with the exception of highly efficient coal plants, for 100% of the year. This means that the EU ETS was capable to drive the fuel-switch on its own in 2018.

On the other hand, the KPI on the deployment of low-carbon technologies in the long-term shows that the EUA price is far from being able to support the mass deployment of new low-carbon technologies such as hydrogen, or CO2 usage.

Higher prices also have implications on the total costs incurred by the installations covered by the ETS, and on the auctioning revenues for Member States. Monetary impacts have so far mostly been limited to combustion of fuels installations, while free allocation has largely covered costs for the industrial sector. As a consequence, carbon leakage risks from direct costs have so far seemed to be mitigated, although the era of overcompensation seems to be over, with 2018 being the second consecutive year where industrial installations as a whole experienced a net direct cost, 3.5% of their verified emissions.

On the other hand, indirect costs are a continuous and growing concern, considering the lack of a harmonized EU-approach to compensation and the long-term drive for increased electrification, which leaves the door open to potential distortions.

With regard to the use of auctioning revenues, Member States report they spent 80% of their auctioning revenues on climate and energy purposes for the period 2013-2017– a vital flow of cash for climate action, which will become more important as prices keep on rising. However, the fact that number is based on self-reported data from the Member States calls for analysis to determine whether this spending is additional or not.

The eight KPIs to evaluate the functioning of the market show that the market again functioned better compared to last year: five out of the eight tracked KPIs exhibited an improvement, while only 3 KPI showed a worsening performance. There is some indication that more speculation is occurring, an element which will have to be monitored in the coming years.

One important new development is the start of the Market Stability Reserve (MSR) in 2019, which is expected to tackle the historical surplus of allowances on the market and any future shocks to the EU ETS. It remains unclear, though, if the MSR will be able to address any and all events leading to market imbalances which might emerge during Phase 4.

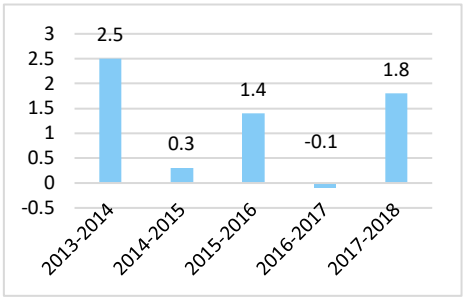
Finally, and very important, the report identifies a number of issues that will need to be monitored in the coming years, to ensure that the EU ETS is "fit for purpose" and ready to face future challenges. Besides issues that are generally "on the radar", such as the upcoming EU elections and Brexit, CORSIA and aviation in EU ETS, and review of the MSR, we need to highlight two areas that will require attention in the future: the operationalization of Article 30 of the Directive on reviewing the EU ETS in light of efforts undertaken in light of the Paris Agreement and developments in other major economies, and the need for mechanisms to finance and incentivize the deployment of carbon negative technologies and how, if in any way, they will interact with the EU ETS.

Key Performance Indicators

Environmental Delivery

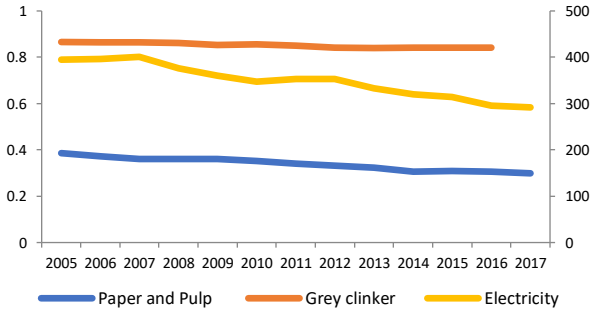
The most recent data available for the KPIs for environmental delivery show good performance. Emissions decreased again in 2018 after a small increase of 0.6% in 2017. In 2018, emissions decreased almost twice as fast as the cap, which is the highest year-on-year decrease since 2014. Carbon intensity levels, for those sectors for which data is available, also show a steady decrease in recent years.

Ratio of the annual variation in emissions to the annual variation in the cap



Source: I4CE elaborations on data from the EEA, 2019 and EU TL, 2019

Carbon intensity data for production of Paper and Pulp, Grey Clinker and Electricity

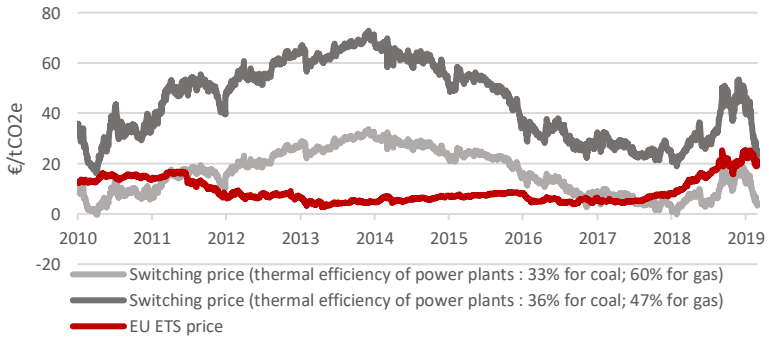


Note: Paper and Pulp & Grey clinker in CO2/ton (left axis) – electricity in gCO2/kWh (right axis)
Source: ERCST elaborations on data from CEPI, GNR, EEA, 2019

Economic Delivery

For the first time since 2010, EUA prices were above the minimum switching price for 100% of the year in 2018, continuing the trend of the last years, up from 5% in 2016 and 53% in 2017. On the other hand, the KPI on the deployment of low-carbon technologies in the long-term shows that the EUA price is far from being able to support the mass deployment of new low-carbon technologies such as hydrogen or CO2 usage.

CO2 switching price for different coal and gas power plants efficiencies, in comparison with EU ETS price



Source: I4CE, with data provided by ICIS, Banque de France, IPCC, WEC, JRC, 2019.

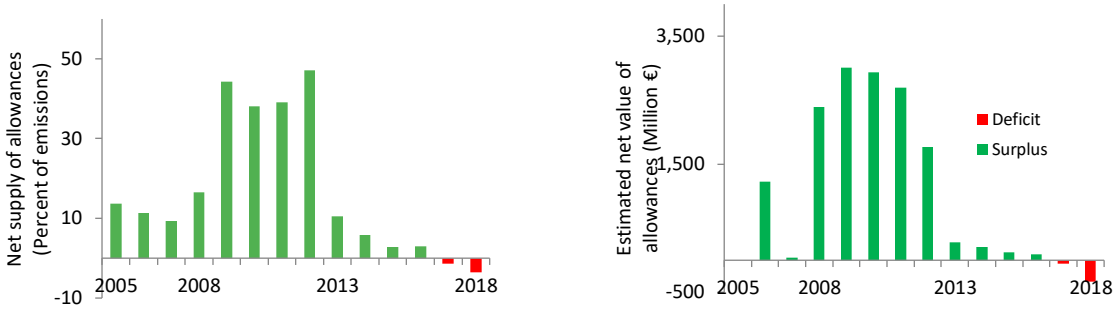
Member States report they spent 80% of their auctioning revenues on climate and energy purposes for the period 2013-2017– a vital flow of cash for climate action, which will become more important if prices keep rising.

Use of auctioning revenues, 2013-2017 (Pie chart in EUR billion).
Right hand graph only reports intra-EU spending

Source: Report from the Commission to the European Parliament and the Council {SWD(2018) 453 final}

With regard to protecting industrial sectors at risk for carbon leakage, the data shows that industrial installations historically received more free allocation than their verified emissions. However, this trend has steadily been reversed over Phase 3; 2018 was the second year that industrial installations as a whole faced direct costs, with free allocation covering 96.5% of their emissions, down from 98.6% in 2017.

Net position and net costs of allowances for industrial installations



Source: Wegener Center elaborations on EEA , 2019 and EU TL, 2019

Market Functioning

The eight KPIs to evaluate the functioning of the market show that liquidity in the market is increasing, with volumes, auction participation, auction coverage and open interest all on the rise.

On the contrary, the spreads show some worrying signals, and volatility remains high compared to other commodities.

Overall, five out of the eight tracked KPIs show a year-on-year improvement, which means we can state at this time the market is functioning well.

Market functioning tracker

Indicator	2017/2016	2018/2017
Volumes	↑	↑
Open Interest	–	↑
Auction participation	↑	↑
Auction coverage	–	↑
Auction vs Spot spread	↑	↑
Bid-ask spread	↑	↑
Cost of carry	–	↑
Volatility	↓	↑

Legend: ↑ Improving; – Stable; ↑ Worsening

1 Background

Following the completion of Phase 4 EU Emission Trading System (EU ETS) review in early 2018, many stakeholders made the assumption that the EU ETS was "fit for purpose" until 2030. However, climate policy needs to evolve as it adapts to new developments, and the EU ETS is no exception.

As any other undertaking, the EU ETS requires, periodically, an assessment regarding its well-functioning and the delivery of its objectives. In this respect, the EU ETS is not different, and should not be treated differently, from any other activity. Article 10(5) of the EU ETS Directive provides for such a yearly assessment, to be carried out by the European Commission (EC).

More changes can be expected during Phase 4 of the EU ETS, given new scientific developments, as well as the reviews which are mandated by the current legislation, and which may also reveal the need for changes – Market Stability Reserve (MSR) reviews in 2021 and 2026; review under Article 30 of the EU ETS Directive; assessment of progress under Article 29 of the Governance of the Energy Union Regulation. The revised EU ETS Directive adds the obligation to also report on 'other relevant climate and energy policies', and the Governance of the Energy Union Directive requires this 'functioning of the carbon market report' to feed into the yearly 'State of the Energy Union Report'.

The "State of the EU ETS" Report is not intended to duplicate or replace mandated work. It aims to be an independent contribution to the policy debate, in spite of the limitations posed on analysts by the lack of publicly accessible data. While the temptation will always be there, as a rule, it will try to abstain from providing solutions. It focuses on identifying issues and making assessments. It is intended as a "snapshot".

While the EU ETS is a complex instrument, and for some a world in itself, it does not exist in a vacuum. For all its faults, the EU ETS should not be compared to an ideal world, but to real options that would be available to address climate change.

It must be remembered that the EU ETS operates in a highly interconnected environment and is affected by climate change and other policies at different levels: global, EU and EU Member State (MS). It has to live with that reality, and respond to it.

The EU ETS was also created lacking the mechanism to mimic reduced supply as a result of reduced demand. The prolonged economic slump that it was subjected to, together with other factors, has created a systemic surplus, some would call it a "structural imbalance", which is still a reality. Both these issues were addressed, and the solution, the Market Stability Reserve, has become operational at the start of 2019. It now needs to deliver.

The EU ETS will continue to face pressure to internalize new and relevant developments. One case in point is the vision expressed by the European Commission's "A clean planet for all" communication from November 2018 (European Commission, 2018a) to embrace the goal of carbon neutrality by 2050, which, if adopted, will require further changes to the EU ETS. Developments such as Brexit, international climate change policy, such as the Paris Agreement Rulebook agreed at COP 24 (except Article 6), and the IPCC special report on 1.5°C, will also need to be taken into account.

Finally, the EU is not the only jurisdiction pricing carbon anymore. It is now part of a growing movement towards carbon pricing, with some jurisdictions that may even have higher levels of carbon prices than the EU ETS.

2 A EU ETS "fit for purpose"

In order to assess whether the EU ETS is "fit for purpose", we first need to identify the parameters which measure its success. Simply put, "what do we expect the EU ETS to deliver?"

In many cases, there are no clear quantitative indicators for what the EU ETS may be expected to deliver. Some of the assessments will have a level of subjectivity and political judgement attached to them. In other cases, objective, quantitative indicators may emerge gradually, as experience is gained with these mechanisms, both in the EU, but also around the world. Finally, in some cases experience with other markets may provide benchmarks.

In this context, we need to remind ourselves that Article 1 of the EU ETS Directive outlines its broad objectives:

> *"This Directive establishes a scheme for greenhouse gas emission allowance trading within the Community in order to promote reductions of greenhouse gas emissions in a cost-effective and economically efficient manner. This Directive also provides for the reductions of greenhouse gas emissions to be increased so as to contribute to the levels of reductions that are considered scientifically necessary to avoid dangerous climate change."*

Some objectives are clearly enunciated and identified, while some stakeholders may see other objectives as implicit. As also mentioned in the 2018 State of the EU ETS report, the direct deliverables include:

1. **Environmental delivery**. Does it deliver against absolute environmental targets as expressed in the EU ETS Directive and the EU's long-term climate change objectives?
2. **Economic efficiency**. Does it deliver macro-economic efficiency and function as a driver for cost-effective decarbonization, taking carbon leakage concerns into account?
3. **Market functioning**. It is worth having a market only if it functions well, and leads to good price discovery.

