Greenhouse Gas Emissions in 2015

Stationary installations and aviation subject to emissions trading in Germany (VET report 2015)

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Summary

Energy and industrial sectors in Germany

In 2015, the European Emissions Trading Scheme (EU ETS) recorded 1,889 stationary installations in Germany. These installations emitted around 456 million tonnes of carbon dioxide equivalent, which represents a 1.2 percent decrease compared to 2014. Figure 1 provides an overview of the distribution of emissions and installations to the energy and industrial sectors.

As of 02/05/2016

Figure 1: Distribution of emissions and installations subject to emissions trading to the energy sector (Activities 2 to 6 as per Annex 1 TEHG) and the industrial sector (Activities 1 and 7 to 29 as per Annex 1 TEHG) in Germany in 2015

Compared to the previous year, energy supply emissions decreased by 1.7 percent to 332 million tonnes of carbon dioxide. The emissions from the energy intensive industry are around 123 million tonnes of carbon dioxide equivalent, the same as in 2013 and 2014. Figure 2 shows the share of individual industrial sectors in the total emissions from the industry. The iron and steel industry has the largest share of industrial emissions at around 30 percent, followed by the mineral processing industry (28 percent) and refineries (20 percent). The remaining 22 percent of industrial emissions can be attributed to three further sectors: chemical industry (15 percent), paper and pulp industry (four percent) and non-ferrous metal industry (two percent). Other combustion plants that cannot be assigned to any of the aforementioned sectors generate only about half a percent of the industrial emissions.

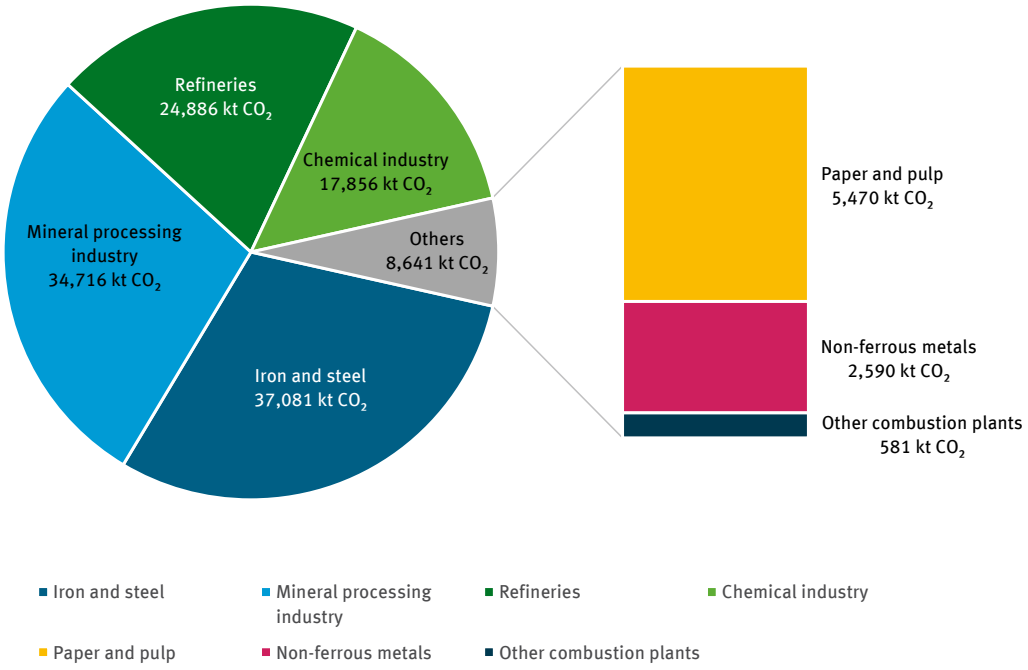

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Figure 2: Share of individual sectors in the industrial area emissions

The fluctuating emission trend in the individual industrial sectors compared to the previous year is summarised in Figure 3: both the iron and steel industry and the non-ferrous metals industry experienced a visible increase of emissions. Emissions increased in the iron and steel industry even though crude steel production decreased by 0.6 percent compared to 2014. This suggests an efficiency decline. In the non-ferrous metal industry, the increase in emissions was accompanied by at least one increase in primary and secondary aluminium production. The increase in the paper industry emission is rather moderate at slightly above one percent while maintaining a generally constant production level. The emissions from refineries and the chemical industry remained approximately constant at a half-percent decline, even though the gross refinery production increased by 2.2 percent compared to the previous year. A greater decline was recorded by the mineral processing industry (minus 1.7 percent) and other combustion plants (minus 4.5 percent). Within the mineral processing industry, emissions declined from cement clinker production because production also decreased compared to the previous year.

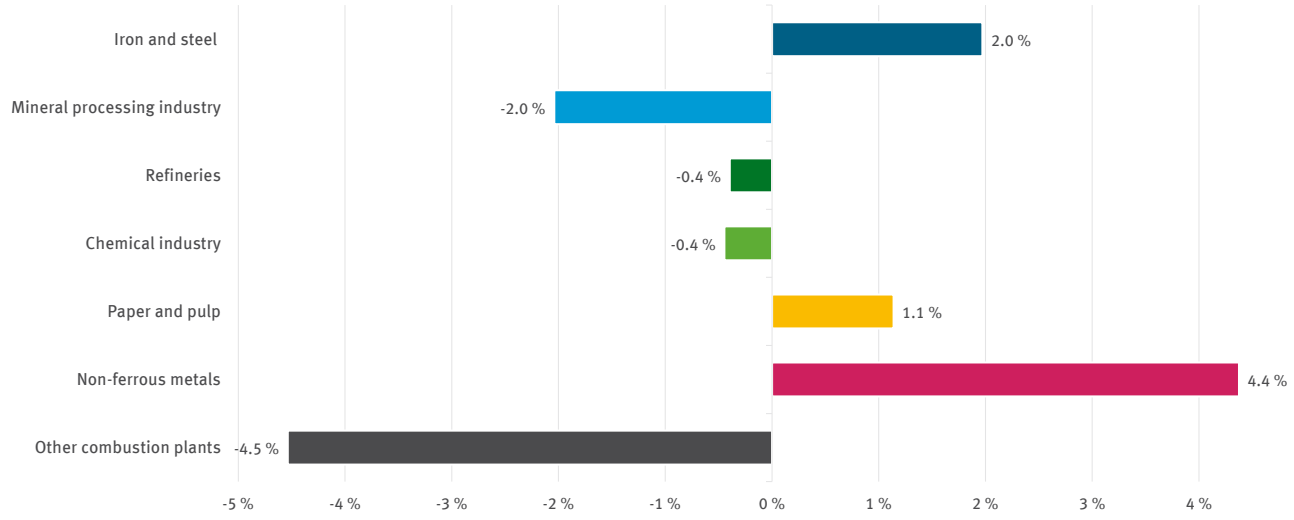

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Figure 3: Emission changes in the industrial sector

The free allocation for stationary installations in 2015 was 156 million emission allowances. The 2015 industrial activities had an allocation surplus of 7.3 million emission allowances. Assuming that the 2015 allocation for transferred waste gases from the iron and steel industry and imported quantities of heat in the paper and chemical industries will be offset or forwarded between the operators – approximately 19.7 million emission allowances altogether would change from the industrial to the energy sector – the industrial sector needs an additional 12.5 million emission allowances for 2015. The energy sector has a deficit of 304 million tonnes of carbon dioxide (without the offset from the industrial sector). This is because electricity production no longer receives a free allocation since the beginning of the third trading period. Allowances on this scale had to be purchased on the market to meet the surrender obligation of operators for the emissions in the previous year.

Germany and Europe

The emissions of EU-wide installations subject to emissions trading (EU 28 plus three, EU 31) decreased in 2015 by about 0.6 percent to around 1.8 million tonnes of carbon dioxide equivalent compared to the previous year.[1] Thus, the EU-wide decline was weaker than in Germany. However, the emissions from installations in Germany decreased significantly less than the European average since 2005, the start of emissions trading:

While emissions in Germany decreased between 2005 and 2015 by approximately 11.5 percent, the decrease in the European average over the same period amounts to more than double – to 24.1 percent.

A large amount of excess emission allowances has accumulated since the beginning of the second trading period in 2008, due mainly to the financial and economic crisis in the EU ETS, which contributed substantially to the observable decline in prices for emission allowances since mid-2011. The calculated cumulative surplus in the EU ETS as the balance of available emission allowances and verified emissions amounted to more than 2 billion allowances at the end of 2014.

Considering these surpluses, the calculated supply available on the market in 2014 was almost twice as high as the demand (verified emissions). Based on preliminary data, it can be assumed for 2015 that the surplus noticeably declined for the first time since 2009 compared to the previous year. Reasons for this are the retained auction amounts (backloading), the small, still available uses for project credits as well as the largely stable emission trend in 2015.

1 This decrease was calculated on the basis of total emissions from the years 2015 and 2014 published by the European Commission (COM 2016c and COM 2015). The methodology is comparable to the calculation of the German decrease in emissions by 1.2 percent (comparison of total ETS emissions in both years)

Aviation

Compared to the originally planned EU ETS scope in aviation, which included the emissions from all flights starting *or* landing in the European Economic Area (EEA), between 2013 and 2016 and according to the 2014 EU provisions, only emissions from flights which start *and* land within the EEA are subject to emissions trading. A total of 67 aircraft operators subject to emissions trading managed by Germany reported emissions of 8.9 million tonnes of carbon dioxide for 2015. This corresponds to about 17 percent of emissions compared to the validity of the original, full scope of the Emissions Trading Directive. Over 99 percent of the emissions can be attributed to commercial aircraft operators, which represent about two-thirds of the operators. Non-commercial operators amount to roughly one-third of the operators, but were responsible for less than one percent of the total emissions.

The 2015 free allocation share in the surrender obligation in aviation amounts, on average, to 57 percent.

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Abbreviations

AA	Allocation amount
AM	Allocation Amount
AGEB	Working Group on Energy Balances (Arbeitsgemeinschaft Energiebilanzen)
BImSchV	Federal Exposure Control Ordinance (Bundes-Immissionsschutzverordnung)
CER	Certified Emission Reductions
CO_2	Carbon dioxide
CO_2eq	Carbon dioxide equivalent
DEHSt	German Emissions Trading Authority at the German Environment Agency
EA	Emission allowance
ETD	Emissions Trading Directive
EM	Emissions
ERU	Emission Reduction Units
EU 25	Austria, Belgium, Czech Republic, Cyprus, Denmark, Estonia, Finland, France, Germany, Great Britain, Hungary, Ireland, Italy, Latvia, Lithuania, Luxemburg, Malta, Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden
EU 31	EU 25 and Bulgaria, Croatia, Iceland, Liechtenstein, Norway, Romania
EU ETS	European Emissions Trading Scheme
EUA	EU allowances
EUAA	EU allowances aviation
ICAO	International Civil Aviation Organisation
ICE	Intercontinental Exchange
kt	Kilotonne or one thousand tonnes
Mt	Megatonne or one million tonnes
MW	Megawatt
N_2O	Dinitrogen monoxide
PFC	Perfluorocarbons
RegVO	EU Registry Ordinance (Registerverordnung)
RTI	Rated thermal input
TEHG	German Greenhouse Gas Emission Allowance Trading Act (Treibhausgas-Emissionshandelsgesetz)
VE	Verified emissions
VET	Verified Emissions Table
ZuV 2020	Allocation Ordinance (Zuteilungsverordnung) 2013 to 2020

1 Introduction

Chapter 1 provides an overview of the main contents and results of the 2015 VET report. Divided into different sectors, Chapter 2 addresses the emissions from stationary installations subject to emissions trading. Chapter 3 presents cross-sectoral evaluations regarding stationary installations firstly with regard to the allocation situation of the installations in Germany, secondly with regard to Germany in the EU. Chapter 4 describes emissions in the aviation sector subject to emissions trading managed by Germany. The appendix contains additional information organised in summary tables.

The data presented in the tables are rounded. Exact values are used in the calculations so that sporadic deviations may occur in the representation of the totals.

VET emissions, annual emissions, number of installations since 2005

The operators must send their electronic emissions report, in which the monitoring and calculation of emission volumes is recorded, to the German Emissions Trading Authority (DEHSt) at the German Environment Agency at the latest by 31.03 of the year following the reporting year. Independent accredited verifiers verify the data in the emissions report. The verifiers must also enter the aggregated emission data by 31.03 directly into the so-called "Verified Emissions Table" (VET) in the European Union Registry. The operator then needs to surrender the same number of emission allowances equal to the emissions volume of the previous year by 30.04. Subsequently the emission reports will be checked by DEHSt. If it detects deficiencies or errors in the reported emissions, DEHSt may correct figures, factors or emission volumes. Table 1 shows the sums of VET entries and the annual emissions for 2005 to 2015. The first registry entry at the cut-off date of 31.03 in one of the years following the reporting year qualifies as a "VET" entry. Figures that result from the emissions report – with or without subsequent changes to the data up to the cut-off date – are referred to as annual emissions. The figure showing the 2015 annual emissions will be available for the first time in the autumn of 2016, after DEHSt has reviewed the emission reports and may later vary due to new knowledge and necessary corrections. The number of reports is the unchecked number of VET entries, regardless of the currently existing emissions trading obligation of the installations because closed or disqualified installations are still obliged to surrender VET entries for the year of closure or disqualification.

Table 1: VET entries and annual emissions of the audited reports and the respective number of installations

Year	Initial report by 31/03 of subsequent year		Audited reports, as of 28/02/2016	
	Number of reports	VET [kt CO_2eq/a]	Number of installations	Annual emission [kt CO_2eq/a]
2005	1815	473,681	1833	474,992
2006	1824	477,382	1783	478,068
2007	1882	487,050	1753	487,166
2008	1660	472,599	1673	472,593
2009	1651	428,198	1659	428,295
2010	1628	453,883	1643	454,865
2011	1631	450,267	1651	450,351
2012	1629	452,586	1625	452,600
2013	1929	480,937	1921	480,970
2014	1905	461,173	1906	461,271
2015	1889	455,528		

As of 02/05/2016

The significant increase in emissions between 2012 and 2013 can be traced back to the expansion of the material application scope at the start of the third trading period. For example, installations for non-ferrous metal processing and aluminium, adipic acid, nitric acid and ammonia production also participated in emissions trading from 2013. In addition, since 2013 the greenhouse gases nitrous oxide (N_2O, laughing gas) from adipic and nitric acid production and perfluorocarbons (PFCs) from primary aluminium production have been subject to emissions trading.

Free allocation in 2015

Free allocation as approved by the European Commission prior to 28/02/2016 is the basis for the assessment of the allocation situation, i.e. comparison of emissions and free allocations in 2015. At this time not all allocation changes that are relevant for 2015 are necessarily approved. That is, the representation of the allocation situation does not include any allocation corrections after 28/02/2016.

The allocation amount approved by the European Commission is included in the National Allocation Table NAT[2], which specifies the free basic allocation for 1,763 existing installations and the first corrections of this basic allocation for individual installations as approved by the European Commission by 28/02/2016. These are, amongst others, allocation changes resulting from partial cessations or capacity reductions. In addition, allocation amounts for new market entrants approved by the European Commission by 28/02/2016 are taken into account, i.e. for new installations or a capacity increase in existing installations which became operational from 01/07/2011. As of 28/02/2016, 1,683 installations considered in the 2015 VET report received free allocations for 2015 totalling 158.6 million allowances.

EU-data

Allocation and emissions data processed by the EEA were primarily used as a basis for the evaluations at EU level both in the sector chapters 2.1 to 2.8 and in Section 3.2 “Germany and Europe: emissions and surpluses” (see EEA, 2015). For 2015, these are supplemented with excerpts from the Union Registry by the European Commission on 01/04/2016 and 02/05/2016 (see EC 2016a and EC 2016b). Information on auction volumes is provided by EEX or ICE.

The evaluations in the sector chapters are based on a summary of the installations by activities in the EU Union Registry (see Table 55, Section 7), thereby differences may occur in the amount of emissions per sector for Germany. A comparison of emissions between Germany, the EU-25 states and the new post-2005 EU ETS participants (Bulgaria, Croatia, Romania, Iceland, Liechtenstein, Norway) will be carried out.

2 Evaluation by Industrial Sectors – Activities 1 to 29 as per Annex 1 TEHG

2.1 Energy installations

2.1.1 Large combustion plants from 50 MW

In 2015, 488 large combustion plants, i.e. power plants, combined heat and power plants and heat plants with a rated thermal input (RTI) exceeding 50 MW (Activity 2 as per Annex 1 TEHG) were subject to emissions trading. One installation first became subject to emissions trading in 2015 and another one is regarded as a stand-alone installation due to an installation separation. In contrast, six large combustion plants closed their operation or will no longer be regarded individually due to installation merging. On balance, participation in emissions trading decreased by four installations compared to 2014.

The emissions from these installations decreased by more than 5 million tonnes of carbon dioxide compared to the previous year and amounted to less than 326 million tonnes in 2015 (see Table 2). The free allocation of 23.4 million emission allowances covers only slightly more than seven percent of emissions.

2 cf. DEHSt 2013b

Table 2: Overview of large combustion plants (Activity 2), number of installations, summary of emission and allocation amounts

Sector/Activity	Number of installa-tions	2014 emissions [kt CO_2eq]	2015 allocation amount [1000 EUA]	2015 VET [kt CO_2eq]	Allocation coverage
Energy conversion ≥ 50 MW RTI	488	329,903	23,398	325,558	7.2 %

As of 02/05/2016

Emissions

Emissions have increased from 261 installations compared to the previous year, while emissions from 220 installations have declined (see Table 3). In 2015, 2014 and 2013 respectively, seven installations did not emit carbon dioxide.

Table 3: Large combustion plants (Activity 2), number of installations, 2014 emissions and 2015 VET entries

No.	Activity	2015 VET vs. 2014 emissions	No. of installa-tions	2014 emissions [kt CO_2eq]	2015 VET [kt CO_2eq]	2015 VET deviation from 2014 emissions [kt CO_2eq]
2	Energy conversion ≥ 50 MW RTI	2015 VET › 2014 EM	261	145,321	161,969	16,648
		2015 VET ‹ 2014 EM	220	184,564	163,565	-21,000
		2015 VET = 2014 EM	4	0	0	0
		Comparison not possible	3	-	-	-
Total			**488**	**329,903**	**325,558**	**-4,352**

As of 02/05/2016

Figure 4 shows the emissions for comparable installations since the start of emissions trading. In the first trading period, emissions from large combustion plants increased steadily. At the beginning of the second trading period, emissions initially reduced, especially under the influence of the financial and economic crisis, then rose again in the following years of the second trading period to between 332 and 338 million tonnes of carbon dioxide per year. In the first year of the third trading period emissions reached 348 million tonnes of carbon dioxide, returning to the high levels of 2008. By 2014 the emissions no longer continued to increase. Also in 2015, emissions from large combustion plants declined, albeit less markedly than in comparison to 2013-2014: While the decline was five percent in 2013/2014, the current decrease is only 1.3 percent in 2014-2015. This shows that power generation from fossil fuels declined only slightly and heat demand increased due to the cooler weather compared to last year[3]. Since the introduction of emissions trading – apart from 2009 – large combustion plants achieved the lowest emissions level.

3 Ziesing 2016

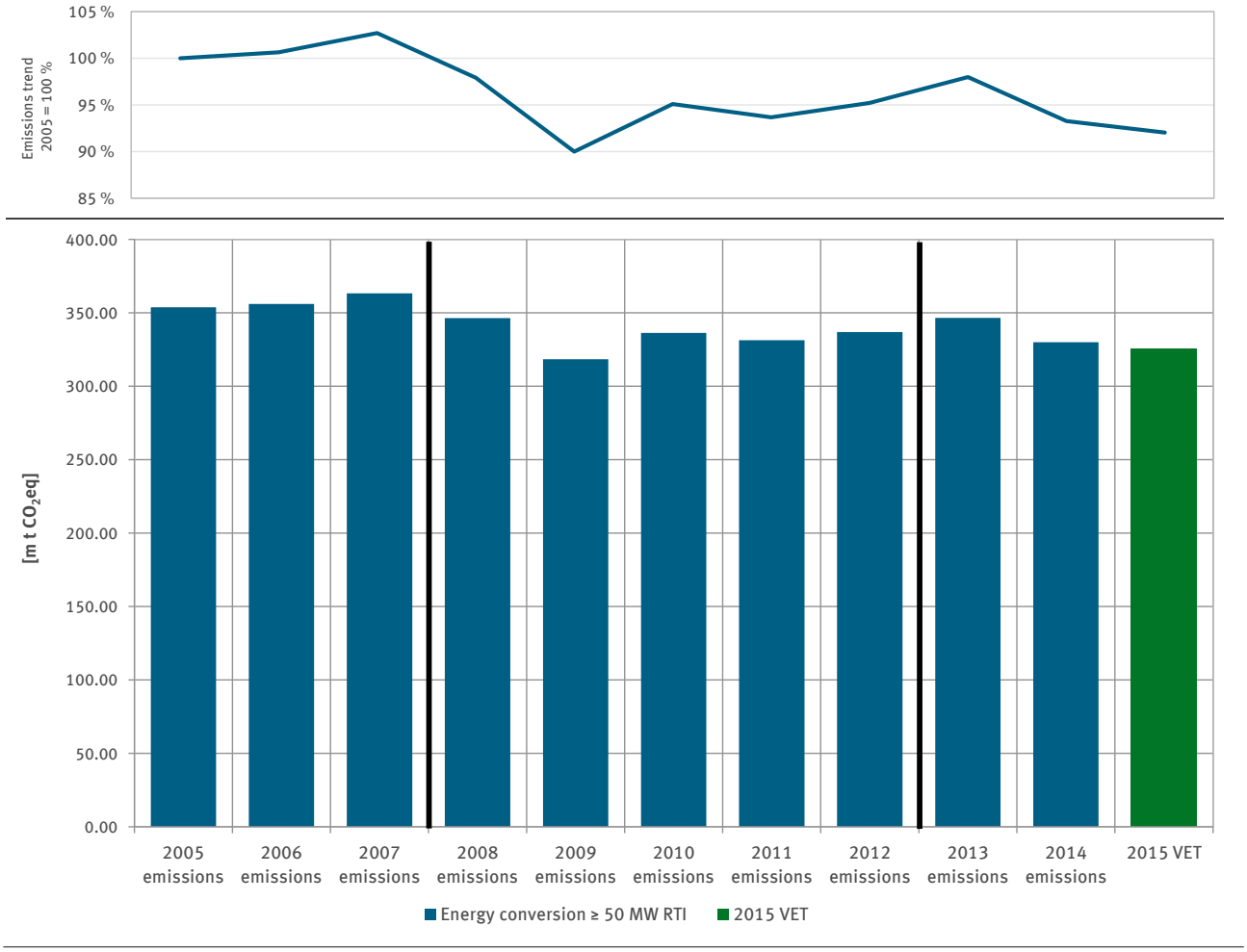

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Figure 4: Large combustion plants (Activity 2), emissions in Germany, 2005-2015

Figure 5 shows emissions from large combustion plants divided by fuels. For this purpose, large combustion plants were assigned to the fuels lignite, hard coal and natural gas according to the largest share[4] of the total energy consumption. Installations that have no "main fuel" assigned and installations that mainly use other fuels (e.g. heating oil and waste gases from iron, steel and coke production) are jointly illustrated.

While emissions from all installations that are associated with the three main fuels had significantly decreased during the previous year, this trend only continued for installations with hard coal as the main fuel 2015[5]. Emissions from these large combustion plants decreased by another 3.7 percent compared to last year[6]. Emissions from natural gas-fired installations and installations using lignite as a main fuel, only decreased minimally compared to the previous year: 0.4 percent for lignite and 0.1 percent for natural gas. In installations that are not associated with any main fuel, emissions have even increased by about one percent.

Based on 2005, the first year of emissions trading, emissions from installations that use lignite as a main fuel only decreased by roughly three percent. Emissions from installations using hard coal or natural gas as the main fuel decreased much more noticeably. Compared to 2005, the decline in the eleventh year of emissions trading amounts to nearly 15 percent for hard coal and 19 percent for natural gas.

4 In contrast, in previous VET reports the assignment to a main fuel was made, provided that more than 80 percent of the energy consumption of an installation could be associated with one fuel type.

5 The main fuel in an installation is identified for the VET report in the database of the current reporting year and consistently used for all previous years, that is, if necessary, adjusted retrospectively. If, for example, fuel input changed in an installation between 2014 and 2015 in such a way that another main fuel is assigned to the installation, this is not reflected by the VET report since the installation is associated with the 2015 main fuel for all previous years. This can lead to discrepancies between the evaluations for the VET report and the UBA/DEHSt press releases about emissions trends in German emissions trading since the assignment of installations to a main fuel in the press releases is not adjusted retrospectively.

6 The press release of 04/04/2016 described a 1-percent emission increase from hard coal (cf. UBA/DEHSt 2016). This emission increase is due to the fact that several energy installations with relatively high emissions in 2015 were associated with the main fuel „hard coal", while they still fell under „other fuels or no assignment" as the main fuel in 2014. The assignment of these installations has been adjusted for the previous years for the VET report, thus this increase is no longer recognisable in the VET report and an emission reduction results for installations with the main fuel hard coal.

Compared to 2005, emissions from installations to which no “main fuel” is assigned and installations using mainly other fuels did not change.

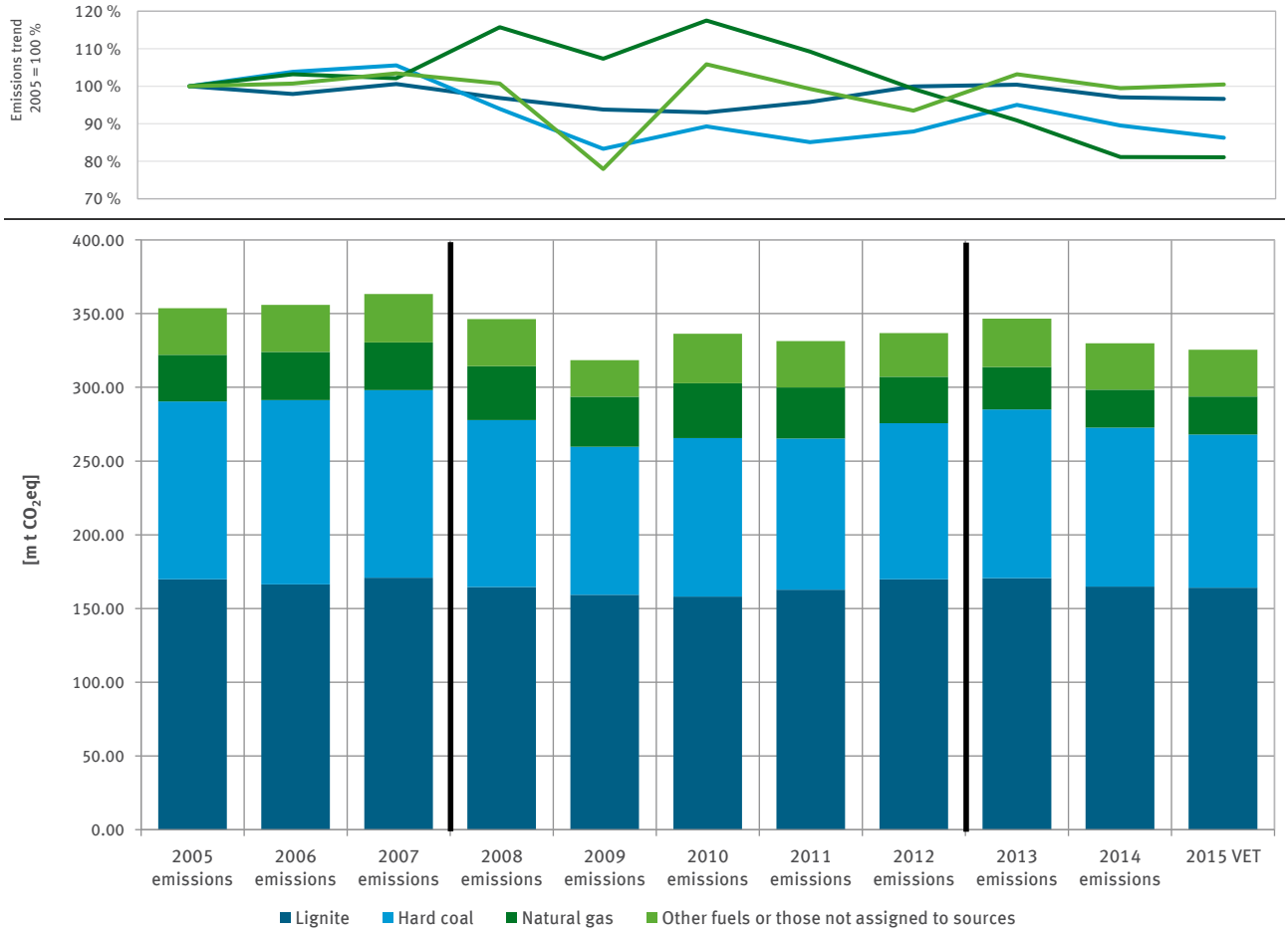

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Figure 5: Large combustion plants (Activity 2), emission trend in Germany, 2005-2014, according to fuel

The four major energy suppliers RWE, Vattenfall, E.ON and EnBW[7] are the main operators of large combustion plants. Their share of the total emissions from large combustion plants with just over 62 percent of the emissions of the activity is somewhat lower than in the previous year. Absolute emissions since 2005 are presented in Figure 6.

While emissions from the RWE Group’s installations were virtually unchanged compared to the previous year, the emissions of the three other undertakings declined, although to different degrees. The decline at Vattenfall was 1.7 percent, i.e. about the same magnitude as in the previous year. RWE’s and Vattenfall’s power generation increased compared to the previous year so that the effects of efficiency measures, or better availability of existing installations, on the total emissions trends are not clearly visible. The decrease in emissions of EnBW were less pronounced compared to 2013/2014. A 4.5-percent decline resulted from lower power generation and changes in the electrical energy mix with low-CO_2 fuels and renewable energy playing a more predominant role. The same applies to the origin of the continued highly significant drop in emissions from E.ON: their installations emitted almost 12 percent less than in the previous year.

7 In alphabetical order: E.ON AG (Düsseldorf), EnBW Energy Baden-Württemberg AG (Karlsruhe), RWE Power AG (Essen/Cologne) and Vattenfall Europe AG (Berlin). The assignment of large combustion plants to the undertakings is based on the operator information available to DEHSt. Therefore on occasion, the assignment does not take into account all large combustion plants belonging to their respective companies or not all large combustion plants which are operated by the company. Compared to the VET reports from previous years, changes may arise in the observed installations (and thus the assigned emissions) due to restructuring and sales.

Even compared to the beginning of the first trading period of emissions trading, the decrease in emissions from E.ON and EnBW is much more pronounced than that of RWE and Vattenfall. E.ON's 2015 emissions were only 60 percent of the 2005 emissions and 86 percent for EnBW and they are assumed to result largely from a restructuring in the undertakings. In contrast, emissions by RWE and Vattenfall only decreased by six and one percent respectively. This relatively low decrease may result largely from the two companies' emissions still being dominated by large lignite power plants. Nevertheless, the specific emissions from these installations have declined as a result of efficiency improvements and newly-built power plants in recent years. There is still a large amount of electricity generated from lignite in Germany; a direct comparison shows that Germany produced even more electricity from lignite in 2015 than in 2005[8].

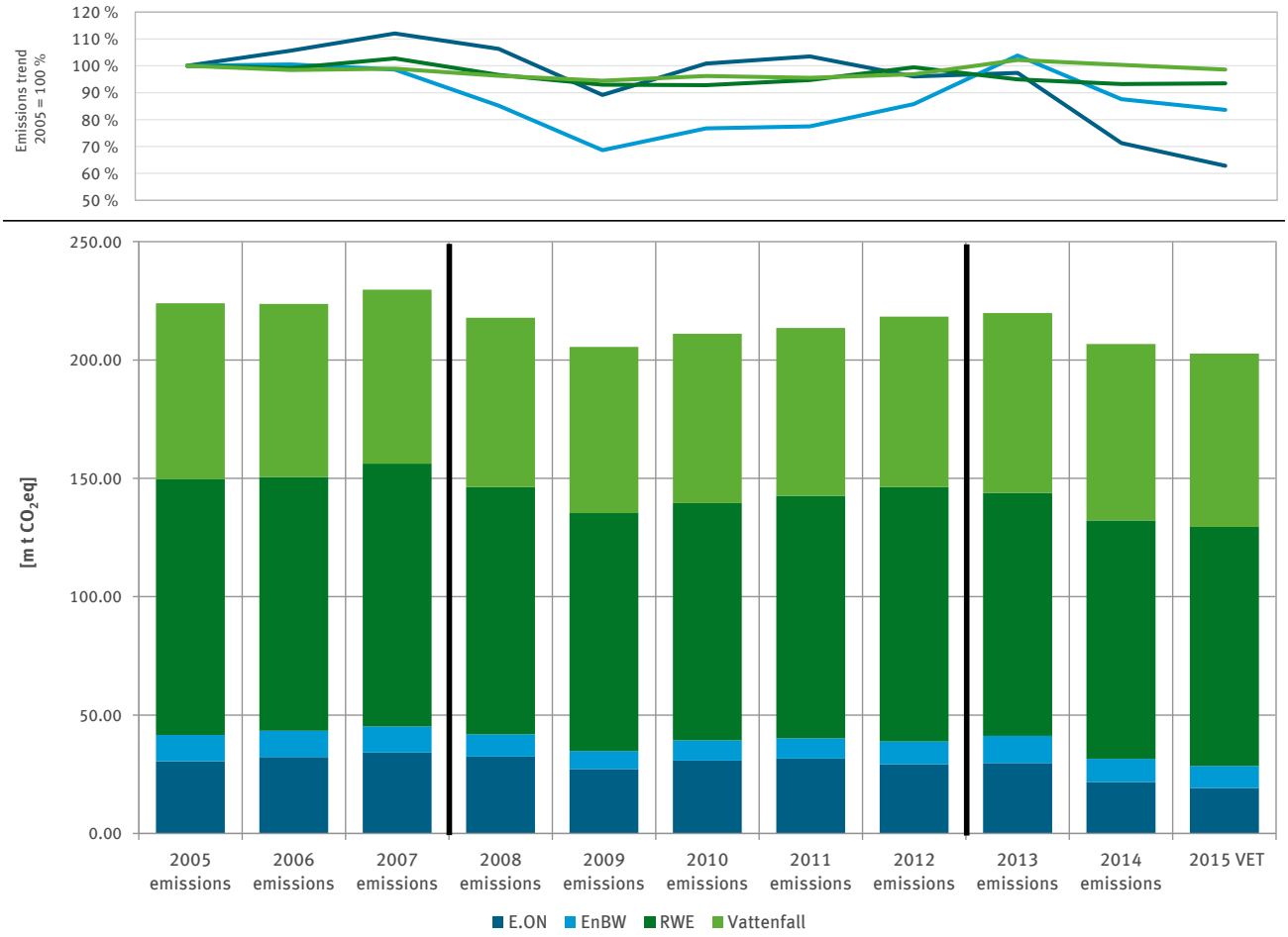

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Figure 6: Large combustion plants of four major utilities, emission trends in Germany, 2005-2015

Allocation status

In the third trading period, the free allocation for power generation was replaced by full auctioning. Thus operators of large combustion plants only received 23.4 million annual emission allowances free of charge for heat production in 2015. That only covers about seven percent of their surrender obligation for the emissions from installations (Table 4).

