DRAFT Guidance Document

The Monitoring and Reporting Regulation – Guidance on Sampling and Analysis

MRR Guidance document No. 5, Final version of 5 October 2012

This document is part of a series of documents provided by the Commission services for supporting the implementation of Commission Regulation (EU) No. 601/2012 of 21 June 2012 on the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council[1].

The guidance represents the views of the Commission services at the time of publication. It is not legally binding.

This guidance document takes into account the discussions within meetings of the informal Technical Working Group on the Monitoring and Reporting Regulation under the WGIII of the Climate Change Committee (CCC), as well as written comments received from stakeholders and experts from Member States. This guidance document was unanimously endorsed by the representatives of the Member States of the Climate Change Committee by written procedure ending on 28th of September 2012.

All guidance documents and templates can be downloaded from the Commission's website at the following address:
http://ec.europa.eu/clima/policies/ets/monitoring/index_en.htm.

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[1] **http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:181:0030:0104:EN:PDF**

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1   INTRODUCTION

1.1   About this document

This document is part of a series of guidance documents provided on specific topics of monitoring and reporting under the EU ETS. While Guidance Document No. 1 provides a general overview on monitoring and reporting of emissions from installations under the EU ETS, this document (Guidance Document No. 5) explains in more detail the requirements for laboratory analyses. It has been written to support the M&R Regulation as well as the Guidance Document No. 1, by explaining its requirements in a non-legislative language. However, it should always be remembered that the Regulation is the primary requirement.

This document interprets the Regulation regarding requirements for installations. It also builds on guidance and best practice developed during the first two phases of the EU ETS (2005 to 2007 and 2008 to 2012), in particular the experience gathered by the Member States based on the MRG 2007 including a set of guidance notes known as the ETSG[2] guidance notes developed under the framework of IMPEL.

It also takes into account the valuable input from the task force on monitoring established under the EU ETS Compliance Forum, and from the informal technical working group (TWG) of Member State experts established under the Working Group 3 of the Climate Change Committee.

1.2   How to use this document

Where article numbers are given in this document without further specification, they always refer to the M&R Regulation (MRR).

This symbol points to important hints for operators and competent authorities.

This indicator is used where significant simplifications to the general requirements of the MRR are promoted.

The light bulb symbol is used where best practices are presented.

The small installation symbol is used to guide the reader to topics which are applicable for installations with low emissions.

The tools symbol tells the reader that other documents, templates or electronic tools are available from other sources (including those still under development).

The book symbol points to examples given for the topics discussed in the surrounding text.

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[2] ETS support group

1.3   Where to find further information

All guidance documents and templates provided by the Commission on the basis of the M&R Regulation and the A&V Regulation can be downloaded from the Commission's website at the following address:

http://ec.europa.eu/clima/policies/ets/monitoring/index_en.htm

The following documents are provided[3]:

- Guidance document No. 1: "The Monitoring and Reporting Regulation – General guidance for installations". This document outlines the principles and monitoring approaches of the MRR relevant for stationary installations.
- Guidance document No. 2: "The Monitoring and Reporting Regulation – General guidance for aircraft operators". This document outlines the principles and monitoring approaches of the MRR relevant for the aviation sector. It also includes guidance on the monitoring plan templates provided by the Commission.
- Guidance document No. 3: "Biomass issues in the EU ETS": This document discusses the application of sustainability criteria for biomass, as well as the requirements of Articles 38, 39 and 53 of the MRR. This document is relevant for operators of installations as well as for aircraft operators.
- Guidance document No. 4: "Guidance on Uncertainty Assessment". This document for installations gives information on assessing the uncertainty associated with the measurement equipment used, and thus helps the operator to determine whether he can comply with specific tier requirements.
- Guidance document No. 5: "Guidance on Sampling and Analysis" (only for installations). The current document.
- Guidance document No. 6: "Data flow activities and control system". This document (applicable to installations as well as aircraft operators) discusses possibilities to describe data flow activities for monitoring in the EU ETS, the risk assessment as part of the control system, and examples of control activities.

The Commission furthermore provides the following electronic templates[4]:

- Template No. 1: Monitoring plan for the emissions of stationary installations
- Template No. 2: Monitoring plan for the emissions of aircraft operators
- Template No. 3: Monitoring plan for the tonne-kilometre data of aircraft operators
- Template No. 4: Annual emissions report of stationary installations
- Template No. 5: Annual emissions report of aircraft operators
- Template No. 6: Tonne-kilometre data report of aircraft operators

Besides these documents dedicated to the MRR, a separate set of guidance documents on the A&V Regulation is available under the same address.

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[3] This list is at the current stage non-exhaustive. Further documents may be added later.

[4] This list is at the current stage non-exhaustive. Further templates may be added later.

All EU legislation is found on EUR-Lex: **http://eur-lex.europa.eu/**

The most important legislation is furthermore listed in the Annex of this document.

Also competent authorities in the Member States may provide useful guidance on their own websites. Operators of installations should in particular check if the competent authority provides workshops, FAQs, helpdesks etc.

2 OVERVIEW

2.1 Overview of this document

> Note: This document is only relevant for installations which determine calculation factors by analyses, or – regarding the competence requirements of laboratories – apply on-line gas analysers or continuous emission measurement systems (CEMS).

This document provides an overview of the importance of sampling and analysis and how this topic is treated in the MRR. In particular, the MRR uses the term "analyses in accordance with Article 32 to 35" on several occasions where calculation factors are to be determined by analysis (usually in the context of high tier approaches). Section 2.2 provides an introduction to this topic, and explains also how those requirements relate to situations where the MRR allows the use of "industry best practice". Section 2.3 then gives a more detailed summary of the MRR's requirements for analyses.

Chapter 3 gives guidance on the requirements of Article 32 for preparing a sampling plan. Chapter 4 discussed how to determine the appropriate frequency of analyses based on Article 35.

Thereafter the requirements for laboratories used to carry out analyses for the determination of calculation factors as laid down in Article 34 are elaborated in Chapter 5. This focusses particularly on the possibilities to demonstrate equivalence to an accreditated service, if the laboratory is not accredited in accordance with EN ISO/IEC 17025.

Annex II supplements Chapters 3 and 4 by providing an example of a sampling plan template.

2.2 Calculation factors – Principles

[This section is based on section 6.2 of Guidance Document 1 (general guidance for installations). It is included here for reasons of completeness and to allow this to be read as a self-standing document.]

Calculation factors are the focus of this paper. These factors are:

- In the case of the standard methodology for combustion of fuels, or fuels used as process input: Emission factors, net calorific values, oxidation factors and biomass fractions;
- In the case of the standard methodology for process emissions (in particular decomposition of carbonates): Emission factors and conversion factors;
- For mass balances: Carbon contents and, if applicable, the biomass fractions and net calorific values.

The following formula shows how the calculation factors relate to the calculation of emissions. The example relates to the most common case, i.e. emissions from the combustion of fuels, using the standard calculation method in accordance with Article 24(1):

> **Example: Calculation-based monitoring of combustions of fuels**
>
> $$Em = AD \cdot NCV \cdot EF \cdot OF \cdot (1 - BF)$$
>
> Where:
>
> *Em*......Emissions [t CO_2]
>
> *AD*......Activity data (= fuel quantity) [t or Nm^3]
>
> **Calculation factors:**
>
> *NCV*....Net Calorific Value [TJ/t or TJ/Nm^3]
>
> *EF*......Emission factor [t CO_2/TJ, t CO_2/t or t CO_2/Nm^3]
>
> *OF*......Oxidation factor [dimensionless]
>
> *BF*......Biomass fraction [dimensionless]

According to Article 30(1) of the MRR, these factors can be determined by one of the following principles:

a. from **default values** (see section 6.2.1 of guidance document 1); or

b. by **laboratory analyses**.

