

Fluorinated greenhouse gases 2013

Aggregated data reported by companies on the production, import and export of fluorinated greenhouse gases in the European Union

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Executive summary

Background and policy

The greenhouse gases (GHGs) covered by the UNFCCC Kyoto Protocol include three groups of fluorinated GHGs (the so-called 'F-gases'): hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆). These F-gases have a high to very high global warming potential (GWP).

Many F-gases are used as replacements for ozone-depleting substances, in the context of their phase-out promoted by the Montreal Protocol and Regulation (EC) No 1005/2009 ⁽¹⁾ on ozone depleting substances. Accordingly, the use of F-gases is increasing in many different applications and thus has a considerable growth potential. F-gases accounted for approximately 2 % of EU-27 overall GHG emissions in 2012 ⁽²⁾, and this share has been on the increase since the 1990s.

The EU-15 had a target under the UNFCCC Kyoto Protocol to reduce the whole basket of GHGs — including F-gases — by 8 % by 2012. To comply with this target, the European Climate Change Programme (ECCP) identified cost-effective measures. One of these proposed measures resulted in Regulation (EC) No 842/2006 (the 'old' F-Gas Regulation) ⁽³⁾.

Following a review of the adequacy of the 'old' F-Gas Regulation, and in the context of the Roadmap

for moving to a low-carbon economy in Europe in 2050 ⁽⁴⁾, a revision of the 'old' F-Gas Regulation was adopted by the European Parliament and the European Council in 2014 ⁽⁵⁾ (the 'new' F-Gas Regulation, Regulation (EU) No 517/2014). The 'new' F-Gas Regulation aims to reduce EU F-gas emissions by two thirds of the 2010 level by 2030.

The 'new' F-Gas Regulation 517/2014 maintains many measures of the 'old' F-Gas Regulation 842/2006, in particular related to leak prevention, recovery, certification of technicians and selected restrictions on the use and marketing of F-gases. However, additional large reductions in F-gas use and emissions are on one hand expected from a novel measure, the 'phase down', which will progressively cap allowed sales of HFCs on the EU market. The new Regulation also introduced a number of new bans of F-gases with a high Global Warming Potential (GWP) in specific sectors.

Reporting under the 'new' F-Gas Regulation will only happen as of from 2015 onwards and thus the present report only summarises the data reported by companies according to Article 6 of the 'old' F-Gas Regulation. This report includes information on the quantities produced, imported and exported, as well as related data such as the net supply to the market and main intended applications of the F-gases. Imports and exports of F-gases contained in products and equipment are not covered by this reporting obligation.

⁽¹⁾ Regulation (EC) No 1005/2009 of the European Parliament and of the Council of 16 September 2009 on substances that deplete the ozone layer.

⁽²⁾ EEA Greenhouse Gas data viewer: www.eea.europa.eu/data-and-maps/data/data-viewers/greenhouse-gases-viewer.

⁽³⁾ Regulation (EC) No 842/2006 of the European Parliament and of the Council of 17 May 2006 on certain fluorinated greenhouse gases — http://ec.europa.eu/clima/policies/f-gas/legislation/documentation_en.htm.

⁽⁴⁾ http://ec.europa.eu/clima/policies/roadmap/documentation_en.htm.

⁽⁵⁾ Regulation (EU) No 517/2014 of the European Parliament and of the Council of 16 April 2014 on fluorinated greenhouse gases and repealing Regulation (EC) No 842/2006.. http://ec.europa.eu/clima/policies/f-gas/legislation/documentation_en.htm.

Key findings

The assessment of trends is dependent upon the unit used to express the amounts of F-gases, i.e. physical metric tonnes or GWP-weighted tonnes (CO₂-equivalents)⁽⁶⁾. A statistic in metric tonnes (see Figure ES.1) reflects the use patterns of F-gases in absolute terms, while F-gas usage expressed as CO₂-equivalents (see Figure ES.2) reflects the potential relevance for climate change policy. However, as F-gas markets are characterised by high market shares of very few major players, confidentiality considerations for reported data prevent the publication of detailed data in many cases.

Net supply of F-gases

- In 2013, net supply⁽⁷⁾ of F-gases has been declining for the third consecutive year since 2010, both in terms of metric tonnes and CO₂-equivalents. 2013 net supply levels are slightly below the low levels of the 'economic crisis' year 2009.
- The decrease rate of net supply in 2013 compared to in 2012 is – 2.4 % (metric tonnes) or – 1.4 % (CO₂-equivalents) which is close to the decrease rates observed for 2012 compared to 2011. The decrease in net supply of fluorinated gases is dominated by a decrease in net supply of HFCs which more than counterbalances a 4.4 % increase in SF₆ net supply in 2013 compared to 2012.
- HFCs constitute 98 % of the net supply in 2013, or 82 % when measured in CO₂-equivalents. SF₆ net supply is only relevant in terms of CO₂-equivalents, with 18 %, while PFC contributes to less than 1 % of total F-gas net supply.
- HFC-134a, HFC-125 and HFC-143a are most relevant single HFCs, accounting for more than 80 % of HFC net supply in 2013 if measured in metric tonnes and more than 90 % if expressed in CO₂-equivalents. Furthermore, HFC-32, HFC-152a and HFC-365mfc are relevant in terms

of metric tonnes, adding up to more than 95 % in combination with the previously mentioned substances. In terms of CO₂-equivalents, however, HFC-227ea and HFC-32 additionally contribute to top 95 % of the HFC net supply.

Production of F-gases

- Production of F-gases has also been declining for the third consecutive year since 2010. Expressed in CO₂-equivalents, however, for 2013 the first decrease (– 8 %) was observed following four years of growth. This is because SF₆ production has dropped in 2013 compared to 2012 after four years of increases, while HFC production has been declining steadily since 2010.
- F-gas production in 2013 in terms of metric tonnes is dominated by HFCs. However, expressed in CO₂-equivalents SF₆ accounts for a considerable share. PFC production in 2013 contributes to total F-gas production in small levels only.

Import of F-gases

- Imports of F-gases in 2013 have risen by 12 % (CO₂-equivalents) compared to 2012. This is the first rise since 2010 where a sharp increase had been observed after the 2009 'economic crisis' year. Overall 2013 imports are at approximately the same level as in 2011.
- F-gas imports in 2013 are almost entirely HFC imports (92 % in CO₂-equivalents).

Export of F-gases

- Exports of F-gases have been on the rise since 2009; when expressed in metric tonnes, however, they are still below 2007 levels. The year-on-year increase from 2012 to 2013 was 2 %. Expressed in CO₂-equivalents, however, 2013 exports dropped by 3 %. This is because SF₆ exports dropped by 7 % compared to 2012, while HFC exports increased 3.1 % (metric tonnes) or 1.4 % (CO₂-equivalents).

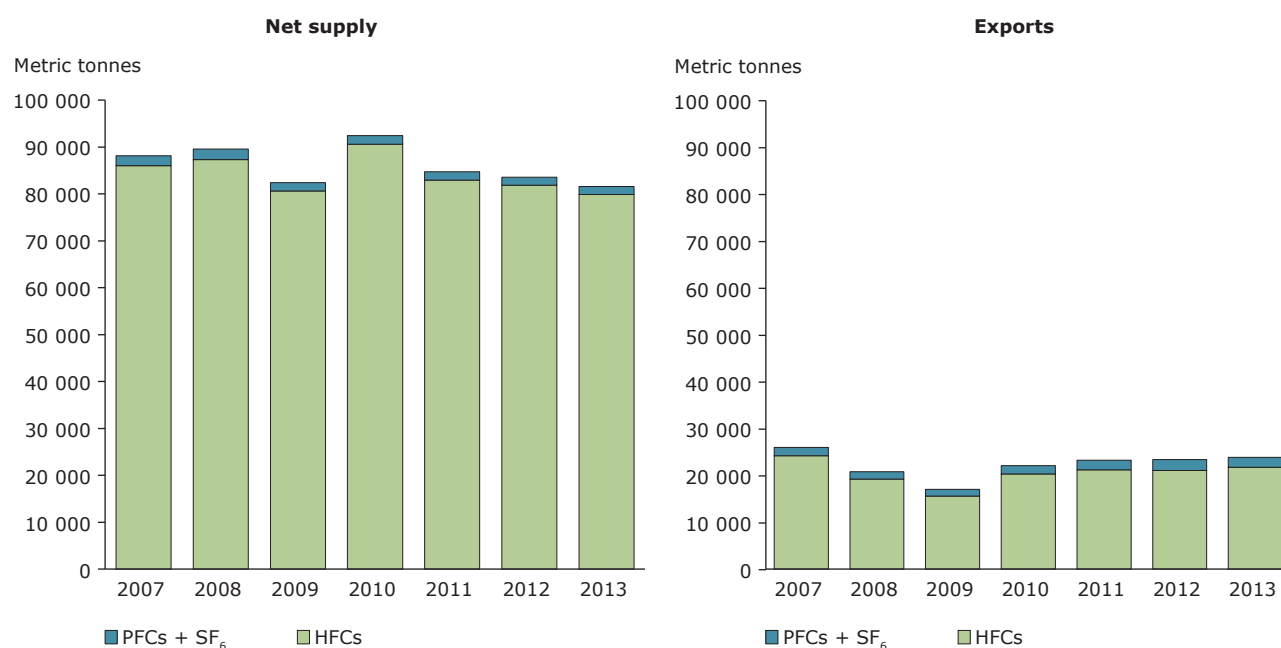
⁽⁶⁾ Unless specified otherwise, the GWP values used in this report are those published in the IPCC's Fourth Assessment Report (AR4). However, a conversion of all GWP-related tables shown in this report into those specified in the 'old' F-Gas Regulation, which are in line with the published values in the IPCC's Third Assessment Report (TAR), is given in Annex 2 to this report.

⁽⁷⁾ 'Net supply' is a parameter that provides information on the actual use of (bulk) F-gases by EU industries. Net supply is calculated by adding reported amounts for production, bulk imports, stocks held 1 January of the reporting year and 'other amounts collected for reclamation or destruction from within the EU' and subtracting reported amounts for bulk exports, destruction (on-site by reporting companies and off-site within the EU on reporting companies' behalf), amounts used as feedstock by reporting companies and stocks held 31 December of the reporting year.

- SF₆ exports contribute to 8 % of the total 2013 F-gas exports when expressed in metric tonnes; however, this amounts to 53 % of the total expressed in CO₂-equivalents. As for production, F-gas exports in terms of metric tonnes are

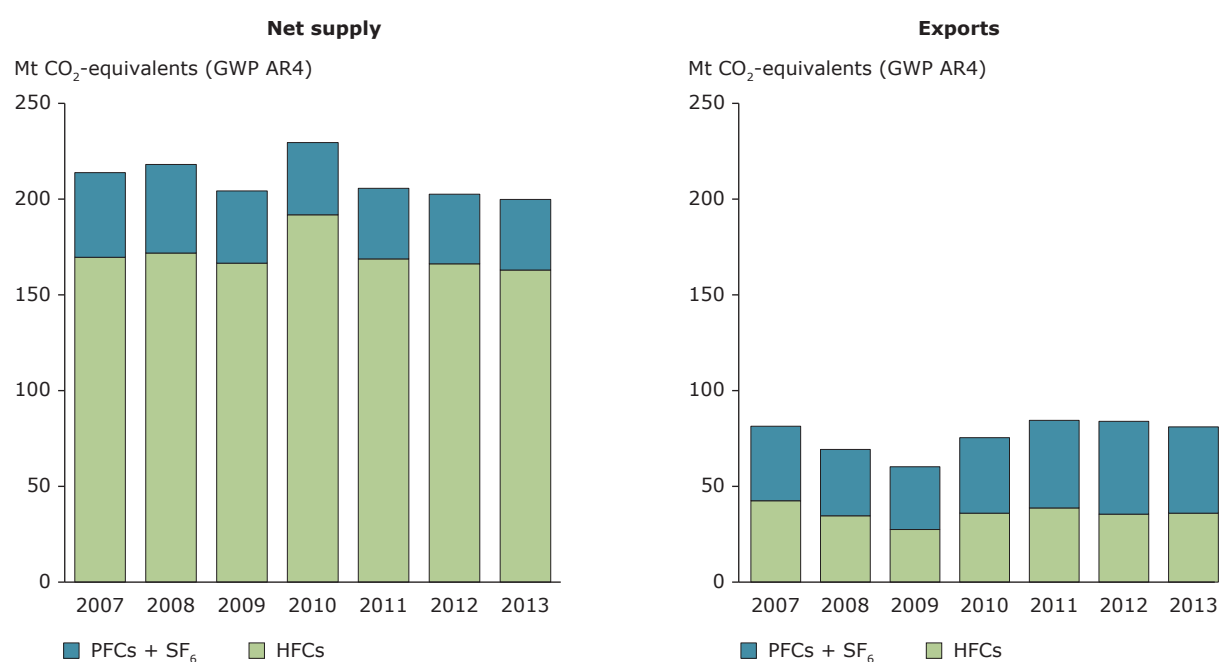
dominated by HFCs (91 % in 2013). However, expressed in CO₂-equivalents SF₆ accounts for 53 % and HFCs for only 44 %. PFCs contribute to 2013 F-gas exports by 1 % (metric tonnes) or 3 % (CO₂-equivalents).

