COMMISSION DECISION

of 8 June 2010

amending Decision 2007/589/EC as regards the inclusion of monitoring and reporting guidelines for greenhouse gas emissions from the capture, transport and geological storage of carbon dioxide

(notified under document C(2010) 3310)

(Text with EEA relevance)

(2010/345/EU)

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

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) Directive 2003/87/EC establishes a scheme for greenhouse gas emission allowance trading within the Community (hereinafter 'the Community scheme'). Directive 2009/29/EC of the European Parliament and of the Council of 23 April 2009 amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community [2] amends Directive 2003/87/EC so as to include the capture, transport and geological storage of carbon dioxide (hereinafter 'CO_2') within the Community scheme from the year 2013 onwards.

(2) Pursuant to Article 14(1) of Directive 2003/87/EC, the Commission should adopt guidelines for monitoring and reporting of greenhouse gas emissions from activities covered by the Community scheme.

(3) Before 2013, CO_2 capture, transport and geological storage activities can be unilaterally included into the Community scheme by Member States pursuant to Article 24(1) of Directive 2003/87/EC.

(4) Article 24(3) of Directive 2003/87/EC provides the legal basis for the Commission to adopt guidelines for activities not yet covered by Annex I to the Directive.

(5) The Commission should adopt guidelines for monitoring and reporting of greenhouse gas emissions resulting from CO_2 capture, transport and geological storage activities with a view to the inclusion of these activities in the Community scheme from 2013 and their possible unilateral inclusion in the Community scheme before 2013.

(6) Commission Decision 2007/589/EC [3] should therefore be amended accordingly.

(7) The measures provided for in this Decision are in accordance with the opinion of the Climate Change Committee referred to in Article 23 of Directive 2003/87/EC,

HAS ADOPTED THIS DECISION:

Article 1

Decision 2007/589/EC is amended as follows:

1. Article 1 is replaced by the following:

'*Article 1*

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 Annexes I to XIV and XVI to XVIII to this Decision. The guidelines for the monitoring and reporting of tonne-kilometre data from aviation activities for the purpose of an application pursuant to Article 3e or 3f of Directive 2003/87/EC are set out in Annex XV.

Those guidelines are based on the principles set out in Annex IV to that Directive.'

2. The Table of Annexes is amended as follows:

(a) the entry for Annex XII is replaced by the following:

'Annex XII: Guidelines for determination of emissions or amount of transfer of greenhouse gases by continuous measurement systems';

[1] OJ L 275, 25.10.2003, p. 32.
[2] OJ L 140, 5.6.2009, p. 63.
[3] OJ L 229, 31.8.2007, p. 1.

(b) the following titles of new Annexes XVI, XVII and XVIII are added:

'Annex XVI: Activity-specific guidelines for determination of greenhouse gas emissions from CO_2 capture activities for the purpose of transport and geological storage in a storage site permitted under Directive 2009/31/EC of the European Parliament and of the Council (*).

Annex XVII: Activity-specific guidelines for determination of greenhouse gas emissions from the transport of CO_2 by pipeline for geological storage in a storage site permitted under Directive 2009/31/EC.

Annex XVIII: Activity-specific guidelines for the geological storage of CO_2 in a storage site permitted under Directive 2009/31/EC.

(*) OJ L 140, 5.6.2009, p. 114.'

3. Annex I is amended as set out in Part A of the Annex to this Decision.

4. Annex XII is replaced by the text set out in Part B of the Annex to this Decision.

5. Annex XVI is added as set out in Part C of the Annex to this Decision.

6. Annex XVII is added as set out in Part D of the Annex to this Decision.

7. Annex XVIII is added as set out in Part E of the Annex to this Decision.

Article 2

This Decision is addressed to the Member States.

Done at Brussels, 8 June 2010.

For the Commission

Connie HEDEGAARD

Member of the Commission

ANNEX

A. Annex I is amended as follows:

1. In Section 1, the words 'Annexes II to XI and XIII-XV' are replaced by the words 'Annexes II to XI and Annexes XIII to XVIII':

2. Section 2 is amended as follows:

(a) In the introductory part, the words 'Annexes II to XV' are replaced by the words 'Annexes II to XVIII'.

