Commissie voor de Regulering
van de Elektriciteit en het Gas

Study

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Study on the functioning of the European Union Emissions Trading Scheme and its impact on the wholesale electricity markets

Non-confidential

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

The European Union's Emissions Trading Scheme constitutes one of the pillars of Europe's climate policy. Through a so-called "cap-and-trade" system, it aims to reduce the emissions of greenhouse gases in a cost-efficient and effective manner.

This study briefly introduces the EU ETS, its history and legal framework, covering the United Nations' Framework Convention on Climate Change, different European Union directives and regulations as well as national and regional legislation in Belgium.

Throughout its history, the general ideal behind the mechanisms has proven to be fairly stable and resilient, yet based on advancing insights several modifications and enlargements have been proposed within and across the different phases. These improvements relate among others to the sectors and gases covered, the methods to allocate allowances and verify emissions, the penalties for non-compliance and the introduction of flexibility mechanisms such as the Market Stability Reserve. In the context of the Fit-for-55 Package, further modifications are proposed to improve the resiliency and the effectiveness of the EU ETS. These are, however, today proposals which have yet to be implemented through changes in the relevant legislation.

While other mechanisms exist to reduce emissions from greenhouse gases and mitigate the most immediate effects of climate change, cap-and-trade mechanisms in general, and the EU ETS in specific, demonstrate some advantages over other, more traditional command-and-control schemes. These advantages are linked to the certainty on the reductions, the flexibility and the cost efficiency for participating actors, the revenues for Member States and hence the minimization of budgetary risks. Some drawbacks are identified as well, mostly focused around the competitiveness of the installations that are targeted by the scheme and the impact of carbon leakage and the difficulty to design the mechanism's parameters in such a manner that a meaningful price signal is accommodated.

The overview and monitoring of the implementation of the EU ETS is typically assigned to governments and Member States. As the mechanism also establishes secondary, financial markets to exchange allowances (the "trade" in "cap-and-trade"), regulatory authorities such as the ESMA (in Europe) and the FSMA (in Belgium) are charged with the oversight of these systems.

From the available data, it can be shown that the emissions of greenhouse gases (mostly those that are covered by the EU ETS, such as CO_2, N_2O and fluorinated gases) have decreased significantly since the inception of the EU ETS in 2005. This reduction is despite a difficult start of the mechanism, where over-allocations in the first two phases (between 2005 and 2012) led to significant surpluses, depressed prices for allowances and generally only a low incentive to actively reduce emissions for participating installations.

While the prices for these allowances have been, historically, on the low side (mostly in phases 1 and 2), they have stared increasing from the end of Phase 3 (starting about 2018) onwards, reflecting improvements in the alignment between supply and demand. These improvements followed from, among others, the introduction of a market stability reserve and stricter reductions of the caps on verified emissions.

One of the main sectors that fall under the scope of the EU ETS is electricity generation. The price for emission allowances, established in primary or secondary markets, are reflected in the marginal costs of electricity producers when these bid into the electricity markets. Through the determination of the merit order and the marginal pricing mechanism, they directly impact the wholesale electricity pricing. Hence, these allowance prices influence the short-term optimal dispatch as well as the long-term investment decisions.

Following from this, it can be observed that the carbon intensity of the Belgian (and European) electricity generation has decreased significantly. The extent to which this can be attributed solely to the functioning and the impact of the EU ETS is difficult to assess. In reality, the interplay between this mechanism and other policy objectives related to the increased penetration of renewables and improvements related to energy efficiency, determines the actual generation mix in Belgium and other European Member States.

Finally, while not covered under the EU ETS, the emissions of methane (CH_4) – another very potent greenhouse gas – are described. These emissions result mainly from the activities of gas companies throughout the value chain of gas production, processing, transmission and distribution.

INTRODUCTION

In this study, the Commission for Electricity and Gas Regulation describes and analyses the impact of the European Union's Emissions Trading Scheme on the European and Belgian electricity markets.

The study starts with an introduction to the EU ETS, presenting its origins, legal basis and a description of the theoretical functioning of the system. The particular nature of the Belgian legal framework is described, including a description of the different tasks and responsibilities between the federal and regional governments. Related to the functioning of the EU ETS, the history (from Phase 1 to 3) and the current mechanism (Phase 4) are elaborated.

In the second chapter, empirical observations based on available data are presented. These observations relate to the emissions from greenhouse gases across different sectors and with different geographical scopes. Where possible, a focus on the gases, sectors and scopes that fall under the direct application of the EU ETS is provided. The allowances and caps on verified emissions are shown, as well as the functioning of secondary markets and the evolution of the prices for allowances since the implementation of the system. Finally, the use of auction revenues in Europe, Belgium and the different Belgian regions are discussed.

The third chapter describes how the functioning of this mechanism impacts the electricity markets and the fourth chapter provides some additional information on methane emissions. The main impact is identified through the direct propagation of allowance prices into the price for electricity, providing a short- and long-term signal to producers of electricity. The coal-to-gas (and vice versa) switch is explained and the impact on other markets is briefly discussed. Finally, the impact on the electricity generation sector (in terms of installed capacity, generated energy and carbon intensity) is analysed.

In a fourth chapter, some additional information on methane emissions, in particular from the energy (gas) sector in Belgium is provided.

The Board of Directors of the CREG approved this study during its meeting on 16 June 2022.

1. INTRODUCTION TO THE EU ETS

1. This chapter provides a general background to the European Union's Emissions Trading Scheme (hereafter: "EU ETS"). The context and the history behind the adoption of this mechanism as well as a general overview of the legal framework are provided. This is followed by an in-depth description of the functioning of the EU ETS, describing the different phases since its inception until today. The rules and procedures for the control and oversight on the functioning of the EU ETS are provided, and, finally, some of the future evolutions – in particular those foreseen in the *"Fit-for-55 Package"* – are presented.

1.1. BACK TO THE ORIGINS OF THE EU TS: THE UNFCCC AND THE KYOTO PROTOCOL

2. The EU ETS is one of the main levers of the European climate policy. It has its origin in the United Nations' Framework Convention on Climate Change or UNFCCC (from 1994) and, more specifically, in the Kyoto Protocol which implements the UNFCCC. The Kyoto Protocol has as objective the stabilization, within sufficient time, of the concentration of greenhouse gasses ("GHG") at a level that prevents dangerous anthropogenic (or human-induced) interference with the climate system.

3. In order to help the signatory countries to achieve their GHG reduction targets, and in addition to any measures taken at the national level, the Kyoto Protocol (from 2005) lays the foundations for an international market, through three mechanisms of flexibility:

- The emissions trading mechanism, which allows parties to the Protocol to buy emission allowances from other parties with commitments under the Protocol and to use them to meet their GHG emission reduction targets;
- the Joint Implementation Mechanism, which makes it possible to obtain credits from investments in projects carried out in other countries that have signed the Protocol; and
- the Clean Development Mechanism, which allows signatory countries to the Protocol to buy emission reductions generated by projects carried out in developing countries.

4. The EU ETS was introduced on 1 January 2005 to meet the commitments made by the European Union (with its 15 Member States at the time) to reduce its GHG emissions by 8% between 2008 and 2012 compared to 1990 levels. This corresponds to the first commitment period from the Kyoto Protocol (2008 – 2012).

5. Although it is not the only emissions trading market to have been developed in the world, the EU ETS is to date the largest market in the world, with the participation of 27 Member States and three EFTA members (since early 2008): Iceland, Norway and Liechtenstein. In its final report on the EU carbon market,[1] the European Securities and Markets Authority (ESMA) reported that the EU ETS accounted for almost 90% of the global carbon market value in 2020.

[1] Published on 28 March 2022: https://www.esma.europa.eu/press-news/esma-news/esma-publishes-its-final-report-eu-carbon-market

1.2. LEGAL FRAMEWORK

1.2.1. European legal framework

6. On 8 March 2000, the European Commission presented its Green Paper on the establishment of a GHG emission trading system in the European Union, with a view to launch a debate on the design of such a system within the EU and its reelationship with other policies and measures aimed at combating climate change.

7. The Green Paper contributed to shape the EU ETS in its very first phase (see section 1.3.2.1) and led to the adoption of the *"EU ETS Directive"*[2], which aims to provide the legal basis to promote reductions of GHG emissions in a cost-effective and economically efficient manner.

8. This directive has been modified and reinforced on several occasions as the system evolves and undergoes evaluation. Modifications have also been adopted in the view of implementing an increasingly strong commitment by the European Union in reducing GHG emissions,[3] without harming certain economic sectors, particularly those exposed to international competition (for example the aviation sector) or subject to possible relocation to regions with less restrictive regulations in terms of GHG emissions.

[2] Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community

[3] *"In line with the European Green Deal, the European Climate Law set a 55 % GHG minimum net reduction (compared to 1990) as an intermediate target for 2030, up from the previous 40 % target. On 14 July 2021, the Commission published a set of proposals aiming to align climate, energy, transport and taxation policies with the new intermediate 2030 climate target, the so-called "Fit for 55" package. It also includes increased renewable energy and energy efficiency targets".*
(Source: https://www.eca.europa.eu/Lists/ECADocuments/RW22_01/RW_Energy_taxation_EN.pdf)

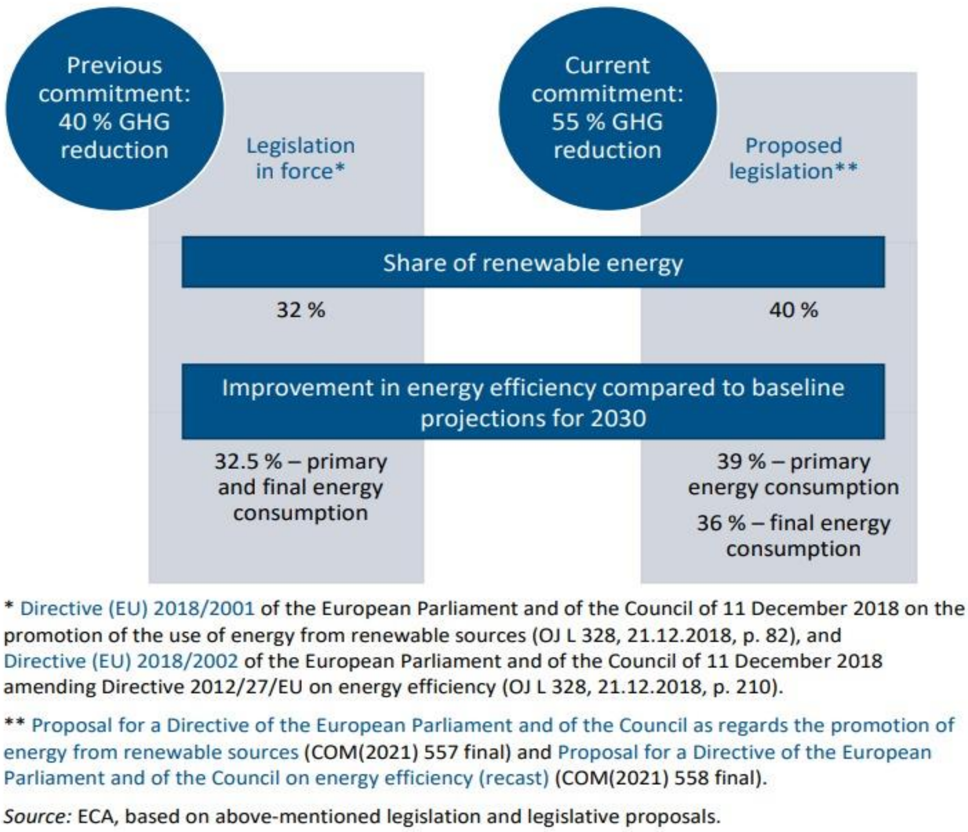

Figure 1 Updates to climate targets

9. Regulatory changes have been made as well, particularly in terms of the inclusion of a greater number of GHGs, countries and sectors subject to the requirements of the directive, while the emissions cap is continuously decreasing. For example, in 2012 the aviation sector joined the list of regulated sectors and other new sectors, such as maritime transport, are likely to follow the same fate under the proposals of the *"Fit-for-55 Package"* of the European Commission (see also section 1.6). More practical considerations of the EU ETS have also been subject to changes over time, such as the methods for allocating emission allowances (see also section 1.3.1).

1.2.2. Belgian legal framework

10. As far as Belgium is concerned, the objective of reducing GHG emissions mobilizes skills, bodies and decision-making processes at different levels of power, due to the federal structure of the country. This structure also implies that the national emission reduction objectives are subject to a distribution of the burdens between the federal state and the regions.

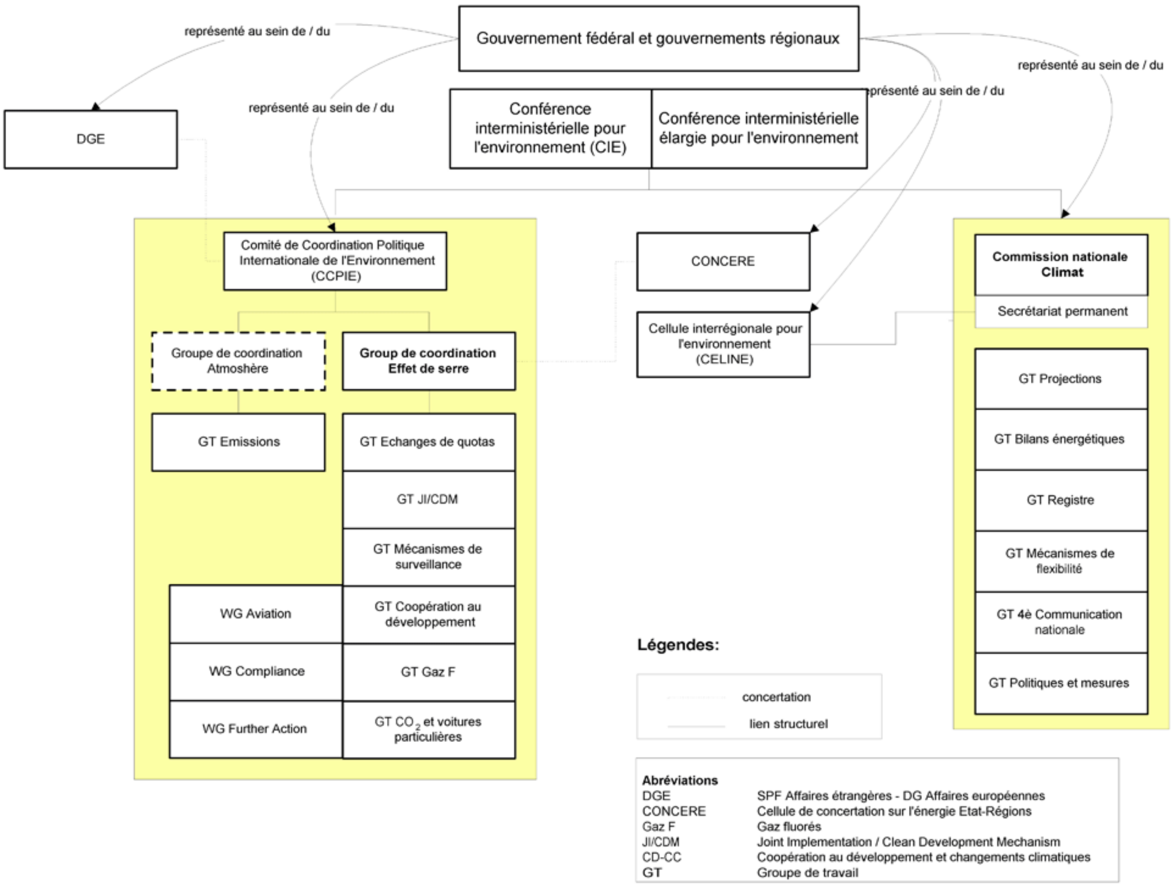

Figure 2 Coordination of the Belgian climate policy[4,5]

[4] *Conférence interministérielle pour l'environnement (CIE):* permanent working group of the Consultation Committee. It consists of the federal and regional ministers responsible for the environment and is chaired by the federal minister for the Environment. When climate change is on the agenda, the CIE is enlarged to include the Prime Minister, the regional Minister-Presidents, the federal treasury minister, the ministers responsible for energy, transportation, taxation and development cooperation, and the regional ministers for the economy.

[5] *Comité de coordination de la politique internationale de l'environnement (CCPIE)* : an administrative consultative body consisting of the cabinets and administrations responsible for the environment, foreign affairs and development cooperation. It is responsible for organizing consultations, preparing policy measures, representation in international organizations or ministerial conferences, etc. Climate policy is monitored by one of the Steering Groups of the CCPIE: the Greenhouse Effect Coordination Group. This in turn oversees various specialized working groups.

11. The EU ETS Directive (and its various amendments) has been transposed mainly by the following regional standards:

- Walloon region: *"Décret du 10 novembre 2004 instaurant un système déchange de quotas d'émission de gaz à effet de serre, créant un Fonds wallon Kyoto et relatif aux mécanismes de flexibilité du Protocole de Kyoto"*;
- Flemish region : *"Decreet van 5 april 1999 houdende algemene bepalingen inzake milieubeleid"* (title VIII)*;*
- Brussels Capital region: *"Ordonnacne du 2 mai 2013 portant le Code bruxellois de l'Air, du Climat et de la Maîtrise de l'Energie "*.

12. There are also cooperation agreements between the federal state and the regions, as for example:

- *l'accord de coopération du 2 septembre 2013 entre l'Etat fédéral, la Région flamande, la Région wallonne et la Région de Bruxelles-Capitale relatif à l'intégration des activités aériennes dans le système communautaire d'échange de quotas d'émission de gaz à effet de serre conformément à la Directive 2008/101/CE du Parlement européen et du Conseil du 19 novembre 2008 modifiant la Directive 2003/87/CE afin d'intégrer les activités aériennes dans le système communautaire d'échange de quotas d'émission de gaz à effet de serre ;*
- *l'accord de coopération du 20 janvier 2017 entre l'Etat fédéral, la Région flamande, la Région wallonne et la Région de Bruxelles-Capitale, relatif à l'organisation et à la gestion administrative du registre national belge de gaz à effet de serre conformément à la directive 2003/87/CE du Parlement européen et du Conseil, au règlement (UE) n° 525/2013 du Parlement européen et du Conseil, et à certains aspects de la mise aux enchères conformément au règlement (UE) n° 1031/2010 de la Commission ;*
- *l'accord de coopération du 12 février 2018 entre l'Etat fédéral, la Région flamande, la Région wallon.*

1.3. DESCRIPTION OF THE EU ETS

1.3.1. Basic principles of the EU ETS

13. The system of emission allowances is a market-based means for public authorities to reduce GHG emissions, in addition to other regulatory measures (such as control or prohibition of certain practices, for example), taxation and subsidization. This is done by allocating emission allowances (quotas) to participants and imposing limits to these allowances that decrease as time passes.

14. This economic regulation tool, designed in the 60s thanks to the work of the economists Ronald Coase and John Dales, is based on a "polluter pays"-principle. This principle implies that the costs for preventing, reducing or correcting environmental damages should be charged to the polluting economic agent. This principle of environmental law, enshrined in Article 191 of the Treaty on the Functioning of the European Union ("TFEU"), makes it possible to internalize the negative externalities generated by polluting companies. Hence, by valuing the cost or the price of pollution on a market, companies that emit GHGs above their permitted level must buy the GHG emission rights, thereby increasing their operational costs. By paying more to cover part of the costs they have incurred by polluting, these companies are thereby internalizing the negative externalities they have generated.

15. The EU ETS is a cap-and-trade system in which the emission rights of certain installations (or the total amount of GHG emissions allowed) are capped (limited to a maximum volume) by the public authorities and can be traded on an organized marketplace, over-the-counter or through intermediaries.

16. In the EU ETS design, one emission allowance corresponds to the right to emit one tonne of $CO_{2\text{-}eq}$ during a specified period. It is the unit of measurement allocated to companies covered by the cap-and-trade system and the commonly accepted benchmark for trading.

17. The existence of a cap on the right to pollute is intended to create scarcity and to ensure that the value for the emission rights is sufficient to stimulate market transactions, with the ultimate objective to limit GHG emissions. Its optimal level should in principle neither be too low to not jeopardise economic activity, nor too high to have a real impact on pollution. In the EU ETS, caps are set to decrease from year to year, with the aim to substantially reduce emissions in the light of the climate emergency while allowing companies to make the necessary adjustments to meet their targets. By structurally decreasing the supply, the price of allowances increases, all other things being equal, hence increasing the cost of pollution.

18. Generally, at the start of any given period, each participant to the scheme receives a number of allowances corresponding to authorized emissions, depending on its sector of activity and through predefined allocation methods (see also section 1.3.3). At the end of that period, the participant must surrender to the public authority the amount of emission allowances or other assets allowed under the scheme, equal to its actual verified emissions. There are significant penalties for companies for non-compliance (with the cap) and additional penalties may be set at the Member State level. In addition, these fines are non-dischargeable in that the companies concerned remain liable for the allowances they are missing, in order to ensure that the targets set are actually met.

19. Under the EU ETS, companies must obtain emission allowances to cover their GHG emissions. Once these allowances have been allocated, there are two possible outcomes for the non-compliant participant (i.e. the participant whose emissions do not correspond to the allowances allocated to them):

- Either the company's GHG emissions are higher than the allowances allocated to it for free or through an auction in its possession, in which case the company may – under penalty of being sanctioned – either buy additional allowances on the market or borrow these allowances (i.e.

resort, in advance, to the use of part of the allowances that will be allocated to it for subsequent years);

- Or the company's GHG emissions are lower than the allowances allocated to it, in which case the company can either sell its unused allowances and benefit from additional income that can be used to finance, for example, investments that will enable it to further reduce or control its emissions, or save them to cover its future needs for periods subsequent to that of their allocation ("banking"). Saving this surplus balance also allows the company to respond to a forecasted growth in production or to anticipate a strengthening of regulatory constraints (e.g. through a further reduction of emission caps).

20. This way, a market for CO_2 develops, with some flexibility in the allowed banking and borrowing options, where companies are allowed to trade emission allowances and the equilibrium price of a tonne of $CO_{2\text{-}eq}$ is determined by the supply and demand of emission rights from market participants. As the number of allowances on the market is limited, there will be more buyers of allowances than sellers if companies plan to emit more than the cap on allowances. Subsequently, the price of allowances will increase according to the law of supply and demand. If, on the other hand, actual emissions are below the annual cap, the market price will fall, all other things being equal.

