

COMMISSION DECISION

of 17 December 2008

amending Decision 2007/589/EC as regards the inclusion of monitoring and reporting guidelines for emissions of nitrous oxide

(notified under document number C(2008) 8040)

(Text with EEA relevance)

(2009/73/EC)

THE COMMISSION OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Community,

Having regard to Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC⁽¹⁾, and in particular Articles 14(1) and 24(3) thereof,

Whereas:

- (1) The complete, consistent, transparent and accurate monitoring and reporting of nitrous oxide (N₂O) emissions in accordance with the guidelines laid down in this Decision are fundamental for the operation of the greenhouse gas emission allowance trading scheme (EU ETS) established by Directive 2003/87/EC in relation to installations included in the EU ETS pursuant to Article 24 of that Directive in respect of their emissions of N₂O.
- (2) The monitoring and reporting guidelines set out in the Commission Decision 2007/589/EC 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⁽²⁾ do not cover emissions of N₂O.
- (3) The Netherlands have applied to include N₂O emissions from nitric acid plants in the EU ETS for the period 2008-2012.
- (4) Specific guidelines for the determination of N₂O emissions by continuous emission measurement systems should therefore be added.
- (5) The global warming potential of 1 tonne of N₂O for emissions during the period 2008-2012 should be considered to be equivalent to 310 tonnes of carbon dioxide, which is the value provided in the Intergovernmental Panel on Climate Change's Second Assessment

Report (1995 IPCC GWP value). This value should be used in order for there to be absolute consistency between reports by installations and by Member States reporting their national emissions inventories under the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol.

- (6) Decision 2007/589/EC should therefore be amended accordingly.
- (7) The measures provided for in this Decision are in accordance with the opinion of the Climate Change Committee,

HAS ADOPTED THIS DECISION:

*Article 1***Amendments to Decision 2007/589/EC**

Decision 2007/589/EC is amended as follows:

1. in Article 1, the first paragraph is replaced by the following:

'The guidelines for the monitoring and reporting of greenhouse gas emissions from the activities listed in Annex I to Directive 2003/87/EC, and of activities included pursuant to Article 24(1) of that Directive, are set out in the Annexes to this Decision.'

2. in the Table of Annexes, the following entry is added:

'Annex XIII: Activity-specific guidelines for determination of nitrous oxide (N₂O) emissions from nitric acid, adipic acid, caprolactam, glyoxal and glyoxylic acid production';

3. Annex I is amended as set out in Part A of the Annex to this Decision;
4. Annex XIII is added as set out in Part B of the Annex to this Decision.

⁽¹⁾ OJ L 275, 25.10.2003, p. 32.

⁽²⁾ OJ L 229, 31.8.2007, p. 1.

*Article 2***Application**

This Decision shall apply from 1 January 2008.

*Article 3***Addressees**

This Decision is addressed to the Member States.

Done at Brussels, 17 December 2008.

For the Commission

Stavros DIMAS

Member of the Commission

ANNEX

A. Annex I is amended as follows:

1. Section 2 is amended as follows:

(a) the introductory part is replaced by the following:

'For the purposes of this Annex and Annexes II to XIII the definitions of Directive 2003/87/EC shall apply.';

(b) in paragraph 1, point (g) is replaced by the following:

'(g) "tier" means a specific element of a methodology for determining activity data, emission factors, annual emission, annual average hourly emission and oxidation or conversion factors.';

2. in Section 3, the second paragraph is replaced by the following:

'*Completeness.* Monitoring and reporting for an installation shall cover all process and combustion emissions from all emission sources and source streams belonging to activities listed in Annex I to Directive 2003/87/EC and other relevant activities included pursuant to Article 24 of the Directive and of all greenhouse gases specified in relation to those activities while avoiding double-counting.';

3. Section 4.3 is amended as follows:

(a) point (g) is replaced by the following:

'(g) evidence demonstrating compliance with the uncertainty thresholds for activity data and other parameters (where applicable) for the applied tiers for each source stream and/or emission source.';

