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COMMISSION IMPLEMENTING REGULATION (EU) 2018/2066

of 19 December 2018

on the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council and amending Commission Regulation (EU) No 601/2012

(Text with EEA relevance)

(OJ L 334, 31.12.2018, p. 1)

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►M3	Commission Implementing Regulation (EU) 2022/1371 of 5 August 2022	L 206	15	8.8.2022
►M4	Commission Implementing Regulation (EU) 2023/2122 of 12 October 2023	L 2122	1	18.10.2023
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CHAPTER I

GENERAL PROVISIONS

SECTION 1

Subject matter and definitions

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Article 1

This Regulation lays down rules for the following:

(i) from 1 January 2021 and subsequent trading periods, monitoring and reporting of greenhouse gas emissions and activity data pursuant to Directive 2003/87/EC in the trading period of the Union emissions trading system;

(ii) from 1 January 2025, monitoring and reporting of non-CO_2 aviation effects pursuant to Article 14 of Directive 2003/87/EC.

Article 2

This Regulation shall apply to the monitoring and reporting of greenhouse gas emissions specified in relation to the activities listed in Annex I and III to Directive 2003/87/EC, to activity data from stationary installations, to aviation activities, including non-CO_2 aviation effects, and to released fuel amounts from activities referred to in Annex III to that Directive.

It shall apply to the following:

(i) from 1 January 2021, emissions, activity data and released fuel amounts occurring;

(ii) from 1 January 2025, non-CO_2 aviation effects.

The monitoring and reporting of non-CO_2 aviation effects from 2025 shall cover all non-CO_2 effects from aviation activities listed in Annex I to the Directive involving an aerodrome located in the EEA. However, in respect of the monitoring and reporting of non-CO_2 aviation effects taking place in 2025 and 2026, such reporting shall

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only be required in respect of routes involving two aerodromes located in the EEA, and routes from an aerodrome located in the EEA departing to Switzerland or to the United Kingdom. In respect of 2025 and 2026, the non-CO_2 aviation effects taking place from other flights may be reported on a voluntary basis.

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Article 3

Definitions

For the purposes of this Regulation, the following definitions shall apply:

(1) ‘activity data’ means data on the amount of fuels or materials consumed or produced by a process relevant for the calculation-based monitoring methodology, expressed in terajoules, mass in tonnes or (for gases) volume in normal cubic metres, as appropriate;

(2) ‘trading period’ means a period as referred to in Article 13 of Directive 2003/87/EC;

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(4) ‘source stream’ means any of the following:

(a) a specific fuel type, raw material or product giving rise to emissions of relevant greenhouse gases at one or more emission sources as a result of its consumption or production;

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(b) in the case of a mass balance methodology in accordance with Article 25 of this Regulation, one of the following:

(i) a specific fuel type, raw material or product containing carbon;

(ii) CO_2 transferred in accordance with Article 49 of this Regulation;

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(5) ‘emission source’ means a separately identifiable part of an installation or a process within an installation, from which relevant greenhouse gases are emitted or, for aviation activities, an individual aircraft;

(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;

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(7) ‘calculation factors’ means net calorific value, emission factor, preliminary emission factor, oxidation factor, conversion factor, carbon content, fossil fraction, biomass fraction, zero-rated biomass fraction, RFNBO or RCF fraction, zero-rated RFNBO or RCF fraction, synthetic low-carbon fraction, zero-rated synthetic low-carbon fraction, zero-rated fraction, or unit conversion factor;

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(8) ‘tier’ means a set requirement used for determining activity data, calculation factors, annual emission and annual average hourly emission, released fuel amount and scope factor;

(9) ‘inherent risk’ means the susceptibility of a parameter in the annual emissions report to misstatements that could be material, individually or when aggregated with other misstatements, before taking into consideration the effect of any related control activities;