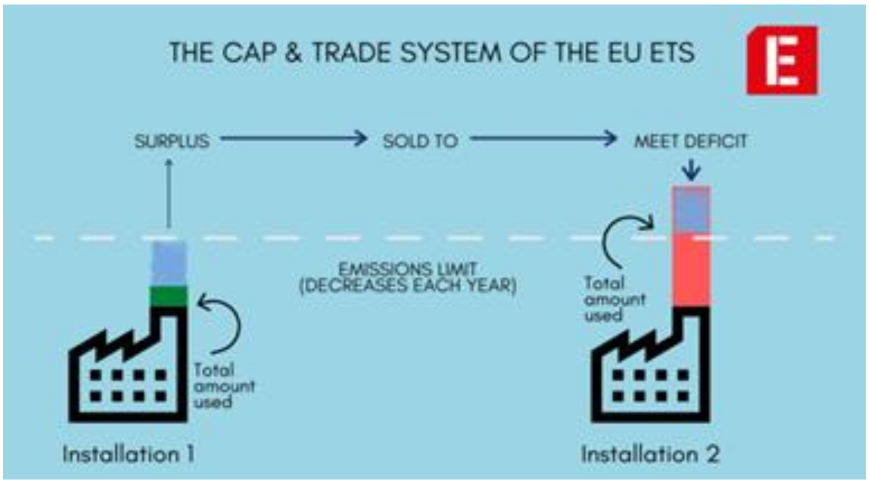

Figure 3 Simplified functioning of a cap-and-trade mechanism
(source: https://www.investigate-europe.eu/en/2020/eu-emissions-trading-scheme-explained)

21. The supply of allowances, which is relatively inelastic, is determined by institutional variables such as the allocation cap determined by the public authorities and the potential use of other types of credits, which constitute the second source of supply of carbon assets. Demand is also influenced by the level of economic activity, the relative prices of fossil fuels and the technical possibilities of GHG emission abatement, weather conditions and, in the long term, by the development of low or non-emitting technologies and investment choices.

22. Much like a carbon tax, the conceptualization of the emission allowance market is part of an economic incentive logic aimed at redirecting the behaviour and investment projects of market participants towards clean alternatives and solutions. The existence of a carbon market and the carbon price signal it provides offer two strategic options to companies: either to acquire, at the market price, the right to emit GHGs; or to invest in more efficient and environmentally friendly means of production and resell the unused allowances on the market. Each company arbitrates between the value of the right to pollute (which it can resell) and the cost of reducing its pollution. Companies that choose to reduce their pollution because their pollution abatement costs are lower than the price of the allowances – the most innovative ones in principle – will sell their rights to pollute to other companies – in principle those using less efficient, older technologies – that have not been able to reduce their emissions because the pollution abatement costs are considered too high. The former will be able to

benefit from the difference between the cost of pollution control and the market price of allowances. The incentive dynamic of the system thus encourages less environmentally efficient companies to improve their performance while rewarding those that are more environmentally efficient.

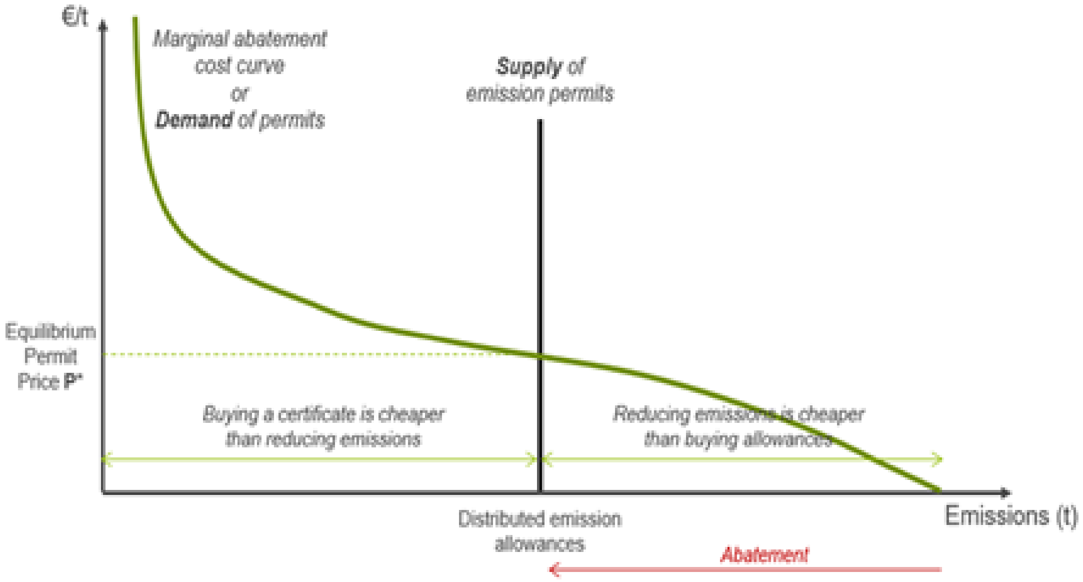

Figure 4 Arbitrating between the option to pollute or the option to reduce emissions
(source: https://www.bearingpoint.com)

23. The higher the price on the carbon market, the greater the incentive to decarbonize the production facilities. Conversely, when the price of carbon is deemed too low, it becomes financially more advantageous for companies, all other things being equal, to buy additional allowances rather than to make green investments. The carbon price signal must therefore be sufficiently high on the market to guide the behaviour of economic actors in the desired direction.

1.3.2. History

24. While the legal basis for the design and the implementation of the EU ETS lies in the so-called "EU ETS Directive" (see also section 1.2), its evolution from the adoption until today was marked by different *"phases"*, each lasting several years.

Phase 1 2005 – 2007	**Phase 2** 2008 – 2012	**Phase 3** 2013 – 2020	**Phase 4** 2021 - 2030
Pilot phase: *Learning by doing*	**Stabilization** phase: *First Kyoto Protocol engagement period*	**Harmonisation and consolidation** phase	Structural **reform** and **future developments**

Table 1 Different phases of the EU ETS

25. A summary overview of the differences in the architecture and the functioning of the EU ETS across the different previous phases can be found in the Table 2 below, while a more in-depth description of some major points is included in the following sections.

26. While the following sections describe, in a high-level manner, the history and the theoretical functioning of the EU ETS, actual observations based on quantitative and qualitative assessments are kept for chapter 2 of this study. When relevant, references to such observations are included throughout the next sections.

<table>
<tr><th></th><th>Phase 1
2005 – 2007</th><th>Phase 2
2008 – 2012</th><th>Phase 3
2013 – 2020</th></tr>
<tr><td>Participating countries</td><td>EU 25 +
Romania and Bulgaria (in 2007)</td><td>EU 27 +
Norway, Liechtenstein and Iceland</td><td>EU 28 (incl. Croatia) +
Norway, Liechtenstein and Iceland</td></tr>
<tr><td>Targeted GHGs</td><td>CO_2</td><td>CO_2 + N_2O (opt-in)</td><td>CO_2, N_2O and PFC</td></tr>
<tr><td>Sectors covered</td><td>Electricity and heating, refineries, steel, iron, cement, chalk, glass, ceramics, paper</td><td>+ aviation from 2012 onwards</td><td>+ ferro- and non-ferrometals, primary and refinery aluminium, nitric acid, adipic acid, glyoxylic acid, ammonia, soda ash, hydrogen, petrochemicals</td></tr>
<tr><td>Cap</td><td>~ 2.300 Mt / year</td><td>~ 2.100 Mt/year</td><td>~ 1.950 Mt in 2013 decreasing on average with 1,74% of the average allocated volumes 2008 - 2012</td></tr>
<tr><td rowspan="3">Allocation methods</td><td colspan="2">Decided by Member States under the supervision of the European Commission</td><td>Decided by the European Commission</td></tr>
<tr><td>Mostly free allocation (min. 95% of allocation)</td><td>Mostly free allocation (min. 90% of allocation)</td><td rowspan="2">Allocation mostly through auctions

(100% for electricity sector with exceptional transitory derogation for some countries;
20% in 2013 growing to 70% in 2020 for other sectors;
exceptions applicable)</td></tr>
<tr><td colspan="2">Free allocation essentially based on historical emissions</td></tr>
<tr><td rowspan="4">Use of assets for compliance</td><td>EUAs only</td><td>EUAs +
Kyoto credits (on average 13,5% of allocated volumes)</td><td>EUAs +
Kyoto credits (residual from Phase 2; ~ 150 Mt)
Credits from HFC23 and N_2O projects no longer accepted</td></tr>
<tr><td colspan="3">Intra-period borrowing of allowances for next year within the same period</td></tr>
<tr><td rowspan="2">Banking from one year to the next within the period only (intra-period banking) but not allowed in 2007, limited to free allocation of year N for compliance in year N-1</td><td colspan="2">Unlimited banking of allowances (intra- and inter-period banking)</td></tr>
<tr><td>Limited to free allocation of year N for compliance in year N-1, but not allowed in 2007.</td><td>Depends on each installation and if it receives free allocation or not (without free allowances, no borrowing possible)</td></tr>
<tr><td>Penalties</td><td>40 €/t</td><td>100 €/t</td><td>100 €/t adjusted for inflation</td></tr>
</table>

(based on CEDD and European Commission)

Table 2 Characteristics of the EU ETS in its first three phases

1.3.2.1. *Phase 1*

27. The first phase essentially consisted of a *"pilot run"* for the subsequent phases. This phase ranged from the initial implementation of the EU ETS, on 1 January 2005, until 31 December 2007. The main purpose of this phase was to test the procedures and infrastructure needed to run the EU ETS on a large scale (both for the primary allocation as well as for the secondary trading) on the one hand, and fixing a price reference for CO_2 allowances (EUAs) on the other hand.

28. In phase 1, only electricity-generating units and energy-intensive industrial consumers were covered by the EU ETS. These installations had to comply with the allowance caps set by the different National Allocation Plans ("NAPs", defined by the Member States) and the EU-wide emissions cap. As these caps were fairly generous and allowances were mostly allocated freely to the participating installations, the prices for EUAs were very low, reaching almost 0 €/t by the end of this phase in 2007 (see also section 2.3).

1.3.2.2. *Phase 2*

29. The actual, large-scale implementation of the EU ETS took place with the entry into operation of Phase 2, on 1 January 2008. While they were again based on individual NAPs, determined by the Member States but approved by the EC, the EU-wide caps were significantly reduced compared to those in Phase 1. The geographical scope was extended to include also the members of the EFTA (Norway, Iceland and Liechtenstein). As a general rule, Member States still allocated free EUAs, nevertheless several countries started organizing, for the first time, auctions to sell the EUAs to the participating installations. An overview of the allocated volumes may be found in section 2.2.

30. Other notable changes to the mechanism include the increase of the penalty for non-compliance (from 40 €/t in Phase 1 to 100 €/t in Phase 2), the inclusion of nitrous oxide (N_2O) emissions in addition to CO_2 and the inclusion of the aviation sector (only from 2012 onwards and only for within-EU flights).

31. Despite the decrease in the (individual and EU-wide) caps, the increase in the penalties for non-compliance and the partial auctioning of the EUs which was introduced in several Member States, the prices for EUAs remained generally low. This was particularly the case following the sharp and unforeseen reductions in the GHG emissions following the global economic crisis in 2008, combined with the possibility to hold on to the surplus EUAs for subsequent years. These elements are described in more detail in section 2.3.

1.3.2.3. *Phase 3*

32. From 2013 onwards, the functioning of the EU ETS was modified significantly through the establishment of a single, EU-wide cap that was no longer based on the sum of individual NAPs as in previous phases. This global cap has been subject to an annual, linear decrease factor, leading to yearly 1,74% decreases of the GHG emissions.

33. At the same time, the free allocation of EUAs was replaced by a default option whereby Member States had to organize auctions for the EUAs (subject to some exceptions, notably for new entrants of industries exposed to *"carbon leakage"*[6]). While installations for electricity generation have, from the beginning of Phase 3, always been 100% subject to the auctioning mechanisms (meaning that no EUAs

[6] Carbon leakage refers to the situation where the costs associated to compliance with climate policies such as the EU ETS would lead to relocation decisions of participating installations to areas where these policies do not apply (outside of the EU), because otherwise these costs would affect the competitive position of the EU-based installation. This is particularly the case for carbon-intensive industries.

are allocated freely), other (mostly industrial) sectors only had to progressively increase their share of EUAs to be procured through auctions.[7] This resulted in the gradual phase-out of the free allocation (from 80% in 2013 to 30% in 2020 or 57% on average during Phase 3, see also section 2.2).

34. In order to address the surpluses of EUAs, several measures were implemented during this phase. As a short-term fix, large shares (in total 900 million) of EUAs were *"backloaded"*, meaning that they would not be auctioned as originally foreseen (in 2014 – 2016) but rather in 2019-2020. As a long-term solution, a Market Stability Reserve was introduced to improve the resilience of the system and restore the balance between the supply and the demand of EUAs (see also section 2.2.2).

1.3.3. Functioning (under Phase 4)

1.3.3.1. Global design overview

35. Today, the EU ETS covers emissions of CO_2, N_2O and PFCs of companies in the power sector, industry and aviation. Union-wide caps for stationary installations and the aviation sector are determined at the start of Phase 4 and decrease annually with a linear reduction factor (2,20% per year). The EUAs are generally allocated to the installations covered under the EU ETS through auctions, organized by the Member States. Specific exemptions to this default option may still apply, especially for the manufacturing and aviation industry: in these cases, EUAs are still allocated freely.

36. Each year, the compliance of the installations with their obligations (based on their verified emissions) is monitored through the "ETS Compliance Cycle" (see also section 1.5.2). All participating installations need to surrender the amount of EUAs necessary to offset their emissions of the selected GHGs. This administrative cycle includes among others the monitoring of emissions, reporting, verification of data and the reporting of improvements. Installations need to submit emissions reports on an annual basis, verified by an accredited party, and subsequently surrender EUAs based on the verified emissions by 30 April of the year following the emissions.

37. EUAs may be traded on secondary markets as well: this ensures that emissions are cut where this is most cost-efficient. Installations with surplus EUAs (resulting from reduced emissions) can either save these for later or sell them to installations with deficits.[8] The ownership of EUAs is accounted for through an Union Registry: this system serves as a single mechanism whereby all installations have accounts where their EUAs are stored. A Transaction Log checks, records and authorizes all transactions between accounts in the Union Registry, in order to ensure compliance with the legislation and the EU ETS rules.

38. Where installations fail to surrender the required amount of EUAs to cover their verified emissions, penalties are imposed of 100 € per missing EUA. These penalties are imposed by the Member States and are added to next year's target, in order to ensure that these failures to comply with the emission rates are not a trade-off against a possible high price of the EUAs. The names of non-compliant operators are also published, through a *"name-and-shame"*-principle and Member States may impose on top of these penalties, other sanctions.

39. Additional flexibility is introduced into the system through the possibility to implicitly borrow or bank allowances within trading periods. This ensures that operators can use their EUAs at the point in

[7] Typically, electricity generation does not imply a risk of carbon leakage and the cost associated to the procurement of EUAs does not significantly distort the level playing field, at least in theory. Additionally, electricity producers have generally been able to pass through most of or at least part of their costs related to the compliance under the EU ETS (see also section 3.1).
[8] A more detailed description on the functioning of secondary markets is included in section 1.3.3.2.

time where this is most convenient. Credits from other mechanisms, while still eligible under the first three phases, were however no longer eligible for compliance under Phase 4.

40. A new mechanism (compared to the previous phases) has been introduced: the Market Stability Reserve. This is adopted to balance the equilibrium between the supply and demand of allowances (which was a problem in notably the first two phases, leading to oversupply and low prices). Each year in May, the European Commission publishes the total number of allowances in circulation (“TNAC”). When the TNAC exceeds 833 million, 24% of the TNAC is withdrawn from the future auctions and placed, temporarily (for 12 months) into the Market Stability Reserve. If the TNAC drops below 400 million EUAs, 100 million EUAs are released from the MSR and auctioned to operators. From 2023 onwards, excessive surpluses (meaning the surplus which is higher than last year’s auctioned volumes) will be cancelled and deleted form the MSR. This should ensure a more structural equilibrium between the supply and demand of EUAs and lead to a more efficient price signal. A more detailed explanation on the functioning and the impact of the MSR is included in section 2.2.2.

1.3.3.2. Primary and secondary markets

41. The **primary market** for EUAs constitutes of auctions where, aside from the installations participating to the EU ETS, most other market participants are allowed to participate. Other market participants may include credit institutions, investment firms, funds, commodity trading companies,… provided that they meet the criteria set out in Regulation (EU) 1031/2010.[9] Most of the European Union’s Member States have designated EEX as the single common platform for auctioning the EUAs. The designation of this platform has been done through a joint procurement procedure between the European Commission and the Member States. Henceforth, EEX is the auctioning platform that covers the entire volume of EUAs under the EU ETS.

42. In the primary market, two types of allowances are offered in the auctions: general allowances (EUAs) and allowances for aviation (EUAAs). The auctions are held on a daily basis according to a fixed schedule. Details of the offered products are described in the Table 3 below:

Auctioned product – EU allowances (EUAs)					
Contract	Delivery day	Contract size	Minimum lot size	Tick size	Fulfilment
EUAs	t+1	1 EUA	500 EUAs (= 500 t $CO2_{eq}$)	EUR 0.01 per allowance	Delivery versus payment

Auctioned product – EU aviation allowances (EUAAs)					
Contract	Delivery day	Contract size	Minimum lot size	Tick size	Fulfilment
EUAAs	t+1	1 EUAA	500 EUAAs (= 500 t $CO2_{eq}$)	EUR 0.01 per allowance	Delivery versus payment

Table 3 Details of EUAs and EUAAs auctioned in primary market through EEX

[9] Commission Regulation (EU) No 1031/2010 of 12 November 2010 on the timing, administration and other aspects of auctioning of greenhouse gas emission allowances

43. The **secondary markets** play an important role in the mechanism by allowing all installations the possibility to acquire allowances without participating to the primary auctions. The organization of these markets are done by three different platforms: EEX in Germany, ICE Endex in the Netherlands and Nasdaq Oslo in Norway. Different contracts are offered: (i) with a daily resolution, (ii) long-term contracts and (iii) options. All these derivative contracts have a standard size of 1.000 EUAs (corresponding to 1.000 tonnes of CO_2 or equivalent GHGs).

Platform	Secondary market for:
EEX	Spot EUA and EUAA Monthly, quarterly and yearly EUA futures Yearly EUAA futures Options on EUA futures
ICE Endex	Daily futures on EUA Monthly and quarterly futures on EUA Monthly and quarterly futures on EUAA Options on EUA futures
Nasdaq Oslo	Daily futures on EUA Quarterly and yearly futures on EUA

Table 4 Contracts traded on secondary markets per platform

44. Secondary markets for carbon allowances basically consists of two segments. The first one is the market for compliance, where the aim is to ensure compliance with the binding emission reduction objectives (the EU ETS). The second one concerns the voluntary markets which allows GHG emitters to voluntarily offset their emissions by purchasing carbon credits that remove or reduce GHGs from the atmosphere. EEX offers this service, among others. These voluntary markets have a much smaller size, and are not established through national or supranational legislations but more by industry-created standards.

45. The share of over-the-counter trading ("OTC") is marginal for mandatory carbon markets, unlike voluntary carbon credits which are traded more often through OTC contracts. As such, secondary trading of carbon allowances is almost done entirely through regulated markets and cleared through the mediation of the central counterparties ("CCPs").

1.4. THEORETICAL ADVANTAGES AND DISADVANTAGES TO A CAP-AND-TRADE SYSTEM

46. The European Union has opted for a *"cap-and-trade"* structure for the design of the EU ETS as the best option to reach the emission reduction objectives at the lowest global cost for the participants to the scheme and the economy in general. The main advantages to this structure are summarized in the Table 5 below.

Assessment criteria	Assessment
Certainty on quantity and reductions	Imposes a direct limit by setting an emissions cap designed to ensure compliance with the corresponding commitment. Direct control ensures that obligations and targets for environmental objectives are met.
Flexibility and cost efficiency	Participants are given free choice to adjust their behaviour: trade-off between reducing emissions or emitting in return for acquiring allowances.

	Trade-off is made possible by the existence of a single market (reference) price, which aims to redirect behaviour and investment choices of economic agents towards low-carbon solutions. Participants for whom the cost of reducing emissions is lower than for other players and who invest in low-carbon alternatives are encouraged to transfer part of their emissions to other participants, for whom these costs are higher. This distribution of efforts allows to minimize the total cost for society.
Revenues	The auction of the EUAs and EUAAs creates a source of revenues for Member States' governments, at least 50% of which have to be used to fund measures to address climate change.
Minimization of budgetary risks	The mechanism ensures that the installations responsible for about 50% of EU-wide GHG emissions are reduced and hence it reduces the risk that Member States will need to purchase additional international credits to meet the commitments under the Kyoto Protocol.

(based on CEDD and European Commission)

Table 5 Advantages of a cap-and-trade system

47. A cap-and-trade system as the EU ETS supports the creation of additional jobs and promotes green growth, while at the same time reinforcing the long-term competitiveness of the European economy. It essentially aims at:

- stimulating investments in energy efficiency, reducing energy-related costs and the risks linked to high energy prices;
- offering an incentive to invest in clean technologies, reducing the dependency on the import of fossil fuels and strengthening the energy security of supply;
- strengthening the European Union's ambition to decarbonize its economy by offering a politically stable climate for investments in low-carbon and clean technologies;
- providing Member States with its revenues to finance support to low-carbon technologies and renewable energy sources; and
- decoupling the consumption of energy, the emission of GHGs and economic growth.

48. On the other hand, associating a price to GHG emissions through a cap-and-trade system increases the cost of pollution for participating installations and may therefore, if no remedial actions are taken, affect the competitiveness of some sectors compared to their competitors with assets in countries with less stringent rules. This may materialize in the risk of carbon leakage, as presented before in section 1.3.2.3. In order to address this, companies at risk of carbon leakage (or relocation of domestic activities to other countries), may be supported by the provision of free allowances or by specific types of support from the Member States, subject to state aid rules.

49. Unlike other industrial sectors, the electricity sector is considered not to be exposed to the risk of carbon leakage, as (i) it can pass on the cost of EUAs in its pricing to consumers, and (ii) the geographical nature of electricity generation does not easily allow relocation. Electricity generators must therefore buy their EUAs in primary or secondary markets, without relying on free allocation.

EUAs are only allocated for free under specific circumstances and to support the modernisation of the electricity sector in some Member States (i.e. Member States with a GDP per capita of less than 60% of the EU average).

1.5. CONTROL AND OVERSIGHT

1.5.1. Market oversight regime and competent authorities

50. The EU ETS is subject to a market oversight regime designed along the lines of the regime applicable to other European financial markets. Market oversight refers to the measures in place for regulatory authorities or supervisory entities to ensure the security and the integrity of the EU ETS.

51. Some of the main rules applicable to the trading of EUAs and EUAAs are:

- the *"Markets in Financial Instruments Directive and Regulation"* (MiFID 2 / MiFIR), setting out rules regarding transparency on publicly available data as well as reporting to regulatory authorities;
- the *"Market Abuse Regulation"* (MAR), prohibiting for example insider trading or market manipulation;
- the *"Criminal Sanctions for Market Abuse Directive"* (CSMAD), containing rules to sanction abusive practices on organized exchanges (trading venues) or in a bilateral OTC context, in the European Union or in third countries; and
- the *"Anti-Money Laundering Directive"* (AMLD) laying down safeguards against money laundering and terrorist financing.