In the third trading period, several factors determined the low allocation rate: first, the power generation's share for which there is no free allocation is very high among the large combustion plants. Second, lignite and hard coal, i.e. high-emission fuels, are used while the allocation for heat production assumes the use of natural gas. In addition, the free allocation for energy recovery from waste gases from iron, steel and coke production goes to producers of waste gases from iron, steel and coke production while a part of the allocation for heat production does not go to the producers but to heat consumers (see Chapters 2.4, 2.7 and 2.8).

8 cf. AGEB 2016

Another effect that will continue to increase its influence over the trading period is the gradual reduction of the allocation for products without carbon leakage risk. While this reduction factor was 0.8 for the first year of the third trading period, it had dropped to 0.65 in 2015 and will further decline to 0.3 by the end of the trading period. While an almost total carbon leakage risk was assumed for free allocations to industrial installations due to EU regulations, slightly more than half of the free allocation was allocated to energy installations with no carbon leakage risk in 2013. This proportion will fall continuously and will only be about 30 percent of the total allocation for energy installations in 2020[9]. Assuming that emissions remain at the same level, allocation coverage for large combustion plants will continue to decline.

Table 4: Large combustion plants (Activity 2), number of installations, allocation amounts, VET entries and 2015 allocation coverage

No.	Activity	2015 VET vs 2015 allocation	No. of installations	2015 VET [kt CO_2eq]	2015 allocation amount	2015 allocation deviation from 2015 VET [kt CO_2eq]	Allocation coverage
2	Energy conversion ≥ 50 MW RTI	2015 VET > 2015 AA	415	323,980	21,042	-302,938	6.5 %
		2015 VET < 2015 AA	68	1,554	2,352	798	151.3 %
		2015 VET = 2015 AA	3	0	0	0	
		Comparison not possible	2	-	-	-	
Total			**488**	**325,558**	**23,398**	**-302,140**	**7.2 %**

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2.1.2 Combustion plants between 20 and 50 MW

With 422 installations, the group of energy installations between 20 and 50 MW RTI, for example smaller heating plants and heat and power plants of district heating, smaller power plants and industrial boilers, decreased on balance by seven installations compared to 2014. Eleven installations no longer take part in emissions trading, four installations newly became subject to emissions trading or were first considered as individual installations due to installation separations.

Although the number of installations is similar, Activity 3 and 4 installations caused significantly less emissions than large combustion plants. In 2015 they emitted 5.5 million tonnes of carbon dioxide, which is only 1.7 percent of the total emissions from large combustion plants. Compared to the previous year, emissions have slightly increased by 54,000 tonnes of carbon dioxide. The allocation coverage of free allocation amounts to 70 percent and is distinctly higher than that of large combustion plants.

Table 5: Overview of combustion plants 20-50 MW (Activities 3 and 4), number of installations, summary of emissions and allocation amounts

Sector/Activity	Number of installations	2014 emissions [kt CO_2eq]	2015 allocation amount [1000 EUA]	2015 VET [kt CO_2eq]	Allocation coverage
Energy conversion 20-50 MW RTI	422	5,438	3,859	5,492	70.3 %

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Emissions

Emissions increased in the majority of Activity 3 installations compared to the previous year, however about 40 percent of the installations produced less emissions. Overall this results in an increase of about one percent compared to the previous year. Emissions declined by about one percent in the much smaller group of Activity 4 installations, i.e. the installations that often use biomass or waste (Table 6).

9 DEHSt 2014a

Table 6: Combustion plants 20-50 MW (Activities 3 and 4), number of installations, 2014 emissions and 2015 VET entries

No.	Activity	2015 VET vs. 2014 emissions	No. of installations	2014 emissions [kt CO_2eq]	2015 VET [kt CO_2eq]	2015 VET deviation from 2014 emissions [kt CO_2eq]
3	Energy conversion 20-50 MW RTI	2015 VET › 2014 EM	238	2,863	3,208	346
		2015 VET ‹ 2014 EM	167	2,423	2,111	-312
		2015 VET = 2014 EM	3	0	0	0
		Comparison not possible	3	-	-	-
			411	5,286	5,341	34
4	Energy conversion 20-50 MW RTI, other fuels	2015 VET › 2014 EM	6	130	141	11
		2015 VET ‹ 2014 EM	5	23	10	-12
			11	153	151	-2
Total			**422**	**5,438**	**5,492**	**32**

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Unlike large combustion plants, many combined heat and power plants and district heating boilers belong to activity 3 and 4 installations, so that emissions depend on the weather-related heat demand. The 2015 weather, which started cooler than in the previous year, certainly had the biggest influence on the minor increase in emissions. Although 2015 was overall one of the warmest years ever recorded since 1881, the beginning of the year was particularly cool in direct comparison with 2014[10]. Figure 7 shows the time series of emission levels from the start of emissions trading for this installation group and the average degree days[11].

Compared to the first year of emissions trading, the emissions of activity 3 installations have declined by eleven percent. A comparison of the 2005 and 2015 emissions for activity 4 installations is not meaningful, since new installations[12] were added at the start of the third trading period, and the emissions of this activity approximately tripled at the start of the third trading period.

10 Ziesing 2016

11 Average of weather stations: Hamburg-Fuhlsbüttel, Düsseldorf, Berlin-Tempelhof, Dresden-Klotzsche, Frankfurt/M-Airport, München/Airport. DWD, cf. IWU 2016

12 The new installations are mainly installations subsidised by the Renewable Energy Act that were not subject to emissions trading in the first and second trading period.

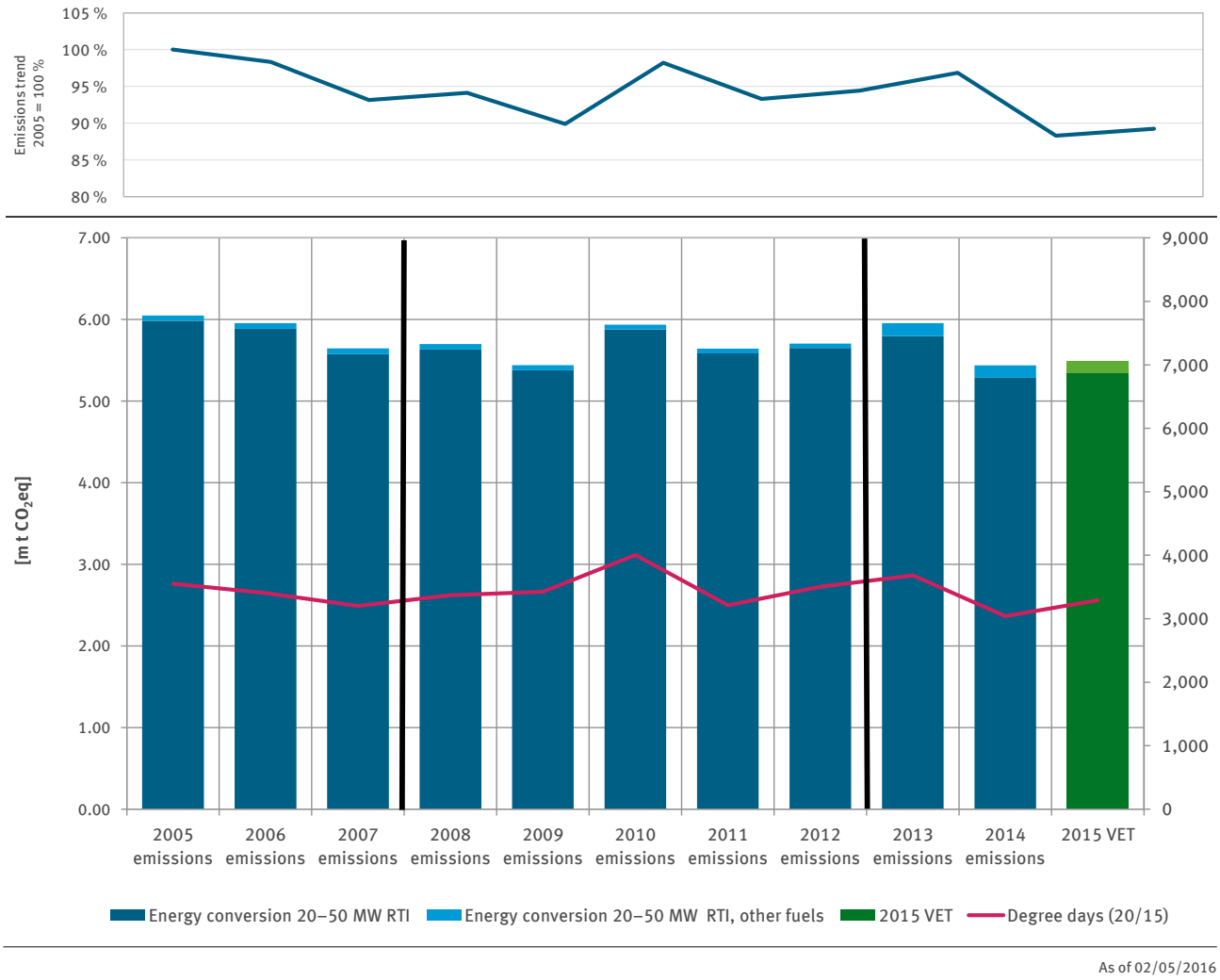

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Figure 7: Combustion plants 20-50 MW (Activities 3 and 4), emission trend in Germany, 2005-2015

Allocation status

The importance of heat production can also be seen by the allocation status of these installations. While large combustion plants only receive a free allocation for approximately seven percent of their emissions, allocation coverage of energy installations with an RTI between 20 and 50 MW is greater by a factor of ten and relates to 70 percent of their emissions. Activity 4 installations, in which biomass and fuels with biogenic components are used, have an even higher allocation coverage of 95 percent. Allocation coverage has decreased in this installation group too due to the decrease of free allocation without carbon leakage risk in comparison to the previous year.

Table 7: Combustion plants 20-50 MW (Activities 3 and 4), number of installations, allocation amounts, 2015 VET entries and allocation coverage

No.	Activity	2015 VET vs 2015 allocation	No. of installations	2015 VET [kt CO_2eq]	2015 allocation amount	2015 allocation deviation from 2015 VET [kt CO_2eq]	Allocation coverage
3	Energy conversion 20-50 MW RTI	2015 VET › 2015 AA	312	4,721	2,598	-2,123	55.0 %
		2015 VET ‹ 2015 AA	96	620	1,117	497	180.2 %
		2015 VET = 2015 AA	2	0	0	0	
		Comparison not possible	1	-	-	-	
			411	5,341	3,716	-1,625	69.6 %
4	Energy conversion 20-50 MW RTI, other fuels	2015 VET › 2015 AA	3	133	24	-109	17.8 %
		2015 VET ‹ 2015 AA	8	18	120	102	668.1 %
			11	151	144	-7	95.2 %
Total			**422**	**5,492**	**3,859**	**-1,633**	**70.3 %**

As of 02/05/2016

2.1.3 Prime movers (natural gas compressors)

There are 57 Activity 5 and 6 installations used to transport, store and process natural gas. Thus one more installation takes part in emissions trading than in the previous year. Emissions from these installations are virtually unchanged compared to last year. Free allocation covers 65 percent of emissions (see Table 8).

Table 8: Overview of prime movers (Activities 5 and 6), number of installations, summary of emission and allocation amounts

Sector/Activity	Number of installations	2014 emissions [kt CO_2eq]	2015 allocation amount [1000 EUA]	2015 VET [kt CO_2eq]	Allocation coverage
Prime movers	57	1,267	849	1,299	65.3 %

As of 02/05/2016

Emissions

Among the prime mover engines and turbines, less than 60 percent exhibit an increase and about 40 percent a reduction in the amount of emissions (Table 9). Overall, emissions increased by 33.000 tonnes of carbon dioxide.

Table 9: Prime movers (Activities 5 and 6), number of installations, 2014 emissions and 2015 VET entries

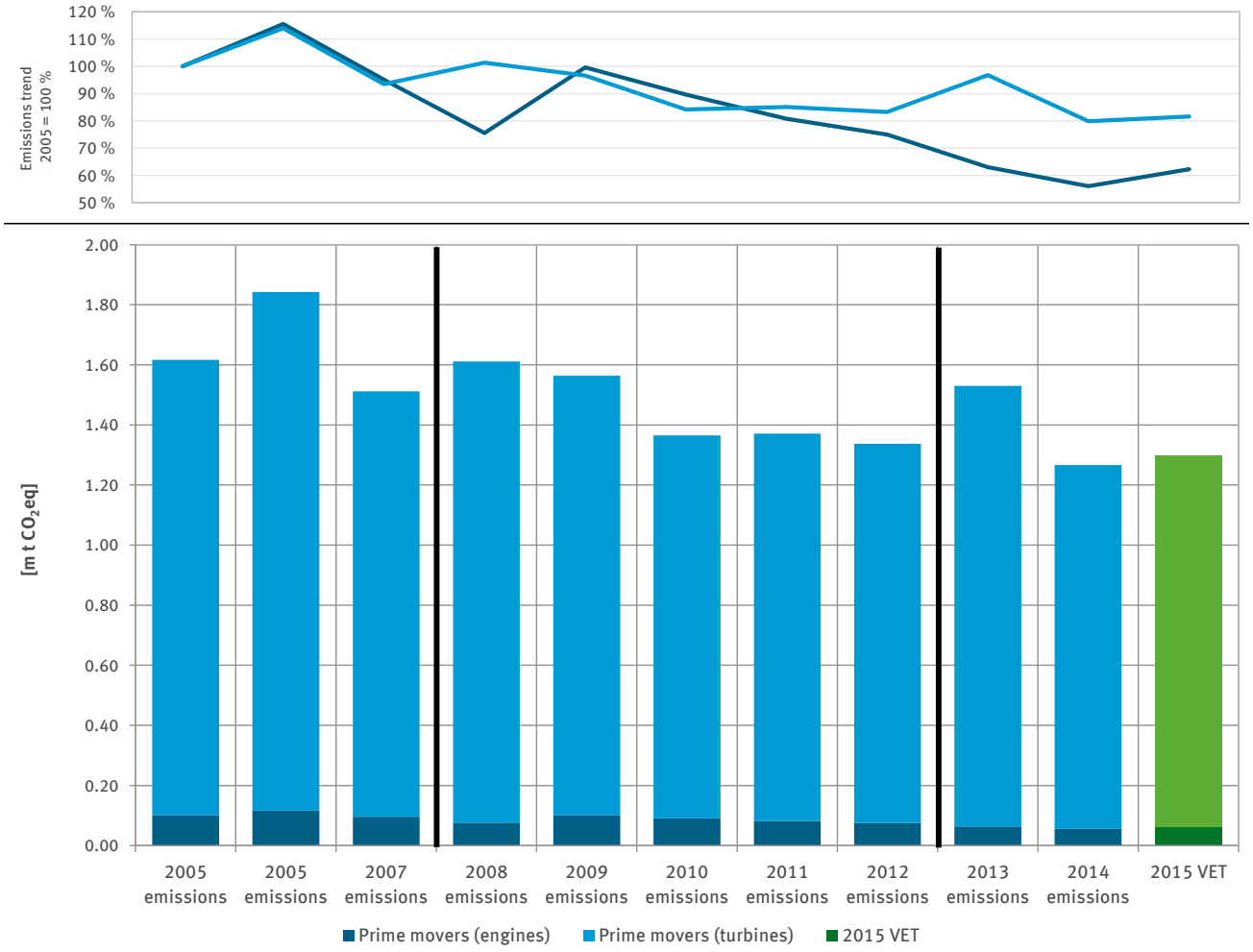
No.	Activity	2015 VET vs. 2014 emissions	No. of installa-tions	2014 emissions [kt CO_2eq]	2015 VET [kt CO_2eq]	2015 VET deviation from 2014 emissions [kt CO_2eq]
5	Prime movers (engines)	2015 VET › 2014 EM	2	48	57	9
		2015 VET ‹ 2014 EM	1	9	5	-3
			3	56	63	6
6	Prime movers (turbines)	2015 VET › 2014 EM	33	447	556	109
		2015 VET ‹ 2014 EM	21	763	680	-83
			54	1,210	1,237	26
Total			**57**	**1,267**	**1,299**	**33**

As of 02/05/2016

Figure 8 shows the emission figures from the beginning of emissions trading in 2005. Overall, emissions decreased by around 20 percent, however, as opposed to the previous year, they exceed the lowest level by far since the introduction of emissions trading. Operation of the installations depends on the conditions in the natural gas grid. Last year, natural gas consumption in Germany increased, mainly due to the somewhat cooler weather and an increase in industrial demand[13], so that transport and storage facilities had to work harder and consequently caused higher emissions.

The 2015 emissions of prime movers were significantly lower than those of 2005 (engines: 62 percent and turbines: 82 percent).

13 Ziesing 2016



As of 02/05/2016

Figure 8: Prime movers (Activities 5 and 6), emission trend in Germany, 2005-2015

Allocation status

Prime movers (engines and turbines) have mainly received a free allocation via the fuel benchmark for producing mechanical work[14]. On average, prime movers received a free allocation covering 65 percent of their emissions (Table 10), thus, allocation for these installations has also worsened compared to the previous year. In 2014, installations received a free allocation up to about 87 percent of their emissions.

14 cf. DEHSt 2014a, Chapter „Energy installations“

Table 10: Prime movers (Activities 5 and 6), number of installations, allocation amounts, 2015 VET entries and allocation coverage

No.	Activity	2015 VET vs 2015 allocation	No. of installations	2015 VET [kt CO_2eq]	2015 allocation amount	2015 allocation deviation from 2015 VET [kt CO_2eq]	Allocation coverage
5	Prime movers (engines)	2015 VET › 2015 AA	2	57	36	-21	63.0 %
		2015 VET ‹ 2015 AA	1	5	8	3	150.2 %
			3	63	44	-19	70.5 %
6	Prime movers (turbines)	2015 VET › 2015 AA	44	1,078	630	-448	58.4 %
		2015 VET ‹ 2015 AA	10	159	175	16	110.2 %
			54	1,237	805	-432	65.1 %
Total			**57**	**1,299**	**849**	**-450**	**65.3 %**

As of 02/05/2016

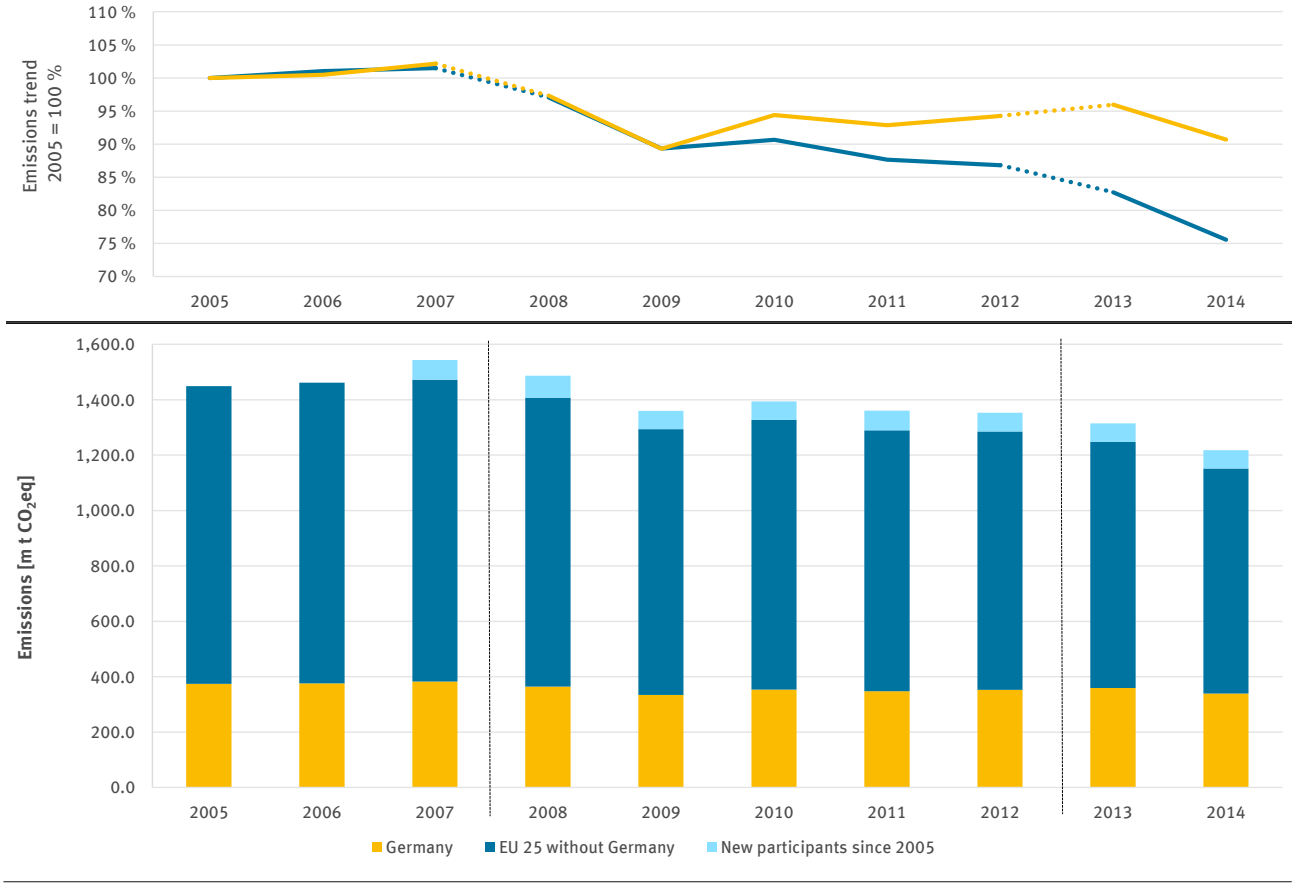
2.1.4 "Combustion" activity in the EU

Figure 9 shows an overview of the EU-wide emissions trend from the activity "combustion"[15] since the start of emissions trading. It differentiates between the emissions trend of German activity 1-6 installations (Appendix 1 TEHG), the emissions trend in other Member States who have participated since the beginning of the emissions trading scheme and those participants who only joined emissions trading after 2005.

Until the financial and economic crisis, the emissions trends between German and EU installations, to which combustion activity is assigned, correspond very well. The emissions reached their highest level in 2007 since the introduction of emissions trading, then they fell very significantly during the economic crisis. But from 2010, the trends are diverging: emissions of German installations rose again from 2010 and only started to decrease in 2013. In contrast, the average emissions of all other Member States – apart from a slight increase in 2010 – have steadily decreased. Compared to the first year of emissions trading, German installations to which combustion activity is assigned, still reached 91 percent of the 2005 emissions in 2014. The emission level from other Member State installations is down to 76 percent of the 2005 emissions.

In 2014, the share of German installations with combustion activity represents around 28 percent of the total EU emissions due to this activity.

15 In contrast to the German scope of emissions trading, which differentiates between six different „combustion activities" in Annex 1 TEHG, only the activity „combustion" is used at EU level. It summarises all energy installations and all other combustion activities in accordance with Annex 1 EHRL.



As of 02/05/2016

Figure 9: 2005 to 2014 emissions trend of combustion and energy (Registry Activity 20) in Germany and the EU[16]

2.2 Other combustion

Slightly more than 70 installations with a minimum rated thermal input of 20 MW have been subject to emissions trading since 2013 due to the broader definition of "combustion" and have been recorded under Activity 1. This section only covers those 44 Activity 1 installations that are not assigned to other industries in this report. In addition to process heaters, this installation group includes asphalt mixing plants and test rigs for turbines or engines for example. Compared to the previous year, one new installation has been added.

Table 11 shows the data framework of this group where installations emitted a total of 581,000 tonnes of carbon dioxide and still have about 91 percent allocation coverage of their actual emissions.

Table 11: Overview of other combustion plants (Activity 1), number of installations, summary of emission and allocation amounts

Sector/Activity	Number of installations	2014 emissions [kt CO_2eq]	2015 allocation amount [1000 EUA]	2015 VET [kt CO_2eq]	Allocation coverage
Other combustion plants	44	609	530	581	91.2 %

As of 02/05/2016

16 Data source: EEA 2015; The evaluation is based on a summary of the installations by activities in EU Union Registry (cf. Table 55, Section 7), thereby differences can occur in the emission amounts per sector for Germany. New post-2005 participants in the EU ETS are Bulgaria, Croatia, Iceland, Liechtenstein, Norway and Romania.

Emissions

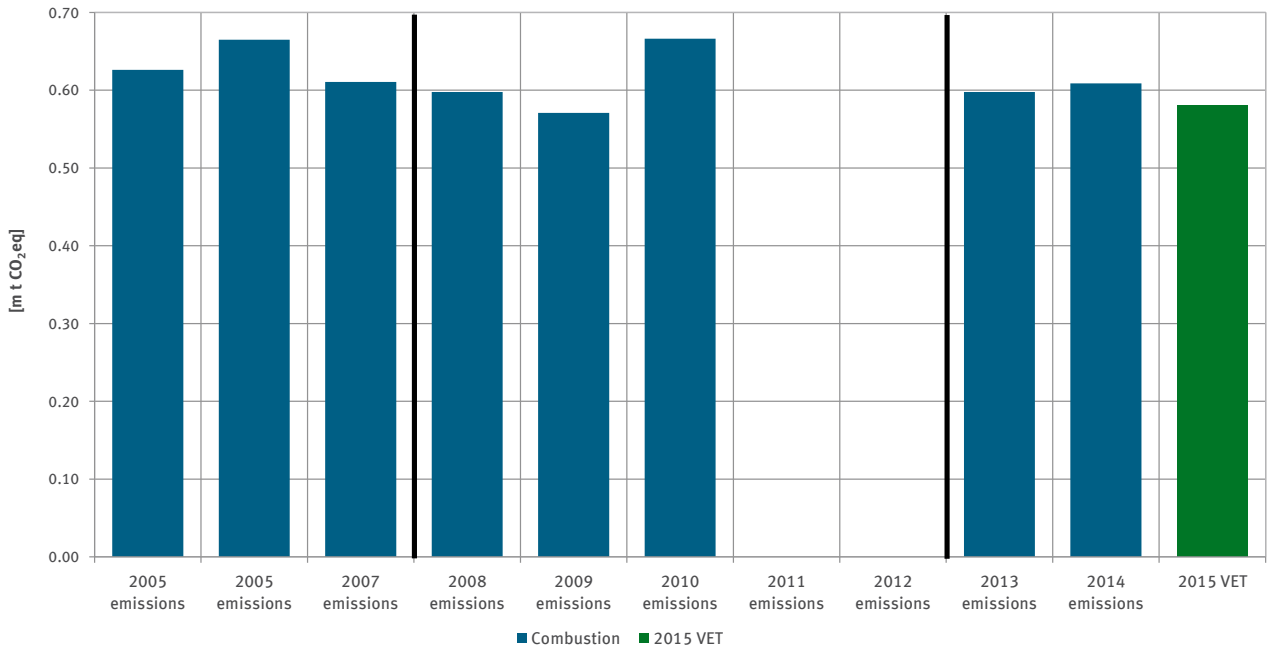
The numbers of other combustion plants with higher or lower emissions compared to 2014 broadly even out (see Table 12). The balance for all installations in the group yields an overall emission decrease of 4.5 percent over the previous year.

Table 12: Other combustion plants (Activity 1), number of installations, 2014 emissions and 2015 VET entries

No.	Activity	2015 VET vs. 2014 emissions	No. of installa-tions	2014 emissions [kt CO_2eq]	2015 VET [kt CO_2eq]	2015 VET deviation from 2014 emissions [kt CO_2eq]
1	Combustion	2015 VET › 2014 EM	19	145	162	17
		2015 VET ‹ 2014 EM	21	460	419	-41
		2015 VET = 2014 EM	2	0	0	0
		Comparison not possible	2	-	-	-
Total			**44**	**609**	**581**	**-24**

As of 02/05/2016

Figure 10 shows the emission trend since 2005. These installations have only participated in emissions trading since 2013, therefore the 2005 to 2010 figures are historic data reported by the operators in the allocation process. The installation group is very varied so that no general conclusions can be drawn from the emission data.



As of 02/05/2016

Figure 10: Other combustion plants (Activity 1), emission trend in Germany, 2005-2015

Allocation status

This group as a whole still achieved a high offset using the free emission allowances equivalent to about 91 percent. However, the allocation status for the individual installations is very different: allowances must be purchased for the majority of installations. The average allocation coverage for these installations is less than 49 percent. In contrast, 14 installations received about 132,000 allowances more than needed to offset their emissions[17]. This corresponds to an average allocation coverage of about 160 percent.

Compared to the previous years, the allocation coverage has decreased. In 2013 and 2014, it was still at almost 105 and 98 percent for this group.

Table 13: Other combustion plants (Activity 1), number of installations, allocation amounts, 2015 VET entries and allocation coverage

No.	Activity	2015 VET vs 2015 allocation	No. of installations	2015 VET [kt CO_2eq]	2015 allocation amount	2015 allocation deviation from 2015 VET [kt CO_2eq]	Allocation coverage
1	Combustion	2015 VET › 2015 AA	27	358	174	-184	48.7 %
		2015 VET ‹ 2015 AA	14	223	355	132	159.4 %
		2015 VET = 2015 AA	1	0	0	0	
		Comparison not possible	2	-	-	-	
Total			**44**	**581**	**530**	**-51**	**91.2 %**

As of 02/05/2016

2.3 Refineries

In 2015, 24 installations belonged to refineries (Activity 7 in Annex 1 TEHG). This still included Wilhelmshaven refinery that ceased its refinery operation in 2013 and only continues to operate as a terminal. This installation reported very low emissions for the past years and has not received any allocation since 2013.

Total 2015 emissions only slightly decreased by 0.4 percent from 25.0 million to 24.9 million tonnes of carbon dioxide compared to 2014 (see Table 14).

The free allocation failed, as in 2014, to fully cover the emissions subject to surrender and was around 5 million emission allowances, or about 19 percent below the amount required to meet the surrender liability.

Table 14: Overview of refineries (Activity 7), number of installations, summary of emissions and allocation amounts

Sector/Activity	Number of installations	2014 emissions [kt CO_2eq]	2015 allocation amount [1000 EUA]	2015 VET [kt CO_2eq]	Allocation coverage
Refineries	24	24,985	20,211	24,886	81.2 %

As of 02/05/2016

17 The majority of these installations are engine test benches whose emissions are subject to large fluctuations from year to year due to an irregular use.

Emissions

Table 15 shows a comparison of the 2014 emissions and the 2015 VET entries. Here, the extent of valid installations in the third trading period was used for both years so that the refinery power plants covered by the uniform installation regulations were also included.

Carbon dioxide emissions from refineries decreased by a total of 99,000 tonnes, or 0.4 percent, compared to the previous year. Specifically, there are twelve installations where emissions increased by 973,000 tonnes, or seven percent, and twelve installations where emissions declined by about 1.1 million tonnes, or nine percent.

In recent years, a steady decline in emissions was recorded in the industry. This is likely to be due mainly to the steady decline in German gross refinery production in 2008. In 2015, emissions have also declined slightly, although the gross refinery production increased by 2.2 percent compared to last year[18].

The cause of a slight decrease in emissions despite increasing production may be the use of an altered fuel mix using lower-emission fuels.