(b) In paragraph 3, the following point (j) is added:

'(j) 'measurement point' means the emission source for which continuous emission measurement systems (CEMS) are used for emission measurement, or the cross-section of a pipeline system for which the CO_2 flow is determined using continuous measurement systems.'

(c) The following paragraph 7 is added:

'7. The following definitions shall apply in relation to greenhouse gas emissions from greenhouse gas capture, transport and geological storage activities:

(a) "geological storage of CO_2" means "geological storage of CO_2" within the meaning of Article 3(1) of Directive 2009/31/EC;

(b) "storage site" means "storage site" within the meaning of Article 3(3) of Directive 2009/31/EC;

(c) "storage complex" means "storage complex" within the meaning of Article 3(6) of Directive 2009/31/EC;

(d) "CO_2 transport" means the transport of CO_2 by pipelines for geological storage in a storage site permitted under Directive 2009/31/EC;

(e) "transport network" means "transport network" within the meaning of Article 3(22) of Directive 2009/31/EC;

(f) "CO_2 capture" means the activity of capturing from gas streams CO_2 which would otherwise be emitted, for the purposes of transport and geological storage in a storage site permitted under Directive 2009/31/EC;

(g) "capture installation" means an installation which carries out CO_2 capture;

(h) "fugitive emissions" means irregular or unintended emissions from sources which are not localised, or too diverse or too small to be monitored individually, such as emissions from otherwise intact seals, valves, intermediate compressor stations and intermediate storage facilities;

(i) "vented emissions" means emissions deliberately released from the installation by provision of a defined point of emission;

(j) "water column" means "water column" within the meaning of Article 3(2) of Directive 2009/31/EC;

(k) "enhanced hydrocarbon recovery" means the recovery of hydrocarbons in addition to those extracted by water injection or other means;

(l) "leakage" in the context of geological storage means "leakage" within the meaning of Article 3(5) of Directive 2009/31/EC.'.

3. Section 4 is amended as follows:

(a) in Section 4.1, the following new paragraph is added after the second paragraph:

'Where leakages from a storage complex pursuant to Directive 2009/31/EC are identified and lead to emissions, or release of CO2 to the water column, they shall be included as emission sources for the respective installation and shall be monitored accordingly as required under the provisions of Annex XVIII. The leakage may be excluded as an emission source subject to approval by the competent authority, when corrective measures pursuant to Article 16 of Directive 2009/31/EC have been taken and emissions or release into the water column from that leakage can no longer be detected.'

(b) in Section 4.3, the following subparagraphs are added after the fourth paragraph:

'(o) where applicable, the location of equipment for temperature and pressure measurement in a transport network;

(p) where applicable, procedures for preventing, detecting and quantification of leakage events from transport networks;

(q) in the case of transport networks, procedures effectively ensuring that CO_2 is transferred only to installations which have a valid greenhouse gas emission permit, or where any emitted CO_2 is effectively monitored and accounted for in accordance with section 5.7 of this Annex;

(r) where CO_2 is transferred according to section 5.7 of this Annex, an identification of the receiving and transferring installations. For installations holding a greenhouse gas emissions permit, this is the installation identification code as defined by the Regulation pursuant to Article 19 of Directive 2003/87/EC;

(s) where applicable, a description of continuous measurement systems used at the points of transfer of CO_2 between installations transferring CO_2 according to section 5.7 of this Annex;

(t) where applicable, quantification approaches for emissions or CO_2 release to the water column from potential leakages as well as the applied and possibly adapted quantification approaches for actual emissions or CO_2 release to the water column from leakages, as specified in Annex XVIII.'

(c) in Section 4.3, the sixth paragraph is replaced by the following:

'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:

— a change of the categorisation of the installation as laid down in Table 1,

— a change between the calculation-based or the measurement-based methodology used to determine emissions,

— an increase of the uncertainty of the activity data or other parameters (where applicable) which implies a different tier level,

— the application or adaption of a quantification approach for emissions from leakage at storage sites.',

4. Section 5 is amended as follows:

(a) in section 5.1, under the heading 'process emissions', in the last paragraph, the words 'Annexes II to XI' are replaced by the words 'Annexes II to XI and XVI, XVII and XVIII' in the whole paragraph;

(b) in section 5.2, first sentence, the words 'Annexes II to XI and Annexes XIV and XV' are replaced by the words 'Annexes II to XI and XIV to XVIII'.