52. From the early stages since the entry into force of the EU ETS, derivative contracts<f[10] have been classified as financial instruments. Since January 2018, spot emission allowances[11]are also classified as financial instruments under the revised MiFID.

53. As a consequence, the European financial markets rules (paragraph 51) fully apply to the primary (auctioning) and secondary markets (trading) of emission allowances and their derivatives. They also cover other units recognized for compliance under the EU ETS, for example allowances issued under the Swiss Emissions Trading Scheme.

54. Under the MAR, each Member State appoints a national competent authority to ensure the proper functioning of its financial markets. The EU carbon market, as any other financial market, is thus supervised by the national competent authorities of 27 Member States. In Belgium, the Financial Services and Markets Authority ("FSMA")[12] has been appointed as national competent authority. At the European level, the actions of the national competent authorities are coordinated by the European Securities and Markets Authoritiy ("ESMA").[13]

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[10] These are derivatives of EUAs or EUAAs, essentially financial contracts with the allowances as underlying assets. Common derivatives include futures contracts, forwards, options and swaps (see also section 1.3.3.2).

[11] These are contracts under which the payment and delivery of the trade are intended to take place *"on the spot"*. A spot contract is in contrast with a forward or futures contract where the contractual terms agreed at the contract date but the delivery and payment occur at a future date.

[12] https://www.fsma.be/en

[13] https://www.esma.europa.eu

55. The national competent authorities have the power to impose remedial actions or sanctions when they decide that specific, targeted behaviour from market participants may give rise to market abuse.

1.5.2. The EU ETS compliance cycle

56. The annual procedure of monitoring, reporting and verification of the GHG emissions of (operators of) industrial installations and aircraft operators, together with all of the associated procedures, is known as the *"EU ETS Compliance Cycle"*.

57. The diagram below illustrates the compliance cycle from the perspective of the participating installations and the aircraft operators.

(source: the EU ETS Handbook)
Figure 5 The EU ETS Compliance Cycle from the perspective of participants

58. Several actors are involved in the EU ETS Compliance Cycle. The table below summarizes their role and responsibilities in the annual procedure of monitoring, reporting and verification of the emissions.

Actor	Roles
Aircraft / installation operator	- Prepare and submit a monitoring plan to the Competent Authority; - prepare an annual emissions report; - submit the verified emissions report (by the accredited verifier) to the Competent Authority; and - surrender allowances equivalent to annual GHG emissions and purchase additional allowances for compliance if required.
Competent Authority	- Carry out inspections of aircraft / installations operators; - check and approve the monitoring plan as well as the annual emissions report; - monitor individual compliance in terms of allowances surrendered; and - enforce penalties in case of non-compliance.
Verifier	- Apply for accreditation with the National Accreditation Body; and - verify the annual emissions report.
National accreditation body	- Carry out the accreditation process of the verifier; and - surveillance of the verifier.
Administrator of the national registry	- collect and check all documents from companies that wish to open an account in the Union Registry[14]

Table 6 Overview of roles assigned to the different actors in the EU ETS Compliance Cycle

59. Industrial installations and aircraft operators covered by the EU ETS are required to have an approved monitoring plan for monitoring and reporting annual GHG emissions. This plan is also a part of the permit to operate, required for industrial installations.

60. Every year, as a part of the EU ETS Compliance Cycle, operators must submit an emissions report to their competent authority. The data for a given year must be verified by an accredited verifier by 31 March of the following year. Once verified, operators must surrender the equivalent number of allowances by 30 April of that (following) year.

61. From Phase 3 (2013 – 2020) onwards, the monitoring, reporting, verification and accreditation requirements of the EU ETS have been harmonized in two regulations which set out rules related to the compliance cycle:

- The *"Monitoring and Reporting Regulation"* (MRR);[15] and
- The *"Accreditation and Verification Regulation"* (AVR).[16]

62. The MMR provides the requirements for the monitoring plan, which must be prepared by each installation or aircraft operator. The monitoring plan based on the MMR ensures harmonized monitoring and reporting of emissions in all Member States.

63. The AVR was introduced to further align the verification processes in different Member States. In Phase 1 and 2 of the EU ETS, accreditation of verifiers followed mostly Member State-specific legislation. The accreditation of verifiers is now better harmonized across the European Union.

[14] The Union Registry is an online database that holds accounts for stationary installations. The Union Registry records national implementation measures (list of installations covered), accounts of companies or individuals holding allowances and the transfer of allowances. See also section 1.3.3.1

[15] Commission Implementing Regulation (EU) 2018/2066 of 19 December 2018 on the monitoring and reporting of greenhouse gas emissions

[16] Commission Implementing Regulation (EU) 2018/2067 of 19 December 2018 on the verification of data and on the accreditation of verifiers

64. In Belgium, the designated national registry administrator is the FPS of Public Health, Food Chain Safety and Environment.[17]

65. The competent Authorities in charge of implementation of the MMR and the AVR are:

- Brussels region: *"Brusels Environment"*[18];
- Flemish region: *"Vlaamse Overheid, Vlaams Energie- en Klimaatagentschap"* (VEKA)[19]; *and*
- Walloon region: *"Service Public de Wallonie, Agence wallonne de l'Air et du Climat"* (AWAC).[20]

66. The list of verifiers accredited by the Belgian Accreditation Body (BELAC) is published at the following address: https://economie.fgov.be/fr/themes/qualite-securite/accreditation-belac/organismes-accredites/organismes-de-validation-et

1.6. FUTURE EVOLUTIONS

67. On 14 July 2021, as part of the *"Fit-for-55 Package"*, the European Commission adopted a set of legislative proposals setting out how it intends to achieve climate neutrality in the European Union by 2050, including the intermediate target of at least a 55% net reduction in GHG emissions by 2030 (compared to 1990 levels).

68. As far as EU climate legislation is concerned, the package proposes a tightening of the existing EU ETS and its extension to the maritime sector, a new and separate ETS system for buildings and road transport, as well as new measures to prevent carbon leakage.

69. While the legislative process is still ongoing and the formal adoption of the proposals has not yet taken place, some of the elements which are included can already be presented and their impact can be assessed in a qualitative manner. Essentially, the modifications concerning the EU ETS can be summarized under the following topics:

- reducing the caps and increasing the ambition of the annual linear reduction factor;
- revising the rules for free allocation of allowances and the MSR;
- extending the system to maritime transport;
- creating a separate system for buildings and road transport;
- strengthening the Innovation Fund and the Modernisation Fund;
- clarifying the rules on the usage of the EU ETS's revenues;
- introducing a Carbon Border Adjustment Mechanism (CBAM) to address carbon leakage; and
- revision of the EU ETS for aviation.

These elements are described in more detail in annex to this study.

[17] https://www.health.belgium.be/nl
[18] https://environnement.brussels/thematiques/air-climat/climat
[19] https://www.energiesparen.be/ets-voor-vaste-installaties
[20] https://www.awac.be

2. OBSERVATIONS ON THE FUNCTIONING OF THE EU ETS

70. After introducing the adoption and functioning of the EU ETS from a theoretical and historical perspective in chapter 1, this chapter presents some findings on the functioning of the mechanism from a practical perspective. Where possible, qualitative assessments are provided on the basis of publicly available data, notably from the European Environment Agency (EEA) and the European Commission.

71. The chapter starts with an overview of the gases and sectors covered under the EUTS. The allowances and the caps on verified emissions are presented in a second section, while the trading on secondary markets is discussed in a third section. Finally, the use of the revenues from allowances auctioning is analysed.

2.1. GASES AND SECTORS COVERED

2.1.1. GHG emissions in Europe

72. The evolution of the total volume of GHG emissions is shown in Figure 6, which contains data from the EU GHG inventory. The following graph presents the total GHG emissions (i.e. not only emissions from sectors covered under the EU ETS) including indirect CO_2 emissions and excluding LULUCF[21] in the EU KP (i.e. the EU27 + UK + Iceland).

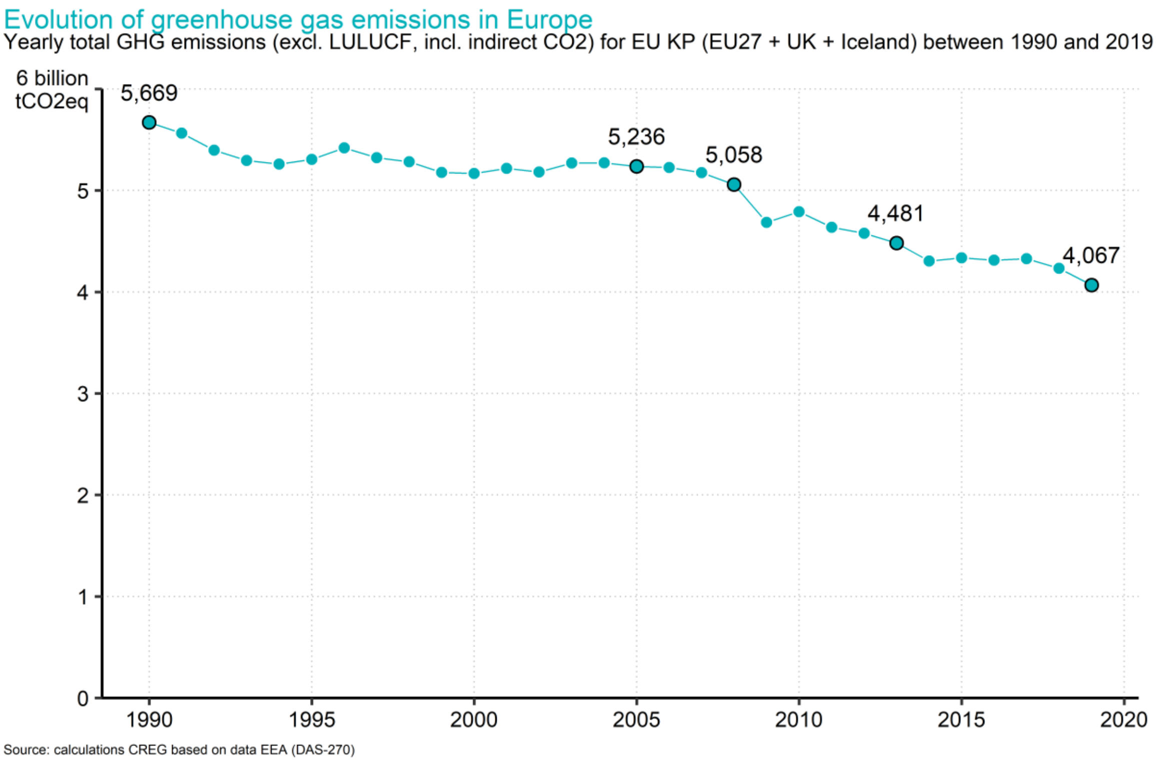


Figure 6 Evolution of greenhouse gas emissions in Europe

[21] LULUCF refers to Land-Use, Land-Use Change and Forestry and consists of the impact of human activity on the ability of natural carbon sinks to reduce GHG emissions.

73. The total GHG emissions decreased by 1.935 million tonnes $CO_{2\text{-eq}}$ (or -34,3%) from 1990, reaching its lowest recorded level in 2020 (3.711 million tonnes $CO_{2\text{-eq}}$). The reduction in GHG emissions was due to a variety of factors, as for example: the growing share in the use of renewables, the use of less carbon-intensive fossil fuels and improvements in energy efficiency, as well as structural changes in the economy (for example lower share of energy-intensive industrial activity). In addition to these long-term trends, which account for the main share in the reduction of GHG emissions, the economic recession linked to the covid-19 pandemic has also played an important role in 2020.

74. The long-term changes have resulted in a decreased energy intensity of the economy and in lower carbon intensity of the energy production and consumption in 2020 compared to 1990. Demand for energy to heat households has also been lower, as Europe has – on average – experienced milder winters since 1990. This has also helped reduce GHG emissions.

75. Emissions from electricity and heat production have decreased strongly since 1990. In addition to improved energy efficiency, there has been a move towards less carbon-intensive heating sources. Between 1990 and 2020, the use of solid and liquid fuels in thermal power stations decreased strongly whereas natural gas consumption more than doubled. Coal consumption in 1990 was three times higher than in 2020. The use of renewable energy sources in electricity and heat generation has increased substantially in the EU since 1990. Improved energy efficiency and a less carbon-intensive fuel mix have resulted in reduced CO_2 emissions per unit of fossil energy generated.

76. In terms of the main GHGs, CO_2 was responsible for the largest reduction in emissions since 1990. Reductions in emissions from N_2O and CH_4 (methane) have been substantial, reflecting lower levels of mining activities, lower agricultural livestock as well as lower emissions from managed waste disposal on land and from reduced adipic and nitric acid production.

2.1.2. GHG emissions from sectors covered under the EU ETS

77. The numbers and figures in section 2.1.2 reflect the emissions of all GHGs across all sectors and countries in the EU-KP (EU-27 + UK + Iceland). As explained in section 1.3 though, not all sectors and GHGs are covered under the EU ETS. Basically, three main (groups of) sectors may be identified: aviation, fuel combustion (for electricity production) and stationary installations. The evolution of the verified emissions from these sectors across all the countries of the EU-KP is shown in the Figure 7 below.

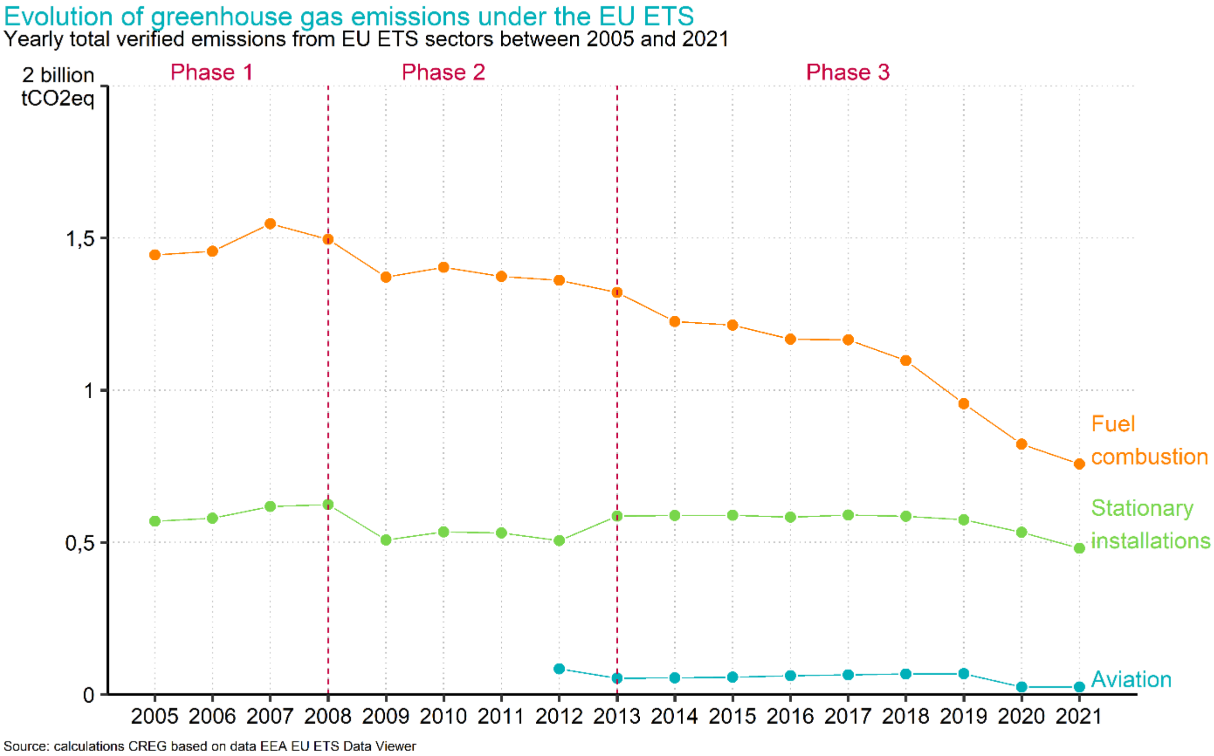


Figure 7 Evolution of greenhouse gas emissions under the EU ETS

78. The most important decrease in verified emissions came from the fuel combustion sector, i.e. the production of electricity. After shortly increasing following the entry into force of the EU ETS in 2005, the sector is marked by a significant and consistent decrease since 2007, reaching 757 million tCO_{2-eq} in 2021 (a 47,6% decrease since 2005). The emissions of the aviation activities covered under the EU ETS (only intra-EU flights) have also decreased, in relative terms even more strongly, with 70,3% since 2012, reaching 25 million tCO_{2-eq} in 2021. Emissions of stationary installations decreased by 15,6% since 2005 to reach 480 million tCO_{2-eq} in 2021.

2.1.3. GHG emissions in Belgium

79. As in sections 2.1.1 and 2.1.2, GHG emissions are shown covering all gasses and sectors in Belgium (Figure 8) and focusing only on the main sectors covered under the EU ETS (Figure 9).

80. The total emissions, covering all gasses and sectors (not only EU ETS), decreased in Belgium from 145,7 million tCO_{2-eq} in 1990 to 116,7 million tCO_2eq in 2019.

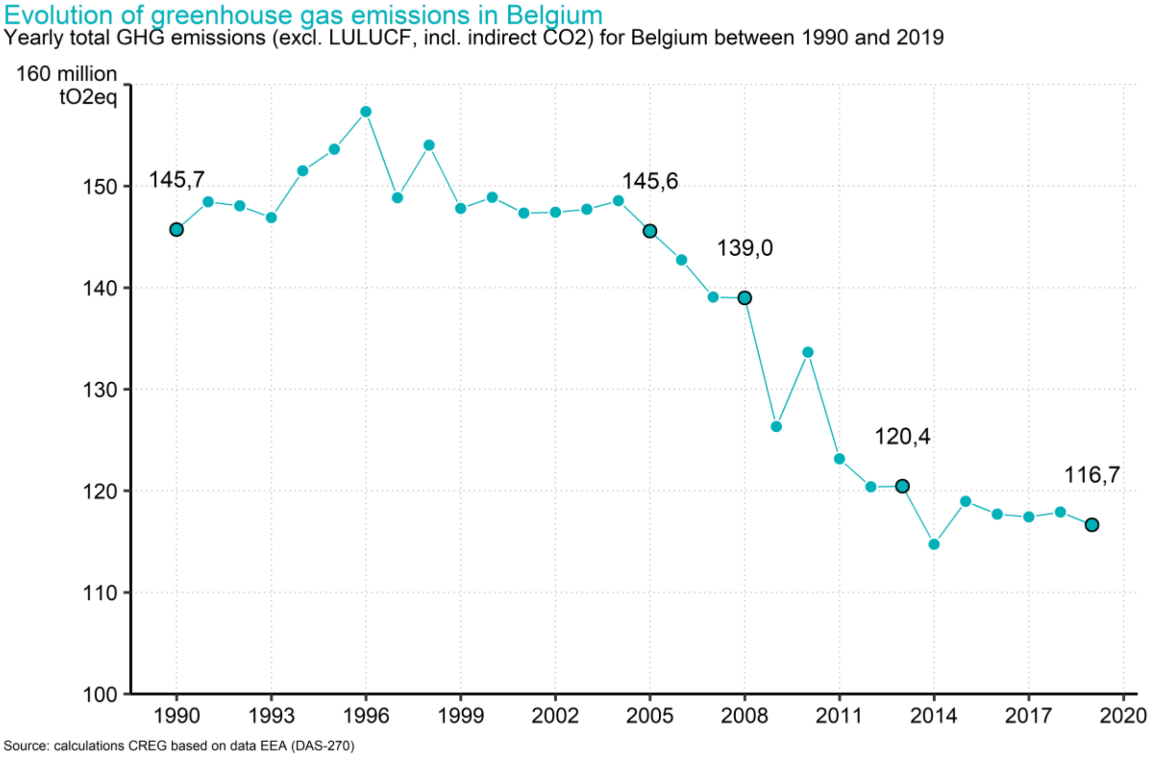


Figure 8 Evolution of greenhouse gas emissions in Belgium

81. Focusing on the main EU ETS sectors (i.e. aviation, fuel combustion for electricity generation and stationary installations), the emissions dropped from 55,4 million tCO_{2-eq} in 2005 to 36,9 million tCO_{2-eq} in 2019 (a 33,4% decrease). Fuel combustion emissions decreased from 25,5 million to 13,5 million tCO_{2-eq} in 2019 (-47,7%) while the emissions from other stationary installations lowered from 29,9 million to 22,9 million tCO_{2-eq} (-23,5%). The fact that, in Belgium, emissions from fuel combustion are much lower than emission from other stationary installations (which is the opposite on European level, see Figure 7) is explained by the relatively low share of fossil fuel-fired electricity generation units (see also section 3.4) and a relatively high share of low-carbon nuclear electricity generation in Belgium.

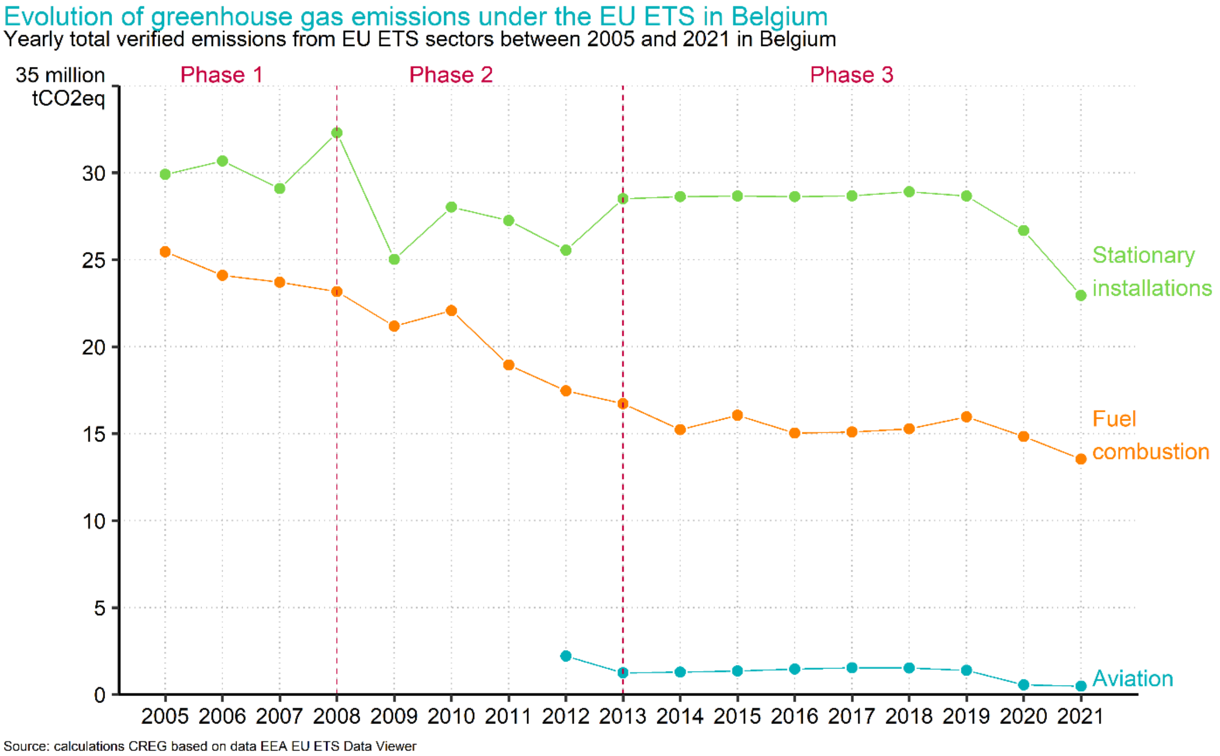


Figure 9 Evolution of greenhouse gas emissions under the EU ETS in Belgium

2.1.4. GHG emissions by region

82. Finally, emissions of GHGs may be examined on a regional level in Belgium. Recalling section 0, different tasks and responsibilities are assigned at various levels of government in Belgium, mostly spread between the federal and the regional level.