Right or wrong, other "deliverables" have come to be "expected". For example, the good functioning of the EU ETS has come to be equated, wrongfully in our view, with the delivery of a "right price" which would incentivize certain technologies or actions. This report will not judge the success or failure of the EU ETS based on price levels.

Another important deliverable which the EU ETS is increasingly expected to deliver, is that of a long-term (competitive) advantage for Europe. Indeed, stakeholders expect that the EU ETS provisions should help accelerate the transition to a low-carbon economy, while managing the transition by addressing the negative social and economic impacts by:

- Generating sufficient investments to accelerate the transition;
- Creating the premises for a low-carbon product market, incentivizing behavioral and system change;
- Helping to address social impacts associated with the transition to a low-GHG economy, following the principles of a 'just transition' (International Labour Organization, 2015);
- Ensuring the right level of protection for industry, both for direct and indirect costs;
- Providing for a long-term price signal in addition to short-term price signal.

One additional role is that of the EU ETS as a pioneer in promoting carbon markets as a tool for addressing climate change. Many studies, including the Annual ICAP Report (ICAP, 2019), show that carbon pricing has spread over the globe. The internationalization of the EU ETS, including through linking it to other markets, needs to be part of the continued vision for the EU ETS.

In examining the three areas of delivery mentioned above, the Report will focus on:

a) Quantitative and qualitative indicators for the functioning of the EU ETS, put in the broader context of the EU and international policies with which it interacts.
b) Lessons learned, and emerging issues.
c) Areas that require further examination.

3 Changes in the regulatory environment and implications for the EU ETS

3.1 Evolution of relevant policy and governance issues

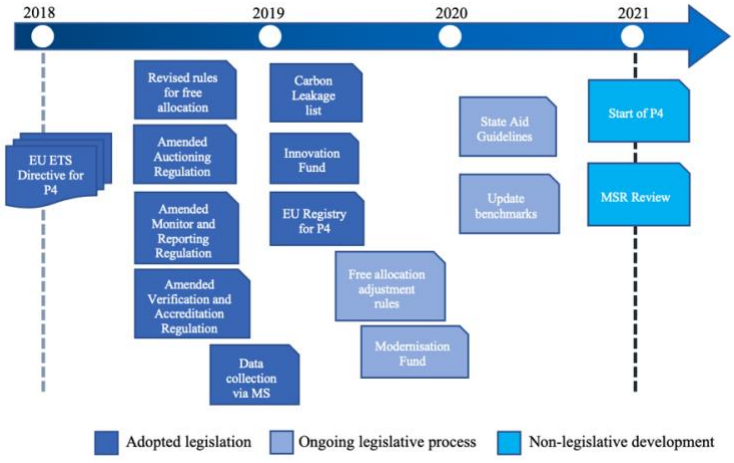
Secondary legislation related to the EU ETS

The EU ETS Phase 4 Directive was adopted in March 2018 (European Commission, 2018b). The important elements of the Phase 4 review included addressing the historical (structural) surplus of European Emission Allowances (EUAs), making the EU ETS supply more responsive to changes in demand and able to deal with any future imbalance, increasing the funds available for innovation and modernization, and making free allocation more reflective of actual production and emission levels.

Work continued during 2018 on the secondary legislation needed to implement the Phase 4 Directive. Important legislation was already adopted in 2018, including the delegated acts on free allocation rules for 2021-2030 (European Commission, 2018c). Work on some other measures was finished in early 2019, such as establishing the Innovation Fund (European Commission, 2019a), and the new Carbon Leakage List (CLL) for Phase 4 (European Commission, 2019b).

For the latter, the list was reduced from 165 to 63 sectors and subsectors, compared to the 2015-2020 CLL – although this does not translate in a big reduction in the share of emissions covered by free allocation: 94% of industrial emissions are still expected to be covered, down by only 4% compared to the 2015-2020 CLL (European Commission, 2019c).

Figure 1: Timeline of the completion of secondary legislation related to the EU ETS



Source: ERCST, 2019

Two other important regulatory processes concerning carbon leakage that were launched in 2018 and are on-going include: free allocation adjustments due to activity level changes in Phase 4, for which the

implementing act is foreseen for adoption by Q3 2019 (European Commission, 2019c) and the revision of the State Aid guidelines for Phase 4, which are to be ready by Q3 2020, and should enter into force at the start of Phase 4 (European Commission, 2019d).

Aviation and CORSIA

The trend of rapidly increasing aviation emissions (intra-EEA flights airlines' emissions covered under the EU ETS grew by 5.7% in 2018 (Refinitiv, 2019)) and how they are addressed, including precedents that are being set, will continue to be an important element for the EU climate change policy, including the EU ETS.

Aviation has been covered by the EU ETS since 2012, though it has its own emissions allowances (EUAAs) and a separate auctioning calendar, where only 15% of the historical aviation emissions[2] are auctioned in Phase 3 (European Commission, 2019e and EEX, 2019). Since 2014, the scope of EU ETS has been limited to flights within the European Economic Area (EEA), in order to 'provide continued momentum to the international process of establishing a global scheme to curb aviation emissions' (European Commission, 2014a).

In 2016 the ICAO Assembly agreed on a resolution on the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). Most recently, in March 2019, the ICAO Council issued a document on CORSIA emissions unit eligibility criteria, which outlines principles aiming to ensure appropriate levels of environmental integrity. This may affect its relationship with Article 6 of the Paris Agreement and set precedents for it, and consequently the possible future use of Art 6 by the EU ETS.

Developments on CORSIA are being closely monitored by European institutions, and the perceived success and ambition of the mechanism will determine how aviation emissions will be dealt with, and interact with the EU ETS in the coming decades.

Clean energy for all Europeans package

The decarbonization of the economy is one of the five core policy areas of the Energy Union. The most significant Energy Union legislative development of the past year was arguably the adoption of the 'Clean Energy for All Europeans' package on 20 June 2018, revising 8 pieces of legislation, all of which were agreed upon by the European institutions by March 2019.

One of the most important implications of the Clean Energy package for EU Member States (MS) is the upwards revision of the EU 2030 targets for Renewable Energy Sources (RES) and Energy Efficiency (EE). The new targets are a 32% penetration of renewables in the EU energy mix, and energy savings of 32.5% compared to a 2030 business as usual scenario.

The Governance Regulation requires Member States to submit National Energy and Climate Plans (NECPs) for the period 2021-2030. Draft versions of the NECPs were submitted by January 2019[3], and will be reviewed by the European Commission by June 2019, after which Member States have to submit their final NECP by the end of 2019.

[2] Historical aviation emissions equal to 95% of the average emissions between 2004 and 2006.

[3] The draft NECPs can be found at this link: https://ec.europa.eu/energy/en/topics/energy-strategy-and-energy-union/governance-energy-union/national-energy-climate-plans.

NECPs could have significant impacts on the EU ETS functioning if Member States take additional actions in ETS sectors. Likewise, the new RES and EE targets, especially the renewable target[4], will contribute to additional CO2 reductions in EU ETS sectors, and influence the EU ETS supply-demand balance, potentially contributing to new oversupply on the market (E3MLab & IIASA, 2016). Changes in the EU energy matrix will also have implications for hedging strategies in the power sector, with potential consequences on the MSR threshold parameters.

Member State policies: coal phase-outs

Coal phase-outs are expected to play an important role in energy and climate strategies of Member States in the near to mid-term future, also in the context of NECPs. In 2018, discussions on coal phase-out picked up speed, with many EU countries considering strategies to either speed up current phase-out plans, or putting phase-out plans in place. To date, ten Member States have legally binding phase-out plans, and discussions are ongoing in Spain, Hungary and Germany.

The debate in Germany, Europe's largest electricity producer from hard coal and lignite, has attracted a lot of attention. Last year, Germany established the German Commission on Growth, Structural Change and Employment (the so-called "coal commission"), which released a final report on 26 January 2019 (Kommission "Wachstum, Strukturwandel und Beschäftigung", 2019).

The report states that the country should close all of its coal-fired power stations by 2038 at the latest, with a goal to bring the deadline forward to 2035. The report sets out the intermediate target of 12.5 gigawatts (GW) of capacity to be retired by 2022, with 17 GW remain operational by 2030, down from 42.7 GW coal-fired capacity in 2018.[5]

Given that coal still accounted for 37% of total ETS covered emissions in 2018 (Sandbag, 2018), a significant reduction of coal-fired power generation could have strong consequences for the EU ETS supply-demand balance.

BREF limits

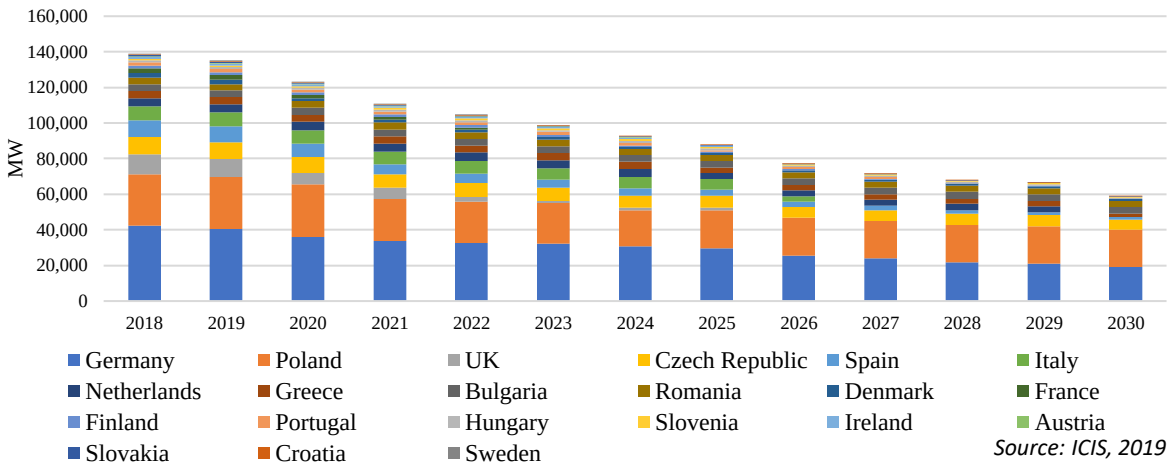
In April 2017, European Union member states agreed to a Best Available Techniques (BAT) Reference Document (BREF) that fixes stricter limits on hard coal/lignite fired large combustion plants as of 2021. These new rules set stricter standards for SO2, NOx and dust, as well as for thermal efficiency, soil and water pollution. Plants that fall below the new emissions levels will in theory be forced to invest in pollution abatement technologies or have to close down.

The stricter rules on derogations mean that fewer plants are likely to be able to avoid the new limits from 2021 onwards, compared to those currently avoiding the existing limits. ICIS expects up to a third of Europe's coal-fired capacity to be affected by the new limits.

[4] This has been the case in the past (e.g. 2017 State of the EU ETS Report) and is also indicated by the PRIMES modelling of the EUCO policy scenarios. See: https://ec.europa.eu/energy/sites/ener/files/documents/20170125_-_technical_report_on_euco_scenarios_primes_corrected.pdf).

[5] The report acts only as a suggestion to the federal government, which should now pass a corresponding law on coal phase-out over the course of 2019.

Figure 2: EU coal & lignite capacity by country 2018-2030 (MW)



Source: ICIS, 2019

Taking into account the announced phase-outs and BREF limits, forecasts by ICIS (2019) expect the EU's overall coal/lignite capacity to decline from 139 GW in 2018 to 88 GW in 2025, and 58 GW in 2030, as shown in Figure 2.

Brexit

The UK is currently the second-largest emitter in Europe, and British companies are among the largest buyers of EUAs (Reuters, 2018). Almost three years after the Brexit referendum, the EU and the UK are yet to find an agreement on their divorce arrangement and the future political relationship. This situation has brought uncertainty to the EU ETS, and is expected to continue to do so until the situation is settled.

