EEA Technical report | No 14/2015

Trends and projections in the EU ETS in 2015

ISSN 1725-2237

European Environment Agency

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Cover design: EEA
Cover photo: © Alexander Khodarev/http://freeimages.com
Layout: EEA/Rosendahls

Luxembourg: Publications Office of the European Union, 2015

ISBN 978-92-9213-695-6
ISSN 1725-2237
doi:10.2800/472636

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Acknowledgements

This report was prepared by Johanna Cludius, Verena Graichen, Sabine Gores, Sean Healy and Carina Zell, all from the Oeko-Institut, Germany. The Oeko-Institut is a partner of the European Topic Centre on Air Pollution and Climate Change Mitigation (ETC/ACM), a consortium of European institutes under contract to the European Environment Agency.

The EEA project manager was François Dejean.

The EEA would like to thank the national focal points and experts of the EEA member countries for their cooperation during the preparation of this report. The EEA also acknowledges the comments received on the draft report from the EEA member countries and the European Commission. These comments were included in the report as far as was practically feasible.

Executive summary

The European Union (EU) Emission Trading System (ETS) covers about 45% of the EU's total greenhouse gas (GHG) emissions. GHG emissions from the installations included in the ETS decreased by 24% between 2005 and 2014. The emission level reached in 2014 was the lowest since 2005, when the system was launched. It was also lower than the 21% reduction target for the year 2020.

Between 2013 and 2014, emissions of stationary installations decreased by 5%. This latest decrease resulted mainly from a reduction in emissions from power plants, driven by decreasing use of fossil fuels and a mild winter. At the same time, emissions from industrial activities such as iron, steel and coke production, as well as from cement, clinker and lime production, increased compared to 2013 levels. Emissions from aviation have also been covered by the EU ETS since 2012. These emissions increased by 3% between 2013 and 2014.

In 2014, ETS emissions exceeded the quantity of ETS emission credits (allowances) which had been auctioned or freely allocated to operators. It was the first time since 2008 that the demand for EU emission allowances was greater than the existing supply. This was a direct consequence of the decision to postpone the auctioning of 400 million EU emission allowances (EUAs) for the year 2014 ('backloading'). Taking into account the additional supply of allowances resulting from the use of international emission credits generated under the Kyoto Protocol, overall supply and demand of allowances were balanced in 2014. The overall surplus of allowances (accumulated over recent years) therefore remained at a level of about 2.1 billion EUAs.

According to the projections Member States submitted in 2015 under the EU reporting regulation, with the existing measures in place, emissions from stationary installations under the EU ETS will decrease by 8% between 2015 and 2020, and by 5% between 2020 and 2030 (compared to 2015 levels). In line with this projection, it is anticipated that in 2020 ETS emissions will stand at least 26% below their 2005 levels, and in 2030 at least 31% below 2005 levels. Most of the projected reductions by 2020 and 2030 are expected to occur in the sector of energy industries, while emissions from other activities are to remain relatively stable during this period.

The European legislators recently approved the use of a market stability reserve (MSR) from 2019 onwards. The supply of allowances in circulation will be regulated by transferring surplus allowances into and out of the MSR, based upon a set of predefined rules. By adjusting the supply of allowances to be auctioned, the MSR is expected to reduce the surplus of allowances available for trading, in order to support carbon prices. Based on national projections of ETS emissions reported by Member States, the surplus of allowances is expected to start declining in 2015. Taking into account the proposed change in the linear reduction factor of the ETS cap after 2020 (in order to achieve a 43% reduction of emissions by 2030 compared to 2005), the surplus could be completely absorbed by the MSR by 2030.

About this report

This 2015 report of the European Environment Agency (EEA) provides an analysis of past, present and future emissions trends under the EU ETS, based on the latest data and information available from the European Commission (i.e. May 2015 data on verified emissions and compliance in 2014 by operators under the EU ETS) and Member States (projections of ETS emissions until 2030, reported under the EU Monitoring Mechanism Regulation). The report also analyses the balance between supply and demand of allowances in the market. The report's annexes provide extensive material describing the functioning, scope and cap of the EU ETS, as well as a specific analysis of emissions of non-CO_2 gases covered by the EU ETS.

This report complements the annual EEA *Trends and Projections in Europe* report, where it was included until 2014 as a chapter on the EU ETS. In 2015, this chapter has become a separate publication of its own. This report also complements EEA Technical report 3/2015, *Application of the EU Emissions Trading Directive.*

1 Trends: 2013 to 2014

Key messages

The EU ETS covers approximately 45% of the EU's total GHG emissions. In 2014, emissions covered under the EU ETS amounted to 1 868 Mt CO_2-eq., with stationary installations representing the largest share (97%, 1 813 Mt CO_2-eq.) and the remainder being attributed to aviation activities (3%, 55 Mt CO_2-eq.).

ETS emissions from stationary installations declined by 5% in 2014, compared to 2013. This decline was caused mostly by the reduced combustion of fossil fuels, where power plants play a predominant role. It was driven by a relatively mild winter in 2013 and 2014, leading to a weak demand for heating, combined with an increased use of renewables (despite very low prices observed for carbon-intensive fuels such as lignite and hard coal).

By contrast, aviation emissions from flights in and between ETS-participating countries increased by 3% in 2014, compared to 2013. As the coverage of aviation emissions has changed between 2012 and 2013 and may change again after 2016, it is not possible to assess longer trends for this sector.

In 2014, the 'backloading' (i.e. postponement) of the auctioning of 400 million allowances resulted in verified emissions being higher than the quantity of emission allowances available through free allocation and auctioning, for the first time since 2008. Taking into account two additional factors impacting the supply and demand of allowances (a higher use of international credits in 2014 compared to 2013 and the net demand for EUAs stemming from the aviation sector), demand and supply for EUAs were balanced in 2014.

1.1 Stationary installations

1.1.1 Emission trends

Power plants and other industrial installations covered by the EU ETS jointly emitted 1 813 Mt CO_2-eq. in 2014. Emissions from stationary installations declined by 5% compared to 2013 levels, a drop equivalent to an emission reduction of 95 Mt CO_2-eq. ([1]).

Sectoral trends

The main source of emissions in the EU ETS is the combustion of fuel, occurring mainly in power and heat plants ([2]). Combustion installations emitted 1 218 Mt CO_2-eq. in 2014, which corresponds to a 67% share of the total verified emissions from stationary installations (Figure 1.1). Of the other industrial activities, cement and lime account for 152 Mt CO_2-eq. or an 8% share of the total verified emissions covered under the ETS. Refineries as well as iron and steel activities each generate 7% of the total stationary emissions.

In 2014, verified emissions from combustion activities declined by 7%, compared to 2013 levels (Figure 1.2). This may be explained by the relatively mild winter in 2013 and 2014, which resulted in a low demand for heating. This effect, combined with the impact of increased use of renewables, offset the very low prices for the emission-intense fuels lignite and hard coal.

By contrast, verified emissions from other industrial activities remained overall stable, although trends differed considerably, depending on the activity concerned:

- Cement and lime activities were responsible for the largest increase (+ 4%) among the various industrial activities covered by the ETS. Emissions from these

([1]) Any comparison between 2013 and 2014 emission trends may be affected by closures or new entrants, or both.
([2]) Furthermore, the sector includes industrial installations carrying out activities not specifically stated in the annex of the EU ETS directive (e.g. sugar plants or breweries).

activities were particularly low in 2013; the current increase may reflect economic growth in many of the countries participating in the ETS (and therefore higher demand for construction), combined with a lack of low-cost abatement options in this sector.

- The relative stabilisation of verified emissions from both the production of iron, steel, coke and metal ore (+ 1%) and other metals activities (+ 1%) may also reflect the economic upturn following the recession, and the increased demand for products from construction sectors.

- The 5% reduction in verified emissions from pulp and paper activities may be due to a reduction in production levels ([3]). This trend could be driven by increased competition at international level and/or changes in consumer behaviour, as electronic media are partly replacing printed publications. Improvements in the specific emissions associated with the production of pulp and paper products (e.g. increased use of biomass) may also have contributed to the annual decline in its verified emissions.

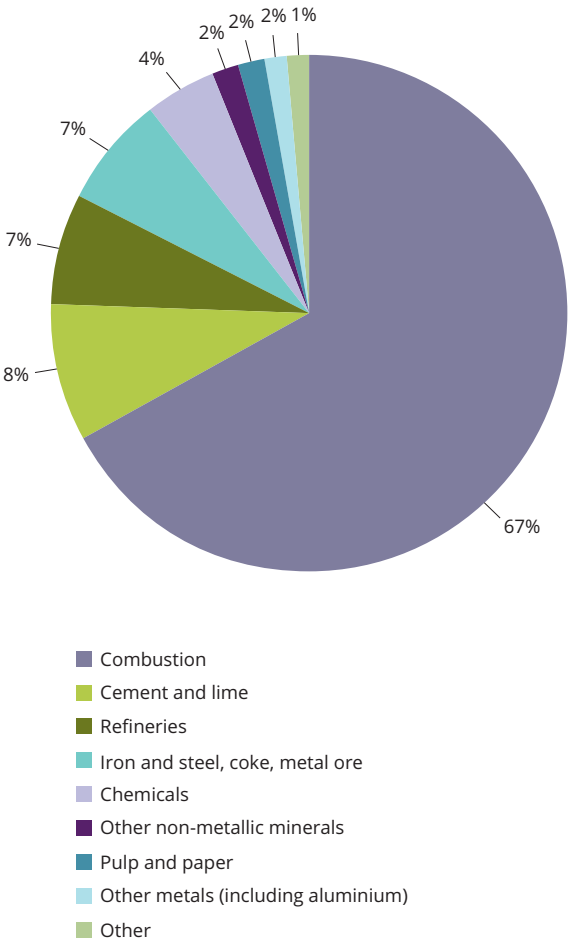
- Emissions from chemical activities decreased by 2% between 2013 and 2014. This resulted partly from investments made in abatement measures — particularly for nitrous oxide (N_2O) catalysts (see Section 2.1 for further information).

National trends

At country level, Germany was the largest emitting country in the EU ETS in 2014, being responsible for 461 Mt CO_2-eq., which corresponds to a 25% share of the total verified emissions covered under the EU ETS (Figure 1.3). The second and third largest emissions were generated respectively by the United Kingdom (198 Mt CO_2-eq.) and Poland (197 Mt CO_2-eq.): each country accounts for 11% of total ETS emissions. The 18 countries with the lowest emission levels covered by the EU ETS together account for an 18% share of the total verified emissions in 2014.

The changes in ETS emissions between 2013 and 2014 vary considerably by country (Figure 1.4). Most ETS countries experienced a decline in emissions between 2013 and 2014, with particularly large reductions observed in Slovenia (− 17%) and Denmark (− 15%). In both countries, combustion emissions declined steeply, while emissions from industrial activities increased. In Denmark, emissions from combustion returned to 2012 levels. In Slovenia, emissions from combustion have kept decreasing since 2007. ETS emissions increased in eight countries. This may reflect stronger annual economic growth; gross domestic product (GDP) and ETS emissions followed similar increasing trends in Bulgaria and Spain.

Figure 1.1 Share of ETS emissions, by main activity, 2014

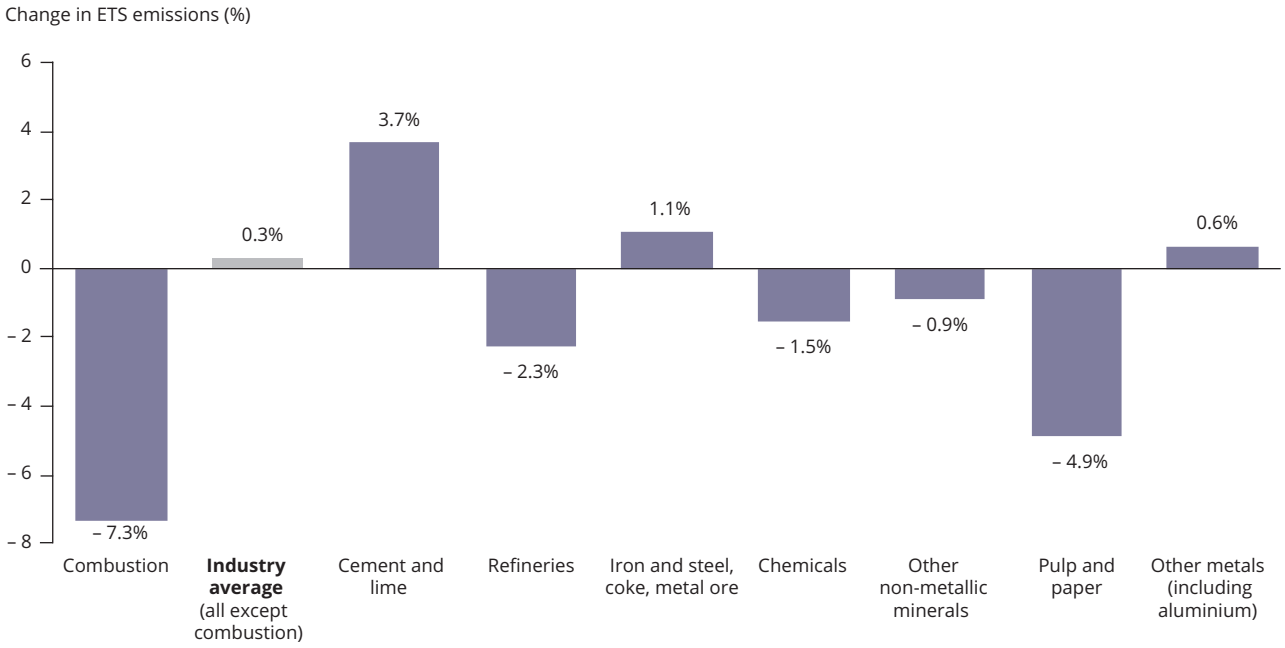


Note: See Section A1.2 in Annex 1 for further information on how ETS activities were grouped into 'main activities'.

Source: EEA/EU ETS Data viewer, 2015 (see http://www.eea.europa.eu/data-and-maps/data/data-viewers/emissions-trading-viewer).

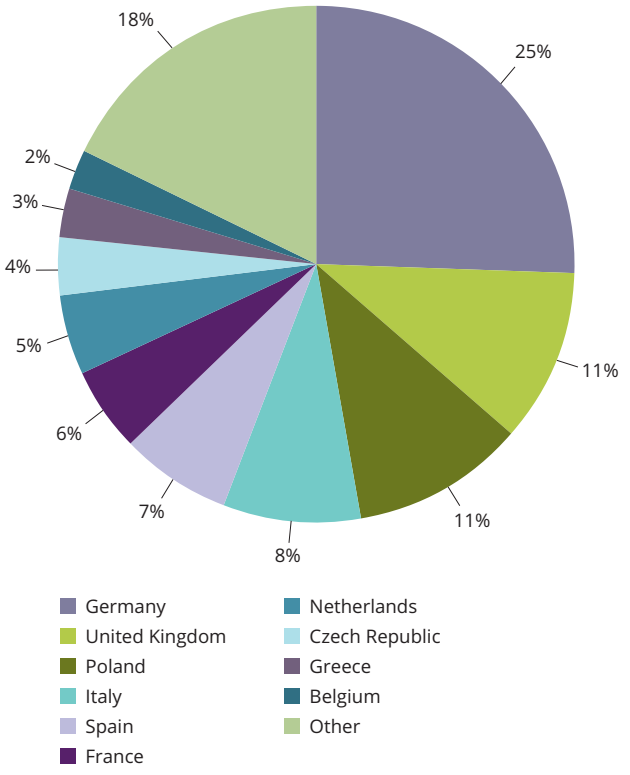
([3]) According to the Confederation of European Paper Industries (CEPI) (2015), paper and paperboard production fell by around 0.2% in 2014, whilst the production of pulp declined by 4.3% compared to 2013 levels.

Figure 1.2 Relative change in ETS emissions, by main activity, 2013–2014



Source: EEA/EU ETS Data viewer, 2015.

Figure 1.3 Share of ETS emissions, by country, 2014



Source: EEA/EU ETS Data viewer, 2015.

1.1.2 Supply and demand of allowances

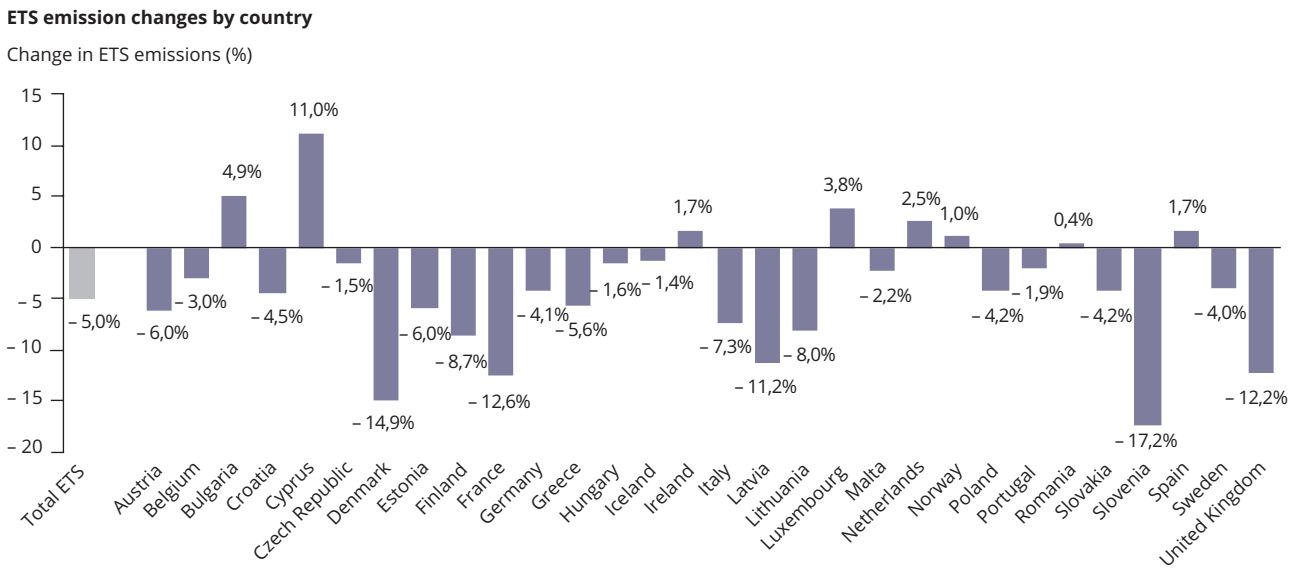
In 2014, the demand for allowances surpassed the supply by a narrow margin (Figure 1.5). The total supply of allowances comprises free allocation, auctioned allowances, and exchange of certified emission reductions (CERs) and emission reduction units (ERUs). The demand is made up of 1 813 million allowances from stationary installations (verified emissions) and a net demand of 17 million allowances from aviation (see Section 2.2).

Verified emissions from stationary installations surpassed the number of EUAs available through free allocation and auctioning by 216 million. But the increased exchange of international emission credits (compared to 2013) at 256 million CER/ERUs and the net demand of allowances from the aviation sector at 17 million EUAs nearly balanced out demand and supply.

As a consequence, the cumulated surplus of allowances in the EU ETS remained stable in 2014, despite the withdrawal of 400 million allowances from the market under the 'backloading' decision (see Section A2.3 in Annex 2).

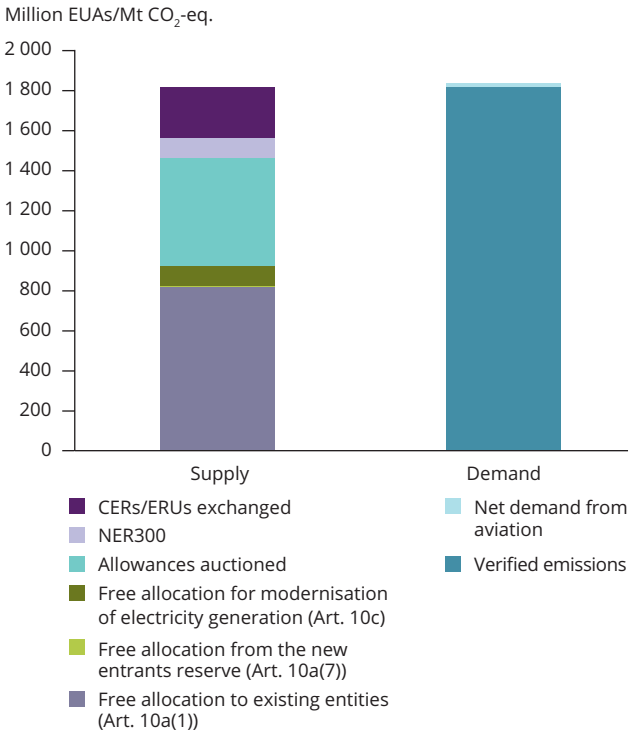
A shortage of allowances would have been observed in 2014 had no extra emission credits (CER/ERUs) been

Figure 1.4 Relative change in ETS emissions, by country, 2013–2014



Source: EEA/EU ETS Data viewer, 2015.

