



Guidance Document

MRR Guidance on Uncertainty Assessment – Example

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Status of this document:

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 Council¹.

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

This document takes into account the discussions within meetings of the informal Technical Working Group on the Monitoring and Reporting Regulation under WGIII of the Climate Change Committee (CCC), as well as written comments received from stakeholders and experts from Member States.

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/documentation_en.htm.

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

1 INTRODUCTION

This document supplements GD 4 “Guidance on Uncertainty Assessment” by presenting an example. For more details on uncertainty assessment in the context of the monitoring and reporting of GHG emissions in the EU ETS, please refer to that guidance document².

Chapter 2 presents an example uncertainty assessment of an “installation with low emissions” pursuant to Article 47 of the Monitoring and Reporting Regulation (hereinafter the “MRR”, see footnote 1).

Note that the example presented is a quite common case. Nevertheless operators should not be tempted to copy text from this document, but should always define their monitoring methodology in a very installation-specific way, choosing the most appropriate means of monitoring, with the lowest possible uncertainty and highest robustness against errors.

2 INSTALLATIONS WITH LOW EMISSIONS

2.1 Requirements

Article 47(3) of the MRR exempts installations with low emissions (i.e. with annual emissions < 25,000 t CO₂) from having to submit to the competent authority evidence for each source stream or emission source demonstrating compliance with the required uncertainty thresholds. However, this does not exempt them from determining whether they comply with the required tiers. Furthermore, Article 19(1) of the AVR requires verifiers to confirm the validity of the information used to calculate the uncertainty levels.

Pursuant to Article 59(1) all operators are required to “ensure that all relevant measuring equipment is calibrated, adjusted and checked at regular intervals including prior to use, and checked against measurement standards traceable to international measurement standards, where available, in accordance with the requirements of this Regulation and proportionate to the risks identified.” For this purpose Article 58(3) of the MRR requires the operator to establish and maintain written procedure(s) for quality assurance of the measurement equipment. Therefore, information about the performance of measurement instruments with respect to the accuracy and reliability of results obtained should be available at every installation. Note that for instruments under national legal metrological control the requirements of Article 59 are often met sufficiently without excessive effort (e.g. the check against traceable international standards is achieved by the official calibration).

In the following section an example for an uncertainty assessment commensurate for a “small installation” (i.e. an “installation with low emissions” pursuant to Article 47 of the MRR) is elaborated. The example installation is described in section 2.2. Section 2.3 contains the exemplar uncertainty assessment.

² http://ec.europa.eu/clima/policies/ets/monitoring/docs/gd4_guidance_uncertainty_en.pdf

2.2 The example installation

The installation discussed in this chapter is producing bricks and pavers, and is emitting on average 15,000 t CO₂ per year. The following source streams need monitoring:

Fuel/Material	Category	Estimated emissions (t CO ₂ / a)	Minimum monitoring requirements for activity data
Light fuel oil	Commercial standard fuel	6,500	Tier 1 (± 7.5%)
Clay	Ceramics: Method A	8,000	Tier 1 (± 7.5%)
Lignite	Other solid fuels (pore-forming agent)	498	De-minimis
Diesel	Other gaseous and liquid fuels (auxiliary power unit)	2	De-minimis

The methods described for monitoring in this example have been chosen due to their wide-spread use. However, they are examples only and should not be applied in practice without checking whether better methods (more reliable, more accurate etc.) are available.. Operators of an installation with low emissions must apply tiers higher than tier 1 if they can be achieved without additional effort³. It is in particular no additional effort to apply a tier higher than tier 1 if the measurement instrument already in use complies with a higher tier, i.e. a higher tier is actually applied.

Light fuel oil:

In the example this fuel is delivered by trucks and stored in tanks (storage capacity <5%). In the example there are clearly commercial transactions between independent parties. Therefore (as in most similar cases) the measurements used for the trading are subject to national legal metrological control (see Route CO-1 or CT-1 of Guidance Document 4 on Uncertainty). Therefore, **maximum permissible error in service** as allowed by the relevant national legislation can be used.