83. While no data related to the GHG emissions which fall under the direct scope (in terms of gases and covered sectors) of the EU ETS are available on a regional level, general trends of all GHG emissions across the regions may be analysed. This is done for the period between 1990 and 2020 in Figure 10. The major share of Belgian GHG emissions can be attributed to the Flanders region, followed by the Walloon and the Brussels Capital regions. Since 1990, GHG emissions have decreased with 19,7%, 38,5% and 22,4% in the Flemish, Walloon and Brussels Capital regions respectively.

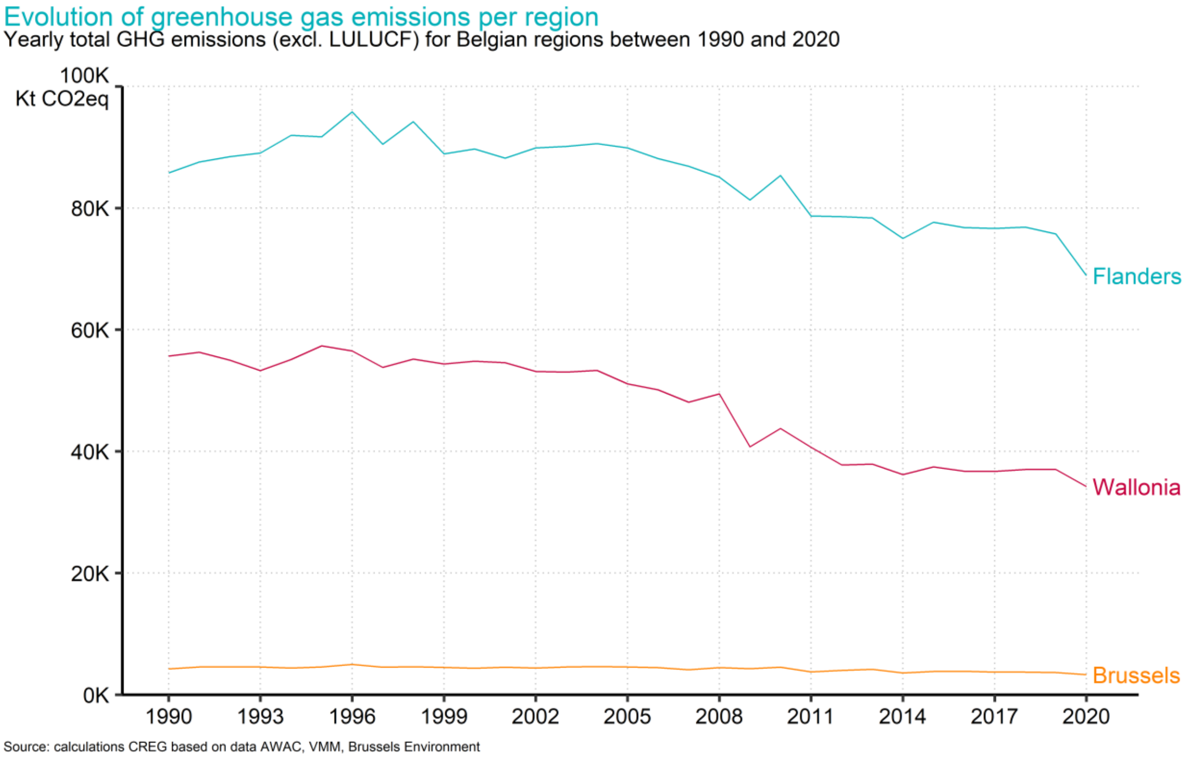


Figure 10 Evolution of greenhouse gas emissions per region

2.1.5. Different GHGs

84. As explained in section 1.3.3, the emissions of different gasses are covered under the EU ETS: CO_2, N_2O and PFCs. While no shares per GHG related to the EU ETS sectors (see above) are available, total GHG emissions (not only for EU ETS sectors) from these gasses are published by the EEA. In 2020, CO_2 emissions accounted for 79,0% of all GHG emissions in the EU-KP, followed by CH_4 (methane, even though these emissions are not covered under the EU ETS) with 11,7%, N_2O (6,6%, covered by the EU ETS) and fluorinated gasses (2,7%, partly covered by the EU ETS).

2.2. ALLOWANCES AND CAPS

2.2.1. Allowances, caps and verified emissions

85. Section 1.3.3 introduced the caps that are set on the emissions of GHGs by participants to the EU ETS. This cap is expressed as a number of EUAs and decreases yearly, in order to reflect the increasing ambition to reduce GHG emissions.

86. In Phase 3 of the EU ETS, this reduction followed a linear trajectory, reducing the volumes of "allowed emissions" by 1,74% per year. This linear reduction factor increased in Phase 4, reaching 2,20% on an annual basis. The goal of this accelerated decrease is to reduce the emissions of the sectors covered under the EU ETS by at least 43% in 2030 (compared to 2005 levels). As an example, the EU-wide cap on the total emissions corresponded to 1.571.593.007 EUAs in 2021.[22]

[22] Commission Decision (EU) 2020/1722 of 16 November 2020 on the Union-wide quantity of allowances to be issued under the EU Emissions Trading System for 2021

87. These caps do not reflect necessarily the actual allocated volumes, as may be seen in the next paragraphs and figures. The actual (future) evolution of the cap does not simply depend on the linear reduction factor, but also on the extent to which EUAs are surrendered by market participants in order to cover their verified emissions. To avoid situations as in Phase 2 where an overallocation led to low EUA prices and generally reduced the effectiveness of the scheme, the MSR was introduced towards the end of Phase 3. This reserve mechanism has an impact on how many allowances of the cap are allocated yearly to the primary market.

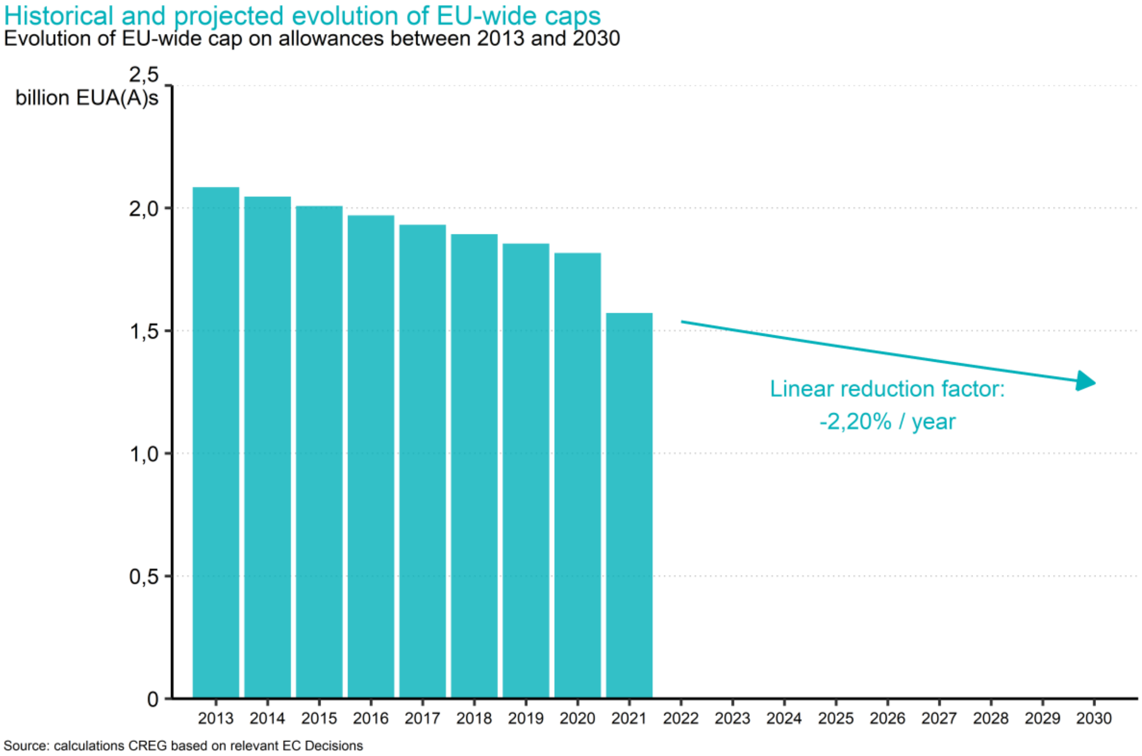


Figure 11 Historical and projected evolution of EU-wide caps

88. Throughout the various phases of the EU ETS, not only the number of allowances allocated evolved but also the way allowances are allocated. During the Phase 1 of the EU ETS (2005 – 2007), almost all allowances were given for free to stationary installations. The proportion of free allocation fell slightly to 90% during Phase 2 (2008-2012) as some countries held auctions.

89. As of Phase 3 of the EU ETS (2013-2020), auctioning became the default method for allocating allowances. This resulted in a significant increase in the share of auctioned allowances to 57% over the total duration of the phase, as illustrated on Figure 12. In particular, electricity producers have been obliged since 2013 to buy all the allowances they need to generate electricity. In Phase 4 of the EU ETS (2021-2030), the share of allowances to be auctioned remains at 57%.

90. As far as the aviation sector is concerned, the allocation of allowances follows a different logic. Emissions from aircraft operators have been covered by the EU ETS from 2012. During Phase 3 the allowances were distributed as follows: 82% of the total number of aviation allowances were granted for free to aircraft operators while 15% were auctioned and 3% were placed in a special reserve for distribution to fast-growing aircraft operators and new entrants.

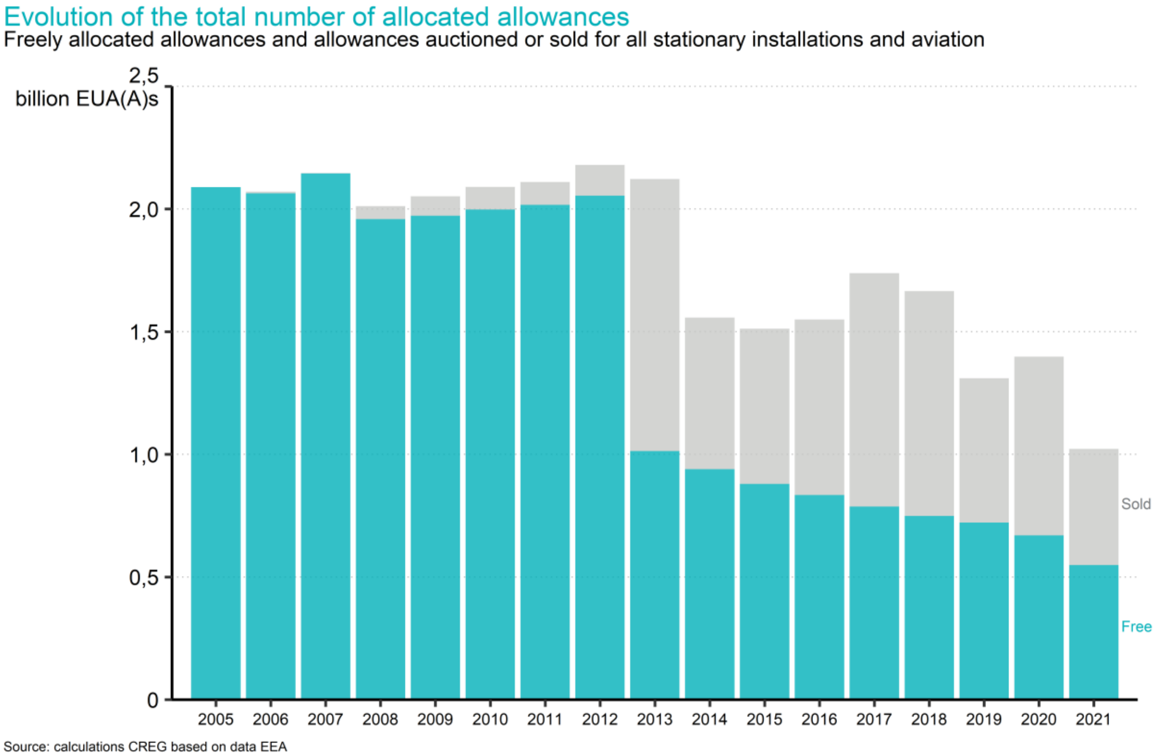


Figure 12 Evolution of the total number of allocated allowances

91. As clearly illustrated on Figure 13, over-allocation was particularly an issue in Phase 1 and Phase 2 of the EU ETS. For several consecutive years, more allowances have been allocated than surrendered to cover emissions from all stationary installations[23]. This led to a significant surplus of allowances and undermined the effectiveness of the scheme. This trend was reversed from 2014 when the decision was taken to deduct 900 000 000 allowances from auctioning volumes during the period 2014-2016. From 2019, when the Market Stability Reserve entered into force, verified emissions outnumbered the total number of allocated allowances with the exception of 2020, though.

[23] The aviation sector has been covered by the EU ETS since 2012.

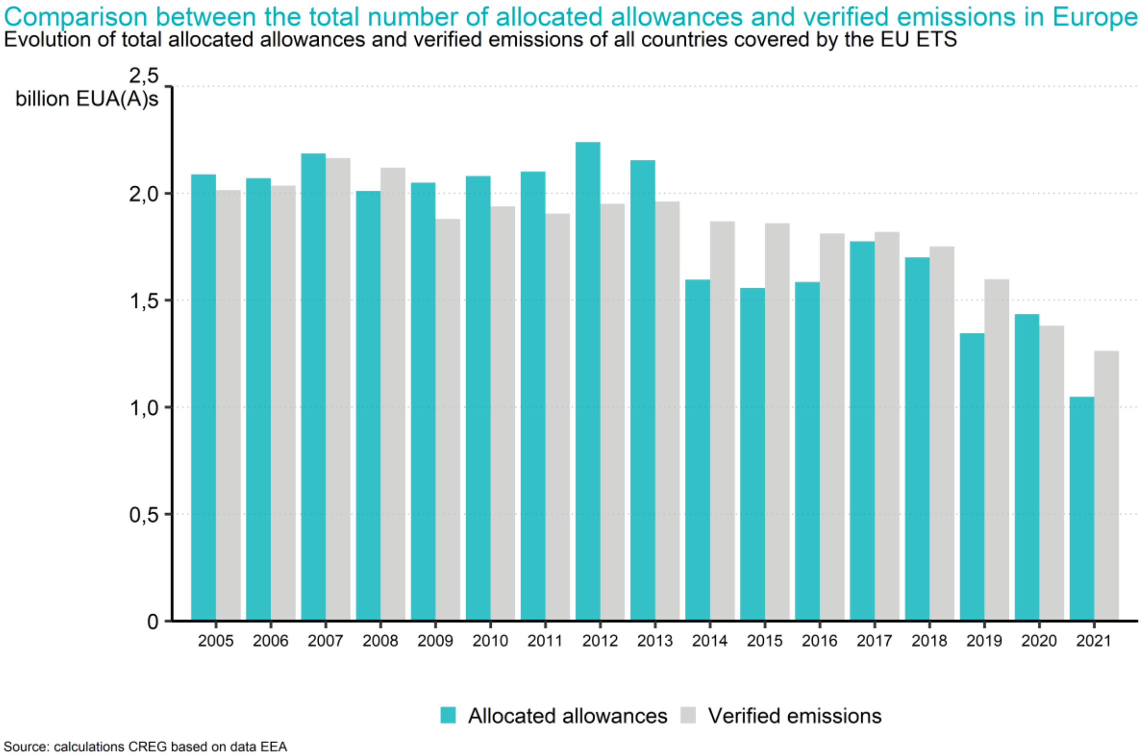


Figure 13 Comparison between the total number of allocated allowances and verified emissions in Europe

92. In 2021, the verified emissions (of all stationary installations and aviation) of all countries covered by the EU ETS decreased by 8,6% compared to 2020 (see Figure 13). This is a significant drop, but not as high as the previous year (from 2019 to 2020, emissions decreased by a record amount of 13,7%). While emissions remained rather stable at the beginning of Phase 3 of the EU ETS, a downward trend from 2019 onwards can be observed. 2021 was the fourth consecutive year where the year-to-year decrease in verified emissions exceeded 8%.

93. In Belgium, the verified emissions of all stationary installations and of the aviation sector dropped by 12,2% from 2020 to 2021, following an 8,6% decrease the previous year (from 2019 to 2020). These reductions are the first after a long period of stagnation of the verified emissions. The evolution of the verified emissions (as well as the allocated allowances) are found in Figure 14.

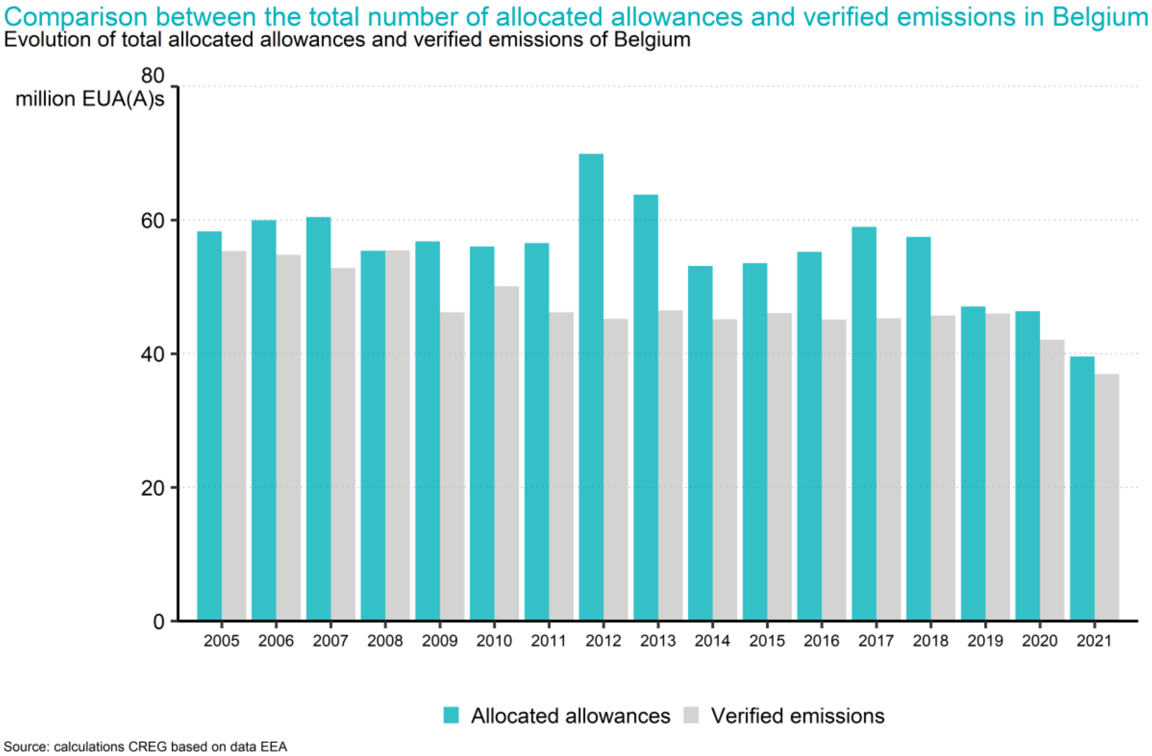


Figure 14 Comparison between the total number of allocated allowances and verified emissions in Belgium

2.2.2. Evolution of the number of allowances in the MSR

94. A key element for the operation of the Market Stability Reserve ("MSR") is the publication of the Total Number of Allowances in Circulation ("TNAC"). The TNAC determines whether allowances – which are intended to be auctioned in the subsequent year – should be placed in the MSR or released from it.

95. The MSR functions in an automatic manner when the TNAC is outside of a predefined range:

- When the TNAC exceeds 833 million allowances, 24% of the TNAC is withdrawn from the future auctions and placed in the MSR over a period of 12 months;
- When the TNAC drops below 400 million allowances, 100 million allowances are released from the MSR and auctioned.

96. The TNAC relevant for the MSR feed-ins and releases is calculated as follows:

TNAC = Supply – (Demand + MSR Holdings)

97. The supply of allowances is determined by various different elements such as the allowances banked from Phase 2 (2008 – 2012)[24], allowances allocated for free since the start of Phase 3, the total number of allowances auctioned since the start of Phase 3 or the number of allowances deducted from auctioning volumes in previous years following the introduction of the MSR in 2019, among others (see Table below for the complete list of elements determining the supply of allowances.

[24] Allowances issued during Phase 2 which were not surrendered to cover verified emissions or cancelled were "banked" for use at the beginning of Phase 3 of the EU ETS. These allowances were deleted and simultaneously an equal number of allowances were created in Phase 3. Thus, this number represents the exact number of allowances in circulation at the start of Phase 3 of the EU ETS.

98. On the other side, the demand of allowances is simply determined by the total verified emissions from the covered installations between 1 January 2013 and 31 December of the considered year, as well as the allowances cancelled during that same period.

99. As an example, the Table 7 below provides an overview of the supply and demand of allowances by 31 December 2021 as published by the European Commission in May 2022.