5. Section 5.7 is replaced by the following:

'5.7 TRANSFERRED CO_2

Subject to approval by the competent authority, the operator may subtract from the calculated level of emissions of the installation any CO_2 which is not emitted from the installation, but transferred out of the installation:

— as pure substance, or directly used and bound in products or as feedstock, or

— to another installation holding a greenhouse gas emissions permit, unless other requirements as set out in Annexes XVII or XVIII apply,

provided the subtraction is mirrored by a respective reduction for the activity and installation, which the respective Member State reports in its national inventory submission to the Secretariat of the United Nations Framework Convention on Climate Change. The respective amounts of CO_2 shall be reported for each installation CO_2 has been transferred to or received from as a memo item in the annual emission report of the transferring as well as the receiving installation.

In the case of transfer to another installation, the receiving installation must add to its calculated level of emissions the received CO_2, unless other requirements as set out in Annexes XVII or XVIII apply.

Respective transferring as well as receiving installations shall be notified by Member States to the Commission pursuant to Article 21 of Directive 2003/87/EC. In case of transfer to an installation falling under that Directive, the transferring installation shall identify the receiving installation in its annual emission report by stating the receiving installation's installation identification code as defined by the Regulation pursuant to Article 19 of that Directive. The receiving installation shall identify the transferring installation through the same approach.

Potential cases of transferred CO_2 out of an installation include, inter alia:

— pure CO_2 used for the carbonation of beverages,

— pure CO_2 used as dry ice for cooling purposes,

— pure CO_2 used as fire extinguishing agent, refrigerant or as laboratory gas,

— pure CO_2 used for grains disinfestations,

— pure CO_2 used as solvent in the food or chemical industry,

— CO_2 used and bound in products or feedstocks in the chemical, pulp industry (e.g. for urea or precipitated carbonates),

— carbonates bound in spray-dried absorption product (SDAP) from semi-dry scrubbing of flue gases,

— CO_2 transferred to capture installations,

— CO_2 from capture installations transferred to transport networks,

— CO_2 from transport networks transferred to storage sites.

Unless other requirements in the activity specific Annexes apply, the mass of annually transferred CO_2 or carbonate shall be determined with a maximum uncertainty of less than 1,5 % either directly by using volume or mass flow meters, weighing or indirectly from the mass of the respective product (e.g. carbonates or urea) where relevant and if appropriate.

In case the amounts of transferred CO_2 are measured both at the transferring and at the receiving installation, the amounts of respectively transferred and received CO_2 shall be identical. If the deviation between measured values is in a range, which can be explained by the uncertainty of the measurement systems, the arithmetic average of both measured values shall be used in both the transferring and receiving installations' emission reports. The emission report shall include a statement that this value has been aligned with the value of the respectively transferring or receiving installation. The measured value shall be included as memo item.

In case the deviation between the measured values cannot be explained by the uncertainty range of the measurement systems, the operators of the installations involved shall align the measured values by applying conservative adjustments (i.e. avoiding under-estimation of emissions). This alignment shall be verified by the verifiers of the transferring and receiving installations, and be subject to approval by the competent authority.

In instances, in which part of the transferred CO_2 was generated from biomass, or whenever an installation is only partially covered by Directive 2003/87/EC, the operator shall subtract only the respective fraction of mass of transferred CO_2 which originates from fossil fuels and materials in activities covered by the Directive. Respective attribution methods shall be conservative and are subject to approval by the competent authority.

In case a measurement approach is applied at the transferring installation, the total amount of transferred/received CO_2 resulting from biomass use shall be reported as a memo-item by both the transferring and receiving installation. The receiving installation shall not be required to conduct its own measurements for this purpose, but report the amount of biomass CO_2 as obtained by the transferring installation.'

6. In Section 6.3, subsection (c), paragraph 3, the words 'Annexes II to XI' are replaced by the words 'Annexes II to XI and XVI, XVII and XVIII'.

7. In Section 7.1, paragraph 5, the words 'Annexes II to XI and Annexes XIV and XV' are replaced by the words 'Annexes II to XI and XIV to XVIII'.