Background:

To show compliance the operator has to demonstrate evidence that the uncertainty threshold of the required tier is not exceeded, e.g. by requesting the trade partner to provide the official calibration certificate/protocol for the volume flow measurement instruments installed on the trucks. This evidence will allow verifiers to confirm the validity of data used to determine the tier which is actually met.

Please note that non-compliance here is very unlikely as it can be assumed that even the least stringent requirement set out in the relevant national legislation will ask for an uncertainty lower than 7.5%. Still, a document confirming that this instrument is subject to national legal metrological control is needed.

If the national legal metrological legislation also allows measurement instruments with a higher uncertainty for that purpose, further evidence would be needed. Such evidence may be documents clearly demonstrating which accuracy classes are allowed to be used, e.g. contractual arrangement with the supplier demonstrating that only measurement instruments with certain accuracy classes are to be used.

³ Article 47(6): "By way of derogation from Article 26(1) the operator of an installation with low emissions may apply as a minimum tier 1 for the purposes of determining activity data and calculation factors for all source streams, unless higher accuracy is achievable without additional effort for the operator, without providing evidence that applying higher tiers is technically not feasible or would incur unreasonable costs."

Clay:

The clay in the example is gathered from the clay pit directly by the operator. Therefore, no commercial transaction takes place and hence any available measurement instrument used is not subject to national legal metrological control. Still, the operator transports the clay from the pit to the installation by trucks. There is a possibility for those trucks to be weighed on a weighing bridge owned by the operator.

The operator can simplify the uncertainty assessment here if the measurement instrument is used in an environment appropriate for its use specifications (→ see Steps 1 to 4, Route CO-2a/2b in Guidance Document 4 on Uncertainty).

Background:

For applying the proposed route CO-2a/2b, the operator has to demonstrate that:

- 1. Operating conditions regarding relevant influencing parameters are available*
- 2. Operating conditions regarding relevant influencing parameters are met*
- 3. Performing of quality assured calibration procedures*
- 4. Further quality assurance procedures for measuring activity data*

Please note that compliance with those four steps is also relevant for light fuel oil (see above). However, the obligations for compliance with national legal metrological control will assure that those four steps are met.

The application of these steps is demonstrated in the exemplar in section 2.3.

It is assumed that for this weighing bridge the manufacturer's specifications contain information about the appropriate operating conditions (requirement step 1 met).

For demonstrating that the requirements for step 2 are satisfied, the operator could prepare a simple checklist like the table displayed in section 2.3.

For demonstrating compliance with steps 3 and 4 to a verifier, the operator has to have in place an appropriate procedure for quality assurance of the measurement equipment and to ensure that all relevant measuring equipment is calibrated, adjusted and checked at regular intervals including prior to use, and checked against measurement standards traceable to international measurement standards (see above the requirements of Articles 58(3) and 59(1)). Please note that there is no exception for any installation to comply with the requirements in those Articles.⁴

Although the storage capacity in the example installation is above 5% of the annual used quantity of clay and, according to Article 47(5), the operator of an installation of low emission could still claim exemption from taking stock changes into account in the uncertainty assessment, this example assumes that the operator prefers to include them on grounds of best practice. The consumed quantity of clay is calculated as:

$$Q = P - E + (S_{begin} - S_{end})$$

Example 7 in section 8.3 of Guidance Document 4 shows how the uncertainty related to the stock changes can be calculated. The operator of the example installation uses this approach, as shown in section 2.3.

Note that Article 47(5)⁵ exempts installations with low emissions to include uncertainties related to stock data in an uncertainty assessment. However, stock data is included in the example to demonstrate how simple the calculation is and how marginal the impact of the associated uncertainty is on the overall uncertainty.

For the determination of CO₂ emissions, activity data and all calculation factors must relate to the same state of the material stream, i.e. in particular to the same level of moisture in the case of clay. Therefore, the uncertainty associated with the determination of the moisture content has to be taken into account (see example 3 in section 8.2 of Guidance Document 4 for uncorrelated uncertainties of a product). The MRR refers to the "dry" clay in section 12 of Annex IV but the "moisture content" is not a calculation factor in the MRR. As a

⁴ Note that complying with those steps is required regardless of the simplification routes being taken.