SUPPLY	
a) Banking from Phase 2	1.749.540.826
b) Allowances allocated for free for the period between 1 January 2013 until 31 December 2021, including from the new entrants reserve	7.141.195.439
c) Unallocated allowances pursuant to Articles 10a(7), 10a(19) and 10a(20) of Directive 2003/87/EC	886.806.455
d) Allowances deducted from c) in order to be auctioned in 2020 for the Innovation Fund	-50.000.000
e) Allowances deducted from c) and placed in the new entrants reserve in 2021	-200.000.000
f) Total number of allowances auctioned between 1 January 2013 and 31 December 2021, including early auctions	6.598.419.287
g) Allowances used for flexibility under Regulation (EU) 2018/842	7.213.787
h) Allowances deducted from auctioning volumes during the period 2014-2016	900.000.000
i) Allowances deducted from auctioning volumes in 2019-2021 pursuant to the previous Commission Communications	1.095.875.607
j) The number of allowances monetised by the European Investment Bank for the purposes of the NER300 programme	300.000.000
k) International credit entitlements exercised by installations in respect of emissions up to 31 December 2020	497.248.017
Total supply	**18.919.085.631**

DEMAND	
a) Tonnes of verified emissions from installations under the EU ETS between 1 January 2013 and 31 December 2021	14.836.567.505
b) Allowances cancelled in accordance with article 12(4) of Directive 2003/87/EC by 31 December 2021	621.882
Total demand	**14.837.189.387**

MARKET STABILITY RESERVE HOLDINGS	
Number of allowances in the Market Stability Reserve	**2.632.682.071**

Total number of allowances in circulation (TNAC)	**1.449.214.182**

Source: Communication from the Commission:
https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ%3AJOC_2022_195_R_0002

Table 7 Overview of the supply and demand of allowances leading to TNAC calculation on 31 December 2021

100. By 31 December 2021, the TNAC reached 1.499.214.182 allowances, which is a slight decrease from the previous year (TNAC on 31 December 2020: 1.578.772.426 EUAs). This is well above the threshold of 833 million. Hence, in accordance with the MSR rules, a total of 24% of the TNAC, or 347.811.404 allowances, will be placed into the MSR from 1 September 2022 to 31 August 2023. This

means that a corresponding amount will be deducted from the auction volumes of the Member States and other countries participating to the EU ETS, in line with their respective auction shared.[25]

101. Even though the MSR only started operating in 2019, the European Commission has been publishing the TNAC since 2017 for information purposes. A significant drop in the TNAC can be observed between 2018 and 2019, as a result of the start of the operation of the MSR. Almost 1,3 billion allowances were placed in the MSR in the first year of operation of the reserve.

102. In 2020, the TNAC considerably increased because of the covid-19 crisis (see Figure 15). GHG emissions in the European Union decreased significantly as a consequence of the confinement measures which forced many factories to shut down or reduce their production volumes, thus negatively impacting the overall economic activity. As a result, the demand for allowances decreased, while the allocated volumes of allowances remained unchanged, resulting in a significant increase in the TNAC.

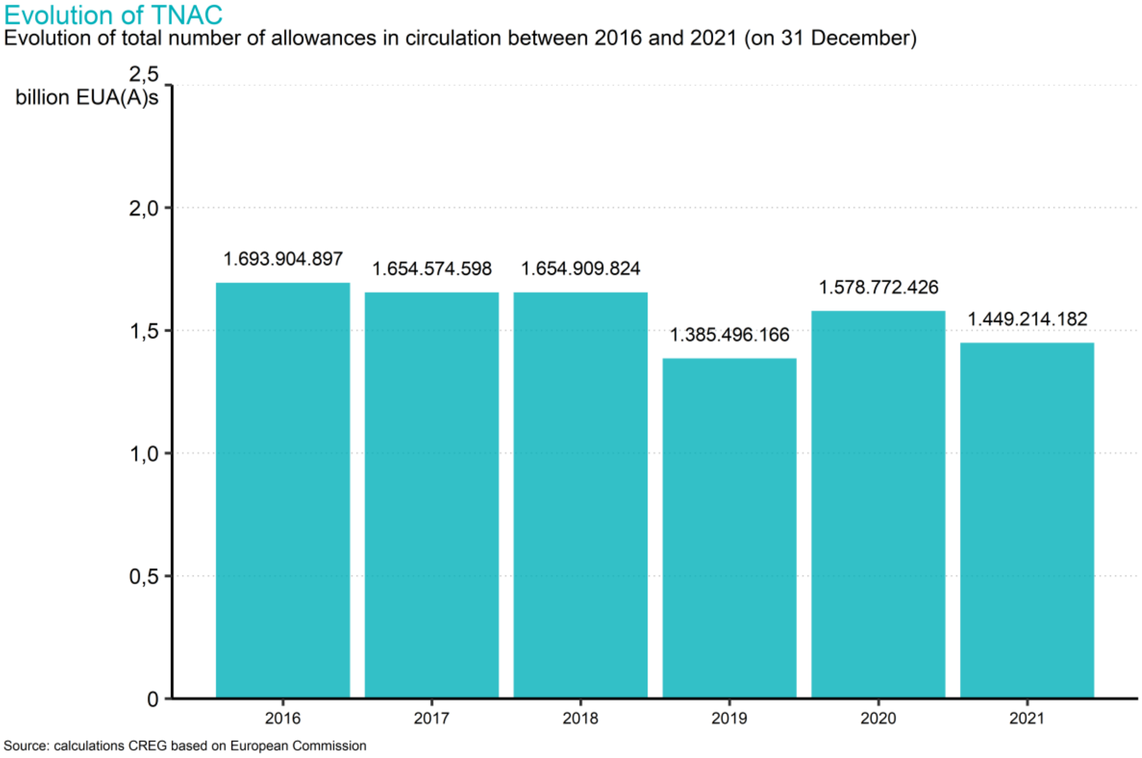


Figure 15 Evolution of TNAC

103. From 2023 onwards, allowances held in the MSR above the previous year's auction volume will no longer be valid and will be deleted from the MSR. This should ensure a more structural equilibrium between the supply and the demand of allowance through a reduction of the TNAC, and lead to a more efficient price signal in line with the increased GHG emission reduction targets.

[25] Commission Decision (EU) 2020/2166 on the determination of the Member States' auction shares during the period 2021-2030 of the EU ETS, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32020D2166

2.3. TRADING AND PRICES

2.3.1. Importance of carbon prices

104. Carbon prices (i.e. the price of EUA(A)s) play an essential role in the context of climate policy aimed at reducing GHG emissions, by encouraging market participants to adopt appropriate behaviour to support this aim. Prices can contribute to this reduction in two ways: by the shift from classical production processes to low-carbon technologies and by the substitution of input factors with less carbon-intensive options (example: coal-to-gas-switch).

105. The existence of a reliable price formation mechanism, providing adequate signals to market participants, is fundamental to enable them to implement trading strategies, risk management and effective investment decisions within the framework of the EU ETS system and the targeted climate objectives.

2.3.2. Key determinants of carbon prices

106. The literature identifies two main categories of explanatory factors underlying the evolution of carbon (EUA(A)) prices: market fundamentals on the one hand, and factors related to institutional and regulatory policies, rules or announcements on the other hand. These factors impact the interaction between the demand and supply of allowances, which drives the carbon price.

107. On the supply side, the amount of allowances offered is initially relatively inelastic to the auction price of these allowances in the primary market, since it results mainly from political decisions (the caps). The supply price elasticity develops later, in particular on the secondary market, where different participants may exchange their assets according to their respective needs.

108. On the demand side, the need for allowances is a function of the expected CO_2 emissions, which themselves depend on several factors such as energy demand, energy prices (mainly oil, natural gas and coal), macroeconomic activity and weather conditions. Economic activity and energy demand are positively correlated with the levels of CO_2 emissions and therefore indirectly with the carbon price.

109. Energy prices (oil, coal, gas) are crucial in determining the relative attractiveness of fuels and the fuel-switching options for power generation electricity. Thus, the influence of the gas/coal switch price on carbon price was particularly highlighted in the economic literature. This ratio represents the carbon price above which it becomes more competitive in the short term, for an electricity producer, to switch from coal to gas and below which, conversely, it becomes more profitable to switch from gas to coal, even in an environment constrained by emissions permits. Overall, results from the economic literature suggest that the drivers of carbon price changes and the correlation (positive or negative) with fuel prices seem to vary over time. It should be noted, however, that this research was conducted before the introduction of the Market Stability Reserve, which had a significant impact on the European carbon market.

110. Weather conditions represent an essential factor due to the relative importance of the electricity generation sector in the EU ETS. Consequently, any meteorological circumstances that may affect the production of electricity are likely to impact the demand for allowances. This is also the case for the demand for electricity: hot summers and cold winters lead to increases in the demand for electricity (as well as other energy sources) and correspondingly, to higher emissions and demand for allowances, leading to higher prices.

111. On the institutional and regulatory level, several factors have been highlighted to explain certain notable evolutions in the price for allowances. For example, the existence (or absence) of an emissions

reduction factor, the possibility (or its absence) of banking allowances, the implementation of the Market Stability Reserve, and communications from public institutions, may have an impact on the supply and demand for allowances, and consequently, their prices.

2.3.3. Evolution of prices

112. The following figures illustrate the evolution of EUA prices since the implementation of the European carbon market until April 2022. Major events have influenced the evolution of those prices over the entire period, some of them closely related to the design choices and regulatory changes made during the distinct phases of the carbon market design.

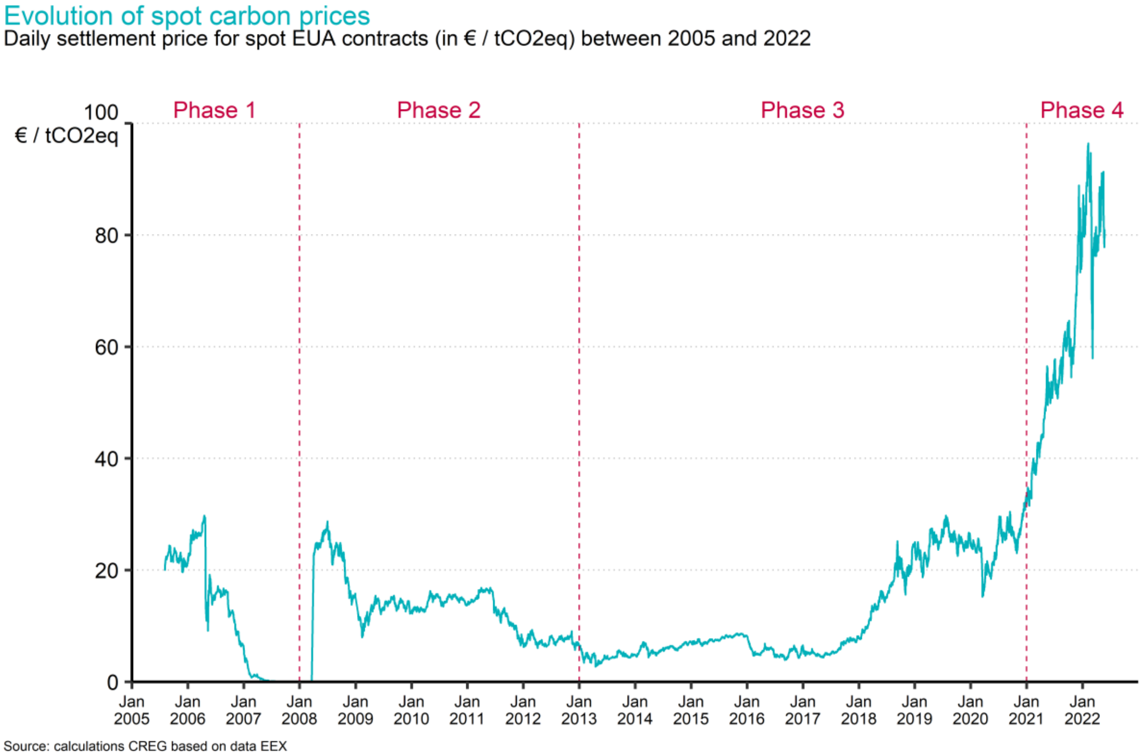


Figure 16 Evolution of spot carbon prices

2.3.3.1. Phase 1 (pilot phase)

113. During this pilot phase, which ran between 2005 and 2007, the design of the EU ETS was such that significant freedom was left to Member States to decide on the caps and subsequently the volumes of allowances to be allocated. In addition, these allowances were mostly allocated for free. Even though carbon prices were driven by the demand at the very beginning of this period, they began to fall spectacularly in April 2006 following the publication of the information that many Member States registered significant surpluses of allowances on their markets. This announcement was followed, the same year, by the official publication of the first emission verification report from the European Commission covering the year 2005. In this report, an excess of allowances compared to verified emissions of the participating European installations was observed, revealing an over-allocation of allowances.

114. This excess supply was reflected in very low price levels as well as in a lack of incentives for market participants to decarbonize their production facilities. Given that the duration of this Phase 1 was only 3 years, no clear signal consistent with the investment horizons for participants in the electricity generation sector was established.

115. As no reduction factor on the cap on the emissions was implemented during this period, and since allowances could be used in subsequent periods (the "banking option"), prices collapsed towards the end of this learning phase, with values close to 0 €/tCO_2eq.

2.3.3.2. *Phase 2 (stabilization) and 3 (European harmonization)*

During Phase 2 (2008 – 2012) and Phase 3 (2013 – 2020), the European Commission exercised a right of control in the allocations of Member States in order to reduce the share of free allowances and increase the share of allocations through the auction option. Possibilities for inter-period banking as well as a reduction path for the EU-wide caps were also introduced. Consequently, and unlike the first period, the possibility to report unused allowances of Phase 2 to the subsequent Phase 3 had an impact on the prices of the allowances, as expectations of tighter caps in Phase 3 supported the value of allowances in Phase 2. Backloading measures (i.e. temporarily withdrawing allowances from auctions to reinject them later without reducing the total number of allocated allowances) and setaway measures (i.e. similar to backloading, but without predefined date for reinjection) were also implemented by the European Commission in Phase 3.

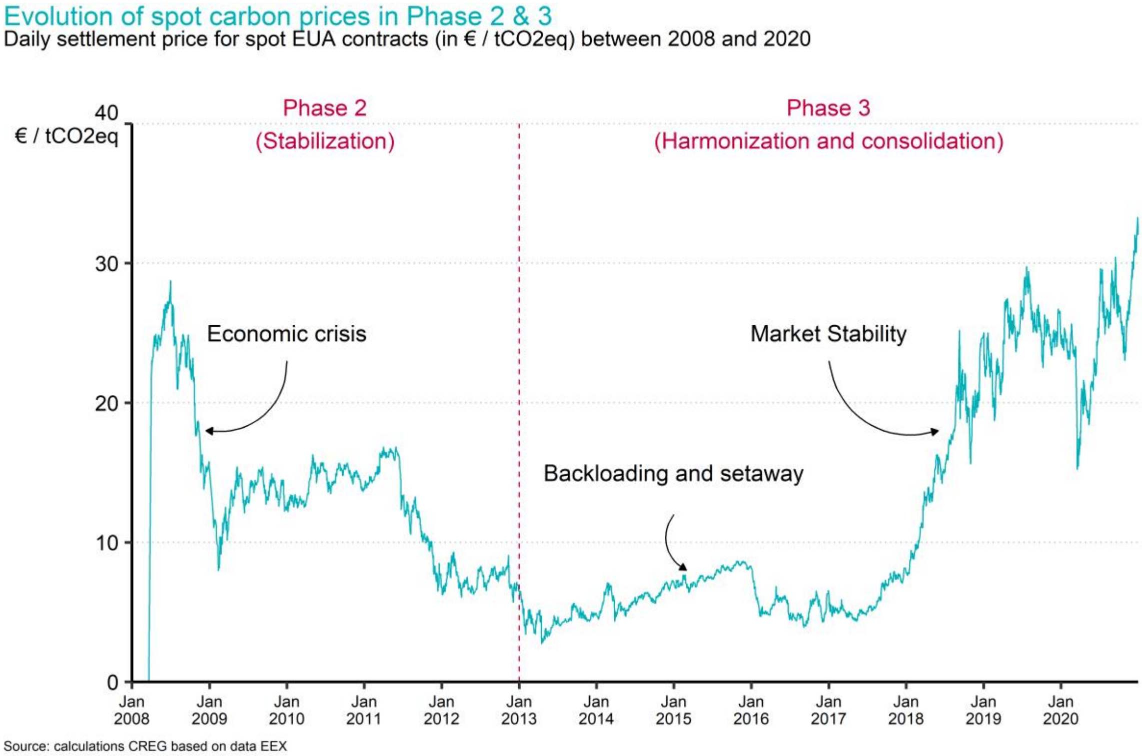


Figure 17 Evolution of spot carbon prices in Phase 2 & 3

116. Despite the fine-tuning of the EU ETS, three factors continue, however, to contribute to a containment of the demand and prevent increases in the price of allowances to higher values and also contributed to the gradual buildout of allowance surpluses:

- the economic and financial crisis in 2008 which reduced emissions and therefore the demand for allowances;
- the possibility for market participants to buy international credits (outside the EU) at lower costs compared to the intrinsic value of EUA(As); and

- the Member States' support policies (e.g. on energy efficiency) and subsidies granted to the development of RES, implemented in parallel with the EU ETS and having resulted in emission reductions and ultimately, a reduced demand for allowances.

117. The design of the EU ETS in those phases struggled to promote consistency between the volumes of allowances in circulation and the volume of European GHG emissions. Overall, as reported by the ESMA, the excess supply of EUAs relative to the verified emissions from installations under the EU ETS (resulting in a peak surplus of 2 billion EUA(A)s in 2013) has been the main reason behind low prices until 2018.

118. Only from 2018 onwards, emission allowances have started to gain value again, in the context of the first revision of the EU ETS Directive, which sets the framework for Phase 4 (2021 – 2030) and introduces, in particular, the Market Stability Reserve. This is a market regulation tool intended to temporarily absorb excess allowances in order to reinject them later on the market on the basis of pre-defined indicators. As such, it's an automatic mechanism. This introduction of this flexibility mechanism created expectations of a tighter market and contributed to restore the credibility of the system and the scarcity of the allowances. These reached, on average, 25 €/tCO_2eq towards the end of 2019 against about 10 €/tCO_2eq on average over Phase 1.

119. Following the sanitary crisis as a result of the covid-19 pandemic and the slowdown in economic activity and energy demand, prices for allowances fell during the first months of 2020 to below 25 €/tCO_2eq, to recover rapidly during the same year (and even to continue further beyond December 2020). This increase can be attributed to the announcement of stronger European political ambitions in term of emissions reduction: the so-called *"European Green Deal"*. This political signal is reflected in expectations that the number of carbon allowances in circulation will reduce further, leading to higher prices.

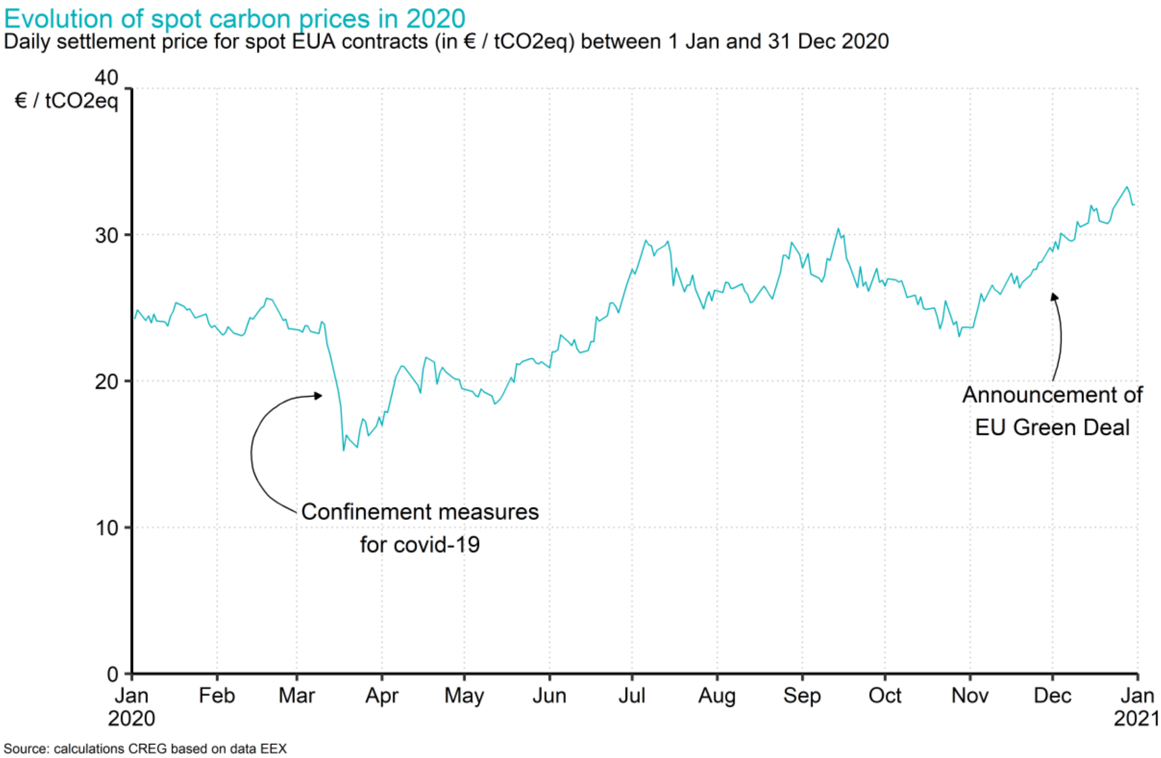


Figure 18 Evolution of spot carbon prices in 2020

2.3.3.3. *Phase 4 (structural reform)*

120. Since 2021 – the year that marks the entry of the EU ETS into Phase 4 and the increase of the linear reduction factor to 2,2% (against 1,74% in Phase 3) – four other major factors have contributed to sustaining the historically high prices for allowances:

- the announcement of the *"Fit-for-55 Plan"* by the European Commission;
- the sharp increases in oil and gas prices, leading to relative increases in competitiveness of coal-fired electricity generation units;[26]
- the post covid-19 economic recovery; and
- anticipation from some market participants that have taken long positions in anticipation of further price increases (for example, Bloomberg's carbon price forecast for 2022 reached 80 €/tCO_2eq in 2021).

121. The increase in prices for allowances has also pushed electricity prices upwards (see also section 3.1). Some Member States and market participants (in particular electro-intensive industries) have attributed these price spikes to speculative behaviour on the market, caused by financial players which only participate in the markets for the purpose of making profits from trading allowances. This behaviour can indeed harm the functioning and the credibility of the EU ETS if its relative weight in total market transactions proves to be significant. According to some authors,[27] even though futures positions are mostly held for hedging and market-making, the number of speculative positions from financial and commercial traders has increased since 2018. However, the current limitations regarding publicly available data (related to quality, harmonization and availability) impede a further analysis of the impact that speculation might have on allowance prices.

EEX	Compliance entities and other non-financial	Funds and other financial	Investment firms	TOTAL
2018	38	0	10	48
2019	44	0	16	60
2020	56	0	16	72
2021	68	1	24	93
2022 (until 04/03)	63	0	33	96
Increase between avg. 2018 and avg. 2020	+65,8%	+0,0%	+230,0%	+100,0%

Table 8 Evolution of the number of counterparties on EEX
(source: ESMA)

122. The Russian invasion in Ukraine, started on 24 February 2022, led to a severe drop in the price of allowances in mere days, while natural gas (and electricity) prices reached historically high levels in Europe. In the space of a week, the carbon price lost almost a third of its value, while this was still close to the symbolic value of 100 €/tCO_2eq in the beginning of February. This backdrop of the war marks a real decoupling between carbon prices and energy prices.