A no-deal Brexit became increasingly likely over the course of 2018. Although a Withdrawal agreement was reached in November, the British Parliament rejected it three times, and the Brexit deadline was extended. At time of writing, the deadline has been postponed to 31 October 2019.

The prospect of a no-deal scenario led the UK government to issue a series of technical notes on the implications of a no-deal scenario. The technical note of October 2018 stated that the UK would drop out of the ETS in case of a no-deal scenario, effectively removing compliance obligations for 2019. Facing this outlook, the European Commission's Contingency Action Plan temporary suspended the free allocation and auctioning of emission allowances in the UK during Q1 2019 (European Commission, 2018d).

Against this backdrop, all potential scenarios for the EU ETS post-Brexit are still on the table. These include: the UK staying in the system; the UK settings its own carbon price; the UK starting an independent ETS, which could be linked to the EU ETS.

EU Long-Term Climate Strategy

Another important development which might affect the EU ETS are the ongoing discussions on updating the EU long-term climate strategy. This revision is seen by many stakeholders as a successor to the Commission's 2011 Roadmap for a competitive low-carbon Europe (European Commission, 2011) – a document which was never formally endorsed by the European Council, but had considerable impact on EU climate change policy, as illustrated by the fact that the impact assessment of the 2030 target of reducing GHG emissions by at least 40% (vs. 1990) is based on the modeling for the 2011 Roadmap (European Commission, 2014b).

In November 2018, the European Commission published its strategic long-term vision, "A clean planet for all" (European Commission, 2018a). The document highlights 8 decarbonization scenarios, two of which aim at net-zero carbon emissions by 2050. As the document advocates for a climate neutral EU economy by 2050, the European Commission seems to put the emphasis on these two scenarios – 1.5 LIFE and 1.5 TECH, which would require a 95% and 102% GHG emission reduction by 2050 compared to 2005 emissions, respectively, for ETS sectors. Chapter 4 will go into greater detail on the additional reduction efforts this implies for EU ETS sectors, given that the current trajectory leads only to 85% emission reductions in EU ETS sectors compared to 2005 levels.[6]

Currently, the vision is being discussed by parliaments and governments, both at the (sub-)national and European level. The European Parliament adopted its resolution welcoming the communication on March 14 (European Parliament, 2019), and the European Council is expected to discuss the document during its June 2019 session (European Council, 2019).

International climate change policy

Even though EU emissions account for only about 9.6% of global emissions (European Commission, 2018e), recent international developments are putting pressure on the EU to increase its climate ambition. In October 2018, the Intergovernmental Panel on Climate Change (IPCC) issued a special report on the impact of global warming of 1.5 °C above pre-industrial levels. The report reinforced the conclusions of the IPCC AR5, emphasizing the need for negative emissions and highlighting the urgency for climate action (IPCC, 2018).

COP 24 represented a partial setback for international carbon markets. Parties could not find an agreement on Article 6 while they delivered on the mandate to agree on the rest of the Paris Agreement Rulebook. COP 24 focused mostly on implementation, failing to meet the expectations of those who wanted the focus to be on raising ambition.

Looking ahead, 2019 could see the international community shift the focus back to ambition. The UN Secretary General has called for a Climate Summit to take place in New York on the 23rd of September, inviting countries to present "concrete, realistic plans to enhance their nationally determined contributions by 2020, in line with reducing greenhouse gas emissions by 45 per cent over the next decade, and to net zero emissions by 2050" (United Nations, 2019). A clear-cut success of the Summit could represent a stepping stone for countries to review their NDCs, which in the case of the EU could result in increasing efforts to decarbonize both ETS and non-ETS sectors.

3.2 "Sentiment" Market Survey

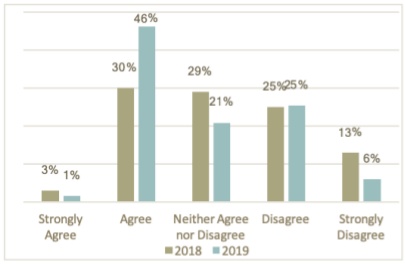
Market sentiment has played an important role, to some degree, more so than fundamentals, in the behavior of the EU ETS. Following the 2018 Market Sentiment Survey (Marcu and al, 2018), we have repeated the exercise for 2019. For this purpose, a short survey was sent out to persons whom the authors believe are "players & stakeholders" in EU ETS. The sample includes policymakers from EU Member States, industrial operators, traders, and civil society and is not intended to be statistically representative. The

[6] An 85% decrease in the EU ETS cap, compared to 2005 emissions, is an estimate which results from plotting the LRF of 2.2% for Phase 4 until 2050. Source: I4CE elaboration based on EC data.

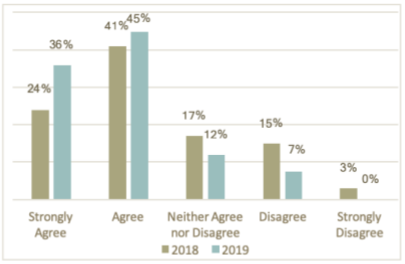
first 6 questions are the same of the 2018 Market Sentiment Survey, while question 7 has been added for this year's report.[7]

The following observations capture the main findings and give an interesting indication of the general sentiment of stakeholders with respect to the EU ETS.[8]

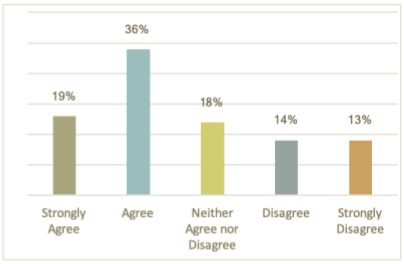
Figure 3: Results for survey questions 1, 6 and 7



Q1: The EU ETS governance will provide a stable and predictable framework for an investment signal



Q6: The new mid-century EU decarbonization strategy will strongly impact the EU ETS



Q7: The EU ETS should continue to play the same role in the EU climate change policy post 2030

A first observation is that the confidence of respondents in the EU ETS providing for a stable and predictable framework for investments has increased between 2018 and 2019, up from 33% to 47% respectively. Moreover, 42% of respondents agree with the statement that the EU ETS will provide a first mover advantage for the EU business community, up from 36% last year, confirming a growing perception of the EU ETS as a driver for clean investments.

Secondly, stakeholders seem to agree that future legislative developments will have implications on the EU ETS: 62% of respondents expect that the MSR will need to be reformed after its 2021 review, and an even wider majority of 81% of respondents see the new mid-century EU decarbonization strategy as having a strong impact on the EU ETS.

Finally, 55% of respondents believe that the EU ETS should continue playing the same role in the EU climate change policy post 2030. However, there is still a minority of 27% of respondents disagreeing with this view.

[7] The following statements could be answered with Strongly Agree – Agree – Neither Agree nor Disagree – Disagree – Strongly Disagree:

1. The EU ETS governance will provide a stable and predictable framework for an investment signal.
2. The EU ETS Phase 4 parameters will lead to price patterns in 2020-2030 which are commensurate with the investment trajectory necessary for 80-95% reduction by 2050
3. The EU ETS will provide a first mover advantage for the EU business community.
4. The EU ETS will require significant changes to the MSR after the 2021 review
5. The mechanisms in place in the EU ETS are able to address the impacts of policies that will overlap with the EU ETS.
6. The new mid-century EU decarbonization strategy will strongly impact the EU ETS.
7. The EU ETS should continue to play the same role in the EU climate change policy post 2030.

[8] All graphs can be reviewed in the PowerPoint annexed to the Report

4 Environmental delivery

The EU ETS needs to be seen as an instrument of delivering price discovery for EUAs for the purpose of delivering a cap in GHG emissions. The power of an ETS is in the cap. If the EU ETS is to be considered successful, the environmental delivery, or delivery against the cap, is key.

However, this delivery must be seen as being multi-faceted, in that it needs to be examined for delivery in the trading period, as set out by the Directive, as well as the achievement of the long-term climate change objectives to which the EU has subscribed. This later condition is not explicitly expressed in the EU ETS Directive, and can be seen as being a political decision in terms of the timing (milestones) of the effort to reach the long-term EU de-carbonisation goals.

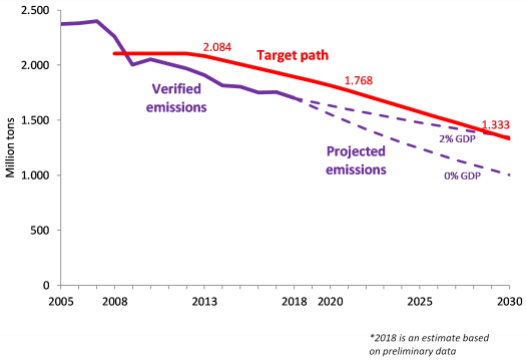
4.1 Delivery against the trading period target

In this case, the issue is straightforward: does the EU ETS deliver against its current trading period target for 2020 (-21% for ETS sectors compared to 2005)? A longer-term view brings in a second question: is the EU ETS, on the current trajectory, expected to deliver against the agreed target for the next trading period, i.e. a reduction of 43% for ETS sectors by 2030 (vs. 2005)? The same is true for the delivery in the long-term target, i.e. an EU-wide 80-95% emission reduction by 2050 (vs. 1990) as referred to in the "2050 Roadmap" (European Commission, 2011).

The EU ETS target for 2020 is being reached ahead of time. The European Environment Agency (EEA) figures show that by the end of 2017, emissions from EU ETS covered installations had already decreased by 26.4% compared to 2005 (EEA, 2018). For 2018, EEA official data is not yet available.

The preliminary data published on April 1, 2019 by DG Climate Action show that emissions from stationary decreased by 4% in 2018 compared to the previous year, which is in stark contrast with the increase of 0,6% from 2017 to 2018 (EU TL, 2019).

Figure 4: verified emissions, target path and projected emissions



Source: Wegener center elaborations on EEA, 2019 and EU TL, 2019

Verified emissions have been under the target path since the start of Phase 2, and are widely expected to remain below the cap during Phase 4. In Figure 4, we apply a statistical model reflecting the dynamics between emissions and GDP, and extrapolate this up to 2030. This shows that projected emissions are not expected to hit the target path before 2030. Only under a high-growth assumption of 2% per year (current GDP growth, and projections up to 5 years, fluctuate around 1.6% (European Commission, 2019)) would projected emissions hit the cap defined by the target path by the end of Phase 4.

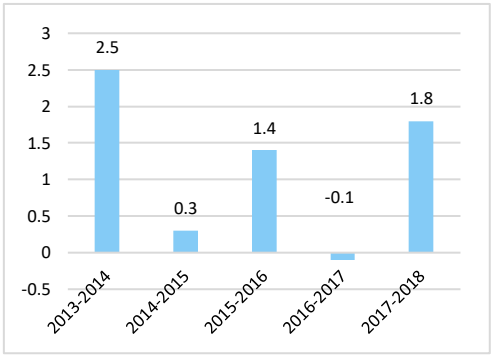
The corridor of these emission projections based on GDP growth can be considered conservative, as it only looks at the recent decoupling trend between GDP and emissions, and does not model further expected emission reductions delivered by climate and energy policies. Based on this statistical model, a yearly growth rate of 1.6% would result in a reduction of 46.5% in emissions by 2030 compared to 2005, while projections by the European Commission in 2018 estimate a 49% reduction (European Commission, 2018a), and projections by Sandbag show a 52% reduction by 2030 (Sandbag, 2019).

How much of this result is due to a decrease in CO2 intensity, and how much it is due to a decrease in the level of economic activity, is an important issue, which will be further explored in the following sections.

4.2 Emission and decarbonization trends

Total emissions have been declining, on average, by 45mt per year during Phase 3, considerably faster than the cap, which declines by 36mt per year.[9] Between 2017 and 2018, emissions decreased almost twice as fast as the cap, which is the highest yearly decrease since 2013-2014 (see Figure 5). This rate of the annual variation in emissions to the annual variation in the cap is an important KPI which will be tracked yearly.

Figure 5: Ratio of the annual variation in emissions to the annual variation in the cap



Source: I4CE elaborations on data from the EEA, 2019 and EU TL, 2019

For the remainder of this part, it is important to note that this analysis is based on sectors as defined in the EU Transaction Log, where an industrial facility could be split up into one or more combustion installations, and industrial installations. Using the EU TL implies that industrial on-site combustion and/or CHP plants are treated under the combustion category.