Figure 1.5 Supply and demand balance of EUAs, 2014



Note: CER: certified emission reduction, generated through the Clean Development Mechanism (CDM); ERU: emission reduction unit, generated through Joint Implementation (JI) projects. The number of auctioned allowances from the NER300 for 2014 is based on assumptions concerning the timing of delivery of these auctioned allowances; as stated in EIB (2014b), this differs slightly from the real timing in 2014, i.e. 89 million EUAs.

Source: EEA/EU ETS Data viewer, 2015; EC, 2015f; EC, 2014b.

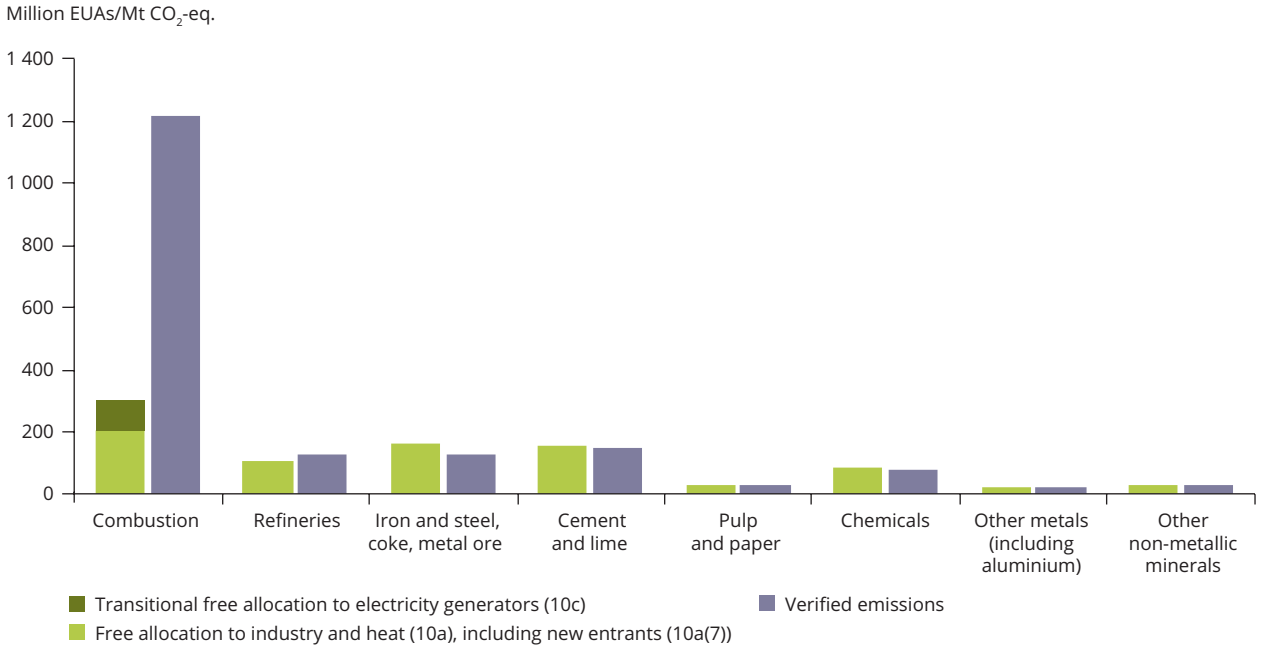
exchanged (Figure 1.5). However, the overall quantity of credits that can be used in the whole third trading period is depleting fast (see Section A2.6).

The installations covered by the ETS due to their combustion activities had to buy most of their allowances to cover their emissions (Figure 1.6). The limited number of free allowances distributed to combustion installations reflects the low risk of carbon leakage for this activity, i.e. the lack of international competition for combustion activities, in particular electricity generation. Electricity generators are only eligible for free allowances for heat production. Furthermore, electricity generators in certain countries are eligible for transitional free allowances under Article 10c of the Emissions Trading System (ETS) Directive (Directive 2009/29/EC amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community, to modernise the electricity system) (see Section A2.2 for further information).

For a number of other industrial activities, verified emissions were lower than freely allocated allowances in 2014 (Figure 1.7). This was the case for iron and steel (30% more allowances compared to verified emissions), cement and lime (6% more allowances compared to verified emissions), pulp and paper (24% more allowances compared to verified emissions) and chemicals (8% more allowances compared to verified emissions).

Most free allowances were distributed to industrial installations in 2014 by applying harmonised allocation

Figure 1.6 Supply and demand balance of EUAs compared to verified emissions, by main activity, 2014



Note: The allocation reported for the iron and steel sector covers emissions which are reported under combustion installations, if blast furnace gas is burnt in power plants. Likewise, albeit to a lesser extent, the allocation reported for the pulp and paper sector and the chemical sector covers emissions which are reported under combustion installations if paper production or chemical facilities buy heat from other installations. That is, allocation takes place to these sectors, whereas corresponding emissions are recorded for the combustion sector. Therefore, the balance of supply and demand is overestimated in those three sectors, and underestimated in the combustion sector.

Source: EEA/EU ETS Data viewer, 2015.

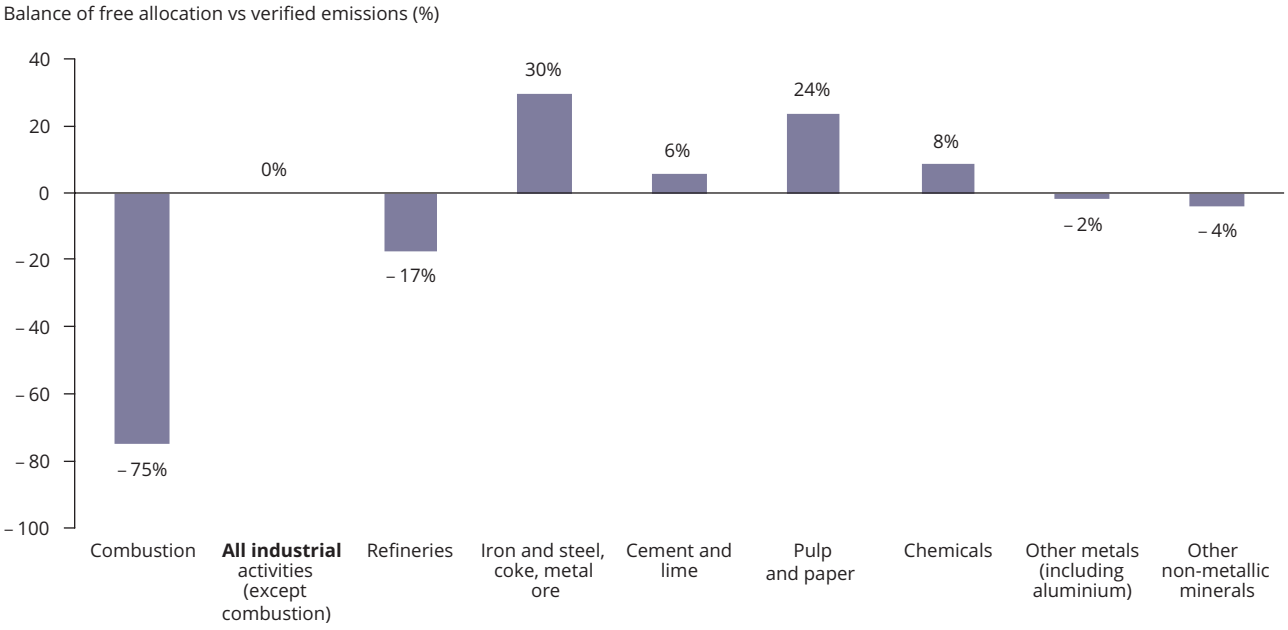
rules that were based on ETS-wide benchmarks and historical production levels as well as considerations of whether each sector is deemed at risk of carbon leakage (see Section A2.2 for further information).

The allowances which are not allocated for free are auctioned, providing ETS countries with an opportunity to receive revenues from the sale of EUAs. The total amount to be auctioned is distributed amongst ETS countries as follows: 88% of the total quantity is distributed according to historical emissions in either 2005 or in 2005 through 2007, depending on which is higher. A further 10% of the total quantity is based on income per capita in 2005, with countries whose GDP per capita is 20% higher than the EU average contributing. A final 2% of the total quantity is distributed according to reduction performance measured by 2005 historical emissions against a country's Kyoto base year (EU, 2009).

In 2012, early auctions of allowances pertaining to the third trading period took place. In 2013 and 2014, Germany generated the largest revenues, at EUR 790 million and EUR 750 million, respectively, followed by the United Kingdom (EUR 410 million and EUR 390 million, respectively) and Italy (EUR 390 million and EUR 360 million, respectively) (Figure 1.8). The level of auction revenue depends on a number of factors, including the number of allowances to be auctioned and the timing of auctions influencing the auction price. On the one hand, auction amounts in 2014 were lower for all countries than in 2013, due to backloading. On the other hand, an increase in average CO_2 prices by about EUR 1.50/EUA could be observed between the 2 years, balancing this effect to some extent. It is to be expected that the backloading measure contributed to this price increase, but the exact extent of this contribution cannot be quantified. Finally, some countries, such as Poland, deduct part of the quantity of allowances to be auctioned and allocate it for free to their electricity generators under Article 10c of the ETS Directive (see also Section A2.2). Since these amounts are not reduced by the backloading of allowances, the difference between the two years is more pronounced for these countries.

Under the Monitoring Mechanism Regulation (MMR) (Regulation (EU) No 525/2013 on a mechanism for monitoring and reporting greenhouse gas emissions and for reporting other information at national and Union level relevant to climate change and repealing Decision No 280/2004/EC), in 2014, for the first time,

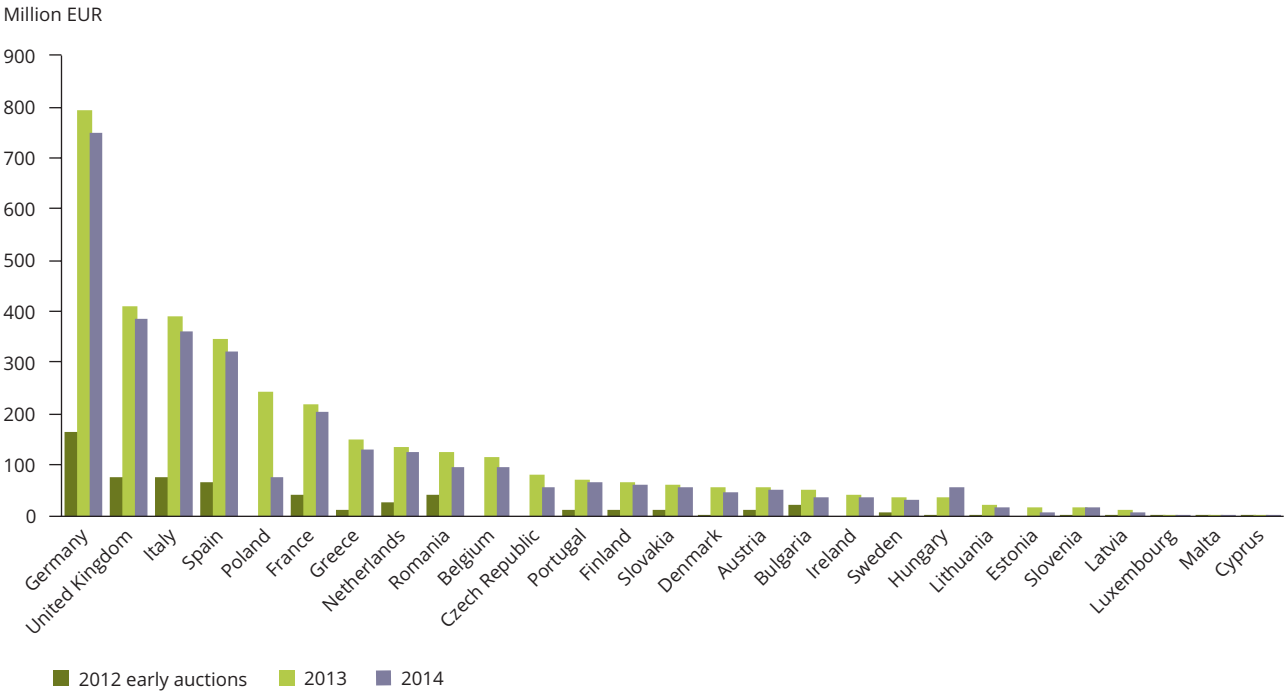
Figure 1.7 Supply and demand balance of EUAs relative to verified emissions, by main activity, 2014



Note: The allocation reported for the iron and steel sector covers emissions which are reported under combustion installations if blast furnace gas is burnt in power plants. Likewise, albeit to a lesser extent, the allocation reported for the pulp and paper sector and the chemical sector covers emissions which are reported under combustion installations if paper production or chemical facilities buy heat from other installations. That is, allocation takes place to these sectors, whereas corresponding emissions are recorded for the combustion sector. Therefore, the balance of supply and demand is overestimated in those three sectors, and underestimated in the combustion sector.

Source: EEA/EU ETS Data viewer, 2015.

Figure 1.8 Auction revenues, by Member State, 2013 and 2014



Note: Iceland, Liechtenstein and Norway had not auctioned any allowances in 2013 and 2014, as preparations with the auctioneer were still ongoing (EEX, 2014).

Source: EEX, 2015; ICE, 2015.

ETS countries reported on their use of auctioning revenues. The ETS Directive notes that at least 50% of auctioning revenues should be used for climate- and energy-related purposes. All Member States reported using at least 50%, with many Member States using higher shares for these purposes. The average across all Member States amounts to 87%. Member States report that auction revenues are used for a wide range of projects including renewable energy, energy efficiency in buildings, international climate finance and support to low income households (EC, 2014d).

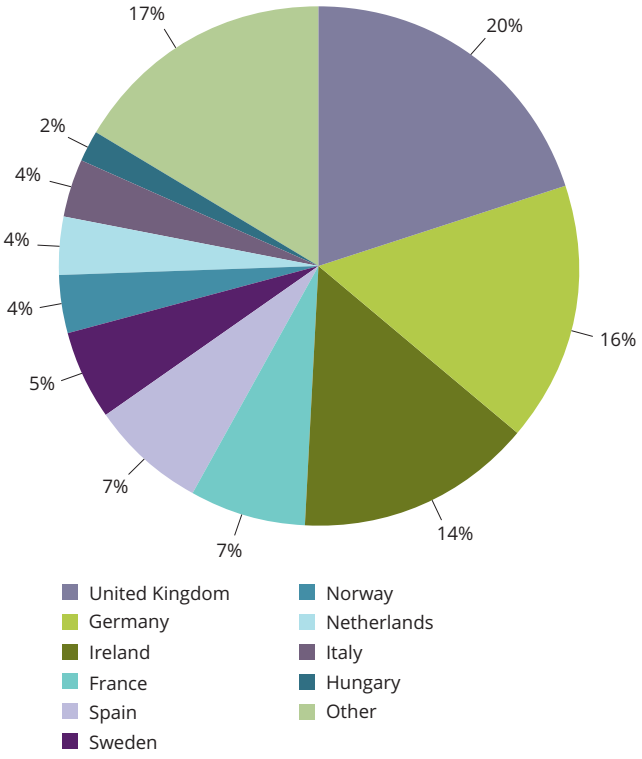
1.2 Aviation

1.2.1 Emission trends

For the period from 2013 through 2016, only flights within the European Economic Area are covered under the EU ETS. In 2014, aviation emissions amounted to 55 Mt CO_2-eq., which corresponds to 3% of total ETS emissions.

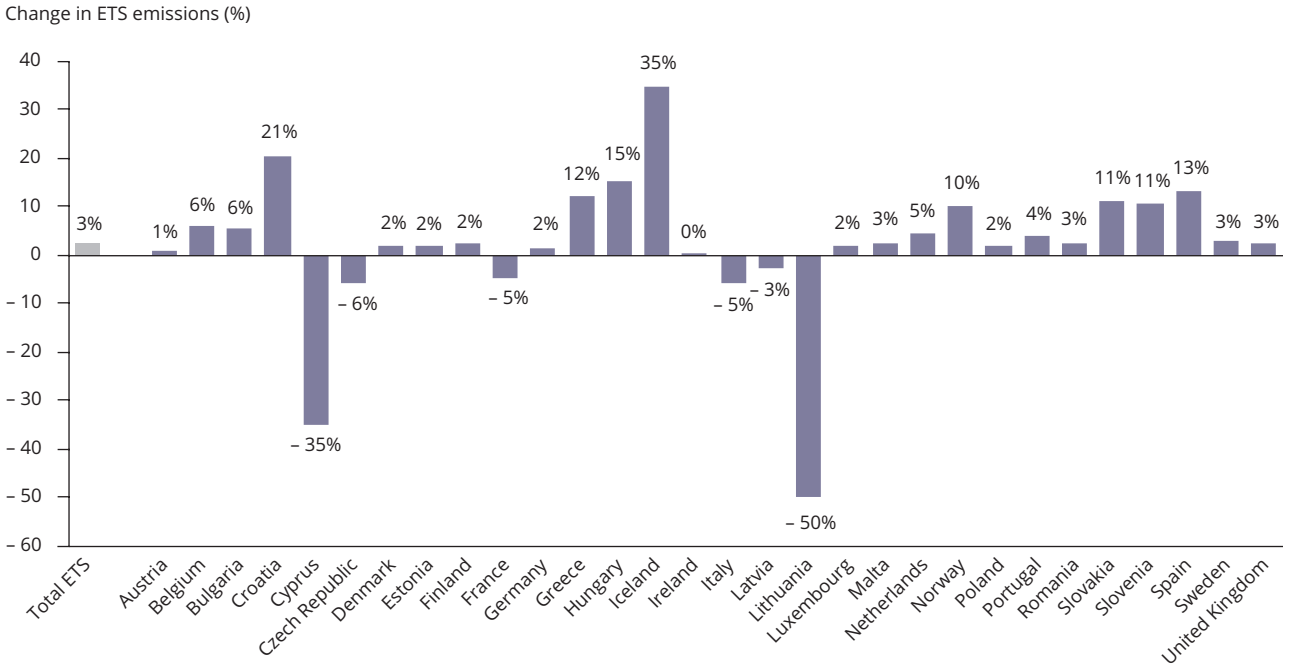
In 2014, the United Kingdom was administrating aircraft operators emitting 11 Mt CO_2-eq., which corresponds to a 20% share of the total aviation emissions covered in the ETS (Figure 1.9). Aircraft operators in Germany were responsible for 9 Mt CO_2-eq. (a 16% share of the total aviation emissions in the ETS), while Ireland

Figure 1.9 ETS emissions in aviation, by administrating country



Source: EEA/EU ETS Data viewer, 2015.

Figure 1.10 Relative change in ETS emissions in aviation, by administrating country, 2013–2014



Source: EEA/EU ETS Data viewer, 2015.

administered operators responsible for 8 Mt CO_2-eq. (14% of ETS aviation emissions).

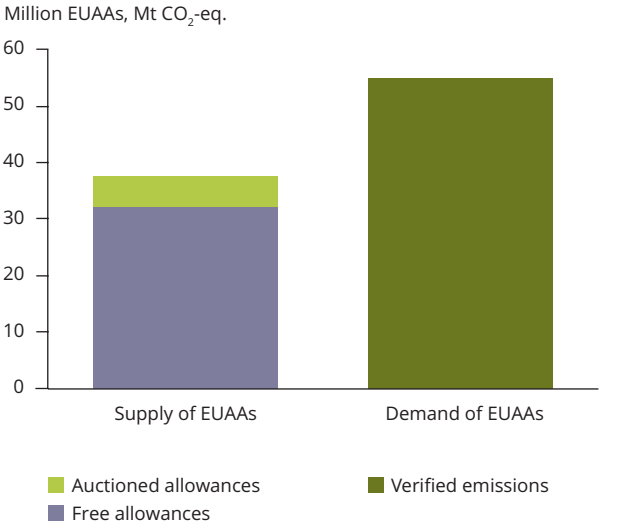
The attribution of aviation emissions to countries under the EU ETS is fundamentally different to that applied in the national GHG inventories, where emissions from each flight are attributed to the country from which the flight leaves. Under the ETS, differences in aviation emissions by country are primarily due to where the operators are administered (e.g. Ryanair is registered to Ireland), rather than the flight movements.

In 2014, total verified emissions in the aviation sector increased by 3% compared to 2013 levels; however, there is considerable variation by country (Figure 1.10). Most ETS countries experienced an increase in the aviation emissions they administer. This is fairly consistent with the expected growth of the aviation sector in the long term ([4]).