(b) point (m) is replaced by the following:

'(m) a description of the procedures for data acquisition, handling activities and control activities as well as a description of the activities (see Section 10.1-3, and Annex XIII, Section 8).';

4. Section 6 is amended as follows:

(a) in Section 6.1, the first paragraph is replaced by the following:

'As set out in Section 4.2, greenhouse gas emissions may be determined by a measurement-based methodology using continuous emission measurement systems (CEMS) from all or selected emission sources using standardised or accepted methods once the operator has received approval from the competent authority before the reporting period that using a CEMS achieves greater accuracy than the calculation of emissions using the most accurate tier approach. Specific approaches for measurement-based methodologies are laid down in Annexes XII and XIII. Installations applying CEMS as part of their monitoring system are to be notified by Member States to the Commission pursuant to Article 21 of Directive 2003/87/EC.';

(b) Section 6.2 is amended as follows:

(i) the first paragraph is replaced by the following:

'The highest tier levels pursuant to Annexes XII and XIII shall be used by the operator of an installation for each emission source which is listed in the greenhouse gas emissions permit and for which relevant greenhouse gas emissions are determined by applying CEMS.';

(ii) the third paragraph is replaced by the following:

'For the reporting periods 2008–12 as a minimum Tier 2 in Annex XII for CO₂ emissions and the minimum tiers set out in Annex XIII for N₂O emissions shall be applied unless technically not feasible.';

(c) Section 6.3 is amended as follows:

(i) point (a) is replaced by the following:

‘(a) **Sampling rates**

Hourly averages (a valid hour of data) shall be computed for all elements of the emission determination (as applicable) — as laid out in Annexes XII and XIII — by using all data points available for that specific hour. In case of equipment being out of control or out of operation for part of the hour, the hourly average shall be calculated pro rata to the remaining data points for that specific hour. In case a valid hour of data cannot be computed for an element of emission determination, as less than 50 % of the maximum number of hourly data points are available, the hour is lost. For each instance where a valid hour of data cannot be computed, values for substitution according to the provisions of this Section shall be calculated.’;

(ii) the introductory part of the first paragraph of point (c) is replaced by the following:

‘Parallel to emission determination by a measurement-based methodology in accordance with Annexes XII and XIII, annual emissions of each considered GHG shall be determined by calculation based on one of the following options:’;

(iii) the fourth paragraph of point (c) is replaced by the following:

‘Where comparison with results of the calculation approach clearly indicates that results of the measurement approach are not valid, the operator shall use substitution values as described under this Section (excluding for monitoring in accordance with Annex XIII).’;

5. in Section 7.2, the introductory part of the first paragraph is replaced by the following:

‘As set out in Section 4.2, an operator can justify the use of measurement-based methodology if it reliably results in a lower uncertainty than the relevant calculation-based methodology (compare Section 4.2) or he is required to use a measurement based method in accordance with Annex XIII. In order to provide this justification to the competent authority, the operator shall report the quantitative results of a more comprehensive uncertainty analysis considering the following sources of uncertainty taking into account EN 14181:’;

6. in Section 8, the 10th paragraph is replaced by the following:

‘Emissions shall be reported as rounded tonnes of CO₂ or CO_{2(e)} (for example 1 245 978 tonnes). Activity data, emission factors and oxidation or conversion factors shall be rounded to include only significant digits both for emission calculations and reporting purposes.’;

7. Section 13.5 is amended as follows:

(a) the heading is replaced by the following:

‘13.5. REQUIREMENTS FOR DETERMINATION OF FUEL AND MATERIAL PROPERTIES, AND CONTINUOUS EMISSIONS MEASUREMENT’;

(b) Section 13.5.1 is replaced by the following:

‘13.5.1. USE OF ACCREDITED LABORATORIES

The laboratory (including other service providers) used to determine the emission factor, net calorific value, oxidation factor, carbon content, the biomass fraction, composition data or to carry out calibrations and relevant equipment assessments for CEMS should be accredited according to EN ISO 17025:2005 (General requirements for the competence of testing and calibration laboratories).’;

8. in Section 14, the following table is added:

14.7. N₂O EMISSIONS REPORTING FOR NITRIC ACID, ADIPIC ACID, CAPROLACTAM, GLYOXAL AND GLYOXYLIC ACID PLANTS

Emissions of Annex I activities — nitric acid, adipic acid etc.