Figure ES.1 Net supply and export fluorinated gases by gas groups (expressed in metric tonnes)



Source: 2007–2010: European Commission (DG CLIMA, revision EEA); 2011–2013: EEA.

Figure ES.2 Net supply and export fluorinated gases by gas groups (expressed in CO₂-equivalents, GWP AR4)



Source: 2007–2010: European Commission (DG CLIMA, revision EEA); 2011–2013: EEA.

Intended applications of F-gases in 2013

Intended applications for F-gases net supplied to the EU market in 2013 are shown in Figure ES.3.

- The majority of F-gases net supplied to the EU market in 2013 were intended for refrigeration and air-conditioning purposes, applications that use almost only HFCs.
- The foams and aerosols sectors are also significant in terms of their use of HFC metric tonnes.
- SF₆ used in electrical equipment (included among 'other' in Figure ES.3) contributes considerably to the intended applications of EU net supply when expressed in terms of CO₂-equivalents.

Trends in intended applications of F-gases

- Despite some data gaps for which no information on intended application is available, the 2007–2013 trends show that there is a strong decrease in the use of F-gases for foams.

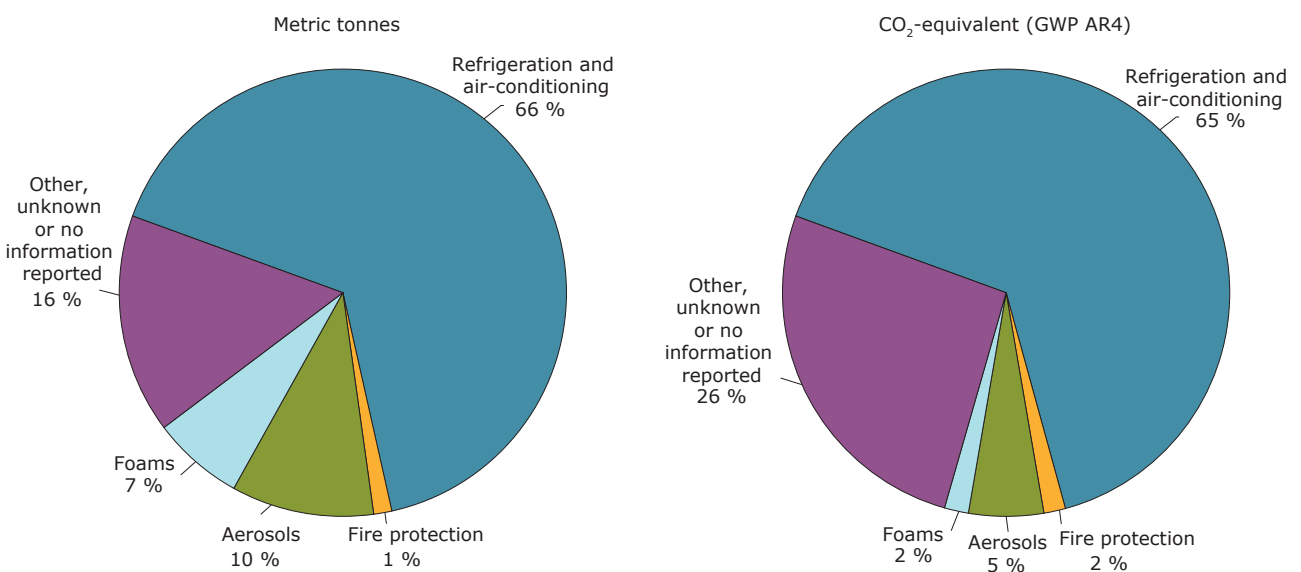
- Refrigeration/air conditioning usage has also declined since 2007 while aerosol use shows certain volatility in the trend. However, it should be noted that the quantities of F-gases contained in imported and exported equipment are not captured in the reported data, and this may affect the observed trends.

Reclamation, destruction and feedstock use of F-gases

- For 2007–2013, reclamation and destruction of F-gases was reported in low quantities, in the order of magnitude of 1 % of the net supply each (measured in CO₂-equivalents, even less when measured in metric tonnes).
- Feedstock use was reported in the order of magnitude of below 5 % of the net supply (measured in CO₂-equivalents, considerably less when measured in metric tonnes).

However, the information reported by companies regarding reclamation and destruction of F-gases cannot fully reflect the complete EU activities due to the scope of the reporting obligation.

Figure ES.3 Percentage of the main intended applications of EU net supply of F-gases in 2013 as reported by companies in the European Union, expressed in metric tonnes (left) and CO₂-equivalents (GWP AR4) (right)



Source: EEA.

Reporting process

In 2014, companies reported for the year 2013, which was the seventh reporting year under the 'old' F-Gas Regulation 842/2006 and the third year for which the European Environment Agency (EEA) has taken over the data management (including collection, compilation, quality control, and analysis of the companies' reports) as well as the responsibility for the provision of support to the reporting companies.

Since the 2012 reporting year companies report their F-gas transactions via a multilingual online platform, the Business Data Repository (BDR, <https://bdr.eionet.europa.eu>). Reporters received support regarding the reporting procedure and technical questions from the EEA in English. A number of manuals and additional guidance documents were also available in all official European languages.

The reported data were subject to automated and manual quality checks and reporters were asked to submit revised reports via BDR where necessary. This process was repeated until submissions passed all quality checks.

According to the F-Gas Regulation, all companies subject to the regulation have to report their transactions of a given year by 31 March of the following year. Potential reporters were invited to report in February 2014 and reminded of their obligation in mid-March. Invited companies who regarded themselves as not covered by the regulation were asked to confirm these circumstances by submitting a so-called NIL report via BDR.

In total, 153 companies correctly reported F-gas activities for 2013.

1 Introduction

1.1 Background

1.1.1 Current policy framework

GHGs covered by the Kyoto Protocol include three groups of fluorinated GHGs (the so-called 'F-gases'): hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆). These F-gases have a high to very high global warming potential (GWP).

Many F-gases are used as replacements for ozone-depleting substances, a process that has been taking place as a result of the phase-out of such substances promoted by the Montreal Protocol and Regulation (EC) No 1005/2009⁽⁸⁾ on ozone depleting substances. Accordingly, the use of F-gases is increasing in many different applications and thus has a considerable growth potential. F-gases accounted for approximately 2 % of EU-27 overall GHG emissions in 2012⁽⁹⁾, and this share has been on the increase since the 1990s.

The EU-15 had a target under the UNFCCC Kyoto Protocol to reduce the whole basket of GHGs — including F-gases — by 8 % by 2012. To comply with this target, the European Climate Change Programme (ECCP) identified cost-effective measures. One of these proposed measures resulted in Regulation (EC) No 842/2006 (the 'old' F-Gas Regulation)⁽¹⁰⁾.

The 'old' F-Gas Regulation followed two tracks of action:

- Improving the 'leak-tightness' of equipment containing F-gases. Measures comprise: labelling of equipment containing F-gases, training

and certification of personnel and companies handling this type of gases, containment of F-gases within equipment, and proper recovery of F-gases from equipment that is no longer used.

- Avoiding the use of F-gases in some applications in which more environmentally superior alternatives are already cost effective. Measures include restrictions on the use and marketing of F-gases in these cases.

The present report summarises the data reported by companies according to Article 6 of the 'old' F-Gas Regulation 842/2006. Article 6 requires producers, importers and exporters of F-gases in the European Union to report on produced, imported and exported quantities of F-gases or preparations (blends) of more than one tonne per year. Commission Regulation (EC) No 1493/2007⁽¹¹⁾ establishes the format for the reports to be submitted. Reported imports and exports of F-gases should include only those quantities imported from, or exported to, countries outside the EU. Reports on quantities imported or exported should include bulk shipments, as well as those shipped with equipment for the purpose of charging that equipment, but not quantities contained in equipment (i.e. pre-charged equipment).

1.1.2 Policy review

Following a review of the adequacy of the 'old' F-Gas Regulation, and in the context of the Roadmap for moving to a low-carbon economy in Europe in 2015⁽¹²⁾, a revision of the 'old' F-Gas Regulation was adopted by the European Parliament and the

⁽⁸⁾ Regulation (EC) No 1005/2009 of the European Parliament and of the Council of 16 September 2009 on substances that deplete the ozone layer.

⁽⁹⁾ EEA Greenhouse Gas data viewer: <http://www.eea.europa.eu/data-and-maps/data/data-viewers/greenhouse-gases-viewer>.

⁽¹⁰⁾ Regulation (EC) No 842/2006 of the European Parliament and of the Council of 17 May 2006 on certain fluorinated greenhouse gases.

⁽¹¹⁾ Commission Regulation (EC) No 1493/2007 of 17 December 2007 establishing, pursuant to Regulation (EC) No 842/2006 of the European Parliament and of the Council, the format for the report to be submitted by producers, importers and exporters of certain fluorinated greenhouse gases.

⁽¹²⁾ http://ec.europa.eu/clima/policies/roadmap/documentation_en.htm.

European Council in 2014⁽¹³⁾ (the 'new' F-Gas Regulation). The 'new' F-Gas Regulation aims to reduce EU F-gas emissions by two thirds of the 2010 level by 2030.

The 'new' F-Gas Regulation 517/2014 maintains many measures of the 'old' F-Gas Regulation 842/2006, in particular related to leak prevention, recovery, certification of technicians and selected restrictions on the use and marketing of F-gases. However, additional large reductions in F-gas use and emissions are expected from a new measure, the 'phase down', which will progressively cap allowed sales of HFCs on the EU market. Reductions are also expected from bans of F-gases with a high Global Warming Potential (GWP) in specific sectors.

The reporting requirements under the 'new' F-Gas Regulation will not come into effect before companies report on their 2014 activities, due 31 March 2015 for the first time. Thus, the present report is fully based on the data reported under the 'old' F-Gas Regulation 842/2006.

1.2 Report structure

This report contains an explanation of the policy background, institutional arrangements and reporting procedure in Chapter 1. The aggregation results as well as the methodology used are summarised in Chapter 2. These include the following F-gas data: net supply (specifying intended applications), production, import, export, reclamation, destruction and feedstock use.

1.3 Institutional arrangements

In 2014, companies reported for the year 2013, which was the seventh reporting year under the 'old' F-Gas Regulation. As of reporting year 2011, the European Environment Agency (EEA) is responsible for collecting, archiving, checking and aggregating information of the companies' reports. The EEA is also responsible for supporting the reporters in fulfilling their obligation.