⁵ Article 47(5): "The operator of an installation with low emissions shall be exempt from the requirement of Article 28(2) to determine stock data at the beginning and the end of the reporting period, where the storage facilities are capable of containing at least 5 % of the annual consumption of fuel or material during the reporting period, in order to include related uncertainty in an uncertainty assessment."

consequence, it has to be taken into account for the determination of the uncertainty of the activity data (see calculation in section 2.3). For the determination of this moisture content as well as for the emission factor laboratory analyses are used, and consequently a sampling plan needs to be in place.

Lignite:

This pore-forming agent is a de-minimis source stream. Therefore, an estimation method may be applied for determining the annual emissions stemming from this source stream. Because this fuel/material is bought on the market by the operator of the installation, invoices may be used to determine the annual activity level. Because the example Member State has not published default values for lignite, which would allow the use of tier 2, emissions are obtained by multiplying the amount lignite used with the net calorific value and emission factor provided in Annex VI of the MRR (Tier 1).

Diesel:

Diesel is a de-minimis source stream as well. Precise measurement would be demanding (because Diesel is also used for mobile machinery such as truck loaders, fork lifts etc. and therefore, fuel invoices can't be used). For determining the diesel used in the auxiliary power unit an estimation method may be used. In the example a common formula is proposed:

$$\text{Activity Data} = \text{AOH} \times \text{CAP} \times (3600 / 10^9) \times (1 / \text{NCV})$$

$$\text{Annual emissions} = \text{AD} \times \text{NCV} \times \text{EF}$$

AOH.... Annual operating hours

CAP Installed capacity of the auxiliary power unit (kW)

AD..... Activity data (t)

NCV Net calorific value (TJ/t, taken from e.g. Annex VI or National Inventory, if available)

EF Emission factor (t CO₂/TJ, taken from e.g. Annex VI or National Inventory, if available)

2.3 Exemplar Uncertainty assessment

The following exemplar elaborates what the example installation's uncertainty assessment could look like.

Light fuel oil:

Tier applied for activity data: **Tier 2 (± 5.0%), based on invoices**

Evidence for complying with the tier requirements: *see attached the latest official calibration certificates for the rotor flow meters on the trucks from our three suppliers*

Clay:

Tier applied for activity data: **Tier 2 (± 5.0%)**, uncertainty achieved = 4.5% (see calculation below)

Evidence for complying with the requirements of the tier: Route CO-2a/2b is used.

"Step 1": *see manufacturer's specification ("MPES ± 4.0%") in the weighing bridge's operating manual; example: see sampling plan for determination of the moisture content of the (raw) clay;*

Error propagation taking into account stock changes:

- storage capacity: 7,000 t,
- uncertainty related to stock estimation at end of year (conservative estimate): 10%;
- average annual amount of clay consumed: 125,000 t,
- max. permissible error in service laid down in manufacturer's specifications: 4%;
- uncertainty related to determine the moisture content: 2%

Calculation:

$$u_{wet} = \frac{\sqrt{2 \cdot (U_{stock})^2 + (U_{clay})^2}}{\text{clay consumed annually}} = \frac{\sqrt{2 \cdot (7,000 \cdot 10\%)^2 + (125,000 \cdot 4\%)^2}}{125,000} = 4.08\%$$

$$u_{dry} = \sqrt{u_{wet}^2 + u_{moisture}^2} = \sqrt{4.08\%^2 + 2\%^2} = 4.5\%$$

Evidence for complying with the requirements in "Step 2":

Checklist for relevant parameters of the weighing bridge:

Parameter listed in manufacturer's specifications	Value specified by manufacturer	Actual applied ranges/conditions	Compliant?
Temperature	-15 – 50 °C	-15 – 40 °C	Yes
Measurement range	2 - 50 tonnes	10 - 35 tonnes	Yes
Wind speed	< 20 m/s	< 15 m/s	Yes
Calibration interval	Every two years	Every two years	Yes

Evidence for complying with the requirements in “Steps 3 and 4”⁶:

See attached the latest calibration certificates for the truck weighing bridge WB-XYZ123 and the quality management procedures in section 2.4.