The applicable tier will determine which of these options is used. Lower tiers allow for default values, i.e. for values which are kept constant throughout the years, and updated only when more accurate data becomes available. The highest tier defined for each parameter in the MRR is usually the laboratory analysis, which is more demanding, but of course more accurate. The result of the analysis is valid for the very batch from which the sample has been taken, while a default value is usually an average or conservative value determined on the basis of big quantities of that material. For example, emission factors for coal as used in national inventories might be applicable to a country-wide average of several (or even many) coal types as used also in energy statistics, while an MRR analysis will be valid for the particular batch analysed (one coal type).

Important note: In all cases the operator must ensure that activity data and all calculation factors are used consistently. Where a fuel's quantity is determined in the wet state before entering the boiler, the calculation factors must also refer to the wet state. Where analyses are carried out in the laboratory from the dry sample, the moisture must be taken into account appropriately, for arriving at calculation factors applicable for the wet material.

Operators must also be careful not to mix up parameters of inconsistent units. Where the amount of fuel is determined per volume, also the NCV and/or emission factor must refer to volume rather than mass[5].

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[5] See section 4.3.1 of guidance No. 1

2.3 General requirements for laboratory analyses

Where the MRR refers to determination "**in accordance with Article 32 to 35**", this means that a parameter must be determined by (chemical) laboratory analyses. The MRR imposes relatively strict rules for such analyses, in order to ensure a high quality level of the results. In particular, the following points need consideration:

New!

- The laboratory must demonstrate its competence. This is achieved by one of the following approaches:

  - An accreditation in accordance with EN ISO/IEC 17025, where the analysis method required is within the accreditation scope; or

  - Demonstrating that the criteria listed in Article 34(3) are satisfied. This is considered reasonably equivalent to the requirements of EN ISO/IEC 17025. Note that this approach is allowed only where use of an accredited laboratory is shown to be technically not feasible or involving unreasonable costs.

- The way samples are taken from the material or fuel to be analysed is considered crucial for receiving *representative* results. Therefore the MRR puts considerably more emphasis on this topic than the MRG 2007. Operators have to develop sampling plans in the form of written procedures (see Chapter 3) and get them approved by the competent authority. Note that this applies also where the operator does not carry out the sampling himself, but treats it as an outsourced process.

- Analytical methods usually have to follow international or national standards[6].

small

Note that the above is usually related to the highest tiers for calculation factors. Therefore, these more demanding requirements are more rarely applicable to smaller installations. In particular operators of installations with low emissions may use "any laboratory that is technically competent and able to generate technically valid results using the relevant analytical procedures, and that provides evidence for quality assurance measures as referred to in Article 34(3)". In fact, the minimum requirements would be that the laboratory demonstrates that it is technically competent and "capable of managing its personnel, procedures, documents and tasks in a reliable manner", and that it demonstrates quality assurance measures and corrective actions, if needed, for calibration and test results[7]. However, it is in the operator's interest to receive reliable results from the laboratory. Therefore operators should strive to comply with the requirements of Article 34 to the highest degree feasible.

Simplified!

Furthermore it is important to note that the MRR, in the activity specific requirements of Annex IV, allows the use of "industry best practice guidelines" for some lower tiers. In some cases this is the lowest tier where no default values are applicable. In such cases, where despite approval to apply a lower tier methodology analyses are still required, it may not be appropriate or possible to apply Articles 32 to 35 in full. However, the competent authority should deem the following as minimum requirements:

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[6] For the use of standards, Article 32(1) defines the following hierarchy: *"The operator shall ensure that any analyses, sampling, calibrations and validations for the determination of calculation factors are carried out by applying methods based on corresponding EN standards.*
Where such standards are not available, the methods shall be based on suitable ISO standards or national standards. Where no applicable published standards exist, suitable draft standards, industry best practice guidelines or other scientifically proven methodologies shall be used, limiting sampling and measurement bias."

[7] Examples for such measures are given in Article 34(3), point (j): regular participation in proficiency testing schemes, applying analytical methods to certified reference materials, or inter-comparison with an accredited laboratory.

- Where the use of an accredited laboratory is technically not feasible or would lead to unreasonable costs, the operator may use any laboratory that is technically competent and able to generate technically valid results using the relevant analytical procedures, and that provides evidence for quality assurance measures and corrective actions, if needed, as referred to in Article 34(3).
- The operator should submit a sampling plan in accordance with Article 33.
- The operator should determine the frequency of analysis in accordance with Article 35.

2.4 Procedures for analytical methods

Annex I of the MRR requires that a monitoring plan shall contain, if applicable, a list of the analytical methods to be used for the determination of all relevant calculation factors for each source streams, and a description of the written procedures for those analyses. How such procedures can be described in the monitoring plan is shown by the following example.

Example of the required MP summary for an analysis procedure:

Item according to Article 12(2)	Possible content (examples)
Title of procedure	Analysis of NCV of solid and liquid fuels.
Reference for procedure	Solid fuels: ANA 1-1/UBA; Liquid fuels: ANA 1-2/UBA; Comparison by external (accredited) laboratory: ANA 1-3/ext
Diagram reference (where applicable)	N.A.
Brief description of procedure	Bomb calorimeter method is used. Appropriate amount of sample is based on experience from earlier measurements of similar materials.
	Samples are used in dry state (dried at 120°C for at least 6h). NCV is corrected for moisture content by calculation.
	Solid fuels: as in standard. Liquid fuels: Only slightly adapted from standard; samples are not dried.
Post or department responsible for the procedure and for any data generated	Company's Laboratory - Head of department. Deputy: HSEQ manager.
Location where records are kept	Hardcopy: Laboratory Office, shelf 27/9, Folder identified "ETS 01-ANA-yyyy" (where yyyy is the current year). Electronically: "P:\ETS_MRV\labs\ETS_01-ANA-yyyy.xls"
Name of IT system used (where applicable).	Internal log of the lab (MS Access database): sample numbers and origin/name of sample are tracked together with the results.
List of EN or other standards applied (where relevant)	EN 14918:2009 with modifications for using also for non-biomass and liquid fuels.

3 SAMPLING PLAN

3.1 Introduction to sampling

"Frequency of Sampling" versus "Frequency of Analyses"

The MRR refers to "Frequency of Analyses" (see Chapter 4) in Article 35. Depending on the specific situation the resulting requirement in the approved monitoring plan for the operator may be e.g. that the minimum frequency of analyses of the emission factor of a certain source stream is four times a year.

This term "Frequency of Analyses" must not be confused with the "Frequency of Sampling", i.e. the frequency of taking samples or increments from a batch or delivery of a fuel or material. In general a lot more samples/increments than four have to be taken over the year to obtain representative results. This Chapter 3 and its sections only deal with the frequency of taking samples.

The following example should help to clarify.

Example: A coal firing plant is burning 500,000 tonnes of coal a year. In accordance with Annex VII (also see section 4.1) the operator is required as a minimum to analyse every 20,000 tonnes of coal. This will at least result in 25 different laboratory samples that are analysed each year. The main objective of the sampling plan, which also includes the frequency of sampling, is to prepare (at least) 25 laboratory samples that are representative for each of the 20,000 tonne batches. In order to have representative laboratory sample more than just one sample/increment will have to be taken from each 20,000 tonne batch.