Since 2012, technical support to the F-gas reporting process was provided by the EEA's European Topic Centre on Air pollution and Climate Change Mitigation (ETC/ACM)⁽¹⁴⁾. In previous years,

collection, quality control, analysis and support were performed by consultants in the context of service contracts with the European Commission.

1.4 Reporting procedure

1.4.1 Reporting format and quality control

The format for the reporting on 2013 transactions of F-gases by companies in accordance with Article 6 of the 'old' F-Gas Regulation is laid down in Commission Regulation (EC) 1493/2007. Specification of data to be reported is included in Section 2.1.

Companies submit their F-gas report online via the Business Data Repository (BDR) at <https://bdr.eionet.europa.eu>. This multilingual online platform is a password protected environment that hosts online questionnaires for the different reporting obligations. The use of this platform for F-gas reporting ensures a transparent documentation of the reporting by companies, while providing the required level of security and confidentiality of the reported data. Reporters received support, both regarding the reporting procedure and regarding technical questions, via EEA and ETC/ACM support team, manuals and additional guidance documents.

Data quality checking procedures included automated quality control implemented in the online questionnaire and manual quality control applied after submission of the reports. Reporters also have the option to autonomously run the automated quality checking procedure in order to check their questionnaire before submission. Where necessary, reporters were contacted to submit a revised report via BDR to assure the transparency of the reporting process. This process was repeated until submissions passed all quality checks.

1.4.2 Reporting companies in 2014

On the basis of information available on companies, the EEA sent out invitation emails in February 2014 reminding companies about the reporting obligations under the 'old' F-Gas Regulation. Additional reminders were sent out in mid-March 2014. Companies who regarded themselves as not covered by the reporting obligation of the F-Gas Regulation were invited to communicate this by

⁽¹³⁾ Regulation (EU) No 517/2014 of the European Parliament and of the Council of 16 April 2014 on fluorinated greenhouse gases and repealing Regulation (EC) No 842/2006.

⁽¹⁴⁾ <http://acm.eionet.europa.eu>.

using the online questionnaire to submit a so-called NIL report. Companies which communicated by email that they considered themselves as not covered by the reporting obligation, were also counted as having submitted a NIL report.

154 companies submitted a data report for the reporting year 2013 by 15 June 2014, the date on which the collection of data was closed. Out of these, one company did submit a data report, which was however rejected during the manual quality check and is thus not taking into account in the data aggregation. Most reporters are situated in large countries like Italy, Germany, Spain or the United Kingdom, while three Member States do not host any reporting company (Austria, Finland, and Luxembourg). The number of reporting companies for 2013 increased by 19 % compared to 2012. The increase is mainly due to an increase in importing companies.

1.5 Terminology

This section presents key terminology and associated assumptions in use throughout this report.

F-gases

F-gases including Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆) have a high to very high global warming potential (GWP). Certain F-gases have also long lifetimes in the atmosphere, especially PFCs and SF₆.

HFCs

Hydrofluorocarbons (HFCs) are organic compounds that contain fluorine and hydrogen atoms. They are most commonly used as used as refrigerants. Seventeen types of HFCs are listed in Annex 1.

PFCs

Perfluorocarbons (PFCs) are organic compounds that contain fluorine and carbon atoms. They are most commonly used in semi-conductor manufacture. Seven types of HFCs are listed in Annex 1.

SF₆

Sulphur hexafluoride (SF₆) is an inorganic compound consisting of one sulphur and six fluorine atoms. As an excellent electrical insulator its main uses is in the electrical industry. SF₆ is a potent GHG and its GWP is listed in Annex 1.

Global warming potentials (GWPs)

In order to make different F-gases comparable in terms of their potential impact on climate change, GWPs are used. The multiplication of a quantity of a given F-gas expressed in metric tonnes with its specific GWP leads to the respective quantity expressed in CO₂-equivalents.

The 'old' F-Gas Regulation 842/2006 defines a set of GWP values in its Annex I. The GWP values of the 'old' F-Gas Regulation are in line with those published in the Intergovernmental Panel on Climate Change (IPCC) Third Assessment Report (TAR) (IPCC, 2001). However, another more recent set of GWPs was published by the IPCC in its Fourth Assessment Report (AR4) (IPCC, 2007). The 'new' F-Gas Regulation 517/2014 makes use of this more recent set of AR4 GWPs in its Annex I.

This report applies the more recent and politically relevant GWP AR4 set for its analyses. On average, the use of GWP AR4 compared to GWP TAR values leads to results approximately 4–5 % higher for quantities expressed in CO₂-equivalents. Annex 1 (of this report) contains the list of F-gases subject to reporting and the GWP AR4 values for these gases.

Net supply

'Net supply' is a parameter that provides information on the actual use of (bulk) F-gases by EU industries. Details on calculation of net supply are included in Section 2.1 and Annex 3.

Intended applications

Information on the intended applications of EU net supply is based on data reported by companies on the intended applications of the amount 'placed on the EU market for the first time'. Detail on calculation of 'intended applications' is included in Section 2.1 and Annex 3.

Preparations (blends)

'Preparation' is defined by Commission Regulation (EC) No 1493/2007 as a mixture composed of two or more substances at least one of which is a fluorinated GHG, except where the total global warming potential of the preparation is less than 150. The total global warming potential of the preparation shall be determined in accordance with Part 2 of Annex I of the 'old' Regulation (EC) No 842/2006 on certain fluorinated GHGs. Industry often refers to preparations as blends.

Reporting year

'Reporting year' means the calendar year on which companies report. For example, in 2014 company reported on their activities in the reporting year 2013.

1.6 Confidentiality

The data reported under the 'old' F-Gas Regulation are protected by strict confidentiality provisions. Hence, the EEA has applied measures to prevent the deduction of commercially sensitive information. The measures include the aggregation of data for substance groups (where applicable), protection of data that are the result of reports from less than three corporate groups, and additional measures to prevent deduction of sensitive information. It is also for confidentiality reasons that statements about F-gas use in the text are of a general nature and do not refer to the concrete figures. A detailed account of the confidentiality measures applied throughout the report is included in Annex 2.

2 Aggregation results

2.1 Methodology

2.1.1 Data covered by this report

The report is based on submissions for the reporting year 2013 — the seventh reporting year under the 'old' F-Gas Regulation — as received by 15 June 2014.

A quality review of the 2007–2011 data was carried out by DG CLIMA which has led to minor adjustments of the data used in the 2013 EEA report ⁽¹⁵⁾. Where these revisions related to 2007–2010 data, the data source for figures and tables in this report is spelled out as 'DG CLIMA, revision EEA' ⁽¹⁶⁾. The dataset covering 2007–2012 was 'frozen' in December 2013. In order not to compromise the baseline data for quota allocation under the 'new' F-Gas Regulation, any further (re)submissions from companies for this period have thus not been included in the present aggregation report.

2.1.2 Information contained in the reporting forms

The set of data to be reported under the 'old' F-Gas Regulation is defined in European Commission Regulation (EC) 1493/2007. The reporting forms differentiate between producers and importers on one hand and exporters on the other.

Producers and Importers report on:

- A. Production;
- B. Import;
- C. Export;
- D. Other amounts collected for reclamation or destruction from within the EU;

- E. Purchases from EU co-producers (producers only);
- F. Sales to EU co-producers (producers only);
- G. Amounts purchased from other EU sources (producers only);
- H. Stocks held 1 January;
- I. Stocks held 31 December;
- J. Amount reclaimed by the reporting company;
- K. Amount destroyed by the reporting company (onsite);
- L. Amount destroyed on behalf of the reporting company (offsite within the EU);
- M. Amount used as a feedstock by the reporting company.

Of these amounts, in the reporting form a calculated total for the 'net amount available for sale in the EU' is determined according to the formula $(A + B - C + D + E - F + G + H - I - K - L - M)$.

Reporting on intended applications:

Producers and importers are required to give their best estimates on the intended applications of the amounts 'placed on the EU market for the first time'. The 'total amount placed on the EU market' is defined in the reporting form as not including any quantities previously held by EU importers and/or distributors. Therefore, for non-producing importers, the sum of the amounts reported for intended applications should equal the calculated total 'net amount

⁽¹⁵⁾ Fluorinated Greenhouse Gases 2012, Data reported by companies on the production, import and export of fluorinated greenhouse gases in the European Union, EEA Technical report No 15/2013, European Environment Agency, 2013.

⁽¹⁶⁾ In the 2013 EEA report on F-gases (cf. footnote 15) 2007–2010 data had been completely taken over from DG CLIMA.

available for sale in the EU' mentioned above. For producers, the sum of the amounts reported for intended applications should equal the calculated total 'net amount available for sale in the EU' minus any quantities sold on the EU market that were previously purchased from EU importers/distributors in the present reporting year or in previous years.

Exporters report on:

- Total exports;
- Exports for recycling;
- Exports for reclamations;
- Exports for destruction.

2.1.3 Calculation of net supply

'Net supply' is the key parameter used in this report describing actual use of (bulk) F-gases by EU industries. The 'net supply' parameter accounts for the amounts exported by companies which did not produce or import. Thus, it does not equal the aggregation of the 'net amount available for sale in the EU' or of the amounts 'placed on the EU market for the first time' as reported by producers and importers. Detail on the calculation of net supply is included in Annex 3.

2.1.4 Intended applications of EU net supply

Information on the intended applications of EU net supply is based on data reported by companies on the intended applications of the amount 'placed on the EU market for the first time'. In the EU-wide aggregation, the amounts 'placed on the EU market for the first time' do not match exactly the EU net supply. The difference can be either positive or negative and is referred to as 'no information reported' in the aggregation results. Details on calculation of 'Intended applications' is included in Annex 3.

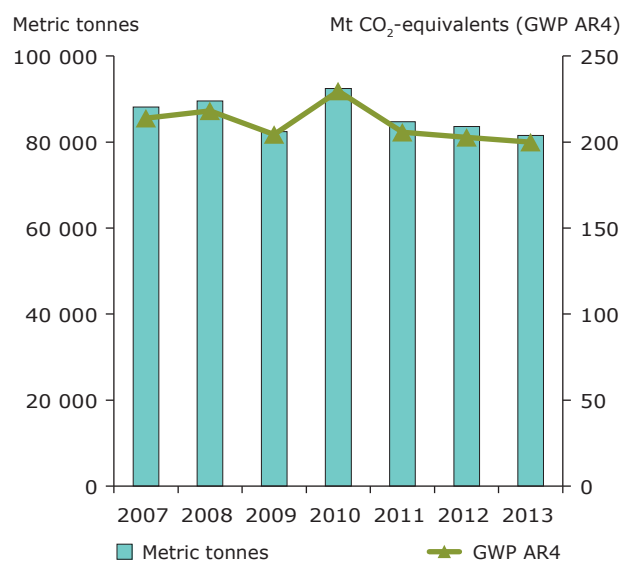
2.2 Net supply of fluorinated gases and their intended applications

2.2.1 Net supply of fluorinated GHGs over time

Net supply of F-gases decreased by 2.4 % in 2013 compared to 2012 when measured in metric tonnes, but only by 1.4 % when measured in CO₂-equivalents (Tables 2.1 and 2.2). The overall trend in the F-gas net supply is mainly due to a 2.4 % (metric tonnes) or 1.9 % (CO₂-equivalents) decrease in HFC net supply and, to a minor extent, by a strong decrease (– 43 % in metric tonnes, – 45 % in CO₂-equivalents) in PFC net supply. However, these decreases are partly compensated by a 4.4 % increase in SF₆ net supply. Figures 2.2 and 2.3 show the development of the split of total F-gases into HFCs, PFCs and SF₆ in metric tonnes and CO₂-equivalents respectively.

Figure 2.1 shows F-gas net supply over time both in metric tonnes and CO₂-equivalents.