Categories	IPCC CRF- Category — Process emissions	IPPC code of EPRTR Category	Monitoring method and tier applied	Tiers changed? Yes/No	Production rate t/year and t/hour	Flue gas flow uncer- tainty (annual average hourly or total annual) %	N ₂ O con- cen- tra- tion uncertainty (annual average hourly or total annual) %	Overall annual emissions uncertainty (if required) %	Annual average hourly emission uncertainty %	Emission t/yr	Annual average hourly emission (kg/hr)	GWP applied	Emissions tCO _{2(e)} and CO ₂ /yr
Activities													
Activity 1													
Activity 2													
Activity N													
Total emissions in tCO _{2(e)} and tCO ₂ per year'													

B. The following Annex XIII is added:

'ANNEX XIII

Activity-specific guidelines for determination of nitrous oxide (N₂O) emissions from nitric acid, adipic acid, caprolactam, glyoxal and glyoxylic acid production

1. BOUNDARIES AND COMPLETENESS

The activity-specific guidelines contained in this Annex shall apply to monitoring N₂O emissions occurring from the production of nitric acid, adipic acid, caprolactam, glyoxal and glyoxylic acid within relevant installations included pursuant to Article 24 of Directive 2003/87/EC.

For each activity from which N₂O emissions result, all sources emitting N₂O from production processes shall be covered, including where N₂O emissions from production are channelled through any abatement equipment. This includes:

- nitric acid production — N₂O emissions from the catalytic oxidation of ammonia and/or from the NO_x/N₂O abatement units,
- adipic acid production — N₂O emissions, including from the oxidation reaction, any direct process venting and/or any emissions control equipment,
- glyoxal and glyoxylic acid production — N₂O emissions, including from the process reactions, any direct process venting and/or any emissions control equipment,
- caprolactam production — N₂O emissions, including from the process reactions, any direct process venting and/or any emissions control equipment.

These provisions are not applicable to any N₂O emissions from combustion of fuels.

Any relevant CO₂ emissions directly associated with the production process (and not already covered under the EU ETS) that are included in the installation's greenhouse gas emission permit shall be monitored and reported in accordance with these guidelines.

Annex I, Section 16 does not apply to the monitoring of N₂O emissions.

2. DETERMINATION OF CO_{2(e)} AND N₂O EMISSIONS

2.1. ANNUAL N₂O EMISSIONS

Emissions of N₂O from nitric acid production shall be measured using continuous emissions measurement (excluding for *de minimis* sources — Section 6.3).

Emissions of N₂O from adipic acid, caprolactam, glyoxal and glyoxylic acid production shall be monitored using continuous emissions measurement for abated emissions and the calculation method (based on a mass balance approach (Section 2.6)) for temporary occurrences of unabated emissions.

Total annual N₂O emissions from the installation are the sum of annual N₂O emissions from all its emission sources.

For each emission source where continuous emissions measurement is applied, the total annual emissions are the sum of all hourly emissions using the following formula:

$$\text{N}_2\text{O emissions}_{\text{annual}} [\text{t}] = \sum [\text{N}_2\text{O conc}_{\text{hourly}} [\text{mg}/\text{Nm}^3] \times \text{flue gas flow}_{\text{hourly}} [\text{Nm}^3/\text{h}]] \times 10^{-9}$$

Where:

N₂O emissions_{annual} = total annual emissions of N₂O from the emission source in tonnes N₂O

N_2O conc_{hourly} = hourly concentrations of N_2O in mg/Nm^3 in the flue gas flow measured during operation

Flue gas flow = flue gas flow as calculated below in Nm^3/h for each hourly concentration