Sampling is a very important task wherever something is to be analysed in a laboratory. It is crucial to develop and apply a reproducible methodology (the sampling plan) which ensures that the sample taken is representative of the whole batch or delivery from which the sample is taken. The sampling plan describes the overall aims and objectives; it includes specific and practical instructions on what is going to be sampled, how it will be sampled, at what frequency, what the sample will be analysed for and by whom. An appropriate sampling plan provides transparency to all users and will not only improve the reliability of the results and the level of assurance; it may also help to reduce costs for analyses and verification.

The complexity of the sampling plan will to a large extent depend on the degree of heterogeneity of the fuel or material. In general, it might be useful in complex cases to put some effort into the preparation of an elaborate sampling plan. However, it should also be noted that the use of highly heterogeneous materials is not a very common practice in EU ETS installations. Therefore few installations will have to develop sophisticated sampling plans. In many cases it may happen that sampling used for other purposes (such as quality or process control) can be used (as it is) without further adaptation, as the examples show.

The development of a sampling plan is explained in section 3.3. Sampling is more complicated the more heterogeneous the material is. For a very homogeneous material (e.g. a liquid fuel which is homogenised in a tank by stirring) a simple sample of 50 ml may well be representative for the whole 500 tonnes in the tank. At the other end of

the spectrum, some waste fractions (e.g. electronic scrap) may consist of items each beyond 50kg mass, while a laboratory analysis usually needs only samples of some grams or even in some cases micrograms (µg).

The aim of every sampling exercise is that the final sample in the laboratory is as representative of the whole delivery period or batch of fuel or material as possible. It is a statistical exercise to determine how many "increments" (smaller samples which are combined into a bigger sample) must be picked from a batch, and how big the increments must be, in order to obtain a reasonably representative "composite sample". The increments must be considerably bigger than the particle size, and the locations of sampling should be spread over the whole area to be sampled. The number of increments must be high enough to allow a meaningful average.

Example 1: An installation is burning clay delivered by storage tanks on trucks. To determine the properties of this source stream, e.g. the EF, of each delivery is sampled and treated according to industry best practise.

Example 2: A power plant is firing coal. Sampling is done by an automatic sampler from the onsite coal stockpile.

In both examples, the provision of a written procedure for the sampling plan may well be an exercise of documenting what is already being done in the past rather than implementing any new process steps.

Example 3: A cement clinker producing installation is exclusively firing petcoke. The operator intends to additionally burn waste tyres and other solid recovered fuels.

In this case the operator is well advised to carefully study relevant standard documents (see below) to prepare a transparent sampling plan accompanied by the underpinning procedure. The accredited laboratory that will be engaged for the analyses may also be consulted for the purpose of preparing an appropriate sampling approach.

Example:

Figure 1 shows a population that consists of a physical mixture of two components that are different in the one material property of interest (indicated by the two different colours), e.g. the NCV. The average value of the property of the population is of interest. It is assumed that only increments sizes of 2x2 boxes (bold frames) can be taken.

This example should help the understanding that even rather simple cases require some effort to prepare an appropriate sampling plan providing representative results after analyses.

Although in the population there are as many green boxes as red ones, not every 2x2 increment will contain the same number of green and red ones. Due to this problem where, in practice, the material may not show visible differences, one of the main tasks of a sampling plan would be to determine the number of increments necessary to obtain sufficiently representative overall results (i.e. to have an equal number of green and red boxes for analysis).
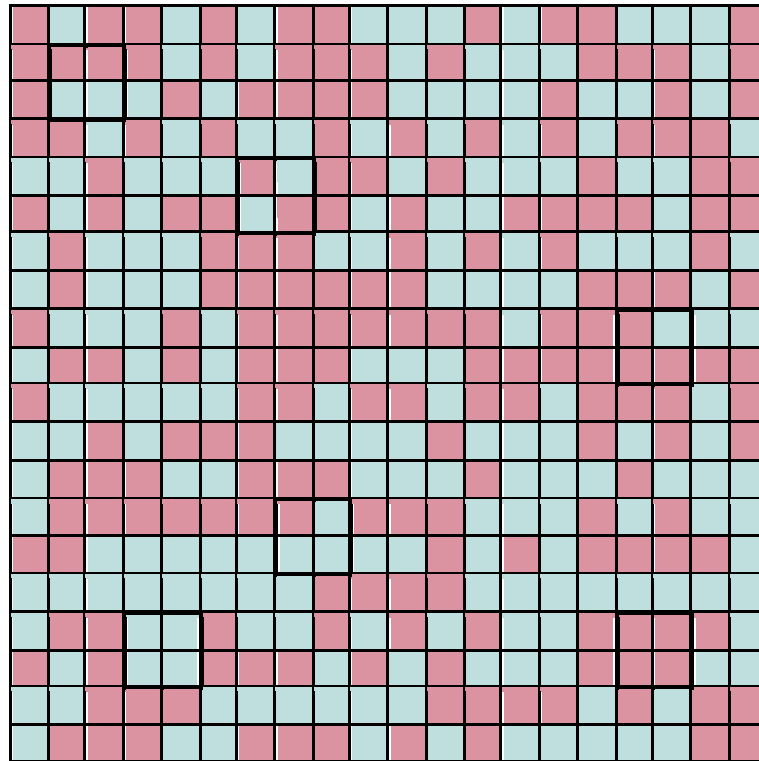
Figure 1:   *Example of a random two-component mixture with highly uniform particle size distribution. The bold squares illustrate possible samples to be taken.*

Furthermore, sampling often requires several consecutive steps of picking increments from a pile, mixing these to a new sample, reducing the particle size, taking new (smaller) samples, mixing again and reducing the size etc., until a final laboratory sample can be obtained. As indicated at the beginning, this process needs more effort the more heterogeneous a material is and the bigger the individual particles are. Figure 2 shows an example of a flow chart to help understand the role of sampling in the determination of calculation factors. Figure 3 shows a more detailed example of a sampling plan.

Truck deliveries in the reporting period

Process steps within the boundaries of the sampling plan

(Composite) sample: e.g. increment or sample taken from every truck delivery (1 g to 100 kg scale)

Storage, mixing, sub-sampling, (particle size reduction) and homogenisation of the samples in installation's own laboratory

Mixed samples: combined samples from several different trucks and from different points in time