Figure 2.1 Total F-gas net supply



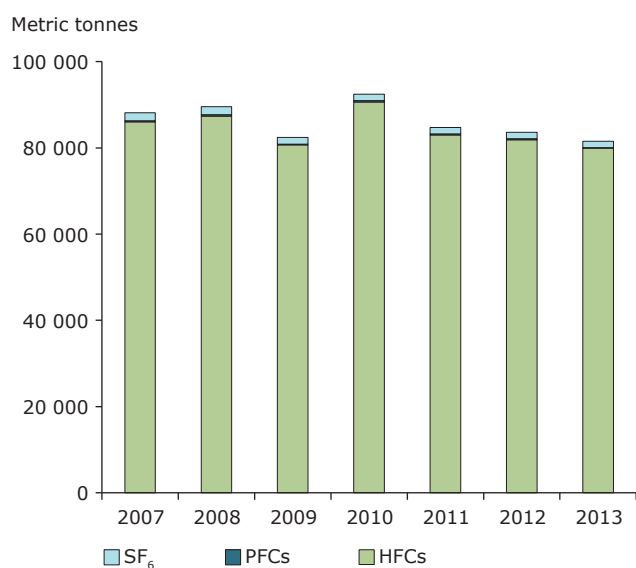
Source: 2007–2010: European Commission (DG CLIMA, revision EEA); 2011–2013: EEA.

In 2013, SF₆ accounted for 18 % of the net supply when measured in CO₂-equivalents (GWP AR4), compared to only 2 % when measured in metric tonnes. The remainder of F-gas net supply consists almost exclusively (98 %) of HFCs.

Among the HFCs, significant contributions are from three gases only, i.e. HFC-134a, HFC-125 and

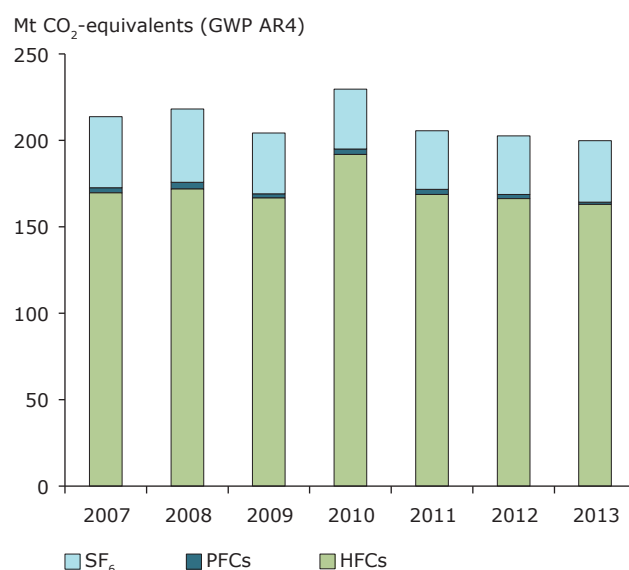
HFC-143a. They contribute with 49 %, 19 %, and 11 % respectively, if measured in metric tonnes. If measured in CO₂-equivalents, the respective contributions to HFC net supply are 33 %, 33 % and 25 %. The share of PFCs in the net supply is very low (0.7 % when measured in CO₂-equivalents, and less than 0.2 % when measured in metric tonnes).

Figure 2.2 Net supply by groups of F-gases (metric tonnes)



Source: 2007–2010: European Commission (DG CLIMA, revision EEA); 2011–2013: EEA.

Figure 2.3 Net supply by groups of F-gases (expressed in CO₂-equivalents – GWP AR4)



Source: 2007–2010: European Commission (DG CLIMA, revision EEA); 2011–2013: EEA.

Table 2.1 Net supply of F-gases in the period 2007 to 2013 (metric tonnes)

	2007	2008	2009	2010	2011	2012	2013
Gas	Metric tonnes						
HFC-23	256	184	190	239	181	106	11
HFC-32	3 977	5 074	4 394	5 361	4 921	5 007	5 310
HFC-41	C	-	C	C	C	C	C
HFC-125	12 453	12 522	13 906	18 150	15 283	15 316	15 101
HFC-134	C	-	-	C	-	-	-
HFC-134a	48 973	46 090	41 233	43 564	40 082	39 939	39 319
HFC-143	C	-	-	-	-	-	-
HFC-143a	9 053	9 883	9 575	10 484	8 840	8 969	8 847
HFC-152a	3 816	6 151	5 182	5 744	6 130	5 567	4 362
HFC-227ea	775	1 780	1 776	2 083	2 038	1 469	1 612
HFC-236cb	-	-	-	-	-	-	-
HFC-236ea	-	-	-	-	-	-	-
HFC-236fa	C	C	C	C	43	30	38
HFC-245ca	-	-	-	-	-	-	-
HFC-245fa	C	C	C	C	C	C	C
HFC-365mfc	C	C	C	C	C	C	C
HFC-43-10mee	C	C	C	C	C	C	C
PFC-14	C	C	C	59	56	C	2
PFC-116	93	178	113	C	C	C	C
PFC-218	112	59	18	23	23	39	38
PFC-318	C	6	C	6	10	C	C
PFC-3-1-10	C	C	-	C	C	-	-
PFC-4-1-12	-	-	-	-	-	-	-
PFC-5-1-14	C	C	C	C	C	C	C
SF ₆	1 805	1 853	1 545	1 519	1 486	1 491	1 556
Total HFCs	85 998	87 306	80 632	90 604	82 932	81 842	79 850
Total PFCs	299	398	238	303	289	242	139
Total F-gases	88 102	89 556	82 415	92 425	84 708	83 575	81 545

Note: -: no data reported; C: confidential.

Source: 2007–2010: European Commission (DG CLIMA, revision EEA); 2011–2013: EEA.

Aggregation results

Table 2.2 Net supply of F-gases in the period 2007 to 2013 (expressed in CO₂-equivalents – GWP AR4)

	2007	2008	2009	2010	2011	2012	2013
Gas	Million tonnes of CO₂-equivalents (GWP AR4)						
HFC-23	3.8	2.7	2.8	3.5	2.7	1.6	0.2
HFC-32	2.7	3.4	3.0	3.6	3.3	3.4	3.6
HFC-41	C	–	C	C	C	C	C
HFC-125	43.6	43.8	48.7	63.5	53.5	53.6	52.9
HFC-134	C	–	–	C	–	–	–
HFC-134a	70.0	65.9	59.0	62.3	57.3	57.1	56.2
HFC-143	C	–	–	–	–	–	–
HFC-143a	40.5	44.2	42.8	46.9	39.5	40.1	39.5
HFC-152a	0.5	0.8	0.6	0.7	0.8	0.7	0.5
HFC-227ea	2.5	5.7	5.7	6.7	6.6	4.7	5.2
HFC-236cb	–	–	–	–	–	–	–
HFC-236ea	–	–	–	–	–	–	–
HFC-236fa	C	C	C	C	0.4	0.3	0.4
HFC-245ca	–	–	–	–	–	–	–
HFC-245fa	C	C	C	C	C	C	C
HFC-365mfc	C	C	C	C	C	C	C
HFC-43-10mee	C	C	C	C	C	C	C
PFC-14	C	C	C	0.4	0.4	C	0.0
PFC-116	1.1	2.2	1.4	C	C	C	C
PFC-218	1.0	0.5	0.2	0.2	0.2	0.3	0.3
PFC-318	C	0.1	C	0.1	0.1	C	C
PFC-3-1-10	C	C	–	C	C	–	–
PFC-4-1-12	–	–	–	–	–	–	–
PFC-5-1-14	C	C	C	C	C	C	C
SF ₆	41.1	42.2	35.2	34.6	33.9	34.0	35.5
Total HFCs	169.7	171.8	166.6	191.8	168.8	166.2	163.0
Total PFCs	3.0	4.0	2.5	3.1	3.0	2.4	1.4
Total F-gases	213.8	218.1	204.3	229.6	205.6	202.6	199.8

Note: –: no data reported; C: confidential.

Source: 2007–2010: European Commission (DG CLIMA, revision EEA); 2011–2013: EEA.

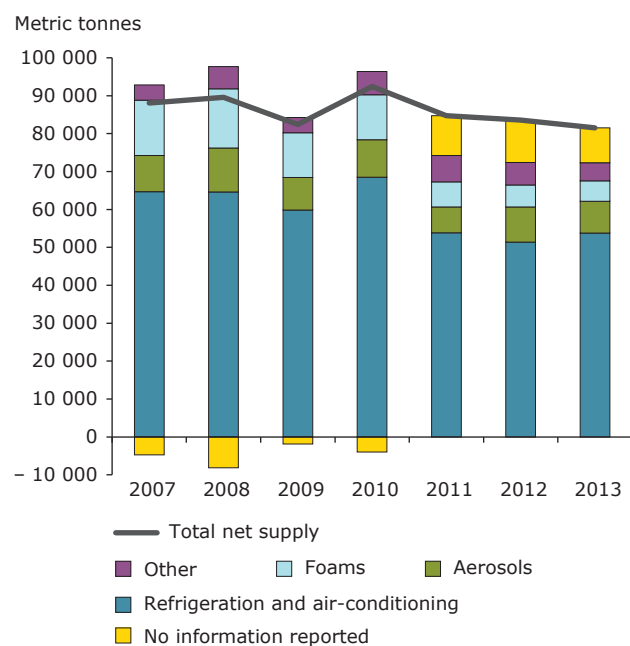
2.2.2 Intended applications of F-gas net supply over time

In this section, the F-gas net supply is no longer differentiated by F-gas groups and species (as in Section 2.2.1) but rather differentiated according to the intended applications by EU industries. Figures 2.4 and 2.5 illustrate the intended applications of F-gas net supply in the period from 2007 to 2013 in metric tonnes and CO₂-equivalents. Tables 2.3 and 2.4 also document the respective amounts.

While the overall net supply decreased only slightly in 2013 compared to 2012, a few trends for major intended applications can be observed:

- Refrigeration and air conditioning, the largest group, showed a 5 % (metric tonnes) or 3 % (CO₂-equivalents) increase. However, it is likely that this effect was triggered to a large extent by the decrease of the net supply share with 'no information available' on intended application (-17 % both in metric tonnes and CO₂-equivalents).

Figure 2.4 Intended applications of F-gas net supply (metric tonnes)

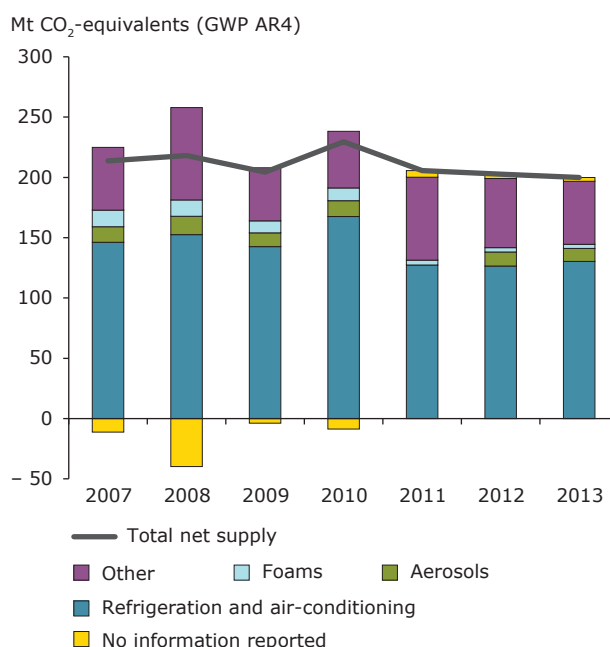


Source: 2007–2010: European Commission (DG CLIMA, revision EEA); 2011–2013: EEA.