Table 15: Refineries (Activity 7), number of installations, 2014 emissions and 2015 VET entries

No.	Activity	2015 VET vs. 2014 emissions	No. of installations	2014 emissions [kt CO_2eq]	2015 VET [kt CO_2eq]	2015 VET deviation from 2014 emissions [kt CO_2eq]
7	Refineries	2015 VET › 2014 EM	12	13,246	14,219	973
		2015 VET ‹ 2014 EM	12	11,739	10,667	-1,072
Total			**24**	**24,985**	**24,886**	**-99**

As of 02/05/2016

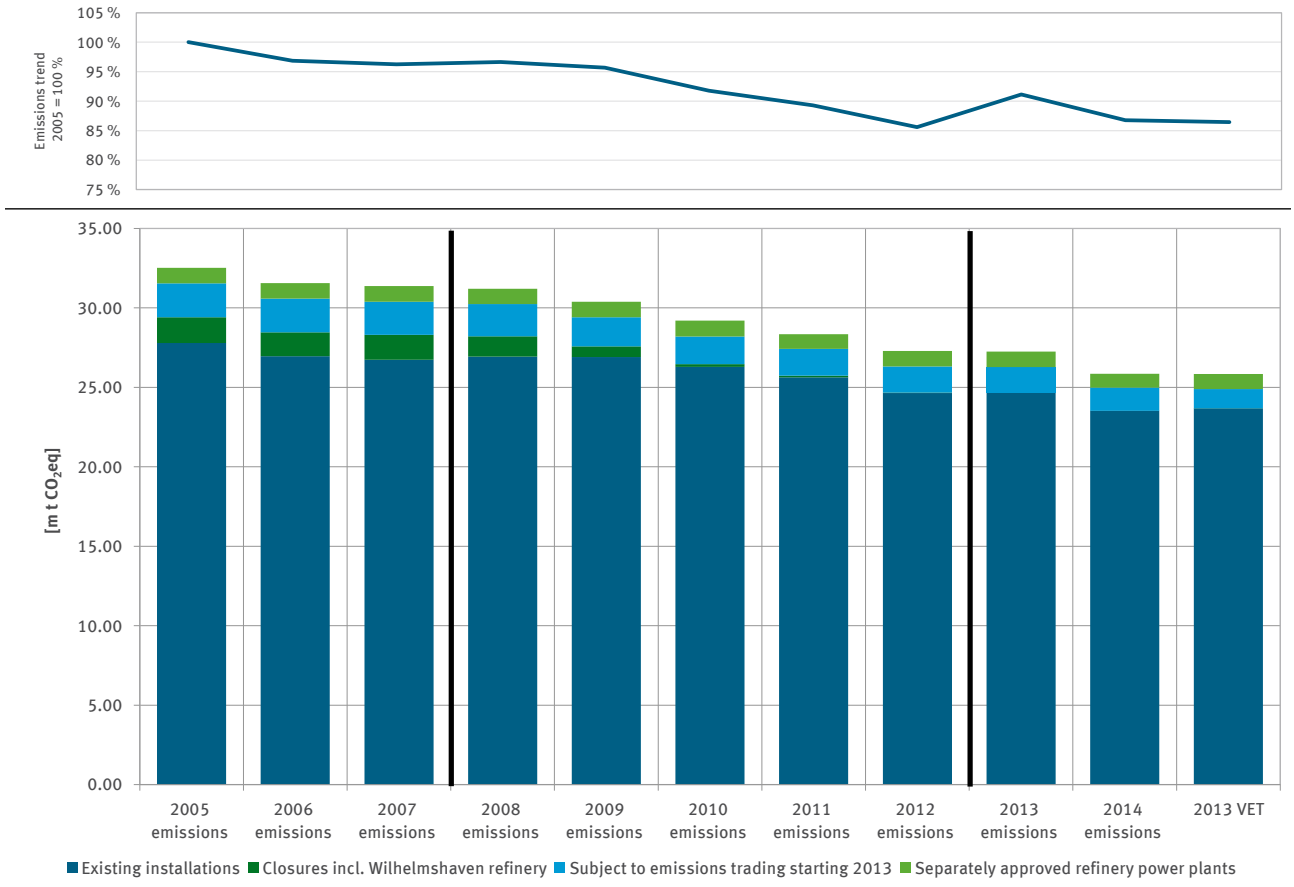
Installations may often be assigned to one of the sector's big corporations. The major operators are grouped here according to their names without any reference to their economic interrelations. The largest emitter is the Ruhr Oel GmbH with 4.4 million tonnes of carbon dioxide from two installations. It is followed by PCK Schwedt with more than 3.5 million tonnes from one installation and Shell with slightly less than 3.5 million tonnes of carbon dioxide from three installations.

Figure 11 shows the emissions from refineries as well as the Leuna and Salzbergen refinery power plants separately approved (Activity 2) for 2005-2015. 2005-2010 emission figures for the new installation added in 2013 are available from the allocation procedure, data for the 2011-2012 emissions were estimated using linear interpolation. Emissions from all refinery power plants jointly approved with the refinery since 2013, or those refineries recorded as uniform installations in emissions trading since 2013, are also shown in Figure 11 for 2005-2012, in order to obtain a consistent time series retrospective to 2005[19].

The time series shows that the trend of decreasing carbon dioxide emissions did not continue in 2015 because the emissions have remained largely at the same level as in 2014. Thus, the carbon dioxide emissions in the sector show a similar constant trend as in the 2006-2008 and 2012-2013 periods.

18 cf. Bafa 2016

19 cf. DEHSt 2014b, Chapter 3.3 "Refineries"



As of 02/05/2016

Figure 11: Refineries (Activity 7), emission trend in Germany, 2005 to 2015, allocation status

Figure 12 shows the carbon dioxide emission trend of the registry Activity 21 refineries in Germany and in the EU. The transitions between trading periods are illustrated by a dotted line because the emissions between the trading periods are not directly comparable, especially in Germany.

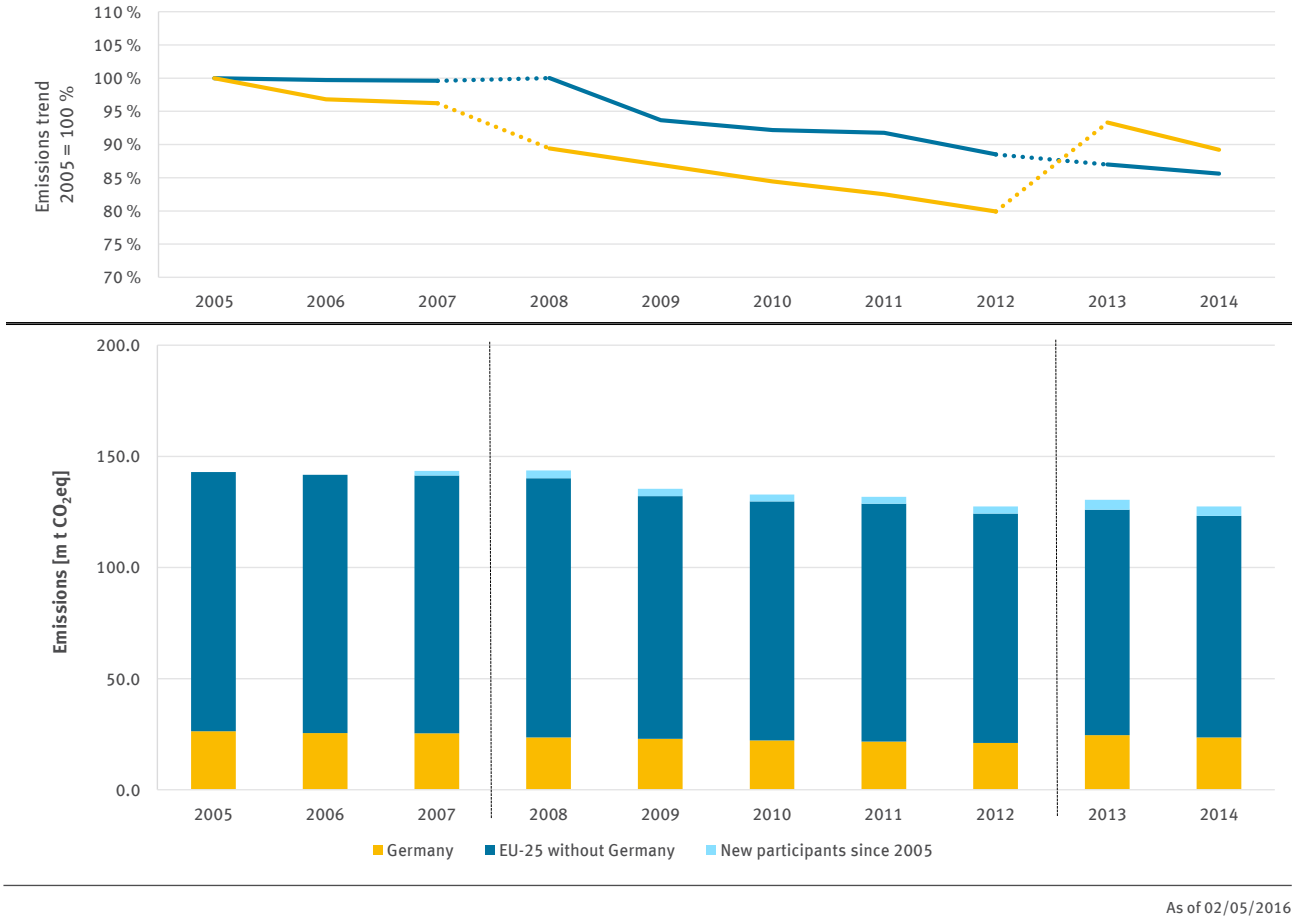


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Figure 12: Emission trend of the refineries (registry Activity 21) in Germany and in the EU, 2005 to 2014[20]

The higher level of emissions from the refineries in Germany after 2013 can be attributed in particular to the mandatory establishment of a so-called unified installation from the third trading period according to §§ 29 (3) of the 2020 Allocation Ordinance, as well as to an additional installation in 2013. Nothing in particular in the average of other EU-25 States suggests that there have been any significant changes in the application scope during the transition into the third trading period.

The trend of decreasing emissions can be seen in both the German refineries and all of the EU countries. In addition to declining production – at least in Germany – this trend can also be traced back to the exclusion of installations from emissions trading.

Allocation status

Among the affected industrial sectors, refineries are hard hit by the discontinuation of the free allocation for power generation in the third trading period because of their associated power plants. Unlike other sectors, refineries are compelled by § 29 (3) of the 2020 Allocation Ordinance to report their emissions together with the power stations of the same operator, even if these are approved separately. This results in a seemingly general shortfall for refineries. In the majority of installations – 19 out of 24 – free emission allowances allocated in 2015 covered on average 74.7 percent of the emissions subject to surrender (Table 16). They covered around 77 percent in the previous year. As a result, the additional shortfall of installations that could not cover their emissions through free allocation in 2014 has further increased.

Five installations continued to receive a higher allocation than they needed for surrender. Three of these higher allocated installations are supplied by other operators' power plants. Compared to 17 percent in 2014, this surplus allocation amounted to 717,000 emission allowances or 20.3 percent in 2015.

20 Data source: 2015 EEA. The evaluation is based on a summary of the installations according to the activities in the EU Union Registry (see Table 55, Section 7). This can lead to differences in the emission amount per sector in Germany. Bulgaria, Iceland, Croatia, Liechtenstein, Norway and Romania have been new participants in the EU ETS since 2005.

Table 16: Refineries (Activity 7), number of installations, allocation amounts, VET entries and allocation coverage in 2015

No.	Activity	2015 VET vs 2015 allocation	No. of installations	2015 VET [kt CO_2eq]	2015 allocation amount	2015 allocation deviation from 2015 VET [kt CO_2eq]	Allocation coverage
7	Refineries	2015 VET › 2015 AA	19	21,347	15,954	-5,393	74.7 %
		2015 VET ‹ 2015 AA	5	3,539	4,256	717	120.3 %
Total			**24**	**24,886**	**20,211**	**-4,676**	**81.2 %**

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Thus, the sector had an additional shortfall in 2015, just as in 2014. This amounts to 4.7 million emission allowances (19 percent of the emissions) and is slightly higher than in 2014, when the additional shortfall decreased to around 4 million emission allowances or 16 percent.

2.4 Iron and steel industry including coking plants

The iron and steel industry includes Activities 8 to 11, as well as an Activity 1 installation[21] as per TEHG, which means a total of 127 installations subject to emissions trading in Germany. Compared to 2014, the number of installations increased in Activity 10 by one new installation and operation was discontinued in one Activity 11 installation.

Activities 8 (coke plants), 9 (metal ore processing, i.e. sinter plants) and 10 (pig iron and steel production) are considered as grouped together because a separate evaluation of these activities would be incomplete. This is mainly because iron and steel industry installations have the possibility to establish “unified installations” according to § 24 TEHG for independently approved installations as well. In these cases, the various activities are combined in one installation and, unlike installations performing one activity, cannot be presented or evaluated separately.

Table 17 shows the emissions for 2014 and 2015 and the allocation amounts for 2015. The data of the 2015 allocation amount and allocation coverage (2015 allocation amount compared to 2015 VET) takes into account that iron and steel industry installations generate waste gases from iron, steel and coke production (blast furnace, converter and coke oven gas) and also receive a free allocation for the use of waste gases from iron steel and coke production, even though potential emissions resulting from the transfer of these gases to other installations are not released by the producer of waste gases from iron, steel and coke production. It is assumed that waste gas generating installations of the iron and steel industry pass emission allowances to the power plants that use them. The estimated transfer for 2015 amounts to about 16.3 million emission allowances (see pp. 46 for explanation of the estimation method).

Thus, the “adjusted” allocation coverage is 89.6 percent. This means that the iron and steel industry must purchase roughly an additional ten percent of their required allowances or use the surplus from the second trading period. The supply accumulated since 2008 outlined in section 3.1 of this report indicates there are sufficient available certificates for 2015.

Table 17: Overview of the iron and steel industry (Activities 8 to 11 and 1), number of installations, summary of emission and allocation amounts

Sector/Activity	Number of installations	2014 emissions [kt CO_2eq]	2015 allocation amount [1000 EUA]	2015 VET [kt CO_2eq]	Allocation coverage
Iron and steel	127	36,364	33,241	37,081	89.6 %

*Adjusted for the estimated allocation amount for transferred waste gases from iron, steel and coke production
As of 02/05/2016

21 This is an independently approved grinding and drying installation for coal, which is part of the pig iron production process.

The nominal allocation without the previously described adjustment amounts to 44 million emission allowances. The nominal supply for the entire action field therefore amounts to 133.6 percent.

Emissions

Table 18 differentiates the trend in emissions compared to the previous year. The collective emissions from Activities 8 to 10 increased by 0.9 million tonnes of carbon dioxide, i.e. by 2.9 percent compared to the previous year, even though the production of crude steel decreased by 0.6 percent compared to 2014. Emissions from blast furnaces producing oxygen steel (including Activities 8 and 9) increased by 1.0 million tonnes of carbon dioxide (3.4 percent) compared to 2014. The production of oxygen steel also increased, but only by 0.6 percent[22]. The decrease of 3.4 percent in electric steel production, which is accompanied by a decrease of 5.1 percent (75,000 tonnes of carbon dioxide) in emissions from electric steel production, is insignificant when comparing the emissions. This is because the emissions of oxygen steel production, including the emissions from Activities 8 and 9, dominate the emissions from crude steel production in Germany, by more than 95 percent.

The data indicates an increase in the intensity of crude steel production emissions. This might point to a change in fuel mix, i.e. a comparatively higher input of high-emission fuels. A further cause could be changes in the quality of raw materials (ores). In principle, an increased self-production of emission-intensive intermediate products (e.g. coke or sintered ore) could also contribute to the emission trend if they had been imported in larger volumes from abroad in previous years.

Emissions from ferrous metal processing (Activity 11) decreased slightly by 174,000 tonnes.

Table 18: Iron and steel industry (Activities 8 to 11 and 1), number of installations, 2014 emissions and 2015 VET entries

No.	Activity	2015 VET vs. 2014 emissions	No. of installations	2014 emissions [kt CO_2eq]	2015 VET [kt CO_2eq]	2015 VET deviation from 2014 emissions [kt CO_2eq]
8, 9, 10	Pig iron and crude steel production*	2015 VET > 2014 EM	19	24,453	25,742	1,288
		2015 VET < 2014 EM	18	6,427	6,038	-388
			37	30,880	31,780	900
11	Ferrous metal processing	2015 VET > 2014 EM	28	1,656	1,779	123
		2015 VET < 2014 EM	61	3,758	3,461	-297
			89	5,415	5,240	-174
1	Combustion	2015 VET > 2014 EM	1	69	60	-9
			1	69	60	-9
Total			**127**	**36,364**	**37,081**	**717**

*Coke ovens, metal ore processing, pig iron and steel production
As of 02/05/2016

Figure 13 shows the historical emissions trend since the start of the EU ETS in 2005. The blue bars illustrate the existing installations in accordance with the scope of the second trading period[23]. The green bars additionally represent the estimated historical emissions from 2005 to 2012 from the installations, which, from 2013 onwards, were newly incorporated in the Emissions Trading Scheme (as installations of Activity 11). In this context, 81 new installations were added to the ten installations for ferrous metal processing, which had already been subject to emissions trading in the second trading period (see DEHSt 2014b).

22 see DBSV 2016: Steel scrap balance 2015: Steel recycling industry looks back on a difficult year

23 Changes in the scope with regard to the first trading period were not retrospectively corrected for the second trading period scope. This means that for 2005-2007 the blue bars represent the current emissions of the application scope of the first trading period. However, there was no substantial extension of the application scope with regard to the emissions between these periods.

The total emissions – analogous to the respective economic development – increased during the first trading period and declined during the second trading period. However, a distinct, clear trend for a reduction in emission intensity has not been seen so far. Rather, there are many indications that the emission intensity has currently increased again.

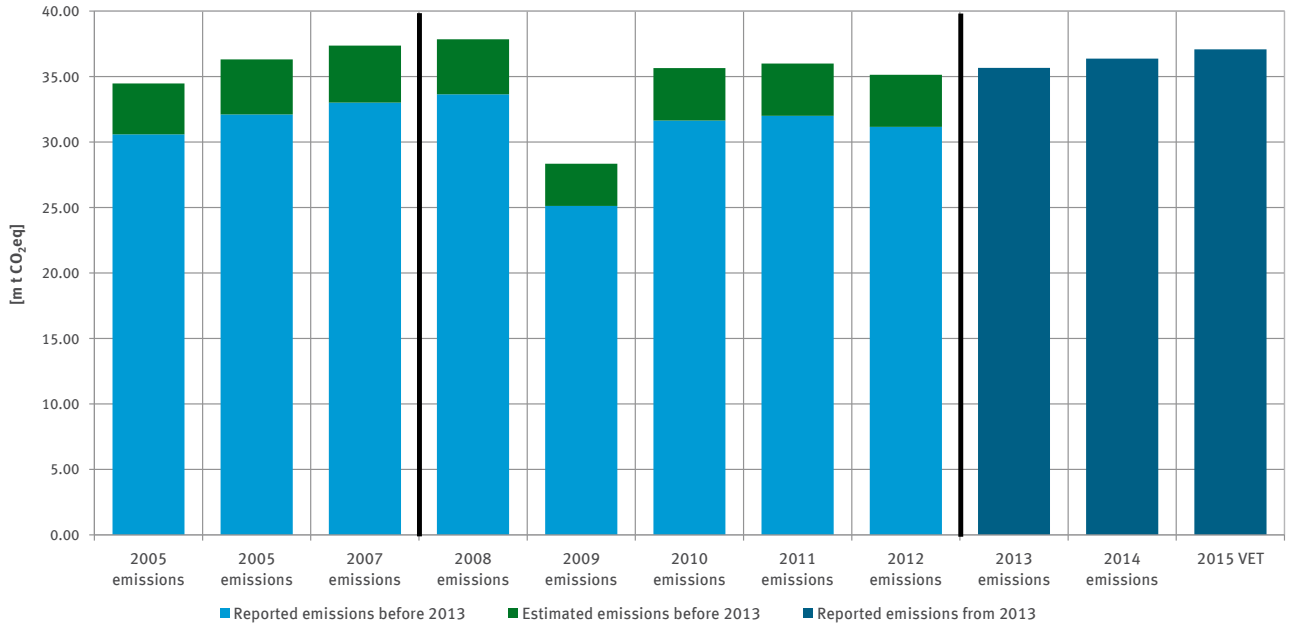

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Figure 13: Iron and steel industry (Activities 8 to 11 and 1), emission trend in Germany, 2005 to 2015

Figure 14 shows the historical emission trend for both the EU and Germany. The dark blue segments represent the EU 25 (without Germany). The light blue segments in the figure below indicate the emissions of States that entered the EU ETS at different times. The figure illustrates that EU-wide emissions significantly decreased since 2008, while emissions in Germany decreased very little compared to 2008 and remained almost constant since 2010[24]. The main cause at an EU level is the noticeably decreased iron and steel production – crude steel production decreased from 198 million tonnes in 2008 to 166 million tonnes in 2015, while the same production decreased in Germany from 45.8 million tonnes (2008) to 42.7 million tonnes (2015)[25]. This caused an increase of the German share in the total EU emissions of the sector (Figure below).

24 Unlike Figure 13, which includes the estimated emissions for the first and second trading periods, Figure 14 shows the emissions of the new Activity 11 only from 2013 onwards.

25 see WSA 2016

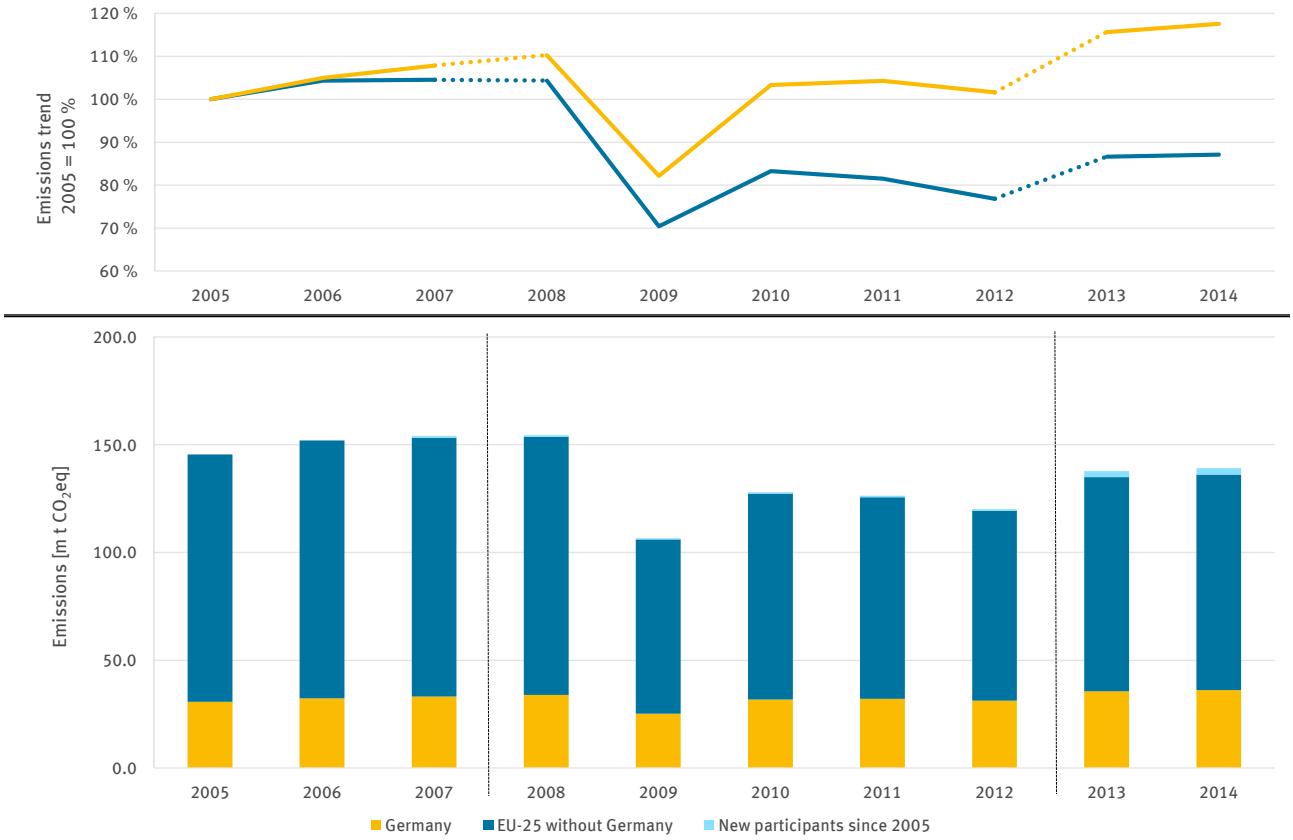

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Figure 14: Emission trend of the iron and steel industry (registry Activity 23 to 25) in Germany and in the EU, 2005 to 2014[26]

Transfer of waste gases from iron, steel and coke production

Characteristic of the "iron and steel" sector is the transfer of waste gases from iron, steel and coke production (blast furnace, converter and coke oven gas; see above pp. 41 f). In 2015 the transfer of waste gases resulted in emissions amounting to around 27 million tonnes of carbon dioxide (see Table 19).

Table 19: Transferred waste gases from the iron and steel industry 2015 – generated in Activities 8 and 10

Transfer to [kt CO_2 eq/a]					Total [kt CO_2eq/a]
Iron and steel production installations (Activities 8 and 10)*	Ferrous metal production and combustion installations (Activities 11 and 1)	Energy installations	Refineries	Non-ETS installations**	
3,813	1,318	21,863	140	140	27,274

* Emission amounts that leave the installation borders, but remain within Activities 8 to 10
**The actual transferred amount totals 178,369 tonnes of carbon dioxide equivalent, of which 38,211 tonnes are inherent carbon dioxide.
As of 02/05/2016

Around 3.8 million tonnes of carbon dioxide were transferred within and between Activities 8 to 10 (emission amounts that leave the installation borders, but remain within Activities 8 to 10). The transfers from these installations to processing installations (Activity 11) amount to 1.3 million tonnes of carbon dioxide. The majority of the remaining transfers went to energy installations (around 21.9 million tonnes of carbon dioxide, compared to 21.8 million in the previous year).

26 Data source: EEA 2015; The evaluation is based on a summary of the installations according to the activities in the EU Union Registry (see Table 55, Section 7). This can lead to differences in the emission amount per sector in Germany. Bulgaria, Iceland, Croatia, Liechtenstein, Norway and Romania have been new participants in the EU ETS since 2005.

When the transfer is to installations not subject to emissions trading, the waste gas generating installation must surrender emission allowances for the inherent share of waste gases from iron, steel and coke production, i.e. for the amount of carbon dioxide that cannot be used for energy production. This amount had already been subtracted from the total transferred amount in Table 19. When the transfer is to installations subject to emissions trading, installations using the waste gases from iron, steel and coke production must surrender emissions allowances for the entire amount of transferred carbon dioxide equivalents.

Allocation status

Table 20 compares the allocation status of the previous year and differentiates between pig iron and crude steel production on one hand, and ferrous metal processing (Activity 11) on the other. This means that Activities 8 (coke plants), 9 (metal ore processing, i.e. sinter plants) and 10 (pig iron and crude steel production) are combined. This is because blast furnace route producing emissions (oxygen steel production) installations are particularly strongly interlinked in terms of authorisation law. Thus, the installations – subject to authorisation or through the establishment of "unified installations" in accordance with §§ 24 TEHG, 29 (3) of the 2020 Allocation Ordinance – partially include both pig iron and steel production as well as coke and sinter plants, which is why the available emission data is not specific for each Activity. In other cases, coke and sinter plants participate in the EU ETS as separate installations. Additionally, waste gases from iron, steel and coke production are transferred between Activities. Due to the different system boundaries, separate allocations would therefore result in a strongly distorted image of the allocation coverage, which would be significantly influenced by the allocations in individual cases[27].

Table 20 shows the nominal allocation amounts and allowance supplies. Overall, the nominal allocation amounts to 44 million emission allowances, setting the nominal allocation coverage at 133.6 percent. However, the general premise in relation to the transfer of waste gases for iron, steel and coke production assumes that waste gas producing installations of the iron and steel industry transfer emissions allowances to energy installations using waste gases. Producers receive an allocation for emissions from waste gases from iron, steel and coke production that occur in excess to the reference fuel natural gas. The benchmark also takes an "inefficiency surcharge" into account, which shows the generally lower efficiency in the energetic use of waste gases from iron, steel and coke production compared to the use of natural gas to produce electricity or heat. The number of transferred emission allowances can be estimated based on the actually transferred volumes of waste gases from iron, steel and coke production. For 2015, the amount of waste gas from iron, steel and coke production transferred to energy installations corresponds to emissions of 21.9 million tonnes of carbon dioxide. The estimated amount of transferred emission allowances corresponds to the emission amount from the transferred waste gases from iron, steel and coke production, which, compared to natural gas, incurred the extra "inefficiency surcharge"[28]. Thus, the 2015 amount of emission allowances transferred to energy installations can be estimated at about 16.3 million allowances. This results in an adjusted allocation amount of about 33 million emission allowances and an adjusted allocation coverage of about 89.6 percent. This means that the iron and steel industry must additionally purchase about ten percent of its required allowances, or can cover them with the surplus from the second trading period.

The evaluation of the allocation coverage of the iron and steel industry must also take into account that a large amount of waste gases from iron, steel and coke production is used to generate electricity. According to the allocation principle in the third trading period, free allocations are no longer granted for electricity production. This means that a part of the shortfall can be attributed to this principle: electricity production from waste gases receives a free allocation only to the extent of which its generated emissions are higher than those from electricity production from natural gas (which no longer receive the free allocation)[29]. The operator that in turn uses the produced electricity for sinter, coke, iron and steel production receives compensation for the additional costs arising from the assumed transfer of CO_2 costs in the electricity price.

27 A few Activity 10 installations include procedural steps for crude iron processing which would be assigned to Activity 11 "Ferrous metal processing" if they were conducted as individual installations.

28 see DEHSt 2014a,"Iron and steel industry" chapter

29 see DEHSt 2014a, "Iron and steel industry" chapter: Residual gases have a special feature when it comes to free allocation, which results from the requirements of the Emissions Trading Directive: as an exception, the production of electricity from residual gases receives a free allocation, unlike electricity production from other fuels. These rules are supposed to ensure that emissions trading does not suppress or prevent the use of the usually high-emission residual gases that are less efficient to use than conventional fuels. This just compensates for the drawback of using inefficient residual gases compared to electricity or heat production from natural gas and ensures that there is no further rectification of residual gases.

Even heat production is subject to a natural gas-based subtraction in the allocation for the iron and steel production; however, unlike in electricity production, the user of waste gases from iron, steel and coke production receives an allocation for the heat generated.

Table 20: Iron and steel industry (Activities 8 to 11 and 1), number of installations, allocation amounts, VET entries and allocation coverage, 2015

No.	Activity	2015 VET vs 2015 allocation	No. of installations	2015 VET [kt CO_2eq]	2015 allocation amount	2015 allocation deviation from 2015 VET [kt CO_2eq]	Allocation coverage
8, 9, 10	Pig iron and crude steel production*	2015 VET › 2015 AA	18	4,825	1,724	-3,101	35.7 %
		2015 VET ‹ 2015 AA	19	26,955	43,076	16,122	159.8 %
			37	31,780	44,801	13,021	141.0 %
11	Ferrous metal processing	2015 VET › 2015 AA	45	3,014	2,080	-935	69.0 %
		2015 VET ‹ 2015 AA	44	2,226	2,651	425	119.1 %
			89	5,240	4,731	-509	90.3 %
1	Combustion	2015 VET › 2015 AA	1	60	0	-60	0.0 %
			1	60	0	-60	0.0 %
Total			**127**	**37,081**	**49,531**	**12.451**	**133.6 %**

*Coke plants, metal ore processing, pig iron and steel production
As of 02/05/2016

The 2013 and 2014 VET reports[30] adopted the estimated amount of transferred emission allowances due to the transfer of waste gases from iron, steel and coke production from the 2013-2020 allocation report[31] and thus presented only rough estimates for the previous years. This year's VET report carried out a more complex but also more precise estimation by considering the amounts of waste gases from iron, steel and coke production that were actually transferred in 2015. By applying the improved calculation method to 2013 and 2014, the estimated amounts of transferred emission allowances increased by about 1.5 million emission allowances per year. This can be explained in particular by the fact that operators incorrectly assigned the transferred waste gas amounts from iron, steel and coke production in the allocation data that was the basis of estimation. This assignment, which is only significant for the calculation of the adjusted allocation has now been corrected. The adjusted allowance supplies therefore decrease by about five percentage points to about 97 percent (2013) and 93 percent (2014)[32]. The consideration of the aggregate allocation status of energy and industry sectors in the second and third trading period (see Table 44, Section 3.1, page 87) takes into account these improved estimates for the previous years.

2.5 Non-ferrous metal industry

Same as in 2014, the non-ferrous metal industry (Activities 12 and 13 according to TEHG Appendix 1) includes a total of 38 installations in the 2015 reporting year.

30 see DEHSt 2013a and DEHSt 2014b, each "Iron and steel industry" chapter
31 see DEHSt 2014a, "Iron and steel industry" chapter
32 see Tables Table 57 and Appendix 8

Table 21: Overview of non-ferrous metal industry (Activities 12 and 13), number of installations, summary of emissions and allocation amounts

Sector/Activity	Number of installations	2014 emissions [kt CO_2eq]	2015 allocation amount [1000 EUA]	2015 VET [kt CO_2eq]	Allocation coverage
Non-ferrous metals	38	2,481	2,471	2,590	95.4 %

As of 02/05/2016

Non-ferrous metal industry installations subject to emissions trading emitted around 2.6 million tonnes of carbon dioxide equivalents in 2015. Compared to 2014, this represents an increase of 4.4 percent.