8. Section 8 is be amended as follows:

(a) in paragraph 5, subparagraph(6), the words 'Annexes I to XI' are replaced by the words 'Annexes I to XI and XVI, XVII and XVIII';

(b) in paragraph 5, a new subparagraph is added at the end:

'(10) where applicable, amounts of CO_2 transferred to or received from other installations, stating the installation's identification code as defined by the Regulation pursuant to Article 19 of Directive 2003/87/EC.';

(c) the following new paragraph 6 is added:

'The competent authority may allow operators of CO_2 storage sites after closure to hand in simplified emission reports containing at least the elements listed under subparagraphs (1) and (9), if the greenhouse gas emissions permit contains no emission sources.'

9. The following new paragraph shall be added at the end of Section 9:

'The following additional information shall be retained for CO_2 capture, transport and geological storage activities:

— where applicable, documentation of the amount of CO_2 injected into the storage complex by installations carrying out geological storage of CO_2,

— where applicable, representatively aggregated pressure and temperature data from a transport network,

— where applicable, a copy of the storage permit, including the approved monitoring plan, pursuant to Article 9 of Directive 2009/31/EC,

— where applicable, the reports submitted pursuant to Article 14 of Directive 2009/31/EC,

— where applicable, reports on the results of the inspections carried out pursuant to Article 15 of Directive 2009/31/EC,

— where applicable, documentation on corrective measures taken pursuant to Article 16 of Directive 2009/31/EC.'.

B. Annex XII is replaced by the following:

'ANNEX XII

Guidelines for determination of emissions or amount of transfer of greenhouse gases by continuous measurement systems

1. **BOUNDARIES AND COMPLETENESS**

The provisions of this Annex apply to emissions of greenhouse gases from all activities covered by Directive 2003/87/EC. Emissions may occur at several emission sources in an installation.

The provisions of this Annex apply furthermore to continuous measurement systems used for determination of CO_2 flows in pipelines, in particular when used for the transfer of CO_2 between installations such as for the capture, transport and geological storage of CO_2. For this purpose, the references to emissions in Sections 6 and 7.2 of Annex I shall be interpreted as references to the amount of CO_2 transferred in accordance with Section 5.7 of Annex I.

2. **DETERMINATION OF GREENHOUSE GAS EMISSIONS**

Tier 1

For each measurement point a total uncertainty of the overall emissions or CO_2 flow over the reporting period of less than ± 10 % shall be achieved.

Tier 2

For each measurement point a total uncertainty of the overall emissions or CO_2 flow over the reporting period of less than ± 7,5 % shall be achieved.

Tier 3

For each measurement point a total uncertainty of the overall emissions or CO_2 flow over the reporting period of less than ± 5 % shall be achieved.

Tier 4

For each measurement point a total uncertainty of the overall emissions or CO_2 flow over the reporting period of less than ± 2,5 % shall be achieved.

Overall approach

Total emissions of a greenhouse gas (GHG) from an emission source or the amount of CO_2 conducted through the measurement point over the reporting period shall be determined by using the formula below. In case several emission sources exist in one installation and cannot be measured as one, emissions from these emission sources shall be measured separately and summed up to the total emissions of the specific gas over the reporting period in the whole installation.

$$GHG_{-tot\ ann}\ [t] = \sum_{i=1}^{operating_hours_p.a.} GHG\text{-}concentration_i * flue\ gas\ flow_i$$

Determination of the parameters GHG-concentration and flue gas flow shall be carried out according to the provisions of Section 6 of Annex I. For measurement of transferred CO_2 in pipelines, Section 6 of Annex I shall apply as if the measurement point were an emission source, as appropriate. For such measurement points no corroborating calculation pursuant to section 6.3 subsection (c) shall be required.

GHG-concentration

The GHG-concentration in the flue gas is determined by continuous measurement at a representative point. The GHG-concentration can be measured by two approaches:

METHOD A

The concentration of GHG is measured directly.

METHOD B

For very high GHG concentrations such as in transport networks, the GHG concentration may be calculated using a mass balance, taking into account measured concentration values of all other components of the gas stream as laid down in the installation's monitoring-plan:

$$GHG\ concentration\ [\%] = 100\ \% - \sum_i Conc.\ of\ component_i\ [\%]$$

Flue gas flow

The dry flue gas flow can be determined using one of the following methods.