- After the strong increase in 2012, HFC use in aerosols drops by 9 % (metric tonnes) or 7 % (CO₂-equivalents).
- HFC use in foams continues to decrease. From 2012 to 2013, a decrease by 7 % (both metric tonnes and CO₂-equivalents) is observed, following a 12 % (metric tonnes) or 10 % (CO₂-equivalents) decrease from 2011 to 2012. HFC use in foams in 2013 is at approximately 25 % of 2007 levels.
- The 'other' category of intended applications is dominated by the use of SF₆ in electrical equipment.

A comparison of the trend for intended applications for the entire 2007–2013 period is difficult due to the amounts of 'no information available' reports, which changed from negative amounts ⁽¹⁷⁾ (2007–2010) to rather large positive amounts for 2011–2013.

Figure 2.5 Intended applications of F-gas net supply (expressed in CO₂-equivalents – GWP AR4)



Source: 2007–2010: European Commission (DG CLIMA, revision EEA); 2011–2013: EEA.

⁽¹⁷⁾ Negative amounts can be interpreted as net exports.

Aggregation results

Table 2.3 Intended applications of F-gas net supply in the period 2007 to 2013 (expressed in metric tonnes)

	2007	2008	2009	2010	2011	2012	2013
Intended application	Metric tonnes						
Refrigeration and air-conditioning	64 712	64 586	59 851	68 475	53 836	51 392	53 766
Fire protection	C	596	556	C	1 938	909	1 066
Aerosols	9 545	11 612	8 572	9 927	6 861	9 254	8 394
Solvents	209	171	162	205	159	185	136
Foams	14 579	15 608	11 789	11 861	6 611	5 809	5 415
Feedstock	C	-	C	C	C	C	C
Electrical equipment	1 253	2 119	1 022	1 310	C	C	C
Magnesium die casting operations	C	8	C	C	C	-	-
Semiconductor manufacture	129	311	184	268	248	178	169
Other or unknown	1 714	2 688	2 107	1 343	1 151	1 274	793
No information reported	- 4 752	- 8 144	- 1 838	- 3 998	10 462	11 172	9 249
Total net supply	88 102	89 556	82 415	92 425	84 708	83 575	81 545

Note: -: no data reported; C: confidential.

Source: 2007–2010: European Commission (DG CLIMA, revision EEA); 2011–2013: EEA.

Table 2.4 Intended applications of F-gas net supply in the period 2007 to 2013 (expressed in CO₂-equivalents – GWP AR4)

	2007	2008	2009	2010	2011	2012	2013
Intended application	Million tonnes of CO₂-equivalents (GWP AR4)						
Refrigeration and air-conditioning	146.1	152.5	142.6	167.7	127.3	126.5	130.2
Fire protection	C	C	3.3	C	7.0	3.8	3.1
Aerosols	12.9	15.3	11.4	12.9	C	11.7	10.8
Solvents	0.4	0.4	0.3	0.4	0.4	0.5	0.4
Foams	13.8	13.5	9.9	10.7	4.1	3.7	3.5
Feedstock	C	-	C	C	C	C	C
Electrical equipment	28.6	48.3	23.3	29.9	C	C	C
Magnesium die casting operations	C	0.2	C	C	C	-	-
Semiconductor manufacture	1.5	3.3	2.1	3.1	2.9	2.2	2.2
Other or unknown	17.0	21.1	15.0	6.1	4.6	4.6	4.3
No information reported	- 11.2	- 39.8	- 3.8	-8.7	5.4	3.6	3.0
Total net supply	213.8	218.1	204.3	229.6	205.6	202.6	199.8

Note: -: no data reported; C: confidential.

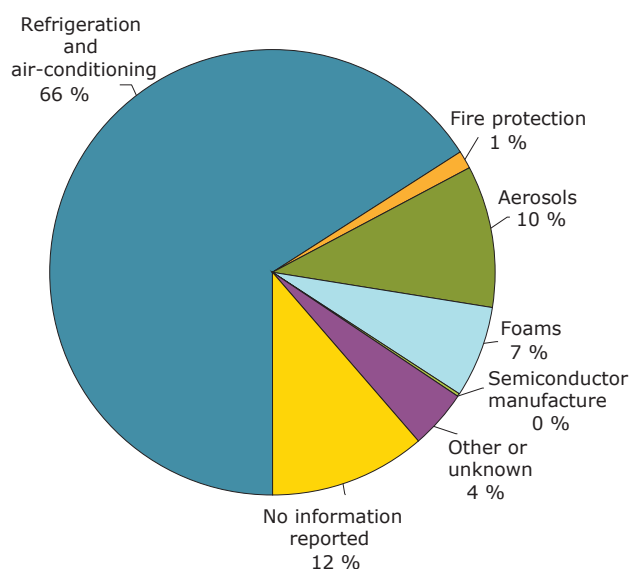
Source: 2007–2010: European Commission (DG CLIMA, revision EEA); 2011–2013: EEA.

2.2.3 Intended applications of F-gas net supply in 2013

Figures 2.6 and 2.7 illustrate the shares of the different intended applications of the total F-gas net supply in 2013, measured in metric tonnes and CO₂-equivalents respectively. Refrigeration and air-conditioning is the most relevant application sector accounting for almost 66 % of 2013 net supply of total F-gases, both in metric tonnes and in CO₂-equivalents. This is an increase from 2012 by 4 %, with all other applications declining slightly. The SF₆-specific applications (mostly electrical equipment) are included in the 'other' category and make up a significant share if measured in CO₂-equivalents.

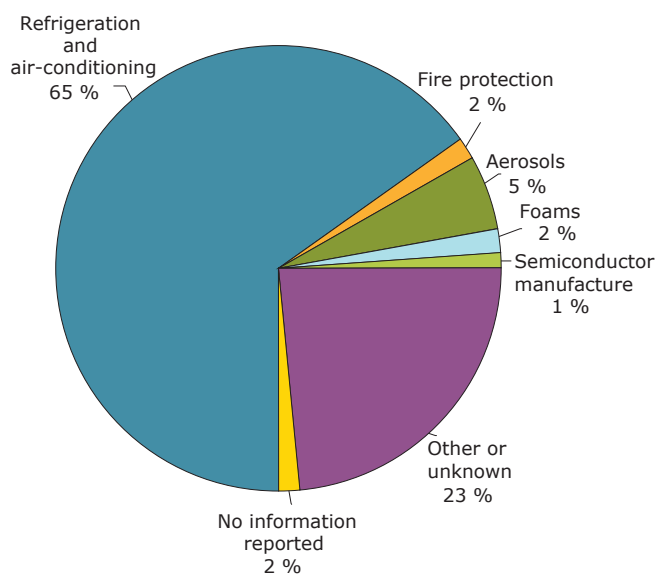
Tables 2.5 and 2.6 provide detailed documentation of the intended applications of 2013 F-gas net supply for each single gas species, measured in metric tonnes and CO₂-equivalents (GWP AR4) respectively. The negative figures that appear for a few F-gases are plausible. Companies with a net export situation for a given F-gas species are required to report a negative amount placed on the market. 'Missing information' data may be negative as well, e.g. in case of exports unaccounted for in the intended applications questionnaire.

Figure 2.6 2013 shares of intended applications of total F-gas net supply (metric tonnes)



Source: EEA.

Figure 2.7 2013 shares of intended applications of total F-gas net supply (expressed in CO₂-equivalents – GWP AR4)



Source: EEA.

Aggregation results

Table 2.5 Intended applications of 2013 F-gas net supply by F-gas species (metric tonnes)

Gas	Refrigeration and air conditioning	Fire protection	Aerosols	Solvents	Foams	Feedstock	Electrical equipment	Magnesium die casting operations	Semiconductor manufacture	Other or unknown	No information reported	Net supply
	Metric tonnes											
HFC-23	24	C	-	-	-	-	-	-	-	14	C	11
HFC-32	5 276	-	-	C	-	-	-	-	-	-15	C	5 310
HFC-41	-	-	-	-	-	-	-	-	-	1	C	C
HFC-125	14 136	56	-	C	-	-	-	-	-	-22	C	15 101
HFC-134	-	-	-	-	-	-	-	-	-	-	-	-
HFC-134a	25 119	C	C	-	509	-	-	-	-	371	5 829	39 319
HFC-143	-	-	-	-	-	-	-	-	-	-	-	-
HFC-143a	9 108	-	-	-	-	-	-	-	-	15	- 277	8 847
HFC-152a	C	-	C	-	2 494	C	-	-	-	171	- 37	4 362
HFC-227ea	C	911	C	C	C	-	-	-	-	C	522	1 612
HFC-236cb	-	-	-	-	-	-	-	-	-	-	-	-
HFC-236ea	-	-	-	-	-	-	-	-	-	-	-	-
HFC-236fa	8	C	-	-	-	-	-	-	-	C	0	38
HFC-245ca	-	-	-	-	-	-	-	-	-	-	-	-
HFC-245fa	C	-	-	C	C	-	-	-	-	C	C	C
HFC-365mfc	-	-	-	C	C	-	-	-	-	-	C	C
HFC-43-10mee	-	-	-	C	-	-	-	-	-	C	C	C
PFC-14	-	-	-	-	-	-	-	-	C	C	- 38	2
PFC-116	C	-	-	-	-	-	-	-	C	C	C	C
PFC-218	C	-	-	-	-	-	-	-	C	18	- 1	38
PFC-318	-	-	-	-	-	-	-	-	C	C	C	C
PFC-3-1-10	-	-	-	-	-	-	-	-	-	-	-	-
PFC-4-1-12	-	-	-	-	-	-	-	-	-	-	-	-
PFC-5-1-14	-	-	-	C	-	-	-	-	-	C	C	C
SF ₆	-	-	-	-	-	-	C	-	28	C	- 443	1 556
Total HFCs	53 765	1 066	8 394	C	5 415	C	-	-	-	594	9 798	79 850
Total PFCs	0	-	-	C	-	-	-	-	141	C	- 106	139
Total F-gases	53 766	1 066	8 394	136	5 415	C	C	-	169	793	9 249	81 545

Note: -: no data reported; C: confidential.

Source: EEA.

Table 2.6 Intended applications of 2013 F-gas net supply by F-gas species (expressed in CO₂-equivalents – GWP AR4)

Gas	Refrigeration and air-conditioning	Fire protection	Aerosols	Solvents	Foams	Feedstock	Electrical equipment	Magnesium die casting operations	Semiconductor manufacture	Other or unknown	No information reported	Net supply
HFC-23	0.4	C	-	-	-	-	-	-	-	0.2	C	0.2
HFC-32	3.6	-	-	C	-	-	-	-	-	-0.0	C	3.6
HFC-41	-	-	-	-	-	-	-	-	-	C	C	C
HFC-125	49.5	0.2	-	C	-	-	-	-	-	-0.1	C	52.9
HFC-134	-	-	-	-	-	-	-	-	-	-	-	-
HFC-134a	35.9	C	C	-	0.7	-	-	-	-	0.5	8.3	56.2
HFC-143	-	-	-	-	-	-	-	-	-	-	-	-
HFC-143a	40.7	-	-	-	-	-	-	-	-	0.1	-1.2	39.5
HFC-152a	C	-	C	-	0.3	C	-	-	-	0.0	-0.0	0.5
HFC-227ea	C	2.9	C	C	C	-	-	-	-	C	1.7	5.2
HFC-236cb	-	-	-	-	-	-	-	-	-	-	-	-
HFC-236ea	-	-	-	-	-	-	-	-	-	-	-	-
HFC-236fa	0.1	C	-	-	-	-	-	-	-	C	0.0	0.4
HFC-245ca	-	-	-	-	-	-	-	-	-	-	-	-
HFC-245fa	C	-	-	C	C	-	-	-	-	C	C	C
HFC-365mfc	-	-	-	C	C	-	-	-	-	-	C	C
HFC-43-10mee	-	-	-	C	-	-	-	-	-	C	C	C
PFC-14	-	-	-	-	-	-	-	-	C	C	-0.3	0.0
PFC-116	C	-	-	-	-	-	-	-	C	C	C	C
PFC-218	C	-	-	-	-	-	-	-	C	0.2	-0.0	0.3
PFC-318	-	-	-	-	-	-	-	-	C	C	C	C
PFC-3-1-10	-	-	-	-	-	-	-	-	-	-	-	-
PFC-4-1-12	-	-	-	-	-	-	-	-	-	-	-	-
PFC-5-1-14	-	-	-	C	-	-	-	-	-	C	C	C
SF ₆	-	-	-	-	-	-	C	-	0.6	C	-10.1	35.5
Total HFCs	130.2	3.1	10.8	C	3.5	C	-	-	-	0.9	14	163.0
Total PFCs	0.0	-	-	C	-	-	-	-	1.5	C	-1.1	1.4
Total F-gases	130.2	3.1	10.8	0.4	3.5	C	C	-	2.2	4.3	3.0	199.8