1.2.2 Supply and demand of allowances

In 2014, aviation operators were allocated 32 million EU aviation allowances (EUAAs) free of charge, and an additional 5 million EUAAs were auctioned ([5]). These allowances covered 69% of the total aviation emissions (55 Mt CO_2-eq.) (Figure 1.11). The difference in allowances (17 million EUAs), necessary for compliance, had to be purchased on the carbon market. Aviation operators can use allowances issued for the stationary sector (EUAs) to comply with their legal obligation (but conversely, stationary installations cannot use EUAAs for compliance). Aviation operators are furthermore allowed to exchange (a limited amount of) international credits into EUAs and surrender these.

Figure 1.11 Supply and demand of aviation allowances, 2014



Note: After the 'Stop the clock' decision taken in 2012, auctions of EUAAs were suspended. Germany had already conducted its EUAA auction for 2012 by that time, and as a result was the only country auctioning EUAAs in 2012 (2.5 million EUAAs). All the other countries started auctioning their 2012 EUAAs in 2014. 2013 to 2015 EUAAS are auctioned in 2015. Poland is the exception: the country auctioned all 2012 to 2015 EUAA volumes in 2015, and did not auction any EUAAs in 2014 (EC, 2015b).
The following approach was taken to distributing auctions between the years:
- divide auctioned amounts of EUAAs in 2015 by 3, and distribute equally between the years 2013 to 2015;
- divide auctioned amounts of EUAAs in 2015 for Poland by 4, and distribute equally between the years 2012 to 2015.

See EEA (2015b) for more information.

Source: EEA/EU ETS Data viewer, 2015.

([4]) The International Air Transport Association (IATA) released its first 20-year passenger growth forecast, projecting that passenger numbers are expected to reach 7.3 billion by 2034. This represents an average annual growth of 4.1% (see http://www.iata.org/pressroom/pr/pages/2014-10-16-01.aspx). In 2015, IATA predicted a slight deceleration, i.e. 4.0% annual increase (see http://airlines.iata.org/agenda/20-year-air-passenger-forecast-remains-bright).

([5]) In fact, 9.3 million EUAAs were auctioned in 2014, corresponding to allowances issued via auctioning for the year 2012, since the auctions for EUAAs started with a delay due to the stop the clock decision. The 5.4 million allowances issued via auctioning for the year 2014 were actually auctioned in 2015 (see also note to Figure 1.11).

2 Trends: 2005 to 2014

Key messages

ETS emissions decreased by 24% compared to 2005. Emissions levels observed in 2014 were the lowest since the scheme was launched in 2005. Consequently, the 2020 target level set for stationary installations (represented by the cap in 2020) was already reached in 2014.

In the first two trading periods (2005 to 2007 and 2008 to 2012), verified emissions were lower than the cap in every single year, with the exception of 2008. A similar situation was also observed in 2013, the first year of the third trading period. Taking into account the use of international credits, a surplus of more than 2 billion allowances had accumulated by the end of 2013, as a consequence of the economic recession and the use of international credits for compliance. This overall surplus remained stable in 2014, at 2.1 billion EUAs, after large increases in the previous years.

2.1 Stationary installations

2.1.1 Emission trends

Stationary ETS emissions (including scope correction ([6])) decreased from 2 375 Mt CO_2-eq. to 1 813 Mt CO_2-eq. between 2005 and 2014. This is equivalent to a 24% decrease (Figure 2.1). Since the cap for stationary installations amounts to 1 816 Mt CO_2-eq. in 2020 (see Figure A2.1 in Annex 2), this target level was already reached in 2014.

A number of factors explain changes in ETS emissions from stationary installations during the 2005 to 2014 period. The interaction between the ETS (as an economic policy instrument) and other policies makes it difficult to identify the specific role of each factor and particularly the role played by CO_2 prices on overall reductions in ETS emissions, compared with the role of other policies.

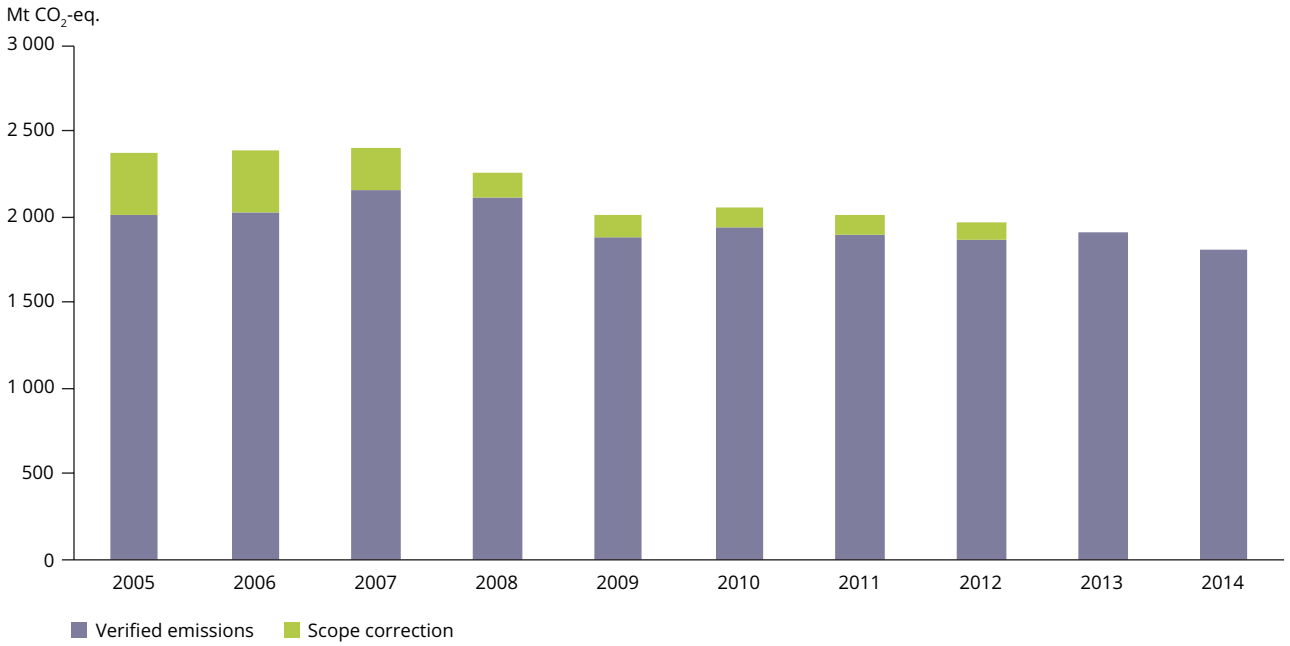
Combustion-related emissions depend directly on primary energy consumption levels and fuel mix. Primary energy consumption depends on the demand in final energy (e.g. electricity consumption by households), transformation efficiency and overall economic activity. The latter was directly affected by the degraded economic situation during the second trading period. Climatic conditions play an important role in annual variations of energy consumption — and therefore of emissions. However, the impact of this factor is less relevant over a longer period. Policies promoting energy efficiency also have a direct impact on energy consumption. The fuel mix used to transform primary energy into electricity or heat is also a determinant. It depends on energy infrastructures and is affected by relative variations in fuel prices. Energy policies also play a key role in modifying fuel mixes, for example by promoting the deployment of renewable energy sources (EEA, 2014).

For emissions from activities other than combustion, there is generally a stronger link between emissions and economic activity/production levels than for combustion-related emissions.

ETS emissions (scope corrected) increased slightly in the first trading period, between 2005 and 2007. Despite this increase, research findings estimate that GHG abatement took place and was attributable to the ETS ranges from between 2.5% and 5% in both 2005 and 2006, compared to a scenario where no ETS were in place (Ellerman and Buchner, 2008). In the second trading period, (scope-corrected) emissions in the ETS decreased from 5% below 2005 levels in 2008, to 17% below 2005 levels in 2012. The impact of the economic recession on this trend made it more difficult to evaluate the impact of the ETS on GHG abatement (Gloaguen and Alberola, 2013). Nevertheless, Egenhofer et al. (2011) estimate an emissions abatement for the

([6]) Since its launch, the EU ETS has broadened its scope, in terms of both countries and activities. To make the time series comparable, the EEA calculated a 'scope correction' to ETS verified emissions for the period from 2005 to 2012 (EEA, 2015b).

Figure 2.1 Change in ETS emissions from stationary installations, between 2005 and 2014



Note: Since its launch, the EU ETS has broadened its scope, in terms of both countries and activities. To make the time series comparable, a scope correction has been carried out in the graph.

Source: EEA/EU ETS Data viewer, 2015.

first 2 years of the second trading period of 3%, which was slightly higher than other estimates available in the literature (Cooper, 2010).

According to a review of the literature conducted by Arlinghaus (2015), numerous studies have quantified abatement that is attributable to the EU ETS. The rate of abatement in these studies varies depending on the coverage of countries and sectors within an assessment, along with the data and methodology applied.

Sectoral trends

Verified emissions from power plants within the EU-25 declined by 18% between 2005 and 2013, despite a decrease in electricity generation of only 2% during this period (Figure 2.2) ([7]). This was largely the result of changes in the mix of fuels used to produce heat and electricity: while the use of hard coal and lignite fuels in electricity generation declined between 2005 and 2013 (by 12% and 5%, respectively), the generation of electricity generation from renewables increased by 76% (Figure 2.2). The Renewable Energy Directive (Directive 2009/28/EC on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC) is likely to have encouraged such uptake in renewables. The reduction in emissions may also have benefited from improvements in transformation efficiency for electricity generation, which means that less primary energy was necessary to generate a constant quantity of electricity.

In most major industrial activities other than combustion, 2014 ETS emissions were below emission levels recorded in the first and second trading periods (Figure 2.3). Notable differences are observed in the chemicals industry and the production of metals other than iron and steel, where the scope increased considerably between the second and third trading period.

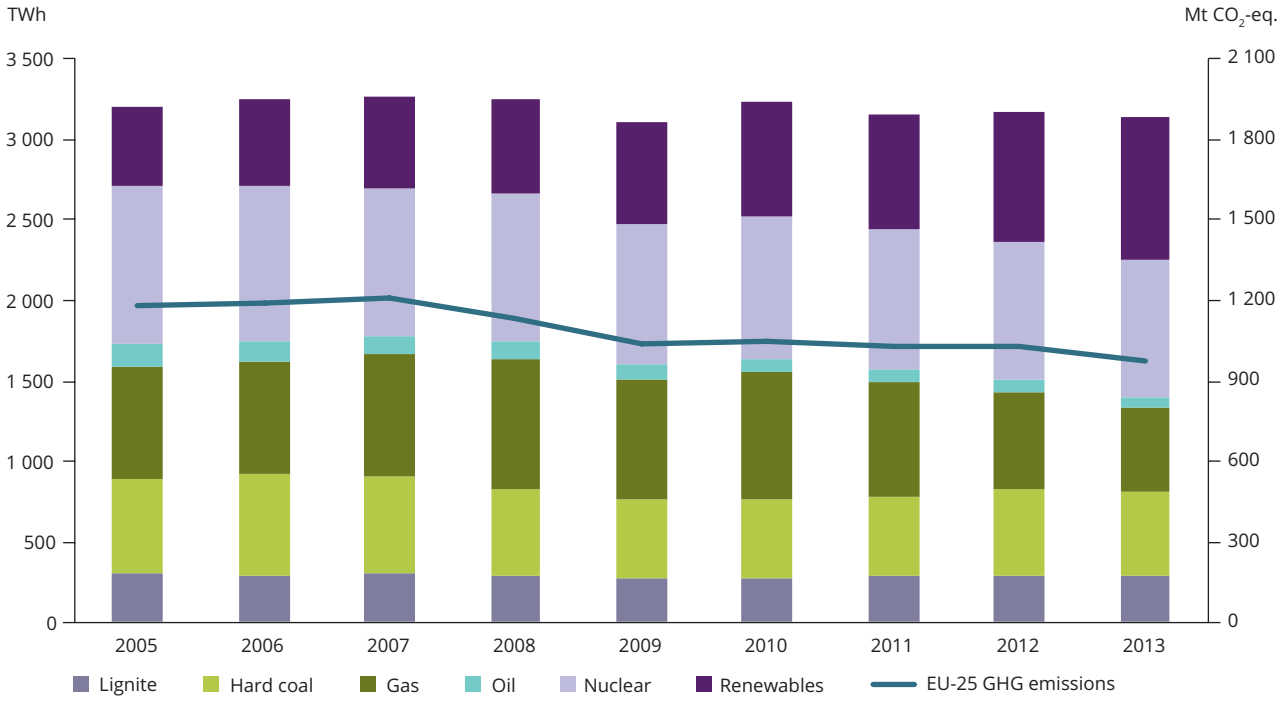
For both activities, the ETS now covers non-CO_2 gases along with CO_2 emissions:

- N_2O emissions from the production of nitric acid, and adipic and glyoxylic acid production;
- perfluorocarbon (PFC) emissions from the production of aluminium.

Further information on successive changes in the scope of the ETS is provided in Section A1.2 of Annex 1.

([7]) No scope correction has been carried out for specific sectors. Therefore, the assessment is based only on emissions from power plants of those countries participating since the system began. The identification of power plants is based on EC (2014a).

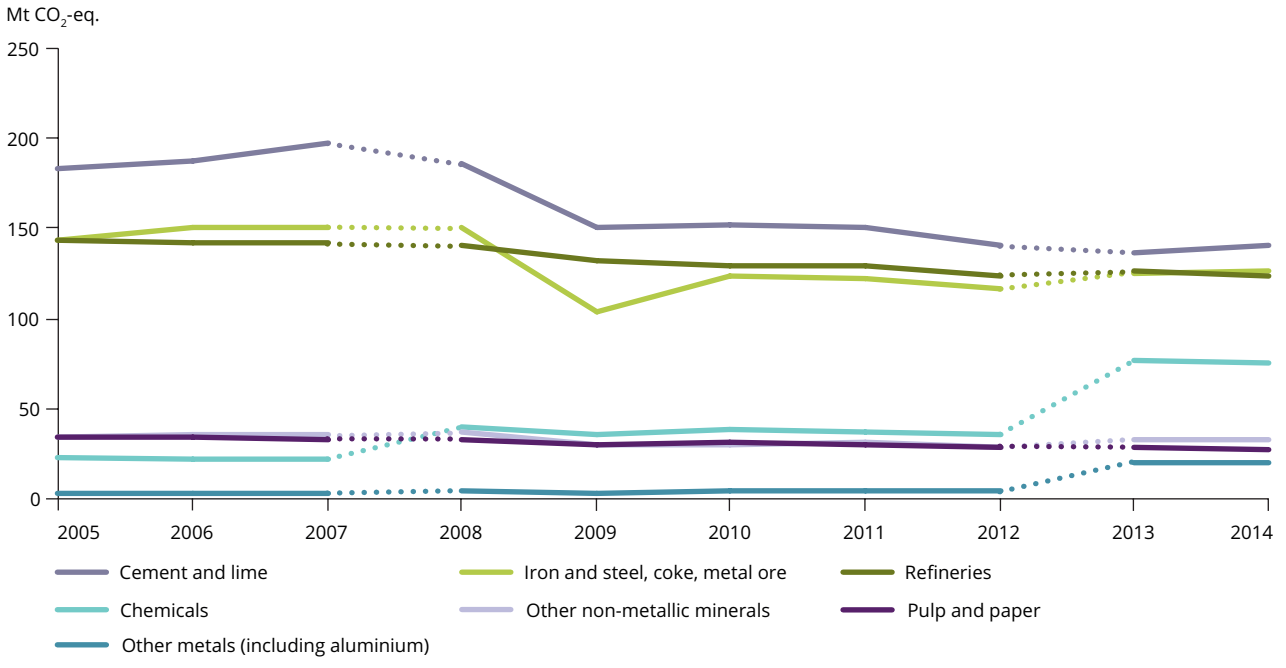
Figure 2.2 **Gross electricity consumption by fuel in the EU-25, compared to ETS emissions from electricity generation**



Note: Power plants are defined as all those installations with the Statistical classification of economic activities in the European Community (NACE) classifications 35.00 or starting with 35.1
The EU-25 consists of all the Member States prior to the accession of Bulgaria and Romania in 2007 and Croatia in 2013.
Data aggregated by fuel type are based on guidance from Eurostat.

Source: Eurostat, 2015a; EC, 2014a; EUTL, 2015 (see http://ec.europa.eu/environment/ets).

Figure 2.3 **ETS emissions by main industrial activity in the EU-25, 2005–2014**



Note: No scope correction has been carried out for specific sectors.

Source: EEA/EU ETS Data viewer, 2015.

Production activities of cement and lime, and iron and steel, show similar trends in emissions. For these industrial activities, production and emissions seem strongly correlated (Figure 2.4). Their emissions increased until 2007 (by 7% and 5%, respectively, compared to 2005 levels) along with production levels. The start of the second trading period coincided with the onset of the economic recession, which resulted in a considerable decline in emissions in those sectors. Verified emissions associated with cement and lime activities dropped by 19% between 2008 and 2009, and the impact was even greater for iron and steel activities (− 32%). A decline in production levels was likely responsible, to a large extent, for the reduction in verified emissions over the second trading period.

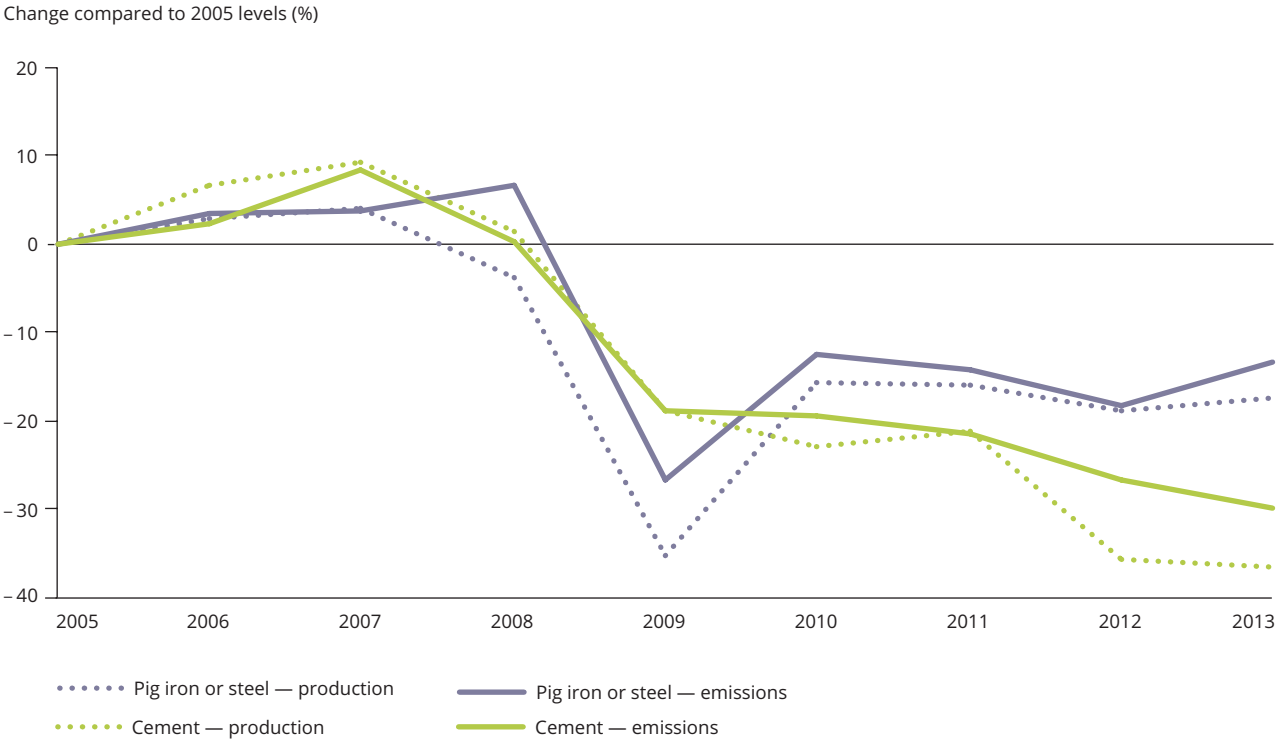
Emissions from refineries show a somewhat stable declining trend over the whole period and do not seem to have been particularly impacted by the crisis. Emissions from pulp and paper activities declined in the second trading period, compared to the first trading period. These emissions decreased even further in the third trading period. These emission reductions may reflect a decrease in production levels and/or an improvement in the specific emissions associated with production (e.g. through increased use of biomass).