However, there is a big difference in the contribution of different 'sectors': while emissions from combustion installations have decreased, in the current phase, by 3.6% per year on average, emissions from industrial installations have remained more or less flat, only decreasing by 0.1% on average. In 2018, combustion emissions declined by 5.7% and industrial emissions by 0.7%.

Table 1: verified emissions of stationary installations

Verified emissions [mt CO2]	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
All stationary installations	**2.120**	**1.880**	**1.939**	**1.904**	**1.867**	**1.908**	**1.814**	**1.803**	**1.751**	**1.754**	**1.684**
Index	100	89	91	90	88	90	86	85	83	83	79
All combustion of fuels	**1.493**	**1.369**	**1.401**	**1.371**	**1.359**	**1.319**	**1.223**	**1.212**	**1.166**	**1.163**	**1.097**
Index	100	92	94	92	91	88	82	81	78	78	73
All industrial sectors	**627**	**511**	**537**	**533**	**508**	**589**	**590**	**591**	**585**	**591**	**587**
Index	100	81	86	85	81	94	94	94	93	94	94
All refining of mineral oil	142	132	130	130	124	128	125	128	127	127	125
Index	100	93	92	91	88	91	88	90	90	89	88
Steel total	179	126	150	148	143	157	159	157	152	152	149
Index	100	71	84	83	80	88	89	88	85	85	83
All production of cement clinker	160	128	126	124	116	113	118	116	117	119	121
Index	100	80	79	78	73	71	74	73	73	75	76
Production of bulk chemicals	32	29	30	28	27	39	38	39	38	39	38
Index	100	91	93	89	84	121	118	120	119	120	120
Paper or cardboard	27	24	25	24	23	23	22	22	22	22	22
Index	100	88	94	91	86	84	81	82	81	83	82
Ceramics	15	11	11	11	10	14	13	13	14	15	15
Index	100	71	70	70	62	88	87	88	91	95	97
Other activities	73	61	66	68	65	116	116	115	115	118	117
Index	100	84	91	93	89	159	159	158	158	162	160

Source: Wegener Center elaborations on EEA, 2019 and EU TL, 2019

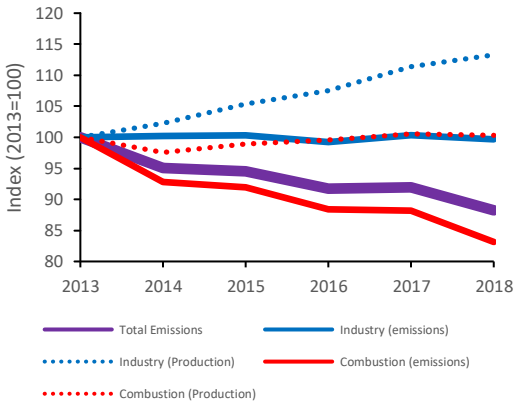
9

Table 1 presents the emissions of the big emitting industrial sectors, with most of the industrial sectors showing only marginal emission reductions over Phase 3, except for the production of cement clinker and ceramics.

It is important to keep in mind that absolute emission reductions only tell part of the story. Indeed, emissions are closely linked to changes in activity levels, and decreasing emissions due to falling activity levels are not always a desired outcome. Ideally, emissions and activity levels should increasingly become decoupled, meaning the EU economy is truly 'decarbonizing'.

However, data showing carbon intensity of production is hard to obtain, as it is not always publicly available for independent research, and when it is available it is often at aggregated levels. Figure 6 shows the index of emissions in all EU ETS sectors based on EU TL data, as well as the indexes for industrial production (volumes) and electricity generation (used as a proxy for combustion emissions). This graph provides some indication that emissions are being decoupled from activity levels.

Figure 6:Index of emissions and index of volumes of production

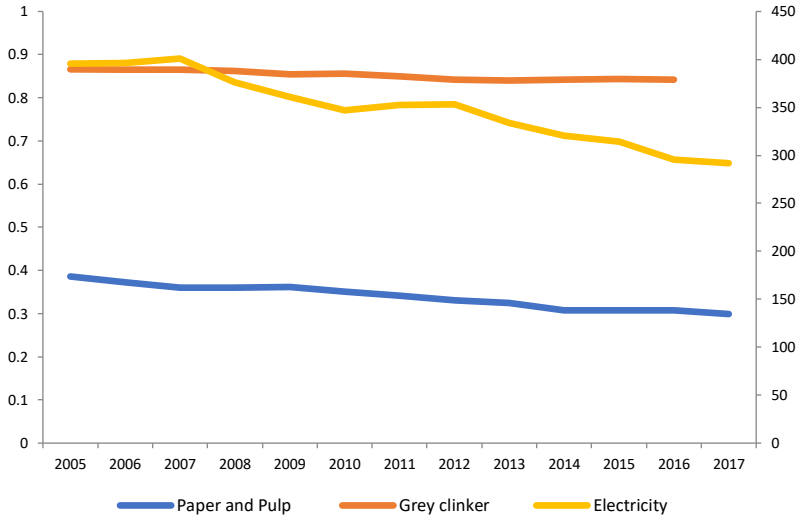


Source: Wegener Center and ERCST elaborations on EEA, 2019, EU TL, 2019, Sandbag & Agora, 2019 and Eurostat, 2019

An examination of carbon intensity levels for some of the industrial sectors for which data is available seems to confirm this decrease in carbon intensity. Figure 7 shows a decrease in the emission intensity of electricity production by 26.2% since 2005, of 22.5% for paper and pulp, and of 2.8% for the production of grey clinker. Data for other sectors, which was provided on a confidential basis, also shows carbon intensity of industrial production with an overall decrease. The year-to-year improvement in carbon intensity for the most recent data available was 1.3% for electricity (2016-2017), 2.6% for Paper and Pulp (2016-2017) and 0.1% for grey clinker (2015-2016). The yearly improvement in carbon intensity is another KPI which will be tracked.

These conclusions need to be tempered by the availability of data for independent research. Most of the data regarding carbon intensity comes from business associations, and is often confidential and difficult to verify. Indeed, this issue of data availability is significant and has been raised repeatedly by this report and others. It was also raised during the preparation of the report in meetings with policymakers, stakeholders and the different sector representatives.

Figure 7: Carbon intensity date for production of Paper and Pulp, Grey Clinker and Electricity

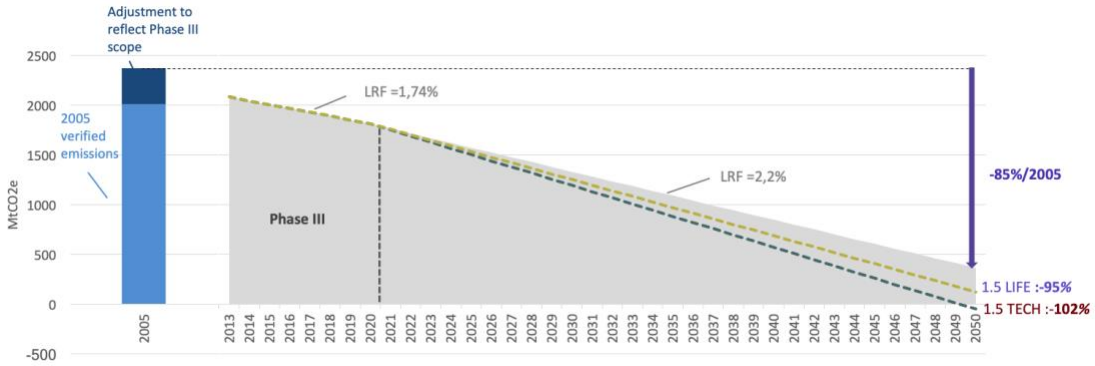


Note: Paper and Pulp & Grey clinker in CO2/ton (left axis) – electricity in gCO2/kWh (right axis)
Source: ERCST elaborations on data from CEPI, GNR, EEA, 2019

4.3 Delivery against EU long-term domestic environmental commitments

To what extent does the trading period target lead the EU to deliver on its longer terms goals and commitments? As discussed in Marcu et al (2016a), EU domestic climate change targets are expressed through a number of documents. The "2050 Roadmap" mentions a number of intermediate GHG reduction targets for the EU as a whole (40% by 2030, 60% by 2040, and 80%-95% by 2050 (vs. 1990)), and proposed a reduction of 90% for ETS sectors compared to 2005 (European Commission, 2011). However, last November the European Commission published a communication which could lay the foundation for a new Long-Term Climate Strategy. This "A clean planet for all" communication for the first time lays out two possible scenarios for reaching carbon neutrality by 2050, next to six other 'lower ambition' scenarios.

Figure 8: EU ETS long-term trajectory



Source: I4CE

As shown in Figure 8, a continuation of the 2.2% LRF – agreed in 2018 – from 2021 onwards corresponds to 85% reduction of GHG ETS emissions in 2050 compared to 2005. The 1.5°C scenarios prepared by the

Commission in its long-term strategy – namely 1.5 LIFE and 1.5 TECH – respectively achieve a reduction of 95% and 102% in EU ETS emissions in 2050 compared to 2005 levels. If the EU ETS cap were to decrease linearly to these levels, it would respectively require increasing the LRF to 2.83% and 2.57% starting from 2021.The cumulative amount of emissions avoided over the period 2021-2050 would amount to 6433mtCO2 for the 1.5 TECH, and 3752mtCO2 for the 1.5 LIFE scenario.

4.4 Lessons learned and issues to understand better

The EU ETS is delivering against its trading period target. While the economic recession has made a contribution, emissions have been under the target path since 2009. The absolute distance between verified emissions and the pathway decreased between 2014 and 2017, but increased again in 2018. Emissions are now 11.1% below the 2018 cap, representing the second largest gap in Phase 3.

For the Paris Agreement to have an impact on the EU ETS, its goals need to be translated into domestic policies. After COP 21, there was no adjustment in EU ETS targets, and as such, no concrete market signal to respond to. However, when EU domestic policies become aligned with international developments through the adjustment of EU targets and the adoption of a new EU long-term climate strategy, the carbon market will react and be impacted.

In this context, it is also important to note that the EU ETS is no longer the only carbon pricing system in operation. How its environmental delivery, i.e. its level of effort or stringency, compares with that in other jurisdictions is important, especially as it will impact competitiveness and carbon leakage issues. Indeed, it must be recalled that Article 30 of the EU ETS Directive stipulates that the carbon leakage rules "shall be kept under review in the light of climate policy measures in other major economies".

The latest ICAP status report (ICAP, 2019) shows that, at present, 8% of global GHG emissions are covered by emission trading systems, while more are scheduled for implementation. There are now 20 systems covering 27 jurisdictions with an ETS in force. Another six jurisdictions are putting in place their systems that could be operating in the next few years, including China and Mexico. 12 jurisdictions are also considering the role an ETS can play in their climate change policy mix, including Chile, Thailand and Vietnam. It is estimated that the number of global emissions under emissions trading could increase by almost 70% in 2020 compared to 2019, as the Chinese system will finally start. Furthermore, as of April 2018, 46 countries and 26 sub-national entities have adopted carbon pricing policies (I4CE, 2018).

5 Economic delivery

The EU ETS is considered by many as the main driver of EU climate change policy. Its stated goal is to "*promote reductions of greenhouse gas emissions in a cost-effective and economically efficient manner".* This creates the expectation that EUA prices will drive decarbonisation is done in the most economically efficient way. This chapter looks at whether the EU ETS delivers in this respect, including other areas where the EU ETS contributes to decarbonisation, such as financing the transition through the use of auctioning revenues.

One of the key indicators of the contribution of the EU ETS towards an economic efficient decarbonisation is the total costs incurred by the installations covered by the ETS to meet the cap. These costs, both direct and indirect, are also an indicator for the risk of carbon leakage, as the related monetary impacts can cause a loss in competitiveness for covered sectors and installations, compared to operators in jurisdictions with less stringent or no carbon constraints. In this context providing protection against the risk of carbon leakage is another area where the EU ETS must deliver.