Emissions

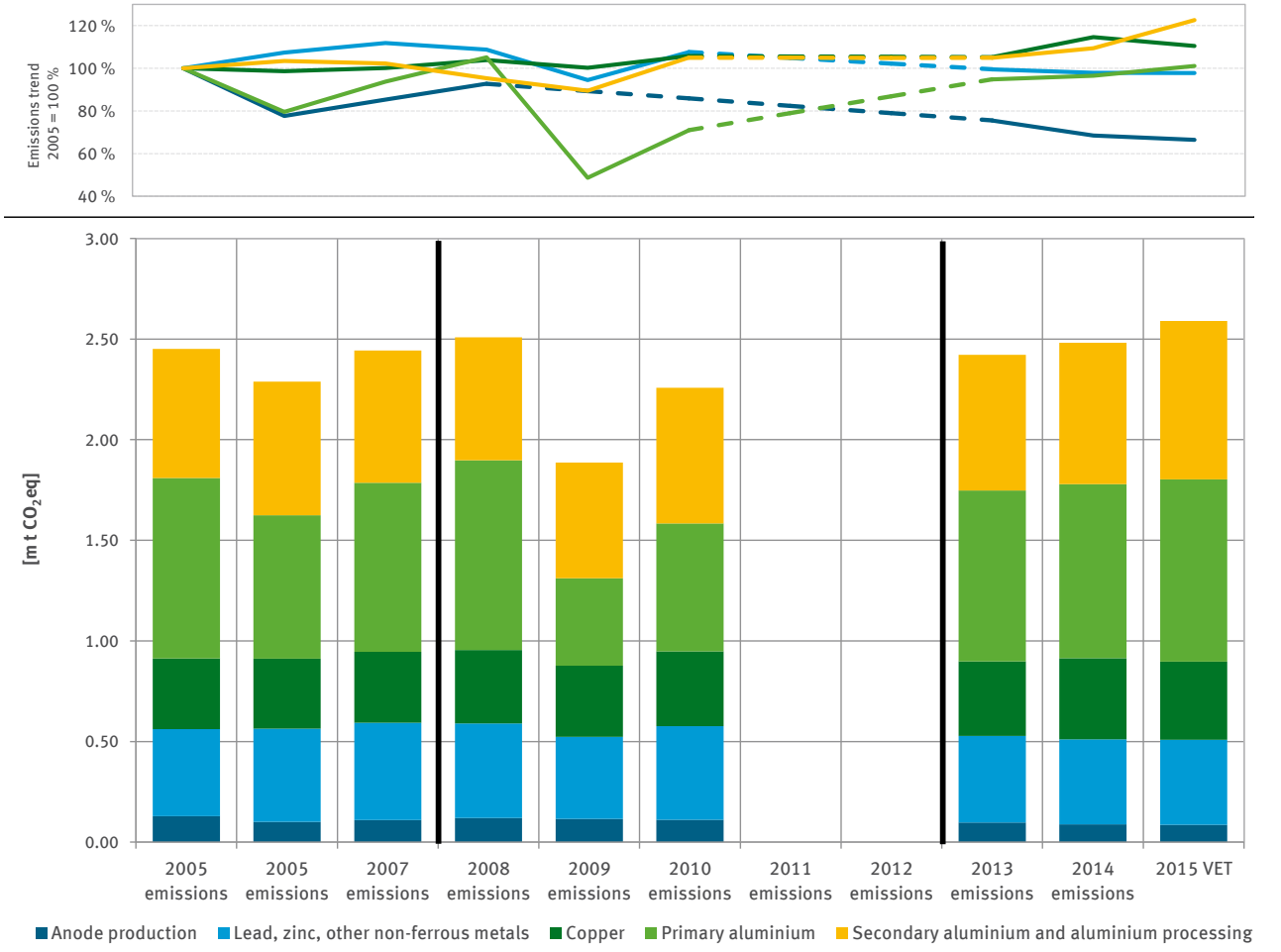
Table 22: Non-ferrous metal industry (Activities 12 and 13), number of installations, 2014 emissions and 2015 VET entries

No.	Activity	2015 VET vs. 2014 emissions	No. of installations	2014 emissions [kt CO_2eq]	2015 VET [kt CO_2eq]	2015 VET deviation from 2014 emissions [kt CO_2eq]
12	Primary aluminium production	2015 VET › 2014 EM	6	919	963	44
		2015 VET ‹ 2014 EM	1	35	29	-6
			7	954	992	39
13	Non-ferrous metal processing	2015 VET › 2014 EM	19	776	879	104
		2015 VET ‹ 2014 EM	12	752	718	-34
			31	1.528	1.598	70
Total			**38**	**2,481**	**2,590**	**109**

As of 02/05/2016

Seven installations produce primary aluminium (Activity 12). They emitted 992,000 tonnes of carbon dioxide equivalents which is four percent more than in the previous year. There are three installations among them that produce anodes used in primary aluminium production. The remaining four Activity 12 installations are electrolysis installations for primary aluminium production. In addition to carbon dioxide, these four installations emit PFC (perfluorocarbons). The 2015 PFC emissions correspond to about 95,000 tonnes of carbon dioxide and are thus 15 percent higher than in the previous year. Compared to the previous year, the average share of emissions from the four electrolysis installations increased slightly to 10.5 percent. Overall, emissions of electrolysis installations subject to emissions trading increased by almost five percent compared to the previous year. The relative increase in emissions is therefore greater than the change in production volume in 2015, which increased by two percent compared to 2014[33]. The 31 installations for the production and processing of other non-ferrous metals such as copper, zinc or lead (Activity 13) emitted approximately 1.6 million tonnes of carbon dioxide in 2015 and thus continue to account for roughly 62 percent of emissions subject to emissions trading in the non-ferrous metal industry. This is around five percent more than in the previous year. Secondary aluminium production is also classified as Activity 13.

33 see WV Metals (2016); Production numbers for the production of aluminium from ore



As of 02/05/2016

Figure 15: Non-ferrous metal industry (Activities 12 and 13). Emission trend in Germany, 2005 to 2015

Figure 15 divides emissions from the non-ferrous metal industry according to the predominantly produced or processed materials or products and shows both absolute emissions and the percentage emission trends in relation to the starting year 2005. Since installations of the non-ferrous metal industry chiefly became subject to emissions trading with the start of the third trading period, emissions data cannot be analysed based on emission reports before 2013. Instead, however, 2005-2010 emissions data from the allocation process of the third trading period can be used for a general overview of the emission trend in the sector. 2009 and 2010 emissions were estimated (linear interpolation of the 2008-2013 data) for five installations. This applies to the three plants for anodes production. No data are available for 2011 and 2012. Data gaps are represented by dotted lines in the relative emission trend.

Due to these limitations, a description of the emission trend of the non-ferrous metals industry in emissions trading starts from only 2013 (see Figure 15). With 35 percent, Activity 12 electrolysis installations had the largest share of emissions of the non-ferrous metal industry in 2015. Their emissions increased significantly by 7 percent since being subject to emissions trading in 2013. This increase in emissions is also due to a 10 percent increase in production[34]. The installations were used more efficiently in 2015 and therefore production was better than in 2013. Emissions from anode production (Activity 12) account for three percent of the non-ferrous metal industry emissions. Their emissions have decreased since being subject to emission trading in 2013. With 30 percent, the production of secondary aluminium and aluminium processing (Activity 13) installations are second to the electrolysis installations in the total emissions of the sector. Their emissions, as well as the production of secondary aluminium have also increased since 2013[35]. Activity 13 installations for copper production and processing account for 15 percent of the non-ferrous metal industry emissions.

34 see WV Metals (2016); Production numbers for the production of aluminium from ore

35 see WV Metals (2016); Production numbers for the production of aluminium from recycling

After an increase from 2013 to 2014, emissions in 2015 decreased again compared to the previous year. Installations for the production or processing of lead, zinc or other non-ferrous metals (Activity 13) account for 16 percent of the total emissions of the sector. Their emissions have decreased slightly since 2013.

Allocation status

Overall, the non-ferrous metals industry had an allocation shortfall of 119,000 emission allowances in 2015.

Table 23: Non-ferrous metal industry (Activities 12 and 13), number of installations, allocation amounts, VET entries and 2015 allocation coverage

No.	Activity	2015 VET vs 2015 allocation	No. of installations	2015 VET [kt CO_2eq]	2015 allocation amount	2015 allocation deviation from 2015 VET [kt CO_2eq]	Allocation coverage
12	Primary aluminium production	2015 VET > 2015 AA	5	708	561	-148	79,2 %
		2015 VET < 2015 AA	2	284	345	61	121.6 %
			7	992	906	-86	91.3 %
13	Non-ferrous metal processing	2015 VET > 2015 AA	22	1,186	913	-273	77.0 %
		2015 VET < 2015 AA	9	412	652	240	158.3 %
			31	1,598	1,565	-33	97.9 %
Total			**38**	**2,590**	**2,471**	**-119**	**95.4 %**

As of 02/05/2016

Activity 12 installations receive a free allocation according to product emission-value ("Aluminium" or "Preburnt Anodes"[36]). On average, the free allocation for these installations corresponded to about 91 percent of their annual emissions in 2015. The operators of these installations did not have to arithmetically purchase allowances to meet their surrender obligations for 2014[37]. In 2015, they had to purchase emission allowances for about nine percent of their surrender obligations. On one hand this is on account of their increased emissions compared to the previous year, and the annually declining free allocation due to the cross-sectoral correction factor on the other. Activity 13 installations are better supplied on average, among others due to the fallback allocation. Their 2015 allocation coverage decreased to only 98 percent compared to 104 percent in the previous year.

2.6 Mineral Industry

2.6.1 Cement clinker production

The 36 installations which produce cement clinker and one installation for the manufacture of products from burnt oil shale are hereinafter referred to under the term „cement industry". Compared to the previous year their emissions decreased by 486,000 tonnes of carbon dioxide, or 2.4 percent, to slightly more than 19 million tonnes of carbon dioxide. The free allocation for 2015 covers 94.5 percent of these emissions. The allocation coverage increased slightly compared to the previous year.

36 see DEHSt 2014a, "Non-ferrous metals industry" chapter

37 see DEHSt 2014b, "Non-ferrous metals industry" chapter

Table 24: Overview of cement clinker production (Activity 14), number of installations, summary of emissions and allocation amounts

Sector/Activity	Number of installations	2014 emissions [kt CO_2eq]	2015 allocation amount [1000 EUA]	2015 VET [kt CO_2eq]	Allocation coverage
Cement clinker production	37	19.598	18,069	19,130	94.5 %

As of 02/05/2016

The entry threshold in the EU ETS scope of 500 tonnes of cement clinker produced per day (Activity 14, Part 2, Annex 1 TEHG) is far exceeded by all installations in the industry in Germany; therefore the data cover the entire sector in Germany. The number of cement clinker production plants has not changed compared to 2014.

Emissions

In the cement industry, emissions have decreased by a total of 486,000 tonnes of carbon dioxide, or 2.4 percent compared to 2014. In 21 installations they dropped by 780,000 tonnes of carbon dioxide; in 15 installations they increased by 312,000 tonnes (Table 25). One installation was finally decommissioned in 2015 and reported zero emissions as in 2013 and 2014. However, it was still subject to emissions trading until the end of 2015 and therefore included in the analysis.

Table 25: Production of cement clinker (Activity 14), number of installations, 2014 emissions and 2015 VET entries

No.	Activity	2015 VET vs. 2014 emissions	No. of installations	2014 emissions [kt CO_2eq]	2015 VET [kt CO_2eq]	2015 VET deviation from 2014 emissions [kt CO_2eq]
14	Cement clinker production	VET 2015 > EM 2014	15	7,770	8,081	312
		VET 2015 < EM 2014	21	11,829	11,049	-780
		VET 2015 = EM 2014	1	0	0	0
Total			**37**	**19,598**	**19,130**	**-468**

As of 02/05/2016

Figure 16 shows the carbon dioxide emissions trend from the cement industry from 2005 to 2015. After emissions rose each year in the first trading period, they clearly declined after the peak in 2007, especially in 2009 and 2010. They then rose again in the last two years of the 2nd trading period, 2011 and 2012, almost to the same level of 2008. In 2014 emissions slightly increased and almost reached the starting level of 2005, in 2013 and 2015 they were slightly below that level[38]. The emissions trend is almost identical to the production trend, but emissions decreased slightly more than production.

38 It should be noted that a fixed emission factor of 0.525 tonnes CO_2/tonne of cement clinker has been applied to the process-related emissions in the time series of the second trading period. Since the beginning of the third trading period, operators must individually analyse the process-related emission factors. It has been found that the amended monitoring method for most installations (even for the most efficient one) leads to higher process-related emissions. The reported emissions have thus been slightly higher due this methodological change since 2013 than they would have been if the fixed emission factors had been updated.

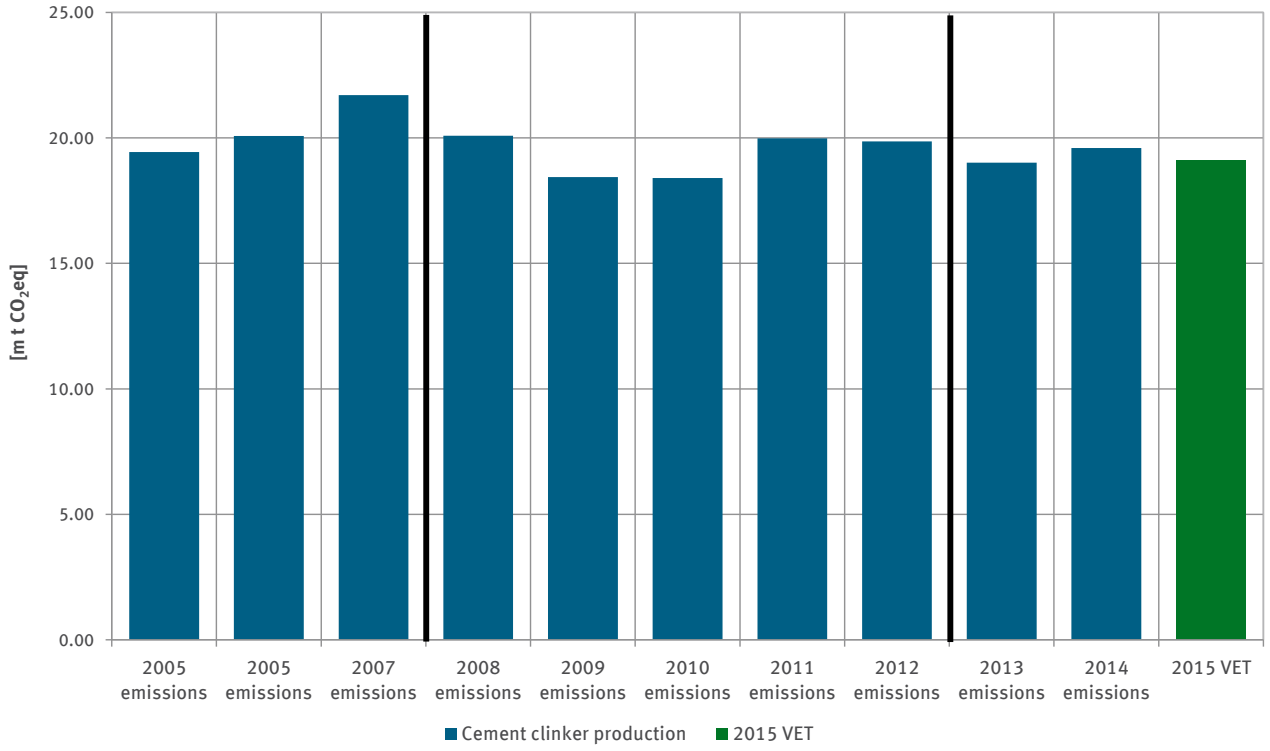


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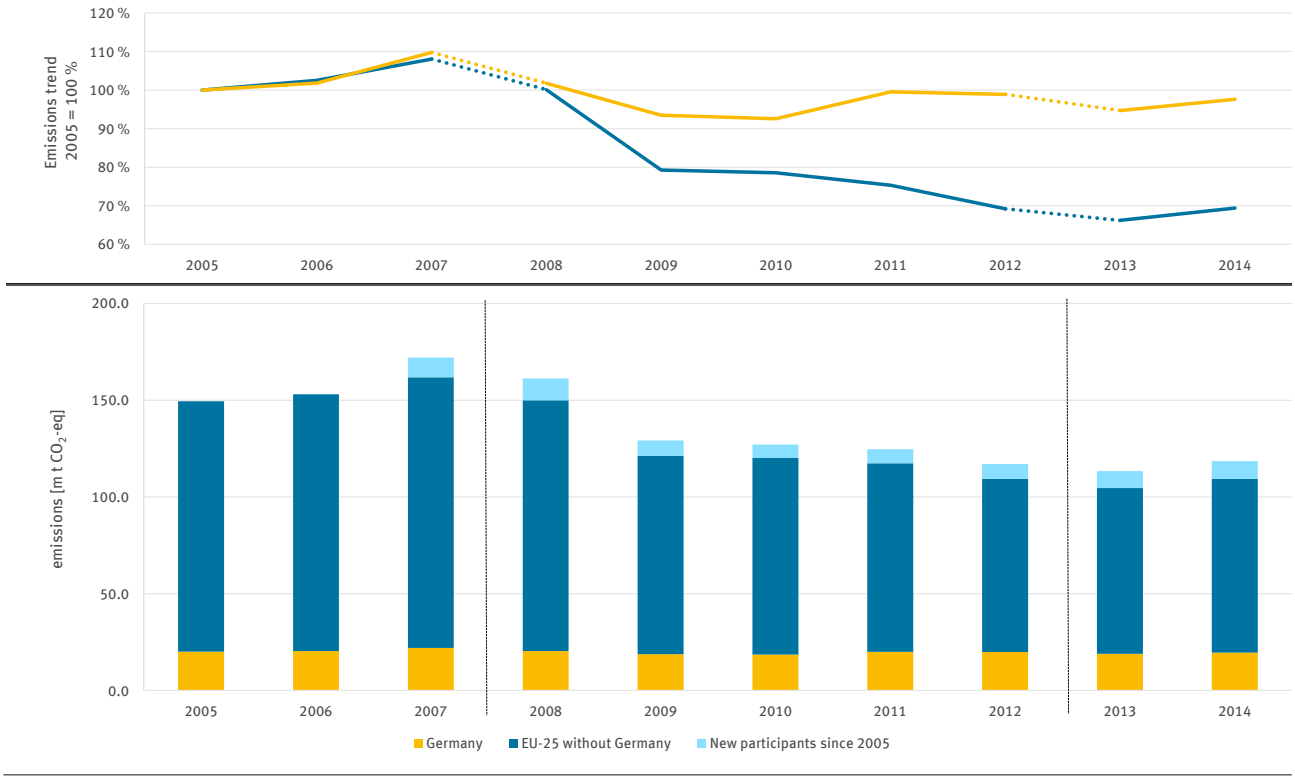
Figure 16: Cement clinker production (Activity 14), emissions trend in Germany, 2005-2015

Thus, the trend in Germany was significantly different from the rest of Europe where the production decline and consequent significant reduction in emissions due to the 2009 economic and financial crisis have been much stronger (the other EU-25 countries' average was about minus 20 percent compared with the 2005 baseline level) and emission reduction continued until 2013 (cf. Figure 17). While emissions from cement clinker production amounted to only about 70 percent of the initial level across the EU, emissions from this sector in Germany have only slightly reduced compared to 2005. Overall, Germany emitted nearly 17 percent of the 2014 total emissions from the cement clinker production in Europe (EU-28).



As of 02/05/2016

Figure 17: 2005-2014 emissions trend of cement clinker production (Registry Activity 29) in Germany and in the EU[39]

Allocation status

For 2015, the free allocation to the cement industry (Table 26) was about 1.1 million emission allowances, or 5.5 percent, below the amount required to meet the surrender obligation. In total, 26 installations had a deficit of 1.75 million emission allowances, ten installations had a surplus of 692,000 allowances. One installation had a zero VET entry as in the previous two years, but did not receive any allocation for 2015.

Table 26: Cement clinker production (Activity 14), number of installations, allocation amounts, 2015 VET entries and allocation coverage

No.	Activity	2015 VET vs 2015 allocation	No. of installations	2015 VET [kt CO_2eq]	2015 allocation amount	2015 allocation deviation from 2015 VET [kt CO_2eq]	Allocation coverage
14	Cement clinker production	2015 VET › 2015 AA	26	13,675	11,922	-1,753	87.2 %
		2015 VET ‹ 2015 AA	10	5,455	6,147	692	112.7 %
		2015 VET = 2015 AA	1	0	0	0	
Total			**37**	**19,130**	**18,069**	**-1,061**	**94.5 %**

As of 02/05/2016

39 Data source: EEA 2015. The evaluation is based on a summary of the installations by activities in EU Union Registry (cf. Table 55, Section 7), thereby differences can occur in the emission amounts per sector for Germany. New post-2005 participants in the EU ETS are Bulgaria, Croatia, Iceland, Liechtenstein, Norway and Romania.

The amount to be purchased was thus slightly lower than in the previous year and, in particular, lower than expected in the context of the allocations according to the product benchmark (0.766 tonnes of CO_2 per tonne of grey cement clinker) and the application of the cross-sector correction factor[40]. This can mainly be explained by the fact that the production and thus the 2015 emissions were lower than in the years of the 2005-2008 period. For 2015, the emission intensity of grey cement clinker installations[41] was 0.797 tonnes of CO_2 per tonne of cement clinker across all 35 installations and was thus somewhat better than in 2014, but all in all remained the same over the last ten years. Similar to 2014, eight installations came in lower than or achieved exactly the product benchmark.

2.6.2 Lime production (including sugar)

The 66 lime production installations are divided into two different sectors of industry: 45 installations produce lime or dolime for the construction, paper, chemical, the iron and steel industry and environmental technology. Their emissions are dominated by the economy of both the steel and construction industries. Further 20 installations produce lime for sugar production and are dominated by the quality and quantity of sugar beet crop. From the third trading period on, these installations, together with the sugar industry's energy installations, have fitted into the lime production activity, while in the second trading period, energy and lime installations were considered separately. In addition, due to the broader definition of "combustion", further partial activities, especially beet slice drying and caramelisation installations, have been added to sugar production. Lime production also includes a limestone drying plant, which was first included in emissions trading as an Activity 1 combustion plant in the third trading period.

The 2015 emissions of Activity 15 (lime production) amounted to a total of 9.2 million tonnes of carbon dioxide and thus decreased by two percent – compared to the previous year. The free allocation on average covered 84.2 percent of emissions. Here, power generation in the sugar industry also plays a role, for which no free allocation will be granted in the third trading period.

Table 27: Overview of lime production (Activity 15, including sugar), number of installations, summary of emission and allocation amounts

Sector/Activity	Number of installations	2014 emissions [kt CO_2eq]	2015 allocation amount [1000 EUA]	2015 VET [kt CO_2eq]	Allocation coverage
Lime production (including sugar)	66	9,385	7,741	9,195	84.2 %

As of 02/05/2016

One installation was decommissioned in 2015. Three other installations have ceased their operation and reported no further emissions, but are still subject to emissions trading and therefore included in the evaluations.

Emissions

While the 2015 emissions of lime production for blast furnaces, power plants and the construction industry changed only slightly compared to the previous year (minus 0.6 percent) and were fairly constant around 7.4 million tonnes of carbon dioxide, the emissions from the sugar industry installations decreased by about 145,000 tonnes, or 7.5 percent, and reached about 1.8 million tonnes of carbon dioxide.

13 lime production installations reported higher emissions than in the previous year and 29 installations reported lower emissions. As in 2013 and 2014, two installations reported zero emissions. For sugar manufacturers, emissions decreased in 16 installations by a total of 190,000 tonnes of carbon dioxide and increased slightly in four more installations than in 2014. The low emissions from the limestone drying installation (combustion plant) remained almost constant.

40 cf. DEHSt 2014a

41 White cement and burnt oil shale have different product benchmarks than grey cement clinker and were therefore not included in the evaluation. However, the cement kiln dust (CKD) production volumes were added to the cement clinker production volumes, as stipulated by the allocation rules.

Table 28: 2015 Lime production (Activity 15), number of installations, 2014 emissions and 2015 VET entries

No.	Activity	2015 VET vs. 2014 emissions	No. of installations	2014 emissions [kt CO_2eq]	2015 VET [kt CO_2eq]	2015 VET deviation from 2014 emissions [kt CO_2eq]
15	Sugar production	2015 VET › 2014 EM	4	566	610	45
		2015 VET ‹ 2014 EM	16	1,368	1,178	-190
			20	1,933	1,788	-145
	Lime production	2015 VET › 2014 EM	13	3,443	3,654	211
		2015 VET ‹ 2014 EM	29	3,996	3,739	-257
		2015 VET = 2014 EM	2	0	0	0
		Comparison not possible	1	-	-	-
			45	7,439	7,393	-46
1	Combustion	2015 VET ‹ 2014 EM	1	14	13	0
			1	14	13	0
Total			**66**	**9,385**	**9,195**	**-191**

As of 02/05/2016

The following figures show the emissions trends of the lime industry since 2005, the beginning of emissions trading, divided into lime (Figure 18) and sugar production (Figure 19).

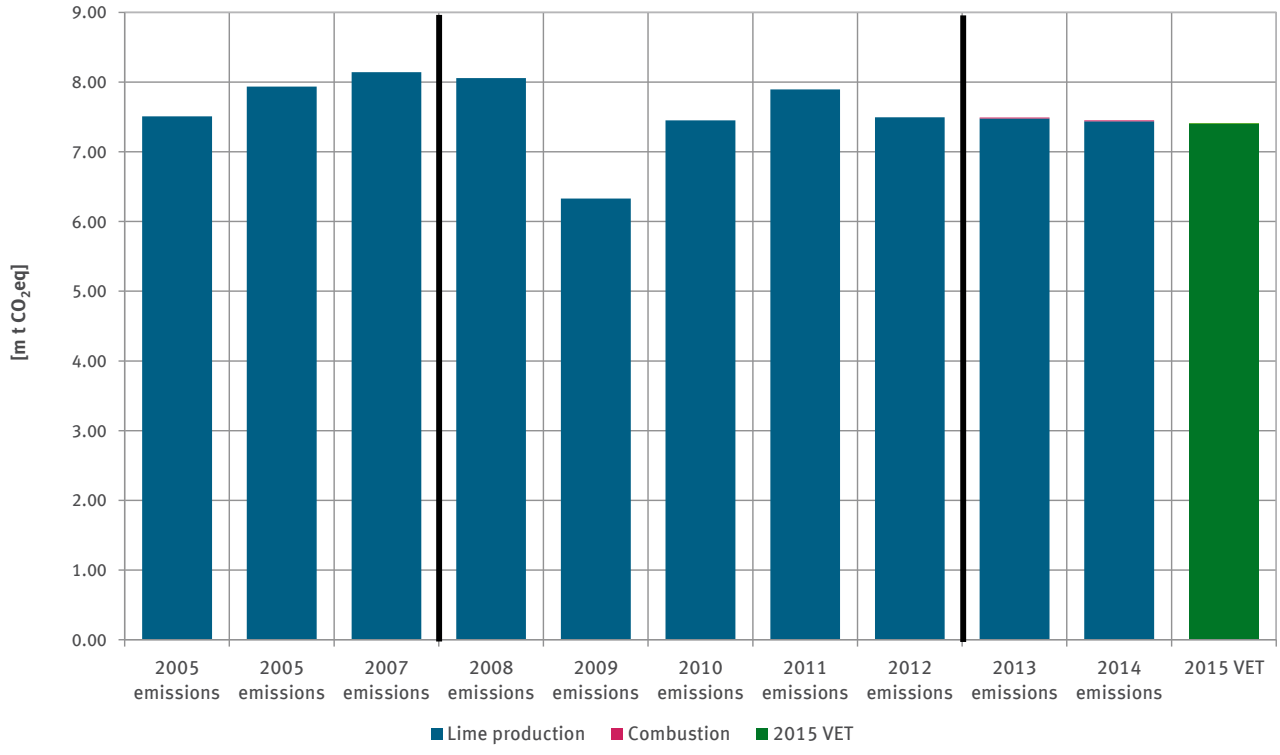


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Figure 18: Lime production (Activity 15), emissions trend in Germany, 2005-2015

The emissions from lime production steadily increased during the first trading period (see Figure 18) and remained constant during the transition to the second trading period. In 2009, which was heavily affected by the financial and economic crisis, emissions from lime kilns, whose production is economically dependent on the steel and construction industry, fell dramatically. In 2010 and 2011 they increased again due to the recovering economic situation. Apart from clearly higher emissions in 2011, emissions have largely been constant at about the 2010 level. However, post-2013 emissions can only be compared to some extent with those from the second trading period on methodological grounds[42].

Figure 19 shows the emissions of the sugar industry from 2005. The emissions deriving from the extended scope of the third trading period were retrospectively estimated for the first and second trading period (top parts of the columns)[43]. The emissions data for 2005 to 2010 from the emission reports were compared with the application data for free allocation in the third trading period, which map the scope of the current third trading period[44].

Figure 19 also includes the sugar industry's energy installations, which were separately considered in the second trading period. The emissions caused by sugar producers increased from 2005 to 2012 with the exception of a few years. At least a part of this increase in emissions is due to the reform of the EU sugar regime of 2006. As a result, some installations were decommissioned and, in return, the utilisation of the remaining installations significantly increased[45]. The emission portion attributable to the scope extension in the third trading period can only be estimated for the last years of the second trading period (see explanation above). Following a decline in emissions in 2013 and an increase in 2014, 2015 emissions dropped significantly below the 2013 level.

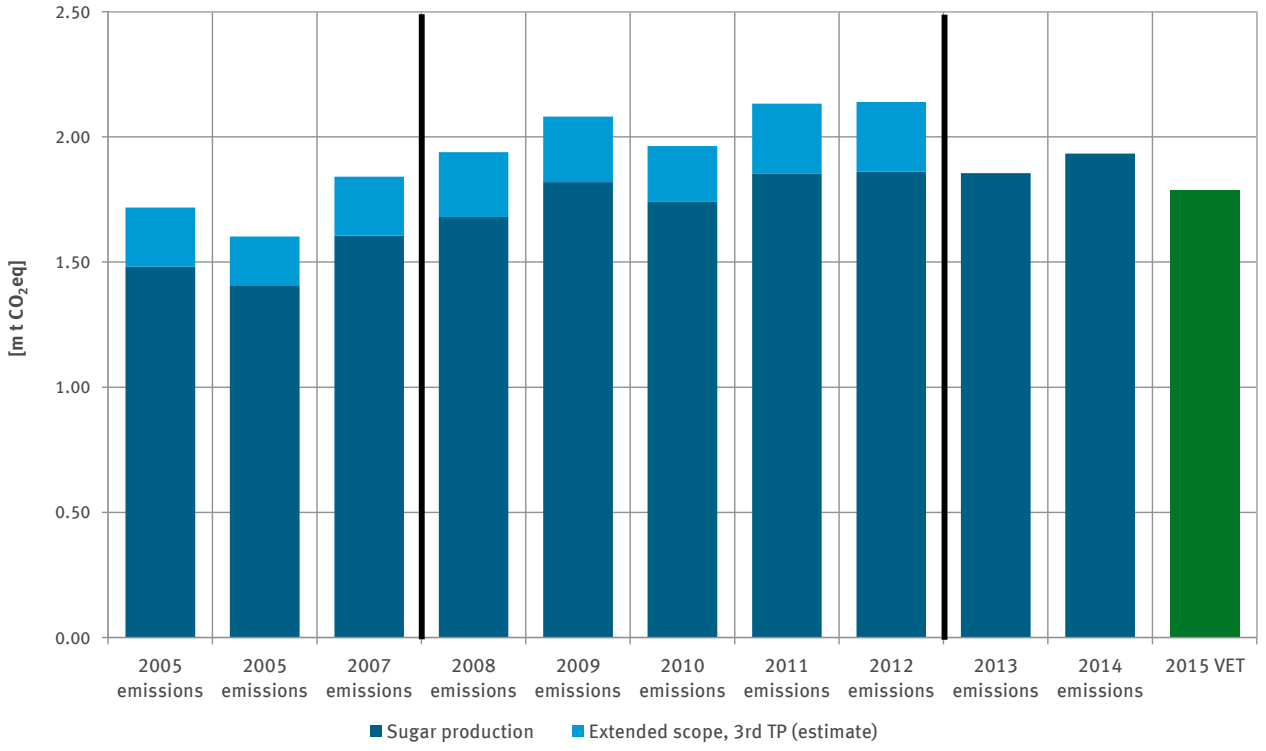

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Figure 19: Emissions trend in the sugar industry, 2005-2015

42 Due to a change in methodology in the determination of emissions between 2012 and 2013 and the extended scope of emissions trading from 2013, pre-2013 emissions cannot be directly compared with post-2013 emissions (cf. DEHSt 2014b, Section „Lime production (including sugar)").

43 cf. DEHSt 2014b, Section "Lime production"

44 For 2011 and 2012, for which no comparative data are available, the average proportion of the extended scope in the 2005-2010 period (about 15 percent of emissions) has been multiplied by the emission data of the respective year.