Transfer to accredited laboratory

Sample in accredited laboratory

Final (sub)-sample : e.g. laboratory sample analysed on the analytical device (μg to mg scale)
→ the (weighted) average of all analytical values in the reporting period will be used for the determination of the calculation factor
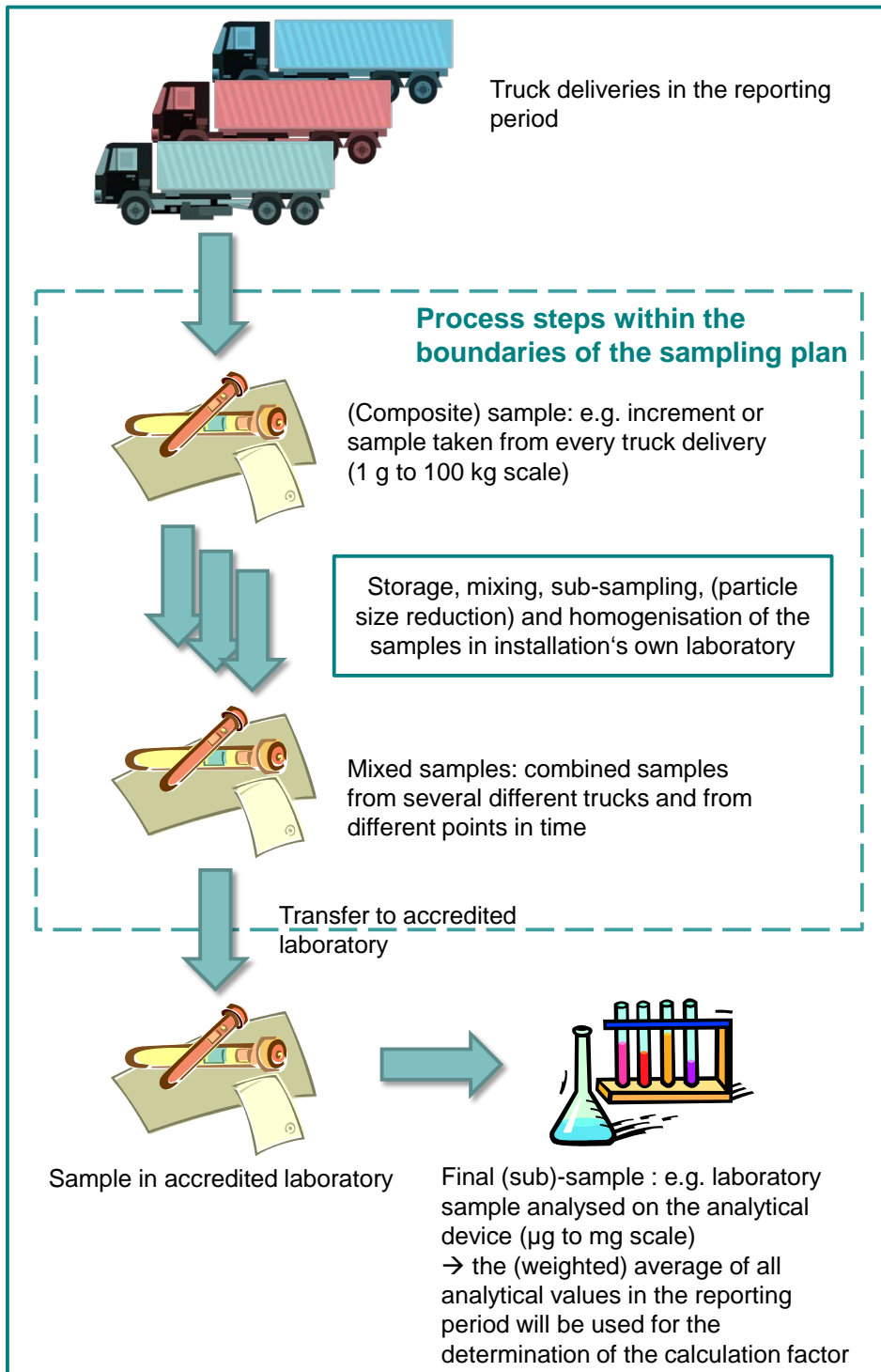
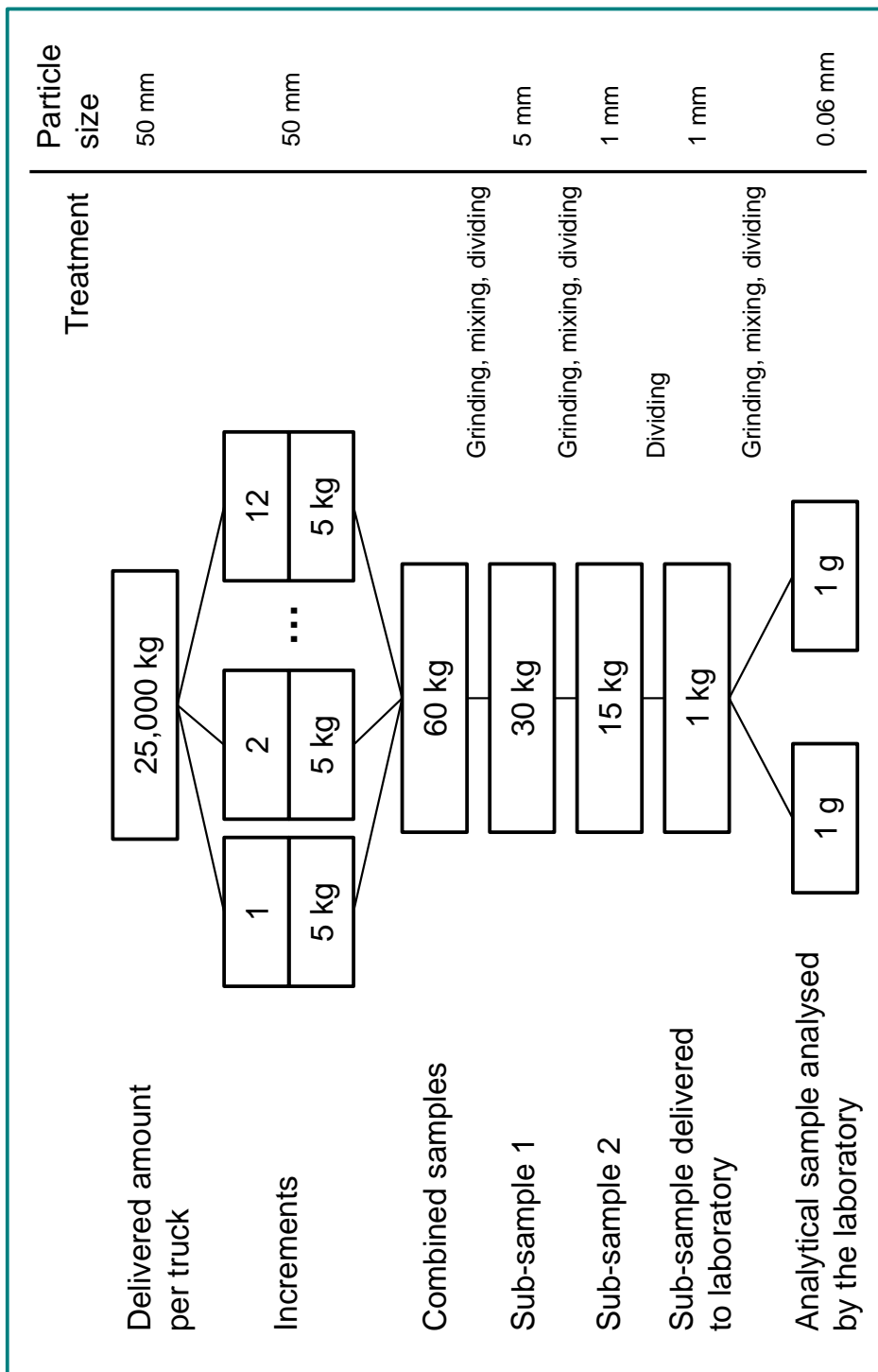*Figure 2:   Example of a flow sheet for sampling and analyses*

Figure 3.   *Example of a sampling plan flow sheet for the determination of the carbonate content of clay*

Generally all standards containing provisions for preparing sampling plans are suitable, in particular those related to the specific type of source stream e.g. coal. The following standards and technical reports may be considered when preparing a sampling plan, in particular for more complex cases:

EN 932-1: Tests for general properties of aggregates - Part 1: Methods for sampling

EN ISO 10715: Natural gas - Sampling guidelines

ISO 13909-2: Hard coal and coke -- Mechanical sampling -- Part 2: Coal -- Sampling from moving streams

EN 14899: Characterization of waste – Sampling of waste materials – Framework for the preparation and application of a Sampling Plan

CEN/TR 15310: Characterization of waste – Sampling of waste materials This technical report consisting of five parts assists and supplements EN 14899

EN 15442: Solid recovered fuels – Methods for sampling

EN 15443: Solid recovered fuels – Methods for laboratory sample preparation

EN 14778: Solid biofuels - Sampling

Some of these standards and technical reports focus on waste materials. However, solid waste materials are often very heterogeneous. Therefore the approaches for preparing a sampling plan related to waste materials presented in the standards and technical reports can be considered to cover even the most complex non-waste cases as well. In the absence of a suitable standard for the specific fuel, considerable simplifications may be possible if the fuel or material is more homogeneous.