2.2. HOURLY N_2O EMISSIONS

Annual average hourly N_2O emissions for each source where continuous emission measurement is applied shall be calculated using the following equation:

$$N_2O \text{ emissions}_{av \text{ hourly}} [kg/h] = \frac{\sum (N_2O \text{ conc}_{hourly} [mg/Nm^3] \times \text{flue gas flow} [Nm^3/h]) \times 10^{-6}}{\text{Hours of operation [h]}}$$

Where:

N_2O emissions_{av hourly} = annual average hourly N_2O emissions in kg/h from the source

N_2O conc_{hourly} = hourly concentrations of N_2O in mg/Nm^3 in the flue gas flow measured during operation

Flue gas flow = flue gas flow as calculated below in Nm^3/h for each hourly concentration

The total uncertainty of the annual hourly average emissions for each emission source must not exceed the tier values as set out below. The highest tier approach shall be used by all operators. Only if it is shown to the satisfaction of the competent authority that the highest tier is not technically feasible or will lead to unreasonably high costs, may a next lower tier be used. For the reporting period 2008–12 as a minimum Tier 2 shall be applied unless technically not feasible.

In cases for which it is technically not feasible or would lead to unreasonable costs to apply at least Tier 1 requirements for each emission source (except *de minimis* sources), the operator shall apply and demonstrate compliance with the appropriate tier for the total annual emission for the emission source as in Section 2, Annex XII. For the reporting period 2008–12 the minimum requirement is Tier 2, unless technically not feasible. Respective installations applying this approach are to be notified by Member States to the Commission pursuant to Article 21 of Directive 2003/87/EC.

Tier 1:

For each emission source a total uncertainty of annual average hourly emissions of less than $\pm 10\%$ shall be achieved.

Tier 2:

For each emission source a total uncertainty of annual average hourly emissions of less than $\pm 7,5\%$ shall be achieved.

Tier 3:

For each emission source a total uncertainty of annual average hourly emissions of less than $\pm 5\%$ shall be achieved.

2.3. HOURLY N_2O CONCENTRATIONS

Hourly N_2O concentrations [mg/Nm^3] in the flue gas from each emission source shall be determined by continuous measurement at a representative point, after the NO_x/N_2O abatement equipment (if abatement is used).

Suitable measuring techniques include IR Spectroscopy, but others can be used in accordance with paragraph 2 of Section 6.1 of Annex I, provided they achieve the required uncertainty level for the N_2O emissions. The used techniques must be capable of measuring N_2O concentrations of all emission sources during both abated and unabated conditions (for example during periods when abatement equipment fails and concentrations increase). If uncertainties increase during such periods, these must be taken into account in the uncertainty assessment.

All measurements shall be adjusted to a dry gas basis and be reported consistently.

2.4. DETERMINATION OF FLUE GAS FLOW

The methods for monitoring flue gas flow set out in Annex XII shall be used for measuring flue gas flow for N₂O emissions monitoring.

For nitric acid production, Method A shall be applied unless it is not technically feasible, in which case an alternative method, such as a mass balance approach based on significant parameters (such as ammonia input load) or determination of flow by continuous emissions flow measurement, can be used provided it is approved by the competent authority as part of the evaluation of the monitoring plan and the monitoring methodology therein.

For other activities, other methods for monitoring flue gas flow described in Annex XII can be used, provided they are approved by the competent authority as part of the evaluation of the monitoring plan and the monitoring methodology therein.

Method A — nitric acid production

The flue gas flow shall be calculated in accordance with the following formula:

$$V_{\text{flue gas flow}} [\text{Nm}^3/\text{h}] = V_{\text{air}} \times (1 - O_{2, \text{air}}) / (1 - O_{2, \text{flue gas}})$$

Where:

V_{air} = total input air flow in Nm³/h at standard conditions;

$O_{2, \text{air}}$ = volume fraction of O₂ in dry air [= 0,2095];

$O_{2, \text{flue gas}}$ = volume fraction of O₂ in flue gas.