METHOD A

The flue gas flow Q_e is calculated by means of a mass balance approach, taking into account all significant parameters such as input material loads, input airflow, process efficiency, and on the output side the product output, the O_2 concentration, SO_2 and NO_x concentrations.

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.

METHOD B

The flue gas flow Q_e is determined by continuous flow measurement at a representative point.'

C. The following Annex XVI is added:

'ANNEX XVI

Activity-specific guidelines for determination of greenhouse gas emissions from CO_2 capture activities for the purposes of transport and geological storage in a storage site permitted under Directive 2009/31/EC of the European Parliament and of the Council

1. **BOUNDARIES AND COMPLETENESS**

The activity-specific guidelines contained in this Annex apply to the monitoring of emissions from CO_2 capture activities.

CO_2 capture can be performed either by dedicated installations receiving CO_2 by transfer from other installations, or by installations carrying out the activities emitting the CO_2 to be captured under the same greenhouse gas emissions permit. All parts of the installation related to the purpose of CO_2 capture, intermediate storage, transfer to a CO_2 transport network or to a site for geological storage of CO_2 greenhouse gas emissions shall be included in the greenhouse gas emissions permit. In case the installation carries out other activities covered by Directive 2003/87/EC, the emissions of these activities shall be monitored in accordance with the respective Annexes of these Guidelines.

2. **EMISSIONS FROM CO_2 CAPTURE ACTIVITIES**

In CO_2 capture operations potential emission sources for CO_2 include:

— CO_2 transferred to the capture installation,

— combustion and other associated activities at the installation (capture-related), i.e., fuel and input material use.

3. **QUANTIFICATION OF TRANSFERRED AND EMITTED CO_2 AMOUNTS**

3.1. INSTALLATION LEVEL QUANTIFICATION

Emissions are calculated using a complete mass-balance, taking into account the potential CO_2 emissions from all emission relevant processes at the installation as well as the amount of CO_2 captured and transferred to the transport network.

The emissions of the installation shall be calculated using the following formula:

$$E_{capture\ installation} = T_{input} + E_{without\ capture} - T_{for\ storage}$$

With:

$E_{capture\ installation}$ = Total greenhouse gas emissions of the capture installation

T_{input} = Amount of CO_2 transferred to the capture installation, determined in accordance with Annex XII and Section 5.7 of Annex I; If the operator can demonstrate to the satisfaction of the competent authority that the total CO_2 emissions of the emitting installation are transferred to the capture installation, the competent authority may allow the operator to use the emissions of the emitting installation determined pursuant to Annexes I to XII instead of using CEMS.

$E_{without\ capture}$ = Emissions of the installation if the CO_2 were not captured, i.e. the sum of the emissions from all other activities at the installation, monitored in accordance with the respective Annexes;

$T_{for\ storage}$ = Amount of CO_2 transferred to a transport network or a storage site, determined in accordance with Annex XII and section 5.7 of Annex I.

In cases, in which CO_2 capture is carried out by the same installation as the one from which the captured CO_2 originates, T_{input} is zero.

In cases of stand-alone capture installations, $E_{without\ capture}$ represents the amount of emissions that occur from other sources than the CO_2 transferred to the installation for capture, such as combustion emissions from turbines, compressors, heaters. These emissions can be determined by calculation or measurement in accordance with the appropriate activity specific Annex.

In the case of stand-alone capture installations, the installation transferring CO_2 to the capture installation shall deduct the amount T_{input} from its own emissions.

3.2. DETERMINATION OF TRANSFERRED CO_2

The amount of CO_2 transferred from and to the capture installation shall be determined in accordance with Section 5.7 of Annex I by means of CEMS carried out in accordance with Annex XII. As a minimum, Tier 4 as defined in Annex XII shall be applied. Only if it is shown to the satisfaction of the competent authority that this tier approach is technically not feasible, may a next lower tier be used for the relevant emission source.'