Lignite:

Tier applied for activity data: **Tier 3 ($\pm 2.5\%$), based on invoices**

Evidence⁷: *see attached the latest official calibration certificates requested from the trading partners delivering lignite*

Diesel:

Tier applied for activity data: **De-minimis**

Approach: Emissions are calculated based on the annual operating hours, the auxiliary power unit's installed rated thermal input and the inventory emission factor of Diesel. Conservative estimates of emissions are typically found to be in the range of 1 to 5 t CO₂ per year.

⁶ Steps 3 and 4 require quality assurance (regular calibration) for the measurement equipment to be carried out. This needs to be covered by a written procedure in accordance with Article 58(3), point a). For further reading please consult section 3.1.1.4 of Guidance Document 4 on Uncertainty.

⁷ Note: If those certificates are not available, activity data can still be determined using invoices. However, without demonstrating compliance with a tier, this would be a no-tier approach. It would be only applicable for de-minimis source streams.

2.4 Quality management for the example installation

The procedure required for quality assurance of measurement equipment could be defined as follows:

Example for a procedure (adapted version of procedure in GD1):

1. The installation is normally shut down between December and February. Measurement equipment (including that for EU-ETS) is usually calibrated during that phase.
2. Responsible person (deputy manager of O&M) maintains a calendar of appropriate calibration and maintenance intervals for all ETS instruments listed in table 7.b of the monitoring plan. Alert is set to 30 Nov of each year.
3. Responsible person (deputy manager of O&M) checks which QM activities are required according to the calendar within the next 4 weeks. As appropriate, he reserves resources required for this task in meetings with the plant manager.
4. Calibration and maintenance of ETS instruments is tracked and documented in file "Z:\ETS_MRV\QM\calibr_log.xls" electronically and hardcopy: Office HS3/27, shelf 3, Folder identified "QM 27-ETS -nnnn". (nnnn=year). Information documented contains: ID of instrument, date when instrument was installed, last calibration, meter reading after last calibration, laboratory hired for the last calibration, statement of the last calibrations, date until next calibration is due.
5. For all measurement instruments for which calibration in that particular year is due the responsible person follows the procedure:
 - a. Responsible person (deputy manager of O&M) orders external experts (calibration institutes).
 - b. Responsible person ensures that QM tasks are carried out on the agreed dates.
 - c. Responsible person keeps records of the above QM activities.
 - d. Responsible person reports back to plant manager on corrective action required. Corrective action is handled under procedure QM 28-ETS

<End of procedure>

The procedure itself, as elaborated above, is a document independent from the monitoring plan. However, a summary of the procedure has to be included in the monitoring plan in a standardised table (section K.22.b of the Commission's Monitoring Plan template). This could be as follows:

Item according to Article 12(2)	Possible content (examples)
Title of the procedure	QM for ETS instruments
Traceable and verifiable reference for identification of the procedure	QM 27-ETS
Post or department responsible for implementing the procedure and the post or department responsible for the management of the related data (if different)	Q&M office
Brief description of the procedure	<ul style="list-style-type: none"> • Responsible person maintains a calendar of appropriate calibration and maintenance intervals for all instruments listed in table 7.b of the monitoring plan • Responsible person checks which QM activities are required. As appropriate, he reserves resources required for this tasks in meetings with the plant manager. • Responsible person orders external experts (calibration institutes and/or service technicians of the manufacturer). • Responsible person ensures that QM tasks are carried out on the agreed dates. • Responsible person keeps records of the above QM activities. • Responsible person reports back to plant manager on corrective action required, if any. • Corrective action is handled under procedure QM 28-ETS, if relevant.
Location of relevant records and information	<p>Hardcopy: Office HS3/27, shelf 3, Folder identified "QM 27-ETS - nnnn". (nnnn=year)</p> <p>Electronically: "Z:\ETS_MRV\QM\calibr_log.pst"</p>
Name of the computerised system used, where applicable	MS Outlook calendar, also used for storing documents as attachments chronologically
List of EN standards or other standards applied, where relevant	In the instrument list (document ETS-Instr-A1.xls) the applicable standards are listed. This document is made available to the verifier upon request.