The V_{air} shall be calculated as the sum of all air flows entering the nitric acid production unit.

The installation shall apply the following formula, unless stated otherwise in its monitoring plan:

$$V_{\text{air}} = V_{\text{prim}} + V_{\text{sec}} + V_{\text{seal}}$$

Where:

V_{prim} = Primary input air flow in Nm³/h at standard conditions;

V_{sec} = Secondary input air flow in Nm³/h at standard conditions;

V_{seal} = Seal input air flow in Nm³/h at standard conditions.

The V_{prim} is determined by continuous flow measurement before the mixing with ammonia takes place. The V_{sec} is determined by continuous flow measurement e.g. before the heat recovery unit. The V_{seal} is the purged airflow within the nitric acid production process (if relevant).

For input air streams accounting for cumulatively less than 2,5 % of the total air flow, the competent authority may accept estimation methods for determination of this air flow rate proposed by the operator based on industry best practices.

The operator shall provide evidence through measurements under normal operation conditions that the flue gas flow measured is sufficiently homogeneous to allow for the proposed measurement method. If non-homogeneous flow is confirmed through these measurements, this must be taken into account when determining appropriate monitoring methods and when calculating the uncertainty in the N₂O emissions.

All measurements shall be adjusted to a dry gas basis and be reported consistently.

2.5. OXYGEN (O₂)

Oxygen concentrations in the flue gas shall be measured if needed for calculating the flue gas flow according to Section 2.4. Requirements described for concentration measurements within Section 6 of Annex I shall apply. Suitable measurement techniques include: paramagnetic alternating pressure, magnetic torsion balance or zirconium dioxide probe. Uncertainty of O₂ concentration measurements shall be taken into account in determining the uncertainty in the N₂O emissions.

All measurements shall be adjusted to a dry gas basis and be reported consistently.

2.6. CALCULATION OF N₂O EMISSIONS

For specific periodic, unabated emissions of N₂O from adipic acid, caprolactam, glyoxal and glyoxylic acid production (such as unabated emissions from venting for safety reasons and/or when abatement plant fails) where continuous emissions monitoring of N₂O is not technically feasible, calculation of N₂O emissions using a mass balance approach can be applied. The calculation method shall be based on the maximum potential emission rate of N₂O from the chemical reaction taking place at the time and the period of the emission. The specific calculation approach shall be approved by the competent authority as part of the evaluation of the monitoring plan and the monitoring methodology therein.

The uncertainty in any calculated emissions for a specific emission source shall be taken into account in determining the annual average hourly uncertainty for the emission source. The same tiers as for emissions measured entirely with continuous emissions measurement shall be applied to calculated emissions, or where a combination of calculation and continuous measurement are used to determine N₂O emissions.

3. CALCULATION OF ANNUAL CO₂ EQUIVALENTS (CO_{2(e)})

The total annual N₂O emissions from all emissions sources (measured in tonnes to three decimal places) shall be converted to annual CO_{2(e)} emissions (rounded tonnes) using the following formula:

$$\text{CO}_{2(e)} [\text{t}] = \text{N}_2\text{O}_{\text{annual}} [\text{t}] \times \text{GWP}_{\text{N}_2\text{O}}$$

For emissions during the period 2008–12, the Global Warming Potential $\text{GWP}_{\text{N}_2\text{O}} = 310 \text{ t CO}_{2(e)}/\text{t N}_2\text{O}$ shall be used, which is the value provided in the Intergovernmental Panel on Climate Change's Second Assessment Report (1995 IPCC GWP value).

The total annual CO_{2(e)} generated by all emission sources and any direct CO₂ emissions from other emission sources (if included in the greenhouse gas permit) shall be added to the total annual CO₂ emissions generated by the installation and shall be used for reporting and surrendering allowances.

4. DETERMINATION OF ACTIVITY PRODUCTION RATES

Production rates shall be calculated using daily production reports and hours of operation.