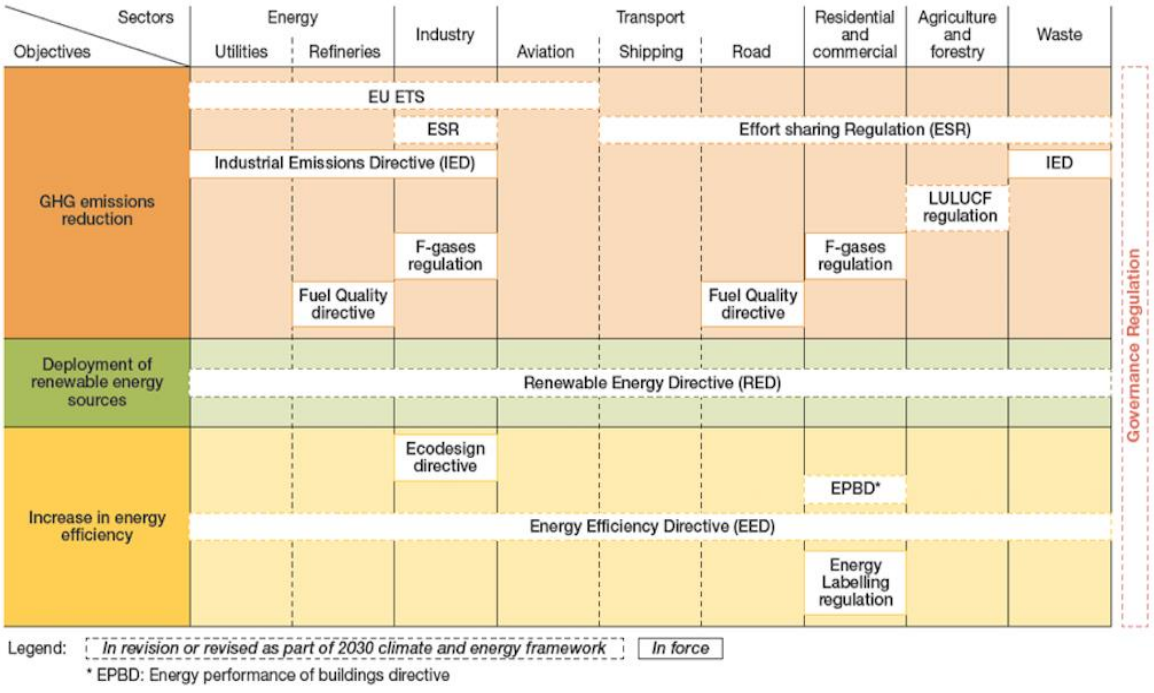
5.1 Is the EU ETS a driver for change?

Interaction with other policies

As discussed in the previous chapter, emissions covered by the EU ETS decreased significantly over the last years. However, it is unclear to which extent this decrease, and a decrease in carbon intensity, was driven by the EU ETS or by changes in levels of production and investment, or through incentives provided by other policies.

There are indeed other policies, some explicitly aimed at decreasing GHG emissions, others aimed at achieving other objectives, such as deploying renewable energy sources and increasing energy efficiency, which also lead to reductions in emissions from EU ETS sectors. An overview of EU policies that impact the functioning of the EU ETS is shown in Figure 9.

Figure 9: Landscape of climate and energy policies



Interpretation of the graph: The different objectives in the left-end column are to be achieved through the legislative texts in the frame with the same color. Those legislative texts apply in the sectors in the respective columns.

Source: I4CE and Enerdata, 2018, based on a visual concept by Ecologic

National policies may also have an impact on the functioning of the EU ETS. In recent years, the most prominent examples include national coal phase-out schemes. As assessed in Chapter 3.1, such phase-outs may have considerable impact on the functioning of the EU ETS, including its supply/demand balance, due to the high share of emissions from coal-fired power installations.

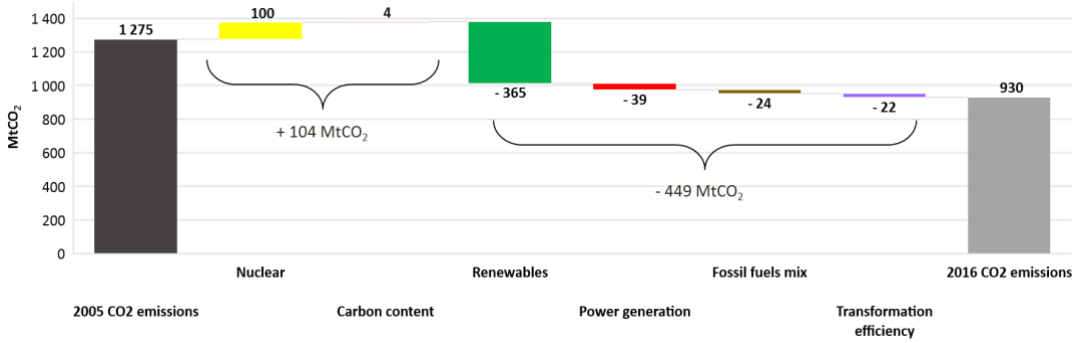
The impact of the EU ETS, and of other policies, on emissions reductions may thus be difficult to assess. As mentioned, not only other climate and energy policies need to be considered, but other factors as well, such as changes in economic activity. This makes the attribution exercise very complex and challenging. The new governance Directive requires Member States to assess the impact of national policies on the functioning of the EU ETS in their NECPs.

Focus on the power sector

To better understand the role of the EU ETS in driving down emissions, a good example is provided by an analysis of the power sector. Between 2005 and 2016, CO_2 emissions from the power sector decreased by almost 350 $MtCO_2$, a decrease of 27%. During the same period, the carbon content of power generation decreased by 24% (I4CE elaborations on Eurostat, 2019 and the IPCC, 2019).

A quantitative analysis[10] of the contribution of different drivers to the variation in emissions from the power sector shows that the deployment of renewable energy sources was the most important driver in decreasing CO_2 emissions from the power sector over 2005-2016 – by 365 $MtCO_2$ in total (see Figure 10).

Figure 10: Drivers of emissions variations in the power sector in the EU (2005-2016)



Source: I4CE elaborations Eurostat, 2019 and the IPCC, 2019

Other factors that contributed to the overall decrease in emissions during this period include a decrease in total power generation (-39 $MtCO_2$); the evolution of the fossil fuels power mix (-24 $MtCO_2$), mainly a switch between coal and gas for power generation; and the improvement of the average transformation efficiency of power plants (-22 $MtCO_2$).

On the other hand, the decrease in the share of nuclear power and the evolution of the carbon content of the different fossil fuels[11] contributed to increase emissions over the period – respectively + 100 $MtCO_2$ and + 4 $MtCO_2$.

While the EU ETS does play a role in the deployment of renewable energy sources, it is definitely not sufficiently on its own (Marcu et al, 2017). However, the EUA price is often seen as a potentially effective tool in triggering a switch from carbon-intensive fuels to less carbon-intensive ones, as in the case of coal-to-gas switch.

Figure 11 breaks down the overall picture in annual drivers of changes in emissions in the power sector. It shows that changes in the fossil fuels mix contributed to an increase in emissions between 2010 and 2014, but contributed to a decrease in the last 2 years of the period studied.

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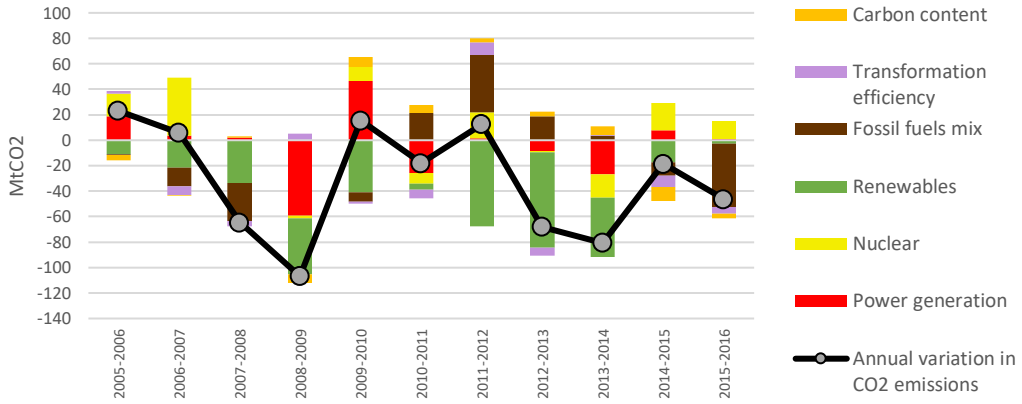
[10] Which is an update from an analysis presented in a report by I4CE and Enerdata in 2018: https://www.i4ce.org/download/full-report-mind-the-gap-aligning-the-2030-climate-and-energy-policy-framework-to-meet-long-term-climate-goals/.
A decomposition analysis was used to quantify the contribution of different drivers to the variations in emissions in the EU over the period 2005-2015 with the Log Mean Divisia Index (LMDI) method. Please refer to the Annexes of the "Mind the gap" report for more details on the methodology.

[11] This variable does not reflect a switch from one fuel to the other (i.e. a coal-to-gas switch), but the variation in the average carbon content of each fuel, for example due to variations in the quality of gas.

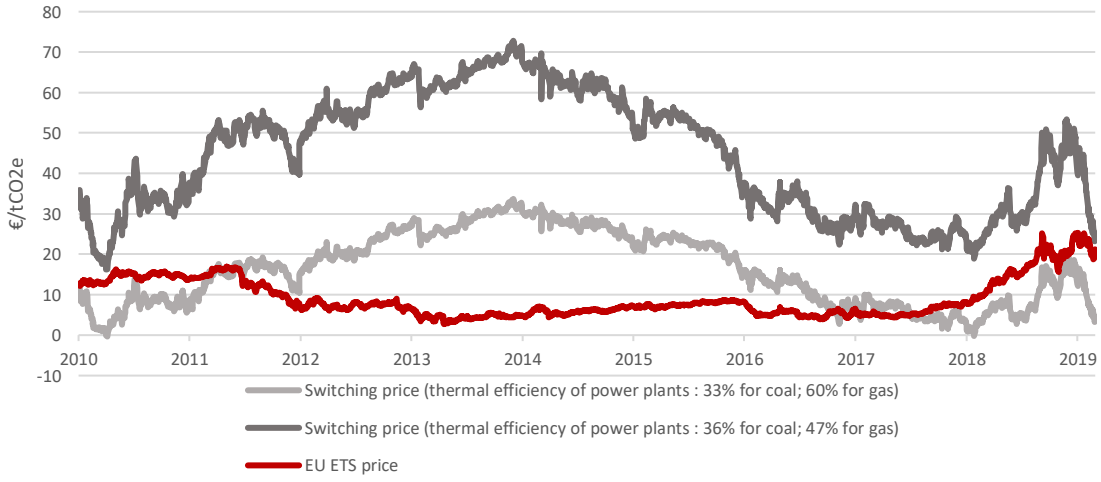
Figure 11: Annual drivers of emissions variations in the power sector in the EU (2005-2016)



Source: I4CE elaborations on Eurostat, 2019 and the IPCC, 2019

To understand the possible role of the EU ETS in this coal-to-gas switch, the EU ETS price was compared with a range of CO_2 switching prices[12] for different gas and coal power plants efficiencies. Figure 12 shows coal-to-gas switching prices in two configurations: for power plants with medium efficiencies, and for an efficient gas power plant and an inefficient gas power plant. The high-end of CO_2 switching prices[13] reaches several hundreds of euros per ton of CO_2 and is not shown on this graph. EU ETS prices have, as yet, been far from these levels.

Figure 12: CO2 switching price for different coal and gas power plants efficiencies, in comparison with EU ETS price



Source: I4CE, with data provided by ICIS (EU ETS prices, CIF ARA API2 prices, and TTF prices).[14]

[12] The CO_2 switching price is the CO_2 price that would make equal the prices of producing electricity from gas and from coal power plants. It depends on the relative gas and coal prices, and on the efficiencies of power plants.

[13] For an efficient coal power plant and an inefficient coal power plant.

[14] Other data sources are: Banque de France for the conversion dollars/euros, IPCC Guidelines and Eurostat for the CO2 content of gas and coal used for power generation in the EU. Average efficiencies of power plants are based on WEC database of energy

With the exception of the higher efficiency curve (which is not shown here), the price of EUAs and the switching price intersect throughout 2010 and again a number of times at the end of 2016, in 2017 and in 2018. We can thus conclude that EUA prices could sometimes be the trigger for the switch, but not enough to drive changes in the fossil fuel mix. However, it clearly contributed to these changes. EUA prices were above the minimum switching price for 5% of the year 2016[15], with the proportion increasing steadily to 53% in 2017, and 100% in 2018. This proportion will be tracked yearly as one of KPIs to assess the functioning of the EU ETS.