45 cf. WVZ 2016

Figure 20 shows the emissions from lime production (lime and sugar industry) in Germany in comparison to the trends in the rest of the EU-25 countries. In Germany there have in part been major changes in the transitions between the trading periods in the scope or in the allocation of power plants in the sugar industry. Therefore, emissions from the different trading periods – at least in Germany – are only partially comparable with each other. The connection between the periods is therefore shown as a dotted line. Also, there are sometimes differences between the values for Germany, since the emissions are allocated in the Union Registry in a slightly different way or some other installation size is used than that in the present report. Despite these limitations in comparability between the periods, Figure 20 clearly shows that for lime production there were differences between the emission trends in Germany and the rest of Europe. The average European emission reduction due to the 2009 economic and financial crisis was slightly greater than in Germany (approximately minus 17 percent compared to the 2005 base level while it was minus 14 percent in Germany), and the emissions have again risen significantly in Germany since 2010. Overall, Germany emitted about 28 percent of the total EU emissions from lime production.

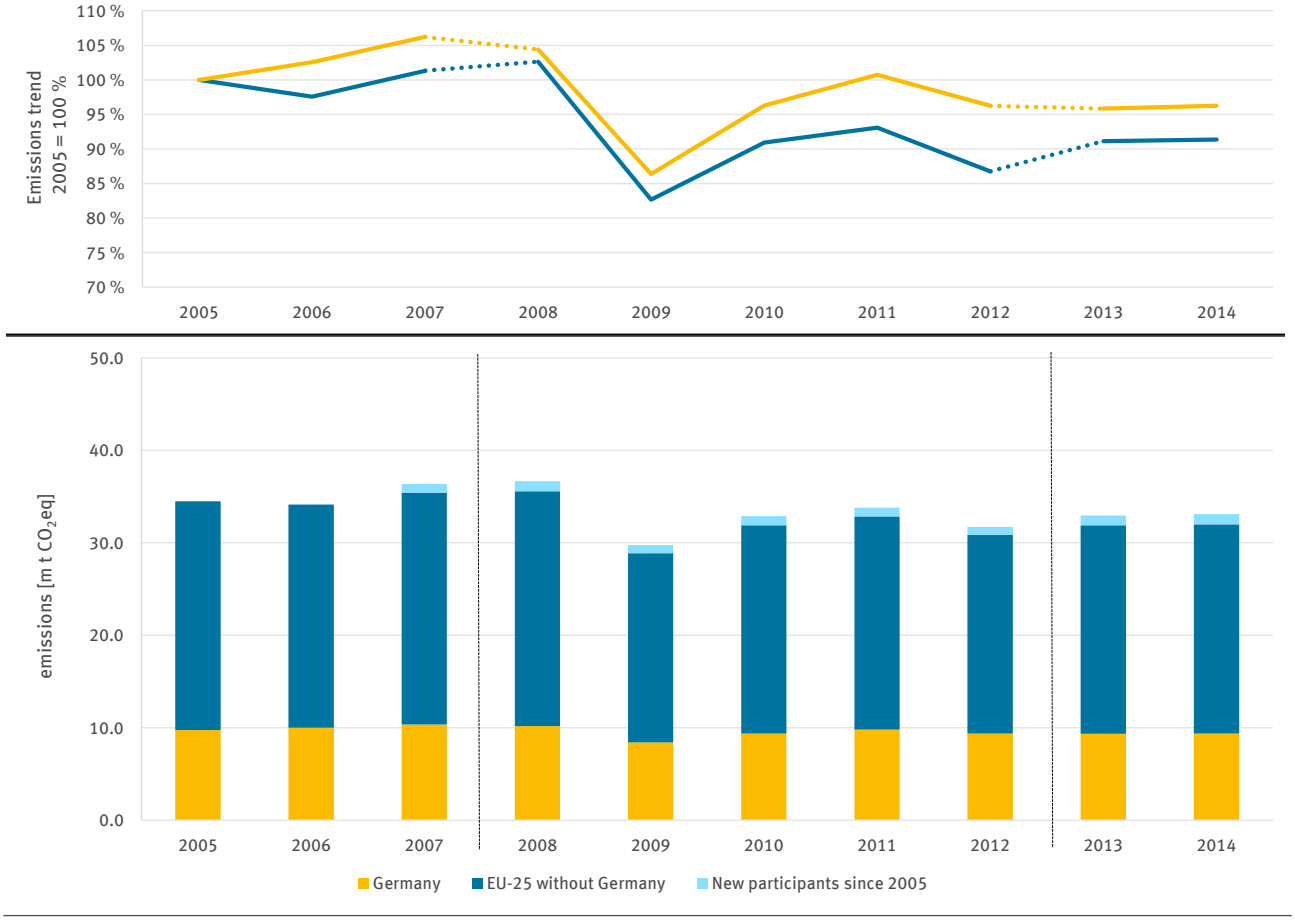

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Figure 20: 2005-2014 emissions trend of lime production (Registry Activity 30), in Germany and in the EU[46]

Allocation status

Lime production had a total deficit of 887,000 allowances, which corresponds to an allowance shortfall of 12 percent of the 2015 emissions. The sugar industry's deficit was 562,000 emission allowances meaning that their relative shortfall was significantly higher at around 31 percent of the 2015 emissions. However, the allocation situation has hardly changed in these two sectors of the industry compared to the previous year, since the free allocation exhibited a smaller decrease compared to the previous year than the emissions despite increasing budget cuts (cross-sectoral correction factor).

46 Data source: EEA 2015. The evaluation is based on a summary of the installations by activities in EU Union Registry (cf. Table 55, Section 7), thereby differences can occur in the emission amounts per sector for Germany. New post-2005 participants in the EU ETS are Bulgaria, Croatia, Iceland, Liechtenstein, Norway and Romania.

28 lime producing installations had to purchase approximately 1.2 million additional emission allowances in order to comply with their surrender obligations. That was slightly less than two-thirds of the lime producers. 14 installations have a surplus.

By contrast, most sugar production installations (17 out of 20) had to purchase additional emission allowances with a total of 583,000. The sugar industry's power production plays a role, for which no free allocation is granted in the third trading period. The free allocation for the Activity 1 combustion plant was also considerably below its reported 2015 emissions.

Table 29: Lime production (Activity 15), number of installations, allocation amounts, 2015 VET entries and allocation coverage

No.	Activity	2015 VET vs 2015 allocation	No. of installations	2015 VET [kt CO_2eq]	2015 allocation amount	2015 allocation deviation from 2015 VET [kt CO_2eq]	Allocation coverage
15	Lime production	2015 VET > 2015 AA	28	6,512	5,320	-1,192	81.7 %
		2015 VET < 2015 AA	14	881	1,186	306	134.7 %
		2015 VET = 2015 AA	3	0	0	0	
			45	7,393	6,507	-887	88.0 %
	Sugar production	2015 VET > 2015 AA	17	1,623	1,041	-583	64.1 %
		2015 VET < 2015 AA	3	165	186	21	112.8 %
			20	1,788	1,227	-562	68.6 %
1	Combustion	2015 VET > 2015 AA	1	13	8	-5	64.5 %
			1	13	8	-5	64.5 %
Total			**66**	**9,195**	**7,741**	**-1,453**	**84.2 %**

As of 02/05/2016

2.6.3 Production of glass and mineral fibres

The production of glass and mineral fibres includes activities 16 (glass production) and 18 (mineral fibre production). In 2015, a total of 89 installations were recorded, one less than in the previous year, of which 82 installations produced glass and seven installations mineral fibres. The 2015 carbon dioxide emissions remained largely constant compared to the previous year at about 4.1 million tonnes (minus 0.2 percent). The free allocation covers about 83.6 percent of the emissions.

Table 30: Overview of glass and mineral fibre production (Activities 16 and 18), number of installations, summary of emissions and allocation amounts

Sector/Activity	Number of installations	2014 emissions [kt CO_2eq]	2015 allocation amount [1000 EUA]	2015 VET [kt CO_2eq]	Allocation coverage
Production of glass and mineral fibres	89	4,143	3,455	4,134	83.6 %

As of 02/05/2016

Emissions

The 2015 emissions from glass production installations (Activity 16) slightly decreased by 0.5 percent, compared to 2014. About half of the installations reported higher emissions in 2015 than in the previous year, a total of about 103,000 more tonnes of carbon dioxide. The emissions decreased by 124,000 tonnes in the other installations. The emissions from mineral fibre production installations (Activity 18) increased by 3.4 percent compared to the previous year (plus 363,000 tonnes of carbon dioxide).

Table 31 shows the emissions trend following the Statistical Classification of Economic Activities (NACE Codes) and is based on information provided by the operators. In the production of flat glass, which is used in the car making and construction industries, emissions slightly increased by one percent. In contrast, the emissions from hollow glass production slightly decreased in 2015 (minus 1.7 percent).

Table 31: Glass and mineral fibre production (Activities 16 and 18), number of installations, 2014 emissions and 2015 VET entries

No.	Activity	2015 VET vs. 2014 emissions	No. of installations	2014 emissions [kt CO_2eq]	2015 VET [kt CO_2eq]	2015 VET deviation from 2014 emissions [kt CO_2eq]
16	Production of hollow glass	2015 VET > 2014 EM	21	722	755	32
		2015 VET < 2014 EM	17	885	827	-59
			38	1,608	1,581	-27
	Production of glass fibres and goods thereof	2015 VET > 2014 EM	6	73	79	7
		2015 VET < 2014 EM	4	142	127	-15
			10	215	206	-9
	Production, finishing and processing of flat glass	2015 VET > 2014 EM	8	778	818	41
		2015 VET < 2014 EM	7	635	609	-25
			15	1,412	1,428	15
	Production, finishing and processing of other glass including technical glassware	2015 VET > 2014 EM	7	224	248	23
		2015 VET < 2014 EM	10	329	309	-20
		2015 VET = 2014 EM	1	0	0	0
		Comparison not possible	1	4	0	0
			19	557	557	3
			82	3,792	3,771	-17
18	Production of glass fibres and goods thereof	2015 VET > 2014 EM	1	46	48	3
		2015 VET < 2014 EM	1	9	8	-1
			2	55	56	2
	Production of other goods from non-metallic minerals n. e. c.	2015 VET > 2014 EM	5	296	306	10
			5	296	306	10
			7	351	363	12
Total			**89**	**4,143**	**4,134**	**-5**

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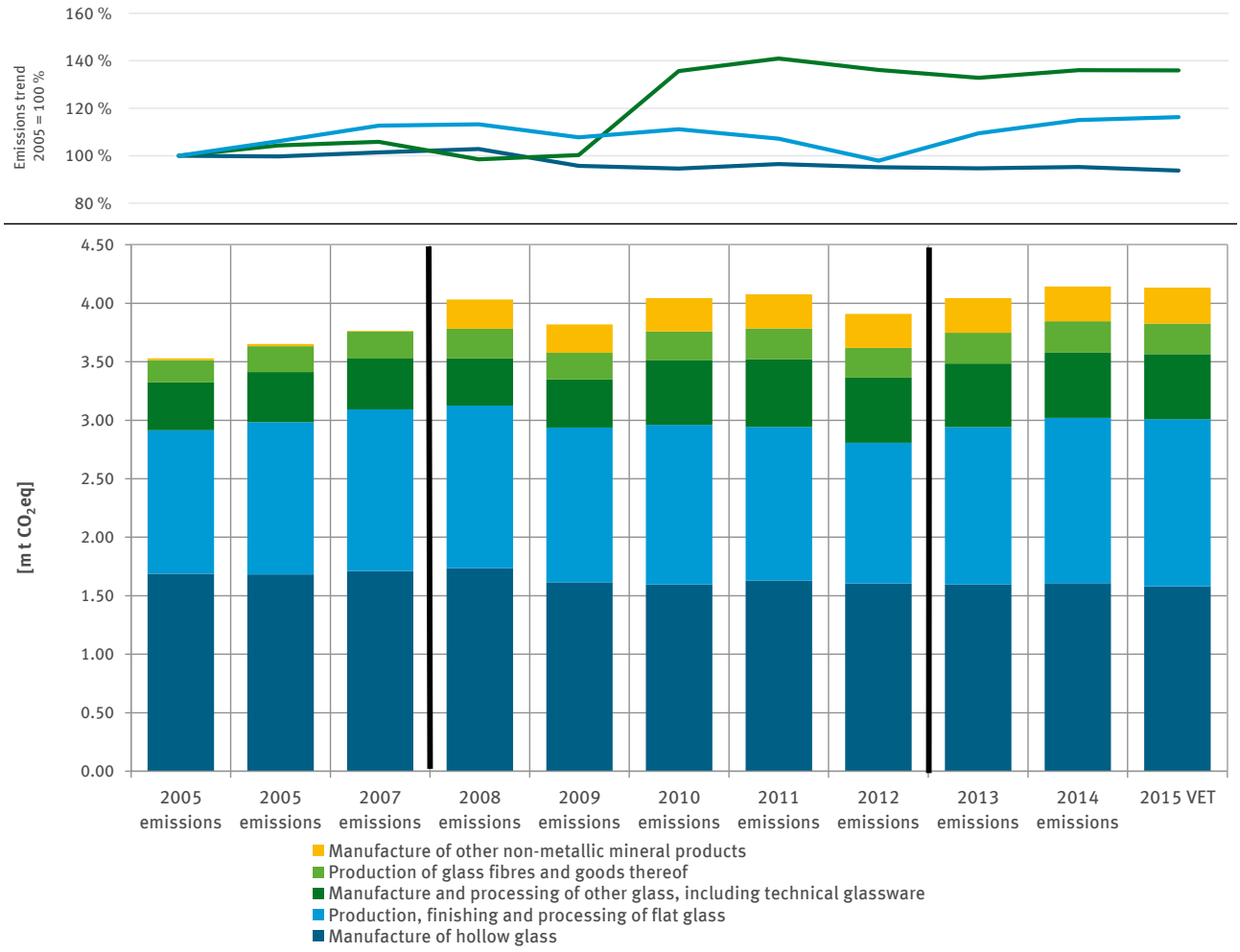
After continuous increases in 2005 to 2008 (Figure 21), emissions from glass and mineral fibre production (Activities 16 and 18) decreased in 2009, the year of the financial and economic crisis. Since then, the emissions have increased again and have been – with the exception of 2012 – above 4 million tonnes of carbon dioxide per year. They reached a peak in 2014, the highest since the beginning of emissions trading[47] and remained almost constant at this level.

47 This also applies without regard to the mineral fibres included in the EU ETS from 2008 onwards.



As of 02/05/2016

Figure 21: Production of glass and mineral fibres (Activities 16 and 18), 2005-2014 emissions trend in Germany

The emissions from flat glass production continuously increased from 2005 to 2008. After a drop in emissions in 2009, 2011 and 2012, presumably due to economic trends, emissions increased again in 2013 and 2014, and reached a record level in 2015 since the beginning of emissions trading. Emissions from the production of other (technical) glass have increased the most since 2005 and are about 36 percent above the 2005 emissions. Emissions from hollow glass production have remained largely constant since 2011 probably due to economic trends and were at 94 percent of the 2005 figure in 2015 – the lowest value since the beginning of emissions trading.

In the glass industry, an increase or decrease in production is not necessarily reflected in emission levels: the installations must be continuously supplied with heat to prevent solidification of the melt in the glass tank during production, even at low utilisation.

Allocation status

The 2015 free allocation was not enough to cover the year's emissions from activities 16 and 18. Overall, the deficit amounted to 688,000 allowances compared to the emissions, of which 616,000 in glass production (see Table 32). The allocation coverage has slightly worsened compared to the previous year and amounted to 83.9 percent in 2015 (80 percent in the production of mineral fibres). The deficit is slightly greater in flat glass than for hollow glass.

Table 32: Glass and mineral fibre production (Activities 16 and 18), number of installations, allocation amounts, VET entries and 2015 allocation coverage

No.	Activity	2015 VET vs 2015 allocation	No. of installations	2015 VET [kt CO_2eq]	2015 allocation amount	2015 allocation deviation from 2015 VET [kt CO_2eq]	Allocation coverage
16	Production of hollow glass	2015 VET › 2015 AA	32	1,334	1,062	-272	79.6 %
		2015 VET ‹ 2015 AA	5	247	283	36	114.6 %
		2015 VET = 2015 AA	1	0	0	0	
			38	1,581	1,345	-236	85.1 %
	Production of glass fibres and goods thereof	2015 VET › 2015 AA	8	179	113	-67	62.8 %
		2015 VET ‹ 2015 AA	2	27	37	10	137.6 %
			10	206	149	-57	72.5 %
	Production, finishing and processing of other glass including technical glassware	2015 VET › 2015 AA	12	484	407	-77	84.1 %
		2015 VET ‹ 2015 AA	5	73	85	12	116.4 %
		2015 VET = 2015 AA	1	0	0	0	
		Comparison not possible	1	-	-	-	
			19	557	496	-65	89.1 %
	Production, finishing and processing of flat glass	2015 VET › 2015 AA	14	1,354	1,097	-257	81.0 %
		2015 VET ‹ 2015 AA	1	73	77	3	104.2 %
			15	1,428	1,174	-254	82.2 %
			82	3,771	3,164	-611	83.9 %
18	Production of glass fibres and goods thereof	2015 VET › 2015 AA	2	56	29	-28	51.0 %
			2	56	29	-28	51.0 %
	Production of other goods from non-metallic minerals n. e. c.	2015 VET › 2015 AA	3	223	169	-54	76.0 %
		2015 VET ‹ 2015 AA	2	83	92	9	110.5 %
			5	306	261	-45	85.4 %
			7	363	290	-72	80.0 %
Total			**89**	**4,134**	**3,455**	**-684**	**83.6 %**

As of 02/05/2016

2.6.4 Ceramics and gypsum production

The emissions from Activities 17 “ceramics production” and 19 “gypsum production” amounted to a total of 2.3 million tonnes of carbon dioxide in 2015 and thus decreased by about two percent or 55,000 tonnes compared to the previous year. The free allocation covered on average 97.6 percent of the emissions.

Six ceramics production installations were decommissioned and are no longer subject to emissions trading so that a total of 147 ceramics and nine gypsum installations are covered by the ETS. Two other installations ceased operations, but are formally still subject to emissions trading so that they are still included in this analysis.

Table 33: Overview of ceramics production (Activity 17), gypsum production (Activity 19), number of installations, summary of emission and allocation amounts

Sector/Activity	Number of installations	2014 emissions [kt CO_2eq]	2015 allocation amount [1000 EUA]	2015 VET [kt CO_2eq]	Allocation coverage
Ceramics and gypsum	156	2,312	2,204	2,257	97.6 %

As of 02/05/2016

Emissions

Emissions from ceramics production decreased by 2.7 percent (minus 55,000 tonnes of carbon dioxide), while emissions from gypsum production remained constant (down 0.2 percent compared to 2014). More than half of the installations reported an emissions decrease in 2015 compared to the previous year. 65 installations reported a total of 69,000 tonnes or about eight percent more emissions than in 2014. Two ceramics installations reported zero emissions as in the previous year. In total, emissions decreased by 2.4 percent or 55,000 tonnes.

Table 34: Ceramics production (Activity 17), gypsum production (Activity 19), number of installations, 2014 emissions and 2015 VET entries

No.	Activity	2015 VET vs. 2014 emissions	No. of installations	2015 VET [kt CO_2eq]	2014 emissions [kt CO_2eq]	2015 VET deviation from 2014 emissions [kt CO_2eq]
17	Ceramics production	2015 VET › 2014 EM	62	888	822	65
		2015 VET ‹ 2014 EM	83	1,101	1,221	-120
		2015 VET = 2014 EM	2	0	0	0
			147	1,988	2,043	-55
19	Gypsum production	2015 VET › 2014 EM	3	77	73	4
		2015 VET ‹ 2014 EM	6	192	196	-4
			9	269	269	-1
Total			**156**	**2,257**	**2,312**	**-55**

As of 02/05/2016

Figure 22 shows the emissions trend since 2005 for the current scope of emissions trading in ceramics and gypsum production. Since 50 ceramics and 9 gypsum installations were newly included in emissions trading due to the extended scope at the beginning of the third trading period and because these installations lack complete information regarding their past emissions, the data for Figure 22 were partly estimated[48]. Overall, a continuous emission decrease has taken place since 2011.

48 In ceramics, the data from 2005 to 2010 come from the applications for free allocation in the third trading period, some missing information for 2009 and 2010 were added as interpolated values. For 2011 and 2012, emissions from the emission reports were used for those installations included in the second trading period, and the values were interpolated for newly added installations. Gypsum installations underwent an analogous procedure and 2011 and 2012 emissions were interpolated.

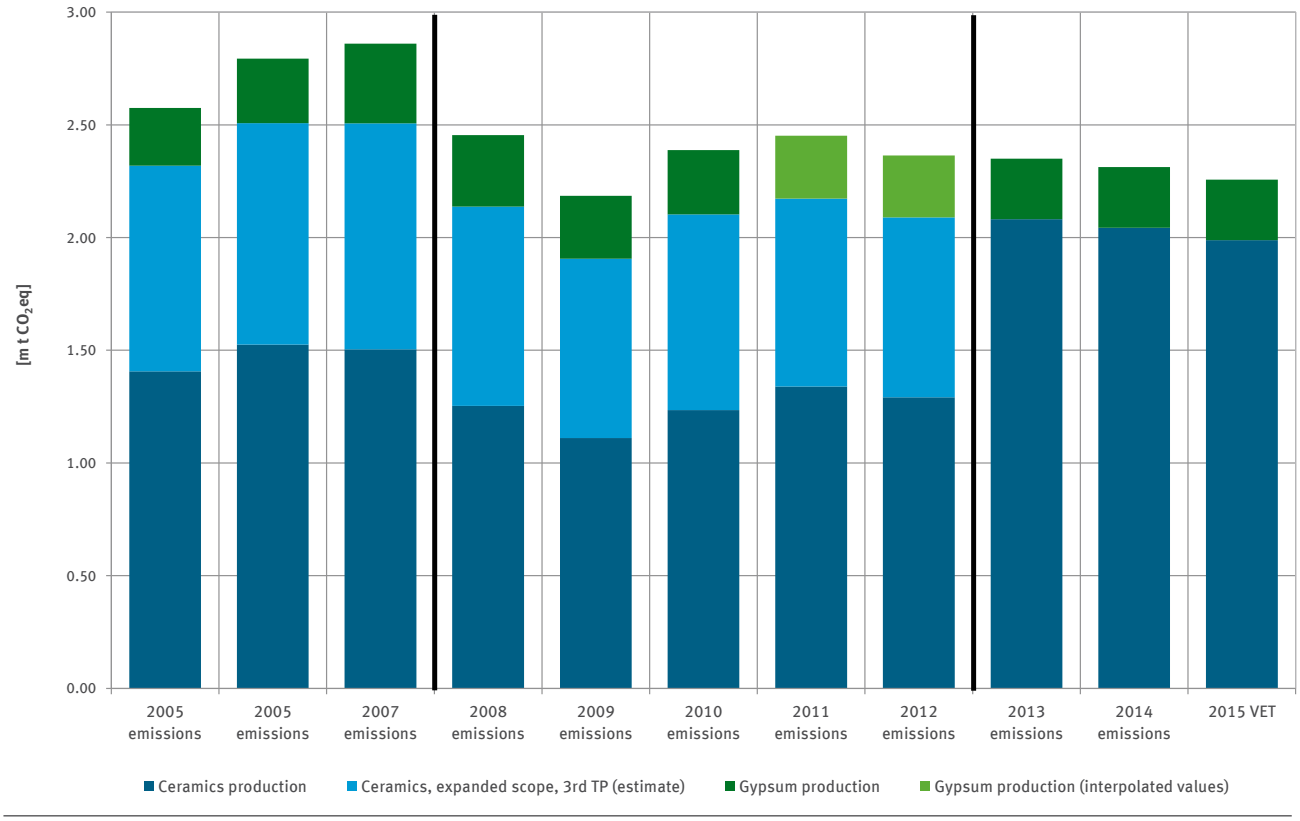


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Figure 22: Ceramics production (Activity 17), gypsum production (Activity 19), emissions trend from 2005 to 2015 in Germany

Allocation status

The allocation coverage for the installations varies significantly: on average, 18 percent of emissions from 85 installations were not covered by the free allocation in 2015, whereas 70 installations received an over-supply of the same proportion.

The average allocation coverage of the installations for ceramics production is approximately 96 percent. They must therefore buy about four percent of their required emission allowances.

The allocation coverage of gypsum production installations is 113 percent. It was only 84 percent in the previous year. The increase in allocation coverage is probably due to the increased free allocation based on the recognition of products in the gypsum industry as being exposed to carbon leakage risk.

Table 35: Ceramics production (Activity 17), gypsum production (Activity 19), number of installations, allocation amounts, VET entries, allocation coverage 2015

No.	Activity	2015 VET vs 2015 allocation	No. of installations	2015 VET [kt CO_2eq]	2015 allocation amount	2015 allocation deviation from 2015 VET [kt CO_2eq]	Allocation coverage
17	Ceramics production	2015 VET › 2015 AA	83	1,228	1,000	-227	81.5 %
		2015 VET ‹ 2015 AA	63	761	899	138	118.2 %
		2015 VET = 2015 AA	1	0	0	0	
			147	1,988	1,899	-89	95.5 %
19	Gypsum production	2015 VET › 2015 AA	2	55	48	-8	85.9 %
		2015 VET ‹ 2015 AA	7	214	257	43	120.3 %
			9	269	304	36	113.3 %
Total			**156**	**2,257**	**2,204**	**-54**	**97.6 %**

As of 02/05/2016

2.7 Paper and pulp industry

The sector includes pulp production and paper, cardboard or paperboard manufacture (Activities 20 and 21 as per Annex 1 TEHG). The number of installations decreased to 152 compared to 153 installations in 2014 due to a decommissioning in the paper production activity. Five installations are associated with pulp production and 147 with paper production. Pulp and paper industry emitted slightly less than 5.5 million tonnes of carbon dioxide in 2015. Compared to 2014 this represents a slight increase of about one percent.

Table 36: Overview of the paper and pulp industry (Activities 20 and 21), number of installations, summary of emission and allocation amounts

Sector/Activity	Number of installations	2014 emissions [kt CO_2eq]	2015 allocation amount* [1000 EUA]	2015 VET [kt CO_2eq]	Adjusted allocation coverage
Paper and pulp	152	5,408	4,788	5,470	87.5 %

*Adjusted for the estimated allocation amount for heat imports.
As of 02/05/2016

Emissions

In pulp production, the amount of emissions subject to emission trading increased slightly from 135,000 tonnes of carbon dioxide in 2014 to 137,000 tonnes (cf. Table 37). Compared to 2014, the paper production activity emissions also slightly increased by 60,000 to 5.3 million tonnes. The emissions increased by about 193,000 tonnes in 45 percent of the installations and decreased by 133,000 tonnes in 42 percent of the installations. Much as in the chemical industry, the pulp and paper industry also has 18 so-called zero-emission installations that have been subject to emissions trading since the third trading period, even though they do not produce any carbon dioxide emissions. Compared to the previous year, emissions in the activity paper have increased by about one percent, at the same time the production of the German paper industry remained broadly constant (up 0.3 percent)[49].

49 cf. VDP 2016, Press Release of 23/02/2016

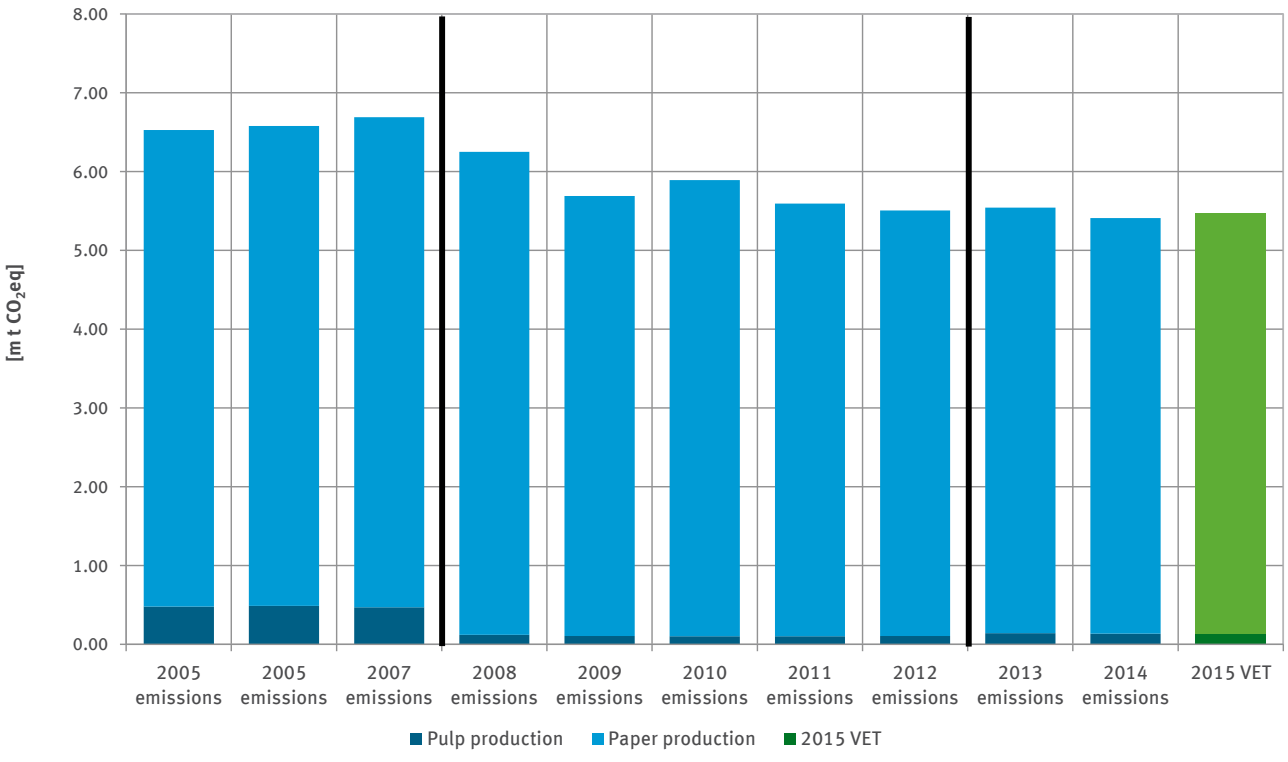
Table 37: Paper and pulp industry (Activities 20 and 21), number of installations, 2014 emissions and 2015 VET entries

No.	Activity	2015 VET vs. 2014 emissions	No. of installa-tions	2015 VET [kt CO_2eq]	2014 emissions [kt CO_2eq]	2015 VET deviation from 2014 emissions [kt CO_2eq]
20	Pulp production	2015 VET › 2014 EM	2	94	89	5
		2015 VET ‹ 2014 EM	2	43	47	-3
		2015 VET = 2014 EM	1	0	0	0
			5	137	135	2
21	Paper production	2015 VET › 2014 EM	67	3,383	3,190	193
		2015 VET ‹ 2014 EM	62	1,950	2,083	-133
		2015 VET = 2014 EM	18	0	0	0
			147	5,333	5,273	60
Total			**152**	**5,470**	**5,408**	**62**

As of 02/05/2016

In spite of a minor increase in 2015, emissions remained below the 2009 level in the first three years of the 3rd Trading Period and therefore reached the lowest level since the introduction of emissions trading (see Figure 23). Compared to 2008 (the first year of the 2nd Trading Period) they decreased by 13 percent.

In addition to the increased energy efficiency in production, one of the reasons is an ongoing decline in sales of newspaper, printing and copying paper due to an increased use of electronic media. In the fields of packaging and hygiene, however, a sustained growth was recorded, which is why production as a whole remained constant[50].