[26] As these coal-fired units have a higher carbon intensity than gas-fired generation units, they require additional allowances to cover the verified emissions which increases the demand and drives up the price for allowances.

[27] Quemin and Phale (2022) "Financial threaten to undermine the functioning of emissions markets", cited in the ESMA report: Final Report "Emission allowances and associated derivatives" (March 2022), page 36.

123. Although it is still early to assess the impact of this conflict on allowance prices (by identifying the different transmission channels), the drop could reflect the difficulties and potential fears on natural gas supply or even import bans, combined with a general economic slowdown and a faster exit from fossil fuels in Europe. Alternatively, the general circumstances on energy markets could lead to market participants closing their positions in allowance markets in order to respond to high margin calls, for example for gas contracts.

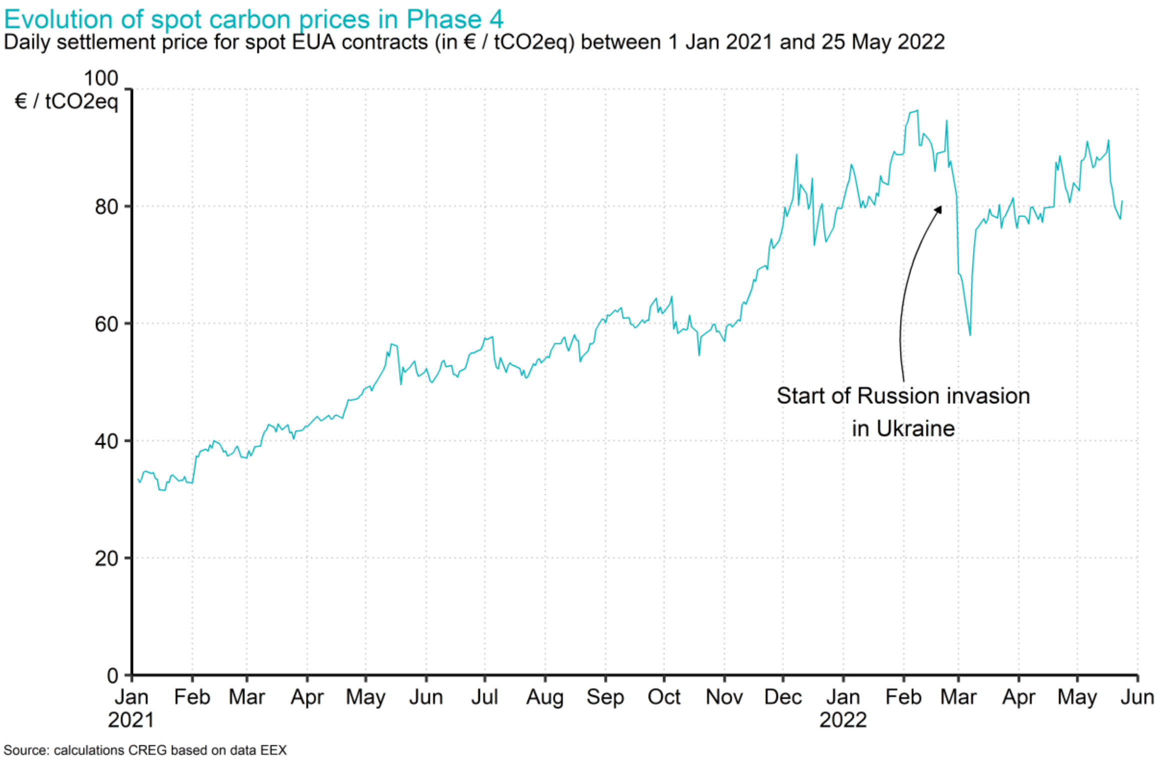


Figure 19 Evolution of spot carbon prices in Phase 4

2.4. USE OF AUCTIONING REVENUES

2.4.1. General instructions related to usage of auctioning revenues

124. Auction revenues generated in Phase 3 of the EU ETS go mainly to the budgets of Member States and are used predominantly to mitigate or adapt to climate change. Member States are required to spend at least half of the auction revenues on measures to support GHG emission reductions, deployment of renewables and carbon capture and storage, or improvement of energy efficiency and district heating.

125. The increases in EUA prices in the EU ETS since Phase 3 (see also section 2.3.3) have brought about an increase in the auction revenues available to spend on climate action, from 3,1 billion € in 2013 to 14,4 billion € in 2020 in the EU-27.

126. Article 17 of Regulation (EU) No 525/2013 requires Member States to report annually on the use of auctioning revenues for climate change and energy purposes. It should be noted that the annual reporting does not necessarily cover the revenues from that year. The reporting covers how revenues are spent during a specific year, yet it is possible that these revenues were generated from auctions during earlier years.

127. Based on the annual reporting, it is estimated that 75% of total revenues (reaching 56,5 billion €) was used for climate and energy purposes during Phase 3, and 72% in 2020. Figure 20 shows the auctioning revenues and the reported usage in the EU-27 between 2013 and 2020.

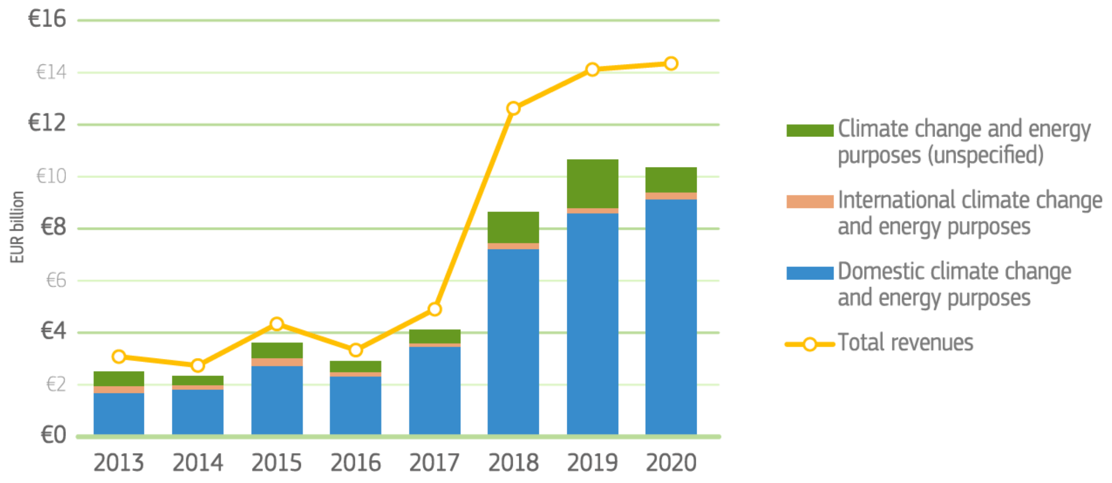


Figure 20 Auctioning revenues and reported usage, 2013 – 2020, EU-27
(source: EU Climate Action Progress report – November 2021)

2.4.2. Belgian revenues from the EU ETS

2.4.2.1. Phase 3

128. For Phase 3 of the EU ETS (2013 – 2020), the auctioning of emission rights has generated almost € 1,7 billion. Table 9 shows the revenues of Belgium from the auctioning of the EUAs and EUAAs between 2013 and 2020.

	EUA			EUAA			EUA + EUAA
	Number of allowances auctioned	Average price (€)	Revenues (€)	Number of allowances auctioned	Average price (€)	Revenues (€)	Revenues (€)
2013	26.122.000	4,40	114.992.255				114.992.255
2014	16.089.000	5,91	95.030.055	341.000	6,01	2.048.600	97.078.655
2015	18.224.000	7,62	138.955.320	383.000	7,04	2.694.600	141.649.920
2016	20.361.000	5,26	107.139.740	139.500	5,29	737.935	107.877.675
2017	24.927.000	5,76	143.523.215	130.500	18,90	2.467.050	145.990.265
2018	24.573.000	15,42	378.996.310	110.500	7,14	788.490	379.784.800
2019	14.299.000	24,63	352.202.500	193.000	23,65	4.565.120	356.767.620
2020	14.521.500	24,31	353.074.565	125.500	23,73	2.978.160	356.052.725
TOTAL	**159.106.500**	**10,58**	**1.683.913.960**	**1.292.500**	**10,69**	**13.812.905**	**1.697.726.865**

Table 9 Belgium's revenues from auctioning of EU ETS allowances (EUA and EUAA) between 2013 and 2020
(source: Belgian Greenhouse Gas Registry)

129. The difference in terms of revenues from one year to another can be explained by the number of allowances auctioned each year but also by the price of allowances. As illustrated in Figure 21, the price of allowances has been increasing considerably since 2018. As a result, auctioning revenues in 2018 were more than twice higher than in 2017, for a comparable number of allowances auctioned.

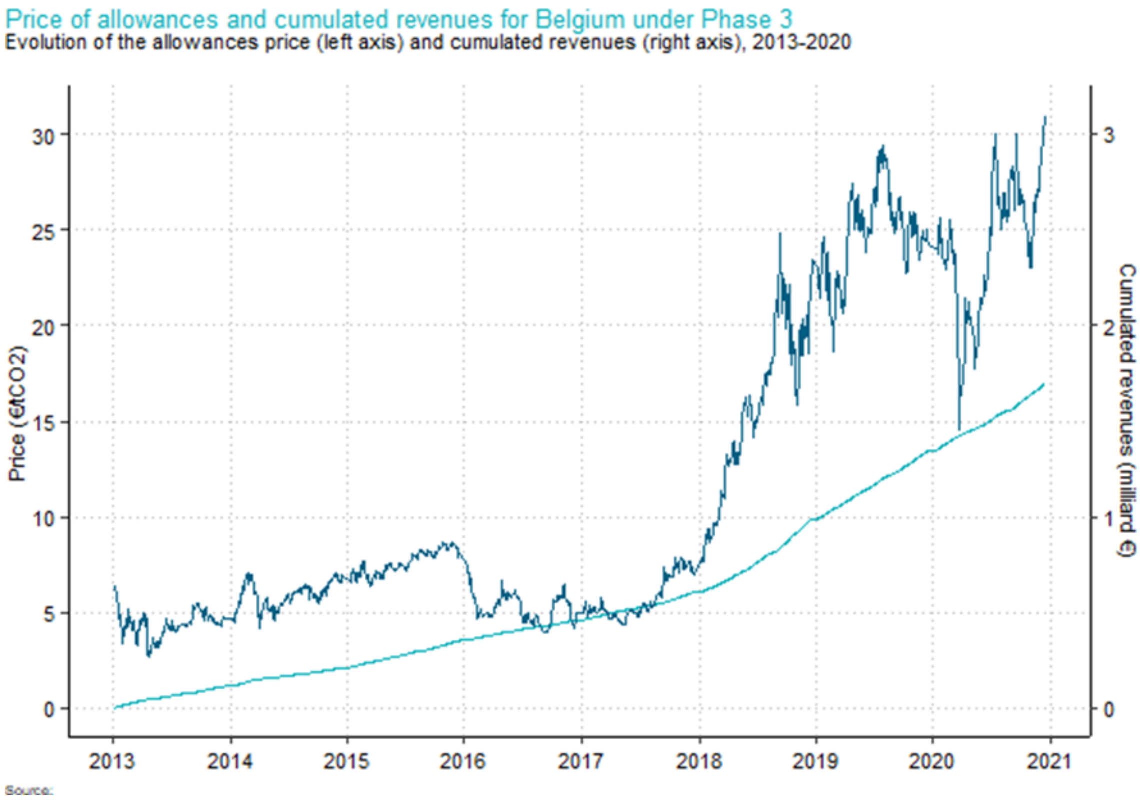


Figure 21 Price of allowances and cumulated revenues for Belgium under Phase 3

130. These revenues were not spent between 2013 and 2015 in Belgium, pending the necessary legal decisions. These revenues have therefore been earmarked and were partly committed and disbursed over the following years.

(million €)	2013	2014	2015	2016	2017	2018	2019	2020
Revenues from auctioning	115	97.1	141.6	107.9	144.3	381.5	356.8	356.1
Reported as spent on climate and energy purposes	0	0	0	37.5	133.1	213.7	357.8	162.6
Fraction spent on climate and energy	N/A	N/A	N/A	35%	92%	56%	100%	46%

Table 10 Amounts spent of Belgium's revenues from the auctioning of allowances on climate and energy purposes (million €) (source: EU Climate Action Progress report – November 2021)

2.4.2.2. <u>Phase 4</u>

131. The latest available data show that the auctioning of emission rights have brought Belgium already more than 431 million € since the beginning of Phase 4 of the EU ETS (data available until 28 October 2021), for an auctioned volume of 8.690.000 allowances (only EUAs, excluding EUAAs). The total estimated revenue for 2021 amounts to 530 million €.

132. This considerable increase in auctioning revenues is explained by the rising prices of allowances. The price of EUAs averaged 50,79 € for that period, a price level never seen before.

2.4.3. Allocation of revenues within Belgium

2.4.3.1. Federal

133. The revenues from the EU ETS allocated to the federal government have been earmarked for a federal fund called the *"Fonds destiné à la responsabilisation climat"* or *"Fonds bestemd voor de klimaatresponsabilisering"* (English: "Fund for climate responsibilisation").

134. Each year since 2016 (fiscal year), an amount of this Fund is allocated via a bonus system to the regions. These amounts are determined on the basis of the difference between the GHG emissions and the respective targets of the regions in the year preceding the fiscal year, multiplied by the average price per emission allowance on an annual basis of the allowances aucitoned by Belgium in the year in which the difference was determined.

2.4.3.2. Flemish region

135. The revenues allocated to the Flemish region are allocated within the *"Vlaams Klimaatfonds"* (English: "Flemish Climate Fund"). These amounts could be used for, among others:

- the co-financing of the internal Flemish climate policy to achieve its GHG emission reduction targets, contributing to the Flemish non-ETS reduction target or to the Flemish LULUCF sector;
- the implementation of the policy on flexibility mechanisms;
- the remediation of the loss of competitiveness by Flemish companies as a result of European or other international climate policy; or
- the covering of all policy costs related to the preparation, organization and contributions to climate auctions.

136. The Flemish government wants to use the free policy space of 169,81 million € within the Flemish Climate Fund in 2022 for its contribution to international climate financing (7,25 million €) and for the Flemish mitigation measures (162,56 million €)[28] as:

- energy measures in the building sector: 92,87 million €;
- local climate actions: 30 million €;
- climate mitigation in agriculture and soil carbon storage: 4,67 million €;
- climate mitigation non-ETS industry : 4,67 million € ;
- transport and mobility : 7,4 million €
- climate mitigation in the waste sector and through the circular economy: 0,5 million €; and
- Climate Plan Flemish government: 3 million €.

[28] https://www.energiesparen.be/sites/default/files/atoms/files/VR%202021%201712%20MED.0459-1%20Besteding%20middelen%20VKF%20in%202022%20-%20mededelingBIS.pdf (link to PDF)

2.4.3.3. Walloon region

137. The revenues allocated to the Walloon region are allocated within the *"Fonds wallon Kyoto"* (English: "Walloon Kyoto Fund"). These amounts could be used for, among others:

- the promotion of activities and projects to reduce or sustainably store GHGs;
- the verification of GHG emissions;
- climate adaptation measures;
- measures to fund research and development on limiting GHG emissions and adapting to the impact of climate change; and
- financing of actions figuring in the PACE (Energy, Air and Climate Plan) as it has been submitted by the Government to the Parliament.

138. 111 million € should have been released from the Fund in 2021, with 61 million € to be made available in the form of loans and 50 million € as direct subsidies for specific measures, such as:

- energy efficiency and energy transition of companies: 35 million € in loans, and 12,5 million € in subsidies;
- support for hydrogen development: 6 million € in loans, and 10 million € in subsidies;
- energy transition via cooperatives: 8,5 million € in loans;
- energy communities: 2,5 million €; and
- deployment of charging points: 2,5 million €.

2.4.3.4. Brussels Capital region

139. The revenues allocated to the Brussels Capital region are allocated within the *"Fonds Climat"* (English: "Climate Fund"). The Climate Fund's resources have notably been used for measures aimed at reducing GHG emissions: measures related to buildings, installations and products and measures related to transport and mobility.

3. IMPACT ON THE ELECTRICITY SECTOR

140. This chapter explores the impact of the functioning of the EU ETS on the wholesale prices for electricity and the abatement of emissions in the electricity generation sector. The latter is presented in terms of installed capacity, generated energy and the resulting emissions from electricity generation.

3.1. PRICE FORMATION IN DAY-AHEAD MARKETS

141. In order to understand the impact that emission allowances (EUAs) have on the wholesale electricity prices, it is worth recalling some basic principles of price formation in day-ahead markets: the merit order and marginal pricing. According to the marginal pricing principle, the clearing price in the day-ahead market (which is to be paid by all parties on the demand side, received by all parties on the supply side) is established at the clearing point of the aggregated demand and supply bid curves.

142. The supply curve is established according to the merit order: production units which intend to sell their output, can introduce supply bids to the power exchange (i.e. the "Nominated Electricity Market Operator" or NEMO, *in casu* EPEX SPOT or Nord Pool in Belgium). According to economic theory, these supply bids reflect their true variable incremental cost of generating an additional MWh of electricity. These costs may vary in function of different elements: for fossil fuel-based generation units, for example, the costs may vary significantly in function of the market price for the underlying fuel (e.g. coal or natural gas). Other production types, such as renewables (solar or wind) or nuclear production typically have much lower variable costs, placing them at the very start of the merit order (leading to them being dispatched before more expensive, fossil-based units).

143. Those production units which are subject to the EU ETS, i.e. those that emit greenhouse gasses, may incorporate the cost of their emission allowances in their variable costs. These costs are typically expressed in € / MWh, and are based on the carbon intensity of their output (in tCO_{2eq} / MWh). Typically, this carbon intensity depends on the type of technology for generating electricity and its thermal efficiency.

144. According to these factors, the variable cost of fossil fuel-based units, and hence the merit order, will increase. The relative position of coal units versus gas units or oil units may change (significantly), depending on the price of the EUAs at a specific point in time. Typically, units with a higher carbon intensity suffer more from price increases of those EUAs, as their variable costs (in €/MWh) tend to increase and their competitive advantage against other units with lower carbon intensity disappears partly or in its entirety.

145. Figure 22 summarizes the micro-economic theory of the impact of the price assigned to emitting greenhouse gasses (i.e. the EUA price) on the day-ahead electricity price, via its propagation through the merit order and marginal pricing model.

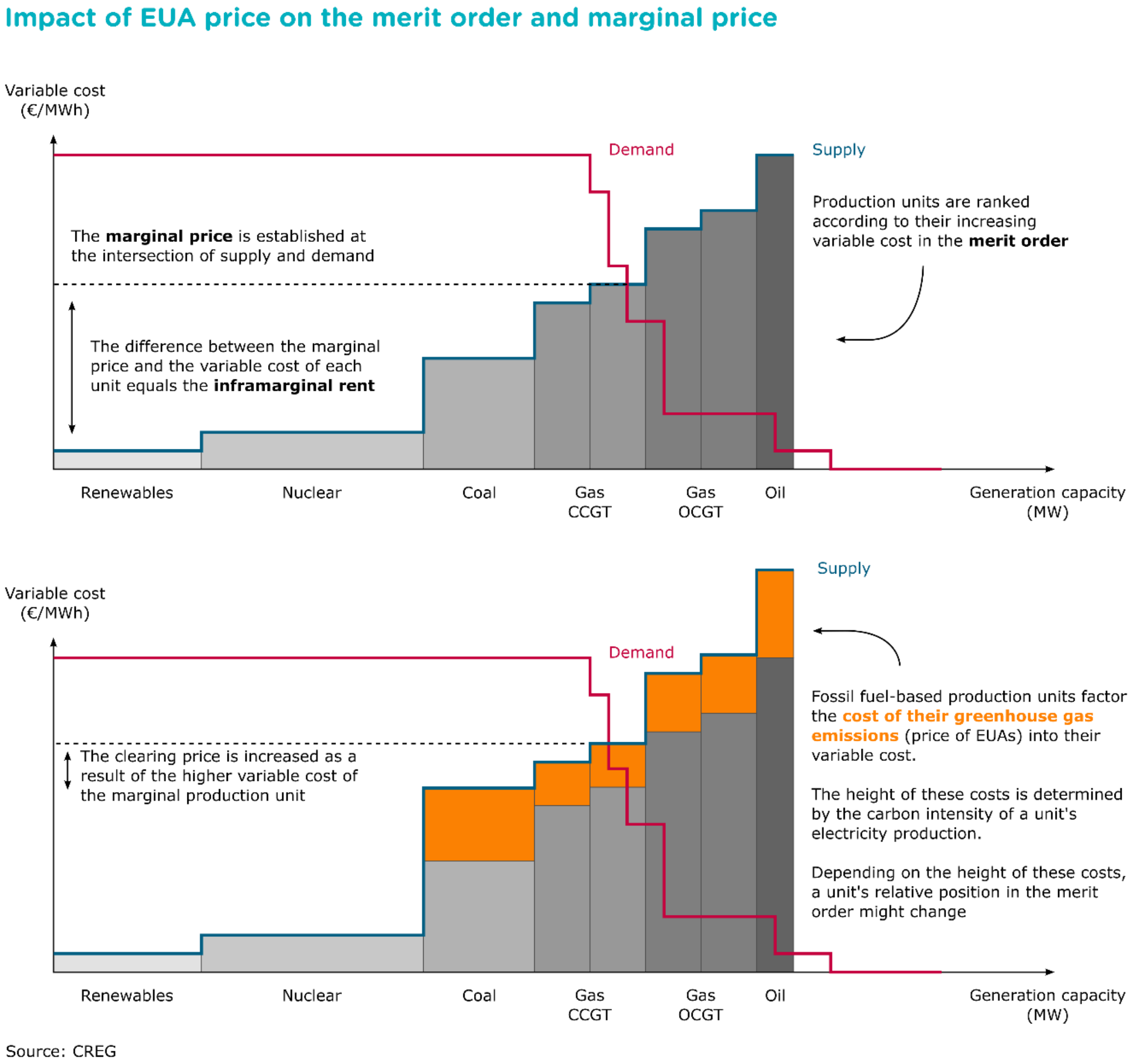


Figure 22 Impact of EUA price on the merit order and marginal price

146. This theoretical link between the price for EUAs and the price for electricity is confirmed in the analysis below (Figure 23). An increase of the price (in €/tonne $CO_{2\text{-eq}}$) tends to increase the price for electricity (in €/MWh), in line with the aforementioned mechanism. While the relation is far from perfect, it is unmistakably a positive one. In particular the bigger variance of the observations when electricity prices exceed 200€/MWh (as has been observed since the second half of 2021) may be attributed to other factors, notably the very strong increase in the natural gas prices (leading to a gas-to-coal switch).[29]