In conclusion, the EU ETS was not the major driver of emissions reductions in the power sector, which mainly came from the deployment of renewable energy between 2005 and 2016. However, over 2015-2016, a coal-to-gas switch in power generation also contributed to reduce emissions, reversing the trend of 2010-2014 when emissions increased due to a gas-to-coal switch. A share of these emissions reductions can be attributed to the impact of the EUA price. Indeed, the EUA price started to reach switching levels by the end of 2016.

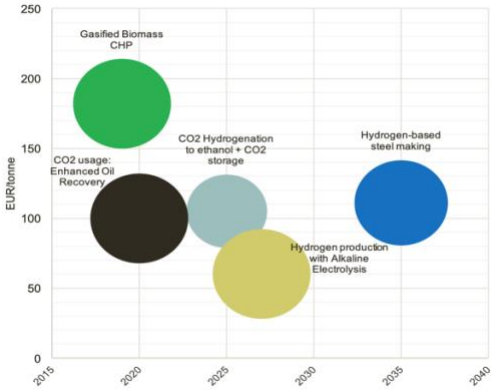
From the last quarter of 2017, the EUA price has substantially increased, and continues to rise, causing it to stay above the threshold of the switching price. However, it is important to keep in mind that the switching price shows a decreasing trend since 2014, also due to a drop in global gas prices. Additional emissions reductions coming from a coal-to-gas switch may thus be expected, which will have to be monitored in future years.

Deployment of low-carbon technologies in the long term

In addition to driving short-term emissions reductions through a switch to fuels with lower carbon content, the EU ETS may have an impact on emissions reductions by supporting the deployment of new technologies. An analysis carried out by ICIS looked at possible new technologies that can be deployed in sectors covered by the EU ETS, and evaluated the timing of market deployment, as well as the cost per ton of CO2 to deploy such technologies (see Figure 13).

These technologies are for the most part still at an early stage of development, and given their estimated cost of abatement, the current EUA price is unlikely to be the main driver for their mass deployment.

Figure 13: price and timeline of deployment of selected new technologies



Source: ICIS, 2019

Use of auctioning revenues

Finally, the EU ETS can play a role in speeding up the transition to a low-carbon economy through the use of auctioning revenues, as Member States are supposed to use at least half of the revenues for climate and energy related purposes, as stated by Article 10 of the EU ETS Directive.

efficiency indicators, minimum and maximum values on "Study on the state of play of energy efficiency of heat and electricity production technologies", (JRC, 2012).

[15] Calculated over working days.

In 2018, total revenues from the auctioning of allowances reached €14.2 billion, which represents an increase of more than 150% compared to the previous year (I4CE elaboration on EEX, 2019 and ICE, 2019). According to the Commission (European Commission, 2019f), over the period 2013-2017[16], around 80% of auction revenues were spent for climate and energy purposes, mainly within the EU. In 2017, the last year for which data is available, 79% of auction revenues were used for climate related purposes, another KPI that will be tracked yearly. Of revenues spent domestically, more than two-thirds were used to support the deployment of renewable energy and energy efficiency. If this trend continues, spending for climate and energy purposes in the future will grow significantly, as EUA prices keep on rising.

Figure 14: Use of auctioning revenues, 2013-2017 (Pie chart in EUR billion). Right hand graph only reports intra-EU spending

Source: Report from the Commission to the European Parliament and the Council {SWD(2018) 453 final}

5.2 Monetary impacts and carbon leakage

The monetary impact faced by industrial installations can be seen as an indicator for the risk of carbon leakage. These monetary impacts are of three types:

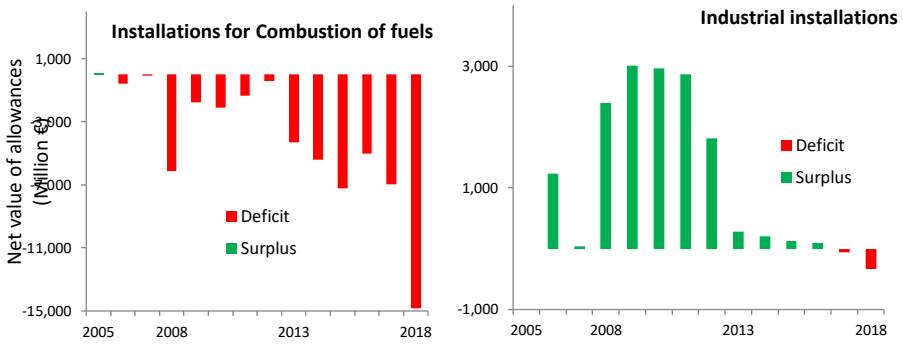
1. Direct costs, which is the amount of allowances that needs to be bought on the market multiplied by the EUA price;
2. Indirect costs, which are the costs of compliance for energy generators that are passed through to their customers, which is especially relevant for energy intensive industries;
3. Administrative costs, which are largely considered to be relatively small, in the order of a few eurocents per ton of product.

Direct Costs

Free allocation is the instrument currently used by the EU to mitigate the risk of carbon leakage from direct costs. Direct costs are the costs that an installation faces to comply under the EU ETS and is the difference between its verified emissions and free allocation multiplied by the EUA price. Figure 15 shows the estimate of the yearly direct costs for the combustion of fuels installations, largely represented by electricity generation, and industry sectors (as defined by EU TL activity codes).[17]

[16] Information on 2018 auctioning revenues was not yet available at the time when this report was written.
[17] For EUA price, ICE closing prices for December delivery of the same year were used.

Figure 15: net cost of allowances



Source: Wegener Center elaborations on EEA , 2019 and EU TL, 2019

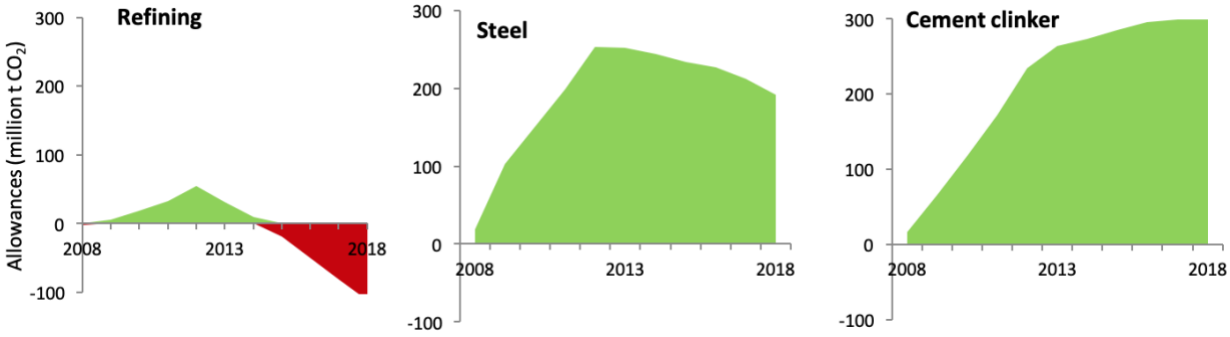
This figure shows that the power sector has been short since 2006, while the industry as a whole did not face any costs historically, and was thus protected from carbon leakage. However, the year-to year position has been decreasing over phase 3, and this downward trend for industrial sectors continued last year: 2018 was the second year that industry as a whole had direct costs. Note that this picture could change dramatically if it was possible to allocate the emissions (and surplus/deficit) from combustion installations to the various industry sectors.

It is important to highlight that the increase in costs in 2018 is not only due to the increase in EUA prices, but also due to coverage. In 2018 free allocation covered 96.5% of industrial emissions, down from 98.6% in 2017.

This data shows that the industrial sector as a whole received up to 624 million free allowances more than their verified emissions over Phase 2 and Phase 3. To give a more detailed picture for the position of some of the main industrial sectors, the net supply of free (as a percentage of the verified emissions) and the resulting cumulated surplus (in million tons of CO2) since 2008 were broken down by sector for steel, refineries and cement – the three biggest emitting activities, which together account for two thirds of industry emissions.

Figure 16 shows the cumulative surplus for these three sectors. Refining shows a negative cumulative surplus, having consistently experienced a shortage over Phase 3, effectively using up the net surpluses cumulated over Phase 2. The steel sector received considerable overallocation during Phase 2, a trend which also reversed during Phase 3. Interestingly, the cement sector saw its cumulative surplus decrease for the first time in 2018.

Figure 16: cumulative surplus of free allowances – Refining, Steel and Cement clinker



Source: Wegener Center elaborations on EEA, 2019 and EU TL, 2019

The picture for the other industrial sectors is similar: most of them cumulated big amounts of surplus over Phase 2, a trend which is slowly being reversed over Phase 3.

In summary, the data suggests that direct costs were so far rather negligible or even negative for most industrial activities. Moreover, it is clear that the trend of overallocation is being reversed for most sectors over Phase 3.

Indirect costs

Indirect costs are the other important aspect in assessing carbon leakage. As mentioned in previous editions of this report, estimating indirect costs is difficult, as they depend on, among others, estimates of cost pass-through. However, it is clear that some electricity intensive industries could experience high indirect costs, especially with EUA prices on the rise.

Indirect costs will gain importance with the increasing trend towards electrification, rising EUA prices and the marginal pricing of electricity.

Contrary to direct costs, there is no harmonized approach for compensation of indirect costs: only partial and regressive compensation is available at the discretion of Member States, and subject to state aid guidelines. Currently, Member States could compensate in 2018 up to 80% of the calculated indirect costs, dropping to 75% in 2019.

In 2018, eleven Member States and Norway are providing compensation for indirect costs. Luxembourg and the region of Wallonia in Belgium are the most recent ones to have been approved by the Commission. Political agreements have recently been reached in the Czech Republic and Poland to start compensating for indirect costs from Phase 4 onwards.

Table 2: Indirect costs compensation and total auction revenues – 2016 and 2017

Member State	Compensation paid for 2016 (€ million)	Auction revenues 2016 (€ million)	Percentage	Compensation paid for 2017 (€ million)	Auction revenues 2017 (€ million)	Percentage
Flanders	46.75	56.92	82.14%	31.72	76.14	41.67%
Netherlands	53.59	142.61	37.58%	36.9	190.71	19.35%
Germany	288.72	850.39	33.95%	202.21	1,146.82	17.63%
UK	19	424.33	4.48%	17.16	566.48	3.03%
Spain	71.44	369.46	19.34%	66.64*	493.55	13.50%
France	135.15	234.68	57.59%	98.73	313.40	31.50%
Slovakia	10	65.05	15.37%	10	87.06	11.49%
Finland	37.91	71.22	53.22%	26.75	95.26	28.08%
Latvia	1.04	11.5	8.70%	0.24	15.39	1.54%
Greece	12.4	148.05	8.38%	12.44	198.03	6.28%

**Note: For Spain only the preliminary data is available, the final amount is expected to be slightly higher*

Source: ERCST elaborations on Member States reports on indirect costs compensation, 2019

Table 2 shows the compensation given by Member States for costs incurred in 2016 and 2017, which is the most recent data available. This is compared with the percentage of auction revenues it represents. According to the revised EU ETS Directive, Member States should seek to compensate for maximum 25% of their auctioning revenues.

The table shows big differences between Member States, which can be largely explained by the fact that some countries have an emission-intensive power production and will thus receive more auctioning revenues, while others might have an energy-intensive industry but a low-carbon power production (or

import their power production). This can cause for big variations in the percentage of auction revenues used for indirect costs compensation.

Overall, both the amount of compensation given and the percentage of revenues used went down considerably from 2016 to 2017. This can be explained by two factors: firstly, the EUA forward price was lower in 2017 compared to 2016; secondly, the auction revenues increased considerably in 2017, mainly due to the end of back-loading, effectively increasing the auction volume.

6 Market functioning

6.1 Market functioning trackers

Next to environmental and economic delivery, the performance of the EU ETS in terms of market delivery is critical. Good market function is critical as it leads to a good price discovery, which is the primary function of a market.

Good market functioning should show, among other things, liquidity, transparency, and ease to get in and out of the market. Eight KPIs are identified in this Report that will help understand how the market is performing over time, and should provide a proxy for the basic requirements of a well-functioning market.

