

Protocol

2E3: HFC EMISSIONS DURING THE REPACKAGING OF HFCs

IPCC Category:	2E3
NFR Code:	n.a.
NOSE Code:	n.a.
NACE Code 2008	2011

FOREWORD

Under the Kyoto Protocol, the Netherlands is required to set up and maintain a national system to monitor its greenhouse gas emissions. One of the elements of this system is a transparent and verifiable description of the methods and processes used in this monitoring system. These methods must meet international guideline criteria, which have been defined by the United Nations (UN) and the European Union (EU).

The Netherlands meets the aforementioned requirement, for example, by defining a series of Monitoring Protocols, which describe the methods and work processes used to determine greenhouse gas emissions and the amounts of carbon sinks available. Protocols have been written for about 40 greenhouse gas sources or sinks. This document describes the protocol for one of these sources or sinks.

The protocols have been compiled in close collaboration with experts from various sectors of society in the Netherlands, particularly experts from the Emissions Registration (ER). The ER is a collaborative group that includes institutions such as CBS, WUR, RIVM and PBL. Until 31 December 2009 this was coordinated by PBL (Planbureau for the Leefomgeving, or the Netherlands Environmental Assessment Agency), but on 1 January 2010 this coordination task was taken over by RIVM (the Netherlands institute for public health and the environment). Other institutions that have contributed to the protocols include NL Agency; Ministry of Agriculture, Nature and Food Quality; and the Ministry of VROM (Housing, Spatial Planning and the Environment).

1. Scope and significance of emission sources/activities

1.1 Scope and definition

This protocol describes the methodology and working processes for determining HFC (hydrofluorocarbon) emissions that are released when repackaging HFCs from large to small packaging units (IPCC code: 2E3). This concerns the SBI (industrial) code 2011 (manufacture of industrial gases).

There are two companies in the Netherlands that, among their other commercial activities, also repackage HFCs from large units (e.g. containers) into smaller units (e.g. cylinders). Small amounts of HFCs can be released during this process. For example, after filling these smaller units a small residue is left behind in the coupling, which is then released when uncoupling the unit.

1.2 Significance and influences

1.2.1 Contribution to total national emissions

The emissions of HFC by repackaging of HFCs contribute less than 0.1% to the total annual greenhouse gases emitted by the Netherlands.

1.2.2 Developments that influence emissions

Goldewijk et al., 2005 reports that significant emission fluctuations have occurred over the last few years. These are explained by the large variety in handling activities. The demand occurring in one year is considerably different to that of the following years.

2. Method, emission factors and activity data

2.1 Calculation method

The method used to define emissions is country-specific (Klein Goldewijk et al., 2005). The two companies in the Netherlands use their own methods to determine these emissions.

1. The first company uses a tier 1 method to calculate emissions from repackaging HFCs (IPCC, 1997). In 1999 the company also carried out a one-time calculation of the emission factor per unpackaged ton of HFC. This led to the following formula for calculating emissions:

$$\begin{array}{c} \textit{HFC emission} \\ = \\ \textit{emission factor HFC (g/repackaged ton of HFC) * amount of repacked HFC (ton)} \end{array}$$

2. The second company uses a different calculation method, depending on the type of repackaging activities undertaken:
 - Level measurements are taken when repackaging from a bulk tank to smaller containers.
 - Emissions are determined via a ‘mass’ balance when repackaging from containers to smaller cylinders. The containers and cylinders are weighed before and after filling, with the difference being equal to the emission.

Sections 2.3 (relevant activity data) and 2.2 (emission factors) of this protocol provide additional information concerning the methods used. The methodology for determining these emissions is not specifically described in the IPCC’s Good Practice Guidance (IPCC, 2001).

2.2 Emission factors

Only the first company uses an emission factor, which is confidential and was determined by the company in 1999.

2.3 Activity data

Corporate annual environmental reports

Companies report emissions as part of their annual environmental reports, which must be submitted to the competent authority for each plant before 1 April in the year following the reporting year.

Confidential information

The first company's production data are supplied as confidential information to the VROM Milieu-Inspectie (Environmental Inspection department at the Ministry of Housing, Spatial Planning, and the Environment).

3. Working processes

Process for estimating (t-1)

If preliminary figures are required at any point, the following process is used to estimate the figure for t-1. The preliminary data for the work package leader are calculated by extrapolating them from the previous years' figures, based on prognoses for the developments in the most important activity data (taken from CBS (Statistics Netherlands) or other statistical sources).

INPUT	PROCESS	OUTPUT	BY WHOM
Preliminary data work package leader (t-1)	Include t-1 data in ER database	ER-db with (t-1) data	Work package leader
ER-db with (t-1) data	Check emission figures: compare with previous years (trend), modify if required and document everything	ER-db (t-1) with any modified figures	Task force

Process for final determination of (t-2)

The final emission figures (as described in this protocol) are calculated using the following process.

