

## ANNEX IV

**Activity-specific monitoring methodologies related to installations (Article 20(2))****8. PFC emissions from production or processing of primary aluminium as listed in Annex I to Directive 2003/87/EC****B. Determination of PFC emissions****Calculation of Overvoltage Method****Method****B —**

Where the anode effect overvoltage is measured, the operator shall use the following equations for the determination of PFC emissions:

$$\text{CF}_4 \text{ emissions [t]} = \text{OVC} \times (\text{AEO/CE}) \times \text{Pr}_{\text{Al}} \times 0,001$$

$$\text{C}_2\text{F}_6 \text{ emissions [t]} = \text{CF}_4 \text{ emissions} \times \text{F}_{\text{C}_2\text{F}_6}$$

Where:

OVC	=	Overvoltage coefficient ('emission factor') expressed as kg CF <sub>4</sub> per tonne of aluminium produced per mV overvoltage;
AEO	=	Anode effect overvoltage per cell [mV] determined as the integral of (time × voltage above the target voltage) divided by the time (duration) of data collection;
CE	=	Average current efficiency of aluminium production [%];
Pr <sub>Al</sub>	=	Annual production of primary Aluminium [t];
F <sub>C<sub>2</sub>F<sub>6</sub></sub>	=	Weight fraction of C <sub>2</sub> F <sub>6</sub> (t C <sub>2</sub> F <sub>6</sub> /t CF <sub>4</sub> );

The term AEO/CE (Anode effect overvoltage/current efficiency) expresses the time-integrated average anode effect overvoltage [mV overvoltage] per average current efficiency [%].

**Emission factor** : The emission factor for CF<sub>4</sub> ('overvoltage coefficient' OVC) shall express the amount [kg] of CF<sub>4</sub> emitted per tonne of aluminium produced per millivolt overvoltage [mV]. The emission factor of C<sub>2</sub>F<sub>6</sub> (weight fraction F<sub>C<sub>2</sub>F<sub>6</sub></sub>) shall express the amount [t] of C<sub>2</sub>F<sub>6</sub> emitted proportionate to the amount [t] of CF<sub>4</sub> emitted.

**Tier 1** : The operator shall apply technology-specific emission factors from Table 2 of this section of Annex IV.

**Tier 2** : The operator shall use installation-specific emission factors for CF<sub>4</sub> [(kg CF<sub>4</sub>/t Al)/(mV)] and C<sub>2</sub>F<sub>6</sub> [t C<sub>2</sub>F<sub>6</sub>/t CF<sub>4</sub>] established through continuous or intermittent field measurements. For the determination of those emission factors, the operator shall use the most recent version of the guidance mentioned under tier 3 of section 4.4.2.4 of the 2006 IPCC Guidelines. The operator shall determine the emission factors with a maximum uncertainty of ± 15 % each.

The operator shall determine the emission factors at least every three years or earlier where necessary due to relevant changes at the installation. Relevant changes shall include a change in the distribution of anode effect duration or a change in the control algorithm affecting the mix of the types of anode effects or the nature of the anode effect termination routine.

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**Changes to legislation:** There are currently no known outstanding effects for the Commission Regulation (EU) No 601/2012 (repealed), Division Calculation Method B —. (See end of Document for details)

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Table 2:

TECHNOLOGY-SPECIFIC EMISSION FACTORS  
RELATED TO OVERVOLTAGE ACTIVITY DATA

<b>Technology</b>	<b>Emission factor for CF<sub>4</sub>[(kg CF<sub>4</sub>/t Al)/mV]</b>	<b>Emission factor for C<sub>2</sub>F<sub>6</sub>[t C<sub>2</sub>F<sub>6</sub>/t CF<sub>4</sub>]</b>
Centre Worked Prebake (CWPB)	1,16	0,121
Vertical Stud Søderberg (VSS)	N.A.	0,053

**Changes to legislation:**

There are currently no known outstanding effects for the Commission Regulation (EU) No 601/2012 (repealed), Division Calculation Method B —.