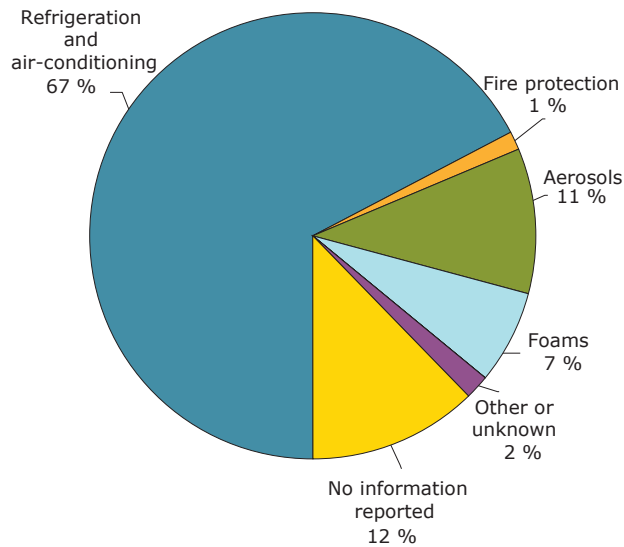
Note: -: no data reported; C: confidential.

Source: EEA.

Figures 2.8 and 2.9 illustrate the shares of the intended applications of HFC net supply in 2013, measured in metric tonnes and CO₂-equivalents respectively. The major share of HFCs 67 % when measured in metric tonnes, 80 % when measured in CO₂-equivalents) is intended for refrigeration

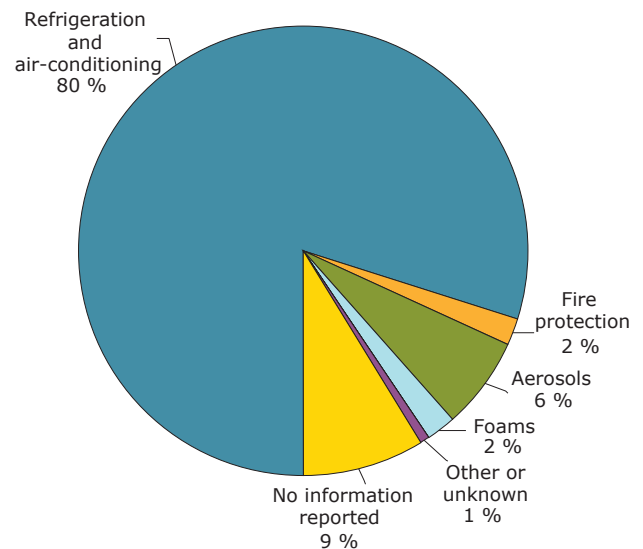
and air-conditioning. This is an increase by 4 percentage points from 2012. It is likely, though, that these shares are in fact even higher, taking into account the relatively large amounts for which no information in intended applications was reported (12 % when expressed in metric tonnes and 9 % when expressed in CO₂-equivalents).

Figure 2.8 2013 shares of intended applications of HFC net supply (metric tonnes)



Source: EEA.

Figure 2.9 2013 shares of intended applications of HFC net supply (expressed in CO₂-equivalents – GWP AR4)



Source: EEA.

PFC net supply in 2013 was dominated by semiconductor manufacture (approximately 60 %, both in metric tonnes and CO₂-equivalents). SF₆ is mainly used in electrical equipment.

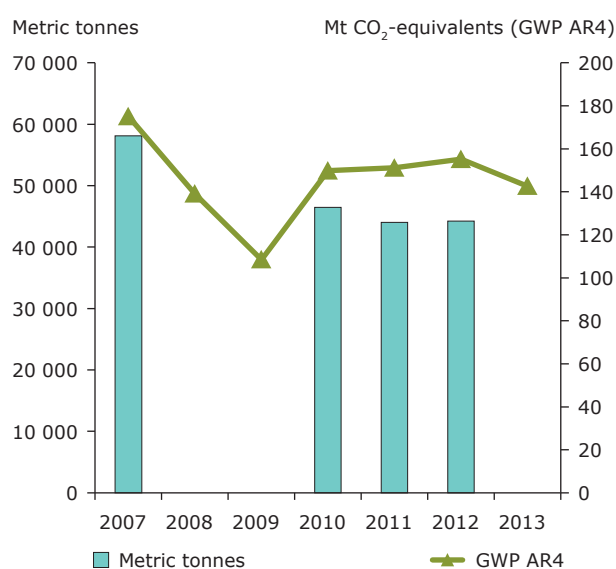
2.3 Production of fluorinated gases

For 2013, companies reported production of 10 out of the 25 F-gases subject to the reporting obligation: HFC-23, HFC-32, HFC-125, HFC-134a, HFC-143a, HFC-227ea, HFC-365mfc, PFC-218, PFC-5-1-14 and SF₆. This is the same set of gases as in 2011 and 2012. However, in order to protect confidentiality of reported data, some values have been hidden here. Figure 2.10 presents F-gas production over time, both in metric tonnes (where not confidential) and CO₂-equivalents.

Total production of F-gases, expressed in CO₂-equivalents, declined compared to 2012 from 151 Mt CO₂-equivalents to 143 Mt CO₂-equivalents (a year-on-year decline of 8 %, Table 2.7). 2013 F-gas production in units of metric tonnes is not published in order to protect confidentiality.

The largest share of 2013 F-gas production took place for HFCs. SF₆ production accounts for significant shares when measured in CO₂-equivalents. The share of PFCs in production is very small. Among HFCs, production volumes (measured in metric tonnes) were greatest for HFC-134a, HFC-365mfc and HFC-143a.

Figure 2.10 Total F-gas production



Note: Total F-gas production in metric tonnes in 2008, 2009 and 2013 is confidential.

Source: 2007–2010: European Commission (DG CLIMA); 2011–2013: EEA.

Table 2.7 Production of F-gases in the period 2007 to 2013

Gases	Unit	2007	2008	2009	2010	2011	2012	2013
SF ₆	t	C	C	C	C	C	C	C
	Mt CO ₂ -equivalent	C	C	C	C	C	C	C
HFCs	t	C	C	C	C	C	C	C
	Mt CO ₂ -equivalent	C	C	C	C	C	C	C
PFCs	t	C	C	C	C	C	C	C
	Mt CO ₂ -equivalent	C	C	C	C	C	C	C
Total F-gases	t	58 098	C	C	46 440	44 030	44 220	C
	Mt CO₂-equivalent	175.0	139.0	108.4	149.8	151.1	155.1	142.6

Note: C: confidential.

Source: 2007–2010: European Commission (DG CLIMA); 2011–2013: EEA.

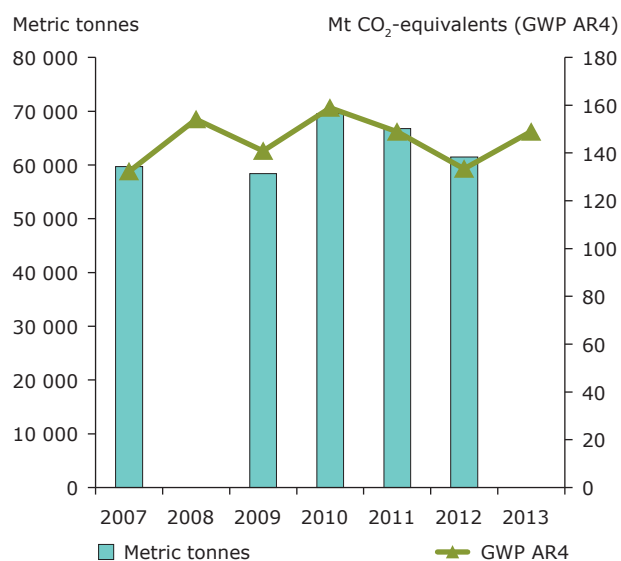
2.4 Imports of fluorinated gases

For 2013, imports were reported for 17 of the 25 F-gases subject to the reporting obligation: HFC-23, HFC-32, HFC-41, HFC-125, HFC-134a, HFC-143a, HFC-152a, HFC-227ea, HFC-236fa, HFC-245fa, HFC-365mfc, HFC-43-10mee, PFC-14, PFC-116, PFC-218, PFC-318 and SF₆. This is one more than in 2012, where there were no imports of HFC-356mfc reported. However, in order to protect confidentiality of reported data, a limited set of aggregated is published here. Figure 2.11 shows F-gas imports over time, both in metric tonnes and CO₂-equivalents.

Total imports of F-gases, expressed in CO₂-equivalents, increased compared to 2012 from 133 Mt CO₂-equivalents to 149 Mt CO₂-equivalents of (a year-on-year increase of 12 %, Table 2.8). 2013 F-gas import in units of metric tonnes is not published in order to protect confidentiality.

The dominant share of imports consists of HFCs. In 2013, HFCs accounts for 92 % of imports when measured in CO₂-equivalents (GWP AR4) and even more when measured in metric tonnes.

Figure 2.11 Total F-gas imports



Note: Total F-gas imports in metric tonnes in 2008 and 2013 are confidential.

Source: 2007–2010: European Commission (DG CLIMA, revision EEA); 2011–2013: EEA.

Table 2.8 Imports of F-gases in the period 2007 to 2013

Gases	Unit	2007	2008	2009	2010	2011	2012	2013
SF ₆	t	C	C	671	539	C	C	C
	Mt CO ₂ -equivalent	C	C	15.3	12.3	C	C	C
HFCs	t	C	C	57 612	C	C	C	C
	Mt CO ₂ -equivalent	112.7	C	C	C	C	C	136.3
PFCs	t	253	306	129	C	238	311	C
	Mt CO ₂ -equivalent	C	3.2	C	C	2.5	3.2	C
Total F-gases	t	59 666	C	58 411	69 564	66 764	61 461	C
	Mt CO₂-equivalent	132.4	154.1	140.9	158.9	148.9	133.4	149.0

Note: C: confidential.

Sources: 2007–2010: European Commission (DG CLIMA, revision EEA); 2011–2013: EEA.

2.5 Exports of fluorinated gases

For 2013, exports were reported for 17 of the 25 F-gases subject to the reporting obligation: HFC-23, HFC-32, HFC-125, HFC-134a, HFC-143a, HFC-152a, HFC-227ea, HFC-236fa, HFC-245fa, HFC-365mfc, HFC-43-10mee, PFC-14, PFC-116, PFC-218, PFC-318, PFC-5-1-14 and SF₆. This is one more than in 2012: HFC-236fa reappeared on the list where there had been no exports in 2012 (Table 2.9).