5. MONITORING PLAN

In addition to requirements set out in Annex I, Section 4.3(a), (b), (c), (d), (j), (k), (m) and (n), monitoring plans for installations covered by this Annex shall contain the following information:

- (a) all relevant emissions points during typical operation, and during restrictive and transition phases (e.g. breakdown periods or commissioning phases) shown in a process diagram;
- (b) the method and parameters used to determine the quantity of materials (e.g. ammonia) used in the production process and the maximum quantity of material used at full capacity;
- (c) the method and parameters used to determine the quantity of product produced as an hourly load, expressed as nitric acid (100 %), adipic acid (100 %), glyoxal and glyoxylic acid and caprolactam per hour respectively;

- (d) the method and parameters used to determine the N₂O concentration in the flue gas from each emission source, its operating range, and its uncertainty, and details of any alternative methods to be applied if concentrations fall outside the operating range and the situations when this may occur;
- (e) the method used to determine the total flue gas flow rate (expressed in Nm³ per hour) from each emission source, its operating range and its uncertainty. If derived by calculation, details for each monitored flue gas stream shall be given;
- (f) the calculation method used to determine N₂O emissions from periodic, unabated sources in adipic acid, caprolactam, glyoxal and glyoxylic acid production;
- (g) the way in which or the extent to which the installation operates with variable loads, and the manner in which the operational management is carried out;
- (h) the method and any calculation formulae used to determine the annual N₂O emissions of each emission source;
- (i) the process conditions that deviate from normal operations, an indication of the potential frequency and the duration of such conditions, as well as an indication of the volume of the N₂O emissions during the deviating process conditions (such as abatement equipment malfunction);
- (j) the assessment used to show that the tier uncertainty requirements referred in Section 2 of this Annex are complied with and the tier achieved;
- (k) the value expressed in kg/N₂O per hour which has been determined in accordance with Annex I, Sections 6.3(a) and (b) in order to be used in case the measuring instrument fails or does not function properly;
- (l) Details of any deviations from the requirements of general standards such as EN 14181 and ISO 14956:2002.

In addition to the requirements in Annex I, Section 4.3, a substantial change to the monitoring methodology as part of the monitoring plan shall be subject to the approval of the competent authority if it concerns:

- significant changes in the functioning of the installation that affect the total level of N₂O emissions, the N₂O concentration, the flow rate or other parameters of the flue gas, especially if N₂O abatement measures are installed or replaced,
- changes in the methods used to determine N₂O emissions, including changes in the continuous measurement of concentrations, oxygen concentrations and flue gas flow, or calculation method which significantly affect the total uncertainty of the emissions,
- changes in the parameters used to determine annual emissions and/or production of nitric acid, adipic acid, caprolactam, glyoxal and glyoxylic acid,
- changes in uncertainty assessment.

6. GENERAL

6.1. SAMPLING RATES

Valid hourly averages shall be calculated in accordance with Section 6.3(a) of Annex I for:

- concentration of N₂O in the flue gas,
- total flue gas flow where this is measured directly and where required,
- all gas flows and oxygen concentrations necessary to determine the total flue gas flow indirectly.

6.2. MISSING DATA

Missing data shall be dealt with in accordance with Annex I, Section 6.3(a) and (b). If missing data occur during failure of abatement equipment, it shall be assumed that emissions for that whole hour were unabated and substitute values calculated accordingly.

The operator shall take all practical steps to ensure that continuous emissions monitoring equipment is not out of operation for more than one week in any calendar year. If this occurs, the operator shall inform the competent authority immediately.

6.3. DE MINIMIS SOURCES OF N₂O

'De minimis source streams' for N₂O emission sources means one or more minor, unabated source streams selected by the operator and jointly emitting 1 000 tonnes of CO_{2(e)} or less per year, or that emit less than 20 000 tonnes of CO_{2(e)} per year and contribute less than 2 % of the total annual emissions of CO_{2(e)} of that installation.

Subject to approval by the competent authority, the operator may apply approaches for monitoring and reporting using his own no-tier estimation method for *de minimis* source streams of N₂O.