(10) ‘control risk’ means the susceptibility of a parameter in the annual emissions report to misstatements that could be material, individually or when aggregated with other misstatements, and not prevented or detected and corrected on a timely basis by the control system;

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(11) ‘combustion emissions’ means greenhouse gas emissions occurring during the exothermic reaction of a fuel with oxygen;

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(12) ‘reporting period’ means a calendar year during which emissions have to be monitored and reported;

(13) ‘emission factor’ means the average emission rate of a greenhouse gas relative to the activity data of a source stream or a fuel stream assuming complete oxidation for combustion and complete conversion for all other chemical reactions;

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(14) ‘oxidation factor’ means the ratio of carbon oxidised to CO_2 as a consequence of combustion to the total carbon contained in the fuel, expressed as a fraction, considering carbon monoxide (CO) emitted to the atmosphere as the molar equivalent amount of CO_2;

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(15) ‘conversion factor’ means the ratio of carbon emitted as CO_2 to the total carbon contained in the source stream before the emitting process takes place, expressed as a fraction, considering CO emitted to the atmosphere as the molar equivalent amount of CO_2. In the case of CO_2 emissions considered to be permanently chemically bound in a product, conversion factor means the ratio of CO_2 bound as carbon in a product during a process, to the total CO_2 contained as carbon in a product leaving that same process;

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(16) ‘accuracy’ means the closeness of the agreement between the result of a measurement and the true value of the particular quantity or a reference value determined empirically using internationally accepted and traceable calibration materials and standard methods, taking into account both random and systematic factors;

(17) ‘calibration’ means the set of operations, which establishes, under specified conditions, the relations between values indicated by a measuring instrument or measuring system, or values represented by a material measure or a reference material and the corresponding values of a quantity realised by a reference standard;

(18) ‘flight’ means flight as defined in point 1(1) of the Annex to Decision 2009/450/EC;

(19) ‘passengers’ means the persons onboard the aircraft during a flight excluding its on duty crew members;

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(20) ‘conservative’ means that a set of assumptions is defined in order to ensure that no under-estimation of annual emissions occurs;

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(21) ‘biomass’ means the biodegradable fraction of products, waste and residues from biological origin from agriculture, including vegetal and animal substances, from forestry and related industries, including fisheries and aquaculture, as well as the biodegradable fraction of waste, including industrial and municipal waste of biological origin;

(21a) ‘biomass fuels’ means gaseous and solid fuels produced from biomass;

(21b) ‘biogas’ means gaseous fuels produced from biomass;

(21c) ‘waste’ means waste as defined in point (1) of Article 3 of Directive 2008/98/EC, excluding substances that have been intentionally modified or contaminated in order to meet this definition;

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(21ca) ‘municipal waste’ means municipal waste as defined in Article 3, point (2b), of Directive 2008/98/EC;

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(21d) ‘residue’ means a substance that is not the end product(s) that a production process directly seeks to produce; it is not a primary aim of the production process and the process has not been deliberately modified to produce it;

(21e) ‘agricultural, aquaculture, fisheries and forestry residues’ means residues that are directly generated by agriculture, aquaculture, fisheries and forestry and that do not include residues from related industries or processing;

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(22) ‘bioliquids’ means liquid fuel for energy purposes other than for transport, including electricity and heating and cooling, produced from biomass;

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(23) ‘biofuels’ means liquid fuels for transport produced from biomass;

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(23a) ‘eligible aviation fuel’ means fuel types eligible for the support under Article 3c(6) of Directive 2003/87/EC;

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(23b) ‘alternative aviation fuels’ means neat aviation fuels containing carbon other than stemming from the neat fossil fuels listed in Table 1 of Annex III to this Regulation;

(23c) ‘zero-rating’ means the mechanism by which the emission factor of a fuel or material is reduced in order to acknowledge:

(a) in case of biomass, its compliance with sustainability or greenhouse gas savings criteria provided by Article 29(2) to (7) and (10) of Directive (EU) 2018/2001, as specified in Article 38(5) of this Regulation;