Trends for N_2O and PFC emissions

Non-CO_2 gases have been included in the EU ETS since 2013. In particular, the EU ETS now covers N_2O emissions from nitric, adipic and glyoxal and glyoxylic acid production, and PFC emissions from aluminium production have been included in the EU ETS. Five countries (Austria, Italy, the Netherlands, Norway and the United Kingdom) had already decided to opt in N_2O-emitting installations during the second trading period. For PFC emissions, this opt-in was not possible.

The emissions reductions in these sectors, observed in the years just before their inclusion under the EU ETS, highlight the impact of a prospective pricing of GHG emissions on reductions (Figure 2.5). In 2005, emissions from N_2O from adipic acid and nitric acid production for the EU ETS countries without opt-ins still amounted to 36 Mt CO_2-eq. In 2012, emissions were down by 75%, to only 9 Mt CO_2-eq. Reductions in N_2O emissions have been even steeper in those countries which opted in the activities in the second

Figure 2.4 Comparison of production and emissions trends for pig iron or steel and cement, relative to 2005



Note: Cement and pig iron or steel selected on the basis of their homogeneous products and data availability.
Emissions shown for ETS activities 'Production of pig iron or steel' (24) and 'Production of cement clinker' (29).
The data on production (cement, iron and steel sectors) include Bulgaria, Romania and Croatia (data for the EU-25 are not available).

Source: EEA/EU ETS Data viewer, 2015; Cembureau, 2014 ; Worldsteel, 2014.

trading period; in 2012, they amounted to only 5% of 2005 emissions.

This steep decline was due to the availability and implementation of relatively cheap abatement options for both N_2O (catalysts) and PFC (process optimisation). The trend is mostly driven by emissions from nitric acid production. In nitric acid production, catalysts were installed at the end of 2008 or in 2009 — amongst others — through JI projects. For adipic acid production, a first decline in emissions had already begun earlier (around 1997), but emissions have since declined further (ETC/ACC, 2010).

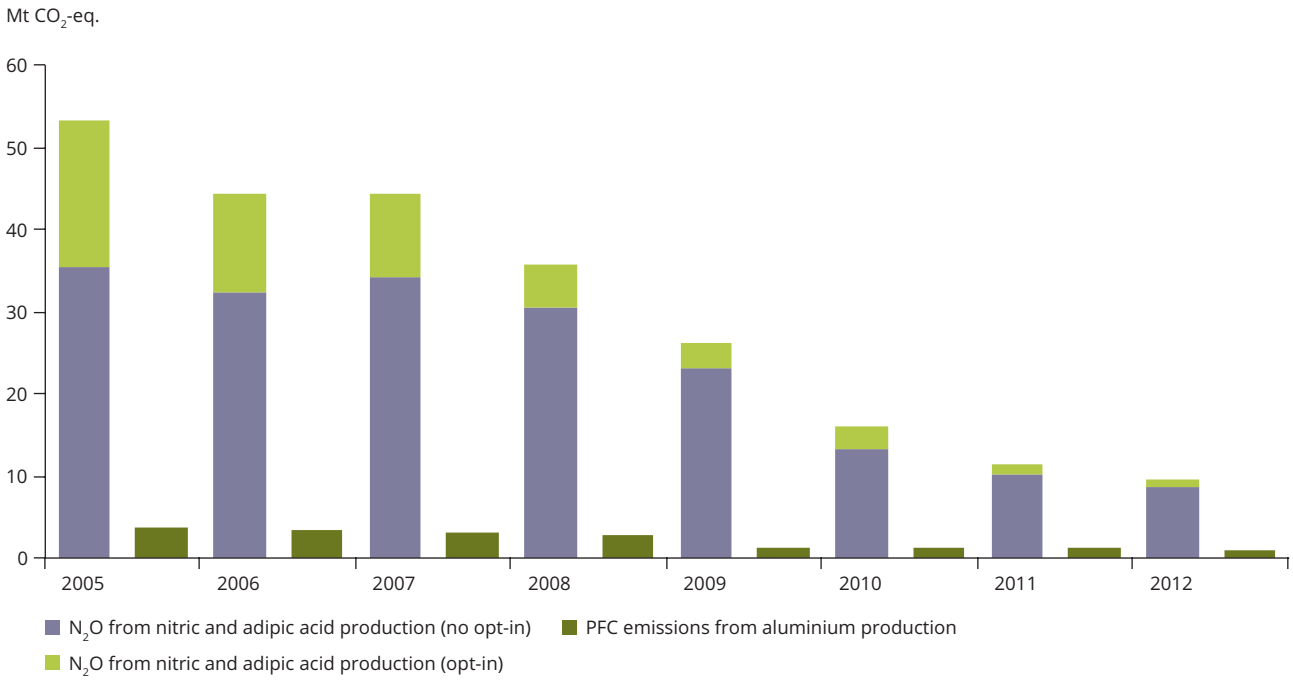
For PFC emissions from the production of aluminium, a similar trajectory can be observed. Compared to 2005, emissions dropped by 76% in 2012. This emissions decline led to a situation where the cap for these gases for the third trading period was based on an emissions baseline (2005 to 2009) that was much higher than the amount of emissions that actually entered the EU ETS in 2013, something which also has repercussions for scope correction. That is why the ETS Directive (EU, 2009) allowed competent authorities to notify of lower emissions than observed in this baseline when significant reductions were expected.

National trends

The 24% decrease in ETS emissions compared to 2005 levels (Figure 2.6) shows significant variations at country level. Emissions decreased in all but two participating countries (Estonia and Iceland ([8])). Most countries have reduced their ETS emissions over the time period. In 16 countries, reductions were larger than the average over the 2005 to 2014 period (Belgium, Croatia, Denmark, France, Greece, Hungary, Ireland, Italy, Lithuania, Luxembourg, Portugal, Romania, Slovakia, Slovenia, Spain and the United Kingdom).

The driving factors influencing the emission trends of all of these countries between 2005 and 2014 are largely dependent on the structure of each country's economy, its economic development, its geographic location (and weather conditions) and changes in the electricity generation mix. Other factors are also important: progress achieved in the deployment of renewable energy sources, and efficiency improvements in electricity and heat generation.

Figure 2.5 **2005–2012 trends in N_2O and PFC emissions, from activities covered in the EU ETS in the third trading period**



Source: Inventory emissions for 2.B.2. Nitric acid production, 2.B.3. Adipic acid production (and 2.B.5.6. Other: glyoxylic acid production in the case of France) as well as 2.C.3. Aluminium production (2014 submission, conversion to Mt CO_2 eq. based on AR4 global warming potentials).

([8]) Stationary installations from Iceland only joined the ETS in 2013. The progress shown is therefore based on scope-corrected emissions in 2005, and existing levels in 2014.

Figure 2.6 Relative change in ETS emissions, by country, 2005–2014

Source: EEA/EU ETS Data viewer, 2015.

The economic recession had different impacts across all countries and its effects were often combined with other factors, such as the impacts of policies and measures (Figure 2.7). The examples of Denmark, Estonia, Greece, Poland and Spain reflect different situations where emissions were affected in varying degrees by the economic recession and policies and measures during the second trading period.

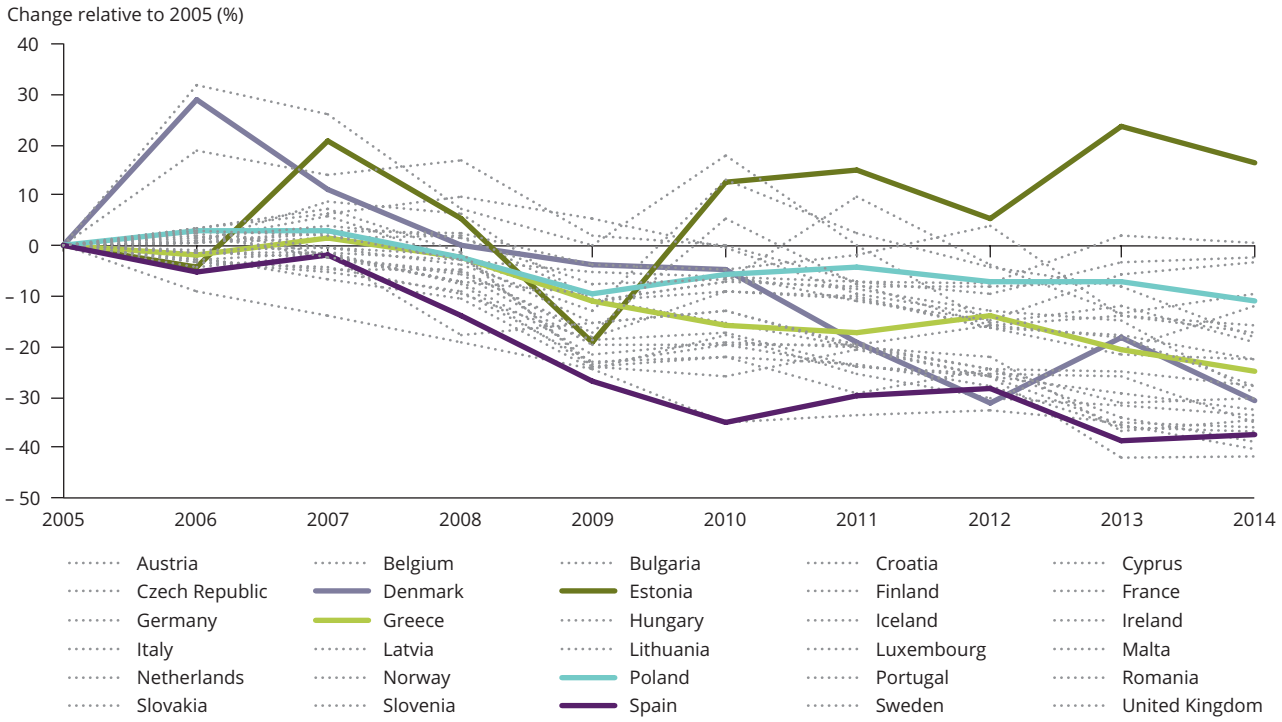
- In Denmark, the declining trend in emissions is due in part to a transformation of the country's energy mix, with the gross generation of electricity from wind increasing by 68% between 2005 and 2013. Wind energy accounted for 32% of total gross electricity production in 2013 ([9]).

- In Estonia, over 90% of the emissions from stationary installations originate from electricity and heat production ([10]). This country is often a net exporter of electricity and relies upon oil shale gas reserves. The emission profile of Estonia is therefore very volatile, fluctuating in response to the demand in electricity of neighbouring countries. Estonia experienced an abrupt reduction in emissions in 2009, with a 17% decrease in electricity production, compared to 2008. This was the consequence of lower demand from industry and more than doubled electricity imports as compared to 2008. Following the recession, electricity exports from Estonia resumed and continued to grow annually, peaking at 6 300 GWh in 2013. This coincided with the highest level in ETS emissions for this country since the introduction of the EU ETS in 2005 ([11]).

- Greece and Spain experienced a prolonged period of lower economic activity. Five years after the economic recession, both Greece and Spain have experienced a reduction in GDP of 26% and 5%, respectively, between 2008 and 2014. This is likely to have contributed to the declining emission trends in these countries ([12]). Other factors, such as the deployment of renewables within the power generation sector, also contributed to the declining emission trends in both countries over the longer time period ([13]).

([9]) Eurostat (2015a) (see http://ec.europa.eu/eurostat).
([10]) EUTL, NACE matching based on EC (2014a).
([11]) Eurostat (2015a) (see http://ec.europa.eu/eurostat).
([12]) Eurostat (2015b)(see http://ec.europa.eu/eurostat).
([13]) The share of renewables in gross final energy consumption for Greece and Spain increased by approximately 8% and 7% respectively between 2005 and 2013 Eurostat (2015c).

Figure 2.7 ETS emissions, by country, 2005–2014



Source: EEA/EU ETS Data viewer, 2015.

- In Poland, ETS emissions (scope corrected) decreased by 11% between 2005 and 2014, less than the average emission reduction for all countries. This could be because of the growth in industrial activity, along with the continuation of high levels of hard coal combustion in the country's gross electricity production ([14]). During the 2005-to-2014 period, the domestic demand for electricity increased due to a rise in population and a growing industrial base, with emissions from industrial activities other than combustion increasing by 34% ([15]).

2.1.2 Supply and demand of allowances

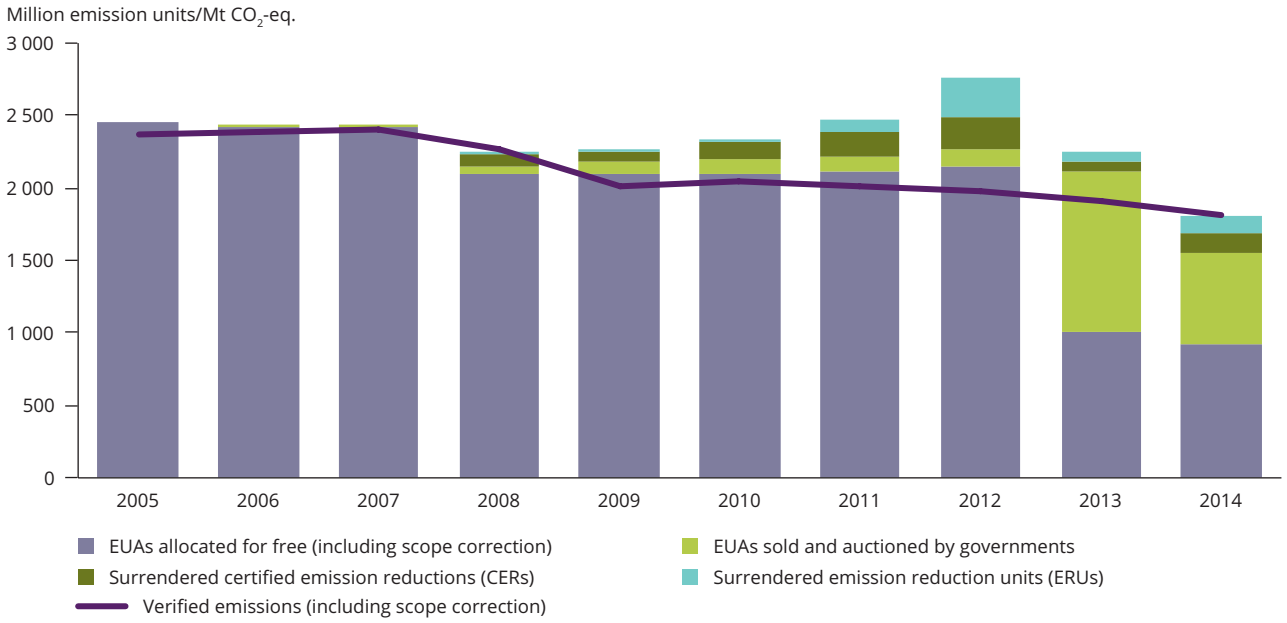
ETS emissions decreased by 24% between 2005 and 2014, taking into account a comparable ETS scope for these 2 years (i.e. after correction of 2005 emissions to account for the emissions of installations joining the ETS post 2005). In all three trading periods to date, the supply of allowances has exceeded the demand (Figure 2.8). At the start of the third trading period, the cumulated surplus of allowances in the EU ETS stood at almost 2 billion allowances.

During each year of the first trading period (2005 to 2007), verified emissions were below the total quantity of EU allowances allocated by governments, resulting in a first oversupply of allowances. Since it was not possible to 'bank' these allowances between the first and the second trading periods, they had to be cancelled, and they therefore retained no value for possible future use. When the EU ETS was introduced in 2005, the EUA price initially reached levels between EUR 25/EUA and EUR 30/EUA. After the publication of 2005 verified emissions in April 2006, it became clear that there were more allowances available to ETS operators than was necessary to cover emissions, and that this situation would remain until the end of the first trading period. Consequently, the EUA price dropped abruptly, and remained close to levels of almost zero until the end of 2007 (Figure 2.9).

Following the setting of more stringent caps for the second trading period, verified emissions exceeded the supply of allowances in 2008, the first year of the second trading period. EUA prices first reached levels of between EUR 25/EUA and EUR 30/EUA. After 2008, activities covered by the ETS were largely

([14]) Eurostat (2015a) (see http://ec.europa.eu/eurostat).
([15]) EUTL, NACE matching based on EC (2014a).

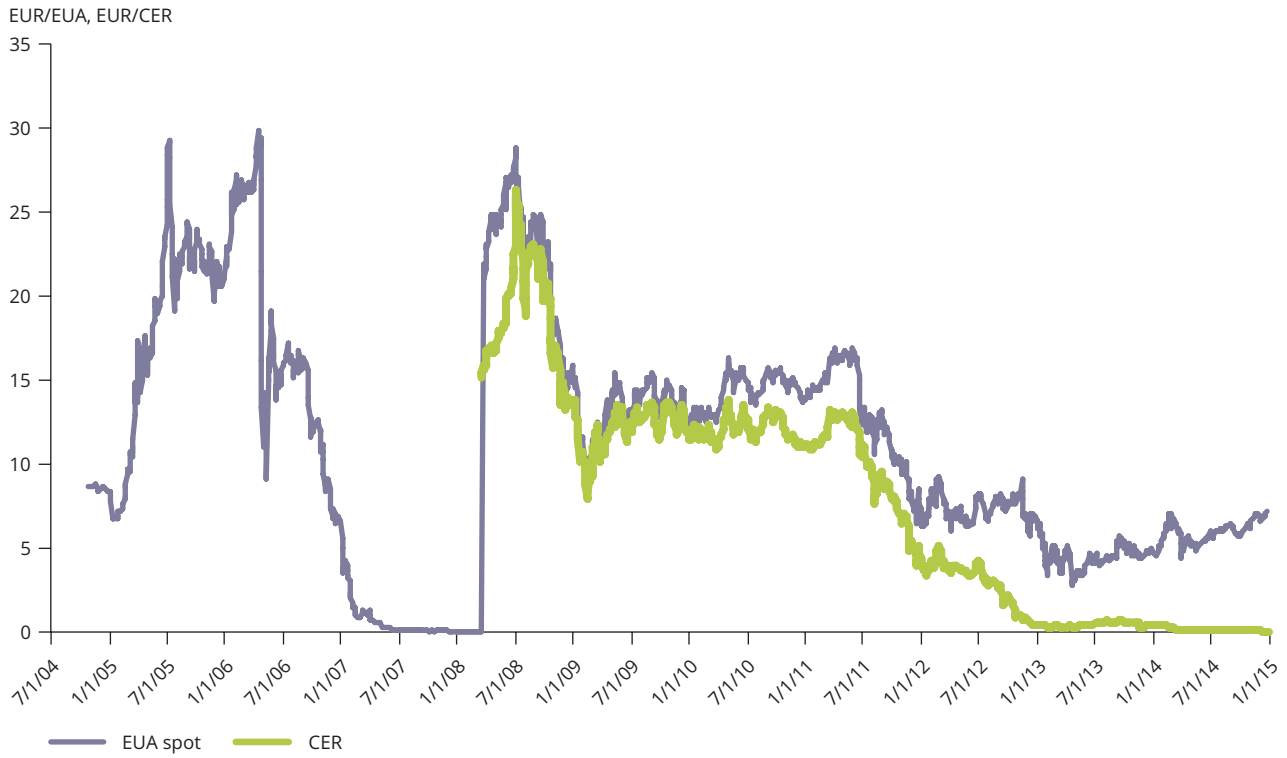
Figure 2.8 Supply and demand balance for EUAs, 2005–2014



Note: Net demand by the aviation sector amounting to 37 million EUAs between 2012 and 2014 is not shown here, due to its small impact. Iceland, Norway and Liechtenstein have not yet auctioned their assigned amounts in the years 2013 and 2014, which would lead to an increase in the supply of allowances in the same order of magnitude.

Source: EEA/EU ETS Data viewer, 2015.

Figure 2.9 Price trends for EUAs and CERs, 2005–2014



Source: EEX (EUA price), 2015; ICE ECX (CER price), 2015.

impacted by the economic recession, and verified emissions decreased abruptly in 2008 and 2009. This unanticipated decline in emissions resulted in verified emissions being markedly lower than the cap. The supply of allowances exceeded verified emissions between 2009 and 2013, leading to the accumulation of a surplus of allowances. EUA prices decreased to around EUR 7/EUA by the end of the period. According to the European Commission (EC, 2014c), the carbon price was more sensitive and responsive to demand factors (i.e. economic activity and weather conditions) due to the fixed supply of allowances (set by the ETS cap) and the elastic demand.

The problem was further exacerbated by the intensive use, towards the end of the second trading period, of international emission credits generated under the Kyoto Protocol's flexible mechanisms and allowed under the ETS. The additional use of CERs and ERUs contributed to an accumulating surplus of allowances over the years 2009 to 2012. This increased use of these emission credits can be explained by the fact that many of them would no longer be eligible under the EU ETS in the third trading period. CERs and ERUs were being traded at less than EUR 1/unit by the end of the second trading period. The imbalance between the supply and the demand of allowances peaked in 2012.

