Comparison of Verified CO_2 Emissions under the EU Emission Trading Scheme with National Greenhouse Gas Inventories for the Year 2005

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ABBREVIATIONS

AD	Activity data
CRF	Common Reporting Format
EC	European Commission
EEA	European Environment Agency
EF	Emission factor
ETS	European Emissions Trading Scheme
EU	European Union
Gg	Gigagram
GHG	Greenhouse gases
IPCC	Intergovernmental Panel on Climate Change
Mt	Megatons
MRG	Monitoring and Reporting Guidelines
MW	Megawatt
NAP	National allocation plan
NIR	National inventory report
UNFCCC	United Nations Framework Convention on Climate Change

1 Summary

The majority of Member States (15 of 23) already used the verified CO_2 emissions reported under the European emissions trading scheme (EU ETS) in the first year in which it became available for the purpose of verifying and improving national greenhouse gas (GHG) inventories. Key areas of improvement were the estimation of emission sources in the national inventory for which previously no data was available, the identification of gaps in the inventory reporting, an improved allocation of fuels and input materials to source categories, improved emission factors as well as improved information on the types, amounts and composition of non-commercial fuels and input materials used in the sectors covered by the EU ETS.

Some Member State provided a quantitative assessment of the differences that they found when they compared the ETS emissions for 2005 with the inventory estimates for particular sectors or source categories. Table 1 summarizes the quantified differences at sectoral level for those Member States that provided such information. This overview shows that the differences encountered were relatively small. France quantified the differences in relation to the total national GHG emissions with < 0.56% of total emissions.

Table 1 Quantified differences in CO_2 emissions between ETS data and inventory data for selected Member States

Quantified differences in CO_2 emissions between ETS and inventory data for 2005		
	% difference *	**Inventory source category**
Czech Republic	± 4%	Lime and Cement production
Germany	-3%	Public Electricity and Heat (waste incineration excluded)
	+ 5.9%	Pipeline Transport
Denmark	± 0.16%	Combustion emissions
Spain	-0.0112	Petroleum Refining
France	+5%	Lime Production (Combustion and process emissions)
	+0.5%	Cement Production (Combustion and process emissions)
	+0.05%	Glass Production (Combustion and process emissions)
	±0.33%	Manufacturing Industry and Construction
	0%	Public electricity abd Heat
	0%	Petroleum refining
	±7%	Coke ovens
	±2%	Steel industry
	≤0.56%	Total GHG emissions

*Notes: * Differences relative to total for sector or source category*
Source: Presentations provided at the 2nd Workshop on data consistency between National GHG inventories and reporting under the EU ETS under WG 1 and WG 3 of the Climate Change Committee, see http://air-climate.eionet.europa.eu/meetings/past_html)

Different CO_2 emission factors (EF) for fuels or other emission sources can potentially be one of the major reasons for discrepancies in CO_2 emissions from ETS installations and

in national inventories. For the reporting in 2005, many Member States already used the information reported under the EU ETS to refine and update the fuel-specific EFs used in the inventories and reported such activities in recent national inventory reports. A detailed comparison of three Member States (Finland, France, the Czech Republic) in this respect revealed a high consistency of fuel-specific emission factors and oxidation factors between ETS and inventory data. Member States also used the new information to improve emission factors used in the estimation of process emissions, in particular for the emissions from mineral products.

Energy statistics usually provide little information on the total amounts and types of other fuels used beyond the common commercial fuel categories. EU ETS data cover more detailed information on a larger variety of fuels and input materials in the different sectors. Some Member States deployed this information to improve the GHG inventories with regard to the less common or less clearly-defined fuels and input materials, such as secondary fuels.

An important area in which data from the EU ETS for 2005 was immediately used by many Member States was to fill reporting gaps in GHG inventories. A number of Member States estimated additional source categories that are covered by the EU ETS in the 2005 inventory submission, for example:

- reporting of CO_2 emissions from flares in the GHG inventory;
- estimation of the source categories 'Limestone and Dolomite Use' and 'Soda Ash Use' in the sectors covered by the ETS which were previously not estimated;
- estimation of additional source categories under mineral products such as 'Glass Production', 'Ceramics Production' or 'Brick and Tiles Production;
- identification of fuels previously not included in the inventory reporting.

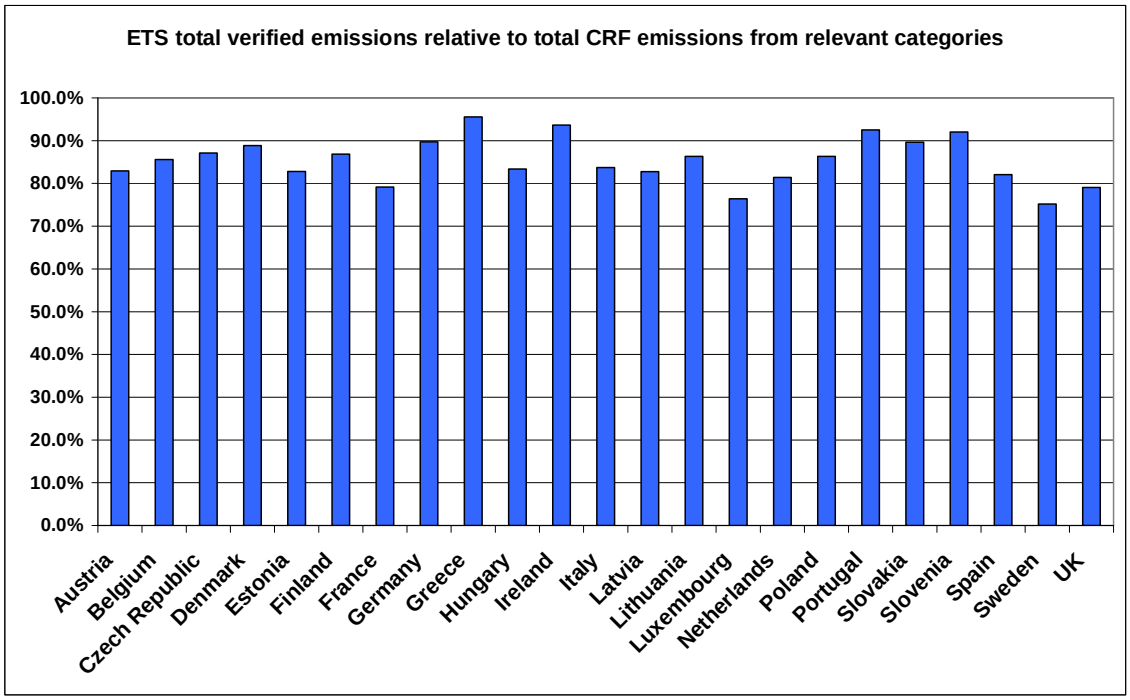
General inconsistencies of CO_2 emissions reported under both schemes arise from a number of general differences in the coverage of emissions between the two reporting schemes:

- from the capacity thresholds used for the participation in the EU ETS and the different importance of small installations in Member States;
- from the differences in scope of the installation definitions applied in the first year of the ETS;
- from the different relevance of CO_2 emissions from waste incineration plants with energy recovery across Member States which are not included in the ETS; and
- from the differences in the accounting of transferred CO_2 under both reporting schemes.

These general differences complicate the comparison of both data sets. As a general indicator of consistency, the total verified emissions in 2005 (ETS total) were divided by the CRF emissions from relevant source categories to calculate the share of verified emis-

sions related to the inventory emissions. The resulting shares of ETS emissions in CRF emissions for 2005 are presented in Figure 1.

Figure 1 *Share of ETS emissions relative to inventory emissions from relevant source categories for the year 2005*



Source: Calculations based on Member States' GHG inventories for 2005, submitted in 2007 to the UNFCCC secretariat and ETS emissions as included in the EU CITL, downloaded in July 2007

The sum of emissions in the GHG inventory from the relevant CRF categories is always higher than the verified ETS emissions due to the fact that the inventory includes all plants and does not use any threshold criteria for the inclusion of installations.

The calculated share of the ETS total in the CRF total ranges from 75 % (Sweden) to 96% (Greece). The average share of the ETS total in the CRF total emissions is 85.4% for EU-23. For 13 Member States, the national shares are within a range of 5% of the EU-23 average value and for 19 Member States they are within a 10% range of the EU-23 average. With few exceptions, the CO_2 emissions covered by the ETS represent a relatively similar share in comparison to inventory emissions across Member States which can be regarded as indirect proof of consistency of both data sets.

The shares below 80% can be explained by the use of narrow installation definitions in the first ETS phase for the Member States concerned. It is likely that the very high shares of ETS emissions relative to CRF emissions for Greece and Portugal are related to small installations below the ETS capacity thresholds having a lower importance in these Member States.

The largest differences in the share of ETS emissions relative to CRF emissions are mainly due to general inconsistencies in the allocation of emissions under the ETS and the GHG inventories and not to problems or inconsistent assumptions in the emission estimations in Member States. Further information on the emissions from waste incineration accounted in GHG inventories and on the transfer of CO_2 under the EU ETS would be necessary for a quantitative assessment of these general inconsistencies.

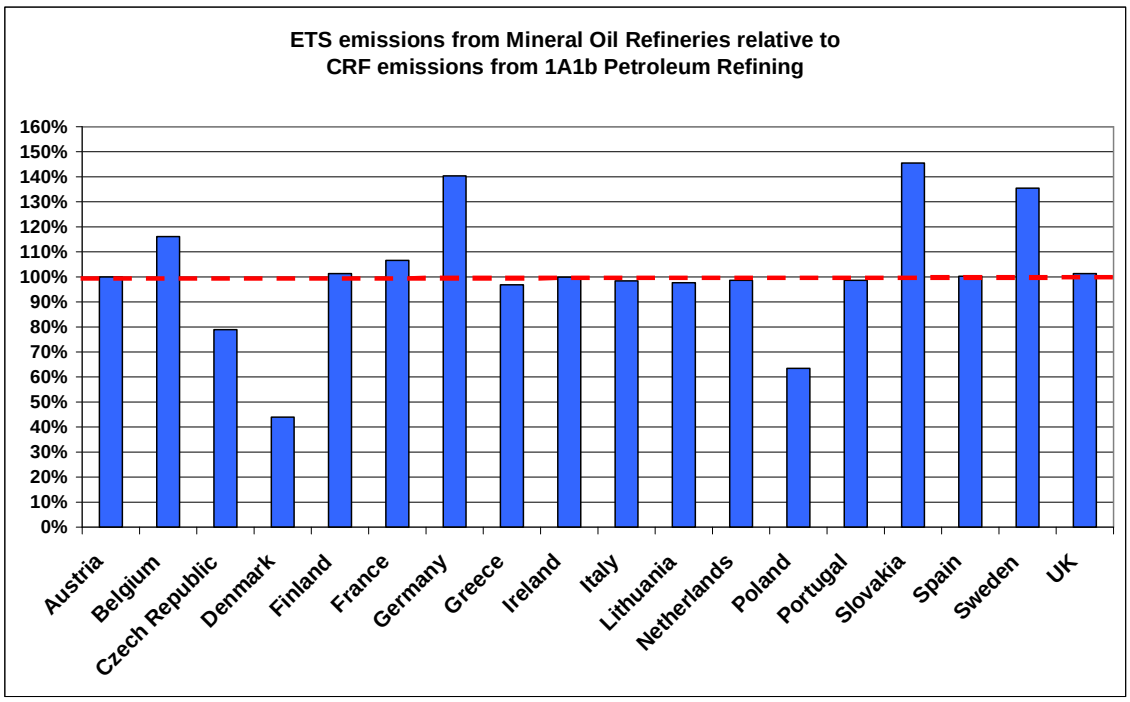
It is difficult to make a comparison between the CO_2 emissions from fuel combustion in ETS data and GHG inventories because of different ways of sectoral allocation of these emissions. Under the ETS, the combustion sector covers combustion installations which have a rated thermal input exceeding 20 MW; however, emissions from fuel combustion are also part of the reported CO_2 emissions of the remaining ETS categories. In the production and processing of ferrous metals and mineral industry, combustion emissions under the ETS are reported together with process emissions. Therefore, no detailed analysis of the consistency of reported CO_2 emissions from fuel combustion can be performed.

Figure 6 compares the CO_2 emissions reported for 'Mineral Oil Refineries' under the EU ETS with the CO_2 emissions reported in the GHG inventory for 'Petroleum Refining' for the year 2005. For 11 of the 18 Member States, ETS data match well with inventory data (AT, FI, FR, GR, IE, ES, IT, LT, NL, PT and UK).

In contrast to the results for refineries, CO_2 emissions for 2005 reported under the EU ETS show large differences to those reported in the national greenhouse gas inventories. One of the main reasons for the differences in reported CO_2 emissions from iron and steel under both schemes is the allocation of blast furnace gas and coke oven gas resulting from iron and steel production to either the iron and steel sector or the combustion sector. These gases can also be transferred as fuels to other plants inside or outside of the EU ETS.

The relationship of ETS emissions from Cement and Lime Production divided by CRF emissions is rather consistent across the Member States, having an average of 160%, i.e. the sum of combustion emissions from cement and lime under the ETS is on average 160% that of process emissions reported in the national GHG inventory. The shares of 18 of the 23 Member States lie within a range of ±10% of this average. For Sweden and the UK this relationship is much lower (around 109% for Sweden and 111% for the UK), which may be due to a different allocation of combustion emissions from cement and lime installations to the general combustion sector under the ETS. For Estonia, Latvia and Lithuania this relationship is much higher (Estonia 194%, Latvia 201%, Lithuania 211%). In these Member States, emissions result from a few plants covered under the EU ETS; further checks may be useful based on the data reported by installations under the EU ETS.

Figure 2 *ETS CO_2 emissions reported for 'Mineral Oil Refineries' divided by CRF CO_2 emissions reported under 1A1b 'Petroleum Refining' and other relevantinventory source categories for 2005*



Source: Calculations based on Member States' GHG inventories for 2005 submitted in 2007 to the UNFCCC secretariat and ETS emissions as included in the EU CITL, downloaded in July 2007. The inventory data included in the comparison is a sum of relevant CRF categories including 1A1b as well as 1B2a and 1B2c, depending on the information provided in Member States national inventory reports on the allocation of emissions from refineries.

2 Introduction and background

In January 2005 the European Union Greenhouse Gas Emission Trading Scheme (EU ETS) commenced operation as the largest multi-country, multi-sector greenhouse gas emission trading scheme world-wide. The scheme is based on Directive 2003/87/EC, which entered into force in October 2003. One of the main goals of the EU ETS is to help Member States and trading sectors to reduce CO_2 emissions cost efficiently in order to reach the GHG emission reduction targets set under the Kyoto Protocol.

The EU ETS covers more than 10,000 CO_2 emitting installations corresponding to approximately 45% of the total CO_2 emission across EU-25. Article 14 of the Emission Trading (ET) Directive requires Member States to ensure that emissions are monitored in accordance with specific monitoring and reporting guidelines (MRG)[1], which are legally binding. In July 2006 the Climate Change Committee adopted unanimously the revised Monitoring and Reporting Guidelines for the EU ETS.[2] The new Guidelines will enter into force on 1st January 2008.

Under the EU ETS, independently verified emission reports for each installation which cover the emissions of the previous year are due at the end of March of each year. Information from the verified emission reports is managed by the competent authority and emissions are made publicly available. Thus, the EU ETS generates a completely new EU-25 (EU-27 in the future) emissions data set on CO_2 emissions for the sectors covered by the scheme. The EU ETS emissions are principally different, being bottom–up plant/installation based in comparison to the traditional top-down based approaches used in the energy statistics or in the industry sector in many countries to derive the national greenhouse gas inventories.

The EU ETS is designed to reduce CO_2 emissions in the trading sectors in a cost effective manner. The overall reduction is set by the total quantity of allocated allowances, which shall be consistent with the Member States' obligation to limit their emissions pursuant to the burden sharing agreement and the Kyoto Protocol. The reported verified emissions under the EU ETS in 2006 for the year 2005 are reflected in the national greenhouse gas inventories submitted in 2007. Any changes in GHG emissions as a result of the EU ETS should ultimately be mirrored in GHG inventory reports by Member States and the EC.

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1 2004/156/EC: Commission Decision of 29 January 2004 establishing guidelines for the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council, see http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32004D0156:EN:NOT

2 2007/589/EC: Commission Decision of 18 July 2007 establishing guidelines for the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council, see http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32007D0589:EN:NOT

The objectives of this paper are to:

- explore whether CO_2 emissions data collected under the EU Emissions Trading Scheme (ETS) for the year 2005 are consistent with CO_2 emissions reported in GHG inventories;
- identify and clarify potential technical or methodological problems in comparing CO_2 emissions reported under the EU ETS with data from GHG inventories;
- present progress in Member States with regard to improving data consistency between GHG inventories and ETS data;
- identify whether actions need to be taken at the EU level to ensure the credibility of the EC inventory and the efficient operability of the EU ETS; and
- develop recommendations on the ways in which data consistency can be further improved in the short and long term; and
- develop recommendations for the future process of harmonising reporting requirements for industrial emissions in the EU.