Table 3: Market functioning tracker

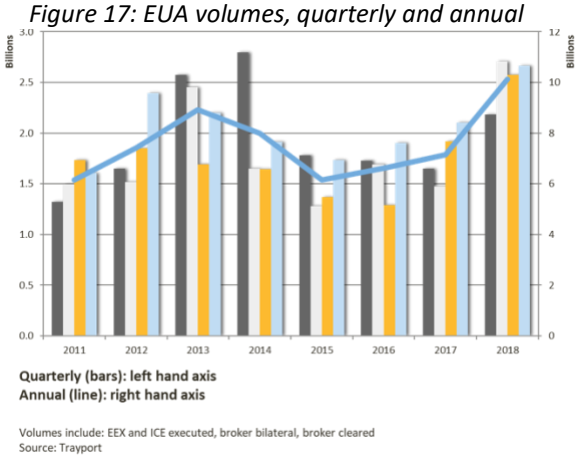
Indicator	2017/2016	2018/2017
Volumes	↑	↑
Open Interest	–	↑
Auction participation	↑	↑
Auction coverage	–	↑
Auction vs Spot spread	↑	↑
Bid-ask spread	↑	↑
Cost of carry	–	↑
Volatility	↓	↑

Legend: ↑ Improving; – Stable; ↑ Worsening

Volumes

The volume of trades on the market is fundamental to guarantee the ability of market participants to open and close positions at any time, at the lowest possible cost. This KPI has been seen as critical for the last years, due to low prices and the exit of many liquidity providers. 2017 showed a slight increase in volumes, which was further cemented in 2018 when overall volumes increased by 42% year-on-year. The majority of this increase is due to the return of financial players that, in light of the approval of the Phase 4 ETS reform, tried to anticipate the effect of the expected scarcity in the market.

Figure 17: EUA volumes, quarterly and annual



Open Interest

Open Interest is an additional KPI that helps us understand trends in liquidity. An open interest indicates the number of outstanding positions in the different contracts. Generally, the higher the open interest, the more a particular contract is traded and hence the higher is the level of liquidity. In line with the increase in volumes, 2018 showed a parallel rise of the open interest. The upward trend is coherent with the observed market behavior, and reflects the activity of financial players, especially if we take into account that emissions from the power sector decreased by roughly 6% last year, thus leading to lower hedging demand from utilities.

Auction participation

Auction participation shows the average number of participants in auctions. This indicator reflects the participation in the primary market, thus the direct demand. The average number of participants in auctions continues to show an improvement: from an average of 21.1 in 2017 to on average 26 participants per auction in 2018.

Auction coverage

Auction coverage represents the ratio between total bids in an auction to the number of EUAs available in the auction. It is an indicator that helps assess the actual demand for allowances on the primary market. Even though the long-term trend is still sloped downward, 2018 showed the first signs of a possible reversal of the trend, thus providing further evidence that demand is increasing. On average, auctions coverage has been stable at a level above 2 on a monthly basis, with a 3-year high in the summer when the auction coverage reached 4.15. We expect to observe a continuation of this trend towards the end of Phase 3.

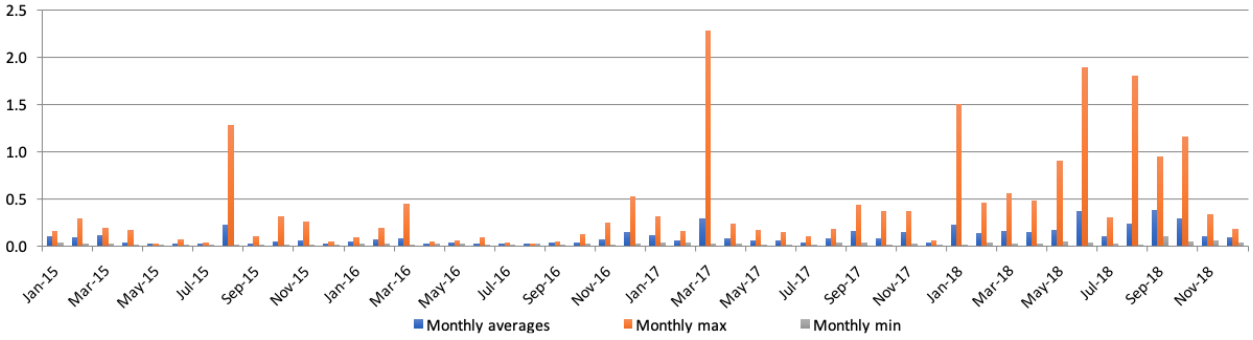
Auction vs Spot spread

The difference between the auction and spot prices reveals the interaction between the primary market and the financial market. A wide spread indicates the possible presence of market power by some players, asymmetry of information, or other factors that highlight a high speculation activity. Contrary to the expectations that we may have by analyzing trends in auction participation and auction coverage, 2018 revealed an increase in the spread between auctions and the spot market. This is a worrisome signal and it will be important to keep an eye on this indicator in the following years, in order to understand whether this is a new trend or just a temporary event.

Bid-ask spread

The bid-ask spread shows the difference between the highest price offered and asked in the marketplace. We look at this indicator focusing mainly on the EEX, which considers the best bid at secondary market before 11 AM and the best ask at secondary market before 11 AM. As was the case of the auction-spot spread, 2018 data shows an increase in the bid-ask spread, reinforcing the assumption that speculation indeed occurred.

Figure 18: Ask-Bid Spread - best ask minus best bid (€)

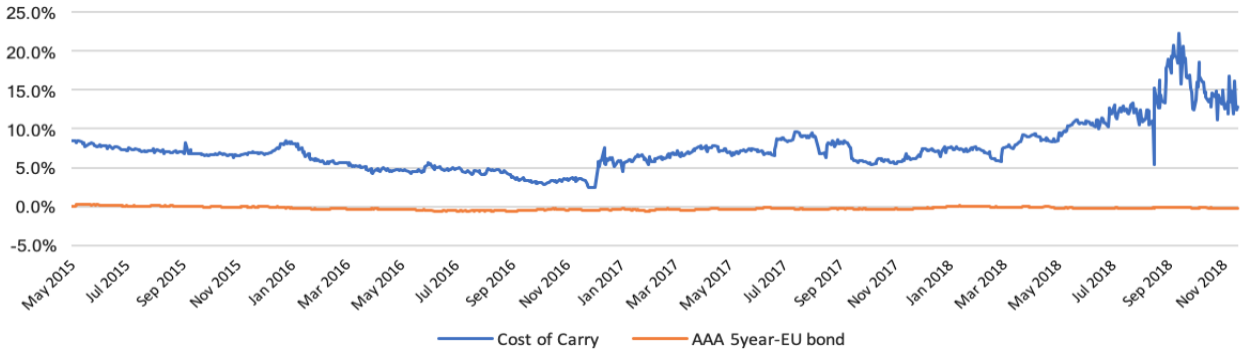


Source: EEX, 2019

Cost of carry

The cost of carry shows the expectations market players have about the future. It is the premium operators are willing to pay to buy a forward contract now and hold it for the future. The data shows a big jump in the cost of carry in 2018, bridging the gap between present and future expectations of market players. This indicates that the future scarcity is becoming priced in by the market.

Figure 19: Cost of carry – EUA vs AAA 5-year EU Bonds

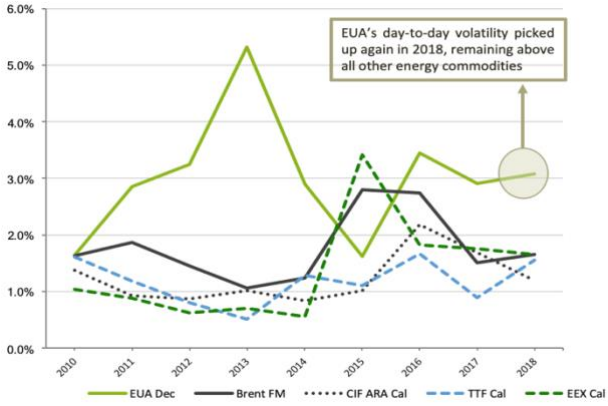


Source: ICE, 2019

Volatility

Volatility refers to the amount of uncertainty or risk in a financial product; it indicates how much and how quickly the value of a market changes. While volatility is a necessary feature of the market for traders and financial players that can take advantage of price fluctuations to make profits, high volatility can also be a disincentive for industries that need a more stable price signal in order to predict costs and make investment decisions.

Figure 20: Volatility



Source: ICIS elaborations on ICE, Platts and EEX,

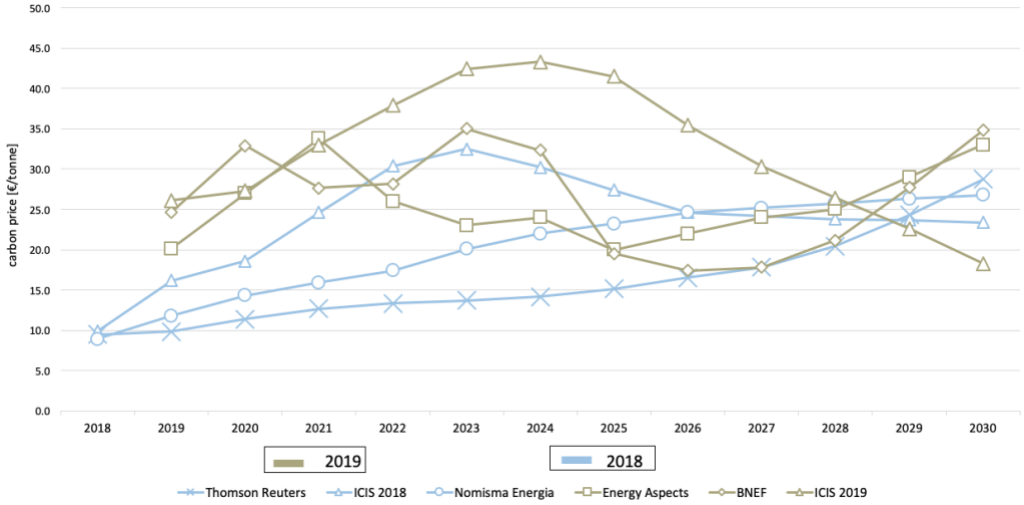
Volatility decreased in 2017, among other things thanks to MIFID2 and MAR (which introduced additional checks against market abuse and additional transparency measures), coming into force, which both applying to the EU ETS. However, in 2018 we saw a new increase in volatility, meaning that carbon still remains a riskier commodity, exhibiting a higher volatility, compared for example to Brent or natural gas.

In conclusion, we can say that the market improved year on a year compared to 2017. Indeed, five out of eight indicators show an improvement, while three KPIs showed a worsening performance. Despite the two spreads which may be seen as showing worrying signals, and volatility remaining an open issue – the trade-off between ensuring a stable and predictable price trajectory vs guaranteeing adequate liquidity which provided by traders and financial players – we can state that at this time the market is functioning well.

6.2 Price forecasts

If the aim of this report is to keep track of changes that have an impact on the EU ETS, it is interesting to follow how the perception of the market changes over time. To do that, we can evaluate price forecasts from different analysts. Figure 21 shows two sets of price forecast: one, in yellow, collected in March 2018; the second one, in blue, collected in March 2019. Though the pool of analysts is different from year to year, and the assumptions behind the modelling may have changed due to new market conditions, it is straightforward to note how all shorter-term price forecasts have now moved up. There is a general expectation by analysts that the carbon price will likely keep increasing in the next years.

Figure 21: Price forecast scenarios



The trend upwards is particularly significant in the short-to-mid-term, with ICIS forecasting EUA prices to top above €40/tCO2e by 2024. In the longer-term, we can notice expectations to converge in 2028, between €22 and €27, while diverging again at the end of Phase 4, when the price range widens between €15 and €35.

6.3 The Market Stability Reserve

The Market Stability Reserve (MSR) started operating in January 2019, four years after it was adopted. It is meant to provide a long-term solution to the problems created by the historical surplus of EUAs which accumulated in the market during the early years of the EU ETS, as well as to make the EU ETS more resilient to new sources of supply-demand imbalance.[18]

The functioning of the MSR is based on the total number of allowances in circulation (TNAC), defined as: *TNAC = Supply – (Demand + allowances in the MSR)*. The instrument works according to pre-set, volume-based triggers:

[18] The historical surplus was primarily caused by the 2008 economic crisis and the high imports of international credits during Phase 2 and the first years of Phase 3. During Phase 3, the EU took the short-term measure of postponing the auctioning of 900 million allowances in 2014, 2015 and 2016 (so-called *backloading*), to partially restore the market balance. Unallocated allowances due to backloading are now been transferred to the MSR in 2019 and 2020, and are calculated as part of the TNAC.

