

ANNEX VIII

Measurement-based methodologies (Article 41)**1. Tier definitions for measurement-based methodologies**

Measurement-based methodologies shall be approved in accordance with tiers with the following maximum permissible uncertainties for the annual average hourly emissions calculated in accordance with Equation 2 set out in section 3 of this Annex.

Table 1

Tiers for CEMS (maximum permissible uncertainty for each tier)

	Tier 1	Tier 2	Tier 3	Tier 4
CO ₂ emission sources	± 10 %	± 7,5 %	± 5 %	± 2,5 %
N ₂ O emission sources	± 10 %	± 7,5 %	± 5 %	N.A.
CO ₂ transfer	± 10 %	± 7,5 %	± 5 %	± 2,5 %

2. Minimum requirements

Table 2

Minimum requirements for measurement-based methodologies

Greenhouse gas	Minimum tier level required		
	Category A	Category B	Category C
CO ₂	2	2	3
N ₂ O	2	2	3

3. Determination of GHGs using measurement-based methodologies

Equation 1: Calculation of Annual Emissions

$$GHG_{\text{tot ann}} [t] = \sum_{i=1}^{\text{operating hours p.a.}} GHG_{\text{conc hourly } i} * \text{flue gas flow}_i * 10^{-6} [t/g]$$

Where:

GHG conc_{hourly} = hourly concentrations of emissions in g/Nm³ in the flue gas flow measured during operation;

Flue gas flow = flue gas flow in Nm³ for each hour.

Equation 2: Determination of average hourly concentrations

$$GHG_{\text{emissions av hourly}} [kg/h] = \frac{\sum GHG_{\text{concentration hourly}} [g/Nm^3] * \text{flue gas flow} [Nm^3/h]}{\text{Hours of operation} * 1000}$$

Where:

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

GHG conc_{hourly} = hourly concentrations of emissions in g/Nm³ in the flue gas flow measured during operation;

Flue gas flow = flue gas flow in Nm³ for each hour.

4. Calculation of the concentration using indirect concentration measurement

Equation 3: Calculation of the concentration

$$GHG \text{ concentration}[\%] = 100 \% - \sum_i \text{Concentration of component}_i[\%]$$

5. Substitution for missing concentration data for measurement-based methodologies

Equation 4: Substitution for missing data for measurement-based methodologies

$$C_{\text{subst}}^* = \bar{C} + 2\sigma_{C_-}$$

Where:

\bar{C} = the arithmetic mean of the concentration of the specific parameter over the whole reporting period or, where specific circumstances applied when data loss occurred, an appropriate period reflecting the specific circumstances;

σ_{C_-} = the best estimate of the standard deviation of the concentration of the specific parameter over the whole reporting period or, where specific circumstances applied when data loss occurred, an appropriate period reflecting the specific circumstances.