From 2013 onwards, an increasing number of allowances are being auctioned every year, which is reflected by the considerable increase in EUAs sold and auctioned in the first 2 years of the third trading period. In 2013, the price of EUAs stabilised at around EUR 5/EUA.

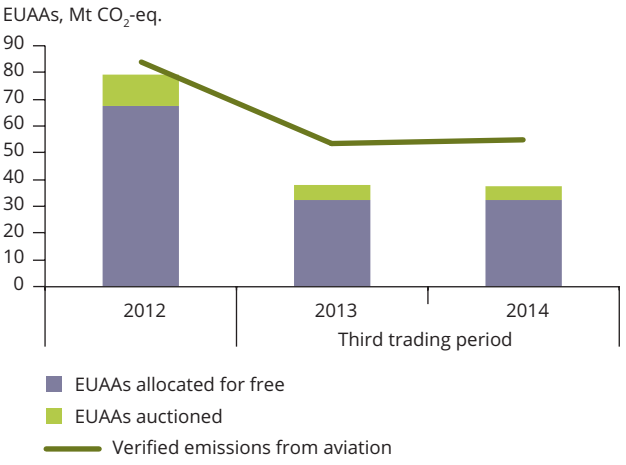
After the backloading of 400 million allowances in 2014 (i.e. a reduction in the overall quantity of allowances to be auctioned in a certain year), the supply and demand of allowances in 2014 were almost even. The cumulated surplus in the EU ETS therefore remained stable, at a level of about 2 100 million EUAs. The EUA price rose to EUR 7/EUA by the end of 2014, while CER and ERU prices remained low, at levels under EUR 1/unit.

2.2 Aviation

Since its inclusion into the EU ETS in 2012, the aviation sector has had to purchase EUAs in addition to EUAAs, in order to fully cover aviation emissions. The cap for aviation was actually established on the basis of such expectation: that the aviation sector would be a net buyer of EUAs. With the reduction of the scope of covered aircraft operators, the amounts of EUAs to be purchased have declined. Furthermore, the balance between the supply and demand of EUAAs changed considerably between 2012 and 2013/2014 (Figure 2.10). Not taking into account the possible use of international credits, the cumulated demand of the aviation sector over 2012, 2013 and 2014 amounts to 37 million EUAs.

The original auctioning calendars were based on the full scope, and therefore had to be revised to reflect the reduced scope. This led to a situation in which Germany was the only country auctioning 2012 EUAAs in 2012, while all other countries auctioned 2012 EUAAs in 2014, and EUAAs for the years 2013 through 2015 in 2015. The exception here is Poland, which decided to auction EUAAs pertaining to the years 2012 through 2015 in 2015 (EC, 2015b).

Figure 2.10 Demand and supply balance for EUAAs, 2012–2014



Note: EUAA total allocated amount in 2012 corrected to 68 Mt; see note to Figure 1.11 and EEA (2015b) for more information on how auctioned amounts in 2012, 2014 and 2015 are assigned to the years 2012 through 2015.

Source: EEA/EU ETS Data viewer, 2015; EEX, 2015; ICE, 2015.

3 Projected trends for stationary installations

Key messages

Projections reported by Member States show that most of them expect emissions from stationary ETS installations to decline further. However, the pace of reductions is expected to decelerate: emission reductions projected by Member States for the period between 2020 and 2030 are significantly smaller than between 2015 and 2020, and the pace of reductions for the period 2015 to 2030 is expected to be slower than observed in the past.

Following the agreement regarding the introduction of a MSR, a further increase in the surplus after its introduction in 2019 is expected to be avoided. In particular, the MSR will prevent a surge of additional allowances coming into the market in 2019 and 2020, due to the end of backloading and other mechanisms such as unallocated allowances from the new entrants reserve (NER), or from closures or partial cessations. Based on current emission projections by Member States, the surplus is expected to start declining from 2015 onwards, and the MSR is projected to have absorbed the surplus completely by 2030.

3.1 Projected emission trends

According to the projections reported by Member States in 2015 under EU legislation ([16]), ETS emissions are projected to further decrease with the current policies and measures in place ([17]). The projected reductions represent an 8% decrease between 2015 and 2020, and a further 5% decrease between 2020 and 2030, resulting in an overall decrease of 13% by 2030 compared to 2015 levels.

Calculating an overall reduction between 2005 and 2020 or 2030 is subject to a certain degree of uncertainty, because national projections are different in terms of methodologies used and assumptions applied. With the current data available, 2020 ETS emissions could be at least 26% below 2005 levels, and 2030 ETS emissions could be at least 31% below 2005 levels, if existing policies and measures are considered. If the additional measures planned by a number of Member States are taken into account, the total reduction of ETS emissions is expected to be 34% below 2005 levels ([18]). This remains less than the 43% reduction below 2005 levels expected from the ETS sectors to contribute to the overall 40% reduction target set for 2030. However, the dynamic effects of the MSR, as well as other new policy proposals which are currently being discussed at EU level (including a reform of the ETS, as well as measures to enhance energy efficiency), are not included in national projections.

The projected average annual decrease of ETS emissions between 2015 and 2030 is slower than the decrease of ETS emissions observed between 2005 and 2014. In fact, 12 Member States project increasing ETS emissions between 2015 and 2030. These national projections differ from the 2013 Reference scenario used by the European Commission in its proposal for a 2030 framework for climate and energy policies (EC, 2013), where ETS emissions are expected to decrease between 2015 and 2030 in all Member States except Latvia.

([16]) Article 14(1)(b) of Regulation (EU) No 525/2013 on a mechanism for monitoring and reporting greenhouse gas emissions and for reporting other information at national and Union level relevant to climate change and repealing Decision No 280/2004/EC.

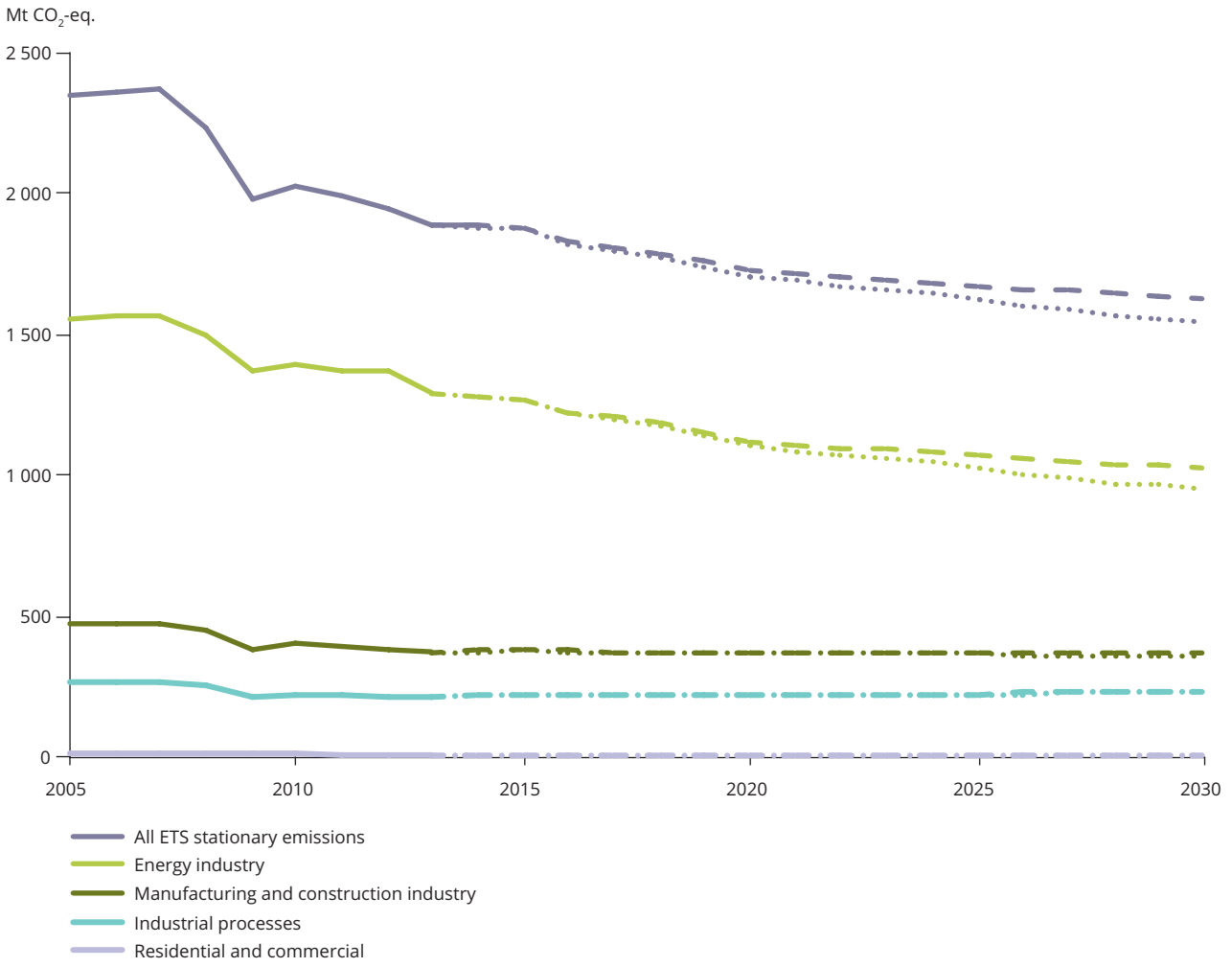
([17]) The analysis is based on projections of ETS emissions in the WEM scenario, reported by Member States under the MMR (EU, 2013a), following the structure and format provided by the Implementing Regulation (EU) No 749/2014 (EU, 2014d). The projections were compiled, assessed and quality checked by the EEA and its ETC/ACM. For Greece, gap-filling was conducted based on projections from the European Commission (2013 Reference scenario based on the PRIMES/GAINS models). Gap-filled emissions represent about 3% (2015) to 1% (2030) of total projected ETS emissions. National GHG projections may be prepared using different methodologies and underlying assumptions.

([18]) WAM scenarios have been reported by 19 Member States (Austria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Hungary, Ireland, Italy, Latvia, Lithuania, Malta, the Netherlands, Portugal, Romania, Slovakia, Spain and the United Kingdom). For an aggregated EU WAM scenario, Member States not reporting a WAM scenario have been gap-filled with the WEM scenario.

Sectoral trends

The decrease in ETS emissions is projected to take place predominantly in the energy sector ([19]), whereas ETS emissions in other sectors are projected to remain stable until 2030 (Figure 3.1). These projected trends contrast with historic trends, where decreases were observed in a number of industrial sectors, like manufacturing and construction and industrial processes (which include cement as well as iron and steel emissions). Based on projections, emissions would decrease at a slower pace between 2020 and 2030 than between 2015 and 2020.

Figure 3.1 Historic and projected EU emission trends in the ETS, by main source category



Note: Solid lines represent historic GHG emissions up to 2012. Dashed lines represent projections 'with existing measures' (WEM). Dotted lines represent projections under the 'with additional measures' (WAM) scenario.
Historic and projected emission trends are split by main Intergovernmental Panel on Climate Change (IPCC) source category ([20]). The allocation of ETS emissions to IPCC sectors presented here is based on the assumption that a constant percentage of emissions from each relevant source category is covered under the EU ETS: 91% of emissions from the IPCC sectors 1.A.1, 1.B and 1.C covering the Energy Industries; 74% of emissions from the IPCC sector 1.A.2, Manufacturing & Construction, 1% of emissions from the Residential & Commercial sector (IPCC sectors 1.A.4 & 1.A.5) and 60% of emissions from the IPCC sector 2, Industrial processes.
Projected ETS emissions reported by EU Member States amount to 1 876 Mt CO_2-eq. in 2015. This level is higher than 2014 ETS verified emissions (1 787 Mt CO_2-eq.). This apparent increase is likely to be a methodological gap due to the time delay between the elaboration of projections and the publication of ETS emissions, as well as the choice of reference years for modelling purposes, rather than the expectation that emissions will increase between 2014 and 2015.
Gap-filling took place for Greece. For Greece and partly for Poland, the separation of ETS emissions into source categories has been conducted by application of average sectoral percentages to total ETS emissions.

Source: Deliveries for projections and national programmes by EU Member States (see http://cdr.eionet.europa.eu), compiled by ETC/ACM as of 31 August 2015; EEA/EU ETS Data viewer, 2015.

([19]) Corresponding to GHG inventory source categories 1.A.1, 1.B and 1.C (IPCC nomenclature).
([20]) These categories are consistent with the IPCC nomenclature used for reporting national GHG inventories. This nomenclature is used by Member States for reporting emission projections by sector. It differs from the typology of activities reported with verified emissions under ETS activities.

National trends

At Member State level, different projected trends in emissions can be observed (Figure 3.2). Overall, projections indicate larger decreases in emissions over the 5-year period from 2015 to 2020 than over the 10-year period from 2020 to 2030. For the period from 2015 until 2020, projections show decreases in ETS emissions for 18 Member States, while between 2020 and 2030, only 13 of these Member States project further emission reductions in the ETS ([21]).

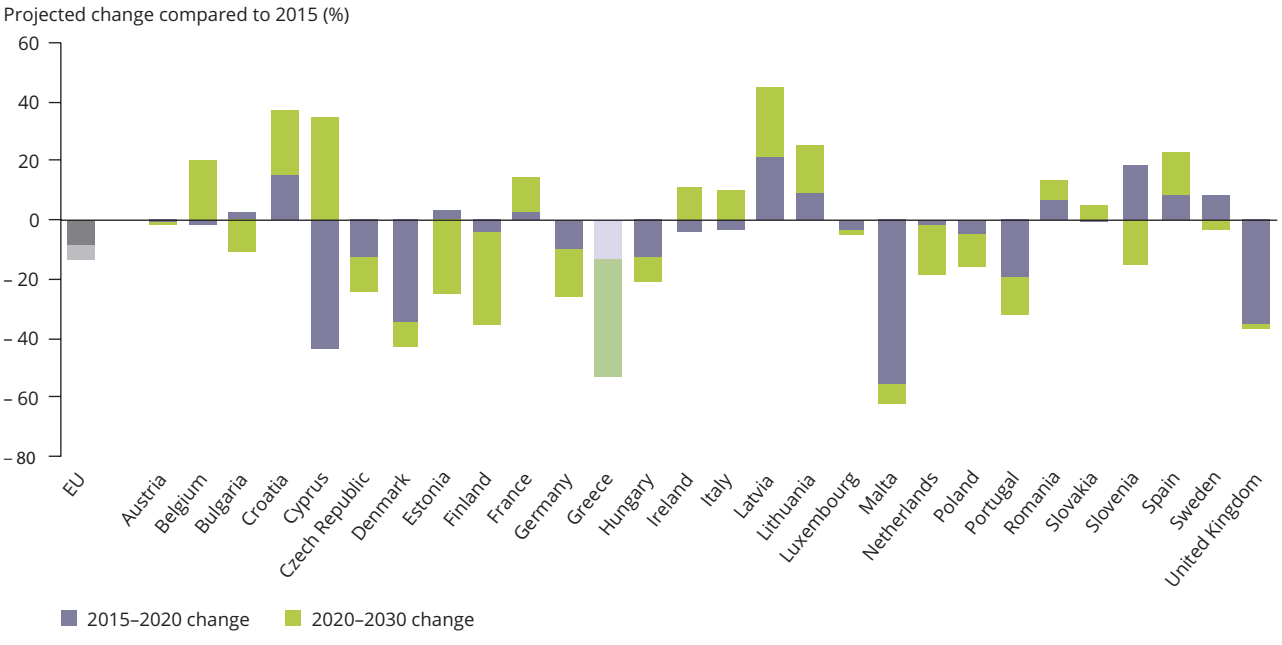
Overall, for the period from 2015 until 2030, emissions are projected to decrease in 16 Member States, with reductions ranging from − 1% (Austria) to − 62% (Malta), and to increase in 12 Member States (Belgium, Croatia, France, Ireland, Italy, Latvia, Lithuania, Romania, Slovakia, Slovenia, Spain and Sweden). For these 12 countries, except France, Slovenia and Sweden, the projected increase in ETS emissions is in line with the projected increase in total GHG emissions during this period. France and Sweden project considerable emission reductions in sectors outside the EU ETS (covered by the Effort Sharing Decision (ESD)) despite projected increases in ETS emissions. In Belgium, Italy, Slovenia and Sweden, increases in ETS emissions drive the increase of total GHG emissions, despite projected reductions in emissions under the ESD). Croatia, Lithuania and Spain project larger increases in ETS emissions than in emissions under the ESD.

Limited explanations are available concerning the projected increases:

- Croatia and Italy plan to reduce imports of electricity by increasing capacity of thermal power plants;
- Belgium and France anticipate a strong decrease in electricity generation from nuclear power plants.

When additional measures (at planning stage) are taken into consideration in projections, Croatia, Ireland, Italy, Lithuania and Slovakia project that such measures could result in emission reductions instead of increases. Spain did not account for additional measures in the ETS sector in its projections.

Figure 3.2 Changes in ETS emissions projected by Member States, 2015–2020



Note: Projections reported under the WEM scenario.
Gap-filling was applied for Greece, based on Commission projections.

Source: Deliveries for projections and national programmes by EU Member States (see http://cdr.eionet.europa.eu), compiled by ETC/ACM as of 31 August 2015.

([21]) Projections reported by 14 Member States, complemented by projections from the Commission for 6 other Member States (Cyprus, Greece, Hungary, Latvia, Luxembourg and Slovenia), for which ETS projections were not available.

3.2 Supply and demand of allowances

The surplus of allowances accumulated in the EU ETS stood at 2.1 billion allowances by the end of 2014, mainly resulting from the economic crisis and large imports of international credits (see Section 2.1.2). As this overall surplus was not expected to decline significantly by 2020, it risked undermining the proper function of the market and affecting the ability of the EU ETS to deliver on more ambitious reductions in future phases in a cost-effective manner. This is because a persistent surplus prevents the ETS from delivering a meaningful signal price to incentivise investments in GHG abatement.

To address the imbalance in the supply and demand of allowances, the European Commission firstly postponed the auctioning of 900 million allowances. This 'backloading' of auctions is currently being implemented through an amendment to the EU ETS Auctioning Regulation (EU, 2014b). For 2014, the auction volume was reduced by 400 million allowances, for 2015 by 300 million, and for 2016 by 200 million. It was originally envisaged that these backloaded EUAs would be returned to the market towards the end of the third trading period. The reintroduction of these backloaded EUAs (and also any unallocated allowances accumulated during the third trading period) would have resulted in a significant increase in the surplus at the end of the third trading period.

As backloading is only a temporary measure, the Commission proposed establishing a market stability reserve (MSR) as a structural measure to address the imbalance between supply and demand. The reserve would both address the surplus of emission allowances that has built up and improve the system's resilience to major shocks, by adjusting the supply of allowances to be auctioned. Following its recent endorsement by the European Parliament, it is now expected that the MSR will be established in 2019 (EU, 2015). Backloaded and certain unallocated allowances will be transferred to the MSR instead of returning to the market towards the end of the third and beginning of the fourth trading period. The MSR will operate entirely according to predefined rules which would leave no discretion to the European Commission or Member States in its implementation (EU, 2014a). See Section A2.4 in Annex 2 for further information on the MSR.