D. The following Annex XVII is added:

'ANNEX XVII

Activity-specific guidelines for determination of greenhouse gas emissions from the transport of CO_2 by pipelines for geological storage in a storage site permitted under Directive 2009/31/EC

1. **BOUNDARIES AND COMPLETENESS**

The boundaries for monitoring and reporting of emissions from CO_2 transport by pipeline are laid down in the transport network's greenhouse gas emissions permit, including all installations functionally connected to the transport network, including booster stations and heaters. Each transport network has as a minimum one starting point and one ending point, each connected to other installations carrying out one or more of the activities capture, transport or geological storage of CO_2. Starting and ending points can include bifurcations of the transport network and national borders. Starting and ending points as well as the installations they are connecting to, shall be laid down in the greenhouse gas emissions permit.

2. **QUANTIFICATION OF CO_2 EMISSIONS**

During the transport of CO_2 by pipeline, potential emission sources for CO_2 emissions include:

— combustion and other processes at installations functionally connected to the transport network, e.g. booster stations,

— fugitive emissions from the transport network,

— vented emissions from the transport network,

— emissions from leakage incidents in the transport network.

A transport network using Method B below shall not add to its calculated level of emissions CO_2 received from another ETS installation, and shall not subtract from its calculated level of emissions any CO_2 which is transferred to another ETS installation.

2.1. QUANTIFICATION APPROACHES

Operators of transport networks may choose one of the following approaches:

METHOD A

The emissions of the transport network are determined using a mass balance according to the following formula:

$$Emissions\ [tCO_2] = E_{ownactivity} + \sum_i T_{IN,i} - \sum_j T_{OUT,j}$$

With:

Emissions = Total CO_2 emissions of the transport network [t CO_2];

$E_{own\ activity}$ = Emissions from the transport network's own activity (i.e. not stemming from CO_2 transported), like from fuel use in booster stations, monitored in accordance with the respective Annexes of these Guidelines;

$T_{IN,i}$ = Amount of CO_2 transferred to the transport network at entry point *i*, determined in accordance with Annex XII and Section 5.7 of Annex I;

$T_{OUT,j}$ = Amount of CO_2 transferred out of the transport network at exit point *j*, determined in accordance with Annex XII and Section 5.7 of Annex I.

METHOD B

Emissions shall be calculated taking into account the potential CO_2-emissions from all emission relevant processes at the installation as well as the amount of CO_2 captured and transferred to the transport facility, using the following formula:

$$Emissions\ [tCO_2] = CO_{2\ fugitive} + CO_{2\ vented} + CO_{2\ leakage\ events} + CO_{2\ installations}$$

With:

Emissions = Total CO_2 emissions of the transport network [tCO_2];

$CO_{2\ fugitive}$ = Amount of fugitive emissions [tCO_2] from CO_2 transported in the transport network, including from seals, valves, intermediate compressor stations and intermediate storage facilities;

$CO_{2\ vented}$ = Amount of vented emissions [tCO_2] from CO_2 transported in the transport network;

$CO_{2\ leakage\ events}$ = Amount of CO_2 [tCO_2] transported in the transport network, which is emitted as the result of failure of one or more components of the transport network;

$CO_{2\ installations}$ = Amount of CO_2 [tCO_2] being emitted from combustion or other processes functionally connected to the pipeline transport in the transport network, monitored in accordance with the respective Annexes of these Guidelines.

2.2. QUANTIFICATION REQUIREMENTS

In choosing either Method A or Method B, the operator has to demonstrate to the competent authority that the chosen methodology will lead to more reliable results with lower uncertainty of the overall emissions, using best available technology and knowledge at the time of application for the greenhouse gas emissions permit, without leading to unreasonable costs. If Method B is chosen the operator shall demonstrate to the satisfaction of the competent authority that the overall uncertainty for the annual level of greenhouse gas emissions for the operator's transport network does not exceed 7,5 %.

2.2.1. SPECIAL REQUIREMENTS FOR METHOD A

The amount of CO_2 transferred from and to the transport network shall be determined in accordance with Section 5.7 of Annex I by means of CEMS carried out in accordance with Annex XII. As a minimum, Tier 4 as defined in Annex XII shall be applied. Only if it is shown to the satisfaction of the competent authority that this tier approach is technically not feasible, may a next lower tier be used for the relevant emission source.