In some cases analytical results may show that the heterogeneity of the fuel or material significantly deviates from the information on heterogeneity on which the original sampling plan for that specific fuel or material has been based. In such cases Article 33(2) requires the operator to adapt the relevant elements of the sampling plan. Those adaptations shall be in agreement with the laboratory carrying out the analysis for the respective fuel or material (see Chapter 5) and subject to the approval of the competent authority.

An example for a sampling plan template can be found in Annex II.

3.2 Sampling plan requirements of the MRR

For putting the above into practice in a practical and consistent manner, Article 33 requires the operator to submit a sampling plan to the competent authority for approval for each fuel or material for which calculation factors are to be determined by analyses. If only tiers using default values or purchasing records are applied for the determination of calculation factors, this requirement (and consequently this guidance document) is not relevant.

The sampling plan shall be in form of a written procedure containing the following information:

- Methodologies for the preparation of samples
- Responsibilities
- Locations
- Frequencies
- Quantities
- Methodology for the storage and transport of samples.

Furthermore, the MRR contains provisions that the sampling plan has to be updated regularly if any changes of source streams or of the properties of source streams occur over time. This is achieved by requiring that the operator puts in place a procedure attached to the monitoring plan related to the revision of the appropriateness of the sampling plan.

The ultimate goal of a sampling plan in the MRR is to ensure that samples analysed are representative for the relevant batches and that the cumulated results of analytical values thereof allow the determination of representative calculation factors, e.g. that sampling and analysis of the carbon content[8] of a source stream is representative for that material over the whole reporting period.

In many cases the requirement to have sampling plan and an underpinning procedure in place does not impose any additional requirements to current practice at the installation. In any case the MRR requires that relevant elements of the sampling plan shall be agreed with the laboratory carrying out the analysis for the respective fuel or material, and evidence of that agreement shall be included in the sampling plan. This is in particular relevant in cases of rather heterogeneous material having properties that vary spatially and temporally.

In some cases sampling itself may be carried out by a third party, e.g. the fuel/material supplier. In such a case it is still the operator's responsibility to demonstrate compliance with the requirements in the MRR for sampling plans. This may be achieved by obtaining information and evidence about the sampling plan by the third party. In any event the operator is responsible for correct sampling defined in an appropriate sampling plan in accordance with Article 33 regardless whether sampling or analysis is carried out by the operator or by third parties.

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[8] As pointed out in section 4.3.2 of Guidance document No. 1, the emission factor is based on the carbon content of a fuel or material. Carbon content is the primary object of analysis.

Example for a relatively simple sampling plan procedure:

Item according to Article 12(2)	Possible content (examples)
Title of the procedure	Sampling Plan for waste oil
Traceable and verifiable reference for identification of the procedure	ETS 01-SP
Post or department responsible for implementing the procedure and the post or department responsible for the management of the related data (if different)	Head of the waste department of the installation's laboratory [9]
Brief description of the procedure [10]	• 1000 ml samples are taken from each truck's storage tank (about 250 trucks a year) • Responsible person makes arrangement that sampling is supervised (weekly spot checks) by the responsible shift manager or a representative nominated by the manager. • Samples are collected in tight bottles clearly marked with date and time, fuel supplier ID, and name of the person who took the sample. • Samples are stored in room LA-007 of the laboratory (at room temperature). • When 10 samples have been collected, they are mixed and homogenised to give "a composite sample". This results in approximately 6 composite samples each quarter. • Once per quarter the composite samples are sent to the accredited laboratory identified in the Monitoring plan.
Location of relevant records and information	Hardcopy: Laboratory Storage Room, shelf 27/9, Folder identified "ETS 01-SP". Electronically: "P:\ETS_MRV\Analyses\ETS_01-SP.xls"
Name of the computerised system used, where applicable	N.A. (Normal network drives)
List of EN standards or other standards applied, where relevant	EN 14899

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[9] Note that this is the installation's own laboratory and not the accredited laboratory used to carry out the analyses.

[10] This description is required to be sufficient dear to allow the operator, the competent authority and the verifier to understand the essential parameters and operations performed.

3.3 Preparing a sampling plan

The following section outlines a step-by-step approach for preparing a sampling plan, including a brief description of the steps. This approach is taken from CEN/TR 15310-1.

1. **Specify the objective of the Testing Programme**

   This should be a general statement on the overall purpose and this is an essential first step. However, it will usually be at a rather high-level and too non-specific to lead directly to detailed instructions for a sampling plan.

   In most cases this objective will simply be something like "to determine the average carbon content" or "to determine the average emission factor of a material over the whole reporting period"

2. **Develop the Technical Goals from the objective**

   (a) Define the population to be sampled

   Population is a statistical term for defining the total volume of material about which information is required through sampling. This should be one of the first steps. In the most general case the population will refer to the total amount of material or fuel consumed within a reporting period. Sub-populations may, for example, be defined as single batches (e.g. each delivery, or as a volume as given by the analysis frequency in Annex VII of the MRR) or as fuel consumed each month in case of a continuous source stream.

   (b) Assess variability
   Variability can be distinguished between

   - Spatial variability
     This term refers to the heterogeneity of a material depending on the location, e.g. the heterogeneity within one single batch

   - Temporal variability
     This term takes into account changes of properties over time, e.g. the variability of the net calorific values between a batch consumed in March and a batch consumed in November

   (c) Select the sampling approach
   This can be distinguished between

   - Probabilistic sampling
     This means that each element within the population to be assessed has an equal chance of being selected. This approach is therefore preferable to obtain representative results and eliminates one source for committing systematic errors.

   - Judgmental sampling
     Due to practical or costs reasons a probabilistic sampling is not always possible. Judgmental sampling will result in sampling sub-populations, e.g. due to technical reasons only samples from the top of a storage tank are being taken.

   (d) Identify the scale
   The scale defines the minimum quantity of material below which variations are judged to be unimportant.

   (e) Choose the required statistical approach
   The relevant statistical parameters will be the mean values as well as the

standard deviation. Although only the mean value over the whole reporting value is to be reported and no specific uncertainty thresholds are mentioned in the MRR for those mean values, the deviation provides information about the appropriateness of the sampling plan to improve the level of assurance.

(f) Choose the desired reliability

Reliability refers to "bias", "precision" and "confidence". Choices must be made on the confidence level, and to the extent that random and systematic errors in sampling can be minimised.

3. Determine the practical instructions

(a) Choose the sampling pattern

The sampling pattern defines when, where and how samples are selected.

(b) Determine the increment/sample size

An increment is the amount of material that is obtained through one single sampling action. It is not analysed as an individual unit, but is combined with other increments to form a composite sample. A simple "sample" is defined as a lot that is analysed individually.

The increment/sample size should depend on properties like heterogeneity or particle size.

(c) Determine the use of composite or individual samples

This selection depends *inter alia* on costs and the statistical parameter. As in general the mean value will be of particular interest, usually composite samples will be used

4. Determine required number of samples

This is a statistical exercise taking into account any standard deviations between increments, samples, composites etc. This point is relevant for the reliability of results but also for cost-efficiency.

After all relevant decisions have been made the sampling plan can be put down on paper. At least the following elements should be covered:

● Who is responsible for each step?

● Where and when are samples taken?