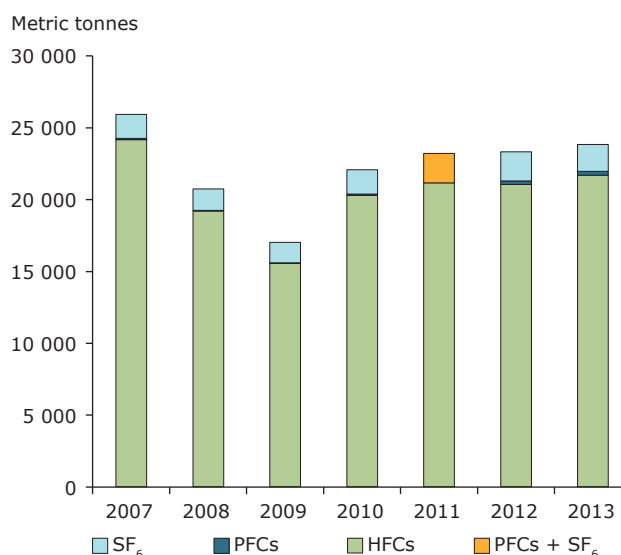
Figure 2.12 shows total F-gas exports over time, both in metric tonnes and CO₂-equivalents.

Total exports of F-gases in 2013 increased to 23.8 kt compared to 23.3 kt in the year 2012, a 2.2 % year-on-year increase (Table 2.9). However, in terms of CO₂-equivalents, exports decreased at – 3.4 % year-on-year (Table 2.10). This is because SF₆ exports (GWP 22 800) decreased by 7.4 % while HFC exports increased (average GWP 1 660 in 2013) by 3.1 % (metric tonnes) or 1.5 % (CO₂-equivalents). Figures 2.13 and 2.14 show the development of the split of total F-gas exports into HFCs, PFCs and SF₆ in metric tonnes and CO₂-equivalents respectively.

In 2013, SF₆ accounted for 53 % of all exports when measured in CO₂-equivalents (GWP AR4), but for only 8 % when measured in metric tonnes. This is a slight decline compared to 2012, but with no clear overall trend. The remainder of exported F-gases consists mostly of HFCs. PFC exports in 2013 remained at the high 2012 levels, however, their

absolute share in exports is still very low (1 % when measured in metric tonnes and 3 % when measured in CO₂-equivalents).

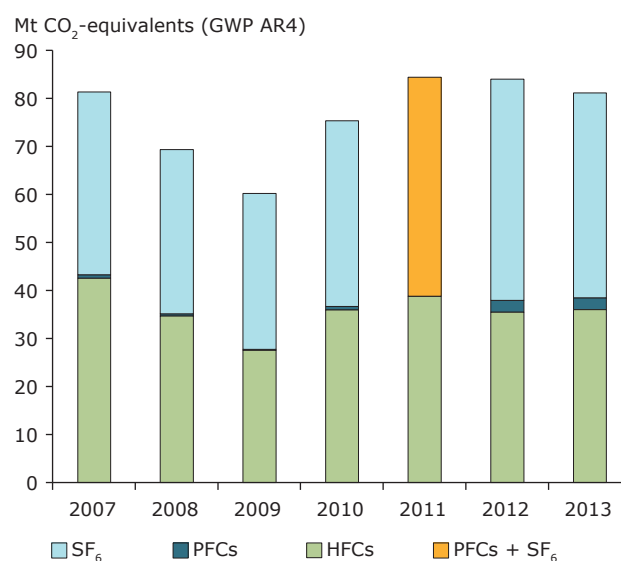
Figure 2.13 Exports by groups of F-gases (metric tonnes)



Note: For 2011, PFC and SF₆ exports are displayed jointly in order to protect the confidentiality of PFC exports.

Source: 2007–2010: European Commission (DG CLIMA, revision EEA); 2011–2013: EEA.

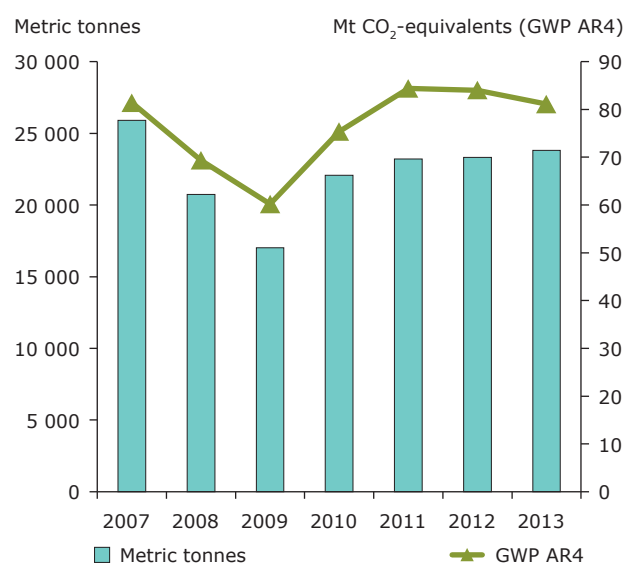
Figure 2.14 Exports by groups of F-gases (expressed in CO₂-equivalents – GWP AR4)



Note: For 2011, PFC and SF₆ exports are displayed jointly in order to protect the confidentiality of PFC exports.

Source: 2007–2010: European Commission (DG CLIMA, revision EEA); 2011–2013: EEA.

Figure 2.12 Total F-gas exports



Source: 2007–2010: European Commission (DG CLIMA, revision EEA); 2011–2013: EEA.

Aggregation results

Table 2.9 Exports of F-gases in the period 2007 to 2013 (metric tonnes)

	2007	2008	2009	2010	2011	2012	2013
Gas	Metric tonnes						
HFC-23	C	C	17	12	8	10	C
HFC-32	1 310	771	706	1 534	1 335	883	1 414
HFC-41	-	-	-	-	-	-	-
HFC-125	2 854	2 038	1 758	2 870	3 521	2 159	1 936
HFC-134	C	-	-	C	-	-	-
HFC-134a	15 999	12 318	9 925	10 703	11 080	12 480	12 101
HFC-143	-	-	-	-	-	-	-
HFC-143a	1 352	1 450	937	1 295	1 237	1 076	1 137
HFC-152a	C	C	C	632	262	186	C
HFC-227ea	204	271	187	352	433	460	526
HFC-236cb	-	-	-	-	-	-	-
HFC-236ea	-	-	-	-	-	-	-
HFC-236fa	C	C	C	C	C	-	C
HFC-245ca	-	-	-	-	-	-	-
HFC-245fa	C	C	C	C	C	C	C
HFC-365mfc	C	C	C	C	C	C	C
HFC-43-10mee	C	C	C	C	C	C	C
PFC-14	C	C	0	C	C	C	C
PFC-116	C	C	C	C	C	C	C
PFC-218	C	C	C	C	C	C	C
PFC-318	-	C	C	C	C	C	C
PFC-3-1-10	C	C	-	C	C	-	-
PFC-4-1-12	-	-	-	-	-	-	-
PFC-5-1-14	C	C	C	C	C	C	C
SF ₆	1 670	1 499	1 423	1 697	C	2 020	1 871
Total HFCs	24 162	19 187	15 564	20 291	21 162	21 041	21 696
Total PFCs	83	57	25	82	C	256	253
SF ₆ and Total PFCs	1 753	1 555	1 448	1 778	2 052	2 276	2 124
Total F-gases	25 915	20 742	17 012	22 070	23 214	23 317	23 820

Note: -: no data reported; C: confidential.

Source: 2007–2010: European Commission (DG CLIMA, revision EEA); 2011–2013: EEA.

Table 2.10 Exports of F-gases in the period 2007 to 2013 (expressed in CO₂-equivalents – GWP AR4)

	2007	2008	2009	2010	2011	2012	2013
Gas	Million tonnes of CO₂-equivalents (GWP AR4)						
HFC-23	C	C	0.3	0.2	0.1	0.2	C
HFC-32	0.9	0.5	0.5	1.0	0.9	0.6	1.0
HFC-41	-	-	-	-	-	-	-
HFC-125	10.0	7.1	6.2	10.0	12.3	7.6	6.8
HFC-134	C	-	-	C	-	-	-
HFC-134a	22.9	17.6	14.2	15.3	15.8	17.8	17.3
HFC-143	-	-	-	-	-	-	-
HFC-143a	6.0	6.5	4.2	5.8	5.5	4.8	5.1
HFC-152a	C	C	C	0.1	0.0	0.0	C
HFC-227ea	0.7	0.9	0.6	1.1	1.4	1.5	1.7
HFC-236cb	-	-	-	-	-	-	-
HFC-236ea	-	-	-	-	-	-	-
HFC-236fa	C	C	C	C	C	-	C
HFC-245ca	-	-	-	-	-	-	-
HFC-245fa	C	C	C	C	C	C	C
HFC-365mfc	C	C	C	C	C	C	C
HFC-43-10mee	C	C	C	C	C	C	C
PFC-14	C	C	0.0	C	C	C	C
PFC-116	C	C	C	C	C	C	C
PFC-218	C	C	C	C	C	C	C
PFC-318	-	C	C	C	C	C	C
PFC-3-1-10	C	C	-	C	C	-	-
PFC-4-1-12	-	-	-	-	-	-	-
PFC-5-1-14	C	C	C	C	C	C	C
SF ₆	38.1	34.2	32.4	38.7	C	46.1	42.7
Total HFCs	42.5	34.6	27.5	36.0	38.8	35.5	36.0
Total PFCs	0.8	0.5	0.2	0.7	C	2.5	2.5
SF ₆ and Total PFCs	39	35	33	39	46	49	45
Total F-gases	81.4	69.3	60.2	75.4	84.4	84.0	81.1

Note: -: no data reported; C: confidential.

Source: 2007–2010: European Commission (DG CLIMA, revision EEA); 2011–2013: EEA.

2.6 Quantities reclaimed, destroyed or used as feedstock

Table 2.11 summarises data reported for reclamation of F-gases. Since 2011, reclamation has been rather stable at approximately 500 tonnes of F-gases. In terms of CO₂-equivalents, however, the reclaimed amounts have been decreasing as levels of high-GWP F-gases like SF₆ have been decreasing. Reported reclamation levels remain below 1 % of net supply, both in terms of metric tonnes and CO₂-equivalents.

Reported data on destruction and feedstock use are displayed for confidentiality reasons. Reported

destruction levels remain well below 1 % of net supply. Feedstock use is reported at levels below 5 % of net supply, the major substance used as feedstock is HFC-23.

However, the reported amounts cannot fully reflect complete EU activities due to the scope of the reporting obligation: only producers and importers are obliged to report on reclamation, destruction and own feedstock use. For example, the activities of specialised reclamation or destruction companies which entirely source on the EU market are not covered by the reporting.

Table 2.11 Reclamation of F-gases in the period 2007 to 2013

Gases	Unit	2007	2008	2009	2010	2011	2012	2013
Total F-Gases	t	417	398	177	326	508	487	484
	% of net supply (t)	0.5 %	0.4 %	0.2 %	0.4 %	0.6 %	0.6 %	0.6 %
	Mt CO ₂ -equivalent	2.1	1.9	1.9	1.3	1.8	1.6	1.2
	% of net supply (GWP AR4)	1.0 %	0.9 %	0.9 %	0.6 %	0.9 %	0.8 %	0.6 %

Source: 2007–2010: European Commission (DG CLIMA); 2011–2013: EEA.

List of abbreviations

AR4	Fourth Assessment Report of the IPCC
BDR	Business Data Repository of the EEA
Blend	Preparation (blend) containing F-gases
CO ₂	Carbon dioxide
DG CLIMA	Directorate-General for Climate Action of the European Commission
ECCP	European Climate Change Programme
EEA	European Environment Agency
ETC/ACM	European Topic Centre for Air Pollution and Climate Change Mitigation
EU	European Union
EU-15	Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom
EU-28	Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, and United Kingdom
F-gases	Fluorinated gases
GWP	Global Warming Potential
HFCs	Hydrofluorocarbons
IPCC	Intergovernmental Panel on Climate Change
kt	Kilotonnes
Mt	Megatonnes
PFCs	Perfluorocarbons
SF ₆	Sulphur hexafluoride
TAR	Third Assessment Report of the IPCC

References

EEA, 2013, *Fluorinated greenhouse gases 2012, Data reported by companies on the production, import and export of fluorinated greenhouse gases in the European Union*, Technical report No 15/2013, European Environment Agency.