2.2.2. SPECIAL REQUIREMENTS FOR METHOD B

2.2.2.1. *Combustion emissions*

Potential combustion emissions from fuel use shall be monitored in accordance with Annex II.

2.2.2.2. *Fugitive emissions from the transport network*

Fugitive emissions include the emissions from the following types of equipment:

— seals,

— measurement devices,

— valves,

— intermediate compressor stations,

— intermediate storage facilities.

Average emission factors *EF* (expressed in g CO_2/unit time) per piece of equipment/occurrence where fugitive emissions can be expected shall be determined by the operator at the beginning of operation, and at the latest by the end of the first reporting year in which the transport network is in operation. These factors shall be reviewed by the operator at least every 5 years in the light of the best available techniques in this field.

Overall emissions shall be calculated by multiplying the number of pieces of equipment in each category by the emission factor and adding up the results for the single categories as shown in the equation below:

$$\textit{Fugitive Emissions}\ [tCO_2] = \left(\sum_{\textit{Category}} EF[gCO_2/\textit{occurrence}] \times \textit{number of occurences}\right)/1\ 000\ 000$$

The number of occurrences is the number of pieces of the given equipment per category, multiplied by the number of time units per year.

2.2.2.3. *Emissions from leakage events*

The operator of the transport network shall provide proof of the network integrity by using representative (spatial and time-related) temperature and pressure data. If the data indicates that a leakage has occurred, the operator shall calculate the amount of CO_2 leaked with a suitable methodology documented in the monitoring plan, based on industry best practice guidelines, e.g. by using the differences in temperature and pressure data compared to integrity related average pressure and temperature values.

2.2.2.4. *Vented emissions*

The operator shall provide in the monitoring plan an analysis regarding potential situations of venting emissions, including for maintenance or emergency reasons, and provide a suitable documented methodology to calculate the amount of CO_2 vented, based on industry best practice guidelines.

2.2.2.5. *Validation of calculation result for fugitive and leaked emissions*

Given that monitoring of CO_2 transferred to and from the transport network will in any case be carried out for commercial reasons, the operator of a transport network shall use Method A for validation of the results of Method B at least once annually. In this regard, for measurement of transferred CO_2 lower tiers defined in Annex XII may be used.'

E. The following Annex XVIII is added:

'ANNEX XVIII

Activity-specific guidelines for the geological storage of CO_2 in a storage site permitted under Directive 2009/31/EC

1. **BOUNDARIES**

Boundaries for monitoring and reporting of emissions from geological storage of CO_2 shall be site-specific and shall be based on the delimitation of the storage site and storage complex as specified in the permit pursuant Directive 2009/31/EC. All emission sources from the CO_2 injection facility shall be included in the greenhouse gas emissions permit. Where leakages from the storage complex are identified and lead to emissions or release of CO_2 to the water column, they shall be included as emission sources for the respective installation until corrective measures pursuant to Article 16 of Directive 2009/31/EC have been taken and emissions or release into the water column from that leakage can no longer be detected.

2. **DETERMINATION OF CO_2 EMISSIONS**

Potential emissions sources for CO_2 emissions from the geological storage of CO_2 include:

— fuel use at booster stations and other combustion activities such as on-site power plants,

— venting at injection or at enhanced hydrocarbon recovery operations,

— fugitive emissions at injection,

— breakthrough CO_2 from enhanced hydrocarbon recovery operations,

— leakage.

A storage site shall not add to its calculated level of emissions CO_2 received from another installation, and shall not subtract from its calculated level of emissions any CO_2 which is transferred to another installation or geologically stored in the storage site.

2.1. EMISSIONS FROM FUEL USE

Combustion emissions from above ground activities shall be determined in accordance with Annex II.

2.2. VENTED AND FUGITIVE EMISSIONS FROM INJECTION

Emissions from venting and fugitive emissions shall be determined as follows:

$$CO_2 \text{ emitted } [tCO_2] = V\ CO_2\ [tCO_2] + F\ CO_2\ [tCO_2]$$

With

$V\ CO_2$ = amount of CO_2 vented

$F\ CO_2$ = amount of CO_2 from fugitive emissions

V CO_2 shall be determined by using CEMS according to Annex XII of these Guidelines. If the application of CEMS would lead to unreasonable costs, the operator may include in the monitoring plan an appropriate methodology based on industry best practice, subject to approval by the competent authority.