3 Use of data from EU ETS for 2005 for the purposes of the national GHG inventory

The ETS data can be used in different ways for the purposes of the national GHG inventories:

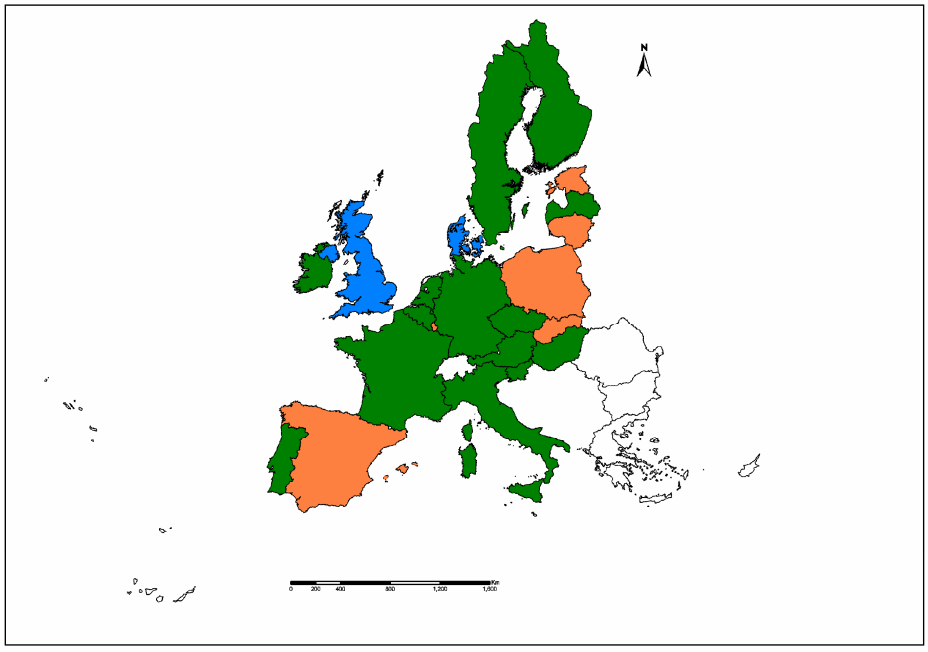
1. Reported verified emissions can be used directly for the GHG inventory for a specific source category. This requires that the coverage of the respective ETS emissions are complete for the respective source category and follow the same definition. If ETS emissions are not complete, the emissions for the remaining part of the source category not covered by the EU ETS have to be calculated separately and added to the ETS data.
2. Emission factors (or other parameters such as oxidation factors) reported under the EU ETS can be checked with emission factors used in the inventory and they can be harmonised if the EU ETS provides improved information.
3. Activity data reported under the EU ETS can be used directly for the GHG inventory, in particular for source categories where energy statistics face difficulties in disaggregating fuel consumption to specific subcategories, e.g. industrial sectors.
4. Data from EU ETS can be used for more general verification activities as part of the national quality assurance (QA) activities without the direct use of emissions, activity data or emission factors. An important part of such QA activities is the identification of gaps in the inventory and the potential to estimate source catego-

ries that were previously not estimated, based on additional data becoming available as a result of the EU ETS.

5. Data from EU ETS can improve completeness of the estimation of IPCC source categories (e.g. for Limestone and dolomite use, Soda ash use or Hydrogen production);
6. ETS data can improve the allocation of industrial combustion emissions to subcategories under 1A2 Manufacturing industries and Construction;
7. The comparison of the data sets can be used.to improve the uncertainty estimation for the GHG inventories based on the range of data reported by installations.

Many Member States immediately used the 2005 EU ETS data to improve their national GHG inventories or for the verification of GHG inventory data in the first year in which ETS data became available. These activities are reflected in the recent modifications and descriptions in Member States' National Inventory Reports (NIR). ETS data for 2005 became available in March 2006; the 2005 inventory had to be submitted by 15 January 2007 to the European Commission. Thus, Member States had a couple of months available to analyse and integrate the new data in the inventory reporting.

Figure 3 *Use of 2005 ETS data for the purposes of the national GHG inventory as indicated in the national inventory reports for 2007*



Notes: ***green:*** *MS used data from the EU ETS for the compilation of the 2007 inventory submission.*
blue: *MS indicated that it plans to use data from the EU ETS for the inventory, but that this work was still ongoing or only partly completed.*
orange: *no information was provided in the national inventory report as to whether data from the EU ETS was used.*

Figure 3 provides an overview of the use of 2005 ETS data for the purposes of the national GHG inventory as indicated in the national inventory reports for 2007.

The analysis in this report does not include Malta and Cyprus for the following reasons:

- Emissions data from these Member States are not very comparable to other Member States due to specific national circumstances.
- Malta did not provide a GHG inventory for 2005.
- No results of an UNFCCC inventory review are available for Cyprus and Malta, which gives an indication of the quality of the reported inventory data.

Table 2 provides a more detailed overview on the way in which Member States used the ETS data for the 2007 inventory submission. The information in this table is derived from the national inventory reports and may not cover all aspects of Member States' use of the ETS data since there is no specific requirement to report on all national activities performed with ETS data in the NIR.

The majority of Member States (15 of 23) already used the ETS data in the first year in which it became available for the purposes of verifying and improving national GHG inventories.

Institutional, administrative and legal arrangements in Member States were adapted to take integrate the new source of emission data in the national inventory system. For example in Austria the ordinance to the Austrian Emissions Certificate Trading Act regarding Monitoring and Reporting of Greenhouse Gas Emissions ensures consistency of emission trading data with the national inventory and an act regulates the data exchange between the inventory agency and the statistic agency.

Key areas of improvement were the estimation of emission sources in the national inventory for which previously no data was available, the identification of gaps in the inventory reporting, an improved allocation of fuels and input materials to source categories, improved emission factors as well as improved information on the types, amounts and composition of other fuels and input materials used in the sectors covered by the EU ETS.

Table 2 *Overview of the ways in which ETS data was used for the purposes of the national greenhouse gas inventories*

Member State	Status of use of ETS data	Use of emissions	Use of Activity data	Use of emission factors	Use for quality assurance
Austria	Used	✓		✓	✓
Belgium	Used	✓			✓
Czech Republic	Used	✓		✓	
Denmark	Expected for 2006 inventory				
Estonia	Not indicated				
France	Used				✓
Finland	Used	✓		✓	✓
Germany	Used			✓	✓
Greece	No 2007 NIR				
Hungary	Used				✓
Ireland	Used	✓	✓	✓	✓
Italy	Used				✓
Latvia	Used	✓			✓
Lithuania	Not indicated				
Luxembourg	Not indicated				
Netherlands	Used	✓		✓	
Poland	Not indicated				
Portugal	Used			✓	✓
Slovakia	No 2007 NIR				
Slovenia	Used				✓
Spain	Not indicated				
Sweden	Used		✓		
United Kingdom	partly			✓	✓

Source: National Inventory Reports submitted in 2007 to UNFCCC

4 Consistency of emission factors between GHG inventories and EU ETS

Different CO_2 emission factors (EF) for fuels or other emission sources can potentially be one of the major reasons for discrepancies in CO_2 emissions from ETS installations and in national inventories. For the 2005 report, many Member States already used the information gathered under the EU ETS to refine and update the fuel-specific EFs used in the inventories and reported such activities as improvements in a number of recent national inventory reports.

In the case of a number of Member States, fuel-specific emission factors used in the EU ETS and the GHG inventories were compared in detail. The data on fuel-specific EF under the EU ETS was taken from the questionnaires provided by Member States under Article 21 of the EU ETS Directive[3]. The comparison was only performed for some Member States because this information is not available for all Member States. Some Member States did not report under Article 21 and others did not report detailed or updated emission factors in the NIR.

Some Member States have implemented specific national legislation that ensures consistency of EFs. Austria adopted national legislation that establishes default EF and NCV for the EU ETS consistent with national inventory as well as consistent fuel categories. Germany also fixed certain fuel-specific emission factors and an oxidation factor of 1 by ETS legislation which ensures consistency of EFs. Hence it is not necessary to analyse EFs for these Member States in detail.

Table 3 shows a detailed comparison of fuel-specific EFs for Finland. The EFs used under both reporting schemes are consistent, with only a few exceptions: refinery gas and a small difference for heavy fuel oil. The EF for refinery gas can include a number of gases and the EF used in the inventory at a national level may adhere to a different definition and/or coverage than the EF reported in the questionnaire under the EU ETS. The notes provided on EUROSTAT or IEA statistics frequently explain specific definitions or compositions for refinery gas for individual countries which deviate from the general definition.

Table 4 presents the results of the comparison of EFs reported for France under the ETS scheme and the GHG inventory. The emission factors from both data sources are rather consistent, with small deviations for natural gas, heavy fuel oil and LPG. But these devia-

[3] Available under: http://cdr.eionet.europa.eu/resultsdataflow?dataflow_uris=http%3A%2F%2Frod.eionet.eu.int%2Fobligations%2F556&years%3Aint%3Aignore_empty=&partofyear=&country=&sort_on=reportingdate&sort_order=reverse

tions are all within the range of EFs provided by installations under the EU ETS. For natural gas, the EF used in the inventory includes a wider range of sources such as households and service sector which may lead to a different aggregate EF than the average reported by installations under the EU ETS.

Table 3 Comparison of fuel-specific CO_2 emission factors for Finland

Comparison of emission factors for Finland		EF CO_2 in t CO_2/TJ	
		ETS	NIR
Refinery gas	EF weighted average	**56.7**	**-**
	EF minimum	**52.1**	**65**
	EF maximum	**62.7**	**71.4**
	Oxidation factor	**1.0**	**0.995**
Natural gas	EF weighted average	55.05	55.04
	EF minimum	54.74	-
	EF maximum	56.10	-
	Oxidation factor	0.995	0.995
Light fuel oil	EF weighted average	74.1	74.1
	EF minimum	74.1	-
	EF maximum	74.1	-
	Oxidation factor	0.995	0.995
Heavy fuel oil	EF weighted average	**77.4**	**78.8**
	EF minimum	77.4	-
	EF maximum	77.4	-
	Oxidation factor	0.995	0.995
Petroleum coke	EF weighted average	97.0	97.0
	EF minimum	97.0	95.0
	EF maximum	97.0	102.0
	Oxidation factor	1.00	0.995
Hard coal, bituminous	EF weighted average	94.6	94.6
	EF minimum	94.6	-
	EF maximum	94.6	-
	Oxidation factor	0.99	0.99
Milled peat	EF weighted average	105.9	105.9
	EF minimum	105.9	-
	EF maximum	105.9	-
	Oxidation factor	0.99	0.99

Sources: Statistics Finland: Greenhouse gas emissions in Finland 1990-2005, National Inventory Report to the UNFCCC, April 15th 2007 and Finnish response to the questionnaire on the implementation of Directive 2003/87/EC

Table 4 Comparison of fuel-specific CO_2 emission factors for France

Comparison of emission factors fro France		EF CO_2 in t CO_2/TJ	
		ETS	NIR
Refinery gas	EF weighted average	55.7	55.7
	EF minimum	40.9	
	EF maximum	66.7	
	Oxidation factor	0.99-1.0	0.995
Natural gas	EF weighted average	54.70	56.7
	EF minimum	51.00	
	EF maximum	57.80	
	Oxidation factor	0.995-1.0	0.995
Light fuel oil	EF weighted average	74.2	74.3
	EF minimum	74.0	
	EF maximum	75.0	
	Oxidation factor	0.995-1.0	0.99
Heavy fuel oil	EF weighted average	78.7	77.2
	EF minimum	73.0	
	EF maximum	81.2	
	Oxidation factor	0.995-1.0	0.99
LPG	EF weighted average	60.6	63.4
	EF minimum	57.0	
	EF maximum	66.4	
	Oxidation factor	0.995-1.0	0.99
Anthracite	EF weighted average	94.7	93.1
	EF minimum	93.4	
	EF maximum	100.0	
	Oxidation factor	0.99	0.98

Sources: OMINEA report 4ème edition 29.02.07, and French response to the questionnaire on the implementation of Directive 2003/87/EC

The reporting under Article 21 of Directive 2003/87/EC requires detailed information to be provided on emission factors and oxidation factors only for installations contributing cumulatively to 50% of the total emissions included in the trading scheme. Therefore, the range of reported fuels varies across Member States. For the Czech Republic, EFs can only be compared for three fuels: brown coal, hard coal and natural gas (see Table 5). The comparison again shows that emission factors used for both schemes are rather consistent.

Table 5 Comparison of fuel-specific CO_2 emission factors for the Czech Republic

Comparison of emission factors for the Czech Republic		EF CO_2 in t CO_2/TJ	
		ETS	CRF
Brown coal	EF weighted average	99.5	101.2
	EF minimum	92.4	
	EF maximum	103.1	
	Oxidation factor	0.98	0.98
Hard coal	EF weighted average	94.50	94.60
	EF minimum	94.45	
	EF maximum	94.60	
	Oxidation factor	0.99	0.98
Natural gas	EF weighted average	56.1	56.1
	Oxidation factor	0.995	1.00

Sources: Sources: Czech Hydrometeorological Institute, Air Quality Control Division: National GHG inventory report of the Czech Republic, May 2007 and Czech response to the questionnaire on the implementation of Directive 2003/87/EC

Different oxidation factors can trigger differences in reported emissions, in particular due to the fact that default oxidation factors provided in the ETS Monitoring Guidelines are different from the oxidation factors in the IPCC Guidelines and Good Practice Guidance. However, for the three Member States considered in detail, the use of oxidation factors was relatively consistent in spite of differing recommendations in guidance documents.

For a comparison of consistency of EFs for more Member States, more complete reporting in the questionnaires under Article 21 of the ETS Directive as well as detailed reporting of the country-specific emission factors used for the inventory as part of the NIR are required.

Member States also used the new information which became available in 2006 in order to improve emission factors for the estimation of process emissions, in particular for the emissions from mineral products as reported in the NIR.

Energy statistics usually provide little information on the total amounts and types of other fuel used apart from the common fuels. EU ETS data cover a larger variety of fuels and input materials for the different sectors. Some Member States used this information to improve the GHG inventories with regard to the less common or less clearly defined fuels and input materials, such as secondary fuels.

5 Consistency of activity data between GHG inventories and EU ETS

Activity data can only be consistent between both reporting regimes when the ETS scheme covers all installations in a country. Coverage of ETS data varies across sectors and across Member States. In the first workshop on data consistency between EU ETS and inventories, the Member States mostly reported complete coverage of GHG sectors by the respective ETS sectors refineries, cement, lime, iron and steel and coke ovens. Based on the additional experiences gained since the first workshop, more information may become available with regard to the consistency of the activity data between ETS sectors and the GHG inventory.

Activity data (AD) reported by installations to competent authorities is considered confidential and is not made publicly available. Therefore, AD used under the EU ETS could not be compared with AD used in GHG inventories or provided in energy or production statistics. To improve consistency of data across reporting schemes, it would be very beneficial if Member States published aggregate AD for ETS sectors as reported by the installations. Such an aggregation – provided that it covers more than three installations – would not contradict confidentiality provisions and would enable the detection of data inconsistencies between energy and production statistics and GHG inventories.

Some Member States base their emission reporting of combustion and industry emissions in GHG inventories on bottom-up estimates using plant-specific data, while others use a top-down approach based on national energy statistics. For Member States which have already used plant-specific data for the compilation of GHG inventories, it is easier to check consistency with ETS activity data because they can compare AD, EFs and emissions reported for specific installations or facilities under both reporting schemes. The results of such comparisons are reported in a number of national inventory reports. It is important that national inventory agencies have access to the data reported under the EU ETS in order to perform such comparisons and consistency checks.

6 Identification of gaps in reporting

An important area in which data from the EU ETS for 2005 was immediately used by many Member States was to fill reporting gaps in GHG inventories. A number of Member States estimated additional source categories in the 2005 inventory submission that are covered by the EU ETS, for example:

- reporting of CO_2 emissions from flares in the GHG inventory;
- estimation of source categories Limestone and Dolomite Use and Soda Ash Use in the sectors covered by the ETS which were previously not estimated;
- estimation of additional source categories under mineral products such as glass production, ceramics production or brick and tiles production;
- identification of fuels previously not included in the inventory reporting.

7 Relationship of CO_2 emissions reported under the EU emission trading scheme to the CO_2 emissions reported in the national GHG inventories

7.1 Methodology

For all Member States the verified emissions for 2005 were compared with CO_2 emissions from relevant source categories reported in GHG inventories for 2005 in order to evaluate the proportion of CO_2 emissions covered by the EU ETS and to analyse the consistency of the ETS data with GHG inventory data.

Only data from the energy and industrial processes sector was used for the purpose of this comparison and not the total inventory submissions, since comparisons of verified emissions with total GHG emissions would be strongly determined by the relevance of non-ETS sectors in different Member States.

The two datasets do not match perfectly due to the differences in the scope of the EU ETS sectors and of the source categories in the inventory. Table 6 explains in which inventory CRF source categories the emissions from the individual ETS sectors can be reported. This table also describes the differences in coverage of both emission reporting regimes.

Table 6 Correspondence of ETS sectors and CRF source categories

ETS sectors	CRF source category of GHG inventory
Combustion installations with a rated thermal input exceeding 20 MW (except hazardous or municipal waste installations)	• Includes all plants without capacity threshold • Includes non-biogenic CO_2 emissions from waste incineration • Emissions from stationary combustion are reported in a number of categories: • 1A1a Public electricity and heat production: Sum of emissions from public electricity generation, public combined heat and power generation, and public heat plants. Public utilities are defined as those undertakings whose primary activity is to supply the public. They may be in public or private ownership. This source category should be completely covered by EU ETS due to the size of individual installations. • 1A1c Manufacture of solid fuels and other energy industries: Emissions arising from fuel combustion for the production of coke, brown coal briquettes and patent fuel. Emissions from fuel combustion in coke ovens within the iron and steel industry should be reported under 1A1c and not within manufacturing industry under 1A2. Combustion emissions arising from the energy-producing industries' own (onsite) energy use not mentioned above. This includes the emissions from onsite energy use in coal mining and oil and gas extraction.