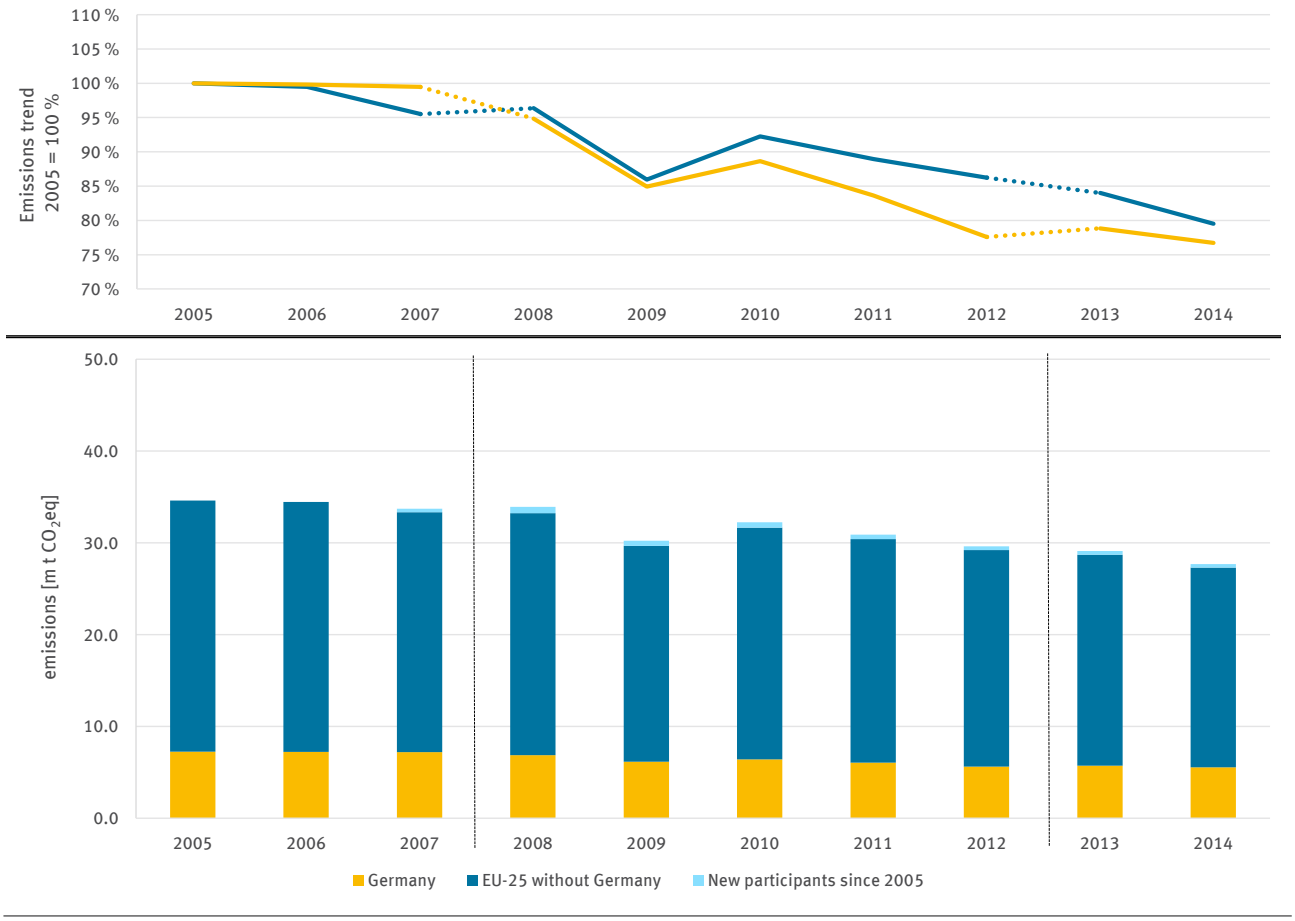


As of 02/05/2016

Figure 23: Paper and pulp industry (Activities 20 and 21), emissions trend from 2005 to 2015 in Germany

50 cf. VDP 2016, Press Release of 23/02/2016

The following Figure 24 shows the emission trend both for the EU as a whole (top diagram, EU-25) and for Germany. It can be seen that the 2005-2014 emissions from the paper and pulp industry (Registry Activities 35 and 36) are clearly declining both in the EU (20 percent) and Germany (23 percent). With the exception of the 2009 crisis year, when a relatively large drop in emissions occurred, emission reduction in the EU and in Germany has run relatively smoothly over the last decade. The main cause is the prevailing general negative sales trend in the paper sector.



As of 02/05/2016

Figure 24: 2005-2014 emissions trend of the paper and pulp industry (Registry Activities 35 and 36) in Germany and in the EU[51]

Allocation

The operators of the 147 installations in the paper Activity acquired a total of 6.6 million emission allowances for 2015, which is 1.2 million or 23 percent more than they would need for surrender according to 2015 VET figures (5.3 million emission allowances, see Table 38). However, this surplus is very unevenly distributed among the installations: while for 72 installations the allocation exceeds the emissions by 2.9 million tonnes, i.e. the 2015 allocations are three times as high as the 2015 emissions, 71 installations are underfunded by slightly less than 1.7 million allowances. Basically, on the one hand this is due to the fact that power generation is no longer granted an allocation and on the other, the allocation for heat imports is distributed very unevenly.

The installations of the pulp industry, however, have a significant total deficit of almost 30 percent of the 2015 emissions.

51 Data source: EEA 2015. The evaluation is based on a summary of the installations by activities in EU Union Registry (cf. Table 55, Section 7), thereby differences can occur in the emission amounts per sector for Germany. New post-2005 participants in the EU ETS are Bulgaria, Croatia, Iceland, Liechtenstein, Norway and Romania.

Table 38: Paper and pulp industry (Activities 20 and 21), number of installations, allocation amounts, 2015 VET entries and allocation coverage

No.	Activity	2015 VET vs 2015 allocation	No. of installa-tions	2015 VET [kt CO_2eq]	2015 alloca-tion amount	2015 allocation deviation from 2015 VET [kt CO_2eq]	Allocation coverage
20	Pulp production	2015 VET › 2015 AA	3	135	81	-53	60.4 %
		2015 VET ‹ 2015 AA	2	3	17	14	671.1 %
			5	137	98	-39	71.7 %
21	Paper production	2015 VET › 2015 AA	71	3,959	2,272	-1,687	57.4 %
		2015 VET ‹ 2015 AA	72	1,373	4,303	2,930	313.4 %
		2015 VET = 2015 AA	4	0	0	0	
			147	5,333	6,576	1,243	123.3 %
Total			**152**	**5,470**	**6,674**	**1,204**	**122.0 %**

As of 02/05/2016

The proportion of allocation which is due to heat imports of other installations subject to emissions trading can be estimated at slightly less than 1.9 million[52] emission allowances. Without this proportion the allocation coverage of the activities paper production (Activity 21) and pulp production (Activity 20) would decrease to 87.5 percent (adjusted allocation coverage), which corresponds to a minor deficit (see Table 36).

2.8 Chemical Industry

The chemical industry comprises Activities 22 to 29 as per Annex 1 TEHG, which for the most part were added to emissions trading at the start of the third trading period. Also allocated to the sector are some installations which do not belong to any chemical activity subject to emissions trading, but which, because of their rated thermal input of a minimum of 20 MW, fall under Activity 1 in Annex 1 TEHG – for example, installations for the production of titanium dioxide or other inorganic chemistry installations. Installations for the generation of electricity and heat for the chemical industry, however, are classified as energy installations, provided they are independently approved in terms of pollution control.

Compared to the previous year the number of existing installations remained constant at 189 installations, however, one installation left the emissions trading and one installation started operation anew. The emissions from the chemical industry amounted to about 17.9 million tonnes of carbon dioxide in 2015.

Table 39: Overview of the chemical industry (Activities 22 to 29 and 1), number of installations, summary of emissions and allocation amounts

Sector/Activity	Number of installa-tions	2014 emissions [kt CO_2eq]	2015 allocation amount* [1000 EUA]	2015 VET [kt CO_2eq]	Adjusted allocation coverage*
Chemical industry	189	17,936	17,977	17,856	100.7 %

* Adjusted by the estimated allocation amount for heat imports
As of 02/05/2016

52 Data from the allocation report (DEHSt 2014a) can only be used as an estimate to provide a basis. This value was derived based on data about heat imports from other EU ETS installations from the allocation procedure (cf. Section 7.7 of the allocation report). This estimate cannot be adjusted to the current situation of heat imports in the paper industry because of lack of any current data.

Emissions

Emissions from the 189 installations declined slightly by 80,000 tonnes of carbon dioxide, or 0.4 percent, compared to the previous year.

In almost all sectors of activity there has been both an increase and a decrease in emissions. Activity 27 (manufacture of bulk organic chemicals) showed the biggest changes compared to the previous year at a decrease of 306,000 tonnes of carbon dioxide (minus 3.8 percent) and Activity 26 (ammonia production) at an increase of 187,000 tonnes of carbon dioxide (+ 4.4 percent). Activities 26 and 27 have the highest emissions within the chemical industry, i.e. 8 million and 4.5 million tonnes of carbon dioxide, followed by Activity 28 (production of hydrogen and synthesis gas) with 1.8 million tonnes of carbon dioxide. The "Miscellaneous" category includes Activity 1 (combustion) and Activity 25 (production of glyoxal and glyoxylic acid) installations.

Table 40: Chemical industry (Activities 22 to 29 and 1), number of installations, 2014 emissions and 2015 VET entries

No.	Activity	2015 VET vs. 2014 emissions	No. of installations	2014 emissions [kt CO_2eq]	2015 VET [kt CO_2eq]	2015 VET deviation from 2014 emissions [kt CO_2eq]
22	Carbon black production	2015 VET › 2014 EM	2	489	502	14
		2015 VET ‹ 2014 EM	3	186	176	-10
			5	674	678	4
23, 24	Adipic and nitric acid	2015 VET › 2014 EM	6	702	726	24
		2015 VET ‹ 2014 EM	3	172	155	-17
		2015 VET = 2014 EM	2	0	0	0
			11	874	881	7
26	Ammonia production	2015 VET › 2014 EM	3	2,086	2,567	480
		2015 VET ‹ 2014 EM	2	2,190	1,897	-293
			5	4,276	4,463	187
27	Production of bulk organic chemicals	2015 VET › 2014 EM	40	3,754	3,881	127
		2015 VET ‹ 2014 EM	46	4,566	4,133	-433
		2015 VET = 2014 EM	31	0	0	0
		Comparison not possible	1	-	-	-
			118	8,330	8,015	-306
28	Production of hydrogen and synthesis gas	2015 VET › 2014 EM	8	1,144	1,292	148
		2015 VET ‹ 2014 EM	7	641	529	-111
			15	1,785	1,821	37
29	Soda production	2015 VET › 2014 EM	2	175	182	6
		2015 VET ‹ 2014 EM	3	442	420	-22
		2015 VET = 2014 EM	1	0	0	0
			6	617	602	-16
1, 25	Miscellaneous	2015 VET › 2014 EM	14	547	626	79
		2015 VET ‹ 2014 EM	14	832	769	-63
		2015 VET = 2014 EM	1	0	0	0
			29	1,379	1,395	16
Total			**189**	**17,936**	**17,856**	**-71**

As of 02/05/2016

Among Activities 23 and 24 there are eleven installations producing adipic or nitric acid which are subject to emissions trading due to their carbon dioxide and nitrous oxide (dinitrogen monoxide, N_2O) emissions. In 2015, nitrous oxide emissions corresponded to 754,000 tonnes of carbon dioxide equivalent, making up an average of 86 percent of the total emissions for these installations.

Similar to the paper industry, there are 35 zero-emission installations in the chemical industry – mainly in the production of bulk organic chemicals, which have been subject to emissions trading from the third trading period, although they do not discharge any carbon dioxide or nitrous oxide emissions.

Some chemical industry installations can be attributed to large chemical corporations. By associating the operators with the corporations by name, regardless of other economic ties, BASF installations produce the highest emissions within the chemical industry (32 installations, 4.2 million tonnes of carbon dioxide), followed by the Agrofert group (three installations, 2.3 million tonnes of carbon dioxide) and INEOS (twelve installations, 2.5 million tonnes of carbon dioxide).[53]

Since the majority of installations only reported their verified emissions from the start of the third trading period, the industry's emission trends since 2005 can only be estimated (see Figure 25). For installations that were not, or only partially, subject to emissions trading in the first and second trading period, but have received an allocation for the third trading period, information about their historic emissions is available from the allocation process[54], usually covering the 2005-2010 period. Emissions in the years with no emission data available from the allocation process and for 2011 and 2012 were estimated using linear interpolation.

53 cf. Explanation of Enterprise assignment in the Glossary, Section 8

54 Some of these emissions have not been verified. In addition, nitrous oxide emissions from adipic and nitric acid installations as reported in the allocation procedure differ from the emissions from the National Inventory Report (cf. DEHSt 2014b).

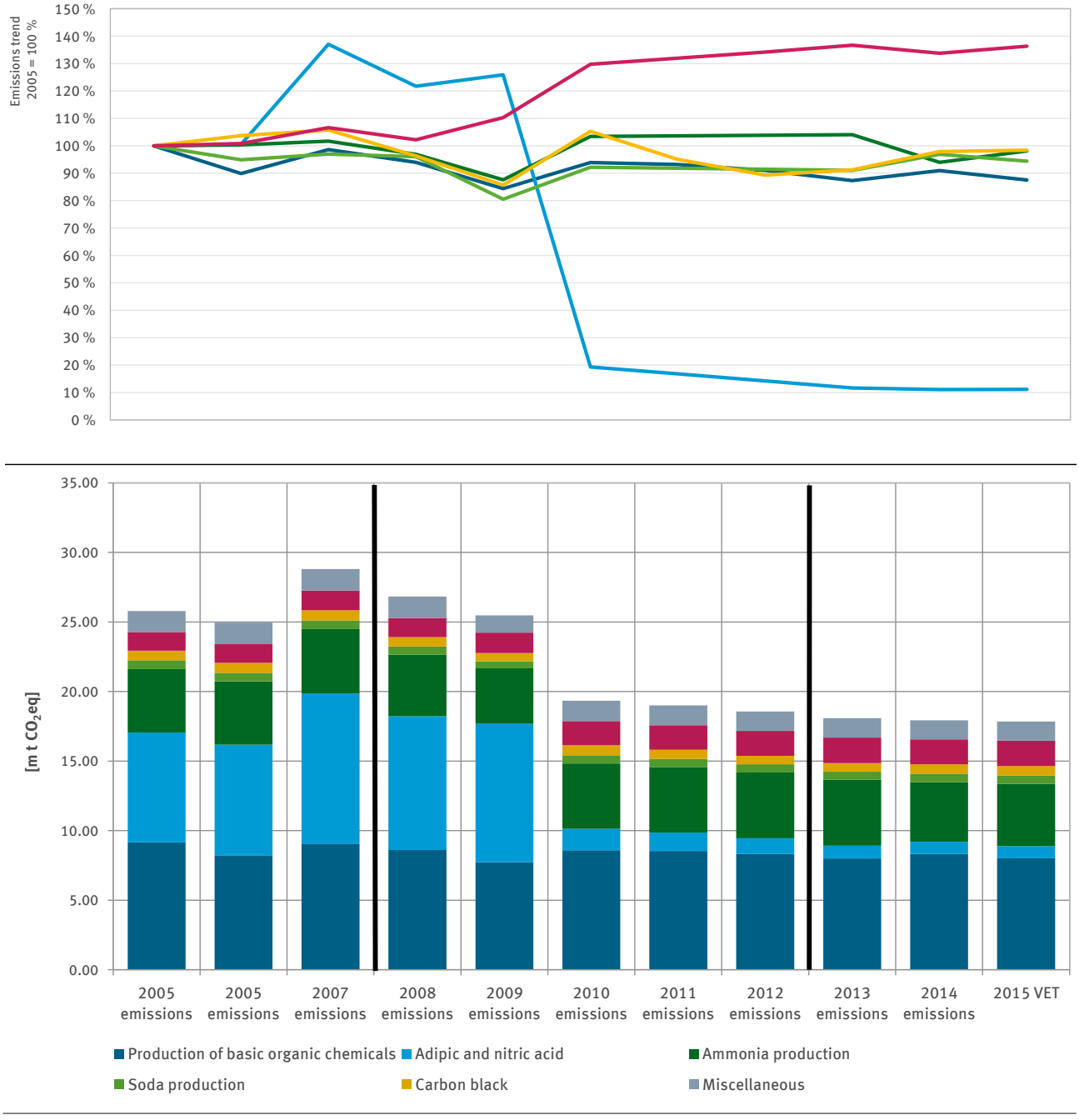


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Figure 25: Chemical industry (Activities 22 to 29 and 1), emissions trend in Germany, 2005-2015

The decrease in emissions from adipic and nitric acid production since 2010 is evident. Implementing reduction technologies reduced nitrous oxide emissions relatively inexpensively, while commitments from industry, legal pollution control requirements and, chiefly, the implementation of Joint Implementation projects in Germany achieved substantial emission reductions even before the start of compulsory emissions trading.

During the 2009 economic crisis, there was also a reduction in emissions from the chemical industry, and the emission level dropped to similar levels as before the crisis in 2010. In some areas, such as hydrogen and synthesis gas production, emissions rose above that level due to new installations starting in 2010.

Allocation status

The installations in the chemical industry are very well equipped with free emission allowances compared with other industries (see also Section 3.1). This also applies to adjusted allocation coverage.

Table 41: Chemical industry (Activities 22 to 29 and 1), number of installations, allocation amounts, 2015 VET entries and allocation coverage supply

No.	Activity	2015 VET vs 2015 allocation	No. of installations	2015 VET [kt CO_2eq]	2015 allocation amount	2015 allocation deviation from 2015 VET [kt CO_2eq]	Allocation coverage
22	Carbon black production	2015 VET > 2015 AA	3	636	490	-145	77.1 %
		2015 VET < 2015 AA	2	42	55	12	129.1 %
			5	678	545	-133	80.4 %
23, 24	Adipic and nitric acid	2015 VET > 2015 AA	4	530	289	-241	54.6 %
		2015 VET < 2015 AA	7	351	1,504	1,153	428.9 %
			11	881	1,793	912	203.6 %
26	Ammonia production	2015 VET > 2015 AA	4	3,644	2,811	-833	77.1 %
		2015 VET < 2015 AA	1	819	918	99	112.1 %
			5	4,463	3,729	-734	83.6 %
27	Production of bulk organic chemicals	2015 VET > 2015 AA	31	5,507	4,107	-1,400	74.6 %
		2015 VET < 2015 AA	73	2,509	5,319	2,810	212.0 %
		2015 VET = 2015 AA	13	0	0	0	
		Comparison not possible	1	-	-	-	
			118	8,015	9,437	1,411	117.7 %
28	Production of hydrogen and synthesis gas	2015 VET > 2015 AA	8	931	479	-452	51.5 %
		2015 VET < 2015 AA	7	890	1,122	232	126.1 %
			15	1,821	1,602	-220	87.9 %
29	Soda production	2015 VET > 2015 AA	1	91	83	-9	90.5 %
		2015 VET < 2015 AA	4	510	1,002	492	196.4 %
		2015 VET = 2015 AA	1	0	0	0	
			6	602	1,085	483	180.3 %
1, 25	Miscellaneous	2015 VET > 2015 AA	17	1,046	687	-359	65.7 %
		2015 VET < 2015 AA	12	349	695	346	199.4 %
			29	1,395	1,382	-13	99.1 %
Total			**189**	**17,856**	**19,574**	**1,707**	**109.6 %**

As of 02/05/2016

In 2015, the operators of chemical installations received approximately 1.7 million free emission allowances – 9.6 percent more than they needed for their surrender obligation. For 106 installations, the amount of emission allowances allocated free of charge exceeded emissions by a total of around 5.1 million allowances. In contrast, 68 installations received a total of approximately 3.4 million fewer free emission allowances than they needed to fulfill their surrender obligation. 14 installations with a zero VET entry, received no free allocation.

The largest relative surplus of free emission allowances can be seen in the installations producing adipic and nitric acid (204 percent). This is due to the fact that advanced emission control technologies of N_2O have been installed, which resulted in specific emissions well below the specific product benchmarks for adipic and nitric acid. This surplus allocation can be up to ten times greater than the emissions for an installation. Installations that get allocated less than they emit either have not yet started any extensive nitrous oxide reduction or have significantly higher process-related CO_2 emissions.

Installations producing bulk organic chemicals (118 percent, or 1.4 million emission allowances) and installations for soda production (180 percent or 483,000 allowances) also feature a significant surplus allocation compared to their emissions. This can, in particular, be attributed to the allocation rules for cross-boundary heat flows: many of these installations import heat from other installations subject to emissions trading and receive a free allocation for it, while the emissions are produced in the installations which generate the heat. In addition, many processes for the production of bulk organic chemicals are exothermic. A large part of the reaction heat can be used by using efficient heat recovery systems without generating additional emissions.

In contrast, the free allocation for the installations producing carbon black, ammonia and hydrogen or synthesis gas was not sufficient to fully cover the emissions from the installations in 2015. The operators of ammonia installations had to purchase a total of 734,000 emission allowances on the market; hydrogen and synthesis gas producers 217,000 emission allowances. In contrast, the shortfall of carbon black installations was lower (133,000 emission allowances) in absolute terms than that of other installations.

After subtracting an estimated allocation amount for heat imports from other installations subject to emissions trading (approx. 1.6 million emission allowances[55]) the adjusted allocation coverage in the chemical industry would still be 100.7 percent.

3 Cross Sector Analysis

3.1 Overview of the allocation status in Germany

The verified emissions of all installations subject to emissions trading in Germany totalled 455.5 million tonnes of carbon dioxide equivalents in the third year of the current trading period, which was significantly more than the free allocation amount. In 2015 a total of approximately 158.6 million free emission allowances were allocated to the operators of 1,683 out of the 1,889 German installations. On average, the free allocation covered 34.8 percent of the verified emissions of all installations in Germany (36.0 percent in 2014). The average allocation coverage was thus slightly lower than in the previous year because the allocation amounts declined by 3.4 percent, i.e. more than the total emissions (minus 0.9 percent). Table 42 shows the allocation and emissions status according to activities (1 to 29). Comparing the different activities clearly reflects the large differences between energy and industrial installations in terms of the third-trading-period allocation rules.

The 922 installations in the industrial sector received a total allocation of 130.5 million emission allowances for the 2015 reporting year. This compares with the total verified emissions of 123.2 million tonnes of carbon dioxide equivalent. On average therefore, the industrial sectors carried a surplus. The allocation corresponded to 105.9 percent of the surrender obligation for these installations (108.2 percent in 2014). The average allocation coverage was slightly below the previous year's level since the allocation amounts declined by 1.3 percent with almost unchanged emissions. The adjusted allocation coverage[56] which takes account of the transferred waste gases from iron, steel and coke production and heat imports is 89.9 percent (91.8 percent in 2014), i.e. below the 100 percent mark, representing a deficit rather than a surplus for the industrial sector (see sections below with Table 43 and Table 44).

The situation for the 967 energy installations (Activities 2-6) is fundamentally different. Due to the discontinuation of the free allocation for power generation in the third trading period, the ratio of allocations to verified emissions on average was only 8.5 percent, thus somewhat lower than in the previous year (9.2 percent in 2014).

55 Data from the allocation report (DEHSt 2014a) can only be used as an estimate to provide a basis. This value was derived based on data about heat imports from other EU ETS installations from the allocation procedure (cf. Section 7.7 of the allocation report). This estimate cannot be adjusted to the current situation of heat imports in the chemical industry because of lack of any current data.

56 cf. Explanations about Adjusted allocation coverage in the Glossary, Section 8

Overall, the energy installations received an allocation of 28.1 million emission allowances for heat production in 2015, while the verified emissions accounted for 332.3 million tonnes of carbon dioxide equivalent. The allocation for these installations reduced by 9.1 percent, which is much greater than the 1.3 percent decrease in emissions compared to the previous year. The noticeable decrease in allocation can be attributed to the fact that no carbon leakage risk applies to a significant part of the allocation to energy installations. The adjusted allocation coverage shows a decreasing value for the energy sector at 14.4 percent in an annual comparison (15.2 percent in 2014) (see sections below with Table 43 and Table 44).

Table 42: Allocation status by activities in 2015 (non-adjusted allocation coverage)

Branch	No.	Activity	No. of installations	2015 allocation amount [1000 EUA]	2015 VET [kt CO_2eq]	2015 allocation surplus [1000 EUA]	2015 allocation coverage*	2014 allocation coverage*
Energy	2	Energy conversion ≥ 50 MW RTI	488	23,398	325,558	-302,140	7.2 %	7.8 %
	3	Energy conversion 20-50 MW RTI	411	3,716	5,341	-1,625	69.6 %	76.9 %
	4	Energy conversion 20-50 MW RTI, other fuels	11	144	151	-7	95.2 %	129.4 %
	5	Prime movers (engines)	3	44	63	-19	70.5 %	113.2 %
	6	Prime movers (turbines)	54	805	1,237	-432	65.1 %	80.8 %
Energy			967	28,106	332,349	-304,223	8.5 %	9.2 %
Industry	1	Combustion	74	1,912	2,041	-128	93.7 %	98.4 %
	7	Refineries	24	20,211	24,886	-4,676	81.2 %	84.0 %
	8	Coking plants	4	1,739	3,747	-2,008	46.4 %	46.2 %
	9	Processing of metal ores	1	69	80	-11	86.1 %	98.3 %
	10	Production of pig iron and steel	32	42,993	27,953	15,040	153.8 %	162.1 %
	11	Processing of ferrous metals	89	4,731	5,240	-509	90.3 %	88.3 %
	12	Production of primary aluminium	7	906	992	-86	91.3 %	99.7 %
	13	Processing of non-ferrous metals	31	1,565	1,598	-33	97.9 %	104.3 %
	14	Production of cement clinker	37	18,069	19,130	-1,061	94.5 %	93.9 %
	15	Lime production	65	7,733	9,181	-1,448	84.2 %	83.9 %
	16	Glass production	82	3,164	3,771	-611	83.9 %	84.9 %
	17	Ceramics production	147	1,899	1,988	-89	95.5 %	94.0 %
	18	Mineral fibres production	7	290	363	-72	80.0 %	84.3 %
	19	Gypsum production	9	304	269	36	113.3 %	115.1 %
	20	Pulp production	5	98	137	-39	71.7 %	73.4 %
	21	Paper production	147	6,576	5,333	1,243	123.3 %	127.8 %
	22	Carbon black production	5	545	678	-133	80.4 %	82.8 %
	23	Nitric acid production	8	744	745	-2	99.7 %	103.7 %
	24	Adipic acid production	3	1,050	136	914	774.2 %	742.7 %
	25	Production of glyoxal and glyoxylic acid	1	8	9	-1	90.2 %	70.9 %
	26	Ammonia production	5	3,729	4,463	-734	83.6 %	90.2 %
	27	Production of bulk organic chemicals	118	9,437	8,015	1,411	117.7 %	115.3 %
	28	Production of hydrogen and synthesis gas	15	1,602	1,821	-220	87.9 %	90.1 %
	29	Soda production	6	1,085	602	483	180.3 %	179.0 %
Industry			922	130,459	123,179	7,265	105.9 %	108.2 %
Total			**1889**	**158,565**	**455,528**	**-296,958**	**34.8 %**	**35.7 %**

*Without taking into account possible offsets in the transfer of waste gases from iron, steel and coke production and heat imports
As of 02/05/2016

However, in addition to the energy sector, the discontinuation of the free allocation for power generation also applies to industrial activities in which heating and power plants are usually in operation such as in refineries and the paper industry installations. In 2015, refineries received an allocation that corresponded to 81.2 percent of their verified emissions (84.3 percent in 2014). In the paper industry, the elimination of the allocation for power generation is more than offset by the allocation rules for cross-boundary heat flows.

These installations even have a surplus of free emission allowances (see Section 2.7, p. 73 Allocation status in the paper industry). For installations in the paper industry, the ratio of allocation to verified emissions was 123.3 percent (126.4 percent in 2014).

Pig iron and steel production also features a large surplus relative to their emissions – the ratio of free allocation to emissions was 153.8 percent (156.4 percent in 2014). This situation, however, must be regarded in a differentiated way similar to the cross-boundary heat flows in the paper and chemical industries (cf. Section 2.8, p. 77 Allocation status of the chemical industry) since the allocation claim does not necessarily emerge at the installations where the emissions actually occur. Installations in the iron and steel industry receive an allocation for the production of waste gases from iron, steel and coke production, although the emissions are released in the importing installation where the waste gases have been transferred to (see Section 2.4, p. 44 Allocation status in the iron and steel industry, including coking plants).

Allocation status taking into account waste gases from iron, steel and coke production and heat imports

The allocation that can be traced back to waste gases forwarded from iron, steel and coke production, and heat imports from other installations subject to emissions trading, had a significant impact on the allocation coverage for the sectors concerned. An estimated 16.3 million emission allowances can be assigned to waste gases forwarded from iron, steel and coke production to energy installations, approximately 3.5 million emission allowances to energy installations importing heat.[57]

Assuming that those quantities were settled among industrial and energy sector operators, the industrial sector exhibited a deficit of about 12.5 million emission allowances in 2015. Thus the allocation coverage would be 89.9 for the industrial sector, instead of the above 105.9 percent, which rather corresponds to a deficit than a surplus. Conversely, under the assumptions made for the energy sector, the allocation coverage, i.e. the ratio of adjusted allocation to verified emissions, increased from 8.5 to 14.4 percent in 2015. Table 43 summarises the 2015 adjusted allocation status adjusted by forwarded waste gases from iron, steel and coke production and imported heat at the sectors level.[58]

Table 43: Adjusted allocation coverage (taking into account waste gases from iron, steel and coke production and heat imports)

Field	Sector	No. of Installations	2015 allocation amount [M EUA]	2015 VET [Mt CO_2eq]	2015 allocation surplus [M EUA]	2015 allocation coverage*	2015 adjusted allocation amount** [M EUA]	2015 adjusted allocation coverage
Energy	Energy installations	967	28.1	332.3	-304.2	8.5 %	47,9	14.4 %
Energy		**967**	**28.1**	**332.3**	**-304.2**	**8.5 %**	**47,9**	**14.4 %**
Industry	Refineries	24	20.2	24.9	-4.7	81.2 %	20,2	81.2 %
	Iron and steel	127	49.5	37.1	12.5	133.6 %	33,2	89.6 %
	Non-ferrous metals	38	2.5	2.6	-0.1	95.4 %	2,5	95.4 %
	Mineral processing industry	348	31.5	34.7	-3.3	90.6 %	31,5	90.6 %
	Paper and pulp	152	6.7	5.5	1.2	122.0 %	4,8	87.5 %
	Chemical industry	189	19.6	17.9	1.7	109.6 %	18,0	100.7 %
	Other combustion plants	44	0.5	0.6	-0.1	91.2 %	0,5	91.2 %
Industry		**922**	**130.5**	**123.2**	**7.3**	**105.9 %**	**110,7**	**89.9 %**
Total		**1889**	**158.6**	**455.5**	**-297.0**	**34.8 %**	**158,6**	**34.8 %**

* Without taking into account possible offsets in the transfer of waste gases from iron, steel and coke production and heat imports
** Taking into account possible offsets in the transfer of waste gases from iron, steel and coke production and heat imports
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57 cf. Explanation of the allocation estimate in Sections 2.4 „Iron and steel industry incl. coke ovens“, 2.7 „Pulp and paper“ and 2.8 „Chemical industry“

58 A recalculation of the adjusted allocation coverage for the iron and steel industry in context with this report (see Section 2.4) also yielded corrections for 2013 and 2014. Analogous to Table 43, Annex 8 shows representations of the adjusted allocation coverage for 2013 and 2014.

Allocation status in the overall 2008-2015 period

In addition to the 2015 allocation surpluses (deficits), the relevant figures from the previous years for the installations considered in this report are included in the following in order to obtain an extended review of the current allocation status. This seems appropriate because emission allowances allocated since 2008 could be converted into emission allowances for the current trading period and therefore can continue to be used for surrender obligations in emissions trading (also called “banking”).

For industrial activities, an overall cumulative allocation surplus resulted from the balance of free allocation and verified emissions in the second trading period (2008 to 2012) totalling 102.2 million allowances.[59] The allocation surplus amounted to another 28.8 million allowances in the first three years of the current trading period. This resulted in a total allocation surplus of 131.0 million emission allowances for industrial activities in the 2008-2015 period.

Under the assumption that the allocations for forwarded waste gases from iron, steel and coke production and imported heat (60.1 million allowances in 2013 to 2015) have been settled between the operators of the industrial and energy sectors, the industrial sector exhibits a cumulated deficit of 31.3 million emission allowances for the first three years of the current trading period, but this deficit is presently fully offset by the surpluses accrued in the second trading period. The total allocation surplus for industrial activities in the 2008-2015 period would be 70.9 million emission allowances according to this delineation. Table 44 summarises the aggregated results differentiated by industrial and energy sectors.

Table 44: Aggregated allocation status in the second and third trading periods

Field	No. of installations	Cumulated allocation surplus				
		2008-2012 adjusted* [M EUA]	2013-2015 non-adjusted** [M EUA]	2008-2015 total [M EUA]	2013-2015 adjusted*** [M EUA]	2008-2015 adjusted total*** [M EUA]
Energy	967	-369.1	-930.6	-1,299.7	-870.5	-1,239.6
Industry	922	102.2	28.8	131.0	-31.3	70.9
Total	1,889	-266.9	-901.8	-1,168.7	-901.8	-1,168.7

* Including redistribution of emission allowances for forwarded waste gases from iron, steel and coke production pursuant to §11 Allocation Act (Zuteilungsgesetz)
** Without taking into account possible offsets in the transfer of waste gases from iron, steel and coke production and heat imports
*** Taking into account possible offsets in the transfer of waste gases from iron, steel and coke production and heat imports
As of 02/05/2016

Unlike in the industrial sector, this resulted in an allocation deficit of 369.1 million emission allowances for the energy installations in the second trading period. Apart from the ambitious level of the benchmarks at the time and the proportional cuts to secure the budget, this is also due to the fact that the free allocation for power generation was reduced in Germany in the second trading period in favour of auctioning emission allowances.[60] Auctioning has been the exclusive standard for power generation in Europe since 2013. The cumulative shortfall in the energy sector including 2015 increased to a total of 1,299.7 million emission allowances (930.6 million allowances of it in the third trading period) when the balance from the second trading period is taken into account.

Assuming the free allocation for waste gases from iron, steel and coke production and heat imports is settled between the industrial and energy sectors, the deficit decreases for the entire 2008-2015 period by 60.1 million allowances to 1,239.6 million.

Use of project credits

In assessing the cumulated allocation deficits and surpluses, it is important to note that in addition to emission allowances (EUA), operators were also able to surrender project credits (CER/ERU from CDM/JI) in the second trading period.

59 Including redistribution of emission allowances for forwarded waste gases from iron, steel and coke production pursuant to § 11 Allocation Act (Zuteilungsgesetz)2012

60 The free allocation for power generation was reduced annually by 38 million allowances in favour of the sales budget according to the provisions of § 20 Allocation Act (Zuteilungsgesetz) 2012.