EEA, 2014, EEA Greenhouse Gas data viewer: <http://www.eea.europa.eu/data-and-maps/data/data-viewers/greenhouse-gases-viewer>, accessed 9 July 2014.

EC, 2006, Regulation (EC) No 842/2006 of the European Parliament and of the Council of 17 May 2006 on certain fluorinated greenhouse gases.

EC, 2007, Treaty of Lisbon amending the Treaty on European Union and the Treaty establishing the European Community, signed at Lisbon, 13 December 2007.

EC, 2007, Commission Regulation (EC) No 1493/2007 of 17 December 2007, establishing, pursuant to Regulation (EC) No 842/2006 of the European Parliament and of the Council, the format for the report to be submitted by producers, importers and exporters of certain fluorinated greenhouse gases.

EC, 2009, Regulation (EC) No 1005/2009 of the European Parliament and of the Council of 16 September 2009 on substances that deplete the ozone layer Commission Regulation (EC) No 1493/2007.

EU, 2014, Regulation (EU) No 517/2014 of the European Parliament and of the Council of 16 April 2014 on fluorinated greenhouse gases and repealing Regulation (EC) No 842/2006

IPCC, 2001, *Third Assessment Report (TAR) – Climate Change*, Intergovernmental Panel on Climate Change. http://www.grida.no/publications/other/ipcc_tar.

IPCC, 2007, *Fourth Assessment Report (AR4) – Climate Change*, Intergovernmental Panel on Climate Change. http://www.ipcc.ch/publications_and_data/ar4/wg1/en/contents.html.

Montreal Protocol on Substances That Deplete the Ozone Layer, international treaty, adopted in Montreal on 16 September 1987.

Annex 1 Global warming potentials of fluorinated gases subject to reporting under the 'old' F-Gas Regulation

Table A1.1 Global warming potentials of fluorinated gases subject to reporting under the 'old' F-Gas Regulation

Fluorinated greenhouse gas	Chemical formula	Global warming potential used in the present report, based on the IPCC Fourth Assessment Report (GWP AR4)
Sulphur hexafluoride	SF ₆	22 800
Hydrofluorocarbons (HFCs):		
HFC-23	CHF ₃	14 800
HFC-32	CH ₂ F ₂	675
HFC-41	CH ₃ F	92
HFC-43-10mee	C ₅ H ₂ F ₁₀	1 640
HFC-125	C ₂ H ₂ F ₅	3 500
HFC-134	C ₂ H ₂ F ₄	1 100
HFC-134a	CH ₂ FCF ₃	1 430
HFC-152a	C ₂ H ₄ F ₂	124
HFC-143	C ₂ H ₃ F ₃	353
HFC-143a	C ₂ H ₃ F ₃	4 470
HFC-227ea	C ₃ H ₂ F ₇	3 220
HFC-236cb	CH ₂ FCF ₂ CF ₃	1 340
HFC-236ea	CHF ₂ CHFCF ₃	1 370
HFC-236fa	C ₃ H ₂ F ₆	9 810
HFC-245ca	C ₃ H ₃ F ₅	693
HFC-245fa	CHF ₂ CH ₂ CF ₃	1 030
HFC-365mfc	CF ₃ CH ₂ CF ₂ CH ₃	794
Perfluorocarbons (PFCs):		
PFC-14	CF ₄	7 390
PFC-116	C ₂ F ₆	12 200
PFC-218	C ₃ F ₈	8 830
PFC-318	c-C ₄ F ₈	10 300
PFC-3-1-10	C ₄ F ₁₀	8 860
PFC-4-1-12	C ₅ F ₁₂	9 160
PFC-5-1-14	C ₆ F ₁₄	9 300

Annex 2 Measures to protect confidential data

Article 6 (3) of the 'old' F-Gas Regulation states that the Commission shall take appropriate steps to protect the confidentiality of the information reported. Hence, the EEA, in agreement with the European Commission, has applied measures to prevent the deduction of commercially sensitive information.

The measures include:

1. Application of the so-called '**3-company group rule**', where the data presented in the report must be the result of reporting by at least three company groups (i.e. corporate groups).
2. Application of a '**5 % significance rule**', where company groups whose reported data add up to less than 5 % of the total amount reported for any data-point represented in the report, are ignored for counting under the '3-company group rule'.
3. Application of additional measures to **prevent the deduction of sensitive information**.

All measures apply both for amounts reported in metric tonnes and GWP tonnes. Each of the measures is explained in more depth below. These measures have been applied consistently for all the data presented in this report thus covering the period 2007–2013.

A.2.1 '3-company group rule'

This measure concerns the treatment of data reported by different legal entities across the EU but belonging to the same company group. For that purpose company groups are defined as 'one or more companies legally belonging to the same corporate group'. The agreed principle is that

companies belonging to the same corporate group need to be seen as a single entity when it comes to confidentiality rules. The companies' relationships among each other are not reported nor publicly known. The approach applied in 2014 was therefore to identify so-called 'obvious cases' based on the information on company names and contact details as reported during the registration process. Once company groups were thus determined, at least three of them must contribute to each reported value. This measure replaces the old '3-company rule' as applied by EEA in previous public F-gas reports, which did not take into account possible corporate relationships.

A.2.2 '5 % significance rule'

As a second measure, company groups were only included in the above count if they contributed significantly to the reported value. That means that the smallest contributors up to an accumulated share of 5 % were not considered when applying the '3-company group rule' above. This ensures that at least three corporate entities contributed significantly to each reported transaction value.

A.2.3 Preventing deduction of sensitive data

Additional measures were applied to prevent deduction of confidential data.

All transactions

Deduction might be possible in cases where transaction data for certain substances or substance groups (i.e. HFCs or PFCs) remain confidential, yet data for other substances or substance groups

Box A.2.1 A practical guide to applying the '3-company group rule' and '5 % significance rule' measures to the data

Operationalisation of the combined '3-company group rule' and '5 % significance rule'

Step 1: All values reported by companies of a given company group for a given transaction year were added up for a given transaction and substance or substance group.

$$\sum X_i = X_1 + X_2 + \dots X_n$$

X_i = individual reported value by a single reporting undertaking

$\sum X_i$ = sum of individual reported values by reporting undertakings belonging to the same company group.

Step 2: The sum of all absolute contributions ($|\sum X_i|$) across company groups was calculated.

Step 3: The percentage share of (2) in relation to (3) was calculated for each company group.

$$\% = \frac{|\sum X_i|}{\sum |\sum X_i|}$$

Step 4: The company groups were sorted in the ascending order of percentages calculated in step 3.

Step 5: An accumulated percentage share was calculated along the sorted company groups.

Step 6: The number of company groups, for which the accumulated share was larger than 5 % was counted.

In case the count was one or two, the full aggregated value across company groups was hidden as confidential. In case the count was three or more, the full aggregated value across company groups was reported and thus not confidential.

along with a total for the transaction in question were published. Confidential data, which were in danger of such deduction, were protected by hiding additional data as confidential (although these additional values had been identified as non-confidential according to the '3-company group' and '5 % significance rule') so that at least values for three (or none) of the substances or substance groups were confidential in the published data for that transaction.

Aggregated transactions

Last but not least, transaction data were hidden in case other confidential transaction data could be implied from its publication. In order to understand this additional measure, it should be remembered, that net supply of F-gases is a calculated transaction that involves production, import, export and few

more data for each substance or substance group. For the reader, this rather complicated calculation can be simplified as:

$$\text{Net supply} = \text{Production} + \text{Import} - \text{Export} + \text{Remainder}$$

The 'Remainder' may appear irrelevant and a confidential value on e.g. production may appear being deductible based on non-confidential information on consumption, import and export. In such cases data were only published in case the 'Remainder' equalled or exceeded 5 % of the consumption. In cases where the 'Remainder' was below 5 %, and if also one term (i.e. net supply, production, import or export) of the above equation was confidential according to the '3-company group' and '5 % significance rule', a second term of the above equation was set confidential in order to prevent deduction.

Annex 3 Calculation of net supply and intended applications

A.3.1 Calculation of net supply

'Net supply' is the key parameter used in this report describing actual use of (bulk) F-gases by EU industries.

Net supply is calculated by adding reported amounts for

- Production;
- imports (bulk imports only, imports contained in products or equipment are not considered in the reporting under the 'old' F-Gas Regulation);
- stocks held on 1 January of the reporting year;
- other amounts collected for reclamation or destruction from within the EU.

and subtracting reported amounts for

- exports (bulk exports only, imports contained in products or equipment are not considered in the reporting under the 'old' F-Gas Regulation);
- destruction (on-site by reporting companies and off-site within the EU on reporting companies' behalf);
- amounts used as feedstock by reporting companies;
- stocks held on 31 December of the reporting year.

The 'net supply' parameter accounts for the amounts exported by companies which did not produce or import. Thus, it does not equal the aggregation of the 'net amount available for sale in the EU' or of the amounts 'placed on the EU market for the first time' as reported by producers and importers.

A.3.2 Intended applications of EU net supply

Information on the intended applications of EU net supply is based on data reported by companies on the intended applications of the amount 'placed on the EU market for the first time'. However, in the EU-wide aggregation, these amounts 'placed on the EU market for the first time' do not total the EU net supply as defined above. This is mainly due to the following three 'corrections':

- a) **Export correction.** Exporters who neither import nor produce are not required to report on amounts placed on the market, nor on intended applications. However, their exports are considered in the net supply parameter.
- b) **Co-producer correction.** Producers report on sales to and purchases from other EU producers (called 'co-producers' in Commission Regulation (EC) No 1493/2007) specifically by co-producer. In the reporting form, the balance of these sales and purchases (i.e. purchases minus sales) is added to the amount of F-gases for which the respective producer is obliged to report on intended applications. However, different producers' reports on these co-producer sales and purchases are not always consistent, so the EU-wide aggregation of purchases from co-producers does not necessarily meet the EU-wide aggregation of sales to co-producers. Thus, this may lead to double-counting or gaps in the EU-wide aggregation of the 'intended application' amounts.
- c) **Intended applications correction.** For importers, the reporting forms demand that intended applications are estimated for exactly the amount of F-gases which is defined as above net supply. In some reports, these figures do not match. This may lead to double counting or gaps.

It is important to note that in the EU-wide aggregation, these amounts 'placed on the EU market for the first time' do not total the EU net supply as defined above. As a consequence, a difference is met between the EU-wide aggregation of the net supply and the EU-wide aggregation of amounts for which intended applications were reported for all reporting years. This difference is accounted for in graphs and tables as 'no information reported'.

This difference can change in its arithmetic sign between reporting years. A negative amount supplied to the EU market can be interpreted as a net export. Deviation a) of the list above (export correction) is always negative and depends on the exported amounts reported by companies which do not produce and import. Deviation b) (co-producer correction) has gained relevance with the reinforced quality control since the 2011 reporting

year and was strongly positive since outweighing the negative contributions of the export correction. Deviation c) (intended applications correction) is mostly relevant for 2007 to 2010, where quality control had been less stringent. In a number of cases, importers' data on intended applications were also reported for amounts which importers had purchased within the EU market and thus are not part of the net supply. These contributions were mostly negative.

As a result, the sum of the amounts of reported intended applications were larger than the net supply in the years 2007 to 2010. This can mainly be attributed to insufficient quality control and the export corrections for 2007 to 2010. For the period from 2011 to 2013, the net supply was larger than the sum of the intended applications. In these years, the co-producer correction outweighed the export correction.

European Environment Agency

Fluorinated greenhouse gases 2013

Aggregated data reported by companies on the production, import and export of fluorinated greenhouse gases in the European Union

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