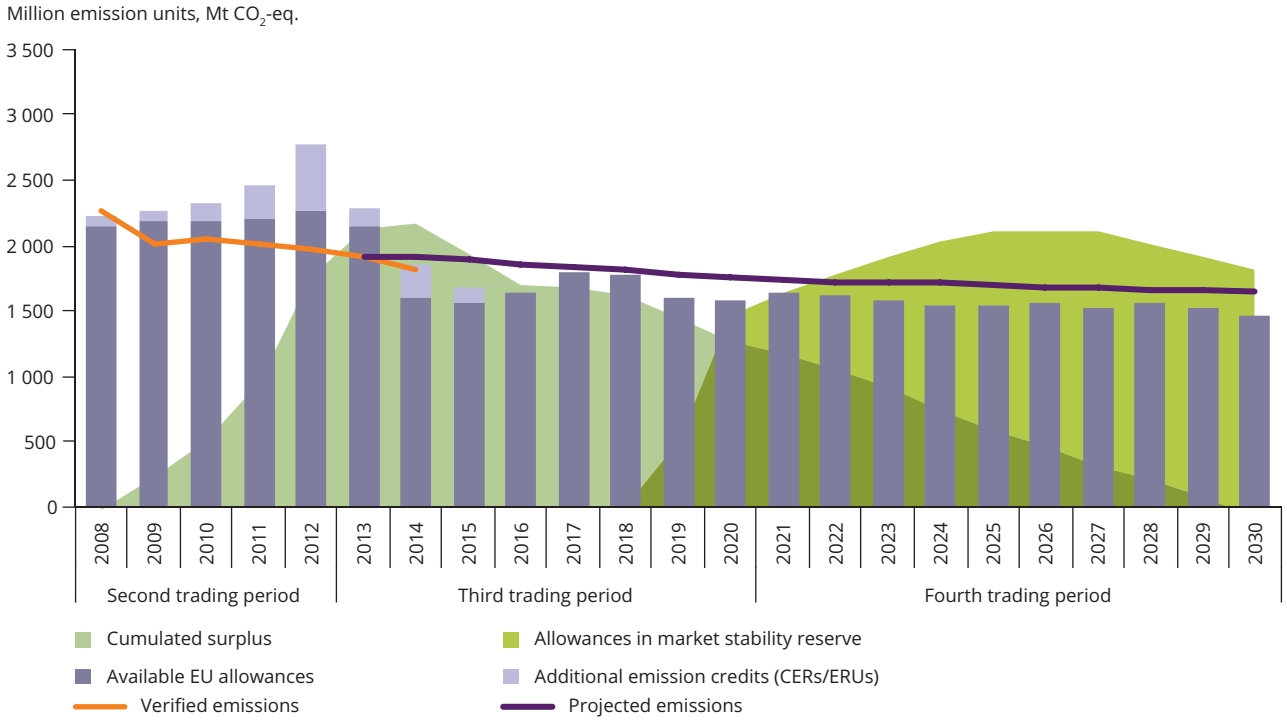
The projections reported by Member States indicate that emissions are expected to remain below the decreasing linear cap throughout the third trading period (Figure 3.3). However, taking into account the backloading of allowances in 2014, 2015 and 2016, as well as the effect of introducing the MSR from 2019 onwards, the overall surplus of emission allowances is expected to decrease continuously after 2014. The MSR is expected to play a significant role in 2019 and 2020 in particular, when backloaded and unallocated allowances would be added to the reserve.

In October 2014, European heads of state or government endorsed a binding EU target of an at least 40% domestic reduction in GHG emissions by 2030 compared to 1990, with a contribution from the ETS amounting to a 43% reduction compared to 2005. This reduction should be achieved by changing the annual factor to reduce the cap from 1.74% (third trading period) to 2.2% from 2021 onwards (European Council, 2014). Taking this additional factor into account, and using the projections available from Member States, the ETS surplus could be absorbed by the MSR in 2030.

Note that the estimation for eliminating the surplus in 2030 relies upon Member State projections submitted by the end of August 2015. These projections do not account for more recent policy developments such as the agreement of the MSR. Taking into account the effect of the MSR, emissions may be lower than currently projected, which would decrease the speed at which the surplus would reduce. Given that a static baseline is applied in order to calculate the elimination of the surplus, the projected emissions from Member States are not responsive to the expected change in EUA prices ([22]) as a consequence of the MSR. The current estimation of the elimination of the surplus may therefore be an over-estimate.

([22]) Within the modelling exercise, future EUA prices are not estimated.

Figure 3.3 Outlook on the supply and demand of allowances until 2030



Note: Between 2005 and 2013, the scope of the EU ETS increased in terms of both countries and activities. To make the time series comparable across the whole period considered, a scope correction has been estimated and added to both ETS emission trends and allocated allowances, for the period from 2005 to 2012.
Projections used are those reported under the WEM scenario. For ETS emissions of Greece, gap-filling was applied (based on Commission projections).
Refer to Section A2.4 for the parameters of the MSR used in this calculation.
Following calculations made by the European Commission in its Impact Assessment (EC, 2015c, p.25), it is assumed that unallocated allowances with respect to Articles 10a(7), 10a(19) and 10a(20) will amount to 480 million EUAs or about 3% of the total third trading period cap. Of this amount, it is assumed that 250 million EUA are to be used towards a NER, and a further 50 million for an innovation fund in the fourth trading period, as suggested in the proposal for a revised ETS Directive (EC, 2015d). The remaining unallocated allowances with respect to Article 10a, estimated at 145 million (EC, 2015c, p.225), are assumed to be also placed in the NER for the fourth trading period (also suggested in EC (2015d)).
It is further assumed that Article 10c Member States continue to allocate at the average rate observed in 2013 and 2014 (refer to Section A2.2), which would mean that 116 million allowances under Article 10c remain unallocated. These are then assumed to be auctioned in 2019 and 2020, with an equal amount being auctioned each year. In fact, when it is confirmed that allowances are not used, they are auctioned and some unused allowances are issued with a delay of e.g. 1-2 years. Therefore, extrapolating based on the percentage requested, on the basis of the first annual report for 2013, may represent an overestimation of the auctioning at the end of the period.

Source: Own calculation based on EEA/EU ETS Data viewer; Deliveries for projections and national programmes by EU Member States (see http://cdr.eionet.europa.eu), compiled by ETC/ACM as of 31 August 2015.

Acronyms

AiC	Allowances in circulation
CCS	Carbon capture and storage
CDM	Clean Development Mechanism
CER	Certified Emission Reductions
EEA	European Environment Agency
EEX	European Energy Exchange
EFTA	European Free Trade Association
ERU	Emission Reduction Units
ESD	Effort Sharing Decision
ETS	Emission Trading System
EU	European Union
GHG	Greenhouse gas
EUA	EU emission allowance
EUAA	EU aviation allowance
EUTL	EU Transaction Log
GDP	Gross domestic product
GHG	Greenhouse Gas
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
ICE	Intercontinental Exchange
IPCC	Intergovernmental Panel on Climate Change
JI	Joint Implementation
MBM	Market-based mechanism
MMR	Monitoring Mechanism Regulation
MSR	Market Stability Reserve
NACE	Statistical classification of economic activities in the European Community
NAP	National allocation plans
NAT	National allocation tables
NER	New entrants reserve
NIM	National implementation measures
PFC	Perfluorocarbon
RES	Renewable energy sources
UCTE	Union for the Co-ordination of Transmission of Electricity
WAM	With additional measures
WEM	With existing measures

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Annex 1 Background information on the EU ETS

A1.1 Introduction to the EU ETS

The EU ETS is one of the key climate policy instruments in the EU to reduce GHG emissions. It was established by the Emissions Trading Directive (Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC) (EU, 2003) and entered into force on 1 January 2005, in the context of international mitigation commitments by the EU under the Kyoto Protocol.

The EU ETS is based upon a 'cap and trade' approach, whereby a total limit (i.e. cap) on covered GHG emissions, in the form of a quantity of emission allowances, is set for the regulated entities. The EU ETS is designed to achieve cost-efficient reductions (that correspond to the cap) by equalising the marginal cost of abatement for all participating entities through the trading of emission allowances on the market.

By setting a cap on emissions, the EU ETS creates a price signal that encourages operators with high abatement costs to purchase additional allowances, and operators with low abatement costs to reduce emissions and sell their allowances or buy less. As the cap of the EU ETS declines, it is expected that the price of allowances will increase to reflect the greater level of emission reductions required. As a consequence, more expensive abatement measures will become financially viable over time, and it is expected that investments in low-carbon technology, driven by the price signal, will also lower abatement costs. In order to lower the cost of compliance, the EU ETS also allows operators, under certain conditions, to implement cost containment measures (i.e. the purchase of international offsets/banking or limited borrowing of allowances ([23])).

In March 2007, the European Council committed the EU to becoming a highly energy-efficient, low-carbon economy by reducing its GHG emissions by 20% from 1990 levels, raising to 20% the share of renewable energy sources (RES) in the EU's gross final energy consumption, and improving the EU's energy efficiency by 20% by 2020 (Council of the European Union, 2007).

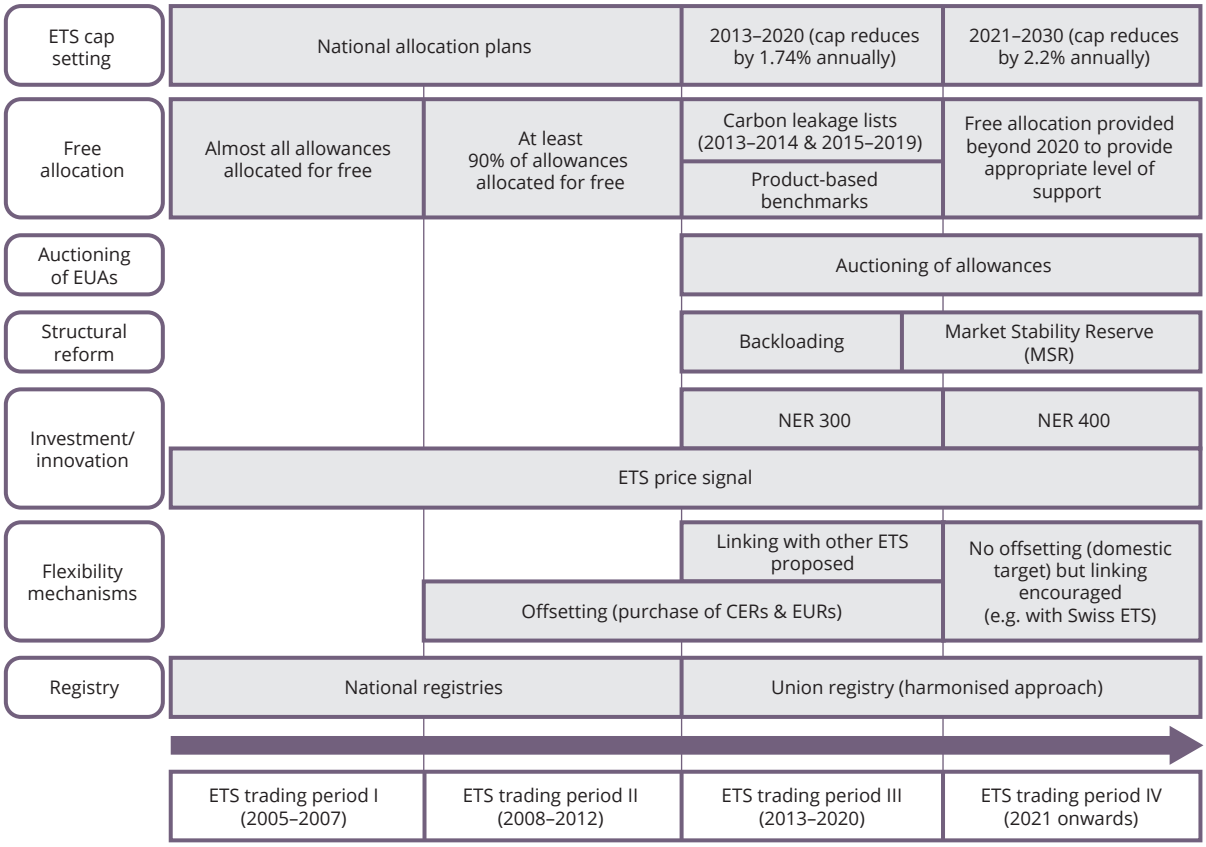
To achieve these domestic commitments, in 2009 the EU adopted the climate and energy package ([24]), legally binding legislation related to the GHG and renewable energy targets. The package introduced a clear approach to achieving the 20% reduction of total GHG emissions from 1990 levels, which is equivalent to a 14% reduction compared to 2005 levels. This reduction objective was divided between two sub-targets: a 21% reduction target compared to 2005 for emissions covered by the EU ETS (representing about 45% of total EU GHG emissions); and a 10% reduction target compared to 2005 for the remaining non-ETS emissions (shared between the 28 Member States through differentiated national GHG targets). This was equivalent to a split of the reduction effort between ETS and non-ETS sectors of two thirds vs one third (EU, 2009).

As part of the climate and energy package adopted in 2009, the 2003 Emissions Trading Directive was revised (Directive 2009/29/EC) (EU, 2009), in order to help the EU achieve its 2020 GHG reduction commitment and to contribute to emissions reductions after 2020.

Under the revised EU ETS Directive, one single EU ETS cap covers the EU Member States and the three European Free Trade Association (EFTA) countries Iceland, Liechtenstein and Norway, i.e. there are no further differentiated caps by country. For allowances allocated for free to the EU ETS participants, annual caps were set for the period from 2013 to 2020; these caps decrease each year by a quantity equivalent to about 1.74% of the average emissions during the second trading period (2008 to 2012). Auctioning is now the default method for allocation; however, a substantial share of free allocation remains until 2020. The EU ETS also has a wider scope than in the

([23]) Borrowing is formally not allowed, but operators receive allocation for the ongoing year in February, i.e. before the date of surrender for the previous year (the following April). They can therefore use the 'new' allocations for covering the previous year's emissions.
([24]) See http://ec.europa.eu/clima/policies/package/index_en.htm for more details.

Figure A1.1 Overview of the development of the key design elements of the EU ETS



Note: The column related to the fourth trading period is based on a Commission proposal, which has been submitted to the European Parliament and to the Council for adoption.
The provision of free allocation is expected to continue beyond 2020, to provide appropriate levels of support for sectors at risk of losing international competitiveness.
An additional key design element of the EU ETS that is not illustrated above is the banking of allowances between periods, which was not allowed from the first to second trading period, but has been allowed since the beginning of the second trading period.

first (2005 to 2007) and second (2008 to 2012) trading periods, as additional countries, gases and sectors have entered the system. These changes were implemented in 2013, when the EU ETS entered its third trading period (2013 to 2020).

A1.2 Scope of the EU ETS

The scope of the EU ETS has broadened since its start, in terms of both countries and activities covered in the stationary sector. By contrast, the coverage of aviation emissions has been reduced since their inclusion in 2012.

Participating countries

The EU ETS began with the 25 Member States of the EU in 2005. There are now 31 participating countries. Bulgaria and Romania entered the EU ETS in 2007. The three EFTA countries participating in the European Economic Area (Norway, Iceland ([25]) and Liechtenstein) joined in 2008; Croatia joined the EU and the EU ETS accordingly in 2013.

([25]) Stationary installations from Iceland have participated since 2013.

Activities covered by the ETS

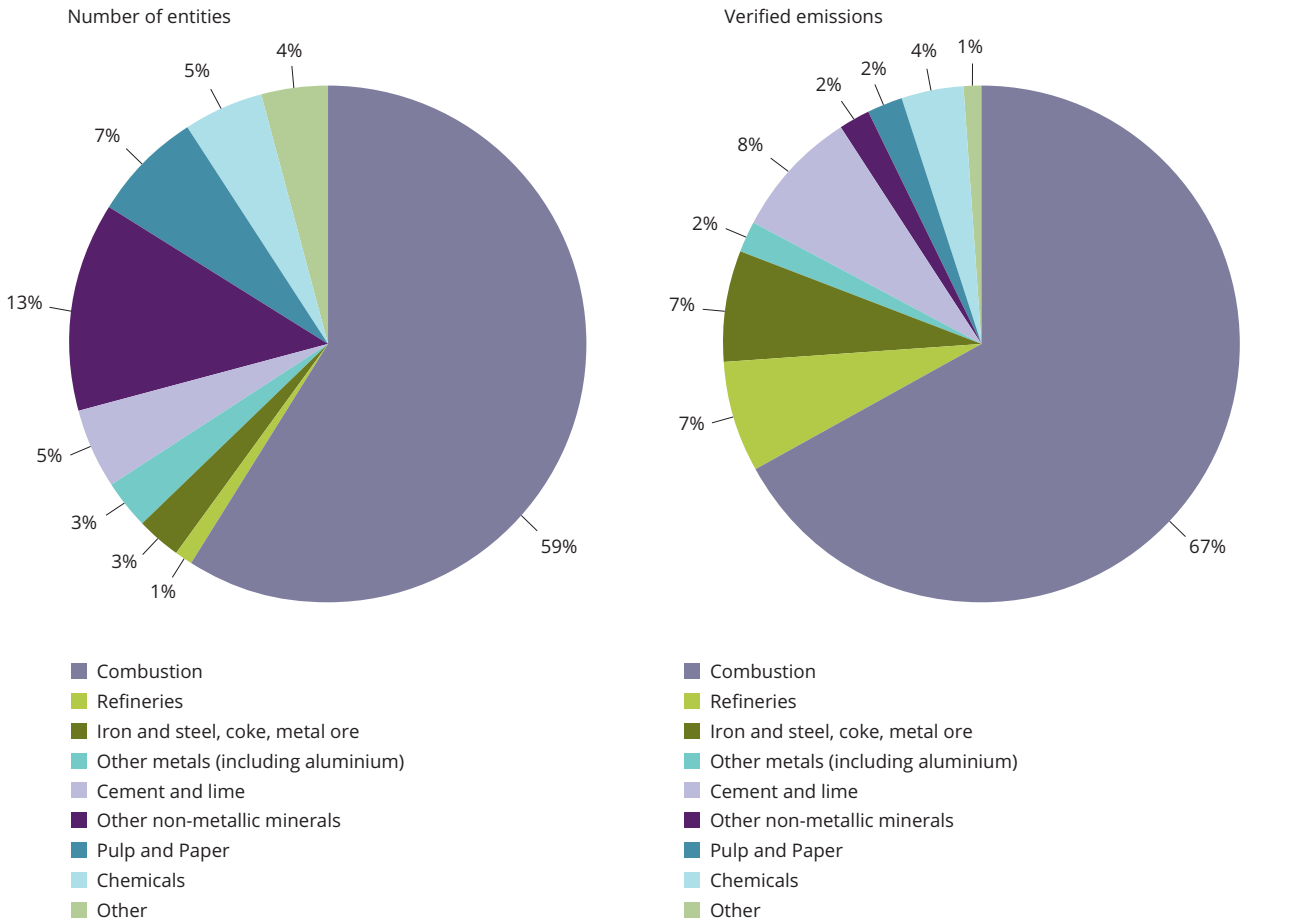
The EU ETS covered approximately 11 200 stationary installations in most industrial sectors in 2014 ([26]). The scope of the EU ETS includes all combustion installations over 20 MW and all installations where activities listed in in Annex I of the EU ETS Directive are carried out (EU, 2003). The total emissions of all stationary installations covered by the EU ETS in 2014 were equal to 1 812 Mt CO_2-eq. (EEA/EU ETS Data viewer, 2015).

The stationary installations covered by the EU ETS can be grouped into eight main categories, based on their main activities responsible for GHG emissions:

- fuel combustion (mainly electricity generation plus various manufacturing industries)
- refineries
- iron and steel, coke and metal ore production
- cement, clinker and lime production
- other non-metallic minerals (glass, ceramics, mineral wool and gypsum)
- production of pulp and paper
- production of chemicals
- other (opt-ins and capture of GHG).

Fuel combustion represents the main activity responsible for the inclusion of stationary installations in the EU ETS. It concerns 59% of all stationary installations and represents an even larger share (i.e. 67%) of the total verified emissions from stationary installations (see Figure A1.2). In terms of emissions,

Figure A1.2 Number of stationary installations (left) and verified emissions (right) in EU ETS sectors, 2014



Note: Number of installations based upon all those installations with verified emissions in 2014.

Source: EEA/EU ETS Data viewer, 2015; EUTL, 01/05/2014.

([26]) This number includes all stationary installations that had verified emissions reported in the EUTL in 2014.

Table A1.1 Activities and sectors covered by the EU ETS in 2014

Sector	Main activity	Activity code	Number of entities	Verified emissions (Mt CO_2-eq.)
Combustion	Combustion of fuels	20	6 629	1 218
All industrial installations (excluding combustion)			4 579	596
Refineries	Refining of mineral oil	21	143	127
Iron and steel, coke, metal ore	Production of coke	22	21	10
	Metal ore roasting or sintering	23	10	3
	Production of pig iron or steel	24	257	114
Other metals (including aluminium)	Production or processing of ferrous metals	25	229	12
	Production of primary aluminium	26	32	7
	Production of secondary aluminium	27	27	1
	Production or processing of non-ferrous metals	28	82	7
Cement and lime	Production of cement clinker	29	259	119
	Production of lime, or calcination of dolomite/magnesite	30	319	33
Other non-metallic minerals	Manufacture of glass	31	360	18
	Manufacture of ceramics	32	969	13
	Manufacture of mineral wool	33	48	2
	Production or processing of gypsum or plasterboard	34	37	1
Pulp and paper	Production of pulp	35	147	5
	Production of paper or cardboard	36	619	22
Chemicals	Production of carbon black	37	10	1
	Production of nitric acid	38	33	4
	Production of adipic acid	39	3	0
	Production of glyoxal and glyoxylic acid	40	1	0
	Production of ammonia	41	26	20
	Production of bulk chemicals	42	425	42
	Production of hydrogen and synthesis gas	43	41	9
	Production of soda ash and sodium bicarbonate	44	14	3
Other	Capture of greenhouse gases under Directive 2009/31/EC	45	1	0
	Other activity opted-in under Art. 24	99	466	22
All stationary installations			11 208	1 813
Aviation		10	516	55
Total ETS			11 724	1 868

Note: Number of entities based upon all those installations with verified emissions in 2014.