INPUT	PROCESS	OUTPUT	BY WHOM
Emission figures defined within the company	Report in AER/MJV (annual environmental report)	AER/MJV	Company
AER/MJV	Validate AER/MJV	Validated AER/MJV	Competent Authority (Province)
Validated AER/MJV	Include in FO-I file	FO-I file	FO-I (Facilitation organisation-industry)
FOI file	Checking emission figures: - Comparing MJVs with MJVs from previous years (trend) If non-substantiated deviations in MJV text found, contact the Province and/or Company → If necessary modify emission figures and document everything.	Final data Work package leader (t-2)	Work package leader
Final data Work package leader (t-2)	Include (t-2) data in ER database	ER-db with (t-2) data	Work package leader
ER-db with (t-2) data	Check, and trend analysis of air emissions: explain deviations or modify figures	Final defined emission figures (t-2)	Task forces and PBL experts

4. Uncertainty and quality

4.1 Estimating uncertainties

A Tier-1 uncertainty analysis is implemented every year before the NIR is submitted by the ER, based on the greenhouse gas inventory and in compliance with IPCC guidelines. The assumptions used and the results thereof are described in a background report to the NIR. In addition to this, where included in the QA/QC programme for the relevant period, extra analyses are implemented regularly in specific situations, which include any updating of the Tier-2 uncertainty analyses.

The Tier-2 uncertainty assessment was last updated in 2006. This assessment showed that a Tier-1 uncertainty assessment is sufficiently reliable and that Tier-2 uncertainty assessments need only be implemented at periodic intervals of around 5 years, unless a major change in an important source is sufficient to require earlier reassessment.

- Source-specific uncertainty

The uncertainty estimate-totaal concerns the root of the sum of uncertainty in the data sources used (AD_{onz}) in the square and the uncertainty of the emission factor (EF_{onz}) in the square. The extent of the total uncertainty is here primarily determined by the greatest AD or EF uncertainty.

$$\text{Uncertainty estimate}_{\text{total}} = \sqrt{EF_{onz.}^2 + AD_{onz.}^2}$$

The uncertainty estimates concerning the data sources (AD) and emission factors (EF) used, and the total uncertainty estimate, are listed in the following table [Olivier et al, 2009].

IPCC	Category	Gas	AD _{onz.}	EF _{onz.}	Uncertainty estimates _{tot}
2E	HFC by-product emissions from HFC manufacture	HFC	10	20	22

4.2 Quality assurance and quality control (QA/QC)

The ER work package leaders check that:

1. the basic data are well documented and adopted (check for typing errors, use of the correct unit sizes and correct conversion);
2. the calculations have been implemented correctly;
3. assumptions are consistent, also whether specific parameters (e.g. activity data) are used consistently;
4. complete and consistent data sets have been supplied.

Any actions that result from these checks are noted on an 'action list'. Before defining the data, supervisors check whether the relevant actions on this list, plus the QC checks, have all been completed. Defining the data is carried out by the WEM (working group on emissions monitoring), and confirmed in writing via an e-mail from the institute representatives to the ER project leader at PBL.

The work package leaders fill out a new documentation sheet when adding new data. For reasons of efficiency a minimum level has been set for obligatory documentation, i.e. 5%

changes at target group level, and 0.5% at levels concerning the national total. These documentation sheets form part of the trend analysis, as well as the eventual definition of the data set.

The ER work package leaders communicate by e-mail regarding these QC checks, results and actions. They send a printed copy to the ER secretary, who keeps a logbook and compiles these e-mails into an 'action list'. This shows explicitly that the required checks and corrections have been carried out.

4.3 Verification

In order to check the quality of the emission figures for the sources in this protocol, general QA/QC procedures have been followed that are in line with the IPCC guidelines. These are described further in the QAQC programme used by the National System, and the annual working plans published by the ER.

- Sector-specific QC

No additional specific verification procedures are implemented for the sources defined in this protocol.

4.4 Possibilities for improvement compared to the current calculation method

4.4.1 History

With respect to the history, no further changes will be made to the calculation method used.

4.4.2 Future

Not applicable

5. Remaining aspects

5.1 Point source criteria

Not applicable

5.2 Substance profiles

Not applicable

5.3 Regionalisation

Not applicable

5.4 Time-based variations in source strength

Not applicable

6. References and additional information

6.1 References

- IPCC, 1997: Revised 1996 IPCC Guidelines for National Greenhouse Gas Emission Inventories, Three volumes: Reference Manual, Reporting Guidelines and Workbook. IPCC/OECD/IEA. IPCC WG1 Technical Support Unit, Hadley Centre, Meteorological Office, Bracknell, UK

- IPCC, 2001: Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories, IPCC-TSU NGGIP, Japan
- Klein Goldewijk, K., Olivier J.G.J., Peters J.A.H.W., Coenen P.W.H.G. and Vreuls H.H.J., 2005: *Greenhouse Gas Emissions in the Netherlands 1990-2003. National Inventory Report 2005*. RIVM report 773201009. Bilthoven, the Netherlands.
- Olivier J.G.J., L.J. Brandes and R.A.B. te Molder, 2009 (in print) Uncertainty in the Netherlands' greenhouse gas emissions inventory: Estimate of annual and trend uncertainty for Dutch sources of greenhouse gas emissions using the IPCC Tier 1 approach, PBL-Report 500080013, Bilthoven

6.2 Additional information

Not applicable