ETS sectors	CRF source category of GHG inventory
	• 1A2 Manufacturing industries and construction: Emissions from combustion of fuels in industry including combustion for the generation of electricity and heat. • 1A3e Other Transportation: Combustion emissions from all remaining transport activities including pipeline transportation, ground activities in airports and harbours, and off-road activities not otherwise reported under 1 A 4 c Agriculture or 1 A 2 Manufacturing Industries and Construction. Only emissions from pipeline compressor stations are included in combustion emissions under the ETS. • 1A5a stationary: All remaining emissions from non-specified fuel combustion. Include emissions from military fuel use which are part of the ETS. • 1B2 Oil and natural gas: The combustion in flares is considered as a non-productive activity and included under fugitive emissions. Flares are defined as part of combustion activities in the monitoring guidelines under the ETS. 1B2aiv refining/storage includes emissions from catalytic crackers in many Member States as well as emissions from hydrogen production in refineries. • 2A3 Limestone and dolomite use: Emissions from Limestone ($CaCO_3$) and dolomite ($CaCO_3.MgCO_3$) use in a number of industries including metallurgy (e.g., iron and steel), glass manufacture, agriculture, construction and desulphurisation equipment. In particular the limestone use for desulphurisation in power plants is included in combustion emissions in the ETS.
Coke ovens	• 1A1c Manufacture of solid fuels and other energy industries: Emissions arising from fuel combustion for the production of coke, brown coal briquettes and patent fuel. Emissions from fuel combustion in coke ovens within the iron and steel industry should be reported under 1A1c and not within manufacturing industry 1A2.
Mineral oil refineries	• 1A1b Petroleum refining: should be completely covered by EU ETS due to size of individual installations. Allocation to refineries can be different in inventory, part of the emissions reported under the EU ETS can be allocated under 1B2 Fugitive emissions from oil and gas or in other 1A1 categories.
Metal ore roasting or sintering installations	No specific CRF category, some Member States report CO_2 emissions from sinter production under 2A7 Other mineral products, combustion emissions part of 1A2 Manufacturing industries and construction, in particular subcategory 1A2a Iron and steel
Production of pig iron or steel: Installations for the production of pig iron or	• No threshold in GHG inventory • 1A2a Iron and steel (combustion emissions) and 2C1 Iron and

ETS sectors	CRF source category of GHG inventory
steel (primary or secondary fusion) including continuous casting, with a capacity exceeding 2,5 tonnes per hour	steel production (process emissions) • The allocation is very difficult, firstly to clearly separate process emissions from combustion emissions and secondly to separate combustion emissions for iron and steel, in particular the allocation of blast furnace gas and coke oven gas. The allocation at sub-source level has high uncertainties • 2A3 Limestone and dolomite use: Emissions from Limestone (CaCO3) and Dolomite (CaCO3.MgCO3) Use in metallurgy (e.g. iron and steel)
Production of cement clinker or lime: Installations for the production of cement clinker in rotary kilns with a production capacity exceeding 500 tonnes per day or lime in rotary kilns with a production capacity exceeding 50 tonnes per day or in other furnaces with a production capacity exceeding 50 tonnes per day	• No threshold in GHG inventory • Combustion emissions reported under 1A2 Manufacturing industries and construction • Process emissions reported under 2A1 Cement Production and 2A2 Lime Production
Manufacture of glass: Installations for the manufacture of glass including glass fibre with a melting capacity exceeding 20 tonnes per day	• No threshold in GHG inventory • Combustion emissions reported under 1A2 Manufacturing industries and construction • Process emissions reported under 2A7 Other Mineral Products – Glass Production • Some Member States report that also category 2A4 Soda ash production and use (sodium carbonate, Na2CO3) is relevant. Soda ash is used as a raw material in a large number of industries including glass manufacture, soap and detergents, pulp and paper production and water treatment. Carbon dioxide is emitted from the use of soda ash, and may be emitted during production, depending on the industrial process used to manufacture soda ash. • 2A3 Limestone and dolomite use: Emissions from Limestone (CaCO3) and dolomite (CaCO3.MgCO3) use in glass industry
Manufacture of ceramic products: Installations for the manufacture of ceramic products by firing, in particular roofing tiles, bricks, refractory bricks, tiles, stoneware or porcelain, with a production capacity exceeding 75 tonnes	• No threshold in GHG inventory • Combustion emissions reported under 1A2 Manufacturing industries and construction • Process emissions sometimes reported under 2A7 Other mineral products

ETS sectors	CRF source category of GHG inventory
per day, and/or with a kiln capacity exceeding 4 m3 and with a setting density per kiln exceeding 300 kg/m3	
Production of pulp, paper and board: Industrial plants for the production of (a) pulp from timber or other fibrous materials (b) paper and board with a production capacity exceeding 20 tonnes per day	• No threshold in GHG inventory • Combustion emissions reported under 1A2 Manufacturing industries and construction • Some emissions from 2A4 Soda Ash production and use may also relate to this ETS category
Other activities opted-in: Other activities for which verified emissions are reported and which are not allocated to a specific ETS sector	Can only be compared to an inventory source category when Member States provided more detailed information on the activities

7.2 Comparison of verified emissions with GHG inventories for 2005

For the year 2005 the CO_2 emissions of the inventory CRF source categories included in Table 6 were compiled and added to a **'CRF total'** for each Member State reflecting the sum of relevant inventory source categories which potentially include emissions reported under the ETS. The most disaggregate information was used aiming at the closest correspondence of CRF source categories with the ETS sectors. CRF data were taken from the Member States GHG inventories submitted in 2007 to the UNFCCC and published at the UNFCCC website (CRF Tables for 2005).[4]

Inventory data was compared to the verified emissions in 2005, taken from CITL data (downloaded in 7 July 2007)[5]; it is referred to as **'ETS total'** in the following section.

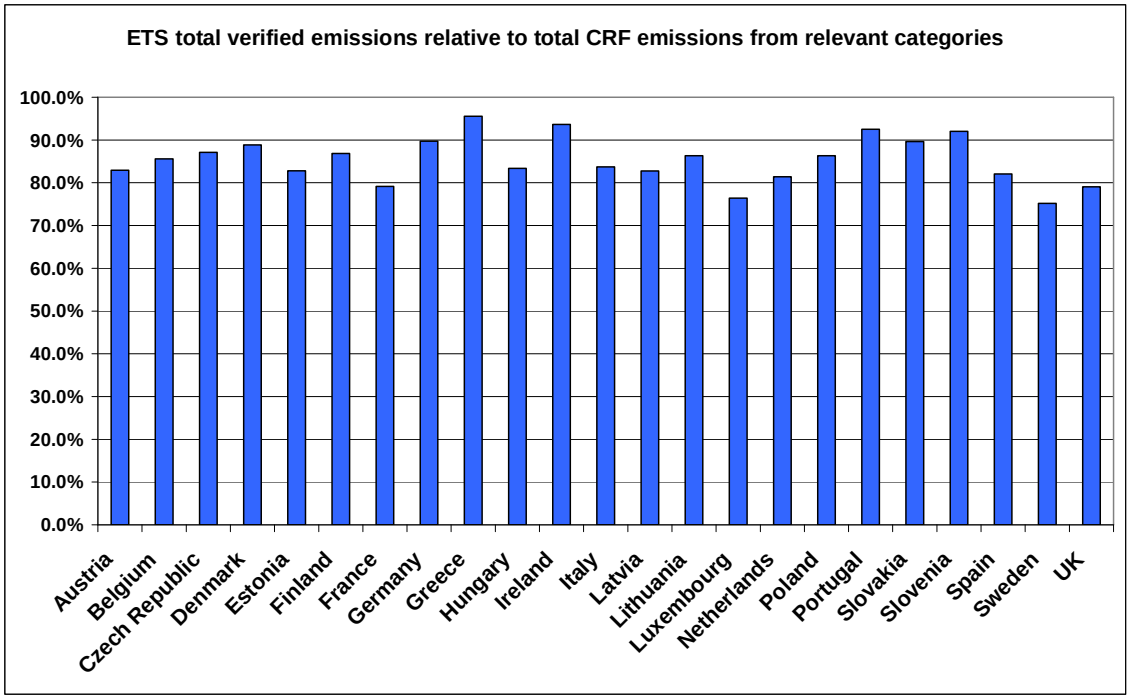
The total verified emissions in 2005 (ETS total) were then divided by the CRF total in order to calculate the share of verified emissions related to the GHG inventory. The resulting shares of ETS emissions in CRF emissions for 2005 are presented in Figure 4 and Table 7. Annex I lists the individual data on CO_2 emissions from ETS and inventory for each Member States underlying the shares presented in this table.

[4] http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/3929.php

[5] http://ec.europa.eu/environment/ets/

The sum of emissions in the GHG inventory from the relevant CRF categories is always higher than the verified ETS emissions due to the fact that the inventory includes all plants and does not use any threshold criteria for the inclusion of installations.

Figure 4 *Share of ETS emissions relative to inventory emissions from relevant source categories for the year 2005*



Source: Calculations based on Member States' GHG inventories for 2005 submitted in 2007 to the UNFCCC secretariat and ETS emissions as included in the EU CITL, downloaded in July 2007

The calculated share of the ETS total in CRF total ranges from 75 % (Sweden) to 96% (Greece). Table 8 presents the average share of the ETS total in the CRF total emissions (arithmetic average), which is very similar for all EC groups, being 85.4% for EU-23[6], 84.8% for EU-15 and 86.3% for EU-8. For 13 Member States, the national shares are within a range of 5% of the EU-23 average value and for 19 Member States they are within a 10% range of the EU-23 average. With few exceptions, the CO_2 emissions covered by the ETS represent a relatively similar share relative to inventory emissions across Member States; this can be regarded as indirect proof of consistency of both data sets. Large deviations in underlying data in different Member States would likely lead to larger differences in the share of ETS emissions relative to inventory data.

[6] All Member States except Malta and Cyprus.

Nevertheless, the difference between the lowest share of 75.2% for Sweden and the highest of 95.6% for Greece seems rather high and some further analysis regarding the underlying reasons was conducted.

The difference between the emissions from EU ETS and GHG inventories arise from the following aspects:

1. In the first year under the EU ETS, the definitions of installations contained differences in terms of coverage. Member States using a broad installation definition from the start of the ETS are likely to show a higher share of ETS emissions in relation to the corresponding inventory emissions. For the second phase the installation definition was clarified and the broadening of the definition resulted in up to 10% of additional emissions for individual Member States.

Table 7 Comparison of ETS total in relation to CRF total for 2005

Member State	ETS total verified emissions/ CRF total inventory emissions for 2005
Austria	82.9%
Belgium	85.6%
Czech Republic	87.1%
Denmark	88.9%
Estonia	82.8%
Finland	86.8%
France	79.2%
Germany	89.7%
Greece	95.6%
Hungary	83.4%
Ireland	93.6%
Italy	83.7%
Latvia	82.8%
Lithuania	86.3%
Luxembourg	76.4%
Netherlands	81.4%
Poland	86.3%
Portugal	92.5%
Slovakia	89.6%
Slovenia	92.0%
Spain	82.1%
Sweden	75.2%
UK	79.1%

Source: Calculations based on Member States' GHG inventories for 2005 submitted in 2007 to the UNFCCC secretariat and ETS emissions as included in the EU CITL (July 2007)

Table 8 Average share of ETS total in relation to the CRF total for 2005

Member State	ETS total verified emissions/ CRF total inventory emissions for 2005
Average EU-23	85.4%
Average EU-15	84.8%
Average EU-8	86.3%

Source: Calculations based on Member States' GHG inventories for 2005 submitted in 2007 to the UNFCCC secretariat and ETS emissions as included in the EU CITL, downloaded in July 2007

2. The ETS only includes installations beyond a specified threshold (20 MW for combustion installations or production-based thresholds for other ETS sectors). The inventory covers all installations in a sector. Due to this inconsistency in coverage, emissions in corresponding sectors or source categories in GHG inventories should be higher than ETS emissions. Member States with more small installations below the thresholds under the ETS will have a lower share of ETS emissions relative to CRF emissions.
3. The EU ETS excludes CO_2 emissions from waste incineration plants; however, CO_2 emissions from the fossil fractions of waste incineration are included in the GHG inventory. Member States which have a high share of energy recovery from waste incineration will show a lower share of EU ETS emissions in the CRF total emissions.
4. Another difference between the recording of CO_2 emissions under the EU ETS and the inventories is the requirement under the ETS to subtract CO_2 which is not emitted from the installation but transferred out of the installation as a pure substance, as a component of fuels or directly used as a feedstock in the chemical or paper industry. IPCC Guidelines for GHG inventories do not allow the subtraction of short-term stored CO_2, such as CO_2 used for the carbonation of beverages or CO_2 used in greenhouses. Member States in which larger amounts of CO_2 emissions are transferred to installations outside the scope of the ETS will show lower shares of ETS emissions relative to CRF emissions.

The potential impact of these issues are further analysed in the following sections.

7.2.1 Quantified differences between ETS CO_2 emissions and inventories

Some Member State provided a quantitative assessment of the differences that they found when they compared the ETS emissions for 2005 with the inventory estimates for particular sectors or source categories in their presentation at the 2nd Workshop on data consistency between National GHG inventories and reporting under the EU ETS under WG 1 and WG 3 of the Climate Change Committee (13-14 September 2007 at EEA,

Copenhagen.[7] Table 9 summarizes the quantified differences at sectoral level for those Member States that provided such information. This overview shows that the differences encountered were relatively small. France quantified the differences in relation to the total national GHG emissions with < 0.56% of total emissions. This estimate refers to the differences encountered before further steps of improvements were undertaken. The largest sectoral discrepancy reported was 6% for CO_2 emissions from pipeline transport.

Table 9 *Quantified differences in CO_2 emissions between ETS data and inventory data for selected Member States*

Quantified differences in CO_2 emissions between ETS and inventory data for 2005		
	% difference *	**Inventory source category**
Czech Republic	± 4%	Lime and Cement production
Germany	-3%	Public Electricity and Heat (waste incineration excluded)
	+ 5.9%	Pipeline Transport
Denmark	± 0.16%	Combustion emissions
Spain	-0.0112	Petroleum Refining
France	+5%	Lime Production (Combustion and process emissions)
	+0.5%	Cement Production (Combustion and process emissions)
	+0.05%	Glass Production (Combustion and process emissions)
	±0.33%	Manufacturing Industry and Construction
	0%	Public electricity abd Heat
	0%	Petroleum refining
	±7%	Coke ovens
	±2%	Steel industry
	≤0.56%	Total GHG emissions

*Notes: * Differences relative to total for sector or source category*
Source: Presentations provided at the 2nd Workshop on data consistency between National GHG inventories and reporting under the EU ETS under WG 1 and WG 3 of the Climate Change Committee, see http://air-climate.eionet.europa.eu/meetings/past_html)

In a detailed investigation of discrepancies for individual plants, some Member States found that few installations reported lower fuel consumption estimates under the EU ETS than in the energy statistic questionnaires and that some fuels reported as fossil in the energy questionnaires were reported as partly biogenic under the EU ETS. However the correspondence at sectoral level in the overview in Table 9 shows that indications of some discrepancies for individual installations do not necessarily lead to large discrepancies at sectoral or source category level.

[7] see http://air-climate.eionet.europa.eu/meetings/past_html

7.2.2 Impact of scope of installation definition in first ETS phase

For Sweden the lowest share of ETS emissions in relation to the inventory emissions was calculated at 75.2%. Sweden used a narrow installation definition in the first ETS phase and a revised installation definition led to an additional coverage of 2 Mt CO_2 or 10% of verified emissions in 2005. When these additional emissions are added to the 2005 verified emissions, the share of ETS in CRF emissions increases from 75.2% to 83%, a value much closer to the EU-23 average of 85.2%. The shares of the UK and France are also relatively low, at 79.2% and 79.1% respectively. When the additional emissions from the increased scope of the ETS are added to the 2005 verified emissions, the share of ETS emissions to CRF emissions for France and the UK increases to 82.2% for both Member States, a value much closer to the EU-23 average. As the scope of the installation definition was further harmonised for the second ETS phase from 2008 to 2012, it can be expected that the share of ETS emissions relative to CRF emissions will increase for the Member States currently using a narrow scope. It can also be expected that the share of ETS emissions in the total CRF emissions will further converge to an average with smaller and fewer deviations. A detailed overview of the differences in scope of the installation definition is presented in Table 10.

Table 10 *Analysis of the impact of a broad or narrow installation definition on the share of ETS emissions relative to the CRF total*

Member State	ETS total verified emissions/ CRF total inventory emissions for 2005	Verified emissions in 2005 Gg CO2	Additional coverage in 2008-2012 period Gg CO2	Share of emissions from additional installations in 2005 verified emissions %
Austria	82.9%	33,373	350	1%
Belgium	85.6%	55,363	4,958	9%
Czech Republic	87.1%	82,455	no expansion	NA
Denmark	88.9%	26,476	no expansion	NA
Estonia	82.8%	12,622	314	2%
Finland	86.8%	33,076	400	1%
France	79.2%	131,268	5,108	4%
Germany	89.7%	474,665	11,000	2%
Greece	95.6%	71,268	no expansion	NA
Hungary	83.4%	26,039	1,432	6%
Ireland	93.6%	22,440	no expansion	NA
Italy	83.7%	225,931	not yet known	NA
Latvia	82.8%	2,854	no expansion	NA
Lithuania	86.3%	6,604	57	1%
Luxembourg	76.4%	2,603	no expansion	NA
Netherlands	81.4%	80,351	3,923	5%
Poland	86.3%	202,502	6,288	3%
Portugal	92.5%	36,426	1,190	3%
Slovakia	89.6%	25,446	1,729	7%
Slovenia	92.0%	8,721	no expansion	NA
Spain	82.1%	183,620	6,700	4%
Sweden	75.2%	19,382	2,000	10%
UK	79.1%	242,480	9,499	4%

Source: Information on additional coverage in the 2008-2012 period was taken from the Commission's NAP decisions and press release IP/07/1274 from 31 August 2007 related to the decision on the Danish NAP

7.2.3 Impact of small installations

At 95.6% Greece has the highest share of ETS emissions in relation to the CRF emissions. Greece used a broad installation definition in the first ETS phase and no expansion in the second phase was necessary. In addition, Greece has the lowest share of emissions from small installations between 20 MW and 50 MW in the EU (see

Table 11).

Table 11 Combustion installations with a rated thermal input of 20 to 50 MW

	Installations		Emissions	
	Number	Share of national installations	- t CO_2 eq -	Share of total national emissions
Austria	47	24%	485,744	1.5%
Belgium[a]	108	45%	1,395,656	3.5%
Cyprus	0	0%	0	0.0%
Czech Republic	-	-	-	-
Denmark[c]	237	62%	1,826,000	6.9%
Estonia	21	50%	372,166	3.0%
Finland	124	22%	846,738	2.6%
France[b]	340	31%	4,200,000	2.8%
Germany[b]	665	36%	9,323,545	1.9%
Greece[bc]	10	7%	249,647	0.4%
Hungary[c]	71	30%	1,103,424	4.2%
Ireland	55	50%	580,675	2.6%
Italy	257	49%	3,589,000	2.5%
Latvia	33	36%	657,151	23.0%
Lithuania[c]	35	38%	323,379	4.9%
Luxembourg	-	-	-	-
Malta	0	0%	0	0.0%
Netherlands	62	30%	2,196,000	2.7%
Poland	253	40%	4,981,058	2.8%
Portugal	29	12%	918,668	2.5%
Slovakia	87	50%	10,983,622	43.5%
Slovenia	32	33%	324,769	3.7%
Spain	113	14%	6,582,238	3.6%
Sweden	164	20%	439,551	2.3%
United Kingdom	387	54%	2,426,374	1.0%
Total	3,130	34%	53,805,405	2.9%

Notes:
[a] Brussels is not included in the calculation of the shares
[b] Approximate values only
[c] The shares are calculated based on CITL data as of 31 October 2006

Source: EEA 2007: Application of the Emissions Trading Directive by EU Member States – Reporting year 2006. EEA Technical report No 4/2007, Table 3, p. 17.

It is likely that the installations below 20 MW will only contribute minimally to total emissions. The negligible importance of small installations may explain the high share of ETS emissions in relation to the inventory. Portugal – which also has a rather high share of ETS emissions in the CRF emissions (92.5%) – also has a low share of small installations (see

Table 11) and a minor contribution from small installations; therefore, the ETS emissions are closer to total inventory emissions. No information is available for individual Member States on the number of installations falling below the ETS thresholds and their relevance for CO_2 emissions. The data provided under Article 21 of the ETS Directive on the number and relevance of combustion installations with a rated thermal input of between 20 and 50 MW was therefore used as an approximation of the role of small installations, assuming that Member States which have a very small number of installations in this capacity range are likely to have a small number of installations with lower capacities.