[29] See also Study (F) 2289 on the increase in electricity and gas prices in Belgium

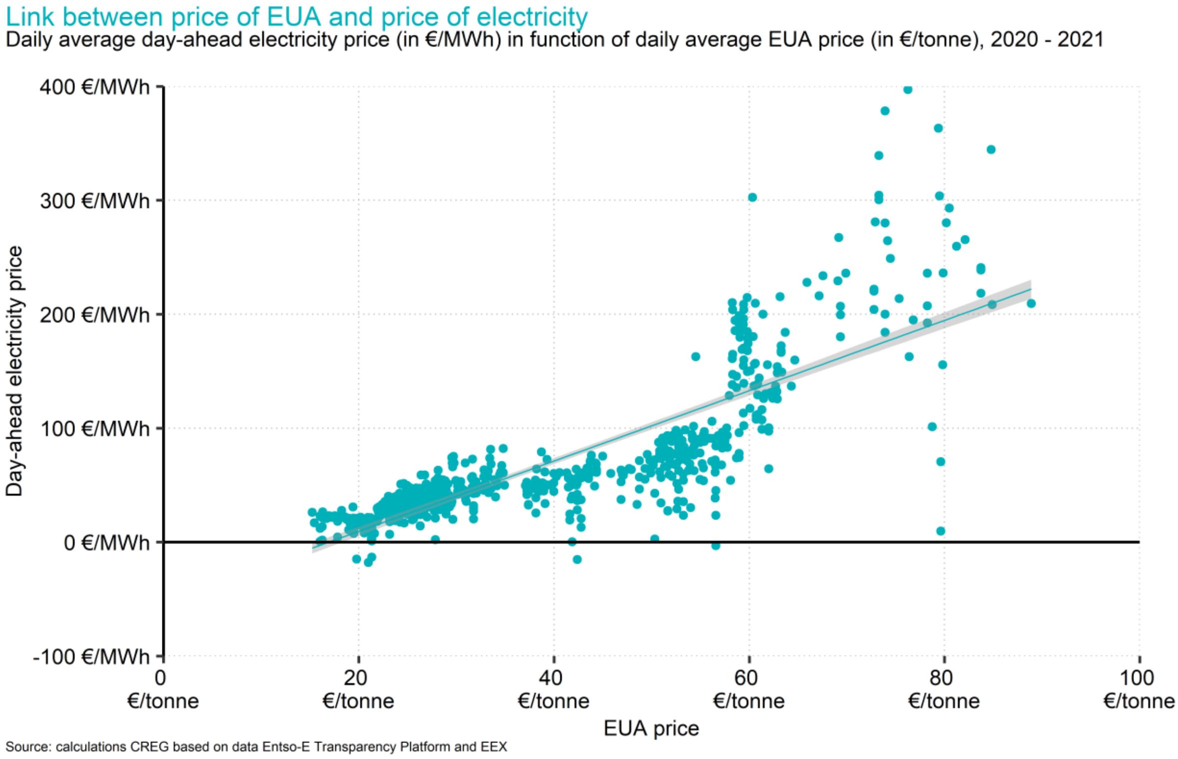


Figure 23 Link between price of EUA and price of electricity

147. This is an ex-post analysis of the empirical impact of an increase in the price of an EUA on the price of electricity, based on actual observations. This is an indirect estimation method: it cannot be excluded that other factors are at play. Another option to investigate the impact of an EUA on the electricity price would consist of modelling the market outcome with and without the taking into account of the price of the EUA in the variable costs of fossil fuel-based units.

148. This is exactly what is done in the studies that lead to an estimation of a market-based CO_2 emissions factor. These calculations are done for the purpose of safeguarding the competitiveness of electro-intensive consumers, by calculating the so-called "pass-through" of the CO_2 price. For Belgium, such a study has been commissioned by the Flemish and Walloon governments, leading to an emissions factor of 0,55 $tCO_{2\text{-}eq}$ / MWh, meaning that an increase of the EUA price with 1 €/tonne $CO_{2\text{-}eq}$ leads to an increase of the electricity price with 0,55 €/MWh. The CREG approved this study, with its Decision (B) 2364.[30] For the same year 2019, the French transmission system operator RTE has calculated a CO_2 emission factor for France reaching 0,59 $tCO_{2\text{-}eq}$/MWh, which is in line with the value calculated for Belgium.

149. The height of this factor may vary in function of, among others:

- The modelling tools and inputs
- The efficiencies of the marginal power units
- The carbon intensities of the marginal power units
- The import and export positions in the day-ahead timeframe, and whether or not convergence with other bidding zones has been observed

[30] Décision (B) 2364 d'approbation de l'étude relative à la détermination du facteur d'émission CO_2 pour la Belgique fondé sur le marché

3.2. COAL-TO-GAS (AND GAS-TO-COAL) SWITCH

150. The uneven impact of the price of EUAs on the variable costs of electricity generation units may have an impact on the position of that unit in the merit order, as already mentioned in Figure 22. In particular, given that usually the electricity output of a coal-fired power plant has a higher carbon intensity than the output of a gas-fired power plant, an increase in the price of EUAs typically prompts a **"coal-to-gas switch"**. This implies that generating electricity from coal-fired sources becomes more expensive than generating the same amount of electricity from gas-fired sources, exactly as a result of the price of EUAs. This is reflected in the clean dark spread and clean spark spread: for a given thermal efficiency of coal and gas units, this reflects the cost of generating electricity, including the cost of EUAs.

151. The evolution of the clean dark and clean spark spread since 2018 is shown in Figure 24. The increase in the price of EUAs since 2018 (see also section 2.3) has prompted a coal-to-gas switch due to the higher impact that the price of EUAs has on the variable costs of coal-fired power plants. Graphically, this is reflected in the clean dark spread being lower than the clean spark spread (meaning that the profitability of coal-fired generation, including the cost for their EUAs, is lower than that of gas-fired generation). Since mid-2019, however, the increase in the prices of natural gas prices (see also paragraph 146) has outweighed the "competitive advantage" that gas has over coal, when only the EUA prices are considered. In order to become competitive again, either natural gas prices would need to return to their normal (pre-2021) levels, or the price of EUAs would need to further increase significantly.

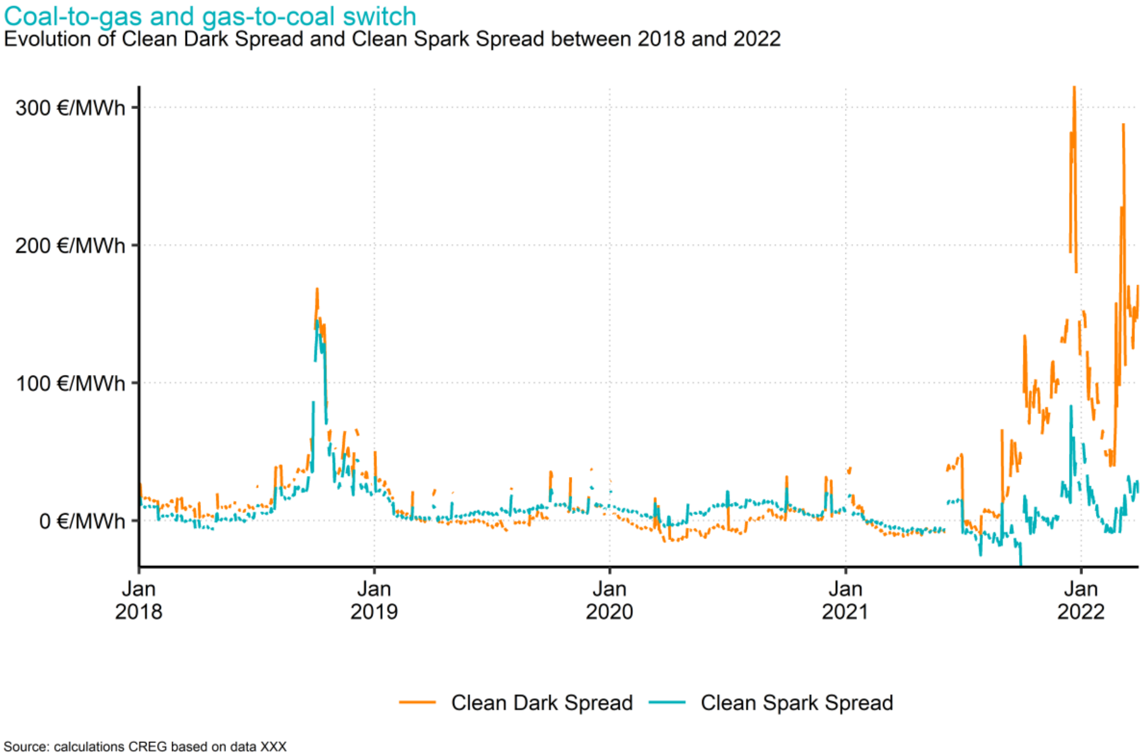


Figure 24 Coal-to-gas and gas-to-coal switch

3.3. IMPACT ON ELECTRICITY RETAIL INVOICE

152. The price of electricity charged to the retail market in Belgium is directly linked to the prices on the wholesale market. Indeed, all variable electricity prices are indexed to the electricity prices on the wholesale markets, whether it is the spot market or the forward markets. In the same way, we can see that the fixed prices offered to the retail market in Belgium evolve in parallel with the evolution of the prices observed on the forward markets.

153. The impact of the CO2 price on the price of electricity on the retail market will therefore be directly linked to the impact of the CO2 price on the price of electricity on the spot or forward wholesale market, to which will be added a corrective factor to take account of network losses (1,45%) and VAT. Taking into account a VAT of 21%, we can estimate that the impact of the CO2 price on the electricity price (in €/MWh) on the retail market corresponds to 122,8% of the impact observed on the wholesale market (in €/MWh)

3.4. ELECTRICITY GENERATION

3.4.1. Generated energy

154. Fuel switching, as described in section 3.2, is the main contributor to the abatement of GHG emissions in the electricity generation sector. It refers to the replacement of one generation fuel with another. In the electricity generation sector, the primary form of fuel switching is the replacement of coal with natural gas – even though sometimes the invers can happen, as described previously.

155. Various studies have shown that the impact of fuel switching on emissions reduction varies across time and Member States.[31] Indeed, fuel switching can only occur when there is spare capacity to switch to: winter months and weekdays are characterised by electricity load peaks, thus leaving little capacity unutilised. At times of lower demand (typically during summer and weekends but also overnight), there is idle capacity in the system, thus enabling a choice between either bringing coal or gas-fired generation online. As a result, the literature shows that a majority of abatement seems to occur in the summer months, during the weekend and overnight.

156. Fuel switching can only occur where coal-fired and gas-fired capacities are present. Depending on the country's electricity generation mix, gas capacity might not always be available for switching to take place. As a result, abatement caused by fuel switching varies significantly across EU Member States. Furthermore, in the future, it is very likely that fuel switching from coal to gas becomes less of a contributor to the decrease in CO_2 emissions from the power sector since more and more EU Member States are planning to phase-out coal in the coming years. These decisions are not necessarily driven by economic factors (that would push electricity producers to shut down coal power plants because coal generation become relatively too expensive compared to other electricity generation sources) but rather by environmental considerations.[32]

[31] Agnolucci, Paolo; Drummond Paul. 2014. The Effect of Key EU Climate Policies on the EU Power Sector. An Analysis of the EU ETS, Renewable Electricity and Renewable Energy Directives. CECILIA2050 WP2 Deliverable 2.1. London: Institute for Sustainable Resources, UCL

[32] idem

157. Since 2017, no electricity has been generated in Belgium from coal-fired power plants (see also Figure 25). To the contrary, natural gas-fired units remain a large source of electricity generated in Belgium. This does not mean that no coal-based electricity is consumed in Belgium: as the Belgian market is coupled to those of its neighbours, the supply from coal- or lignite-based power plants in neighbouring countries is also used to address the demand for electricity in Belgium.

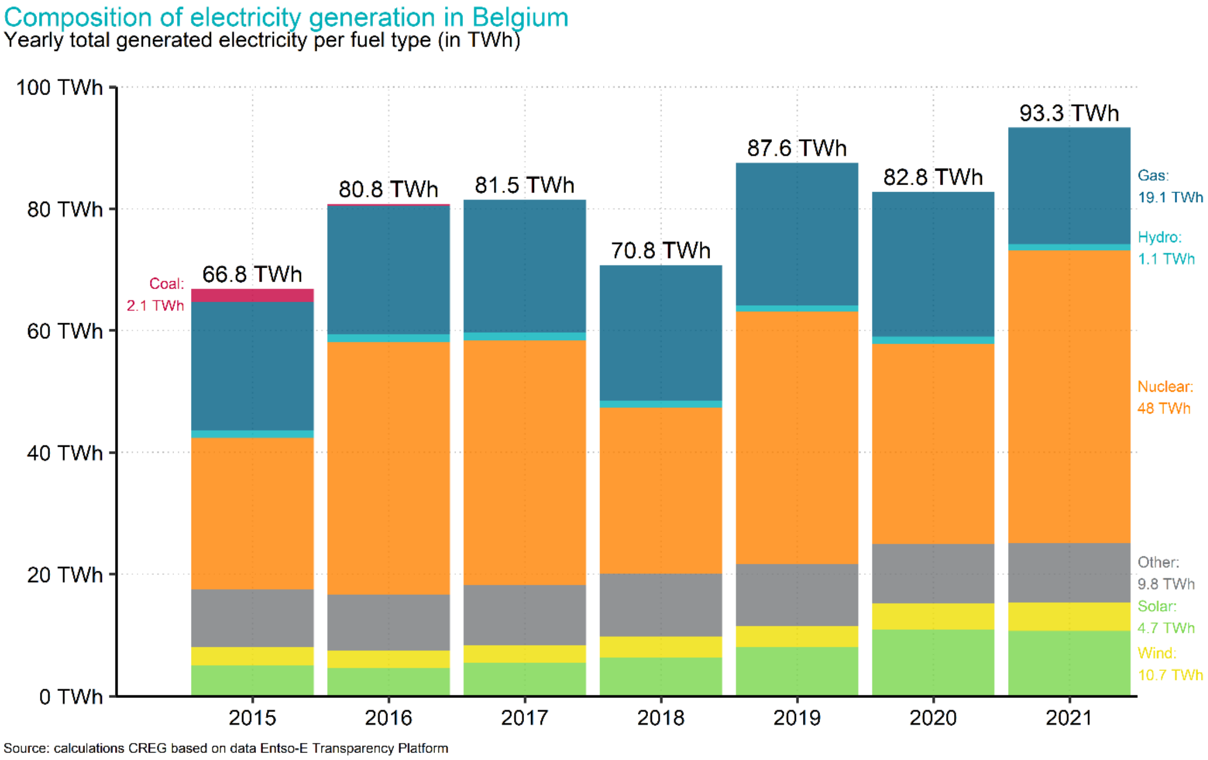


Figure 25 Composition of electricity generation in Belgium

3.4.2. Installed capacity

158. In order to understand if the EU ETS has had, and continues to have, long-term and systemic effects to the electricity sector, attention must be paid to the influence of the EU ETS on the generation capacity in different EU Member States. The system has the ability to influence power investments in low-CO_2 and CO_2-free generation capacity, but only if the prices for the EUAs reach an adequate level and if the resulting costs are integrated into the producer's investment plans.

159. Most renewable energy sources have, in the past years, become significantly cheaper than gas-fired combined cycle turbines and coal-fired generation units. As far as new capacity is concerned, one of the main drivers for investment decisions between different electricity generation technologies is the relative difference between the technologies' Levelized Costs of Electricity ("LCOE"). The LCOE for different new projects across the EU are presented in Figure 26, based on data from 2018.

160. The LCOE refers to the estimated revenue required to build and operate a generation unit over its entire lifetime. Key inputs to calculate the LCOE include capital costs, fixed and variable operational and maintenance costs, fuel costs, but also carbon costs, financing costs and an assumed utilization rate for each type of generation unit. To be exhaustive, also possible decommissioning costs for the residual value of the installation at the end of its lifetime should be included in this list.

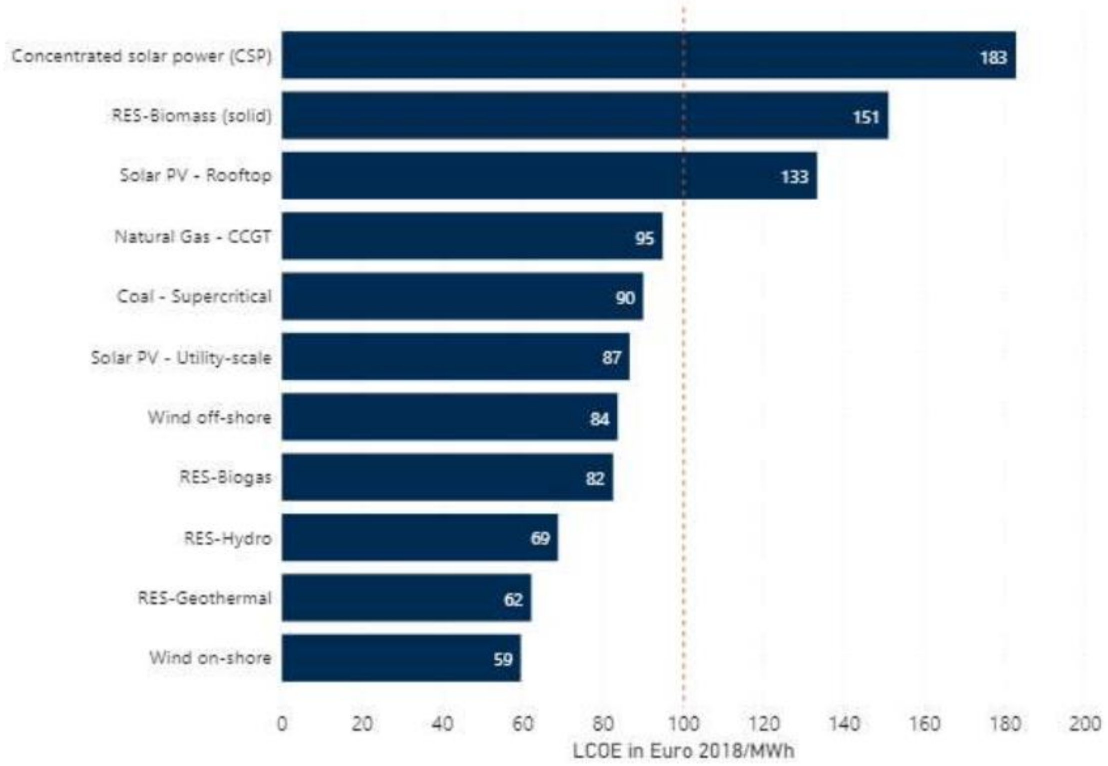


Figure 26 LCOE for different technologies in EU27
(source: report Trinomics for European Commission)[33]

161. As the carbon price (value of the EUAs) is factored into the LCOE, the EU ETS may impact investment decisions. It is worth noting, however, that the LCOE does not capture all factors that contribute to actual investment decisions. These decisions also factor in specific technological and regional characteristics of a project, which involve many other elements (e.g. the demand for electricity, load characteristics in the considered area, the existing capacity mix in areas where new capacity is needed, etc.). Additionally, the European Union's targets for renewable energy sources integration have a strong impact on the evolution of the individual Member States' installed capacities and production mixes.

162. While the direct impact of the EU ETS is hard to assess, the evolution of the installed capacity in Belgium is worth presenting. This is done in Figure 27. The absolute value of the installed fossil capacity remained relatively stable between 2015 and 2021, due to the decrease in coal-fired generation offset by the increase in gas-fired (mainly cogeneration) units. At the same time, there has been a very significant increase in the installed capacities of wind (on- and offshore) and solar (PV) installations. Taken together, these represent almost 10GW of installed capacity in Belgium in 2021.

163. In summary, while it is impossible to assess exactly to which extent the GHG reduction framework of the EU ETS has been a decisive factor in investment decisions in less carbon-intensive alternatives to generate electricity, it is clear that it has contributed – together with other targeted policies – to a changing capacity mix.

[33] European Commission, Final Report Cost of Energy (LCOE), Energy costs, taxes and the impact of government interventions on investments, October 2020, written by Trinomics, https://op.europa.eu/en/publication-detail/-/publication/e2783d72-1752-11eb-b57e-01aa75ed71a1/language-en

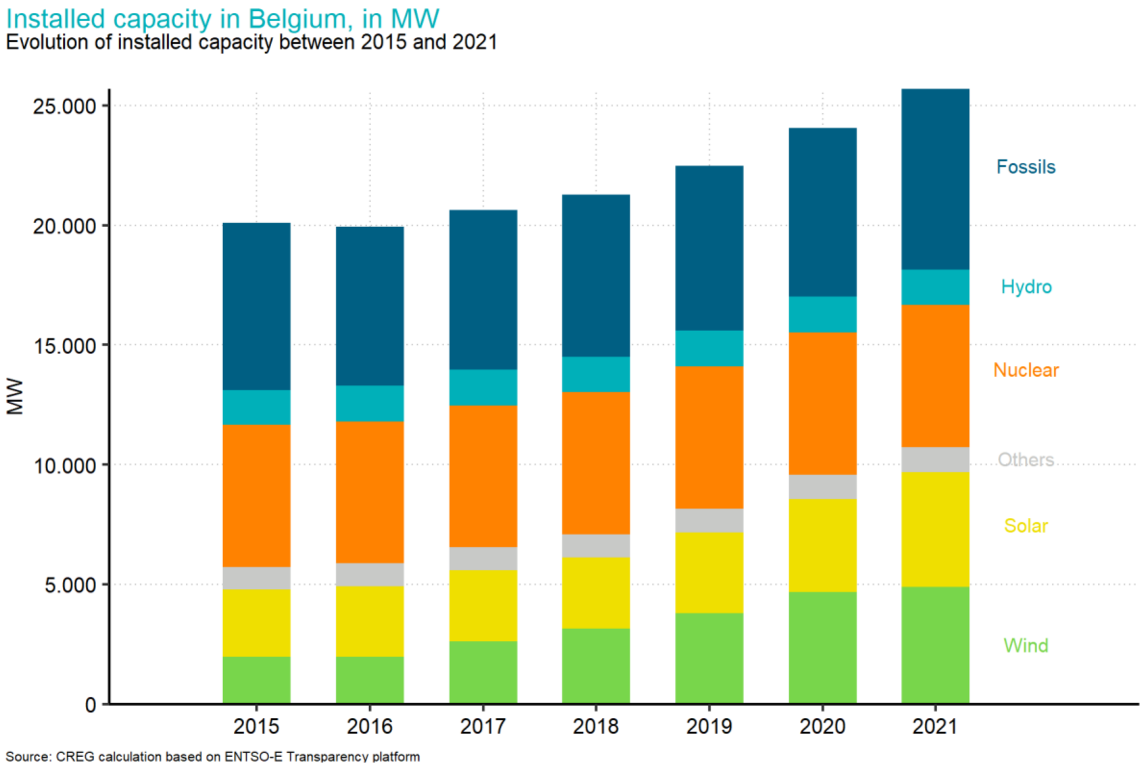


Figure 27 Installed capacity in Belgium, in MW

3.4.3. Emission intensity of electricity generation

164. As a result of the evolutions presented in sections 3.4.1 and 3.4.2, Belgium's GHG emissions from electricity generation have been continuously and considerably decreasing since 2019. As illustrated in Figure 28 and Figure 29, these emissions have decreased by more than 35% in the past three decades (from 23,6 million tCO_2eq in 2019 to 15,36 tCO_2eq in 2019). A clear decreasing trend may be observed from 2005 onwards. This is the date of the entry into force of the EU ETS, which covered the emissions of the electricity generation sector from its inception. It is important to recall, though, that other factors and schemes may have had an impact and this reduction is not solely attributable to the functioning of the EU ETS.