● How are the samples taken? E.g. it might be necessary to first clean pipes where residues from previous samples might still be contained, etc.

● Which instruments are used, if relevant? Describe automatic sampling equipment, but also describe the tools for manual sampling. It might also be important how samples can be picked out from sufficiently deep in a pile of several metres height.

● How will the identity of the samples be ensured?

● How are the samples stored (dry, cool, dark, inert atmosphere, etc.)?

● How and when are increments combined?

● When are the samples analysed, are remaining samples stored after analysis, etc.?

As further help for the development of a sampling plan, the Annex of this document contains an example of a template for a sampling plan.

4 FREQUENCY OF ANALYSIS

According to Article 35 the operator has to consider the following options when determining the minimum frequency of analyses:

● Applying the minimum frequency for relevant fuels and materials listed in Annex VII of the MRR (see Table 1 in section 4.1);
● Analysis frequencies different from those listed in that table may be allowed where the operator demonstrates one of the following:
  ● Based on historical data, any variation in the analytical values for the respective fuel or material does not exceed 1/3 of the uncertainty value to which the operator has to adhere with regard to the activity data determination of the relevant fuel or material (see section 4.2)
  ● Applying the minimum frequency listed in Table 1 would incur unreasonable cost (see section 4.3)

4.1 Minimum frequency of analyses (Annex VII of the MRR)

Table 1 lists the minimum frequency of analyses for relevant fuels and materials as laid down in Annex VII of the MRR.

Table 1:   Minimum frequency of analyses

Fuel/material	Minimum Frequency of Analyses
Natural gas	At least weekly
Process gas (refinery mixed gas, coke oven gas, blast-furnace gas and convertor gas)	At least daily - using appropriate procedures at different parts of the day
Fuel oil	Every 20,000 tonnes and at least six times a year
Coal, coking coal, petroleum coke	Every 20,000 tonnes and at least six times a year
Solid waste (pure fossil or mixed biomass fossil)	Every 5,000 tonnes and at least four times a year
Liquid waste	Every 10,000 tonnes and at least four times a year
Carbonate minerals (including limestone and dolomite)	Every 50,000 tonnes and at least four times a year
Clays and shales	Amounts of material corresponding to 50,000 tonnes of CO_2 and at least four times a year
Other input and output streams in the mass balance (not applicable for fuels or reducing agents)	Every 20,000 tonne and at least once every month
Other materials	Depending on the type of material and the variation, amounts of material corresponding to 50,000 tonnes of CO_2 and at least four times a year

4.2 The "1/3" rule

An operator may apply a different frequency to that listed in Table 1 (see section 4.1) if any variation in the analytical values for the respective fuel or material does not exceed 1/3 of the uncertainty value to which the operator has to adhere with regard to the activity data determination of the relevant fuel or material. The determination of this variation has to be based on historical data, including analytical values for the respective fuels or materials in the reporting period immediately preceding the current reporting period.

Any variation in the analytical value may be determined as the overall uncertainty of uncorrelated input quantities (see Annex III of Guidance Document 4 on Uncertainty):

$$u_{\text{total}} = \frac{\sqrt{(u_1 \cdot x_1)^2 + (u_2 \cdot x_2)^2 + ... + (u_n \cdot x_n)^2}}{\left| x_1 + x_2 + ... + x_n \right|}$$

where:

u_i .... relative uncertainty of the analytic value of sample i

x_i .... sample size of sample i

Under the assumptions that the uncertainty of the analytic value of each sample is the same and all sample sizes are similar, the formula simplifies to:

$$u_{\text{total}} = u_i \cdot \frac{\sqrt{n}}{n} = \frac{u_i}{\sqrt{n}}$$

where:

n .... number of samples

If the total uncertainty related to the analytic values is known (in most cases it is a direct result of the standard deviation of the analytical values) the required minimum number of samples can be determined as:

$$n = \frac{u_i^2}{u_{\text{total}}^2}$$

This approach has been successfully implemented in an Excel based tool as part of the ETSG guidance notes, provided by the Netherlands. It can be downloaded from **http://ec.europa.eu/clima/policies/ets/monitoring/documentation_en.htm**

Example:

A category B installation is burning heavy fuel oil. In the monitoring plan the heavy fuel oil is listed as a major source stream to be monitored by a calculation-based approach. The MRR (and approved monitoring plan) requires it to meet tier 4 (±1.5%) for activity data and to determine the calculation factors emission factor (EF) and net calorific value (NCV) by laboratory analyses in accordance with Articles 32 to 35. The "1/3" rule requires that the uncertainty related to the determination of the calculation factors does not exceed 0.5% (This u_{total} is the input parameter for determining the number of samples).

Table 1 (see section 4.1) would require analysing at least six times a year. From historic analyses the operator demonstrates that the uncertainty related to the determination of the NCV is 1.00%. The following table displays the results from historic samples.

# of sample	NCV [GJ/t]
1	42,28
2	42,41
3	42,35
4	42,68
5	42,44
6	42,4
7	42,68
8	42,6
9	42,02
10	42,33
11	42,41
12	42,2
average	42.4
Uncertainty u_i	1.00%

The uncertainty is determined as the standard deviation of the data series (0.45%) multiplied by the Student t-factor for 12 values and a 95% confidence interval (=2.201). The application of this factor is required because uncertainty as defined in Article 3(6)[11] always refers to a confidence interval of 95%. The minimum frequency of analysis to meet the requirements of the "1/3" rule is then calculated by:

$$n = \frac{1.0\%^2}{0.5\%^2} = 4$$

Therefore, in this case, the operator may be allowed to apply a lower frequency of analysis of four times per year instead of six times for NCV determination. For the emission factor a similar test can be carried out whether these requirements are fulfilled with 4 samples per year as well.

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[11] Article 3(6): 'uncertainty' means a parameter, associated with the result of the determination of a quantity, that characterises the dispersion of the values that could reasonably be attributed to the particular quantity, including the effects of systematic as well as of random factors, expressed in per cent, and describes a confidence interval around the mean value comprising 95% of inferred values taking into account any asymmetry of the distribution of values;

4.3   Incurrence of unreasonable costs

An operator is also allowed to deviate from applying the minimum requirements for frequency of analyses in Table 1 (see section 4.1) or applying minimum frequency of analyses resulting from the "1/3" rule if he can demonstrate they would incur unreasonable costs.

Article 18(1) defines costs as unreasonable if they exceed the benefit. The benefit shall be calculated by multiplying an improvement factor with a reference price of 20 euro per allowance and costs shall include an appropriate depreciation period for the economic lifetime of the equipment. Article 18(3) defines this improvement factor as 1% of the average annual emissions of the respective source streams of the three most recent reporting periods. For further guidance on unreasonable costs, please see section 4.6.1 of Guidance Document 1 (General Guidance for Installations).

Example: The heavy fuel oil source stream above emits about 40,000 tonnes of CO_2 annually. The costs for the analyses have to exceed the benefit in order to be regarded as unreasonable. If the costs are lower they are not unreasonable:

$$C < P \cdot AEm \cdot IF$$

where:

C .... Costs [€/year]

P .... specified allowance price = 20 €/ t $CO_{2(e)}$

AEm .... Average emissions from related source stream(s) [t $CO_{2(e)}$/year]

IF .... improvement factor = 1%

It is assumed that one analysis costs 1,000 € As the benefits are 8,000 €/ year (20 x 40,000 x 1%) the costs for six analyses per year cannot be regarded as unreasonable.