The low share of ETS emissions in CRF emissions for Luxembourg (76.4%) cannot be clearly explained, mainly because the national inventory report is not very detailed and further analysis is difficult.

7.2.4 Transferred CO_2

Table 12 shows the amounts of transferred CO_2 reported in the questionnaires under Article 21 of the ETS Directive. Member States for which larger amounts of CO_2 emissions are transferred to installations outside the scope of the ETS will show lower shares of ETS emissions relative to CRF emissions. This overview shows that the amounts transferred are considerable in some Member States, but the reporting is not very transparent with regard to whether these amounts are transferred to installations outside the EU ETS or to ones which form part of the ETS. Thus, it is difficult to provide a quantitative analysis of the impact of transferred CO_2 emissions.

7.2.5 Waste incineration

Another difference between ETS emissions and GHG inventories is the coverage of emissions from hazardous or municipal waste incineration installations. Combustion emissions in GHG inventories include CO_2 emissions from fossil fractions from waste incineration plant that recover energy. However, there is no detailed and reliable information on the CO_2 emissions from waste incineration plants with energy recovery for 2005 that are part of the national GHG inventories because these emissions are not reported separately. Waste fuels are aggregated in the reporting with other fuels. Energy balances also report waste fuels usually in a category merged with other fuels. The European Pollutant Emission Register (EPER) provides CO_2 emissions from installations for the disposal or recovery of hazardous waste or municipal waste for 2004; however the guidance documents do not specify the methods used for these emissions and whether they cover only the fossil shares of waste. Therefore, the impact of CO_2 emissions from

waste incineration on the comparability of ETS data and GHG inventories could not be analysed on a quantitative basis.

Table 12 CO_2 transferred from installations

	Main Annex I activity	No. of installations	CO_2 transferred [kt CO_2]	Use of transferred CO_2
Belgium	F1	1	3.6	Fl: blast furnace gas for electricity
	F2	1	1,099.0	W: blast furnace gas to power plants included in ETS (E1)
Finland	E1	1	0.3	precipitated calcium carbonate (PCC)
	E2	1	39.4	CO_2 is liquefied and forwarded to gas supplier
	M1	1	1.2	precipitated calcium carbonate
	O1 & O2	8	192.1	precipitated calcium carbonate
Germany	E1	5	65.5	no data
	E2	2	108.2	no data
	E3	1	3.2	combustion
	E3/F2	5	7,271.9	combuston
	F2	1	351.1	combustion
Hungary	E1	2	3,331.3	various
	E3	1		
	F2	1		
	O2	1		
Italy	E1	5	5.4	various
	E2	2	494.0	component of fuels
Netherlands	E1	1	31.0	greenhouse industry
Poland	M1	2	751.7	food processing, substrate for chemical industry
Slovenia	E1	1	2.1	selling
Spain	E1	2	23.1	carbonation of beverages
	F2	1	1,370.6	CO_2 in combustible gases to plants outside ETS
Sweden	F1	3	21.3	mixed gas and coke oven gas for combustion
	F2	1	2,310.8	carbon content in ore-pellets
	O2	1	6.0	gas from lime kiln used for making precipitated calcium carbonate
United Kingdom	E1	3	13,910.0	diesel house recovered as waste precipitated calcium carbonate as component of natural gas supplied to national grid
SUM		**54**	**31,392.9**	

Source: EEA 2007: Application of the Emissions Trading Directive by EU Member States – Reporting year 2006. EEA Technical report No 4/2007, Table 14, p. 30

Against the background of this analysis of the impacts of several general inconsistencies between the two reporting schemes, the lowest and highest shares of ETS emission relative to total CRF emissions can be explained by the scope of the installation definition chosen or by there being few small installations below the ETS capacity thresholds. This means the largest differences in the share of ETS emission relative to CRF emissions are mainly due to the general inconsistencies in the allocation of emissions under the ETS and the GHG inventories and not due to problems or inconsistent assumptions in the emission estimations of the Member States. Further information on the emissions from

waste incineration accounted in GHG inventories and on the transfer of CO_2 under the EU ETS would be necessary for a quantitative assessment of these general inconsistencies.

8 Analysis of individual sectors

A key problem in comparing emissions between the EU ETS and the GHG inventories in respect of the individual sectors is the fact that combustion emissions are not differentiated from process emissions under the EU ETS.[8] In GHG inventories, CO_2 emissions from 'industrial processes' include only process emissions whereas all combustion activities are reported under 1A2 Manufacturing Industries and Construction. However, disaggregation of combustion emissions for all sectors included under the EU ETS is not required in the inventories and therefore combustion emissions from Cement and Lime Production, Glass Production or Ceramics Production are usually not reported separately in the inventories.

Another problem for a sectoral analysis is that the allocation of an installation under the ETS to a certain sector may vary across and within Member States and depends on the competent authority providing the permit to the installation. The sectoral allocation under the ETS is not very transparent and is not without ambiguities, e.g. in the combustion sector, installations are reported that would also fit in the other sectors. Due to advantages or disadvantages regarding the allocation rules for certain ETS sectors, individual installations may have changed their allocation to a certain ETS sector in some Member States depending on the allocation rules.

8.1 Combustion emissions

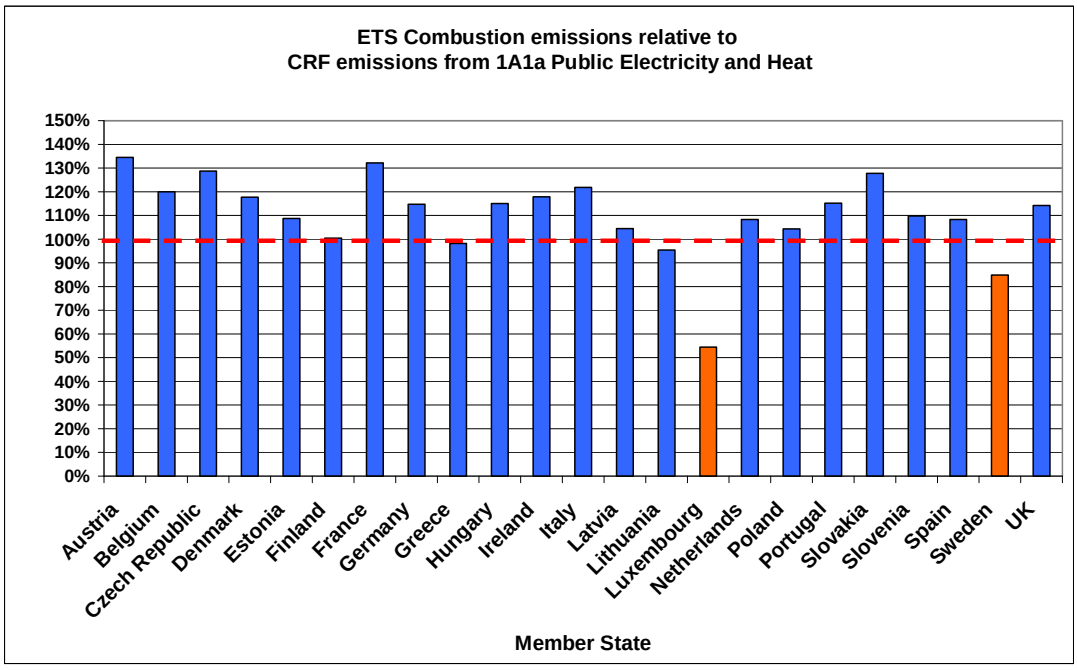
It is difficult to make a comparison of CO_2 emissions from fuel combustion in ETS data and in GHG inventories because of the differences in the reporting of these emissions. Under the ETS, the combustion sector covers combustion installations with a rated thermal input exceeding 20 MW; however emissions from fuel combustion are also part

[8] The ETS monitoring guidelines define combustion emissions as "greenhouse gas emissions occurring during the exothermic reaction of a fuel with oxygen" and IPCC Good Practice Guidance as "Carbon dioxide (CO2) emissions from stationary combustion result from the release of the carbon in fuel during combustion (fuel combustion as well as fugitive fuel emissions)." Process emissions are defined in the ETS monitoring guidelines as following: "Greenhouse gas emissions other than "combustion emissions" occurring as a result of intentional and unintentional reactions between substances or their transformation, including the chemical or electrolytic reduction of metal ores, the thermal decomposition of substances, and the formation of substances for use as product or feedstock." IPCC 1996 Guidelines for national GHG inventories provide the following guidance for process emissions: "Emissions within this sector comprise by-product or fugitive emissions of greenhouse gases from industrial processes. The main emission sources are industrial production processes which chemically or physically transform materials. Where the main purpose of the fuel combustion is to use the heat released, the resulting emissions are included as energy emissions, not industrial process emissions."

of the reported CO_2 emissions of the remaining ETS categories. In the production and processing of ferrous metals and mineral industry combustion, emissions under the ETS are reported together with process emissions. Therefore no detailed analysis of the consistency of reported CO_2 emissions from fuel combustion can be performed.

Figure 5 shows the relationship between ETS CO_2 emissions reported under combustion to CO_2 emissions reported in the CRF source category 1A1a Public Electricity and Heat Production for 2005. This category covers emissions from public electricity generation, public combined heat and power generation, and public heat plants. Public utilities are defined as those undertakings whose primary activity is to supply the public. Emissions from industrial combustion activities are reported in a separate CRF source category (1A2 Manufacturing Industries and Construction). Emissions from public power generation form a major part of combustion emissions reported under the ETS, but it can be assumed that emissions included in the ETS combustion sector are generally higher as they cover public as well as industrial combustion activities. The reported ETS data match this assumption (shares ≥ 100% in Figure 5), except for Luxembourg where the share of ETS combustion emissions in CRF 1A1a is only 54% and for Sweden where this share is only 85%. For these Member States it is unclear why the GHG inventory reports a larger amount of fuel combustion emissions from public plants than the ETS emissions reported under combustion.

Figure 5 *ETS CO_2 emissions reported under combustion divided by CRF CO_2 emissions reported under 1A1a Public Electricity and Heat Production for 2005*



Source: Calculations based on Member States' GHG inventories for 2005 submitted in 2007 to the UNFCCC secretariat and ETS emissions as included in the EU CITL, downloaded in July 2007

For the Member States which have higher CO_2 emissions from ETS combustion than for 1A1a Public Electricity and Heat, the share varies from 100% up to 134% for Austria. This variation depends on the allocation of installations to combustion or other sectors and on the relevance of small combustion plants not covered under the EU ETS.

For the plant-level reporting under the EU ETS, it is likely that the sectoral emissions will not be fully comparable across different years, due to the outsourcing of combustion plants in industrial combustion to independent operators. When combustion activities are outsourced to a different operator, the emissions will be covered under a separate permit that only includes combustion emissions in the following years. When a Member State shows a general tendency of increasing or decreasing the outsourcing of combustion activities, the sectoral trend of combustion emissions may be affected. A change in allocation rules from the first to the second ETS phase in some Member States regarding the allocation of allowances to installations with process emissions may induce an inconsistency in the sectoral allocation between the first (2005-2007) and the second ETS phase (2008-2012).

8.2 Mineral oil refineries

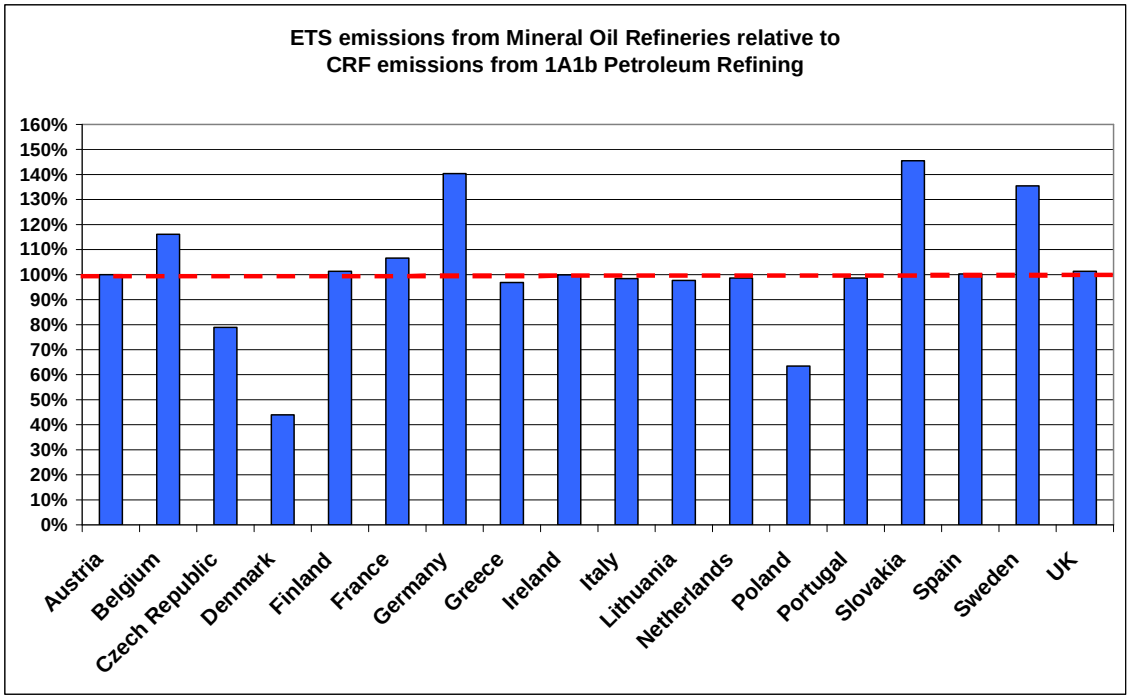
For Mineral Oil Refineries, the ETS data includes combustion emissions, process emissions and fugitive emissions. Energy-related emissions occur in boilers, process heaters/treaters, internal combustion engines/turbines, catalytic and thermal oxidizers, coke calcining kilns, incinerators and crackers. Fugitive emissions occur from flares and process emissions from hydrogen production installations, catalytic regeneration (from catalytic cracking and other catalytic processes) and cokers. In the GHG inventory, the same emissions can be split to different categories and be partly reported under 1A2 Manufacturing industries and combustion, 1A1b Petroleum refining and 1B2a.iv Oil refining and storage as well as under 1B2ci Flaring.

Figure 6 compares the CO_2 emissions reported for Mineral Oil Refineries under the EU ETS with the CO_2 emissions reported in the GHG inventory for Petroleum Refining for 2005. For 11 of 18 Member States ETS data match well with inventory data (AT, FI, FR, GR, IE, ES, IT, LT, NL, PT and UK). Most of these Member States also reported efforts to analyse the data consistency between GHG inventories and the EU ETS.

Estonia reports 2.7 Mt CO_2 emissions in 2005 from Petroleum Refining in the GHG inventory, but no emissions are reported for Mineral Oil Refineries under the EU ETS. Hungary reports 1.3 Mt CO_2 emissions under the EU ETS, but 'included elsewhere' for 'Petroleum Refining' in the inventory. There are no refining activities in Luxembourg, Latvia and Slovenia.

The combustion plants of refineries may be part of one refinery installation, but they may also be outsourced to an independent operator. The results of the comparison of emissions will largely depend on the allocation of industrial combustion plants to the refineries or to the combustion sector under the ETS and in the GHG inventory. When ETS emissions from mineral oil refineries are lower than emissions reported in GHG inventories (the Czech Republic, Denmark, Poland), combustion-related emissions may be reported under combustion. Emissions from crackers and flaring were part of the areas of inconsistent interpretation of the scope of combustion installations across Member States in the first ETS phase which was then clarified for the second phase. But a narrow interpretation with regard to crackers and flares may also lead to lower ETS emissions from refineries than those reported in the inventories.

Figure 6 *ETS CO_2 emissions reported for Minera lOil Refineries divided by CRF CO_2 emissions reported under 1A1b Petroleum Refining and other relevant source categories for 2005*



Source: Calculations based on Member States' GHG inventories for 2005 submitted in 2007 to the UNFCCC secretariat and ETS emissions as included in the EU CITL, downloaded in July 2007. The inventory data included in the comparison is a sum of relevant CRF categories including 1A1b as well as 1B2a and 1B2c depending on the information provided in Member States national inventory reports on the allocation of emissions from refineries.

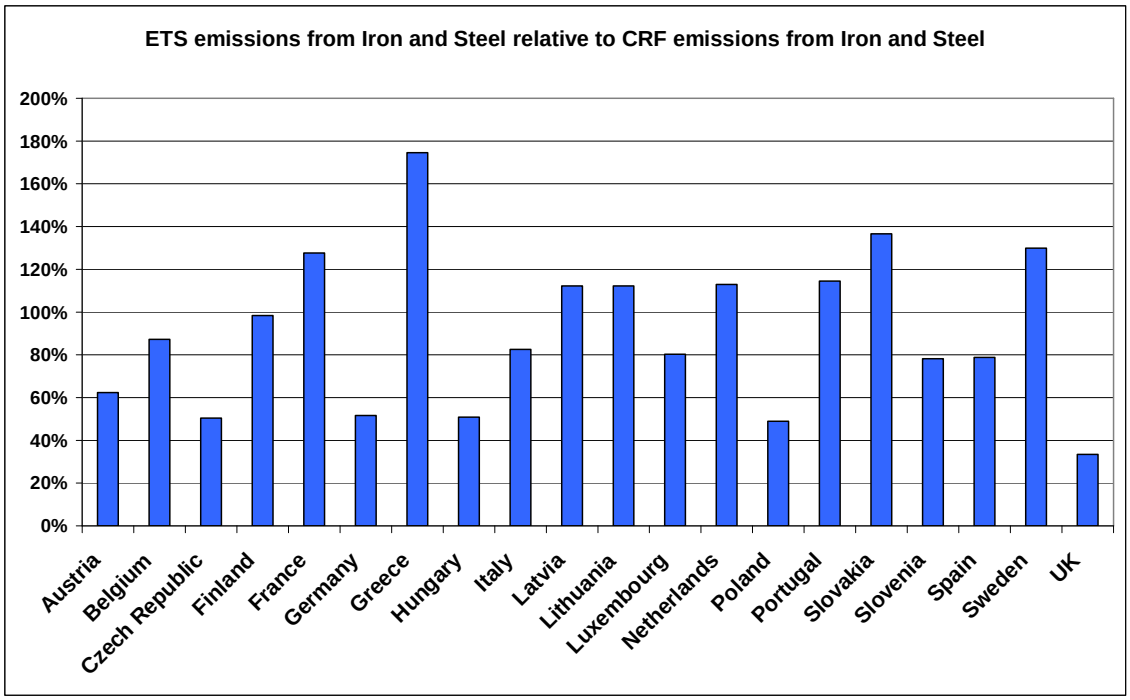
When ETS emissions from mineral oil refineries are higher than emissions reported in GHG inventories (Belgium, Germany, Slovakia or Sweden), it may indicate a different allocation of combustion emissions to the refining sector in the national energy statistics, but could also be due to some reporting gaps or incomplete reporting in the GHG inven-

tory, e.g. for fugitive emissions from flares or refining storage under 1B2a and c. Another reason for divergences may be different emission factors for refinery gas under both reporting schemes. Member States should further analyse their specific situations when the data shows a larger deviation for refineries.