Source: EEA/EU ETS Data viewer, 2015.

the cement, clinker and lime production sector is the second largest sector, with about 8% of total verified emissions from stationary installations, even though it ranks fourth in terms of the number of installations. The iron, steel and coke sector and the refinery sector each account for 7% of emissions from stationary installations, followed by chemicals responsible for 4% of the emissions. The remaining activities represent 27% of the stationary installations covered by the EU ETS, but only account for 6% of the total verified emissions for stationary installations.

In fact, emissions in the EU ETS are dominated by a small subset of large emitters. Of the 9 000 installations that were reported in relation to Article 21 of the ETS Directive (EEA, 2015a), 72% of installations emit less than 50 000 Mt CO_2-eq. and are jointly responsible for 10% of overall emissions.

Aviation

The EU ETS covered approximately 514 aircraft operators in 2014. The total emissions of aviation covered by the EU ETS in 2014 were equal to 55 Mt CO_2-eq. The aviation sector has been included in the EU ETS since 1 January 2012 (EU, 2009). In principle, the EU ETS should cover all flights departing from **or/and** arriving at airports in all EU Member States, as well as Norway, Iceland and Liechtenstein and closely related territories. However, since 2012, only flights departing from **and** arriving at aerodromes located in these countries (and Switzerland in 2012) have been included in the EU ETS. This exclusion, first resulting from the 'Stop the clock' decision (EU, 2013a) was taken in order to facilitate negotiation of a global agreement to address aviation emissions in the forum of the International Civil Aviation Organization (ICAO). The ICAO assembly agreed in 2013 on a roadmap for developing a global market-based mechanism (MBM) which aims to finalise the design of the global MBM in 2016 with implementation from 2020. The EU has decided to continue with a reduced scope in the 2013 to 2016 period (EU, 2014c).

Emissions for the year 2012 are not comparable to 2013 and 2014 emissions, as operators could choose whether to report 2012 emissions from the full scope (including international flights) or a from reduced scope — in this case, they had to return the allocation received for their international flights ([27]). It can be expected that those operators receiving a high share of emissions for free would choose the original scope, whereas those operators needing to buy a substantial number of allowances to cover for their emissions would choose the reduced scope. As can be seen in Section 2.2, free aviation allowances covered a higher share of aviation emissions in 2012 (81%) than in 2013/2014 (59%) (see Figure 2.10).

Every second aircraft operator is excluded from compliance: from 2013, as the EU regulation (2014c) introduced a temporary exemption for flights performed by non-commercial aircraft operators with total annual emissions lower than 1 000 t CO_2 per year (based on the full scope).

Aviation operators are allocated EUAAs which can be used for compliance for aviation emissions only and not by stationary installations. Furthermore, EUAAs are auctioned at the same auctioning platforms that auction EUAs; these are the European Energy Exchange (EEX) and the Intercontinental Exchange (ICE). Finally, aircraft operators are entitled to use international credits beyond those allowed in 2012, up to a maximum of 1.5% of their verified emissions in the third trading period, and to purchase EUAs in addition to EUAAs (unlimited).

([27]) The devolution of allowances is not yet recorded for all cases in the EUTL. Based on information from the European Commission, ETC/ACC Member Oeko-Institut has corrected EUTL information on allocation to aviation operators choosing the 'Stop the clock' scope. The approach is described in EEA (2015b).

Annex 2 The EU ETS cap and its composition

A2.1 Overall cap

The emissions target of the EU ETS — the cap — represents the maximum volume of GHG emissions that can be emitted by all the participating installations ([28]). It consists in a quantity of emission allowances which are available to the regulated entities, through either free allocation or auctions.

In the first and second trading periods, national emission caps were determined at national level by all participating countries in their national allocation plans (NAPs). These NAPs had to be set up in accordance with guidance published by the European Commission (European Commission, 2005). After submission, they were reviewed by the European Commission for approval. The review process of the national emission caps for the second trading period by the European Commission is documented in Communication COM(2006) 725 (EC, 2006). In essence, the NAPs were checked against Member States' emission projections — based on GDP growth and reduced carbon intensity taken from the PRIMES 2005 modelling. This was to make sure they were in line with Member States' Kyoto or burden-sharing targets for the first commitment period (which corresponds to the second trading period in the EU ETS). The sum of all individual caps in the Member States formed an EU-wide cap.

In 2013, the EU ETS entered its third trading period. For this trading period and the subsequent ones, a single EU ETS wide cap is set to govern the supply of allowances under the EU ETS. The cap level is determined on the basis of the expected contribution of the EU ETS towards achieving the EU's 20% emissions reduction target for 2020 compared to 1990, which amounts to a 21% reduction compared to 2005 levels in the EU ETS sectors. From 2013 onwards, the cap is equal to a trajectory that decreases every year by an amount equivalent to 1.74% of the average emissions between 2008 and 2012, starting in 2010 — and taking into account additional emissions from the installations that joined the EU ETS in 2013 (EU, 2009). From 2021 onwards, the linear reduction factor will be increased to 2.2%, in order to deliver GHG emission reductions of 43% by 2030, in line with a cost-efficient achievement of the agreed target to reduce the EU's domestic GHG emissions by 40% in 2030 compared to 2005 (European Council, 2014).

In addition, until 2020, operators can use a certain number of international credits, subject to certain conditions. In practice, this flexibility increases the overall amount of emissions allowable under the system (see Section A2.6 for more information on use of flexible mechanisms).

A2.2 Free allocation

Community-wide and harmonised free allocation

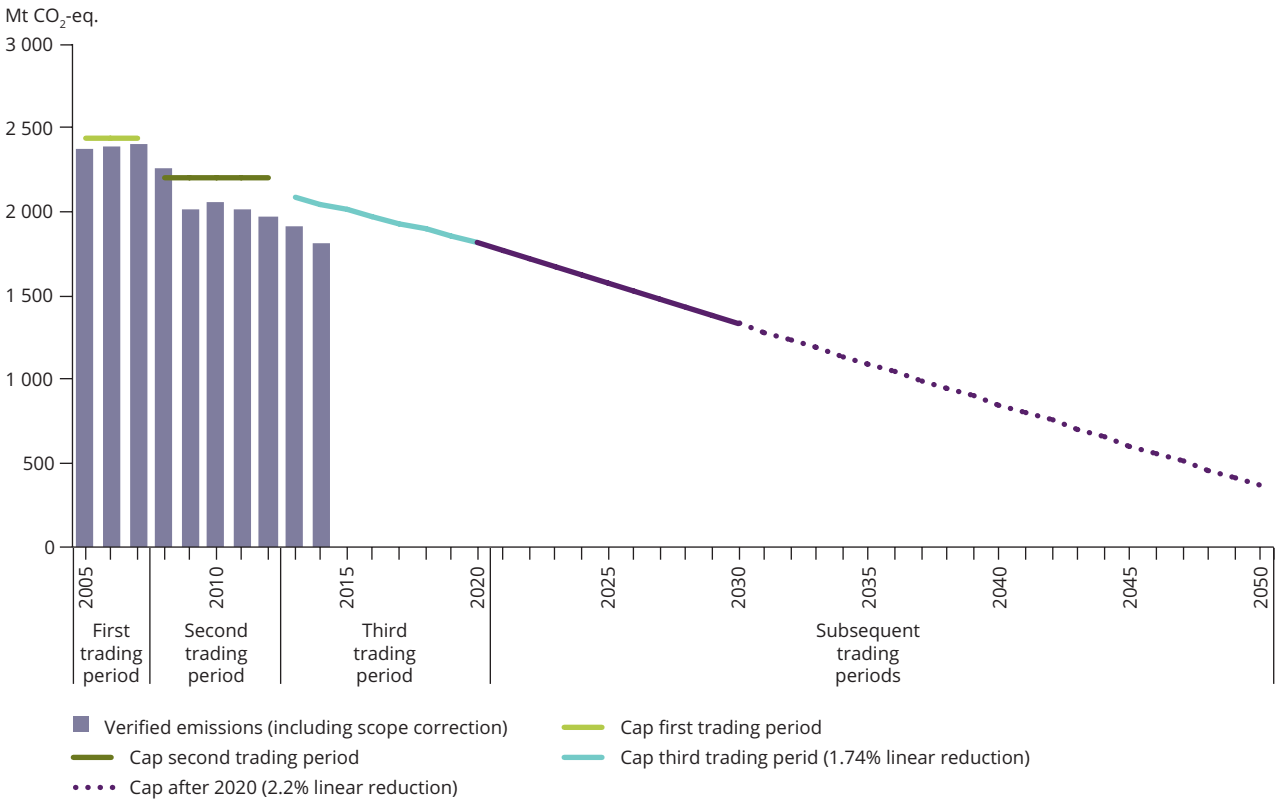
During the first trading period (2005 to 2007), almost all allowances were allocated for free (less than 1% was auctioned or sold). The allocation level for individual installations was mainly based on historical emissions ('grandfathering'). The rules for allocation of allowances to individual installations in the first and second trading periods were determined in the NAPs (EU, 2003).

In the second trading period (2008 to 2012), 95% of emission allowances were still allocated for free (EEA, 2013). In many countries (e.g. Denmark, Germany or the United Kingdom), benchmarks were used to calculate an allocation of allowances to electricity generators, while allocation for industrial sectors was still largely based on historical emissions. As a result, free allocation (relative to emissions) tended to be higher for industrial sectors compared to combustion installations (a large part of which generate electricity).

The number of allowances allocated free of charge follows a decreasing path over the third trading period (EU, 2009). The provision of free allowances limits the cost of compliance with the main objective to protect industry against the risk of carbon leakage (i.e. firms relocating

([28]) There is a cap on aviation emissions as well, but as the scope of aviation emissions to be covered and the resulting cap is expected to change from 2017, aviation is not included in the figures of this chapter.

Figure A2.1 EU ETS cap, 2005–2050



Note: The data presented do not include the aviation sector.

Source: EEA/EU ETS Data viewer, 2015; EU, 2013b.

production and associated emissions to jurisdictions with lower environmental standards). Most of these free allowances are therefore allocated to industrial sectors, although installations producing electricity receive an allocation for heat production, free of charge.

Free allocation to the manufacturing sector follows harmonised allocation rules from the third trading period onwards: it is based on EU ETS-wide benchmarks and historical production levels from the years 2005 to 2008, or 2009 to 2010 (EC, 2011). Benchmarks are largely product based, and correspond to the average GHG emission performance of the 10% most efficient installations in the EU producing that product in the years from 2007 through 2008. For sectors not deemed at 'risk of carbon leakage', the share of allowances provided free of charge will decrease from 80% in 2013 to 30% in 2020; but sectors or subsectors deemed to be at 'risk of carbon leakage' are allocated 100% of allowances for free — as applied to EU-wide benchmarks and historical production values.

On the basis of these harmonised allocation rules, governments submitted preliminary calculations ('national implementation measures' (NIMs)) of the number of free allowances to be allocated to each installation in their jurisdiction to the European Commission. As the preliminary allocation through the NIMs exceeded the maximum amount of allowances laid down in Art. 10a (5) of the ETS Directive (EU, 2013b), a cross-sectoral correction factor — equal to 5.73% in 2013 and rising to 17.56% in 2020 — is applied to non-electricity generators, in order to comply with these rules. Allocations for heat production by electricity generators according to Article 10a (4) of the ETS Directive are not subject to the above-mentioned maximum amount, and are instead reduced by the linear reduction factor of 1.74%. After applying those factors, the final allocations to installations in each country were calculated, inscribed in the national allocation tables (NATs) and published on the EU Transaction Log (EUTL).

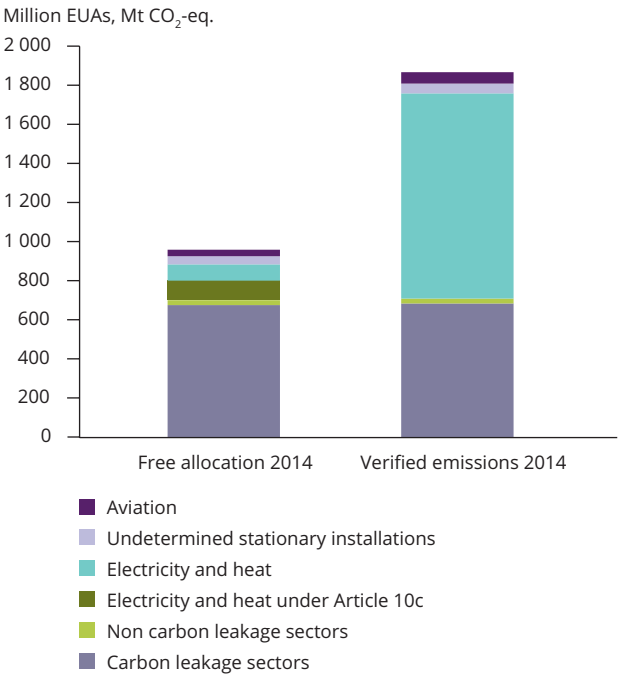
The European Commission is responsible for producing a carbon leakage list of exposed sectors or subsectors, which is primarily based upon both carbon cost (i.e. direct and indirect carbon costs/GVA) and trade intensity (i.e. imports and exports/production and imports). These indicators are updated every 5 years. The second carbon leakage list ([29]), which will apply for the years 2015 through 2019, was adopted by the European Commission in October 2014 (EC, 2014f). Since a carbon price of EUR 30 per tonne of CO_2-eq. was assumed for the assessment of the risk of carbon leakage, more sectors and subsectors were included in this second carbon leakage list, than would have been had current carbon prices been considered. The European Commission justifies the choice of a higher carbon price by the expectation that introducing a MSR (see Section A2.4) will increase carbon prices in the medium and long term by managing the supply of allowances in circulation (EC, 2014f).

Free allocation differs significantly across the different categories of allocation considered (Figure A2.2). Industrial installations emit 39% of total emissions covered by the EU ETS; 56% are emitted by power plants and 3% by aircraft operators ([30]). Operators of industrial installations as a group receive certificates worth 100% of their 2014 emissions for free. The vast majority of industrial installations host an activity considered to be at risk of carbon leakage — only 5% of industrial emissions are caused by installations having an activity not deemed at risk of carbon leakage.

Electricity and heat installations have to purchase the majority of allowances needed to cover for their emissions. They receive on average 8% of their emissions as free allocation for heat (88 million EUAs ([31])) and an additional 97 million EUAs as transitional free allocation, which is only available to power plant operators in a number of eastern European countries.

Finally, aviation operators also have to purchase allowances to cover their verified emissions. In 2014, aviation operators were allocated 32 million EUAAs free of charge — this corresponds to 59% of their emissions.

Figure A2.2 Verified emissions and free allocation, 2014, according to allocation rules



Note: 'Electricity and heat' refers to electricity generators. 'Carbon leakage sectors' and 'non-carbon leakage sectors' both refer to non-electricity generators (industry installations).
Verified emissions data for installations producing electricity and heat are only available at an aggregate level.

Source: EEA/EU ETS Data viewer, 2015; EC, 2015e; sector classification based on EC (2014a).

Transitional free allocation

In eight Member States, some installations in the electricity generation sector continue to receive transitional free allocation over and above this allocation for heat, in order to help modernise electricity generation under Article 10c of the EU ETS Directive (EU, 2009) ([32]). The free allowances under Article 10c are deducted from the quantity that the Member State would otherwise auction. The total maximum number of allowances that can

([29]) The first carbon leakage list applied from 2013–2014.
([30]) Attribution to sectors is based on NACE codes published by the European Commission in the process of determining the carbon leakage list (EC, 2014a). The remaining 3% are emitted by stationary installations which cannot be attributed to a specific sector, e.g. due to no NACE code being available.
([31]) Estimate based on the quantity of allowances allocated free of charge (Art. 10a(1)) to installations whose NACE code corresponds to heat and electricity production. It is assumed that these installations were only producing heat, since installations producing electricity are covered by Art. 10c and therefore available separately in the EUTL. It is also possible that certain free allowances were dedicated to installations with undefined activity, but their share is assumed to be very low.
([32]) Under Article 10c, paragraph 1, Member States are permitted to allocate free allowances to electricity generation: (a) when the national electricity network is not connected to the Union for the Co-ordination of Transmission of Electricity (UCTE); b) when the national electricity network is only connected to the UCTE through a line with a capacity of less than 400 MW; and c) when the GDP per capita of the Member State does not exceed 50% of the average and more than 30% of electricity is produced from a single fossil fuel.

be allocated for free by Member States under these rules was published in two decisions of the European Commission (EC, 2014e; EC, 2015e). Power plant operators benefiting from such free allocation can use it to finance retrofitting or upgrading infrastructure, install clean technology and for the diversification of energy mix or sources of supply. If investments to modernise electricity generation are not implemented as planned, the amount of free allocation is reduced and the allowances auctioned instead (EU, 2011).

In 2013, at total of 136 million allowances were allocated free of charge to 238 installations under Article 10c, which corresponds to 90% of the maximum allowed amounts (EC, 2014e). In 2014, a total of 97 million allowances were allocated to 214 installations, which corresponds to 75% of the maximum allowed amount. Notably in Hungary, transitional free allocation was restricted to 2013 only, while in all other countries the allowed amounts are reduced steadily until they reach 0 in 2020 (Table A2.1).

Summary of planned free allocation

A summary of the planned allocation of free allowances up until 2020 is provided in Figure A2.3, which is disaggregated according to the different types of allocation.

- The largest share of allowances planned to be allocated for free between 2013 and 2020 is for non-electricity generators, mainly industrial activities, in accordance with Article 10a(5) of the EU ETS Directive. On average, this corresponds to about 78% of free allocation during the third trading period (EU, 2013b).
- In general, electricity generators only receive free allocation for heat produced under Article 10a(4) of the EU ETS Directive. Free allocation decreases over time, from 80% of the benchmark in 2013 to 30% in 2020. The share of allowances planned to be allocated for heat production in total free allocation amounts to about 8% during the third trading period (EU, 2013b).
- The transitional free allocation for power generators in eight Member States will decline to zero by 2020, in accordance with Article 10c of the EU ETS Directive. The share of the maximum allowed amount of transitional free allocation in total free allocation is at an average of 9% during the third trading period (EU, 2013b). If the maximum allowed amount is not allocated for free, it will be auctioned by the relevant Member States.
- Furthermore, for new entrants, there will be maximum free allocation of about 480 million EUAs ([33]) that have been placed into

Table A2.1 Maximum and allocated transitional free allocation for the modernisation of electricity generation under Article 10c of the ETS Directive

	Maximum number of free allowances pursuant to Article 10c (million EUAs)									Allocated free allowances pursuant to Article 10c		
	2013	2014	2015	2016	2017	2018	2019	2020	'Total 2013–2020'	2013	2014	Share of allocated in maximum 2013/2014
Bulgaria	13.5	11.6	9.7	7.7	5.8	3.9	1.9	0.0	54.2	11.0	9.8	83%
Cyprus	2.5	2.2	1.9	1.6	1.3	0.9	0.6	0.0	11.0	2.5	2.2	100%
Czech Republic	26.9	23.1	19.2	15.4	11.5	7.7	3.8	0.0	107.7	25.7	22.0	95%
Estonia	5.3	4.5	3.8	3.0	2.3	1.5	0.8	0.0	21.2	5.1	4.4	97%
Hungary	7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.0	6.1	0.0	87%
Lithuania	0.6	0.5	0.5	0.4	0.4	0.3	0.2	0.0	2.9	0.3	0.3	55%
Poland	77.8	72.3	66.7	60.0	52.2	43.4	32.2	0.0	404.7	69.2	49.6	79%
Romania	17.9	15.3	12.8	10.2	7.7	5.1	2.6	0.0	71.4	15.7	8.6	73%
Total	151.6	129.5	114.5	98.4	81.1	62.7	42.1	0.0	679.9	135.7	96.9	83%

Source: EC, 2012; EC, 2014e; EC, 2015e; EU, 2012.