5 LABORATORIES

Pursuant to Article 34 all analyses for the determination of calculation factors shall be carried out by laboratories that are accredited for the relevant analytical methods in accordance with EN ISO/IEC 17025. However, operators may deviate from this requirement if it can be demonstrated to the satisfaction of the competent authority that access to accredited laboratories is technically not feasible or would incur unreasonable costs. In this case also non-accredited laboratories may be used provided that they meet the requirements listed in Article 34(3). Those requirements are considered appropriate to demonstrate competence equivalent to accreditation in accordance with EN ISO/IEC 17025.

The equivalent requirements concern the quality management and technical competence of the laboratory, and should be demonstrated in form of procedures attached to the monitoring plan.

With respect to **quality management**, the operator may demonstrate the competence by an accredited certification of the laboratory in conformity with EN ISO/IEC 9001, or other certified quality management systems that cover the laboratory. In the absence of such certified quality management systems, the operator shall provide other appropriate evidence that the laboratory is capable of managing in a reliable manner its

- personnel,
- procedures,
- documents and
- tasks.

With respect to **technical competence**, the operator shall provide evidence that the laboratory is competent and able to generate technically valid results using the relevant analytical procedures. Article 34(3) lists the topics on which evidence is to be provided. Table 2 lists elements which the competent authority should take into account when assessing an operator's proposed evidence on the laboratory he uses.

Simplified!

Note: Article 47(7) allows operators of installations with low emissions to use any laboratory to determine calculation factors by analyses that is technically competent and able to generate technically valid results using the relevant analytical procedures. Evidence only needs to be provided for the quality assurance measures referred to in point j of Table 2.

Table 2: Elements for demonstrating equivalent technical competence to an accreditation for laboratories

Element of Article 34(3), on which competence needs to be demonstrated	Important elements for the competent authority to assess (non-exhaustive)
(a) Management of the personnel's competence for the specific tasks assigned	- Is the personnel executing the sampling and analysis authorised for their job by the management? - Can the competence of the personnel be proven by records of their education, training and experience? - Is an adequate procedure for training and supervision of personnel implemented (especially for new personnel)?

Element of Article 34(3), on which competence needs to be demonstrated	Important elements for the competent authority to assess (non-exhaustive)
(b) suitability of accommodation and environmental conditions	• Is the building and the laboratory area sufficiently heated / air-conditioned, safe, secure and clean for the purpose? • Is access to and use of areas affecting the quality of the tests and/or calibrations controlled and are measures taken to ensure good housekeeping? • Are environmental conditions monitored, controlled and recorded, and tests and calibrations stopped when the environmental conditions jeopardise the results?
(c) selection of analytical methods and relevant standards	• Is an adequate procedure in use to ensure that the latest valid edition of a standard is used? • Is the procedure for the selection of a method documented and is the procedure actually used for the selection of appropriate methods? • Is the reporting of deviations from the standardised method ensured?
(d) where applicable, management of sampling and sample preparation, including control of sample integrity	• Are adequate procedures for representative sampling of substances, materials or products implemented? • Are deviations from the required sampling procedures recorded?
(e) where applicable, development and validation of new analytical methods or application of methods not covered by international or national standards	Note: these requirements only apply if the operator's monitoring plan requires analyses which are not yet established, or where no standards are available. • When non-standard methods are used, are these methods well described? • Are the methods used for the determination of the calculation factor(s) validated? • Where new methods are used or developed, at least the following performance characteristics must be known or be determined: selectivity of the method, repeatability and/or reproducibility, cross-sensitivity against interference from the matrix of the sample/test object
(f) uncertainty estimation	• Does the procedure for the estimation of the uncertainty include all components of uncertainty? • Are previous experiences and the results of the validation of the applied method included in the estimation of the uncertainty?
(g) management of equipment, including procedures for calibration, adjustment, maintenance and repair of equipment, and record keeping thereof	• Are records maintained of each item of equipment and its software? • Does the laboratory apply procedures for safe handling, transport, storage, use and planned maintenance of the measuring equipment to ensure proper functioning? • Is there a scheme for calibration of the equipment and its software implemented? • Can the state of calibration be proven with certificates? • Is there an adequate procedure to ensure that calibration factors are correctly implemented in time?
(h) management and control of data, documents and software	• Is an adequate procedure for checking calculations and data transfer on a regular basis implemented and are the corrective actions in case of encountered mistakes specified?

Element of Article 34(3), on which competence needs to be demonstrated	Important elements for the competent authority to assess (non-exhaustive)
(i) management of calibration items and reference materials	• Is there a programme and procedure for calibration of the reference standards, or for regular purchase of new standards? • Are the reference materials used, where possible, traceable to international standards? • Are adequate procedures for intermediate checking of the calibration status documented and implemented on a regular basis? • Are procedures implemented for safe handling, transport, storage and use of reference standards and reference materials? • Are procedures implemented for safe transportation, receipt, handling, protection, storage, retention and/or disposal of calibration items? • Is a system used, which enables unambiguous identification of calibration items and reference materials?
(j) quality assurance for calibration and test results, including regular participation in proficiency testing schemes, applying analytical methods to certified reference materials, or inter-comparison with an accredited laboratory	• Does the laboratory apply procedures to monitor the validity of the test and calibration results? • Are the results of these checks recorded, stored and, where practicable, statistically evaluated? • Does the laboratory participate in inter-laboratory comparison and proficiency testing programmes? • If the laboratory participates in inter-laboratory comparison and proficiency testing programmes, how will adjustment factors be applied or appropriate corrective action taken in case differences are observed between laboratories? • Which other measures has the laboratory implemented for quality assurance of calibration and test results;
(k) management of outsourced processes	Only relevant where processes are outsources (e.g. calibration of instruments, analyses by external laboratories etc.) • Does the laboratory have a procedure implemented which guarantees that the purchased services and supplies are within the required specifications? • Are the required specifications included in each order and is each delivery checked against those requirements?
(l) management of assignments, customer complaints, and ensuring timely corrective action	• Is the laboratory willing to cooperate with customers in clarifying the customer's request, in monitoring the laboratory's performance in relation to the work performed and in seeking feedback from its customers? • Does the laboratory have a procedure for handling complaints, non-conformities in the application of the methods and mistakes in data handling and calculation methods, including keeping a documentation thereof? • Does this procedure include an analysis of the source of errors or complaints, and identification of corrective actions as well as the timely implementation of the corrective actions?

6 ONLINE GAS ANALYSERS

Gaseous fuel or material streams may contain organic carbon substances that give rise to emissions and vary in composition over time. The most common gaseous source stream is natural gas which might exhibit fluctuating composition depending on the Member State or region the installation is situated. There are analytical methods based on chromatographic separation of these substances and subsequent detection of each substance. The most common detectors are e.g. the flame ionisation detector (FID)[12] or the mass spectrometry detector. These allow determination of the composition of the gas online and thus calculation of relevant parameters such as NCV or EF.

Article 32(2) requires the operator to obtain approval from the competent authority for the use of equipment where online gas chromatographs or extractive or non-extractive gas analysers are used for emission determination. To obtain approval the relevant information might best be addressed by using a procedure describing the equipment, the method used for sampling and analysis and the relevant standards. The use of these systems is limited to the determination of composition data of gaseous fuels and materials. As minimum quality assurance measures, the MRR requires that the operator shall ensure that an initial validation and annually repeated validations of the instrument are performed.

It is recommended that the operator meets the requirements of EN ISO 9001 and that calibration services and the suppliers of calibration gases are accredited in accordance with EN ISO/IEC 17025. Also, where applicable, the initial and annually repeated validation of the instrument should be carried out by a laboratory accredited in accordance with EN ISO/IEC 17025.