German operators were allowed to surrender CER/ERU up to an amount equal to 22 percent of their allocation. Unused claims usually also remained available in the third trading period[61]. Operators without prior claims can always use CER/ERU up to an amount equal to 4.5 percent of their cumulated emissions in the third trading period. Since the prices of project credits are below the EUA price levels, their claim for use leads to an effective relaxation of the allocation situation for the installations concerned (see Section below with Figure 26 und Table 46).

The total claim to use project credits currently stands at 426.7 million allowances for the 1,889 installations considered in this report. This claim relates to the entire 2008-2020 period[62]. 287.5 million project credits have already been used for surrender in the second trading period (2008-2012). Another 120.5 million credits were used by the installations considered in the first three years of the current trading period for conversion into EUA.

Therefore, a residual claim for use totalling 18.7 million project credits currently remains based on the total specified claim. This corresponds to 4.4 percent of all German installations' total specified claim. For the 967 energy installations, the residual claims amount to 15.9 million project credits, or 5.8 percent of their total claim. The 922 industrial installations can convert 2.8 million credits into EUA (which is 1.8 percent of their total claim). Table 45 summarises the cumulated results differentiated by industry and energy sectors.

Table 45: Surrendered and converted project credits in the second and third trading periods

Field	No. of installations	Total 2008-2020 claim for CER/ERU use [million]	Surrendered 2008-2012 CER/ERU [million]	Converted 2013-2020 CER/ERU [million]	Remaining 2008-2020 claim for CER/ERU use [million]
Energy	967	274.4	162.9	95.6	15.9
Industry	922	152.3	124.6	24.8	2.8
Total	**1889**	**426.7**	**287.5**	**120.5**	**18.7**

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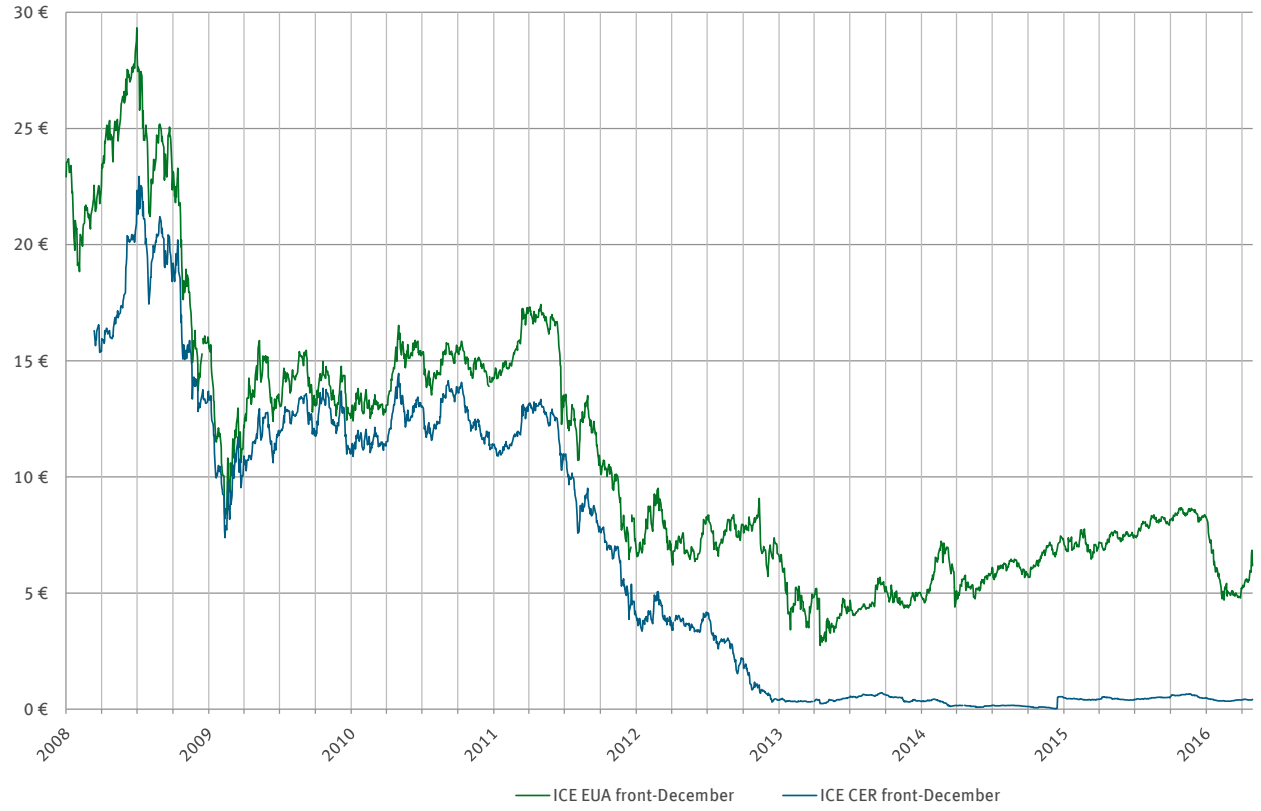
EUA und project credit price trends

The EUA price history has been subject to substantial fluctuations in the past. At the beginning of the second trading period the EUA price reached a level of 25 to 30 euros. By the beginning of 2009, prices fell initially to less than ten euros, then stabilised at about 15 euros between 2009 and 2011. From mid-2011, the price has dropped continuously. In April 2013, finally, the lowest level of under three euros was reached at the start of the second trading period. The price stabilised again gradually by the end of 2015 and climbed to a level of about eight euros, but another price fall to around five euros occurred around the turn of 2015/2016. The price has recovered since the end of March 2016 and has climbed to a level of between six and seven euros.

Since 2008, the project credit (CER/ERU) price level has always moved below the EUA price. The relative price difference between this and the EUA has increased since the end of the second trading period. Currently an exchange-traded CER is only listed at around 40 cents, which corresponds to less than ten percent of an EUA's market value. Figure 26 shows the price trends for EUA and CER/ERU in the period from January 2008 to April 2016.

61 However, CERs/ERUs cannot be directly used for surrender, but must be converted into EUAs in the Union Registry.

62 In addition to the second trading period claims, the specified total claim also includes claims that derive from the 2013-2015 reporting years emissions. The total claim will further increase later on in the third trading period depending on the verified 2016-2020 emissions.



Source: ICE, Thomson Reuters, DEHSt Illustration
As of 02/05/2016

Figure 26: Price trends of emission allowance (EUA) and international project credits (CER) in the second and third trading periods

In addition, Table 46 shows the average EUA and CER prices for the completed second and the current third trading period[63]. The relevant average price for EUA was 13.62 euro (CER: 10.00 euro) in the second trading period and 6.04 euro (CER: 0.37 euro) in the period from January 2013 to April 2016.

Table 46: Average prices for emission allowances (EUAs) and international project credits (CERs) in the second and third trading period

Time Period	2nd trading period 03/2008-04/2013 [Euro]	3rd trading period 01/2013-04/2016 [Euro]
EUA price*	13.62	6.04
CER price**	10.00	0.37

* VWAP ICE EUA front-december
** ICE CER front-december
Source: ICE, Thomson Reuters, DEHSt calculation
As of 02/05/2016

63 Reference contract for the following consideration is the futures traded at the London energy and commodities exchange ICE for delivery in December of the current or following year (so-called front-December Futures) for EUA and CER.

3.2 Germany and Europe: emission and surplus trend

Approximately 11,500 stationary installations in the 28 Member States of the European Union and the three states of Iceland, Liechtenstein and Norway (EU-31) participate in European emissions trading (excluding aviation). With approximately 1.8 billion tonnes of carbon dioxide equivalent[64], the sum of emissions subject to reporting exceeded the allocated free and auctioned emission allowances in 2015 by about 262 million tonnes of carbon dioxide[65]. Nevertheless, it was still significantly lower than the 2015 cap value of 2.01 billion emission allowances.

3.2.1 Emission trend in the EU ETS and in Germany

In 2015, the emissions of ETS installations decreased across the EU (EU-31) to roughly 1.8 billion tonnes of carbon dioxide equivalent or about 0.6 percent compared to the previous year. The reduction target for the EU ETS by 2020 (21 percent reduction compared to 2005) had therefore already been achieved or surpassed in 2014 and 2015. Both years complied with or even achieved lower values than the cap value for 2020 of 1.816 billion tonnes of carbon dioxide. The emissions from approximately 1,900 German installations included in emissions trading in 2015 were lower by nearly 6 million tonnes at 456 million tonnes of carbon dioxide equivalent (minus 1.2 percent) compared to the previous year. For the first time this was a larger emission reduction than the European average since the start of emissions trading. Overall, ETS emissions in Germany were significantly lower than the European average since the start of emissions trading in 2005: while emissions in Germany fell by around 11.5 percent between 2005 and 2015, the European average emissions decreased by 24.1 percent over the same period (see Figure 27).

Figure 27 shows the emission trend of the five Member States with the highest emissions: the values in parentheses shown in the legend quantify the span of each Member State's share in the overall ETS emissions since 2005. The emission trend in these Member States that produce approximately 62 percent of the overall ETS emissions presents a very different trend: while ETS emissions reduction in Germany and Poland was significantly less than the European average since 2005, ETS installations in the other three Member States – the UK, Spain and Italy – registered markedly above average emission reductions. Thus, emissions in Germany and Poland decreased less than the emissions in the other Member States even during the economic and financial crisis (2008/2009). In addition, emissions in Germany and Poland increased again after 2009 to a significantly higher level. Poland recorded a moderate emissions reduction since 2011 and Germany only since 2013. In comparison, ETS emissions in the UK, Italy and Spain decreased significantly over the entire period and, in 2015, amounted to less than two-thirds of their level in the first year of emissions trading in 2005 or almost 70 percent in Spain (Germany: 88.5 percent, Poland: 89.2 percent). These trends are linked to the different industrial and power production trend in the above mentioned countries[66].

64 Source: preliminary figures of the European Commission

65 Source: own calculation. Note: this figure does not represent the EU ETS surplus for 2015. See Section 3.2.2

66 Industrial production in Germany decreased less during the economic crisis than in the other countries and has now returned to the pre-crisis level; industrial production in Poland has increased compared to the beginning of 2008. By contrast, industrial production in the UK and particularly in Italy and Spain is well below the pre-crisis level, see Destatis 2016; COM 2014, Figure 1.4.

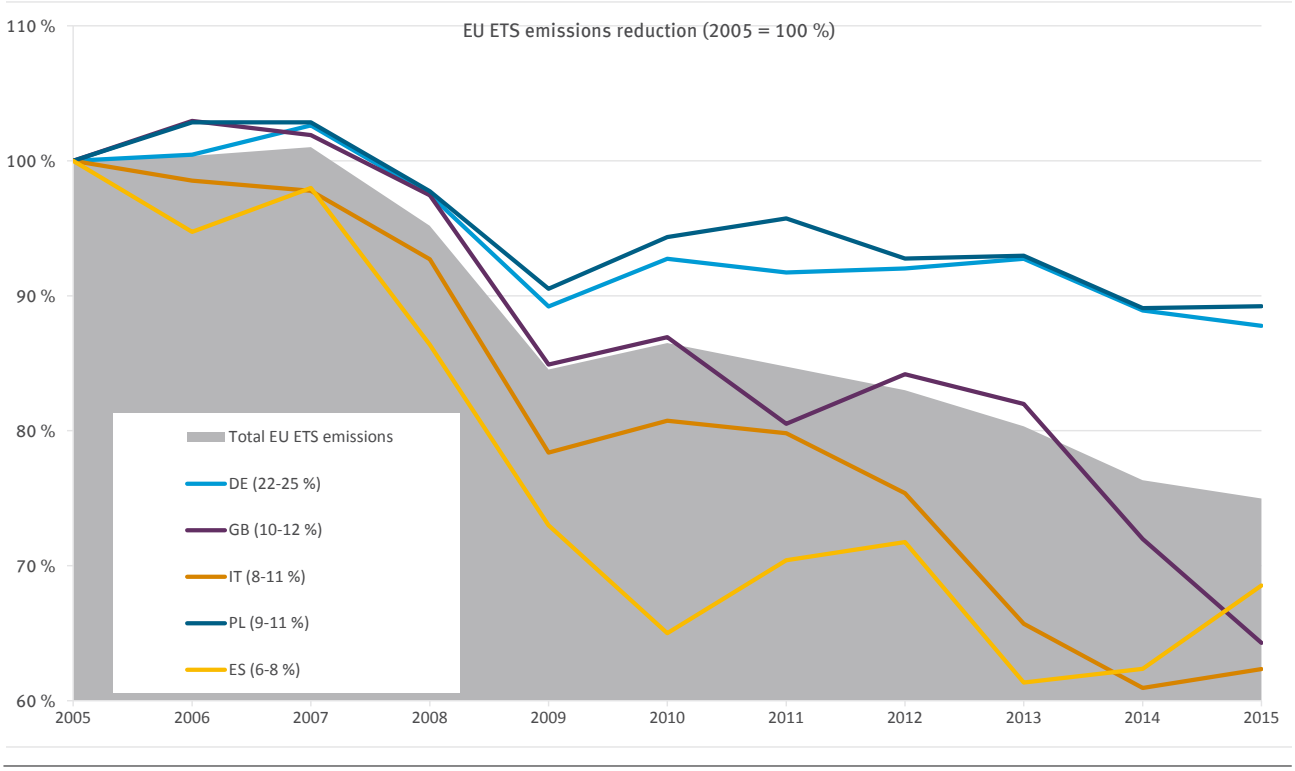


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Figure 27: Emission trend of the largest European emitters compared to the EU average (2005 emissions plus correction for extended scope of the third trading period = 100 percent)[67]

3.2.2 Emissions and available emission allowances in the EU ETS

Status in the Member States

Figure 28 shows a comparison of emissions with freely allocated and auctioned emission allowances by countries. In the majority of the 31 countries participating in the EU ETS, operators surrendered more emission allowances than they received for free or purchased on the market. This is mainly due to the impact of "backloading": between 2014 and 2016, a total of 900 million allowances are to be retained from auctions and moved to the market stability reserve (MSR) which will be established in 2018, in order to reduce the surplus of emission allowances (more than 2 billion emission allowances at the end of 2014) on the market. In 2015, auctions in Europe sold around 300 million allowances less than originally planned due to backloading. The illustration in the figure does not allow conclusions about the actual shortfall of the total of all installations in a Member State because it does not include project credits and accumulated ("banked") emission allowances from previous years. In addition, the auction amounts of Member States should not be allocated to the installations of a single Member State because operators can purchase emission allowances from all Member States.

67 Sources: 2015 EEA for 2005-2014, EU 2016a for 2015

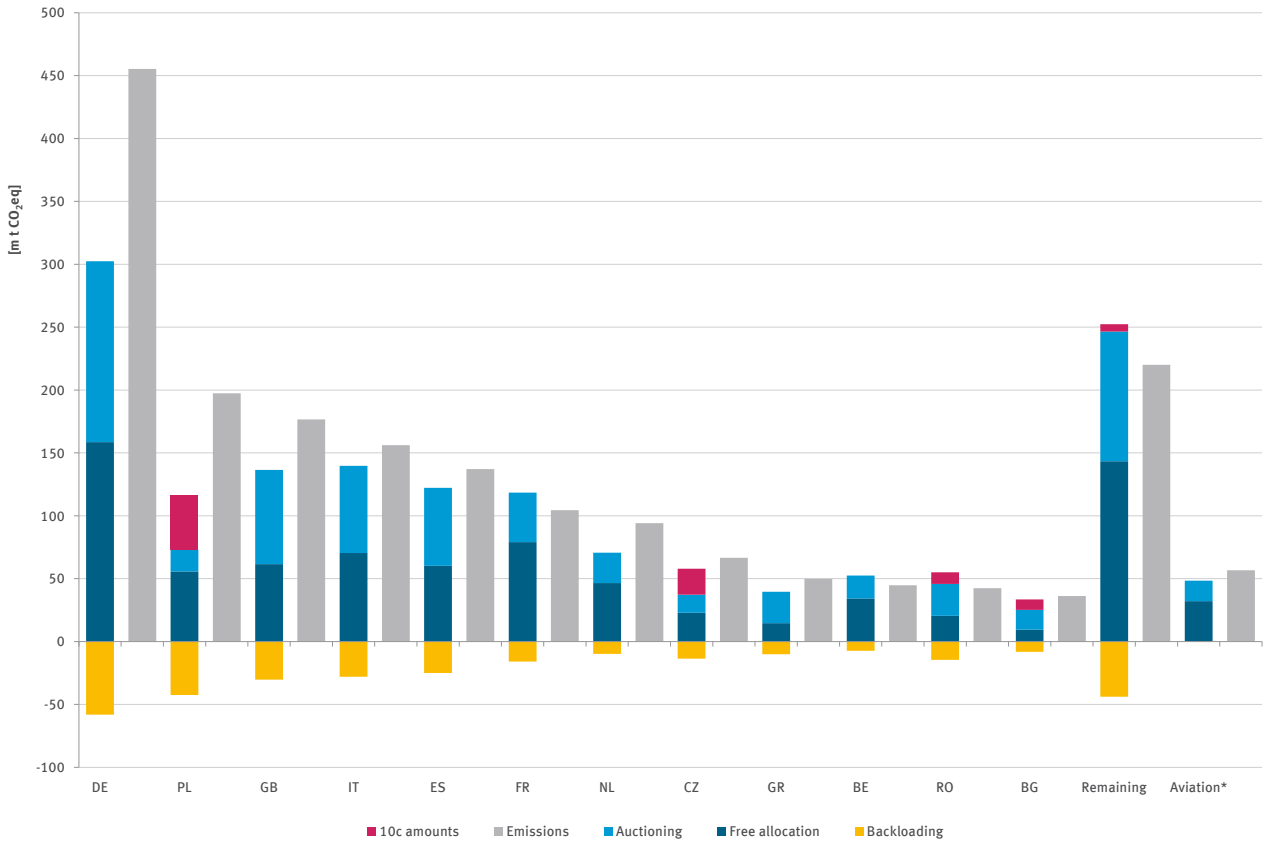

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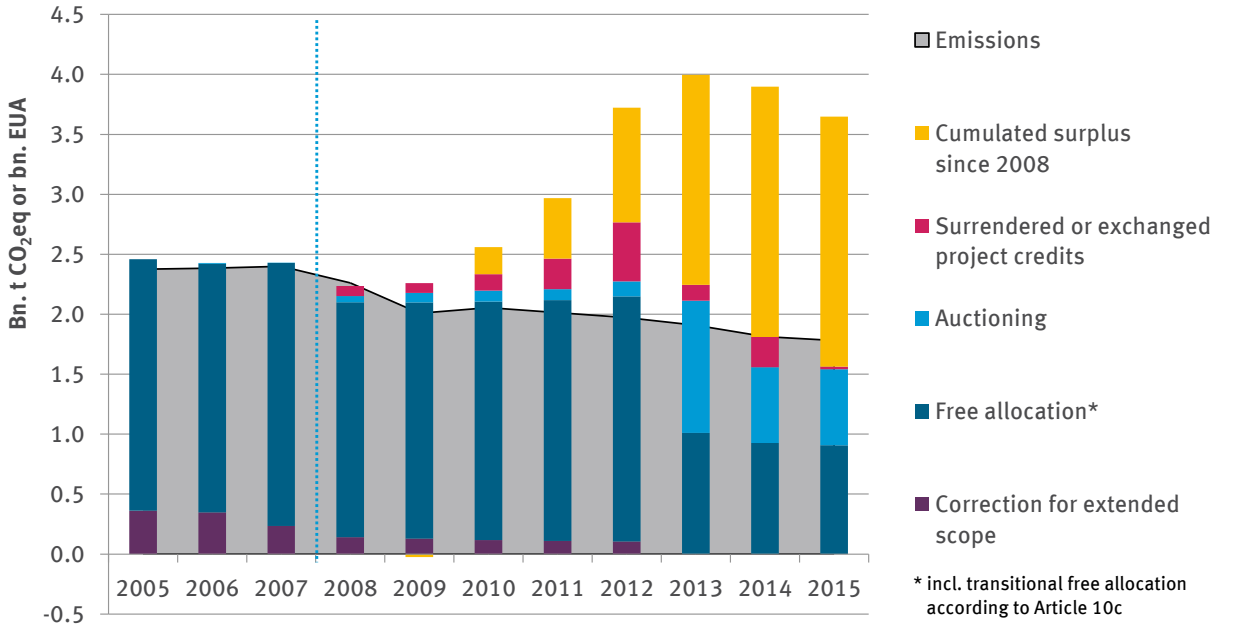
Figure 28: Emissions, free allocation and auction amounts for 2015 compared to all countries participating in the EU ETS

One reason for the differences in the ratio of auctioned to freely allocated emission allowances on one hand and the emissions on the other between Member States is the distribution key for national auction amounts under Article 10 (2) of the Emissions Trading Directive. This causes a redistribution of auction amounts in favour of certain countries. In addition, the distribution key for the auction amounts is based on the emissions from 2005 to 2007. Thus, Member States with a larger decrease in emissions currently have a more favourable ratio of auction amounts to emissions. In addition, some new Member States can be granted a transitional free allocation for electricity production (Article 10c of the Emissions Trading Directive).

Demand and supply in the stationary sector (across the EU)

Since the introduction of the possibility for transferring emission allowances into following trading periods (banking), i.e. since 01/01/2008, large amounts of surplus allowances have accumulated in the EU ETS, which have contributed significantly to the price decline for emission allowances seen since mid-2011. At the end of 2014, the cumulative notional surplus in the EU ETS, as in the balance of available emission allowances (free and auctioned emission allowances as well as surrendered and exchanged project credits) and verified emissions amounted to more than 2 billion allowances[68]. Considering these surpluses, the notional available supply on the market was almost twice as high as the demand in 2014 (verified emissions). Based on the partial preliminary data available at the editorial deadline, it can be assumed that the surplus has noticeably declined for the first time in 2015, compared to the previous year. This is due to reduced auction amounts (backloading), small residual amounts of project credits still available and the largely stable emission trend in 2015.

68 18/05/2015 press release of the European Commission



As of 02/05/2016

Figure 29: Demand and supply in the overall system: comparison of emissions with the available emission allowances since 2005[69]

Demand and supply in Germany (stationary sector)

While the overall European surplus continued to grow in the first two years of the third trading period and – according to preliminary data – only declined noticeably in 2015, emissions in Germany have been above the sum total of allocated emission allowances (freely or by auction) plus the project credits exchanged by German operators since the beginning of the third trading period. Emissions between 2013 and 2015 amounted to about 1.4 billion tonnes of carbon dioxide (see Figure 30) and were almost 310 million tonnes higher than the sum total of free allocations and auction amounts (970 million emission allowances) plus the exchanged project credits (121 million emission allowances) that can be notionally allocated to Germany[70]. Thus, to cover their total emissions, German operators had to surrender unused emission allowances from the second trading period or emission allowances from abroad (i.e. from foreign operators or other Member States on the primary or secondary market) in order to meet their surrender obligation. In terms of balance, German operators had surpluses that were carried over from the second trading period (265 million emission allowances) and were used in 2015, which means that German operators had a net shortfall of around 43 million emission allowances. For a macroeconomic evaluation, the associated capital outflow for the purchase of emission allowances should be compared with other economic variables such as the industrial added value.

69 Sources: 2015 EEA for 2005-2014, EU 2016a for 2015 or other preliminary data published by the EU Commission as well as information of the EEX/ICE for auction amounts.

70 The distribution of auction amounts and freely allocated emission allowances over the years follows the allocation of the EEA ETS Data Viewer, i.e. the emission allowances of the third trading period that were auctioned early (so-called early auctions) are attributed to 2013. DEHSt data was used for the 2015 emissions.

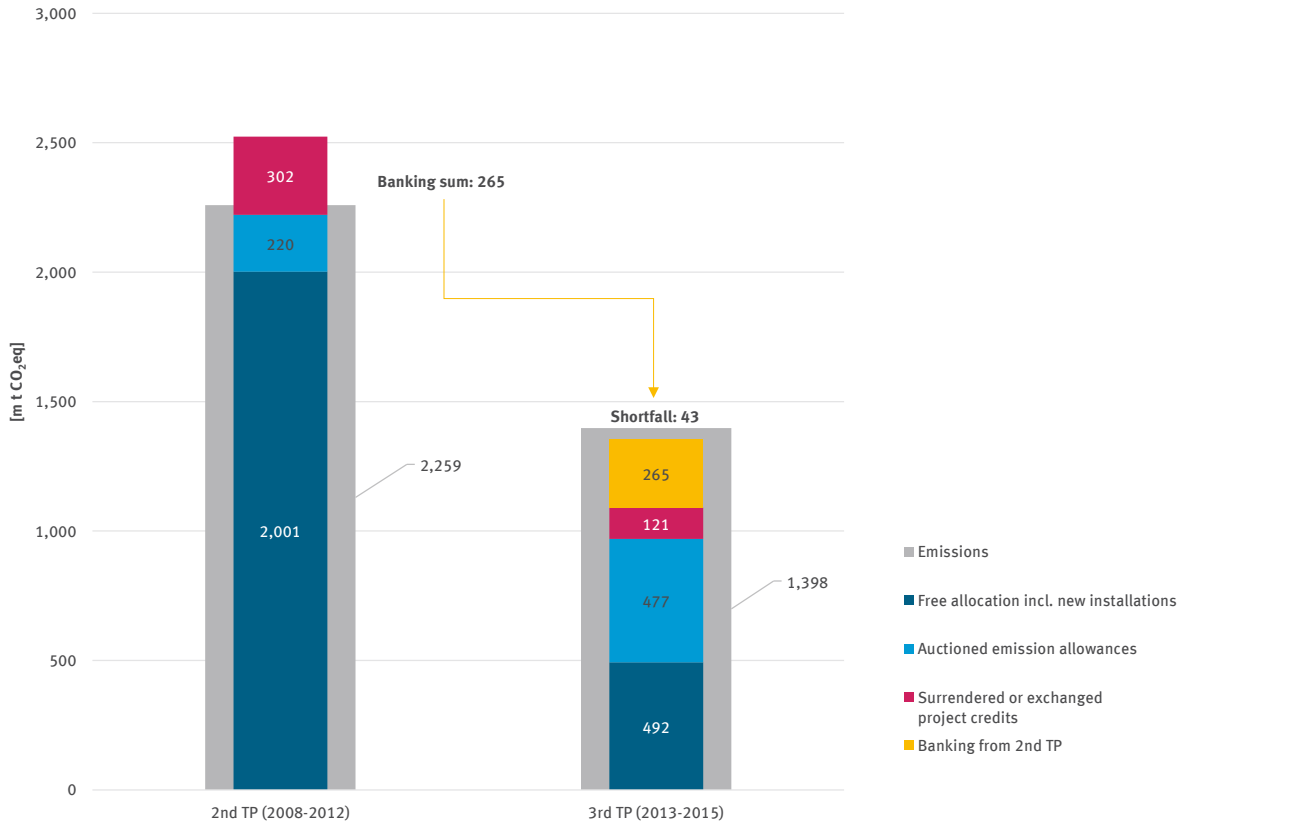


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Figure 30: Low shortfall of Germany in the third trading period

The relationships shown in Figure 30 are influenced by the previously described redistributive elements in auctioning as well as the national share in the free allocation. Overall, Germany's share amounts to less than 19 percent of the European total free allocation and auctioning between 2013 and 2015. This share is lower than Germany's share (21.3 percent of the cap) used to determine the EU-wide cap under Article 9 of the Emissions Trading Directive[71]. This value can be interpreted as the cap share attributable to German installations in the third trading period. When applied to the auctioned and freely allocated emission allowances across Europe between 2013 and 2015, the historical German cap share (21.3 percent) is correspondingly higher than the sum of emission allowances auctioned and freely allocated in Germany because the described redistributive elements are not included in the share (1.11 billion emission allowances instead of 970 million). If the project credits and the emission allowances transferred from the second trading period are added to this sum, the comparison with the ETS emissions in Germany produces a different result: despite reductions in the auction amounts in 2014 and 2015 (backloading), the German share in the amounts surrendered on the market is still higher by almost 100 million emission allowances than the emissions between 2013 and 2015.

71 Analogous to the cap determination at EU level, the calculation of the (notional) German cap share is based on the continuation of the German emission budget of the second trading period applying the linear reduction factor as of 2010 in addition to the activities and gases newly added in the third trading period.

4 Emissions in aviation

4.1 The EU emissions trading trend in aviation

Since the beginning of 2012, aviation has also been included in the European Emissions Trading Scheme (EU ETS) in addition to stationary activities. Emission trading obligation includes flights that land and take off ("full scope") within the European Economic Area (EEA)[72] and also applies to aircraft operators' flights that have their headquarters outside the EU. Monitoring and reporting obligations regarding their emissions have existed since the beginning of 2010.

The delimitation of aviation emissions included in the EU ETS is established by the Emissions Trading Directive[73]. The scope of the Emissions Trading Directive was adjusted twice in previous years (see Table 47). First, the scope for the reporting year 2012 was considerably restricted through the so-called "Stop the Clock" resolution of the EU[74]. In that year the EU relinquished the sanctioning of violations of the reporting and surrender obligations for flights subject to emissions trading that started or ended outside the EEA, Switzerland or Croatia. This led to the exclusion of a large amount of flights to and from third parties from emissions trading in 2012. The EU wanted to set a positive example at an International Civil Aviation Organisation (ICAO) level for negotiating a global instrument aimed at the reduction of international aviation emissions.

The scope was further reduced for a limited time between 2013 and 2016 ("reduced scope")[75]. This followed the ICAO General Assembly decision of autumn 2013 to draw up a global market-based measure to reduce international aviation emissions by 2016 and introduce the measure in 2020 as well as to establish working groups for the specific development of this global instrument. The ICAO General Assembly scheduled for September 2016 will decide on the global market-based emissions reduction instrument.

Under the "reduced scope", emissions from flights that start or end outside the EEA are no longer subject to emissions trading. Unlike in 2012, this also applies to flights from the EEA to Switzerland and back. In addition, non-commercial aircraft operators are excluded from emissions trading if their annual emissions based on the original scope are lower than 1,000 tonnes of carbon dioxide.

According to current legislation, the original scope again applies from 2017.[76] The EU's decision on the scope of the Emissions Trading Directive starting with the reporting year 2017 largely depends on the decisions of the ICAO General Assembly for the creation of the global market-based emissions reduction instrument in autumn 2016. Table 47 summarises the scope trend in aviation.

72 In addition to the EU 27, the European Economic Area (EEA) included Norway, Iceland and Liechtenstein. Since its entrance into the EU in 2014, Croatia also belongs to the EEA.

73 Directive 2003/87/EG

74 Decision 377/2013/EU

75 Regulation 421/2014/EU

76 The exclusion criterion for small, non-commercial operators introduced in 2013 must still be complied with.

Table 47: Overview of the EU ETS scope in aviation

Period	Description of scope[1]	Reporting obligation	Surrender obligation	Extent of scope			
				Geographic		Exclusion criteria[2]	
				Flights in and between EU ETS Member States[3]	Flights to/ from third countries	Commercial operators[4]	Non-commercial operators
2010-2011	Full scope	x	-	x	x	Flights < 243 per four months or Full scope emissions < 10,000 t CO_2/a	-
2012	Stop-the-clock	x[5]		x	Switzerland only		
2013-2016	Reduced scope	x		x[6]	-		Full scope emissions < 10,000 t CO_2/a
2017-2020[7]	Full scope	x		x	x		

[1] See Glossary for the definitions of scope
[2] Flights with a maximum take-off mass less than 5,700 kg, military, police, customs, non-EU regimes, research, sightseeing and training flights are excluded
[3] The Group of EU ETS Member States includes all EU Member States as well as Norway, Iceland and Liechtenstein (the latter has no airport). Includes Croatia since 2014.
[4] Commercial operators are defined as operators that offer public transport services in exchange for remuneration.
[5] Within the framework of Stop the Clock (StC) regulations, operators could choose to report for the StC scope or according to the "Full scope" and surrender accordingly.
[6] Flights between EEA States and European areas in the outermost regions (i.e. Canary Islands) are also exempt from the emissions trading obligation.
[7] Post-2016 aviation regulations in the EU ETS will be adapted by the EU after considering the 2016 ICAO General Assembly results.
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4.2 Assignment of aviation emissions to Member States

The allocation of ETS emissions to an EU Member State is organised fundamentally differently in aviation than in stationary activities. The so-called territorial principle applies to stationary installations. Accordingly, Germany is assigned the emissions of all stationary installations in Germany. Regarding emissions from aviation however, each aircraft operator is assigned a single administering Member State. This aims to simplify the administration for operators and enforcement authorities. The assignment is determined by the European country that grants the operating license. If the operating license was issued outside the EU, the assignment will go to the EU Member State in which the aircraft operator has the largest estimated share of its emissions.

This system differs significantly from the emission assignment in the national greenhouse gas inventory. In the inventory, a country is only assigned aviation emissions from flights starting within its territory. However, because in emissions trading aircraft operators are divided and assigned to individual Member States according to said management criteria, all flights subject to emissions trading and the associated emissions of a specific operator are assigned to and managed by a single Member State. As a result, Germany also manages flights that do not start in Germany and therefore emissions that are not attributable to the German greenhouse gas inventory. Likewise, aviation emissions that in turn are attributed to the German inventory are also managed by other EU Member States. Aviation emissions managed by Germany therefore offer no direct conclusions regarding the German aviation emissions in the greenhouse gas inventory[77]. This circumstance must be considered in the interpretation of the following evaluation.