8.3 Production of iron and steel

In contrast to the results for refineries, CO_2 emissions for 2005 reported under the EU ETS show large differences in both directions to those reported in the national greenhouse gas inventories (see Figure 7).

Figure 7 *ETS CO_2 emissions reported for iron and steel and metal ore roasting and sintering divided by CRF CO_2 emissions reported under 2C1 and 1A2a Iron and steel for 2005*



Notes: CRF emissions include process emissions reported under 2C1 Iron and steel and combustion emissions reported under 1A2a Iron and steel. Additional categories were included when clearly related to iron and steel production. For ETS emissions the sectors production of pig iron and steel and metal ore roasting or sintering were added.

Source: Calculations based on Member States' GHG inventories for 2005 submitted in 2007 to the UNFCCC secretariat and ETS emissions as included in the EU CITL, downloaded in July 2007

One of the main reasons for the differences in reported CO_2 emissions from iron and steel under both schemes is the allocation of blast furnace gas and coke oven gas resulting from iron and steel production to either the iron and steel sector or the combustion sec-

tor. These gases can also be transferred as fuels to other plants inside or outside of the EU ETS (see Table 12). When they are transferred outside the scope of the ETS scheme or are accounted under combustion installations, ETS emissions from iron and steel will be considerably lower than inventory emissions that include these emissions.

IPCC Good Practice Guidance recommend reporting CO_2 emissions from blast furnace gas under iron and steel in industrial processes.[9] However, reporting guidelines for the ETS recommend the inclusion of CO_2 transferred to another installation as a fuel under the emissions of such combustion installations.[10] This provision was modified in the revised guidelines for the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC, but currently lead to inconsistencies in the sectoral allocation of emissions between the ETS and GHG inventories. This difference in allocation may explain the data for those Member States which have lower emissions in the ETS data compared to the inventories.

Another reason for differences in the reporting of emissions from iron and steel are differences in the allocation of industrial combustion plants to either the iron and steel sector or to the general industrial combustion emissions, similar to the case of refineries.

Discrepancies may also arise from differences in emission factors for blast furnace gas or coke oven gas under both schemes.

Another area of difficulties for the comparison is the use of limestone in iron and steel production. Some Member States record the emissions from limestone use under Iron and Steel in the GHG inventories, but the IPCC Guidelines recommend the inclusion of such emissions under 2A3 Limestone and Dolomite Use. As several additional sources apart from limestone use for iron and steel production are included in this separate CRF category, the part of emissions relating to iron and steel cannot be disaggregated for the inventory data. The estimation of emissions from limestone and dolomite use in iron and steel estimated under the EU ETS are likely to be more certain than the estimates in the inventories as plants will have an exact knowledge of the input of $CaCO_3$ materials.

Integrated steelworks were another area in which differences in the scope of the interpretation of installations occurred in the first ETS phase, in particular with regard to the

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[9] IPCC Good Practice Guidance chapter 3, p. 3.24 “Carbon plays the dual role of fuel and reductant. It is important not to double-count the carbon from the consumption of coke or other reducing agents if this is already accounted for as fuel consumption in the Energy Sector. Since the primary purpose of carbon oxidation is to reduce iron oxide ore to crude or pig iron (carbon is used as a reducing agent), the emissions are considered to be industrial processes emissions, and they should be preferably reported as such. This source category should include CO_2 emissions from the use of blast furnace gas as a fuel if emissions are reported in the Industrial Processes Sector.”

[10] Monitoring guidelines, p. 11, CO_2 being transferred to an installation as part of a mixed fuel (such as blast furnace gas or coke oven gas) shall be included in the emission factor for that fuel. Thereby, it shall be added to the emissions of the installation where the fuel is combusted and deducted from the installation of origin.

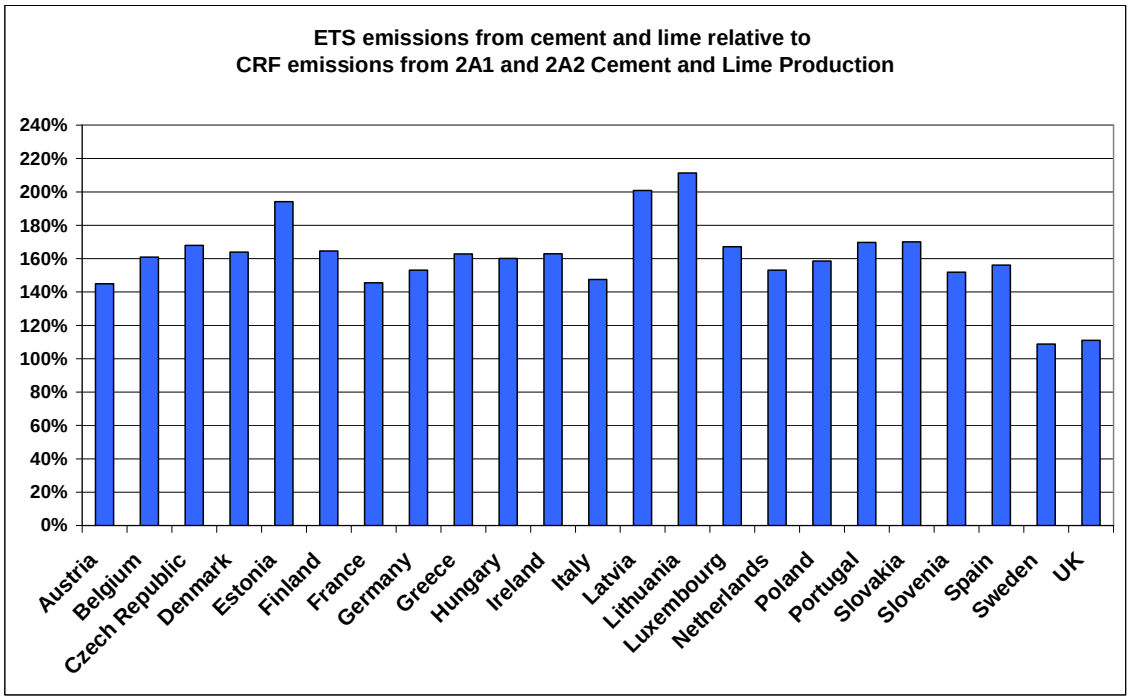
coverage of rolling mills, re-heaters and annealing furnaces. These differences further add to the inconsistencies in emissions from iron and steel reported under both schemes.

It is quite apparent that the cumulative impact of all these differences can lead to rather strong differences in CO_2 emissions reported for iron and steel under both schemes.

8.4 Production of cement and lime

CO_2 emissions from cement and lime production under the ETS include process emissions as well as combustion emissions whereas CO_2 emissions reported in GHG inventories only include process emissions. Therefore, CO_2 emissions for these sectors should be higher in the ETS data than in the respective inventory categories. Figure 8 shows the comparison of both data sources.

Figure 8 *ETS CO_2 emissions reported for cement and lime production divided by CRF CO_2 emissions reported under 2A1 Cement Production and 2A2 Lime production for 2005*



Source: Calculations based on Member States' GHG inventories for 2005 submitted in 2007 to the UNFCCC secretariat and ETS emissions as included in the EU CITL, downloaded in July 2007

It is interesting that the relationship of ETS emissions from cement and lime divided by CRF emissions is rather consistent across Member States and has an average of 160%, i.e. the sum of combustion emissions from cement and lime under the ETS is on average 160% of process emissions reported in the national GHG inventory. The shares of 18 of 23 Member States lie within a range of ±10% of this average. In the case of Sweden and

the UK this relationship is much lower (around 109% for Sweden and 111% for the UK) which may be due to a different allocation of combustion emissions from cement and lime installations to the general combustion sector under the ETS. In the case of Estonia, Latvia and Lithuania this relationship much higher (Estonia 194%, Latvia 201%, Lithuania 211%). In these Member States, emissions result from a few plants covered under the EU ETS; further checks may be useful based on the data reported by installations under the EU ETS.

8.5 Production of pulp and paper

Combustion CO_2 emissions from pulp, paper and board is an area in which huge differences occur between the reporting under the EU ETS and GHG inventories. However, total emissions from this category are relatively small (see Table 13).

Table 13 *ETS CO_2 emissions reported for Production of Pulp, Paper and Board divided by CRF CO_2 emissions reported under1A2d Pulp, Paper and Print for 2005*

Member State	Pulp & paper %
Austria	88%
Belgium	123%
Czech Republic	25%
Denmark	10%
Estonia	1335%
Finland	99%
France	64%
Germany	31803%
Greece	78%
Hungary	74%
Ireland	41%
Italy	108%
Latvia	48%
Lithuania	48%
Luxembourg	
Netherlands	108%
Poland	8%
Portugal	0
Slovakia	5%
Slovenia	83%
Spain	72%
Sweden	92%
UK	

Source: Calculations based on Member States' GHG inventories for 2005 submitted in 2007 to the UNFCCC secretariat and ETS emissions as included in the EU CITL, downloaded in July 2007

The large differences arise from the fact that the allocation to this source category is ambiguous and uncertain under both reporting schemes. Under the ETS combustion plants providing energy and heat for paper, pulp and board production may either be allocated to the general combustion sector or to pulp and paper. This is the responsibility of the competent authority providing the permit; the practice may vary across Member States. GHG inventories use energy statistics that try to allocate combustion emissions to general economic activities. Often the allocation of particular industrial combustion plants and their emissions to specific economic sectors is difficult and related with considerably uncertainties in the energy statistics. Therefore, the CO_2 emissions provided in the inventories are related to considerable uncertainties.

Consequently, Table 13 compares two rather uncertain CO_2 estimates and the resulting differences are high. This does not lead to major problems in the estimation of emissions under both schemes as the part of emissions not covered in the pulp and paper sector is accounted under industrial combustion activities.

9 Conclusions and recommendations

A large number of Member States already used the CO_2 emissions reported for 2005 under the EU ETS for quality assurance activities and compared the new data source with the national GHG inventories. This resulted in improvements in a number of areas, such as the replacement of default emission factors by country-specific emission factors or the identification of emissions in some source categories that were previously not estimated in GHG inventories.

Some Member States provided a quantitative assessment of the differences between ETS emissions and inventory emissions for 2005 and the differences encountered were relatively small. France quantified the differences in relation to the total national GHG emissions with < 0.56% of total emissions. The largest sectoral discrepancy reported was 6% for CO_2 emissions from pipeline transport.

The share of ETS total CO_2 emissions relative to CRF total emissions calculated in this paper is 85.4% for EU-23[11] in 2005. For 13 Member States, the national shares lie within a range of 5% of the EU-23 average value and for 19 Member States within a 10% range of the EU-23 Thus, CO_2 emissions covered by the ETS represent a relatively similar share relative to inventory emissions across most Member States; this can be regarded as indirect proof of consistency of both data sets. Large deviations in underlying data in different Member States would likely lead to larger differences in the share of ETS emissions relative to inventory data.

At sectoral level, a comparison is difficult due to differences in allocation of emissions and correspondence of reporting categories. For the mineral refining sector ETS data from 11 of 18 Member States match well with inventory data (AT, FI, FR, GR, IE, ES,

[11] All Member States except Malta and Cyprus.

IT, LT, NL, PT and UK). Discrepancies for the other Member State are likely related to the allocation of combustion emissions to the refining or the general combustion sector, but this could not be investigated in detail.

CO_2 emissions from cement and lime production under the ETS include process emissions as well as combustion emissions whereas CO_2 emissions reported in GHG inventories only include process emissions. Therefore, ETS CO_2 emissions are generally higher than inventory CO_2 emissions for cement and lime. The reported showed that the relationship of ETS emissions from cement and lime divided by CRF emissions is rather consistent across Member States with an average of 160%, i.e. the sum of combustion emissions from cement and lime under the ETS is on average 160% of process emissions reported in the national GHG inventory. The shares of 18 of 23 Member States lie within a range of ±10% of this average.

In general, the analysis of the year 2005 does not indicate any serious problems with consistency of CO_2 emission data reported under the EU ETS and GHG inventories. However, the analysis was limited at sectoral level due to correspondence and allocation problems.

Emission factors

Different CO_2 emission factors (EF) for fuels or other emission sources can potentially be one of the major reasons for discrepancies in CO_2 emissions from ETS installations and in national inventories. For the reporting in 2005, many Member States already used the information under the EU ETS to refine and update the EFs used in the inventories and reported such activities as improvements in recent national inventory reports. A detailed comparison for three Member States (Finland, France, the Czech Republic) revealed a high consistency of fuel-specific emission factors and oxidation factors between ETS and inventory data. Some Member States implemented ETS legislation in a way that ensures consistency of emission factors between the reporting schemes.

Activity data

Activity data (AD) reported by installations to competent authorities is considered as confidential. Consequently, AD used under the EU ETS could not be compared with AD used in GHG inventories or provided in energy or production statistics. To improve consistency of data across reporting schemes, it would be beneficial if Member States published aggregate AD for ETS sectors as reported by the installations. Such an aggregation – provided that it covers more than three installations – would not contradict confidentiality provisions and would enable the detection of data inconsistencies between energy and production statistics and GHG inventories.

Correspondence problems

A comparison of total or sectoral CO_2 emissions from EU ETS with data from national GHG inventories is not straightforward for a number of reasons. The differences be-

tween the emissions from EU ETS and GHG inventories arise from the following aspects:

- The ETS only includes installations beyond a specified threshold (20 MW for combustion installations or production-based thresholds for other ETS sectors). The inventory covers all installations in a sector. Due to this inconsistency in coverage, emissions in corresponding sectors or source categories in GHG inventories should be higher than ETS emissions.
- In the first year under the EU ETS, differences arose in the scope of the installation definition used by Member States, which led to differences in the share of ETS emissions in relation to CRF emissions. For the 2008-2012 period, the installation definition was clarified. Broadening of the definition resulted in up to 10% additional emissions for individual Member States under the ETS.
- The EU ETS excludes CO_2 emissions from waste incineration plants; however, CO_2 emissions from the fossil fractions of waste incineration are included in the GHG inventory.
- Emissions reported under the ETS can be allocated to different sectors in the GHG inventory, e.g. in some Member States residential or commercial/institutional fuel combustion reported in the inventory includes some ETS installations whereas in other Member States these inventory source categories lie completely outside the ETS scheme.

These general differences in coverage and allocation of CO_2 emissions under both schemes potentially hide real differences between both reporting schemes, such as differences in activity data, emission factors or other parameters (e.g. oxidation factors) used in the estimation of CO_2 emissions.

Improvement of comparability of data

Further activities should be undertaken to enhance the comparability of both data sets in the future.

One key area in which the comparability should be improved is the reporting of combustion emissions from process emissions under the EU ETS. In the national allocation plans, many Member States provided data which showed that they are able to separate process emissions from combustion emissions under the EU ETS since they used different allocation rules for both types of emissions. Such differentiation between process emissions and combustion emissions should be implemented in the emission reporting under the EU ETS that is accessible to the general public. This would strongly improve the possibility of checking the consistency of both data sets.

At the moment, the sectoral disaggregation of ETS data leads to one sector – combustion - having a very large share of emissions. It would be useful to further disaggregate the large share of emissions in the combustion sector in the reporting under the ETS. Several options are possible: a further disaggregation could follow plant types (e.g. con-

densing plants, CHP plants similar to energy statistics), NACE Codes or a breakdown in public and industrial plants (similar to the inventory requirements). In many Member States competent authorities have such information available, but they are currently not required by the Commission to report such additional disaggregation. The detailed recommendations for such further disaggregation should be developed as part of the future process of harmonising reporting requirements for industrial emissions in the EU.

The future elaboration and updating of technical monitoring and reporting guidelines under both schemes should take into account the requirements under the other scheme; also, allocation rules and estimation methods should be coordinated and harmonised whenever possible.

Additional efforts are required to improve the reporting and the access to information on emissions from waste incineration with energy recovery. The reporting of such emissions could be improved when UNFCCC Guidelines for national GHG inventories are revised in the future, but additional activities could be started at an EU level to gather reliable emission estimates for these sources. This would be useful for the purpose of verifying reporting in the waste sector in inventories as well as for an analysis of the impact of these emissions on combustion emissions reported under the ETS and in the inventory.

Improvement of transparency

Transparency should be improved to promote a comparison of both data sources. Germany, for example, chose to report combustion emissions for most ETS sectors separately in the national GHG inventories. The German CRF tables include additional source categories for combustion emissions from cement, glass and ceramics production on a voluntary basis. These additional subcategories for combustion emissions clearly show the consistency between ETS data and inventory data for these source categories. Similar voluntary reporting of additional source categories under manufacturing industries and combustion in the national GHG inventory could be adopted by other Member States for enhanced transparency.

Some Member States included very detailed assessments of comparability and the use of ETS data in the national inventory reports (e.g. Austria, Ireland or Finland). It is strongly recommended that Member States that have not yet done so follow their example and add relevant information on the use of ETS data in the NIRs. Such improved transparency will strongly contribute to the credibility and reliability of national GHG inventories.

Problems regarding the comparability arise from different definitions or definitions that are not sufficiently precise - in particular with regard to the scope of installations and activities covered in sectors and source categories. Both reporting regimes should increase transparency in this regard.

Analysis of emission trends

In future years, it will be important to analyse the trend in emissions between both reporting schemes in addition to the emissions levels assessed in this report to confirm that

the emission trend monitored by GHG inventories is consistent with the trend in emissions under the EU ETS. However, this analysis will be complicated through the change in scope of installation definition between the first and the second ETS phase. Installations may also change their allocation to a specific sector over time under the EU ETS. Any effects of the change in scope of the data has to be carefully considered in a future analysis related to the consistency of the emission trend.