- If TNAC > 833mt: Fixed percentage of the TNAC to be subtracted from the auctioning calendar and placed in MSR (24% between 2019-2023, 12% from 2024 onwards).
- If TNAC < 400mt: 100mt to be released from the MSR and added to the auctioning calendar

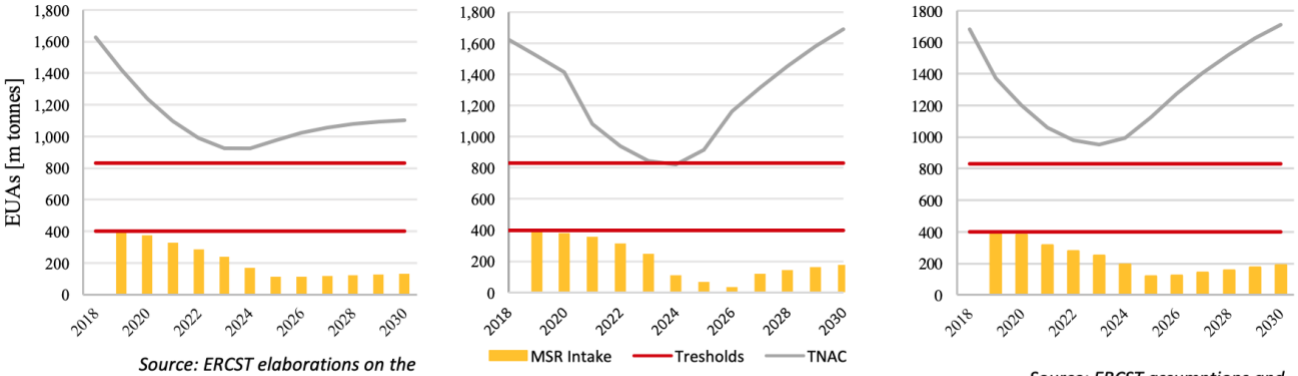
Furthermore, from 2023 a yearly invalidation of allowances is foreseen, to address part of the surplus held in the MSR: any allowances above the number of allowances auctioned the previous year will be invalidated in the MSR.

The combination of 24% intake rate until 2024 and yearly invalidation of allowances is expected to enable the MSR to cope effectively with the current surplus in its first years of operation. Already in 2019, thanks to the MSR, the year's auction volumes are expected to be reduced by close to 397 million allowances (European Commission, 2018f). This corresponds to approximately 21.4% of the supply of allowances for 2019, and might therefore create considerable market scarcity.

Furthermore, with the start of the yearly invalidation of allowances, the MSR is expected to invalidate an amount of allowances in the range of 2230mt to 2428mt in 2023 – including backloaded allowances from 2014-2016 (sources: ICIS, 2019 and Wegener Center, 2019). This will have a positive impact on the EU ETS market functioning and price setting in the upcoming years.

Notwithstanding these positive effects, however, different models agree that with the current design parameters the MSR will not be able to absorb surpluses from potential new sources of imbalance which might emerge during Phase 4 – e.g. new EU-wide 2030 targets for renewables and energy efficiency; new Member States policies such as coal phase-outs, at least in the absence of voluntary cancellation; new economic shocks; etc. Indeed, Figure 22 shows three projections which indicate that the TNAC will not remain within thresholds in the period 2021-2030, and will actually go on an upward trajectory after 2024. This implies that the MSR will fall short of fulfilling its long-term goal of making the EU ETS more resilient to future sources of imbalance, unless the MSR design parameters are adapted to the new market environment.

Figure 22: projections of MSR functioning and intake volumes 2019-2030



Source: ERCST elaborations on the European Commission, 2018; and modelling by the Wegener Center, 2019

Source: ICIS, 2019

Source: ERCST assumptions and Sandbag modelling, 2019

7 Policy issues to monitor in the future

This chapter will discuss eight issues that need to be monitored in the coming years in order to ensure that the EU ETS is 'fit for purpose' and is prepared for future reviews and challenges.

7.1 Implementation of secondary legislation related to the EU ETS

Three key pieces of secondary legislation from the EU ETS Phase 4 review are still to be finalised and will need to be monitored in the future. The first key issue is the finalisation of the work on free allocation, and is following two different tracks.

- The implementing act on rules for adjusting free allocation due to production changes will determine how the level of free allocation given is adjusted on the basis of changing levels of production. These rules are expected to significantly improve the ability of the EU ETS to respond to changes in activity levels. The act is expected for adoption in the third quarter 2019.
- The Update benchmark values implementing act will determine updated benchmarks for 2021-2025 is expected in 2020.

Secondly, the adoption of the rules for the operation of the Modernisation Fund is expected in 2020. The Fund will be vital in helping lower-income Member States finance their ongoing efforts to modernise their energy systems and improve energy efficiency.

Thirdly, the Commission has initiated a revision of the EU ETS State Aid Guidelines for the next trading period, which could change quite drastically compared to Phase 3. Important issues, most prominently the list of eligible sectors, and the method of calculating how much compensation Member States can give to industry, will have to be decided on. The revision is expected to be ready by the third quarter of 2020.

7.2 Implications of EU elections on climate change policy

As climate change policy issues and legislation, including EU ETS provisions, will be managed by a new European Parliament and Commission, the result of EU elections will have a significant impact on future orientations.

A significant change in the composition of the current EU Parliament towards more-non-establishment Parties may have a significant policy impact, as they are generally less inclined to give priority to climate change ambition. The ongoing work on the EU ETS Directive implementation for its Phase 4 and more broadly on the climate change actions will be suspended until the Autumn, pending the inauguration of the new European Parliament and the nomination of the new EU Commission.

7.3 Brexit

Brexit creates broad policy uncertainty in the EU, and the EU ETS is no exception. At the time of writing, the Brexit deadline was postponed to October 31, 2019. Scenarios that can be envisaged include a "no deal" in which case the UK will replace the EU ETS with a domestic carbon tax; a "deal" scenario, in which the UK could stay in the EU ETS (linked or standalone.

A number of questions remain, including the adjustment of the EU ETS cap, recalculation of the benchmark, as well as the impact on the EU ETS funds: the innovation fund and the modernization fund.

The Brexit result may lead to the need to adjust EU ETS parameters. If the ambition of the EU ETS without the UK remains similar to the current 2030 target, then Brexit will have a moderate impact on the EU ETS market balance. Indeed, Brexit is expected to contribute to a tighter supply-demand balance for the ETS during Phase 4, but the absolute effect on prices would only be moderately bearish as the MSR counteracts such an effect. The overlap of Brexit-related supply and MSR operation could trigger a discussion whether the MSR thresholds should be adjusted (ICIS, 2017).

7.4 Future of the aviation sector under EU ETS – CORSIA

The EU ETS for aviation will be subject to a new review in the light of the international developments related to the operationalisation of CORSIA. According to this review, the LRF could be applied to the aviation sector from 2021 onwards (European Union, 2017). In the absence of a new amendment, the EU ETS would revert back to its original full scope from 2024. Within 12 months of the adoption by the ICAO of the relevant instruments, the EU Council requested that the Commission presents a report on the adequacy, ambition and environmental integrity of CORSIA, and any needed legislative proposals to amend, delete, extend or replace the ongoing derogations from the EU ETS compliance obligations for international flights, according to the EU climate targets (European Union, 2017).

7.5 Preparing the MSR review

The Market Stability Reserve (MSR), has a first review foreseen for 2021 and a second one for 2026. Several analyses demonstrate that, in the current setting, the MSR will not be able to cope with the surplus that will be generated by new events such as ambitious RES and EE targets or the German coal phase out. Bringing the total number of allowances in circulation (TNAC) within range of the MSR thresholds in case of new events would necessitate revisiting the MSR parameters.

Each review should analyse the effectiveness of the MSR in achieving its objectives of eliminating the historical structural imbalance; bringing the (TNAC) within range of the MSR thresholds; and assessing the impact of the MSR on growth, jobs, and industrial competitiveness.

According to work by ERCST (Marcu and Caneill, 2019), a first list of indicators to monitor the MSR functioning towards 2021 includes the ones outlined in Table 4 below.

Table 4 - Tentative list of indicators to monitor the MSR functioning.

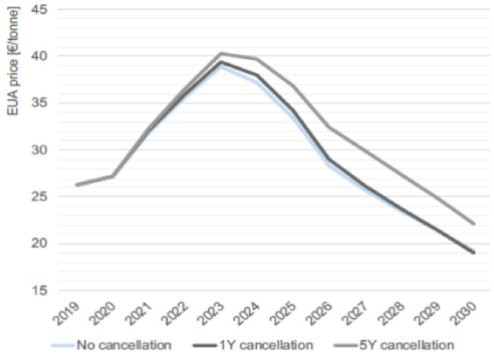
Goal 1 - Eliminate the historical structural imbalance	**Goal 2 - Bring the TNAC within range of the MSR thresholds in case of new events**	**Goal 3 - Monitor the impact of the MSR on competitiveness**
• TNAC for 2019-2021 • Estimated TNAC for Phase 3 compared to TNAC for 2019-2021	• RES/EE achievements of MS in 2020 • RES/EE targets towards 2030 • Overlapping MS policies (e.g. coal phase outs) • Variations in economic growth • Hedging strategies of industrial and power companies	• Carbon leakage impact of EUA price (both direct and indirect costs) • Change in auction revenues for MS • Implications of the MSR functioning on the innovation and modernisation funds

Source: Marcu and Caneill, 2019

7.6 Cancellation of allowances in the event of closure of electricity generation capacity

One important question is whether and how Member States will cancel allowances to be auctioned in the event of closure of electricity generation capacity, including how many carbon allowances can be cancelled in order to compensate for the effect of the coal phase-out. Indeed, Article 12.4 of the EU ETS Directive foresees the cancellation of allowances to be auctioned as a voluntary decision by Member States, "*In the event of closure of electricity generation capacity*".

Figure 23: The EUA price development over Phase IV according to three scenarios around the German coal phase-out and linked cancellation from the auction calendar



Source: ICIS, February 2019.

As specified in Chapter 3, several countries foresee a coal-phase out plan by 2030. As there are different interpretations, assessing the potential impact of those plans on the EU ETS will require some clarifications regarding the protocol, amount and timing of cancellation. The impact on the EU ETS supply-demand balance will much depend on this interpretation. The importance of the issue is shown in Figure 23, which shows that no cancellation or a one-year cancellation of the coal phase-out effect would have a bearish impact on carbon prices by €3-5/tonne, compared to a scenario assuming a five-year cancellation. Therefore, the specification by Member States of how much of the effect of the closure of the electricity generation capacity will be cancelled will be essential to properly evaluate the impact of the coal phase-out plans on EUA prices.

7.7 Operationalizing Article 30 of the EU ETS Directive

The EU ETS includes provisions for mitigating the risks of carbon leakage, including free allocation. This protection is subject to review under Article 30 of the EU ETS Directive, which states that the Directive "shall be kept under review in the light of international developments and efforts undertaken to achieve the long-term objectives of the Paris Agreement" and "in light of climate policy measures in other major economies".

So far, this Article has not been operationalized. However, it could become increasingly important, given the pressure to increase EU ambition to meet the goals of the Paris Agreement, and the impact that this may have on competitiveness as well as on the level of ambition of other Parties to the Paris Agreement. Developing generally accepted methodologies to compare the level of ambition of different countries, and translating that into actions at the EU level is a process which is likely to take time, and an early start should be encouraged. An issue that requires attention.

7.8 The role of market mechanisms in achieving negative emissions

One of the key objectives in the Paris Agreement is achieving net carbon neutrality by the second half of the century. This is translated in two of the EC's "strategic long-term vision" scenarios, issued in November 2018, which make it clear that there will be a need for technologies that have negative emissions.

Given this vision, the technologies to achieve negative emissions and the mechanisms to finance and incentivize their deployment are issues that will need to be monitored. Their development needs to start now, if they are to be available by the second half of Phase 4. How, if in any way, they will interact with

the EU ETS is an issue that needs to be explored sooner rather than later. The EU Commission should launch new thinking processes around market mechanisms for negative emissions.

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