The following standards may be considered:

EN ISO 10723: "Natural gas - Performance evaluation for on-line analytical systems".

EN 12619: Stationary source emissions - Determination of the mass concentration of total gaseous organic carbon at low concentrations in flue gases - Continuous flame ionisation detector method

EN 13526: Stationary source emissions - Determination of the mass concentration of total gaseous organic carbon in flue gases from solvent using processes - Continuous flame ionisation detector method

EN ISO 6976: Natural gas - Calculation of calorific values, density, relative density and Wobbe index from composition (ISO 6976:1995 including Corrigendum 1:1997, Corrigendum 2:1997 and Corrigendum 3:1999)

ISO 6974: Natural gas – Determination of composition with defined uncertainty by gas chromatography – Part 6: Determination of hydrogen, helium, oxygen, nitrogen, carbon dioxide and C1 to C8 hydrocarbons using three capillary columns

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[12] The detection principle of the FID is the oxidation/ionisation of substances. As CO_2 is fully oxidised carbon the FID is insensitive to CO_2. Therefore this detector is not suitable to detect inherent CO_2 which should be part of the fuels emission factor according to Article 48.

7 ANNEX I: ACRONYMS AND LEGISLATION

7.1 Acronyms used

EU ETS ......EU Emission Trading Scheme

MRV ....Monitoring, Reporting and Verification

MRG 2007 ..Monitoring and Reporting Guidelines

MRR ....Monitoring and Reporting Regulation (M&R Regulation)

MP.............Monitoring Plan

CA ....Competent Authority

CEMS ....Continuous Emission Measurement System

MS.............Member State(s)

7.2 Legislative texts

EU ETS Directive: 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, most recently amended by Directive 2009/29/EC. Download consolidated version: **http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CONSLEG:2003L0087:20090625:EN:PDF**

M&R Regulation: Commission Regulation (EU) No. 601/2012 of 21 June 2012 on the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council. **http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:181:0030:0104:EN:PDF**

A&V Regulation: Commission Regulation (EU) No. 600/2012 of 21 June 2012 on the verification of greenhouse gas emission reports and tonne-kilometre reports and the accreditation of verifiers pursuant to Directive 2003/87/EC of the European Parliament and of the Council. **http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:181:0001:0029:EN:PDF**

MRG 2007: 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. The download of the consolidated version contains all amendments: MRG for N_2O emitting activities, aviation activities; capture, transport in pipelines and geological storage of CO_2, and for the activities and greenhouse gases only included from 2013 onwards. Download: **http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CONSLEG:2007D0589:20110921:EN:PDF**

8   ANNEX II: EXAMPLE FOR A SAMPLING PLAN TEMPLATE

1. General information

Operator name:

Installation ID:
Fill in the installation ID (as used by your competent authority)

Title of sampling plan:

Reference of procedure:

2. Responsibilities

Sampling plan completed by:
Fill in the name of the author of the sampling plan

Post or department responsible for sampling:
Fill in the name of the post or department responsible for the actual sampling

Post or department responsible for sampling data:
Fill in the name of the post or department that is responsible for the collection of sampling data

Laboratory responsible for analysis:
Fill in the name of the laboratory that is responsible for analysis of the sample

Other parties:
If applicable, fill in the names of other parties involved in sampling and describe their relevance

1   **3. Sampling objectives**

Sampling objectives:
Describe the objective(s) of the sampling, e.g. determination of net calorific value, emission factor, oxidation factor
Analysis required:
Describe what the laboratory is testing for, e.g. identify constituents to be tested.

2

3   **4. Specifications of source stream or mass stream**

Name of material or fuel:
Fill in the name of the source stream or mass stream, as used in the monitoring plan
Characteristics of the source stream or mass stream:
Describe the relevant characteristics, such as its phase (gas, liquid or solid), if relevant common or maximum particle size of the fuel or material, density, viscosity, temperature, etc., if those properties are relevant for the sampling procedure
Source and origin of the material or fuel:
Describe the source and origin of the source stream or mass stream, e.g. is the source stream delivered continuously, in batches, produced on site, etc?
Heterogeneity of the material or fuel and causes of variability (spatial and in time):
Describe the heterogeneity of the material, both spatial and in time, and justify (e.g. origin of source stream, stability of manufacturing process).

4

5   **5. Sampling methodology**

Sampling frequency:
Describe the sampling frequency (e.g. "every Monday morning", "every 3 hours", "once per truck load", "once every 200 tonnes",…)
Relevant standards:
Describe the relevant standards for the sampling methodology

Define place and point of sampling:

Specify the place (e.g. the stockpile) and point of sampling (e.g. after delivery or after completion of a deposit). Please note that the sample should be as representative as possible

Equipment used for sampling:
Describe the equipment used for sampling

Sampling approach:
Describe how the sample is taken, e.g. by probabilistic or judgmental approach

Sampling pattern:

Define how the sample is taken, e.g. in the case of random sampling describe how inaccessible parts of the population are dealt with; define how a probabilistic approach is implemented, and/or how decisions are made for a judgmental approach

Sample composition:

Describe whether each increment (amount of material obtained through one single sample action) is analysed individually, or combined with other increments to form a composite sample

Number of increments to be collected:
Describe the number of increments that make up a sample

Increment and sample size:

Describe the size of one increment (the amount of material that is obtained through one single sampling action). The increment size should accommodate all particle sizes present. Describe the minimum sample size. The minimum sample size must take into account the level of heterogeneity of individual particles, to ensure representativeness of the sample.

Sample reduction or sub sampling (if applicable):

If the overall sample is too large for transport to a laboratory, a sub-sample should be prepared in such a way that the integrity of the sample is protected. If relevant, describe this procedure and justify the representativeness of the final sample

Justification of representativeness:

Give a justification that the chosen approach leads to a representative sample. Take into account the source stream or mass stream information and character-

istics of the population (i.e. the amount of fuel or material represented by the sample)
Access, health and safety: *Identify access problems or restrictions that may affect the sampling programme. Identify health and safety precautions.*

1

2   **6.   Procedures for packaging, preservation, storage and transport**

Packaging: *Briefly describe the size, shape and material of the containers used, taking into account the risk of adsorption/absorption/reaction*
Sample coding methodology: *Describe how samples are coded. All sample containers should be marked with a unique identifier that is recognized by sampler and laboratory*
Preservation: *Justify how samples are packed and transported in such a way that the conditions at the time of sampling are preserved*
Storage: *Describe how the sample is stored on site and in the laboratory*
Transport: *Describe relevant conditions during storage; Describe or refer to a chain of custody form that should be completed and sent with each sample*
Data storage system: *Briefly describe the location and functioning of the data storage system and the information it contains, such as sample date, sample code, stockpile reference number, product type, specific location, size, etc.*

3

4   **7.   Analytical laboratory**

Company: *Fill in the name of the laboratory responsible for analyses of the sample*

EN ISO/IEC 17025 Accreditation:
Justify to what extent the scope of accreditation of the laboratory covers analysis of samples described in this sampling plan. If the laboratory is not accredited, please refer to the provided evidence that it meets the relevant criteria of Article 34(3).
Contact details:
Fill in contact details of the analytical laboratory
Analyses carried out:
Describe the properties to be analysed (e.g. net calorific value, emission factor, oxidation factor, carbon content)
Standards used:
Describe the relevant standards used for each parameter analysed

1

2 **8. Signatures**

Operator and laboratory have agreed on the content of this sampling plan; in case of evidence that the described heterogeneity of the source stream or mass stream differs significantly from the information described above, the sampling plan will be updated and notified to the competent authority.			
	Name	Signature	Date
Operator			
Analytical laboratory			

3

4

5