10 Annex 1

10.1 Austria

Table 14 *Comparison of verified emissions under the EU ETS for 2005 with relevant CRF source categories of the GHG inventory data for 2005 for Austria*

AUSTRIA

ETS categories	Verified Emissions 2005 [Gg CO2]	GHG Inventory 2005 [Gg CO2]	Inventory category
Combustion installations	17,127	12,736	1A1a Public electricity and heat production
		272	1A1c Manufacture of solid fuels and other energy industries
		15,538	1A2 Manufacturing industries and construction
		544	1A3e Other transportation - pipeline transport
		NA	1A5a Other, stationary
		IE	1B1b Solid fuel transformation
		122	1B2aii Oil production/processing
		83	1B2bii Gas production/processing
		0	1B2biii Gas transmission
		IE	1B2c Flaring
Mineral oil refineries	2,827	2,827	1A1b Petroleum refining
Coke ovens	1,354		
Metal ore roasting or sintering installations	5,874	310	2A7 Sinter Production
		6,393	*1A2a Iron and steel*
Production of pig iron or steel	67	4,995	2C1 Iron and steel
Production of cement clinker or lime	3,443	1,797	2A1 Cement Production
		579	2A2 Lime production
		291	2A3 Limestone and Dolomite Use
		15	2A4 Soda Ash production and use
Manufacture of glass	215	IE	2A7 Glass production
Manufacture of ceramic products	447	128	2A7 Bricks and tiles
Production of pulp, paper and board	2,017	*2,283*	*1A2d Pulp, paper and print*
ETS Total	**33,373**	**40,236**	**CRF Total**

Sources:

- File 'AUT-2007-2005-v1.2.xls' as part of Austrian inventory submission to UNFCCC in 2007 and information from the NIR
- CITL downloaded on 7th July 2007

Notes:

- Estimates shown in the table for 1A2a Iron and steel and 1A2d Pulp, paper and print are not added to the CRF total, because they are included in 1A2 Manufacturing industries and construction. They are presented in the table for information purposes only in order to check the data consistency at a sub-source level.
- CRF category 1A1c includes emissions from fuel combustion in the oil and gas extraction sector and compressors used for natural gas storage tanks.

- Emissions from CRF category 1B2c Flaring are included in 1A1b Petroleum refining.

10.2 Belgium

Table 15 Comparison of verified emissions under the EU ETS for 2005 with relevant CRF source categories of the GHG inventory data for 2005 for Belgium

BELGIUM

ETS categories	Verified Emissions 2005	GHG inventory 2005	Inventory category
	[Gg CO2]	[Gg CO2]	
Combustion installations	29,538	24,624	1.A.1.a Public electricity and heat production,
		27,682	1.A.2 Manufacturing industries and construction
Coke ovens	0	429	1.A.1.c Manufacture of solid fuels and other energy industries
		131	1A3e Other transportation - pipeline transport
		NA	1A5a Other, stationary
		NA	1B1b Solid fuel transformation
		NE	1B2bii Gas production/processing
		1	1B2biii Gas transmission
		0	1B2biv Gas distribution
		145	1B2c Flaring
Mineral oil refineries	5,576	4,656	1.A.1.b Petroleum refining
Metal ore roasting or sintering installations	0		
		9,470	*1.A.2.a Iron and steel*
Production of pig iron or steel	9,602	1,535	2.C.1 Iron and steel
		2,934	2.A.1 Cement Production
		2,018	2.A.2 Lime production
Production of cement clinker or lime	7,965		
		IE	2.A.3 Limestone and Dolimite Use
		NE	2.A.4 Soda Ash Production and Use
Manufacture of glass	1,296	283	2.A.7 Glass Production
Manufacture of ceramic products	639	207	2.A.7 Ceramics
		9	2.A.7 Other mineral products, non-specified
Production of pulp, paper and board	743	*605*	*1.A.2.d Pulp, paper and print*
Other activities opted-in	5		
		20	ETS emissions in 1A4 Other sectors
ETS Total	**55,363**	**64,675**	**CRF Total**

Sources:

- File 'BEL-2007-2005-v1.1.xls' as part of Belgian inventory submission to UNFCCC in 2007 and information from the NIR
- CITL downloaded on 7th July 2007

Notes:

- Estimates shown in the table for 1A2a Iron and steel and 1A2d Pulp, paper and print are not added separately to the CRF total, because they are included in 1A2 Manufacturing industries and construction. They are presented in the table for information purposes only in order to check the data consistency at a sub-source level.
- In CRF category 1.A.3.e. the energetic emissions originating from the compression activities in the sector storage and transport of natural gas are reported.

- CRF category 1.B.2.bii/ gas distribution includes emissions of CO_2 from the gas distribution based on the composition of the natural gas (natural gas contains +/- 1% of CO_2).
- CRF category 1.B.2.b.ii includes emissions originating from the storage and transport of natural gas in Belgium.
- Belgium reported in the NAP summary table III that the ETS scheme covers a small share of emissions from 1A4 Other sectors. The estimate provided in NAP summary table II was added to the CRF total to improve the correspondence of both datasets.
- With regard to source category 2.B.1 Ammonia Production, Belgium reports that in the Walloon region, the CO_2 emissions were calculated based on the natural gas used as feedstock. The amount of natural gas used in the process was specified directly by the plant. Since 2005, CO_2 emissions have been given directly by the reporting of the plant under the emission trading scheme. However, CO_2 emissions from 2B1 Ammonia Production are considered to be process emissions which are not covered by the EU ETS and the inclusion of combustion emissions in the industrial processes sector seems to be a misallocation. For the overview tables, the totals without Ammonia Production were used.

10.3 Czech Republic

Table 16 Comparison of verified emissions under the EU ETS for 2005 with relevant CRF source categories of the GHG inventory data for 2005 for the Czech Republic

CZECH REPUBLIC

ETS categories	Verified Emissions	GHG inventory	Inventory category
	2005	2005	
	Gg CO2	Gg CO2	
Combustion installations	71,457	55,505	1.A.1.a Public electricity and heat production
		26,387	1.A.2 Manufacturing industries and construction
		1,164	1.A.1.c Manufacture of solid fuels and other energy industries
		347	1A3e Other transportation - pipeline transport
		NO	1A5a Other, stationary
		IE	1B1b Solid fuel transformation
		NE	1B2aii Oil production/processing
		NO	1B2bii Gas production/processing
		NO	1B2biii Gas transmission
		NE	1B2c Flaring
Combustion installations	71,457	*83,403*	*Total combustion (1.A.1.a+1.A.2+1.A.1.c)*
Mineral oil refineries	997	1,263	1.A.1.B Petroleum Refining
Coke Ovens	0		
Metal ore roasting or sintering installations	0		
		2,888	*1.A.2.A Iron & Steel*
Production of pig iron or steel	4,681	6,403	2.C.1 Iron and Steel Production
		1,625	2.A.1 Cement
		496	2.A.2 Lime
Production of cement clinker or lime	3,561		
		1,055	2.A.3 Limestone and Dolimite Use
		NO	2.A.4 Soda Ash Production and Use
Manufacture of glass	769	232	2.A.7 Glass
Manufacture of ceramic products	724	181	2.A.7 Bricks and ceramics
Pulp, paper and board	265	*1,056*	*1.A.2.D Pulp, paper and print*
ETS Total	**82,455**	**94,658**	**CRF Total**

Sources:

- File 'CZE-2007-2005-v1.xls' as part of the inventory submission to UNFCCC in 2007 and information from the NIR
- CITL downloaded on 7th July 2007

Notes:

- Estimates shown in the table for 1A2a Iron and steel and 1A2d Pulp, paper and print are not added separately to the CRF total, because they are included in 1A2 Manufacturing industries and construction. They are presented in the table for information purposes only in order to check the data consistency at a sub-source level.
- NIR does not provide detailed information on the allocation of sub-categories under CRF 1A1; therefore it is unclear which exact emissions are reported under 1A1c Manufacturing of solid fuels and other energy industries.

10.4 Denmark

Table 17 *Comparison of verified emissions under the EU ETS for 2005 with relevant CRF source categories of the GHG inventory data for 2005 for Denmark*

DENMARK

ETS categories	Verified Emissions 2005	GHG Inventory 2005	Inventory category
	[Gg CO2]	Gg CO2	
Combustion installations	23,077	19,606	1.A.1.A Public electricity and heat production,
		5,571	1.A.2 Manufacturing industries and construction
Coke ovens	0	1,593	1.A.1.c Manufacture of solid fuels and other energy industries
		NO	1A3e Other transportation - pipeline transport
		NA,NO	1A5a Other, stationary
		NO	1B1b Solid fuel transformation
		NA	1B2aii Oil production/processing
		NA	1B2bii Gas production/processing
		NA	1B2biii Gas transmission
		435	1B2c Flaring
Total combustion	*23,077*	*27,205*	*Total combustion (1.A.1.a+1.A.2+1.A.1.c)*
Mineral oil refineries	410	932	1.A.b Petroleum refining
Metal ore roasting or sintering installations	0		
		524	*1.A.2.a Iron and steel*
Production of pig iron or steel	5	16	2.C.1 Iron and steel
Production of cement clinker or lime	2,566	1,456	2.A.1 Cement Production
		110	2.A.2 Lime production
		61	2.A.3 Limestone and Dolimite Use
		IE,NO	2.A.4 Soda Ash Production and Use
Manufacture of glass	71	13	2.A.7 Glass, tile and brick
Manufacture of ceramic products	326		
Production of pulp, paper and board	21	*223*	*1.A.2.d Pulp, paper and print*
ETS Total	**26,476**	**29,791**	**CRF Total**

Sources:

- File 'DNK-2007-2005-v1.1.xls' as part of the inventory submission to UNFCCC in 2007 and information from the NIR
- CITL downloaded on 2nd May 2007

Notes:

- Estimates shown in the table for 1A2a Iron and steel and 1A2d Pulp, paper and print are not added separately to the CRF total, because they are included in 1A2 Manufacturing industries and construction. They are presented in the table for information purposes only in order to check the data consistency at a sub-source level.
- According to the NIR, CRF category 1A1c includes stationary combustion plants (p. 383).

10.5 Estonia

Table 18 *Comparison of verified emissions under the EU ETS for 2005 with relevant CRF source categories of the GHG inventory data for 2005 for Estonia*

ESTONIA

ETS categories	Verified Emissions 2005	GHG Inventory 2005	Inventory category
	[Gg CO2]	[Gg CO2]	
Combustion installations	12,450	11,452	1.A.1.A Public electricity and heat production,
		112	1.A.2 Manufacturing industries and construction
Coke ovens	0	527	1.A.1.c Manufacture of solid fuels and other energy industries
		NO	1A3e Other transportation - pipeline transport
		NO	1A5a Other, stationary
		NO	1B1b Solid fuel transformation
		NO	1B2aii Oil production/processing
		NO	1B2bii Gas production/processing
		NO	1B2biii Gas transmission
		NA,NO	1B2c Flaring
Mineral oil refineries	0	2,752	1.A.b Petroleum refining
		3	1.A.2.a Iron and steel
Production of pig iron or steel	0	NA	2.C.1 Iron and steel
Metal ore roasting or sintering installations	0		
Production of cement clinker or lime	35		
		373	2.A.1 Cement Production
		29	2.A.2 Lime production
		NO	2.A.3 Limestone and Dolomite Use
		NO	2.A.4 Soda Ash Production and Use
Manufacture of glass	32	NA	2.A.7 Glass, tile and brick
Manufacture of ceramic products	53	NA	2.A.7 Concrete pumice stone
Production of pulp, paper and board	51	4	1.A.2.d Pulp, paper and print

Sources:

- File 'EST-2007-2005-v1.1.xls' as part of the inventory submission to UNFCCC in 2007 and information from the NIR
- CITL downloaded on 7th July 2007

Notes:

- Estimates shown in the table for 1A2a Iron and steel and 1A2d Pulp, paper and print are not added to the CRF total, because they are included in 1A2 Manufacturing industries and construction. They are presented in the table for information purposes only in order to check the data consistency at a sub-source level.
- No details are provided with regard to the coverage of CRF category 1A1c Manufacture of solid fuels and other energy industries.
- CRF category 1Ab Petroleum refining includes emissions from the production of shale oil.

10.6 Finland

Table 19 Comparison of verified emissions under the EU ETS for 2005 with relevant CRF source categories of the GHG inventory data for 2005 for Finland

FINLAND

ETS categories	Verified Emissions 2005	GHG Inventory 2005	Inventory category
	[Gg CO_2]	[Gg CO_2]	
Combustion installations	18,727	18,651	1.A.1.a Public electricity and heat production,
		11,407	1.A.2 Manufacturing industries and construction
Coke ovens	0	394	1.A.1.c Manufacture of solid fuels and other energy industries
		NO	1A3e Other transportation - pipeline transport
		1,380	1A5a Other, stationary
		NO	1B1b Solid fuel transformation
		1	1B2aii Oil refining/ storage
		3	1B2biii Gas transmission
		4	1B2biv Gas distribution
		77	1B2c Flaring
Mineral oil refineries	2,661	2,626	1.A.b Petroleum refining
		3,627	*1.A.2.a Iron and steel*
Production of pig iron or steel	6,310	2,394	2.C.1 Iron and steel
Metal ore roasting or sintering installations	*0*		
		542	2.A.1 Cement Production
		455	2.A.2 Lime production
Production of cement clinker or lime	1,641		
		134	2.A.3 Limestone and Dolomite Use
		19	2.A.4 Soda Ash Production and Use
Manufacture of glass	154	IE	2.A.7 Glass
Manufacture of ceramic products	61		
Production of pulp, paper and board	3,465	3,509	1.A.2.d Pulp, paper and print
Other activity opted-in	80		
ETS Total	**33,076**	**38,089**	**CRF Total**

Sources:

- File 'FIN-2007-2005-v1.5.xls' as part of the inventory submission to UNFCCC in 2007 and information from the NIR
- CITL downloaded on 7th July 2007

Notes:

- Estimates shown in the table for 1A2a Iron and steel and 1A2d Pulp, paper and print are not added to the CRF total, because they are included in 1A2 Manufacturing industries and construction. They are presented in the table for information purposes only in order to check the data consistency at a sub-source level.
- CRF category 1A1c includes emissions from fuels used in coking plants (coke oven gas and BF gases).

- Emissions from CRF category 1A3e were not included for Finland in the CRF total as this category only includes emissions from off-road vehicles and other machinery which are as mobile sources not part of the EU ETS.
- CRF category 1A5 includes other non-specified emissions from stationary sources and non-specified emissions from feedstocks. It is not completely clear whether the sources reported in the CRF are part of the scope of the EU ETS.
- CRF category 1B2aii Oil refining/storage includes emissions from flaring in oil refining.

10.7 France

Table 20 Comparison of verified emissions under the EU ETS for 2005 with relevant CRF source categories of the GHG inventory data for 2005 for France

FRANCE

ETS categories	Verified Emissions 2005	GHG Inventory 2005	Inventory category
	[Gg CO2]	[Gg CO2]	
Combustion installations	60,507	45,788	1.A.1.A Public electricity and heat production,
Other activity opted-in (Combustion)	137	81,448	1.A.2 Manufacturing industries and construction
Coke ovens	256	3826	1.A.1.c Manufacture of solid fuels and other energy industries
		963	1A3e Other transportation - pipeline transport
		NO	1A5a Other, stationary
		NA	1B1b Solid fuel transformation
		3053	1B2aii Oil refining/ storage
		328	1B2bi Gas exploration
		72	1B2aii Oil production
		495	1B2c Flaring
Mineral oil refineries	18,230	13,554	1.A.b Petroleum refining
Metal ore roasting or sintering installations	59		
Production of pig iron or steel	26,704		
		17,694	*1.A.2.a Iron and steel*
		3,227	2.C.1 Iron and steel
			2.A.1 Cement Production
			2.A.2 Lime production
		9,239	2.A.1 Cement Production
		2,475	2.A.2 Lime production
Production of cement clinker or lime	17,043		
		IE	2.A.3 Limestone and Dolomite Use
		384	2.A.4 Soda Ash Production and Use
Manufacture of glass including glass fibre	3,706	683	2.A.7 Glass
Manufacture of ceramic products by firing	977	294	2.A.7.2 Brick and Tile Production
Production of pulp, paper and board	3,647	*5,713*	*1.A.2.d Pulp, paper and print*
ETS Total	**131,268**	**165,831**	**CRF Total**

Sources:

- File 'FRA_Kyoto-2005-v1.3.xls' as part of the inventory submission to UNFCCC in 2007 and information from the NIR
- CITL downloaded on 7th July 2007

Notes:

- Estimates shown in the table for 1A2a Iron and Steel and 1A2d Pulp, paper and print are not added to the CRF total, because they are included in 1A2 Manufacturing industries and construction. They are presented in the table for information purposes only in order to check the data consistency at a sub-source level.
- CRF category 1A1c includes emissions from fuels used in coke plants.
- CRF category 1B2sii Oil refining/storage includes emissions from catalytic crackers, flares in refineries and emissions from Claus units (sulphur recuperation).

10.8 Germany

Table 21 *Comparison of verified emissions under the EU ETS for 2005 with relevant CRF source categories of the GHG inventory data for 2005 for Germany*

GERMANY

ETS categories	Verified Emissions 2005	GHG Inventory 2005	Verified emissions/ GHG inventory	Inventory category
	[Gg CO2]	[Gg CO2)	%	
Combustion installations	373,375	325,398	115%	1.A.1.A Public electricity and heat
		102,781		1.A.2 Manufacturing industries + construction
Coke ovens	2,904	15,916		1.A.1.c Manufacture of solid fuels and other energy industries
		1,604		1A3e Other transportation - pipeline transport
		841		1A5a Other, stationary
		NE		1B1b Solid fuel transformation
		NE		1B2aii Oil production/processing
		0		1B2bii Gas production/processing
		NE		1B2biii Gas transmission
		NE		1B2c Flaring
Mineral oil refineries	28,964	20,639	140%	1.A.b Petroleum refining
		16,544		*1.A.2.a Iron and steel (combustion)*
		42,621		2.C.1 Iron and steel
Production of pig iron or steel	30,557	*59,165*	*52%*	*1.A.2.a + 2.C.1 Iron and steel*
Metal ore roasting or sintering installations	0			
		12,921		2.A.1 Cement Production
		7,564		*1.A.2.f Cement (combustion)*
		5,415		2.A.2 Lime production
		1,456		*1.A.2.f Lime (combustion)*
Production of cement clinker or lime	28,065	*27,355*	*103%*	*Cement & Lime (comb+process)*
		0		2.A.3 Limestone and Dolimite Use
		IE		2.A.4 Soda Ash Production and Use
		635		2.A.7 Glass
		3,018		*1.A.2.f Glass (combustion)*
Manufacture of glass	3,952	*3,653*	*108%*	*Total glass (comb + process)*
		1,209		*1.A.2.f Ceramics (combustion)*
		359		2.A.7 Bricks and tiles
Manufacture of ceramic products	1,771	*1,568*	*113%*	*Total ceramics (comb + process)*
Production of pulp, paper and board	5,079	*16*	*31803%*	*1.A.2.d Pulp, paper and print*
ETS Total	**474,665**	**529,128**	**90%**	**CRF Total**

Sources:

- File 'DEU-2007-2005-v1.2.xls' as part of the inventory submission to UNFCCC in 2007 and information from the NIR
- CITL downloaded on 7th July 2007

Notes

- Estimates shown in the table for 1A2a Iron and steel, 1A2f Cement, lA2f Lime, 1A2f Glass, 1A2f Ceramics and 1A2d Pulp, paper and print are not added to the CRF total, because they are included in 1A2 Manufacturing industries and construction. They are presented in the table for information purposes only in order to check the data consistency at a sub-source level. Germany provided an additional disaggregation of emissions from 1A2 Manufacturing industries and construction which allows for a more detailed check of consistency at a sub-category level. Therefore, additional lines

summarising process and combustion emissions for iron and steel, cement, lime, glass and ceramics were added.