F CO_2 shall be considered as one source, meaning that the uncertainty requirements of Annex XII and Section 6.2 of Annex I apply to the total value and not to the individual emission points. The operator shall provide in the monitoring plan an analysis regarding potential sources of fugitive emissions, and provide a suitable documented methodology to calculate or measure the amount of F CO_2, based on industry best practice guidelines. For the determination of F CO_2 data collected pursuant to Article 13 and Annex II 1.1 (e) – (h) of Directive 2009/31/EC for the injection facility can be used, where they comply with the requirements of these Guidelines.

2.3. VENTED AND FUGITIVE EMISSIONS FROM ENHANCED HYDROCARBON RECOVERY OPERATIONS

The combination of enhanced hydrocarbon recovery (EHR) with geological storage of CO_2 is likely to provide an additional source stream of emissions, namely the breakthrough of CO_2 with the produced hydrocarbons. Additional emission sources from EHR operations include:

— the oil-gas separation units and gas recycling plant, where fugitive emissions of CO_2 could occur,

— the flare stack, where emissions might occur due to the application of continuous positive purge systems and during depressurisation of the hydrocarbon production installation,

— the CO_2 purge system, to avoid that high concentrations of CO_2 extinguish the flare.

Any fugitive emissions occurring will usually be rerouted in a gas containment system, to the flare or CO_2 purge system. Any such fugitive emissions or CO_2 vented e.g. from the CO_2 purge system shall be determined in accordance to Section 2.2 of this Annex.

Emissions from the flare stack shall be determined in accordance with Annex II, taking into account potential inherent CO_2 in the flare gas.

3. **LEAKAGE FROM THE STORAGE COMPLEX**

Monitoring shall start in the case that any leakage results in emissions or release to the water column. Emissions resulting from a release of CO_2 into the water column shall be deemed to be equal to the amount released to the water column.

Monitoring of emissions or of release into the water column from a leakage shall continue until corrective measures pursuant to Article 16 of Directive 2009/31/EC have been taken and emissions or release into the water column can no longer be detected.

Emissions and release to the water column shall be quantified as follows:

$$CO_2\ emitted\ [tCO_2] = \sum_{T_{Start}}^{T_{End}} L\ CO_2\ [tCO_2/d]$$

With

$L\ CO_2$ = mass of CO_2 emitted or released per calendar day due to the leakage. For each calendar day for which leakage is monitored it shall be calculated as the average of the mass leaked per hour [tCO2/h] multiplied by 24. The mass leaked per hour shall be determined according to the provisions in the approved monitoring plan for the storage site and the leakage. For each calendar day prior to commencement of monitoring, the mass leaked per day shall be taken to equal the mass leaked per day for the first day of monitoring.

T_{start} = the latest of:

(a) the last date when no emissions or release to the water column from the source under consideration were reported;

(b) the date the CO_2 injection started;

(c) another date such that there is evidence demonstrating to the satisfaction of the competent authority that the emission or release to the water column cannot have started before that date.

T_{end} = the date by which corrective measures pursuant to Article 16 of Directive 2009/31/EC have been taken and emissions or release to the water column can no longer be detected.

Other methods for quantification of emissions or release into the water column from leakages can be applied if approved by the competent authority on the basis of providing a higher accuracy than the above approach.

The amount of emissions leaked from the storage complex shall be quantified for each of the leakage events with a maximum overall uncertainty over the reporting period of ± 7,5 %. In case the overall uncertainty of the applied quantification approach exceeds ± 7,5 %, an adjustment shall be applied, as follows:

$$CO_{2,\ Reported}\ [tCO_2] = CO_{2,\ Quantified}\ [tCO_2] \times (1 + (Uncertainty_{System}\ [\%]/100) - 0{,}075)$$

With

$CO_{2,\ Reported}$: Amount of CO_2 to be included into the annual emission report with regards to the leakage event in question;

$CO_{2,\ Quantified}$: Amount of CO_2 determined through the used quantification approach for the leakage event in question;

$Uncertainty_{System}$: The level of uncertainty which is associated to the quantification approach used for the leakage event in question, determined according to section 7 of Annex I to these guidelines.'