6.4. CORROBORATING CALCULATION OF EMISSIONS

Annex I, Section 6.3(c) shall apply to corroborating reported emissions of N₂O (from continuous emissions measurement and calculation) and performed using production data, the 2006 IPCC Guidelines and the approach specified in Annex I, Section 10.3.3 "Horizontal approach".

7. UNCERTAINTY ASSESSMENTS

Uncertainty assessments required to demonstrate compliance with relevant tiers in Section 2 shall be determined by means of an error propagation calculation taking into account the uncertainty of all relevant elements of the emission calculation. For the continuous measurement the following sources of uncertainty should be assessed in accordance with EN 14181 and ISO 14956:2002:

- the specified uncertainty of continuous measurement equipment, including sampling,
- uncertainties associated to the calibration, and
- additional uncertainty connected to how the monitoring equipment is used in practice.

For the calculation of the total uncertainty to be used in Section 2.2, hourly N₂O concentrations as determined pursuant to Section 2.3 shall be used. For the purpose of uncertainty calculation only, hourly N₂O concentrations below 20 mg/Nm³ shall be substituted by a default value of 20 mg/Nm³.

The operator, via the quality assurance and control process, shall manage and reduce the remaining uncertainties of the emissions data in his emissions report. During the verification process, the verifier shall check the correct application of the approved monitoring methodology, and shall assess the management and reduction of remaining uncertainties via the operator's quality assurance and control procedures.

8. CONTROL AND VERIFICATION

8.1. CONTROL

In addition to the requirements in Annex I, Sections 10.1, 10.2 and 10.3, the following quality assurance procedures shall apply:

- quality assurance of the continuous measurements of the concentration of N₂O and oxygen shall take place in accordance with EN 14181,
- the installed measurement equipment shall be calibrated by means of parallel measurements once every three years,

- where emission limit values (ELVs) are typically used as the basis for calibration of continuous emissions monitors, and where no ELV exists for N₂O or O₂, then the annual average hourly concentration shall be used as a proxy for such ELVs,
- the QAL 2 should be done with suitable reference gases in addition to the sample gas, to ensure that a wide enough calibration range is assessed,
- the measurement equipment that measures the flue gas flow volume shall be calibrated annually or when the plant is maintained, whichever is sooner. Quality assurance of flue gas flow volume does not need to be performed in accordance with EN 14181,
- if internal audits find non-compliance with EN 14181 or that recalibration has to be performed, this shall be reported to the competent authority without undue delay.

8.2. VERIFICATION

In addition to the verification requirements set out in Section 10.4, the following will be checked:

- correctness of application of requirements of the standards named under Sections 7 and 8.1 of this Annex,
- calculation approaches and results where missing data has been substituted by calculated values,
- plausibility of calculated substitute values and measured values,
- any comparative assessments corroborating emissions results and calculation based methods and the reporting of activity data, emission factors and alike.

9. REPORTING

Total annual emissions of N₂O shall be reported in tonnes to three decimal places and as CO_{2(e)} to rounded tonnes.

In addition to the reporting requirements set out in Section 8 of Annex I, operators of installations covered by this Annex shall report the following information for installations:

- (a) annual process unit operating time and total plant operating time;
 - (b) production data for each unit and the method used to determine the quantity of product;
 - (c) measurement criteria used in the quantification of each parameter;
 - (d) the uncertainty for each measured and calculated parameter (including gas concentrations, flue gas flow, calculated emissions) and the resulting total uncertainty of the hourly load and/or annual emission figure;
 - (e) details of any equipment malfunctions that affected emissions and emissions/flue gas flow measurements and calculations, including number of occasions, hours affected, duration and dates of malfunctions;
 - (f) details of when Section 6.2 of this Annex needed to be applied, including number of occasions, hours affected, calculations and substitute values used;
 - (g) the input data used in any corroborating assessments in accordance with Annex I, Sections 6.3(c) and 4.3 to check the annual N₂O emissions.'
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