- The CO_2 emissions for 1A3e Other transportation only present a part of the CRF estimate for this sector which also includes emissions from construction-related transportation. The disaggregated estimate was made based on the fuel use for this category in CRF Table 1.A(a)s3.
- CRF category 1A5a includes CO_2 emissions from military stationary sources.
- CRF category 1A1c Manufacture of solid fuels and other energy industries includes electricity and heat generation in steam-turbine power stations, with a differentiation between hard-coal mining and lignite mining (pit power stations), electricity and heat generation in gas turbines, gas engines and diesel engines of all pit (Zeche + Grube) power stations, other heat generation in industrial boilers within the transformation sector (not including refineries) and manufacture of hard-coal coke and operation of diesel engines for propulsion purposes in pit (Zeche + Grube) power stations.

10.9 Greece

Table 22 Comparison of verified emissions under the EU ETS for 2005 with relevant CRF source categories of the GHG inventory data for 2005 for Greece

GREECE

ETS categories	Verified Emissions 2005	GHG Inventory 2005	Inventory category
	[Gg CO2]	[Gg CO2]	
Combustion installations	53,770	54,342	1.A.1.A Public electricity and heat production,
		8,430	1.A.2 Manufacturing industries and construction
Coke ovens	0	80	1.A.1.c Manufacture of solid fuels and other energy industries
		4	1A3e Other transportation - pipeline transport
		NO	1A5a Other, stationary
		NE	1B1b Solid fuel transformation
		0	1B2aii Oil refining/ storage
		0	1B2bi Gas production/processing
		0	1B2biv Gas transmission
		9	1B2c Flaring
Mineral oil refineries	3,637	3,757	1.A.b Petroleum refining
Metal ore roasting or sintering installations	868		
Production of pig iron or steel	386		
		207	*1.A.2.a Iron and steel*
		511	2.C.1 Iron and steel
Production of cement clinker or lime	11,566	6,615	2.A.1 Cement Production
		490	2.A.2 Lime production
		303	2.A.3 Limestone and Dolomite Use
		NE,NO	2.A.4 Soda Ash Production and Use
Manufacture of glass	68	22	2.A.7 Glass, tile and brick
Manufacture of ceramic products	786		
Production of pulp, paper and board	186	*238*	*1.A.2.d Pulp, paper and print*
ETS Total	**71,268**	**74,564**	**CRF Total**

Sources:

- File 'GRC-2007-2005-v1.1.xls' as part of the inventory submission to UNFCCC in 2007 and information from the NIR
- CITL downloaded on 7th July 2007

Notes:

- Estimates shown in the table for 1A2a Iron and steel and 1A2d Pulp, paper and print are not added to the CRF total, because they are included in 1A2 Manufacturing industries and construction. They are presented in the table for information purposes only in order to check the data consistency at a sub-source level.
- No NIR for 2007 is available for Greece and the 2006 NIR does not include detailed information on the coverage of CRF category 1A1c.

10.10 Hungary

Table 23 Comparison of verified emissions under the EU ETS for 2005 with relevant CRF source categories of the GHG inventory data for 2005 for Hungary

HUNGARY

ETS categories	Verified Emissions 2005	GHG Inventory 2005	Inventory category
	[Gg CO2]	[Gg CO2]	
Combustion installations	19,452	16,913	1.A.1.A Public electricity and heat production,
		11,796	1.A.2 Manufacturing industries and construction
Coke ovens	185	IE,NO	1A1c Manufacture of solid fuels and other energy industries
		NO	1A3e Other transportation - pipeline transport
		NO	1A5a Other, stationary
		IE	1B1b Solid fuel transformation
		IE	1B2aii Oil production/processing
		NO	1B2bii Gas production/processing
		NO	1B2biii Gas transmission
		85	1B2c Flaring
Mineral oil refineries	1,317	IE,NO	1.A.b Petroleum refining
Metal ore roasting or sintering installations	321		
		2,849	*1.A.2.a Iron and steel*
Production of pig iron or steel	1,257	254	2.C.1 Iron and steel
Production of cement clinker or lime	2,436	1,199	2.A.1 Cement Production
		323	2.A.2 Lime production
		332	2.A.3 Limestone and dolimite use
		IE,NA	2A4 Soda Ash production and use
Manufacture of glass including glass fibre	275	67	2.A.7 Glass, tile and brick
Manufacture of ceramic products by firing	624	271	2.A.7 Other non-specified
Production of pulp, paper and board	172	*232*	*1.A.2.d Pulp, paper and print*
ETS Total	**26,039**	**31,240**	**CRF Total**

Sources:

- File 'HUN-2007-2005-v2.1.xls' as part of the inventory submission to UNFCCC in 2007 and information from the NIR
- CITL downloaded on 7th July 2007

Notes:

- Estimates shown in the table for 1A2a Iron and steel and 1A2d Pulp, paper and print are not added to the CRF total, because they are included in 1A2 Manufacturing industries and construction. They are presented in the table for information purposes only in order to check the data consistency at a sub-source level.

10.11 Ireland

Table 24 *Comparison of verified emissions under the EU ETS for 2005 with relevant CRF source categories of the GHG inventory data for 2005 for Ireland*

IRELAND

ETS category	Verified emissions 2005	GHG Inventory 2005	Inventory category
	Gg CO_2	**Gg CO2**	
Combustion installations	17,837	15,136	1.A.1.a Public electricity and heat
		5,454	1.A.2 Manufacturing industries and construction
Coke Ovens	0	110	1.A.1.c Manufacturing of solid fuels and other energy industries
		165	1A3e Other transportation - pipeline transport
		NO	1A5a Other, stationary
		NO	1B1b Solid fuel transformation
		NE	1B2aii Oil refining/ storage
		60	1B2bi Gas production/processing
		IE	1B2biv Gas transmission
		NO	1B2c Flaring
Mineral oil refineries	411	411	1.A.b Petroleum refining
Metal ore roasting or sintering installations	0		
Production of pig iron or steel	*0*		
		2	*1.A.2.a Iron and steel*
Production of cement clinker or lime	4,138	2,357	2.A.1 Cement Production
		184	2.A.2 Lime production
		13	2.A.3 Limestone and Dolomite Use
		NO	2.A.4 Soda Ash Production and Use
Manufacture of ceramic products	30		
Manufacture of glass	24	NE	2A7 Glass production
Paper, board, power industry	2	*72*	*1.A.2.d Pulp, paper and print*
		77	ETS emissions in 1A4 Commercial and instutitional, residential and agricultural use
ETS Total	**22,440**	**23,967**	**CRF Total**

Sources:

- File 'IRE-2007-2005-v1.1.xls' as part of the inventory submission to UNFCCC in 2007 and information from the NIR
- CITL downloaded on 7th July 2007

Notes:

- Estimates shown in the table for 1A2a Iron and steel and 1A2d Pulp, paper and print are not added to the CRF total, because they are included in 1A2 Manufacturing industries and construction. They are presented in the table for information purposes only in order to check the data consistency at a sub-source level.
- Ireland reported in the NAP summary table III that the ETS scheme covers a small share of emissions from 1A4 Other sectors. The estimate provided in NAP

summary table II was added to the CRF total to improve the correspondence of both datasets.

10.12 Italy

Table 25 *Comparison of verified emissions under the EU ETS for 2005 with relevant CRF source categories of the GHG inventory data for 2005 for Italy*

ITALY

ETS categories	Verified Emissions 2005	GHG Inventory 2005	Inventory category
	[Gg CO2]	Gg CO2	
		120,589	1.A.1.A Public electricity and heat production,
Combustion installations	146,952	81,960	1.A.2 Manufacturing industries and construction
Coke ovens	0	12,797	1.A.1.c Manufacture of solid fuels and other energy industries
		751	1A3e Other transportation - pipeline transport
		NA	1A5a Other, stationary
		NA	1B1b Solid fuel transformation
		341	1B2aii Oil production/processing
		1,534	1B2aiv Refining/storage
		23	1B2bi Production/processing
		215	1B2c Flaring
Mineral oil refineries	26,079	26,491	1.A.b Petroleum refining
Metal ore roasting or sintering installations	0		
		15,607	*1.A.2.a Iron and steel*
Production of pig iron or steel	13,897	1,221	2.C.1 Iron and steel
Production of cement clinker or lime	30,332	17,886	2.A.1 Cement Production
		2,674	2.A.2 Lime production
		2,548	2.A.3 Limestone and Dolimite Use
		275	2.A.4 Soda Ash Production and Use
Manufacture of glass	2,958	525	2.A.7 Glass production
Manufacture of ceramic products	686		
Production of pulp, paper and board	5,028	*4,636*	*1.A.2.d Pulp, paper and print*
ETS Total	**225,931**	**269,829**	**CRF Total**

Sources:

- File 'ITA-2007-2005-v1.1.xls' as part of the inventory submission to UNFCCC in 2007 and information from the NIR
- CITL downloaded on 7th July 2007

Notes:

- Estimates shown in the table for 1A2a Iron and steel and 1A2d Pulp, paper and print are not added to the CRF total, because they are included in 1A2 Manufacturing industries and construction. They are presented in the table for information purposes only in order to check the data consistency at a sub-source level.
- CRF category 1A1c includes emissions from one small manufactured gas producing plant, emissions from power plants which use coal gases, in particular referring to the electricity generated in the steel plant sites (using coal gases and other fuels).
- CRF category 1B2aiv includes fugitive CO_2 emissions from refineries during petroleum production processes, e.g. fluid catalytic cracking and flaring.

10.13 Latvia

Table 26 *Comparison of verified emissions under the EU ETS for 2005 with relevant CRF source categories of the GHG inventory data for 2005 for Latvia*

LATVIA

ETS categories	Verified Emissions 2005	GHG Inventory 2005	Inventory category
	[Gg CO2]	[Gg CO2]	
Combustion installations	2,086	1,996	1.A.1.A Public electricity and heat production,
		1,135	1.A.2 Manufacturing industries and construction
Coke ovens	0	72	1.A.1.c Manufacture of solid fuels and other energy industries
		NE	1A3e Other transportation - pipeline transport
		NA	1A5a Other, stationary
		NE	1B1b Solid fuel transformation
		NO	1B2aii oil production
		NO	1B2bi Gas transmission
		NO	1B2biv Gas distribution
		NO	1B2c Flaring
Mineral oil refineries	0	*NO*	1.A.b Petroleum refining
Metal ore roasting or sintering installations	0		
		287	*1.A.2.a Iron and steel*
Production of pig iron or steel	366	39	2.C.1 Iron and steel
Production of cement clinker or lime	285	140	2.A.1 Cement Production
		2	2.A.2 Lime production
		42	2.A.3 Limestone and dolimite use
		1	2.A.4 Soda Ash Production and Use
Manufacture of glass including glass fibre	51	0	2.A.7 Production of glass
		0	2.A.7 Production of tiles
		11	2.A.7 Production of bricks
Manufacture of ceramic products by firing	38		
Production of pulp, paper and board	7	*14*	*1.A.2.d Pulp, paper and print*
Other activity opted-in	21		
		10	ETS emissions in 1A4 Other sectors
ETS Total	**2,854**	**3,449**	**CRF Total**

Sources:

- File 'LVA-2007-2005-v1.3.xls' as part of the inventory submission to UNFCCC in 2007 and information from the NIR
- CITL downloaded on 7th July 2007

Notes:

- Estimates shown in the table for 1A2a Iron and steel and 1A2d Pulp, paper and print are not added separately to the CRF total, because they are included in 1A2 Manufacturing industries and construction. They are presented in the table for information purposes only in order to check the data consistency at a sub-source level.
- Latvia reported in the NAP summary table III that the ETS scheme covers a small share of emissions from 1A4 Other sectors. The estimate provided in NAP summary table II was added to the CRF total to improve the correspondence of both datasets.

10.14 Lithuania

Table 27 *Comparison of verified emissions under the EU ETS for 2005 with relevant CRF source categories of the GHG inventory data for 2005 for Lithuania*

LITHUANIA

ETS categories	Verified Emissions 2005	GHG Inventory 2005	Inventory category
	[Gg CO2]	[Gg CO2]	
Combustion installations	3,745	3,926	1.A.1.A Public electricity and heat production,
		1,353	1.A.2 Manufacturing industries and construction
Coke ovens	0	39	1.A.1.c Manufacture of solid fuels and other energy industries
		NO	1A3e Other transportation - pipeline transport
		NO	1A5a Other, stationary
		NO	1B1b Solid fuel transformation
		0	1B2aii Oil production/processing
		0	1B2ai Oil exploration
		0	1B2biii Gas transmission
		18	1B2c Flaring
Mineral oil refineries	1,870	1,915	1.A.b Petroleum refining
Metal ore roasting or sintering installations	0		
Production of pig iron or steel	0	NO	1A2a Iron and steel
		NO	2C1 Iron and steel
Production of cement clinker or lime	833	363	2.A.1 Cement Production
		31	2.A.2 Lime production
		NE	2A3 Limestone and Dolomite Use
		5	2A4 Soda Ash production and use
Manufacture of glass including glass fibre	75	IE	2.A.7 Glass production
Manufacture of ceramic products by firing	32		
Production of pulp, paper and board	49	*4*	*1.A.2.d Pulp, paper and print*
Other activity opted-in	0		
ETS Total	6,604	7,650	**CRF Total**

Sources:

- File 'GRC-2007-2005-v1.1.xls' as part of the inventory submission to UNFCCC in 2007 and information from the NIR
- CITL downloaded on 7th July 2007

Notes:

- Estimates shown in the table for 1A2a Iron and steel and 1A2d Pulp, paper and print are not added to the CRF total, because they are included in 1A2 Manufacturing industries and construction. They are presented in the table for information purposes only in order to check the data consistency at a sub-source level.

10.15 Luxembourg

Table 28 Comparison of verified emissions under the EU ETS for 2005 with relevant CRF source categories of the GHG inventory data for 2005 for Luxembourg

LUXEMBOURG

ETS categories	Verified Emissions 2005 [Gg CO2]	GHG Inventory 2005 [Gg CO2]	Inventory category
		356	1.A.1.A Public electricity and heat production,
Combustion installations	1,250	2,295	1.A.2 Manufacturing industries and construction
Coke ovens	0	NO	1.A.1.c Manufacture of solid fuels and other energy industries
		NO	1A3e Other transportation - pipeline transport
		IE,NO	1A5a Other, stationary
		NO	1B1b Solid fuel transformation
		NO	1B2aii Oil production/processing
		NO	1B2bii Gas production/processing
		NO	1B2biii Gas transmission
		NO	1B2c Flaring
Mineral oil refineries	0	NO	1A1b Petroleum refining
Metal ore roasting or sintering installations	0		
		252	*1.A.2.a Iron and steel*
Production of pig iron or steel	400	246	2.C.1 Iron and steel
Production of cement clinker or lime	732	438	2.A.1 Cement Production
		NO	2.A.2 Lime production
		NE	2A3 Limestone and Dolomite Use
		NE	2A4 Soda Ash production and use
Manufacture of glass including glass fibre	222	62	2.A.7 Glass, tile and brick
Manufacture of ceramic products by firing	0		
Production of pulp, paper and board	0	NE	1A2d Pulp, paper and print
		10	ETS emissions in 1A4 Other sectors
ETS Total	**2,603**	**3,406**	**CRF Total**

Sources:

- File 'LUX-2007-2005-v2.1.xls' as part of the inventory submission to UNFCCC in 2007 and information from the NIR
- CITL downloaded on 7th July 2007

Notes:

- Estimates shown in the table for 1A2a Iron and steel and 1A2d Pulp, paper and print are not added separately to the CRF total, because they are included in 1A2 Manufacturing industries and construction. They are presented in the table for information purposes only in order to check the data consistency at a sub-source level.
- Luxembourg reported in the NAP summary table III that the ETS scheme covers a small share of emissions from 1A4 Other sectors. The estimate provided in NAP summary table II was added to the CRF total to improve the correspondence of both datasets.

10.16 Netherlands

Table 29 Comparison of verified emissions under the EU ETS for 2005 with relevant CRF source categories of the GHG inventory data for 2005 for the Netherlands

NETHERLANDS

ETS categories	Verified Emissions 2005 [Gg CO2]	GHG Inventory 2005 [Gg CO2]	Inventory category
Combustion installations	58,426	53,961	1.A.1.A Public electricity and heat production,
		27,182	1.A.2 Manufacturing industries and construction
Coke ovens	0	2,057	1.A.1.c Manufacture of solid fuels and other energy industries
		NO	1A3e Other transportation - pipeline transport
		NA	1A5a Other, stationary
		457	1B1b Solid fuel transformation
		945	1B2aii Oil refining/storage
		NO	1B2bii Gas production/processing
		0	1B2biv Gas distribution
		90	1B2c Flaring
Mineral oil refineries	12,119	11,338	1.A.b Petroleum refining
Metal ore roasting or sintering installations	0		
		4,538	*1.A.2.a Iron and steel*
Production of pig iron or steel	6,487	1,208	2.C.1 Iron and steel
Production of cement clinker or lime	644	421	2.A.1 Cement Production
		NE	2.A.2 Lime Production
		293	2.A.3 Limestone and dolimite use
		177	2A4 Soda Ash production and use
Manufacture of glass	646	253	2.A.7 Glass production
Manufacture of ceramic products	212		
Production of pulp, paper and board	1,818	*1,690*	*1.A.2.d Pulp, paper and print*
		300	ETS emissions in 1A4 Other sectors
ETS Total	**80,351**	**98,680**	**CRF Total**

Sources:

- File 'GRC-2007-2005-v1.1.xls' as part of the inventory submission to UNFCCC in 2007 and information from the NIR
- CITL downloaded on 7th July 2007

Notes:

- Estimates shown in the table for 1A2a Iron and steel and 1A2d Pulp, paper and print are not added separately to the CRF total, because they are included in 1A2 Manufacturing industries and construction. They are presented in the table for information purposes only in order to check the data consistency at a sub-source level.
- CRF category 1B2aii Oil refining/storage includes process emissions of CO_2 from a hydrogen plant of a refinery (about 0.9 Tg CO_2 per year) are reported in this category. Refinery data specifying these fugitive CO_2 Refinery data specifying these fugitive CO_2 emissions are available from 2002 onwards and re-allocated from 1A1b to 1B2a-iv for 2002 onwards.