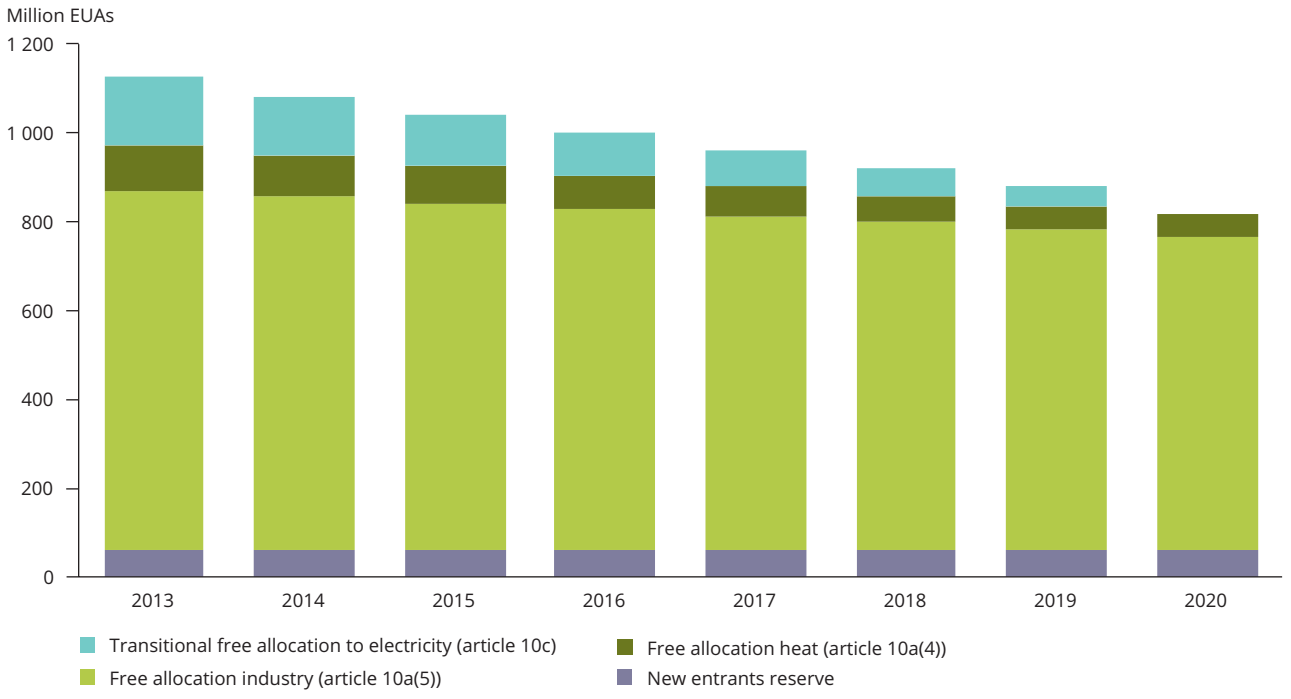
([33]) The overall size of the NER is 780 million EUAs (5% of the cap in the period from 2013 to 2020). In order to generate financial support for CCS and innovative renewable energy projects, 300 million EUAs are taken out of this reserve and auctioned ('NER300').

the NER, as stipulated in Article 10a(7) of the EU ETS Directive. The share of free allocation to new entrants in total free allocation is about 6%.

It can already be projected that not all of the allowances planned to be allocated for free will indeed be allocated (EC, 2015c). There are several different potential uses for those unallocated allowances (EC, 2015a). The proposal for a MSR (see Section A2.4) suggests that any amounts not given out under Articles 10a(4) and 10a(5) due to closures of plants (10a(19)) or partial cessation of activities (10a(20)), as well as allowances from the NER that are not allocated, are placed into the MSR (EU, 2015). The amount is estimated to lie in the range of 480 million EUA or 3% of the third trading period cap (EC, 2015c, p.25). However, the proposal for a revised ETS Directive (EC, 2015d) suggests that 250 million of these allowances should go towards a NER for the fourth trading period, and a further 50 million towards an innovation fund (NER400). There may be further 'de facto' unallocated allowances due to the application of a carbon leakage factor for sectors not on the carbon leakage list, estimated at 145 million EUA (EC, 2015c, p.225). These amounts are also suggested to go towards a NER for the fourth trading period (EC, 2015d).

Therefore, the allocation of allowances up until 2020 may not necessarily correspond with that currently planned and shown in Figure A2.3. This may be due to four reasons: (a) closure of plants or partial cessation of activities (Article 10a(19) and 10a(20) of the ETS Directive); (b) the allowances in the NER not being fully used up; (c) de facto unallocated allowances due to a carbon leakage factor having been applied to sectors not on the carbon leakage list; and (d) less than the maximum amount of free allocation under Article 10c of the Directive being allocated for free to electricity generators.

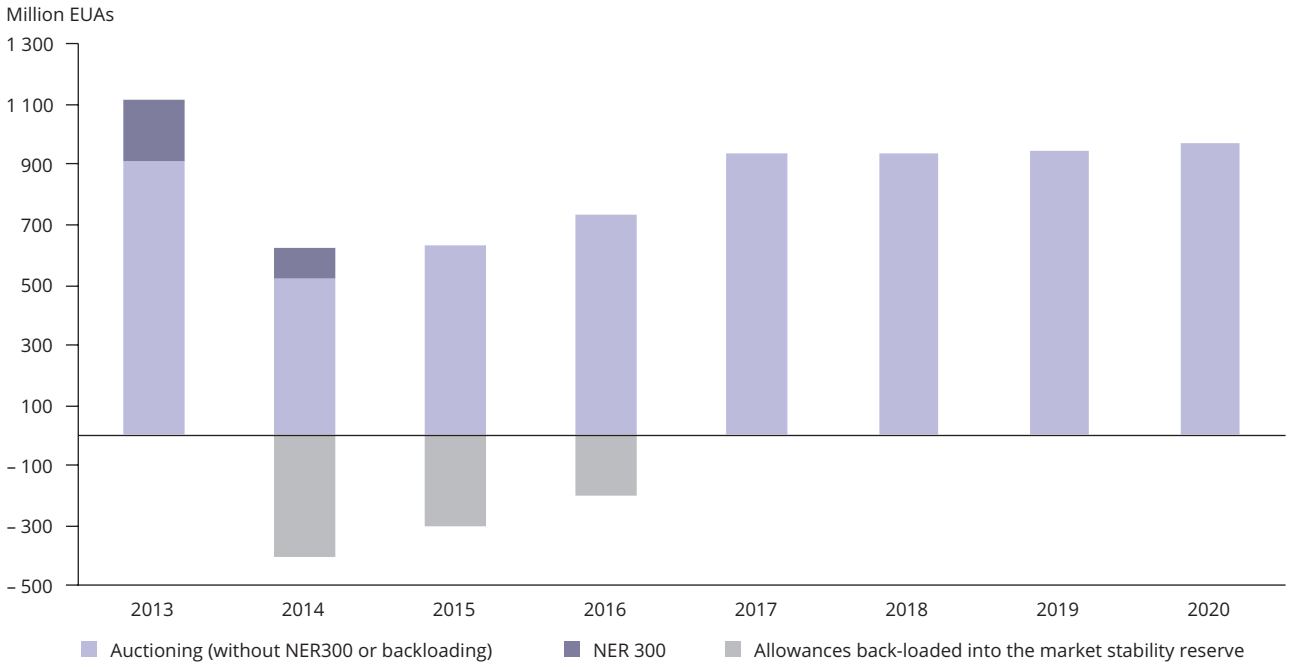
Figure A2.3 Planned allocation of free allowances, 2013–2020



Note: The maximum number of allowances planned for the NER are equally distributed over the 8 years of the third trading period.
Maximum amounts for Article 10c allocation are shown.
No projections of potentially unallocated allowances due to partial cessations or closures, nor further unallocated allowances due to the application of a carbon leakage factor, are take into account.

Source: EC, 2012; EU, 2009; EU, 2012; EU, 2013b.

Figure A2.4 Planned auctions of allowances, 2013–2020 without the MSR



Note: The number of auctioned allowances from the NER300 for 2013 and 2014 are based upon assumptions on the timing of the delivery of these auctioned allowances, which differs slightly from the timing as stated in EIB (2014b), i.e. 211 million EUAs in 2013 and 89 million EUAs in 2014.

Source: EU, 2013b; EIB, 2014a; EU, 2012; EC, 2012.

A2.3 Auctions

Since the start of the third trading period, auctioning has become the default method for allocating EUAs ([34]). At the start of the third trading period, a surplus of almost 2 billion allowances had accumulated, mainly as a result of lower demand for EUAs due to the economic crisis, an inflexible supply of allowances and high imports of international credits (Figure 2.8). As a short-term measure to rebalance supply and demand and reduce price volatility, it was decided that the auctioning of 900 million allowances would be postponed through an amendment to the EU ETS Auctioning Regulation (backloading). Through this mechanism, the auctioning quantities are reduced by 400 million EUAs in 2014, 300 million EUAs in 2015 and 200 million EUAs in 2016. These backloaded amounts were supposed to be reintroduced in 2019 and 2020 (300 million EUAs and 600 million EUAs, respectively) (EU, 2014b). As backloading is only a temporary measure, the Council and the European Parliament have agreed to set up a MSR. Backloaded allowances will be directly transferred into the MSR in 2020 (EU, 2015). Figure A2.4 also includes sales of some 300 million EUAs that have been taken from the NER (NER300) (EIB, 2014a) ([35]). These EUAs were sold in order to generate financial support for carbon capture and storage (CCS) and for innovative renewable energy projects.

Similarly to the amounts of allowances allocated for free, actual amounts auctioned will differ from planned amounts — both year on year, as well as overall. Firstly, yearly differences may be attributable to different starting dates of auctioning: certain countries started auctioning later than planned due to administrative matters having to be resolved with the auction platform (EC, 2015b). Secondly, as noted above, a number of unallocated allowances will be auctioned rather than given out for free, including those allowances that are placed into the MSR. In fact, the MSR is expected to further reduce auctioned amounts in 2019 and 2020, after it starts operating.

([34]) The EU jointly auctions allowances for all Member States, except three which have opted out of this common auctioning platform: Germany, Poland and the United Kingdom. The EEX carries out EU-wide auctions, German auctions and Polish auctions. ICE carries out auctions for the United Kingdom.

([35]) A first tranche of 200 million EUAs had already been sold by October 2012. However, they are attributed to the auctions and sales in 2013, as it was only possible to use these allowances from 2013 onwards. A second tranche of 100 million EUAs was sold between November 2013 and April 2014. The second tranche is allocated to the year 2014.

A2.4 The market stability reserve (MSR)

In July 2015, the European Parliament endorsed a proposal on the set-up of a MSR based on an agreement reached between the Council and the European Parliament in May 2015 (EU, 2015). It indicates that the MSR should be set up in 2018, with the first adjustment to auctions starting in January 2019. Starting on 15 May 2017, the Commission will publish each year (year 'x') a report on the total number of allowances in circulation (AiCs), which correspond to the sum of EUAs issued and international credits used/exchanged, minus the sum of verified emissions under the EU ETS (both since 2008), minus any allowances in the MSR. The AiCs are counted in each year to 31 December of the year in question (year x-1).

Should this AiC be greater than 833 million allowances, 12% of this amount will be deducted from auctioned amounts by adjusting auction calendars between September of the year when the AiC calculation was released by the Commission, and August of the following year. In the first year, i.e. between January and August 2019, only 8% of the AiCs will be deducted from auctioning amounts, and 1% in each month between January and August 2019. If the AiCs are determined to be fewer than 400 million, 100 million allowances will be released into the market via auctioning.

Furthermore, the MSR proposal states that backloaded allowances will be placed into the reserve, as will unused allowances due to the NER not being fully used up (10a(7)), and that allowances may be returned by operators due to cessations and closures (10a(19) and 10a(20)). These will be placed into the reserve in 2020, with possible alternatives to be set out in a proposal by the European Commission for the fourth trading period, if appropriate. Any other unused allowances under Article 10a or unallocated allowances under Article 10c should be auctioned by the relevant Member States.

In their proposal for a revised ETS Directive, the European Commission suggest that 250 million unallocated allowances placed in the MSR should instead be used towards a NER for the fourth trading period. It is suggested that a further 50 million allowances go towards an innovation fund, also operational during the fourth trading period (NER400) (EC, 2015d).

See Table A2.2 for a summary on the design parameters of the MSR.

A2.5 Summary of the total supply of allowances

The total supply of planned allowances for the third trading period are illustrated in Figure A2.5, which provides a comparison of the relative shares of allowances that are expected to be either allocated for free or auctioned. As noted above, actual amounts allocated for free or auctioned will differ — both year on year and in aggregate. This is due, amongst other reasons, to unallocated allowances, the MSR or yearly effects such as changes to the auction calendars.

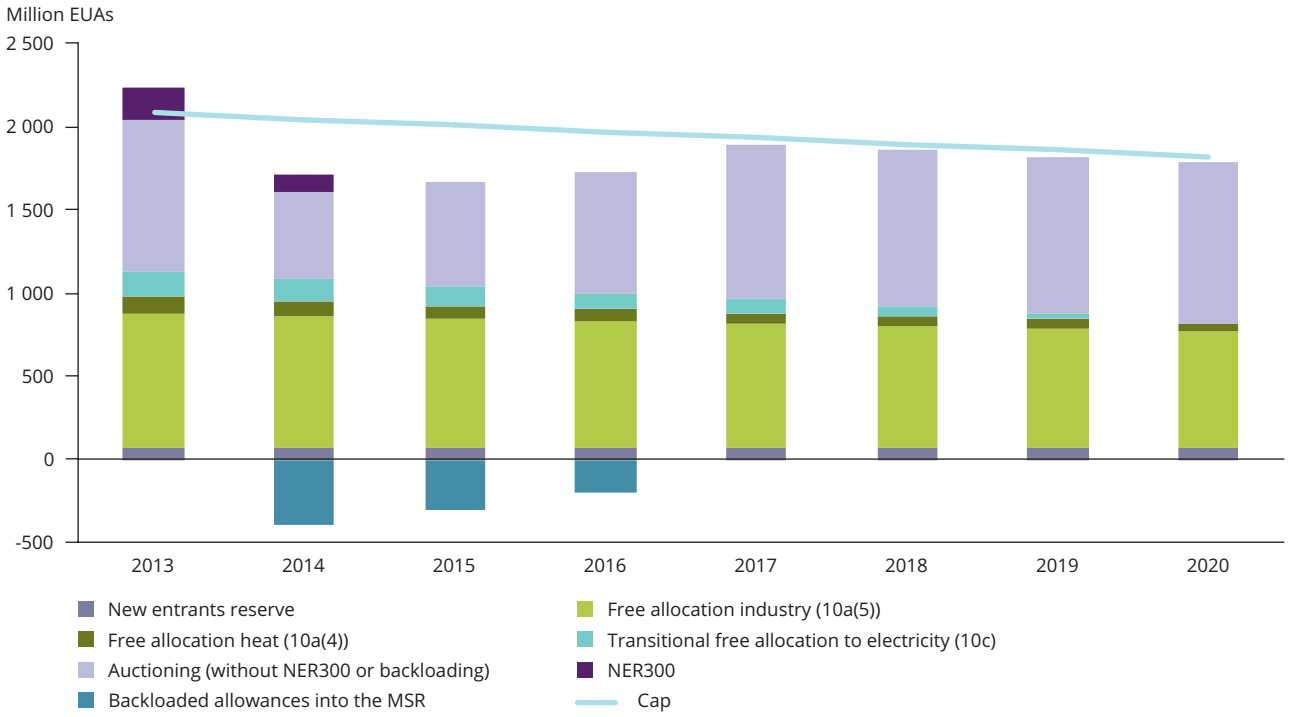
Table A2.2 Proposed design parameters of the MSR

Established	**2018**
Start date	January 2019
Publication of AiCs in year 'x-1'	15 May of year 'x' (starting on 15 May 2017)
Thresholds	< 400 million → release; > 833 million → build-up
% put in MSR if AiCs > 833 million	12% of AiCs
Release from MSR if AiCs < 400 million	100 million
900 million backloaded allowances	Placed into reserve
Unallocated allowances 10a(7), 10a(19), 10a(20)	Placed into reserve
of which 250 million	to be used towards NER in fourth trading period
of which 50 million	to be used towards NER400
Remaining unallocated 10a	To be used towards NER in fourth trading period
Unallocated 10c	Auctioned by relevant Member States

Note: AiC: allowances in circulation.

Source: EC, 2015d; EU, 2015.

Figure A2.5 Planned supply of allowances, 2013–2020 without the MSR



Note: The maximum number of allowances planned for the NER are equally distributed over the 8 years of the third trading period. The number of auctioned allowances from the NER300 for 2013 and 2014 are based upon assumptions on the timing of the delivery of these auctioned allowances, which differs slightly from the timing as stated in EIB (2014b), i.e. 211 million EUAs in 2013, and 89 million EUAs in 2014.

Source: EC, 2012; EU, 2009; EU, 2012; EU, 2013b; EIB, 2014a.

A2.6 Use of flexible mechanisms

Operators liable under the EU ETS are allowed to use emission credits to comply with part of their legal obligation. These credits stem from flexible mechanisms set under the Kyoto Protocol: the Clean Development Mechanism (CDM) and Joint Implementation (JI). According to the Linking Directive, CERs from the CDM were allowed from 2005, and ERUs from JI were allowed from 2008 (EU, 2004). Before 2006, only a small amount of CERs had been issued ([36]), and in 2006, EUA prices decreased significantly. Therefore, no CERs and ERUs were surrendered during the first trading period of the ETS. The use of CDM and JI credits gained increasing importance during the second trading period.

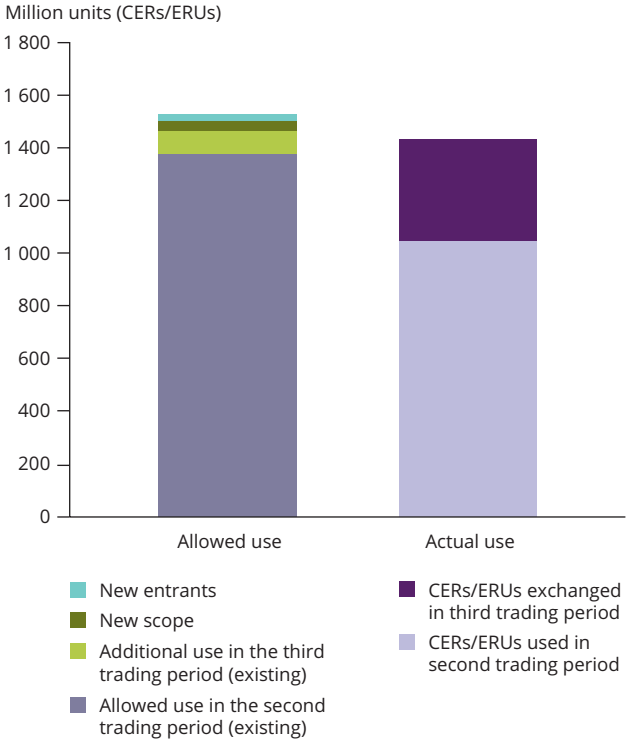
For the second trading period of the EU ETS, entitlement limits were set in the NAPs. These defined the entitlements as a percentage of the free allocation to each installation in the 2008 to 2012 period. The national average percentages vary from 4% in Estonia ([37]) to 22% in Germany. In total, they add up to an upper limit of 1.4 billion CERs or ERUs that could be used in the second trading period. This corresponds to 14% of the total free allocation in the second trading period. Overall, 76% of this maximum limit was used in the second trading period (Figure A2.6).

([36]) See http://cdmpipeline.org.
([37]) Estonia allowed 10% starting in 2011, which amounts to an average 4% over the whole second trading period.

In the third trading period, operators of stationary installations are entitled to either use up the remainder of their international credit entitlement specified in the NAPs, or 11% of the free allocation of EUAs granted to them in that period (if higher). This mechanisms leads to an additional allowance of 90 million units for existing generators.

Operators of stationary installations newly included in the scope of the EU ETS in the third trading period which did not receive free allocations nor entitlements for international credit use during the second trading period, are able to use international credits up to a maximum of 4.5% of their verified emissions during the third trading period, adding another 40 million units. The same holds for operators of installations that are new entrants to the EU ETS, the total effect of which will only be known once the total emissions of these installations are confirmed at the end of the third trading period.

Figure A2.6 Allowed and existing use of international credits, 2008–2020



Note: Additional allowed use for new scope is calculated based on cap adjustment in 2013; additional allowed use for new entrants is based on the assumption that roughly 2% of the cap will be allocated to new entrants during the third trading period, and that about the same number of new entrants will enter in electricity generation, receiving no free allocation.
In 2012, aviation operators were also allowed to submit international credits for up to 15% of their verified emissions. This amount is reduced for the period between 2013 and 2020, with aviation operators only allowed to submit international credits for up to 1.5% of their verified emissions. At current levels, this would amount to around 7 million credits to be added by aviation operators during the third trading period, which is not included here.

Source: EEA, 2013; EU, 2013b; EEA/EU ETS Data viewer, 2015.

European Environment Agency

Trends and projections in the EU ETS in 2015

2015 — 46 pp. — 21 x 29.7 cm

ISBN 978-92-9213-695-6
doi:10.2800/472636

TH-AK-15-014-EN-N
doi:10.2800/472636

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