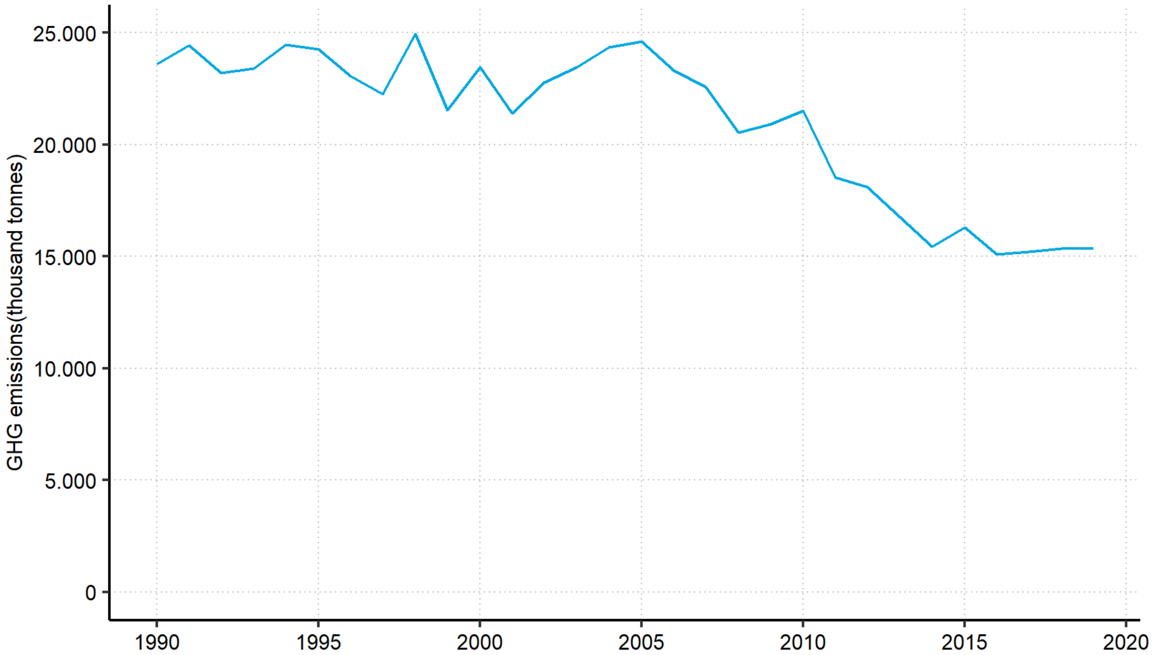
165. The sharp decrease in Belgium's greenhouse gas emissions can also be explained by the phase-out of coal (since 2016, no more electricity is produced from coal-fired power plants in Belgium) and by the growth of solar and wind production in the electricity production mix, slowly replacing carbon intensive generation capacities. As a result, the greenhouse gas emission intensity of electricity production[34] in Belgium has been continuously decreasing over the last three decades to reach 161 gCO_{2eq}/kWh in 2020, i.e. a reduction of 55% compared to 1990 (see Figure 30).

166. Similar observations can be made at the European level. Between 1990 and 2019, the EU27's greenhouse gas emissions from electricity generation decreased by more than 38% while the GHG emission intensity of electricity production dropped from 500 gCO_{2eq}/kWh in 1990 to 230 gCO_{2eq}/kWh in 2020, i.e. a reduction of 54%. From 2006, a significant drop in greenhouse gas emissions can also be observed at the European level.

[34] Eurostat calculates the greenhouse gas emission intensity (in gCO2/kWh) as the ratio of CO2 equivalent emissions from public electricity production (as a share of CO2 equivalent emissions from public electricity and heat production related to electricity production), and gross electricity. In short, it refers to the amount of greenhouse gas (in CO2 equivalent) emitted to produce 1 kilowatt hour of electricity.

Evolution of GHG emissions of the electricity sector in Belgium

GHG emissions of electricity generation (in thousand tonnes)

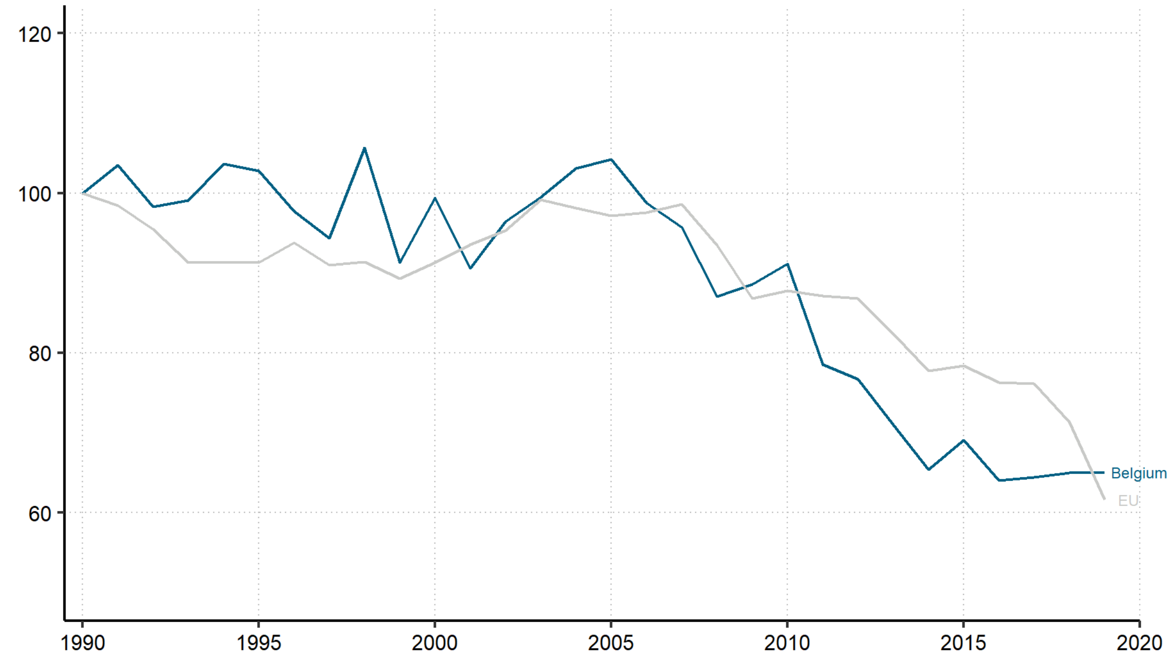


Source: CREG calculation based on Eurostat data

Figure 28 Evolution of GHG emissions of the electricity sector in Belgium

Evolution of GHG emissions of the electricity sector in the EU and Belgium

GHG emissions of the electricity sector, index (1990 = 100%)



Source: CREG calculation on Eurostat data

Figure 29 Evolution of GHG emissions of the electricity sector in the EU and Belgium

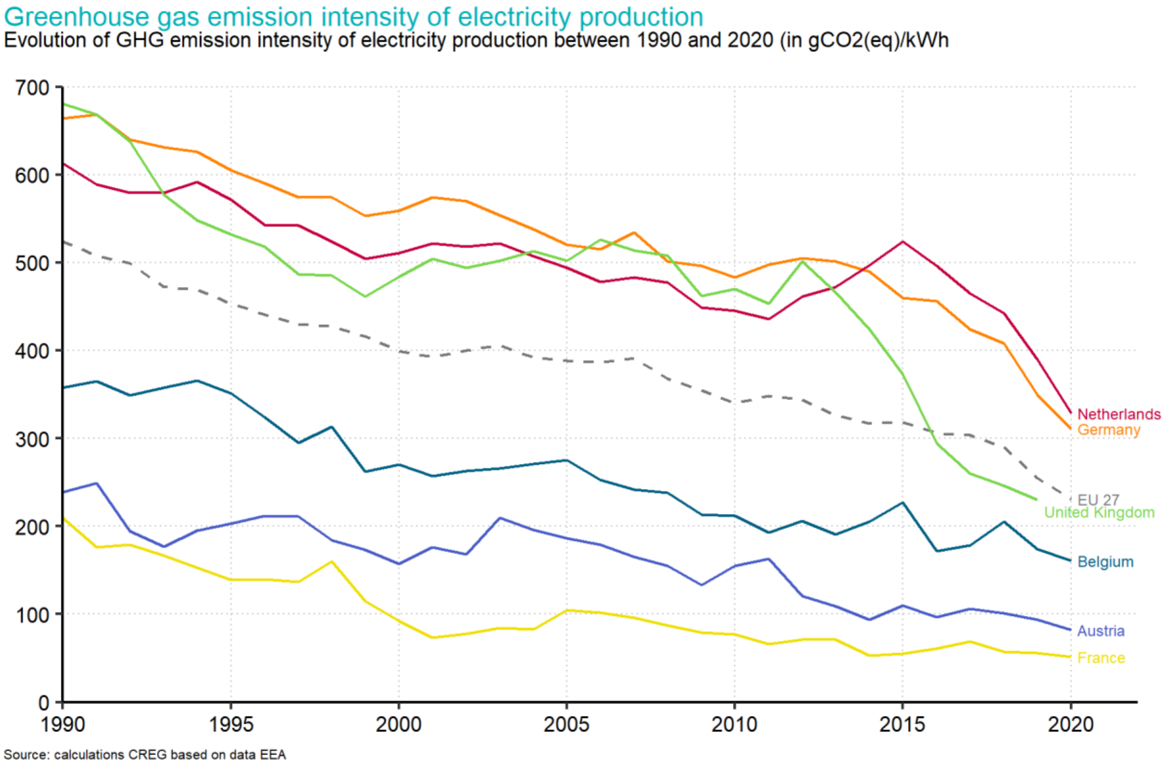


Figure 30 Greenhouse gas emission intensity of electricity production

4. METHANE EMISSIONS

167. Methane (CH_4) is a potent GHG that is responsible for around 30% of the rise in global temperatures since the Industrial Revolution, according to the International Energy Agency (IEA). While it dissipates faster than CO_2, it is a much more powerful GHG during its shorter lifespan: on a 100-year timescale, methane has 28 times greater potential for global warming (or 84 times more on a 20-year timescale), compared to CO_2.

168. Agriculture, waste and the energy sector are the main sources of anthropogenic methane emissions in the European Union. According to the EU GHG inventory data, the energy sector is estimated to be responsible for 19% of methane emissions within the EU. In particular, it is estimated that methane emissions from gas operations represented 6% of the total EU methane emissions in 2016.[35]

169. While emissions of methane do not fall under the EU ETS, the *"EU Methane Strategy"* of the European Commission is a crucial element of the upcoming legislative actions to combat climate change under the EU Green Deal.

4.1. METHANE EMISSIONS IN BELGIUM

170. Methane emissions in Belgium amounted to 7.100 kilotons $CO_{2\text{-eq}}$ in 2020, a 38,4% decrease since 1990 when emissions were still 11.520 kilotons $CO_{2\text{-eq}}$. In 2020, methane emissions represented 6,7% of Belgium's total greenhouse gas emissions.

171. The main source of methane emissions in Belgium is the agricultural sector. This sector along represented 73,6% of all methane emissions in 2020, followed by waste (11,6%) and energy supply (7,7%). As far as the supply of energy is concerned, the oil and gas sectors are the main sources of these methane emissions.

[35] Source: GIE & Marcogaz report, https://www.gie.eu/wp-content/uploads/filr/3297/GIE-MARCOGAZ_Report%20for%20the%20Madrid%20Forum%20-%20Potential%20way%20gas%20industry%20can%20contribute.pdf (link to pdf)

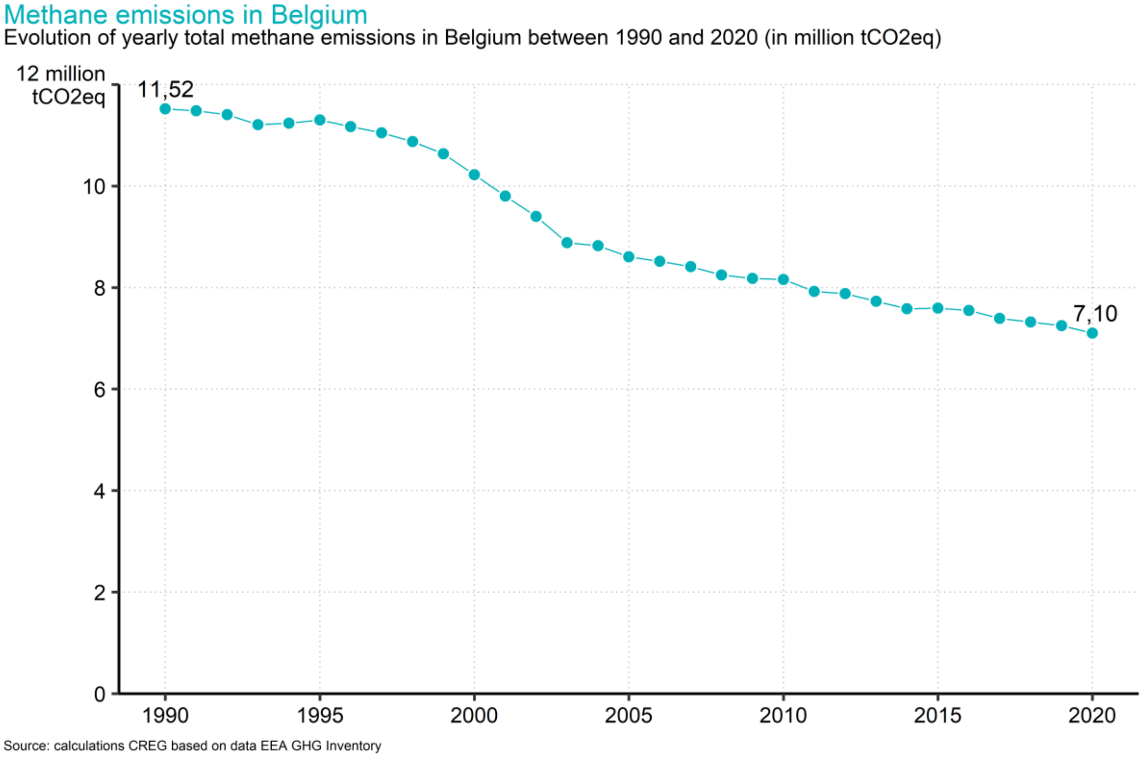


Figure 31 Methane emissions in Belgium

4.2. METHANE EMISSIONS IN THE GAS SECTOR

172. There is a wide dispersion of methane emission levels along the gas value chain. As illustrated in the figure below, the majority of methane emissions stemming from gas industry activities in the EU is caused by the distribution of gas.[36] Production and processing of gas account only for 18% of methane emissions since the EU has limited gas production capacities. Finally, transmission and storage of gas account for 23% of methane emissions from the gas industry.

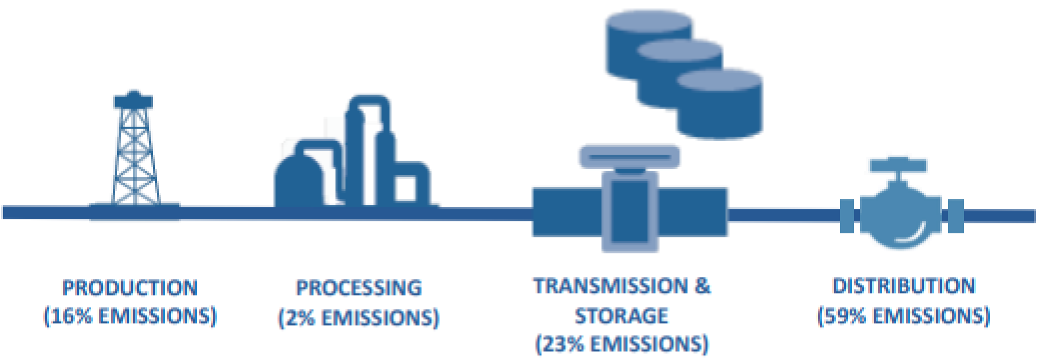


Figure 32 Methane emissions from natural gas operations across the EU gas chain in 2016
Source: GIE & Marcogaz report

173. As operator of the Belgian gas transmission network, Fluxys Belgium SA is active at the transmission and storage level of the gas value chain. In order to reduce its carbon footprint on the

[36] Data from Fluxys Belgium SA's Annual Report 2021, https://www.fluxys.com/fr/company/fluxys-belgium/financial-information

climate, Fluxys was given an incentive during the period 2020-2023 to reduce methane emissions from its operations by 10% per year compared to 2017. In 2017, Fluxys' methane emissions from transport and stockage reached 142 kilotons CO2 equivalent.

174. As a result, Fluxys' methane emissions decreased significantly in 2020 and 2021. Fluxys' methane emissions from transport and stockage decreased by 27% in 2020 compared to 2017 (103 kilotons CO2 equivalent in 2020 vs 142 kilotons CO2 equivalent in 2017) and by 11,6% in 2021 compared to 2020 (91 kilotons CO2 equivalent in 2021).

4.3. FUTURE EUROPEAN LEGISLATION

175. In order to achieve the EU target of reducing greenhouse gas emissions by 55% by 2030, compared to 2019, methane emissions from the energy sector should decrease by around 58% by 2030 at the EU level compared to 2020. According to data from the EU greenhouse gas inventory, more than half of all direct energy sector methane emissions is due to unintentional release of emissions into the atmosphere. In the case of oil and gas sectors, that represents the largest share of methane emissions.

176. As part of the gas decarbonisation package released on 15 December 2021, the European Commission adopted an EU legislative proposal for reducing methane emissions in the energy sector.[37]

177. The following paragraphs present the measures as proposed by the European Commission in its legislative proposal, which is still subject to amendments by the European Parliament and the Council. One can expect that the final text, as a result of the interinstitutional negotiations, will contain significant changes compared to the initial proposal by the European Commission.

4.3.1. Sectors covered

178. The EC's proposal covers direct methane emissions from the oil, fossil gas and coal sectors and from biomethane, once it is injected in the gas network.

179. More specifically, it should apply to the reduction of methane emissions in:

- oil and fossil gas upstream exploration and production, fossil gas gathering and processing, including inactive oil and fossil gas wells;
- gas transmission, distribution, underground storage and liquid fossil gas (LNG) terminals operating with fossil and/or renewable (bio-or synthetic) methane;
- operating underground and surface coalmines, closed and abandoned underground coal mines.

[37] European Commission, Proposal for a Regulation of the European Parliament and of the Council on methane emissions reduction in the energy sector and amending Regulation (EU) 2019/942 ; https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2021%3A805%3AFIN&qid=1639665806476

4.3.2. Concrete measures

180. The proposed Regulation lays down rules for accurate measurement, reporting and verification of methane emissions in the oil, gas and coal sectors, as well as for immediate reduction of those emissions through mandatory leak detection and report and a ban on venting and flaring.

181. As far as the oil and gas sectors are concerned, operators would need to develop a leak detection and repair programme and frequently survey their equipment in order to detect leaks and to repair them immediately.

182. The proposed regulation also provides for a ban on venting[38] and routine flaring[39]. It allows venting only in exceptional or unavoidable circumstances for reasons of safety and flaring only if re-injection, utilisation on-site or transport of the methane to a market are not technically feasible. Additionally, it requires flaring to occur under conditions of complete combustion.

183. Finally, operators would also need to notify the competent authorities of venting and flaring events under certain circumstances.

[38] Venting consists of the release of uncombusted methane into the atmosphere either intentionally from processes or activities or devices designed to do it, or unintentionally in the case of a malfunction.

[39] Flaring is the controlled combustion of methane for the purpose of disposal in a device designed for said combustion. When carried out during the normal production of oil or fossil gas and as a result of insufficient facilities or amenable geology to re-inject methane, utilise it on-site, or dispatch it to a market, it is considered routine flaring.

5. CONCLUSION

In this study, the Commission for Electricity and Gas Regulation described the characteristics of the European Union’s Emissions Trading Scheme and analysed its impact on the European and Belgian electricity markets.

The study started with an introduction to the EU ETS, presenting its origins, legal basis and a description of the theoretical functioning of the system. In the second chapter, empirical observations based on available data are presented. The third chapter describes how the functioning of this mechanism impacts the electricity markets and the fourth chapter provided some additional information on methane emissions.

For the Commission for Electricity and Gas Regulation

Andreas TIREZ Director	Laurent JACQUET Director	Koen LOCQUET Acting President of the Board of Directors

LIST OF FIGURES AND TABLES

LIST OF ABBREVIATIONS

AMLD	*Anti-Money Laundering Directive*
AVR	Accreditation and Verification Regulation
AWAC	Agence wallonne de l’Air et du Climat
CBAM	Carbon Border Adjustment Mechanism
CCP	Central Counterparty
CEDD	Conseil économique pour le développement durable
CSMAD	*Criminal Sanctions for Market Abuse Directive*
EC	European Commission
EEX	European Energy Exchange
EFTA	European Free Trade Association
ESMA	European Securities and Markets Authority
EU ETS	European Union’s Emissions Trading Scheme
EUA	European Union Allowance
EUAA	European Union Aviation Allowance
FPS	Federal Public Service
FSMA	Financial Services and Markets Authorit
GHG	Greenhouse gasses
LCOE	Levelized Cost Of Electricity
LULUCF	Land Use, Land Use Change and Forestry
MAR	*Market Abuse Regulation*
MiFID	Markets in Financial Instruments Directive
MRR	Monitoring and Reporting Regulation
MSR	Market Stability Reserve.
NAP	National Allocation Plan
NEMO	Nominated Electricity Market Operator
OTC	Over-the-counter
PFC	Perfluorinated compound
tCO_2eq	Tonnes of CO_2 equivalent
TNAC	Total Number of Allowances in Circulation
UNFCCC	United Nations’ Framework Convention on Climate Change
VAT	Value-added tax
VEKA	Vlaams Energie- en Klimaatagentschap
IEA	International Energy Agency