- The fugitive CO_2 emissions from refineries are included in the combustion emissions reported in category 1A1b. In addition, the combustion emissions from exploration and production are reported under 1A1c.
- The Netherlands reported in the NAP summary table III that the ETS scheme covers a small share of emissions from 1A4 Other sectors. The estimate provided in NAP summary table II was added to the CRF total to improve the correspondence of both datasets.

10.17 Poland

Table 30 Comparison of verified emissions under the EU ETS for 2005 with relevant CRF source categories of the GHG inventory data for 2005 for Poland

POLAND

ETS categories	Verified Emissions 2005	GHG Inventory 2005	Inventory category
	[Gg CO2]		
Combustion installations	179,027	171,639	1.A.1.a Public electricity and heat production,
		37,258	1.A.2 Manufacturing industries and construction
Coke ovens	2,289	4,120	1.A.1.c Manufacture of solid fuels and other energy industries
		615	1A3e Other transportation - pipeline transport
		5,477	1A5a Other, stationary
		NE	1B1b Solid fuel transformation
		224	1B2aii Oil production/processing
		0	1B2aiil Oil transport
		9	1B2bii Gas production/processing
		0	1B2biii Gas transmission
		1	1B2biv Gas distribution
		NE	1B2c Flaring
Mineral oil refineries	3,221	4,856	1.A.b Petroleum refining
Metal ore roasting or sintering installations	0		
		7,944	*1.A.2.a Iron and steel*
Production of pig iron or steel	5,259	2,807	2.C.1 Iron and steel
Production of cement clinker or lime	10,113	5,006	2.A.1 Cement Production
		1,373	2.A.2 Lime production
		NE	2A3 Limestone and Dolomite Use
		413	2A4 Soda Ash production and use
Manufacture of glass including glass fibre	1,309	343	2A7 Glass production
Manufacture of ceramic products by firing	1,061	378	2A7 Other non-specified
Production of pulp, paper and board	224	*2,671*	*1.A.2.d Pulp, paper and print*
ETS Total	**202,502**	**234,520**	**CRF Total**

Sources:

- File 'POL-2007-2005-v1.1.xls' as part of the inventory submission to UNFCCC in 2007 and information from the NIR
- CITL downloaded on 7th July 2007

Notes:

- Estimates shown in the table for 1A2a Iron and steel and 1A2d Pulp, paper and print are not added separately to the CRF total, because they are included in 1A2 Manufacturing industries and construction. They are presented in the table for information purposes only in order to check the data consistency at a sub-source level.

10.18 Portugal

Table 31 Comparison of verified emissions under the EU ETS for 2005 with relevant CRF source categories of the GHG inventory data for 2005 for Portugal

PORTUGAL

ETS categories	Verified Emissions 2005	GHG Inventory 2005	Inventory category
	[Gg CO2]	[Gg CO2]	
Combustion installations	24,393	21,174	1.A.1.A Public electricity and heat production,
Coke ovens	0	NO	1A1c Manufacture of solid fuels and other energy industries
		10,515	1.A.2 Manufacturing industries and construction
			1A3e Other transportation - pipeline transport
		NO	1A5a Other, stationary
		NO	1B1b Solid fuel transformation
		14	1B2aiii Oil transport
		464	1B2aiv Refining/storage
		25	1B2av Distribution of oil productsRefining/storage
		107	1B2biii Gas transmission
		IE	1B2c Flaring
Mineral oil refineries	3,009	2,588	1.A.b Petroleum refining
Metal ore roasting or sintering installations	0		
		180	*1.A.2.a Iron and steel*
Production of pig iron or steel	220	12	2.C.1 Iron and steel
Production of cement clinker or lime	6,983	3,656	2.A.1 Cement Production
		458	2.A.2 Lime production
		91	2.A.3 Limestone and Dolomite Use
		IE	2A4 Soda Ash production and use
Manufacture of glass	640	173	2.A.7 Glass Production
Manufacture of ceramic products	866		
Production of pulp, paper and board	315	*1,168*	*1.A.2.d Pulp, paper and print*
		100	ETS emissions in 1A4 Other sectors
ETS Total	**36,426**	**39,378**	**CRF Total**

Sources:

- File 'GRC-2007-2005-v1.1.xls' as part of the inventory submission to UNFCCC in 2007 and information from the NIR
- CITL downloaded on 7th July 2007

Notes:

- Estimates shown in the table for 1A2a Iron and steel and 1A2d Pulp, paper and print are not added separately to the CRF total, because they are included in 1A2 Manufacturing industries and construction. They are presented in the table for information purposes only in order to check the data consistency at a sub-source level.
- CRF category 1A3e only includes emissions from agricultural machinery and was therefore not included in this comparison as these emissions do not form part of the EU ETS.
- Portugal reported in the NAP summary table III that the ETS scheme covers a small share of emissions from 1A4 Other sectors. The estimate provided in NAP

summary table II was added to the CRF total to improve the correspondence of both datasets.

10.19 Slovakia

Table 32 Comparison of verified emissions under the EU ETS for 2005 with relevant CRF source categories of the GHG inventory data for 2005 for Slovakia

SLOVAKIA

ETS categories	Verified Emissions 2005	GHG Inventory 2005	Inventory category
	[Gg CO2]	[Gg CO2]	
Combustion installations	10,499	8,219	1.A.1.A Public electricity and heat production,
		12,254	1.A.2 Manufacturing industries and construction
Coke ovens	0	1,480	1.A.1.c Manufacture of solid fuels and other energy industries
		NO	*1A3e Other transportation - pipeline transport*
		1,431	1A5a Other, stationary
		NO	*1B1b Solid fuel transformation*
		0	*1B2aii Oil production/processing*
		0	*1B2bii Gas production/processing*
		0	*1B2biii Gas transmission*
		0	1B2c Flaring
Mineral oil refineries	2,293	1,576	1.A.b Petroleum refining
Metal ore roasting or sintering installations	0		
		6,168	*1.A.2.a Iron and steel*
Production of pig iron or steel	9,120	506	2.C.1 Iron and steel
Production of cement clinker or lime	3,250	1,234	2.A.1 Cement Production
		677	2.A.2 Lime production
		471	2.A.3 Limestone and Dolomite Use
		NO	2A4 Soda Ash production and use
Manufacture of glass	140	IE	2.A.7 Glass
Manufacture of ceramic products	113		
		476	2.A.7 Other non-specified (unclear whether glass, ceramics included)
Production of pulp, paper and board	32	*620*	*1.A.2.d Pulp, paper and print*
		70	ETS emissions in 1A4 Other sectors
ETS Total	**25,446**	**28,394**	**CRF Total**

Sources:

- File 'SVK-2007-2005-v1.1.xls' as part of the inventory submission to UNFCCC in 2007 and information from the NIR
- CITL downloaded on 7th July 2007

Notes:

- Estimates shown in the table for 1A2a Iron and steel and 1A2d Pulp, paper and print are not added separately to the CRF total, because they are included in 1A2 Manufacturing industries and construction. They are presented in the table for information purposes only in order to check the data consistency at a sub-source level.
- CRF category 2A7 Other non-specified includes emissions from magnesite clinker production.
- The NIR does not include sufficient detailed information in order to specify which emissions are reported under 1A1c Manufacture of solid fuels and other energy industries and 1A5a Other Stationary.

- Slovakia reported in the NAP summary table III that the ETS scheme covers a small share of emissions from 1A4 Other sectors. The estimate provided in NAP summary table II was added to the CRF total to improve the correspondence of both datasets.

10.20 Slovenia

Table 33 *Comparison of verified emissions under the EU ETS for 2005 with relevant CRF source categories of the GHG inventory data for 2005 for Slovenia*

SLOVENIA

ETS categories	Verified Emissions 2005	GHG Inventory 2005	Inventory category
	[Gg CO2]	[Gg CO2]	
Combustion installations	6,974	6,354	1.A.1.A Public electricity and heat production,
		2,455	1.A.2 Manufacturing industries and construction
Coke ovens	0	2	1.A.1.c Manufacture of solid fuels and other energy industries
		NO	1A3e Other transportation - pipeline transport
		NA	1A5a Other, stationary
		NO	1B1b Solid fuel transformation
		NO	1B2aii Oil production/processing
		NA	1B2bii Gas production/processing
		NA	1B2biii Gas transmission
		NO	1B2c Flaring
Mineral oil refineries	0	1	1.A.b Petroleum refining
Metal ore roasting or sintering installations	0		
		207	*1.A.2.a Iron and steel*
Production of pig iron or steel	186	30	2.C.1 Iron and steel
Production of cement clinker or lime	940	498	2.A.1 Cement Production
		121	2.A.2 Lime production
		5	2.A.3 Limestone and Dolomite Use
		7	2A4 Soda Ash production and use
Manufacture of glass	65	0	2.A.7 Glass Production
Manufacture of ceramic products	82		
Production of pulp, paper and board	473	*567*	*1.A.2.d Pulp, paper and print*
ETS Total	**8,721**	**9,475**	**CRF Total**

Sources:

- File 'SVN-2007-2005-v1.2.xls' as part of the inventory submission to UNFCCC in 2007 and information from the NIR
- CITL downloaded on 7th July 2007

Notes:

- Estimates shown in the table for 1A2a Iron and steel and 1A2d Pulp, paper and print are not added separately to the CRF total, because they are included in 1A2 Manufacturing industries and construction. They are presented in the table for information purposes only in order to check the data consistency at a sub-source level.

10.21 Spain

Table 34 Comparison of verified emissions under the EU ETS for 2005 with relevant CRF source categories of the GHG inventory data for 2005 for Spain

SPAIN

ETS categories	Verified Emissions 2005	GHG Inventory 2005	Inventory category
	[Gg CO2]	[Gg CO2]	
Combustion installations	119,173	110,032	1.A.1.A Public electricity and heat production,
		71,179	1.A.2 Manufacturing industries and construction
Coke ovens	26	2,037	1.A.1.c Manufacture of solid fuels and other energy industries
		300	1A3e Other transportation - pipeline transport
		NO	1A5a Other, stationary
		90	1B1b Solid fuel transformation
		1,934	1B2aii Oil refining/ storage
		0	1B2biii Gas transmission
		0	1B2biv Gas distribution
		216	1B2c Flaring
		121	6.C Flaring in ferrous metallurgy
Mineral oil refineries	15,281	13,092	1.A.b Petroleum refining
Metal ore roasting or sintering installations	195		
Production of pig iron or steel	7,912		
		2,176	2.C.1 Iron and steel
Production of cement clinker or lime	29,253	17,141	2.A.1 Cement Production
		1,594	2.A.2 Lime production
		2,292	2.A.3 Limestone and dolimite use
		744	2.A.4 Soda Ash Production and Use
Manufacture of glass	2,572	469	2.A:7 Other
Manufacture of ceramic products	4,902		
Production of pulp, paper and board	4,307	*5,998*	*1.A.2.d Pulp, paper and print*
		340	ETS emissions in 1A4 Other sectors
ETS Total	**183,620**	**223,757**	**CRF Total**

Sources:

- File 'ESP-2007-2005-v1.3.xls' as part of the inventory submission to UNFCCC in 2007 and information from the NIR
- CITL downloaded on 7th July 2007

Notes:

- Estimates shown in the table for 1A2a Iron and steel and 1A2d Pulp, paper and print are not added to the CRF total, because they are included in 1A2 Manufacturing industries and construction. They are presented in the table for information purposes only in order to check the data consistency at a sub-source level.
- CRF category 1A1c includes solid fuel transformation plants (SNAP categories 01.04.01 to 01.04.07) and includes emissions from coke ovens and from a coal gasification plant.
- The value for 1A3e is an estimate for emissions from compressor stations for pipeline transport. CRF category 1A3e includes a significant amount of emissions

from agricultural machinery not covered by the EU ETS. The data for compressor station emissions were available separately for 2004 and the relationship of these emissions to the total 1A3e emissions was kept constant to derive the estimate included in the table above.

- CRF category 1B2aii includes emissions from catalytic cracking of crude oil, coke calcination and hydrogen production. It is not completely clear whether the Spanish installation definition for the 2005-2007 period already included these installations.
- Spain reported in the NAP summary table III that the ETS scheme covers a small share of emissions from 1A4 Other sectors. The estimate provided in NAP summary table II was added to the CRF total to improve the correspondence of both datasets.

10.22 Sweden

Table 35 Comparison of verified emissions under the EU ETS for 2005 with relevant CRF source categories of the GHG inventory data for 2005 for Sweden

SWEDEN

ETS categories	Verified Emissions 2005	GHG Inventory 2005	Inventory category
	[Gg CO2]	[Gg CO2][	
Combustion installations	7,159	8,436	1.A.1.a Public electricity and heat production
		10,403	1.A.2 Manufacturing industries and construction
Coke ovens	0	350	1.A.1.c Manufacture of solid fuels and other energy industries
		NO	1A3e Other transportation - pipeline transport
		NO	1A5a Other, stationary
		NA	1B1b Solid fuel transformation
		NO	1B2aii Oil production/processing
		NO	1B2bii Gas production/processing
		NO	1B2biii Gas transmission
		90	1B2c Flaring
Mineral oil refineries	3,249	2,399	1.A.b Petroleum refining
Metal ore roasting or sintering installations	439		
		1,186	*1.A.2.a Iron and steel*
Production of pig iron or steel	4,104	1,974	2.C.1 Iron and steel
Production of cement clinker or lime	2,118	1,341	2.A.1 Cement Production
		607	2A2 Lime production
		137	2A3 Limestone and Dolomite Use
		28	2A4 Soda Ash production and use
Manufacture of glass including glass fibre	266	IE	2.A.7 Glass
Manufacture of ceramic products by firing	36	7	2.A.7 light expanded clay aggregate???
Production of pulp, paper and board	1,954	*2,124*	*1.A.2.d Pulp, paper and print*
Other activity opted-in (Combustion)	57		
ETS Total	**19,382**	**25,771**	**CRF Total**

Sources:

- File 'SWE-2007-2005-v1.2.xls' as part of the inventory submission to UNFCCC in 2007 and information from the NIR
- CITL downloaded on 7th July 2007

Notes:

- Estimates shown in the table for 1A2a Iron and steel and 1A2d Pulp, paper and print are not added separately to the CRF total, because they are included in 1A2 Manufacturing industries and construction. They are presented in the table for information purposes only in order to check the data consistency at a sub-source level.

10.23 United Kingdom

Table 36 Comparison of verified emissions under the EU ETS for 2005 with relevant CRF source categories of the GHG inventory data for 2005 for the United Kingdom

UNITED KINGDOM

ETS categories	Verified Emissions 2005	GHG Inventory 2005	Inventory category
	[Gg CO2]	[Gg CO2]	
Combustion installations	197,687	173,071	1.A.1.A Public electricity and heat production,
		85,093	1.A.2 Manufacturing industries and construction
Coke ovens	12,180	17,990	1.A.1.c Manufacture of solid fuels and other energy industries
			1A3e Other transportation - pipeline transport
		NA	1A5a Other, stationary
		110	1B1b Solid fuel transformation
		121	1B2ai Exploration
		1,026	1B2aii Oil production/processing
		NE	1B2biii Gas transmission
		4,597	1B2c Flaring
Mineral oil refineries	18,416	18,174	1.A.1.b Petroleum refining
Metal ore roasting or sintering installations	0		
		17,866	*1.A.2.a Iron and steel*
		1,879	2.C.1 Iron and steel
Production of pig iron or steel	6,602		
		5,423	2.A.1 Cement Production
Production of cement clinker or lime	6,839	738	2.A.2 Lime production
		1,261	2.A.3 Limestone and Dolomite Use
		202	2.A.4 Soda Ash production and use
Manufacture of glass including glass fibre	392	NO	2.A.7 Glass
Manufacture of ceramic products by firing	135	129	2.A.7 Fletton brick production
Production of pulp, paper and board	230	IE	1.A.2.d Pulp, paper and print
		1,020	Energy emissions from Overseas Territories
		2,070	Energy emissions from Crown Dependencies
		18	ETS emissions in 1A4 Other sectors
ETS Total	**242,480**	**306,725**	**CRF Total**

Sources:

- File 'GBR-2007-2005-v1.4.xls' as part of the inventory submission to UNFCCC in 2007 and information from the NIR
- CITL downloaded on 7th July 2007

Notes:

- Estimates shown in the table for 1A2a Iron and steel and 1A2d Pulp, paper and print are not added separately to the CRF total, because they are included in 1A2 Manufacturing industries and construction. They are presented in the table for information purposes only in order to check the data consistency at a sub-source level.
- The UK CRF data in the energy sector include emissions from fuel combustion in Overseas Territories and Crown Dependencies which are not part of the EU. These

emissions (as specified in the NIR) have been subtracted from the total CRF emissions for the UK.

- CRF category 1A2 includes emissions from off-road vehicles and other machinery which are not part of the EU ETS, but those emissions are not provided separately and could therefore not be subtracted from the remaining emissions in this source category.
- CRF category 1A1c includes emissions from SSF Production, Coke Production Collieries, Gas Production, Gas Separation Plant (Combustion), Offshore Own Gas Use, Production of Nuclear Fuel, Town Gas Production.
- CRF category 1B1b Solid Fuel Transformation includes emissions from Coke Production (Fugitive), SSF Production (Fugitive), Flaring (Coke Oven Gas).
- CRF category 1B2aii Oil production/ processing includes emissions from offshore oil and gas production.
- CRF category 1B1b Petroleum Refining includes combustion emissions from refineries.
- The UK reported in the NAP summary table III that the ETS scheme covers a small share of emissions from 1A4 Other sectors. The estimate provided in NAP summary table II was added to the CRF total to improve the correspondence of both datasets.