77 In addition, emissions included in the inventory do not fall entirely under the scope of emissions trading. Flights that are not subject to emissions trading are basically all flights of aircrafts having a maximum take-off mass less than 5,700 kg, military, police, customs, non-EU regimes, research, sightseeing and training flights (see also Table 47).

4.3 Overview of aircraft operators managed by Germany

According to the list of administrative Member States, Germany is responsible for around 500 aircraft operators for the 2015 reporting year. This assignment is purely administrative because not all of these operators perform activities subject to emissions trading every year. Furthermore, cases of partial shut-downs and insolvency proceedings are also included in this list. In addition, the number of aircraft operators with activities subject to emissions trading decreases significantly by excluding small emitters with less than 1,000 tonnes of carbon dioxide per year.

67 of approximately 500 aircraft operators reported emissions from their flights subject to emissions trading for 2015. The emissions amounted to approximately 8.95 million tonnes of carbon dioxide and were significantly above the free allocation amount. Overall, about 5.1 million emission allowances were allocated. The 67 operators managed by Germany thus had an average allocation coverage of about 57.0 percent. The average ratio of free allocation to emissions under surrender obligation declined slightly compared to the previous years (2014: 58.1 percent and 2013: 59.9 percent). This fact can be attributed to rising emissions in conjunction with declining allocation amounts. Table 48 summarises the emission and allocation status of the aircraft operators managed by Germany between 2013 and 2015.

Table 48: Overview of aviation for the period of 2013 to 2015 (reduced scope)

Year	No. of operators	Allocation amount [1000 EUA]	2015 VET [kt CO_2eq]	Allocation coverage
2013	62	5,160	8,610	59.9 %
2014	65	5,149	8,860	58.1 %
2015	67	5,101	8,946	57.0 %

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4.4 Emissions trend

Table 49 separates the VET emissions of aircraft operators managed by Germany into commercial and non-commercial operators. Accordingly, slightly more than two-thirds of the operators had commercial status and a little less than a third had a non-commercial status in the 2015 reporting year. This ratio was the other way around in the 2012 reporting year because the flights of non-commercial aircraft operators with emissions below 1,000 tonnes of carbon dioxide per year were still subject to emissions trading.

Overall, the emissions of aircraft operators managed by Germany amounted to around 8.95 million tonnes of carbon dioxide in 2015. Emissions were almost completely due to commercial operators: their share of total emissions was 99.6 percent. The four largest commercial emitters made up around 87 percent of the total emissions. The emissions of 19 non-commercial aircraft operators amounted to only 0.4 percent.

Table 49 also contains information on the emission trend of aircraft operators under the obligation to surrender in 2015 compared to the 2014 reporting year. The aggregated emissions of these 67 operators were 114,000 tonnes of carbon dioxide (1.3 percent) above the previous year's figure. The emissions of 29 of these operators actually grew (2014 EM < 2015 VET). However, 32 operators' emissions were lower than in the previous year (2014 EM > 2015 VET). A comparison is not possible for six operators because no emissions were reported for 2014.

Table 49: Aviation, number of aircraft operators, 2014 emissions and 2015 VET entries by operator category

Operator category	2014 VET vs. 2015 VET	No. of operators	2014 emissions [kt CO_2eq]	2015 VET [kt CO_2eq]	2015 VET deviation from 2014 EmO
Commercial	2014 EM › 2015 VET	22	6,198	5,925	-273
	2014 EM ‹ 2015 VET	22	2,597	2,917	320
	Comparison not possible	4	0	65	65
		48	8,795	8,907	112.0
Non-commercial	2014 EM › 2015 VET	10	10	7	-3
	2014 EM ‹ 2015 VET	7	26.2	30.0	3.8
	Comparison not possible	2	0.0	1.1	1.1
		19	37	39	1.9
Total		**67**	**8,832**	**8,946**	**114**

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Figure 22 additionally shows EU ETS aviation emissions managed by Germany for the period between 2010 and 2015, i.e. since the start of the reporting obligation. The emission trend clearly reflects the adaptations to the scope of the Emissions Trading Directive described under Section 4.1. In 2010 and 2011, the emissions of all flights starting or landing in the EEA had to be reported ("full scope"). For Germany, the emissions of these 2010 and 2011 flights amounted to more than 52 million tonnes of carbon dioxide per reporting year.

The surrender obligation for emission allowances was introduced for the first time in 2012. However, the actual extent of emissions managed by Germany was reduced to only about 30 percent of the full scope due to the EU's Stop the Clock resolution. It should be noted that in 2012, aircraft operators were free to choose between reporting their emissions in accordance with the full scope or only reporting emissions for flights within the European Economic Area-provided that they returned the free allocation for the remaining flights. Aircraft operators, whose 2012 allocation was higher than their full-scope emissions therefore reported according to the full application scope rule. In total, the emissions managed by Germany in 2012 amounted to around 15.7 million tonnes of carbon dioxide.

With the limiting of the scope to the reduced scope, aviation emissions managed by Germany were once more significantly reduced. With approximately 8.9 million tonnes in 2015, they amounted to about 17 percent of the full scope (2011 reporting year).

Under the reduced scope, aircraft operators managed by Germany contributed to approximately 16 percent of the overall European aviation emissions of the EU ETS. It was 19 percent under Stop the clock. No European total values were published for 2011 and 2012, which means that no German share can be derived for this period.

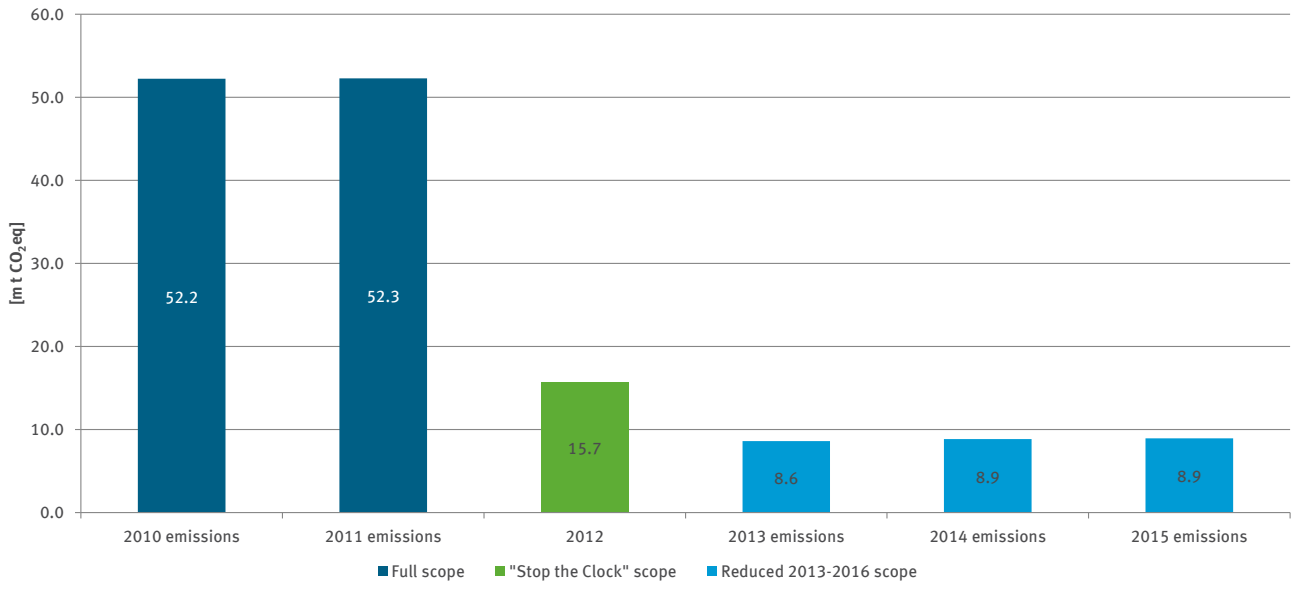

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Figure 31: Aviation (aircraft operators managed by Germany), trend of emissions subject to emissions trading from 2010 to 2015

4.5 Allocation status

60 of the observed 67 operators received a free allocation in the 2015 reporting year. Overall, the free allocation covers about 57 percent of the emissions. It is noteworthy that non-commercial aircraft operators are supplied with much fewer emission allowances than commercial operators. With 3.8 percent, their 2015 allocation coverage was significantly lower than that of commercial aircraft operators (57.2 percent). This can be attributed to the EU-wide uniform allocation rules in aviation. The amount of free allocation can be derived from the transport performance of the operators in tonne-kilometres in the 2010 base year and the aviation benchmark[78]. Regarding their transport performance, non-commercial aircraft operators have a significantly higher fuel consumption and thus higher emissions than commercial operators. This is due to (usually) smaller aircraft types, smaller capacity as well as the mode of operation. Thus, the allocation coverage of non-commercial aircraft operators is significantly lower than that of commercial aircraft operators.

Table 50: Aviation, number of aircraft operators, allocation amounts, 2015 VET entries and allocation coverage

Operator category	No. of operators with an entered VET value	No. of operators with 2015 allocation	2015 VET [kt CO_2eq]	2015 allocation amount [1000 EUA]	2015 allocation deviation from 2015 VET [kt CO_2eq]	Allocation coverage
Commercial	48	45	8,907	5,099	-3,808	57.2 %
Non-commercial	19	15	39	1	-37	3.8 %
Total	**67**	**60**	**8,946**	**5,101**	**-3,845**	**57.0 %**

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78 see DEHSt 2012b, Section 3.1.2 “Allocation benchmarks“.

5 States (Länder)

Table 51: Overview of 2014 verified emissions per state (Land), by activities

2014 emissions [kt CO_2eq]		State (Land)																
	Activity	BB	BE	BW	BV	HB	HE	HH	MW	LS	NW	RP	SH	SL	SN	ST	TH	Total
1	Combustion	17	0	36	59	0	22	5	7	139	1,272	426	4	0	0	60	12	2,059
2	Energy conversion ≥ 50 MW RTI	39,249	6,918	17,294	8,315	6,431	4,645	3,176	3,140	21,868	157,327	4,734	3,756	8,848	33,207	10,099	894	329,903
3	Energy conversion 20-50 MW RTI	212	169	574	931	118	409	204	37	723	988	292	96	141	145	133	113	5,286
4	Energy conversion 20-50 MW RTI, other fuels	0	0	10	13	0	0	0	0	42	60	0	0	0	0	0	28	153
5	Prime movers (engines)	0	0	0	13	0	0	0	0	43	0	0	0	0	0	0	0	56
6	Prime movers (turbines)	269	0	71	182	0	83	0	0	214	238	49	0	0	5	23	76	1,210
7	Refineries	3,715	0	2,783	3,394	0	0	1,175	0	1,142	7,937	22	2,448	0	0	2,370	0	24,985
8	Coking plants	0	0	0	0	0	0	0	0	0	2,857	0	0	975	0	0	0	3,832
9	Processing of metal ores	0	0	0	0	0	0	0	0	0	71	0	0	0	0	0	0	71
10	Production of pig iron and steel	1,537	0	116	144	2,409	39	90	0	4,430	13,198	17	0	4,869	88	0	41	26,977
11	Processing of ferrous metals	279	0	226	92	603	430	330	0	420	1,743	103	0	892	131	105	61	5,415
12	Production of primary aluminium	0	0	0	0	0	0	261	0	0	693	0	0	0	0	0	0	954
13	Processing of non-ferrous metals	0	0	20	155	0	0	234	0	164	682	60	0	51	107	53	0	1,528
14	Production of cement clinker	1,267	0	3,441	3,731	0	324	0	0	1,072	5,239	805	1,171	0	0	1,555	994	19,598
15	Lime production	410	0	436	1,072	0	337	0	96	834	4,159	501	0	0	0	1,338	189	9,372
16	Glass production	127	0	130	753	0	12	0	21	357	992	283	37	13	241	579	247	3,792
17	Ceramics production	105	0	89	679	30	23	0	0	240	328	154	0	25	163	101	106	2,043
18	Production of mineral fibres	0	0	46	91	0	0	0	0	9	63	0	0	0	84	57	0	351
19	Gypsum production	93	0	19	83	0	0	0	0	21	31	0	0	0	22	0	0	269

2014 emissions [kt CO_2eq]		State (Land)																
	Activity	BB	BE	BW	BV	HB	HE	HH	MW	LS	NW	RP	SH	SL	SN	ST	TH	Total
20	Pulp production	0	0	0	15	0	0	0	0	4	0	0	0	0	0	74	43	135
21	Paper production	49	0	919	740	0	308	0	8	875	1,456	409	73	0	382	35	20	5,273
22	Carbon black production	0	0	0	0	0	0	0	0	134	541	0	0	0	0	0	0	674
23	Nitric acid production	0	0	0	0	0	0	0	168	0	45	436	0	0	53	29	0	730
24	Adipic acid production	0	0	0	0	0	0	0	0	0	24	0	0	0	0	120	0	144
25	Production of glyoxal and glyoxylic acid	0	0	0	0	0	0	0	0	0	0	12	0	0	0	0	0	12
26	Ammonia production	0	0	0	0	0	0	0	0	0	443	1,465	0	0	0	2,368	0	4,276
27	Production of bulk organic chemicals	0	0	47	534	0	40	0	0	283	4,183	1,567	150	0	1,345	180	0	8,330
28	Production of hydrogen and synthesis gas	45	0	0	74	0	0	0	0	21	420	447	114	0	0	664	0	1,785
29	Soda production	0	0	0	0	0	0	0	0	0	167	96	0	0	0	354	0	617
Total		**47,373**	**7,087**	**26,259**	**21,071**	**9,591**	**6,671**	**5,475**	**3,476**	**33,034**	**205,156**	**11,879**	**7,848**	**15,814**	**35,975**	**20,296**	**2,824**	**459,829**

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Table 52: Overview of 2015 VET entries per state (Land), by activities

2015 VET [kt CO_2eq]		State (Land)																
	Acitivity	BB	BE	BW	BV	HB	HE	HH	MW	LS	NW	RP	SH	SL	SN	ST	TH	Total
1	Combustion	18	0	31	71	0	16	4	5	133	1,289	398	3	0	0	63	8	2,041
2	Energy conversion ≥ 50 MW RTI	39,291	6,663	17,970	8,875	6,512	5,886	6,108	2,927	22,155	149,042	4,650	3,808	8,756	32,334	9,692	891	325,558
3	Energy conversion 20-50 MW RTI	202	183	612	929	104	393	193	35	767	1,025	297	101	145	109	129	116	5,341
4	Energy conversion 20-50 MW RTI, other fuels	0	0	9	1	0	0	0	0	42	66	0	0	0	0	0	32	151
5	Prime movers (engines)	0	0	0	12	0	0	0	0	50	0	0	0	0	0	0	0	63
6	Prime movers (turbines)	266	0	60	175	0	84	0	0	233	252	51	1	0	9	30	75	1,237
7	Refineries	4,016	0	2,445	3,730	0	0	1,116	0	1,217	7,635	5	2,212	0	0	2,510	0	24,886
8	Coking plants	0	0	0	0	0	0	0	0	0	2,845	0	0	901	0	0	0	3,747
9	Processing of metal ores	0	0	0	0	0	0	0	0	0	80	0	0	0	0	0	0	80
10	Production of pig iron and steel	1,742	0	127	153	2,768	38	90	0	4,256	13,552	18	0	5,093	80	0	36	27,953
11	Processing of ferrous metals	279	0	231	84	596	434	314	0	424	1,613	98	0	891	126	95	58	5,240
12	Production of primary aluminium	0	0	0	0	0	0	259	0	0	733	0	0	0	0	0	0	992
13	Processing of non-ferrous metals	0	0	20	161	0	0	222	0	158	684	60	0	57	107	129	0	1,598
14	Production of cement clinker	1,274	0	3,330	3,584	0	328	0	0	1,112	5,028	807	1,217	0	0	1,512	938	19,130
15	Lime production	423	0	426	972	0	360	0	85	840	4,082	495	0	0	0	1,316	183	9,181
16	Glass production	124	0	141	734	0	13	0	22	356	1,001	277	37	13	241	568	243	3,771
17	Ceramics production	112	0	84	652	30	25	0	0	235	323	144	0	25	161	95	104	1,988
18	Production of mineral fibres	0	0	48	94	0	0	0	0	8	64	0	0	0	90	58	0	363
19	Gypsum production	93	0	20	82	0	0	0	0	21	30	0	0	0	23	0	0	269

2015 VET [kt CO_2eq]		State (Land)																
	Acitivity	BB	BE	BW	BV	HB	HE	HH	MW	LS	NW	RP	SH	SL	SN	ST	TH	Total
20	Pulp production	0	0	0	17	0	0	0	0	3	0	0	0	0	0	77	41	137
21	Paper production	70	0	900	784	0	305	0	7	905	1,463	399	76	0	370	35	19	5,333
22	Carbon black production	0	0	0	0	0	0	0	0	133	545	0	0	0	0	0	0	678
23	Nitric acid production	0	0	0	0	0	0	0	176	0	39	440	0	0	53	37	0	745
24	Adipic acid production	0	0	0	0	0	0	0	0	0	23	0	0	0	0	113	0	136
25	Production of glyoxal and glyoxylic acid	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	9
26	Ammonia production	0	0	0	0	0	0	0	0	0	636	1,538	0	0	0	2,289	0	4,463
27	Production of bulk organic chemicals	0	0	42	481	0	41	0	0	261	4,175	1,546	163	0	1,172	135	0	8,015
28	Production of hydrogen and synthesis gas	44	0	0	68	0	0	2	0	19	404	500	87	0	0	697	0	1,821
29	Soda production	0	0	0	0	0	0	0	0	0	166	92	0	0	0	344	0	602
Total		**47,954**	**6,846**	**26,498**	**21,660**	**10,010**	**7,923**	**8,308**	**3,258**	**33,328**	**196,795**	**11,822**	**7,705**	**15,881**	**34,876**	**19,925**	**2,741**	**455,528**

As of 02/05/2016

Table 53: Overview of 2015 allocation amounts per state (Land), by activities

2015 allocation amount [1000 EUA]		State (Land)																
	Activity	BB	BE	BW	BV	HB	HE	HH	MW	LS	NW	RP	SH	SL	SN	ST	TH	Total
1	Combustion	53	0	28	25	0	83	3	7	111	1,084	410	5	0	0	102	2	1,912
2	Energy conversion ≥ 50 MW RTI	1,206	1,487	1,506	2,239	192	1,449	524	400	2,322	6,512	1,965	642	343	1,008	1,203	402	23,398
3	Energy conversion 20-50 MW RTI	98	107	443	562	70	269	161	74	616	685	190	50	128	98	69	94	3,716
4	Energy conversion 20-50 MW RTI, other fuels	0	0	53	40	0	0	0	0	24	17	0	0	0	0	0	10	144
5	Prime movers (engines)	0	0	0	14	0	0	0	0	31	0	0	0	0	0	0	0	44
6	Prime movers (turbines)	121	0	43	109	0	45	0	0	197	152	43	0	0	3	16	76	805
7	Refineries	1,931	0	2,161	2,897	0	0	1,379	0	1,019	6,484	17	2,047	0	0	2,277	0	20,211
8	Coking plants	0	0	0	0	0	0	0	0	0	1,452	0	0	287	0	0	0	1,739
9	Processing of metal ores	0	0	0	0	0	0	0	0	0	69	0	0	0	0	0	0	69
10	Production of pig iron and steel	2,931	0	139	148	3,793	48	72	0	5,920	23,731	16	0	6,066	86	0	44	42,993
11	Processing of ferrous metals	254	0	221	78	278	382	311	0	443	1,751	104	0	634	118	97	59	4,731
12	Production of primary aluminium	0	0	0	0	0	0	210	0	0	696	0	0	0	0	0	0	906
13	Processing of non-ferrous metals	0	0	15	138	0	0	379	0	186	609	65	0	34	124	15	0	1,565
14	Production of cement clinker	1,330	0	2,840	3,258	0	244	0	0	1,018	5,061	703	989	0	0	1,723	902	18,069
15	Lime production	309	0	504	937	0	261	0	56	658	3,313	500	0	0	0	1,016	179	7,733
16	Glass production	97	0	131	661	0	9	0	6	296	838	191	34	9	212	482	198	3,164
17	Ceramics production	96	0	98	656	29	26	0	0	193	319	141	0	25	143	80	96	1,901
18	Production of mineral fibres	0	0	24	83	0	0	0	0	5	72	0	0	0	50	56	0	290
19	Gypsum production	98	0	29	94	0	0	0	0	24	35	0	0	0	24	0	0	304

2015 allocation amount [1000 EUA]		State (Land)																
	Activity	BB	BE	BW	BV	HB	HE	HH	MW	LS	NW	RP	SH	SL	SN	ST	TH	Total
20	Pulp production	0	0	9	16	0	0	0	0	8	0	0	0	0	0	44	22	98
21	Paper production	478	0	973	1,296	0	380	0	6	1,066	1,146	488	171	0	318	116	135	6,576
22	Carbon black production	0	0	0	0	0	0	0	0	90	455	0	0	0	0	0	0	545
23	Nitric acid production	0	0	0	0	0	0	0	278	0	166	239	0	0	27	34	0	744
24	Adipic acid production	0	0	0	0	0	0	0	0	0	222	582	0	0	0	246	0	1,050
25	Production of glyoxal and glyoxylic acid	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	8
26	Ammonia production	0	0	0	0	0	0	0	0	0	522	1,445	0	0	0	1,762	0	3,729
27	Production of bulk organic chemicals	0	0	18	456	0	110	0	0	501	4,575	2,435	141	0	1,008	193	0	9,437
28	Production of hydrogen and synthesis gas	23	0	0	105	0	0	0	0	6	441	617	67	0	0	342	0	1,602
29	Soda production	0	0	0	0	0	0	0	0	0	221	102	0	0	0	762	0	1,085
Total		**9,025**	**1,594**	**9,236**	**13,810**	**4,362**	**3,307**	**3,038**	**828**	**14,735**	**60,628**	**10,261**	**4,145**	**7,524**	**3,218**	**10,634**	**2,220**	**158,567**

As of 02/05/2016

6 Main Fuels by Sectors

Table 54: 2015 emissions and allocations* for stationary installations in EU ETS using the main fuels: natural gas, lignite and hard coal (*no redistribution of waste gases from iron, steel and coke production)

Sector/Activity	Main fuel	2015 allocation amount [1000 EUA]	2015 VET [kt CO_2eq]
Energy installations	Lignite	2,667	164,250
	Hard coal	5,108	104,139
	Natural gas	15,002	31,764
Other combustion plants	Lignite	128	249
	Hard coal	127	126
	Natural gas	90	57
Refineries	Natural gas	2,512	2,532
Iron and steel	Lignite	9	245
	Hard coal	44,033	30,301
	Natural gas	3,628	3,765
Non-ferrous metals	Hard coal	230	261
	Natural gas	748	897
Mineral industry	Lignite	6,231	7,553
	Hard coal	1,722	1,989
	Natural gas	6,241	6,895
Paper and pulp	Lignite	305	620
	Hard coal	305	846
	Natural gas	4,668	3,674
Chemical industry	Lignite	286	151
	Hard coal	1,268	855
	Natural gas	6,643	6,800
Total		101,952	367,967
Complement: main fuel is not natural gas, hard coal or lignite		56,613	87,558
Total		**158,565**	**455,525**

As of 02/05/2016

7 Fields, sectors and activities in the EU ETS

Table 55: Activities (short description) according to Annex 1 TEHG and summary of sectors and fields

TEHG No.	Activity	Sector	Field
2	Energy conversion ≥ 50 MW RTI	Energy installations	Energy
3	Energy conversion 20-50 MW RTI		
4	Energy conversion 20-50 MW RTI, other fuels		
5	Prime movers (engines)		
6	Prime movers (turbines)		
1	Combustion	Other combustion plants, iron and steel, non-ferrous metals, mineral processing industry, chemical industry	Industry
7	Refineries	Refineries	
8	Coking plants	Iron and steel	
9	Processing of metal ores		
10	Production of pig iron and steel		
11	Processing of ferrous metals		
12	Production of primary aluminium	Non-ferrous metals	
13	Processing of non-ferrous metals		
14	Production of cement clinker	Mineral processing industry	
15	Lime production		
16	Glass production		
17	Ceramics production		
18	Mineral fibres production		
19	Gypsum production		
20	Pulp production	Paper and pulp	
21	Paper production		
22	Carbon black production	Chemical industry	
23	Nitric acid production		
24	Adipic acid production		
25	Production of glyoxal and glyoxylic acid		
26	Ammonia production		
27	Production of bulk organic chemicals		
28	Production of hydrogen and synthesis gas		
29	Soda production		

Table 56: Activities (short description) according to Annex 1 TEHG and equivalent in the Union Registry (Registry Activity)

TEHG-No.	TEHG Activity	Registry Ordinance No.	Registry Ordinance Activity
2	Energy conversion ≥ 50 MW RTI	20	Combustion and energy
3	Energy conversion 20-50 MW RTI		
4	Energy conversion 20-50 MW RTI, other fuels		
5	Prime movers (engines)		
6	Prime movers (turbines)		
1	Combustion		
7	Refineries	21	Refineries
8	Coking plants	22	Coking plants
9	Processing of metal ores	23	Processing of metal ores
10	Production of pig iron and steel	24	Production of pig iron and steel
11	Processing of ferrous metals	25	Processing of ferrous metals
12	Production of primary aluminium	26	Production of primary aluminium
13	Processing of non-ferrous metals	27	Production of secondary aluminium
		28	Production or processing of non-ferrous metals
14	Production of cement clinker	29	Production of cement clinker
15	Lime production	30	Lime production
16	Glass production	31	Glass production
17	Ceramics production	32	Ceramics production
18	Mineral fibres production	33	Mineral fibres production
19	Gypsum production	34	Gypsum production
20	Pulp production	35	Pulp production
21	Paper production	36	Paper production
22	Carbon black production	37	Carbon black production
23	Nitric acid production	38	Nitric acid production
24	Adipic acid production	39	Adipic acid production
25	Production of glyoxal and glyoxylic acid	40	Production of glyoxal and glyoxylic acid
26	Ammonia production	41	Ammonia production
27	Production of bulk organic chemicals	42	Production of bulk organic chemicals
28	Production of hydrogen and synthesis gas	43	Production of hydrogen and synthesis gas
29	Soda production	44	Soda production

8 Adjusted allocation coverage for 2013 and 2014 (taking into account waste gases from iron, steel and coke production and heat imports)

The recalculation of the adjusted allocation coverage of the iron and steel industry within the framework of this report (see section 2.4) resulted in corrections of the adjusted allocation coverage for 2013 and 2014. The representations of the adjusted allocation coverage for 2013 and 2014 corresponding to Table 43 are shown below.

Table 57: Adjusted allocation coverage 2013 (taking into account waste gases from iron, steel and coke production and heat imports)

Field	Sector/Branche	No. of installa-tions	2013 allocation amount [M EUA]	2013 emissions [M t CO_2eq]	2013 allocation deviation from 2013 emissions	2013 allocation coverage*	2013 adjusted allocation coverage** [M EUA]	2013 adjusted allocation coverage**
Energy	Energy installations	967	33.4	354.0	-320.7	9.4 %	53.6	15.1 %
Energy		967	33.4	354.0	-320.7	9.4 %	53.6	15.1 %
Industry	Refineries	24	21.0	26.2	-5.2	80.2 %	21.0	80.2 %
	Iron and steel	127	51.1	35.7	15.5	143.3 %	34.5	96.8 %
	Non-ferrous metals	38	2.4	2.4	0.0	100.2 %	2.4	100.2 %
	Mineral processing industry	348	32.2	34.8	-2.5	92.7 %	32.2	92.7 %
	Paper and pulp	152	7.0	5.5	1.4	125.9 %	5.0	90.5 %
	Chemical industry	189	20.4	18.1	2.3	112.6 %	18.8	103.4 %
	Other combustion plants	44	0.6	0.6	0.0	103.8 %	0.6	103.8 %
Industry		922	134.8	123.4	11.5	109.3 %	114.6	92.9 %
Total		**1889**	**168.2**	**477.4**	**-309.2**	**35.2 %**	**168.2**	**35.2 %**

* Without taking into account possible offsets in the transfer of waste gases from iron, steel and coke production and heat imports
** Taking into account possible offsets in the transfer of waste gases from iron, steel and coke production and heat imports
As of 02/05/2016

Table 58: 2014 adjusted allocation coverage (taking into account waste gases from iron, steel and coke production and heat imports)

Field	Sector/Activity	No. of installations	2014 allocation amount [M EUA]	2014 emissions [M t CO_2eq]	2014 allocation deviation from 2014 emissions [M t CO_2eq]	2014 allocation coverage*	2014 adjusted allocation amount ** [M EUA]	2014 adjusted allocation coverage**
Energy	Energy installations	967	30.9	336.6	-305.7	9.2 %	51.0	15.2 %
Energy		967	30.9	336.6	-305.7	9.2 %	51.0	15.2 %
Industry	Refineries	24	21.0	25.0	-4.0	84.0 %	21.0	84.0 %
	Iron and steel	127	50.3	36.4	14.0	138.4 %	33.8	92.9 %
	Non-ferrous metals	38	2.5	2.5	0.1	102.6 %	2.5	102.6 %
	Mineral processing industry	348	32.0	35.4	-3.4	90.3 %	32.0	90.3 %
	Paper and pulp	152	6.8	5.4	1.4	126.5 %	4.9	91.0 %
	Chemical industry	189	20.0	17.9	2.0	111.3 %	18.3	102.3 %
	Other combustion plants	44	0.6	0.6	0.0	99.5 %	0.6	99.5 %
Industry		922	133.3	123.2	10.1	108.2 %	113.2	91.8 %
Total		**1889**	**164.2**	**459.8**	**-295.6**	**35.7 %**	**164.2**	**35.7 %**

*Without taking into account possible offsets in the transfer of waste gases from iron, steel and coke production and heat imports
** Taking into account possible offsets in the transfer of waste gases from iron, steel and coke production and heat imports
As of 02/05/2016

9 Glossary

Allocation coverage

The ratio of free allocation to emissions. An allocation coverage of 100 percent or more means that no emission allowances need to be purchased to meet the annual surrender obligation. An allocation coverage below 100 percent means that the free allocation of one year is not sufficient to meet the surrender obligation through emission allowances from the current allocation. In this case, emission allowances must be purchased or certificates from the second trading period must be used.

Commercial aircraft operator

An aircraft operator that provides scheduled or non-scheduled air transport services to the public and carries passengers, cargo or mail in exchange for remuneration (Article 3 p, Emissions Trading Directive).

Enterprise assignment

The assignment of installations to the listed groups or enterprises in Sections 2.1.1 Large combustion plants, 2.3 Refineries and 2.8 Chemical industry is based on the operator information available to DEHSt. Thus, the assignment cannot always consider all installations of the respective enterprises or not all installations operated by the enterprises. Shares of less than 100 percent are not assigned to any enterprise. Compared to the VET reports from previous years, restructurings and sales may result in changes in the installations concerned and assigned emissions.

EU allowances (EUA)[79]

Emission certificates at a corporate level for emissions trading in Europe (EU ETS). Emission certificates are referred to as emission allowances. They have been tradable within the EU since 2005 and are issued to installations subject to emissions trading in the EU. One EUA legitimises the emission of one tonne of CO_2 (carbon dioxide) or CO_2 equivalent (CO_2eq).

EU allowances (EUAs) and emission allowances can be transferred in accordance with the European Emissions Trading Directive (EHRL) and the Greenhouse Gas Emissions Trading Act (§ 6 (1) TEHG). EUAs enable operators to comply with their annual obligation to surrender emission allowances.

Full scope

Original application scope of the EU ETS in aviation. It includes the carbon dioxide emissions of all commercial and non-commercial flights in accordance with Annex I EHRL, which start from or end in airports in EEA States.

Main fuel

The main fuel in an installation is the fuel with the largest share in the total energy of all fuel streams used in this installation. In contrast, previous VET reports assigned an installation to a main fuel only if more than 80 percent of the energy consumption of an installation could be assigned to a fuel.

Adjusted allocation coverage

The ratio of free allocation to emissions, adjusted by the allocation for transferred waste gases from iron, steel and coke production of the iron and steel industry and imported heat quantities of the paper and chemical industry. Producers of waste gases form iron, steel and coke production and heat importers receive a free allocation for this purpose, although emissions arise from waste gas users or heat producers. The adjusted allocation coverage is based on the assumption that producers of waste gases form iron, steel and coke production and heat importers transfer emission allowances to the installations that produce the emissions. The respective amounts are estimated for this report. The amounts are subtracted from the actual free allocation of industry sectors and added for energy installations.

79 see DEHSt Glossary, https://www.dehst.de/DE/service/glossar/glossar_node.html, as of 27/04/2016

Reduced scope

Reduced scope of the EU ETS in aviation from 01/01/2013 to 31/12/2016. Unlike the full scope, emissions from flights that start or end outside the EEA, are no longer subject to emissions trading. Flights between EEA States and European territories of the outermost regions (e.g. Canary Islands) were also exempted from emissions trading obligation.

Stop the clock 2012

The EU renounced the sanctioning of violations of the 2012 reporting and surrender obligations for flights that started or ended outside the EEA, Switzerland and Croatia. This led to the exclusion of a large amount of aviation with third party countries from emissions trading in 2012. This enabled aircraft operator to choose to surrender allowances for a reduced amount of emissions if they simultaneously renounced a part of the freely allocated emission allowances. The EU wanted to set a positive example at an International Civil Aviation Organisation (ICAO) level for the negotiations for a global instrument aimed at the reduction of international aviation emissions.

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