(b) in case of RFNBO or RCF, its compliance with the greenhouse gas savings criteria in accordance with Article 29a of Directive (EU) 2018/2001, as specified in Article 39a(3) of this Regulation;

(c) in case of synthetic low-carbon fuels, its compliance with the greenhouse gas savings criteria provided by Article 2 point 13 of Directive (EU) 2024/1788 on common rules for the internal markets in renewable gas and natural gas and in hydrogen; and the prior surrendering of allowances under Directive 2003/87/EC for the captured carbon necessary to produce the synthetic low-carbon fuels, as specified in Article 39a(4) of this Regulation, unless that captured carbon is zero-rated carbon as defined in Article 3(38f).

(23d) ‘zero-rated fuels’ means biofuels, bioliquids, biomass fuels, synthetic low-carbon fuels, RFNBO or RCF or fractions of mixed fuels or materials which comply with the criteria as specified in Articles 38(5) or 39a(3) or 39a(4) of this Regulation, as applicable;

(23e) ‘recycled carbon fuels’ (RCF) means recycled carbon fuels as defined in Article 2, point (35) of Directive (EU) 2018/2001;

(23f) ‘renewable fuels of non-biological origin’ (RFNBO) means renewable fuels of non-biological origin as defined in Article 2, point (36) of Directive (EU) 2018/2001;

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(23g) ‘neat fuel’ means a fuel in its pure form containing only one of the following fractions:

(i) fossil fraction;

(ii) non-zero-rated biomass fraction;

(iii) zero-rated biomass fraction;

(iv) non-zero-rated RFNBO or RCF fraction;

(v) zero-rated RFNBO or RCF fraction;

(vi) non-zero-rated synthetic low-carbon fraction;

(vii) zero-rated synthetic low-carbon fraction;

(viii) fraction of fuels containing carbon other than stemming from the fossil fuels listed in Table 1 of Annex III to this Regulation or from biomass, RFNBO, RCF or synthetic low-carbon fuels;

(23h) ‘synthetic low-carbon fuels’ means gaseous and liquid fuels, the energy content of which is derived from low-carbon hydrogen as defined in Article 2, point (13) of Directive (EU) 2024/1788, which meet the greenhouse gas emission reduction threshold of 70 % compared to the fossil fuel comparator for renewable fuels of non-biological origin set out in the methodology adopted according to Article 29a(3) of Directive (EU) 2018/2001, as certified in accordance with Article 9 of Directive (EU) 2024/1788;

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(24) ‘legal metrological control’ means the control of the measurement tasks intended for the field of application of a measuring instrument, for reasons of public interest, public health, public safety, public order, protection of the environment, the levying of taxes and duties, the protection of consumers and fair trading;

(25) ‘maximum permissible error’ means the error of measurement allowed as specified in Annex I and instrument-specific annexes to Directive 2014/32/EU of the European Parliament and of the Council ([1]), or national rules on legal metrological control, as appropriate;

(26) ‘data-flow activities’ mean activities related to the acquisition, processing and handling of data that are needed to draft an emissions report from primary source data;

(27) ‘tonnes of $CO_{2(e)}$’ means metric tonnes of CO_2 or $CO_{2(e)}$;

(28) ‘$CO_{2(e)}$’ means any greenhouse gas, other than CO_2, listed in Annex II to Directive 2003/87/EC with an equivalent global-warming potential as CO_2;

([1]) Directive 2014/32/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of measuring instruments (OJ L 96, 29.3.2014, p. 149).

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(29) ‘measurement system’ means a complete set of measuring instruments and other equipment, such as sampling and data-processing equipment, used to determine variables such as the activity data, the carbon content, the calorific value or the emission factor of the greenhouse gas emissions;

(30) ‘net calorific value’ (NCV) means the specific amount of energy released as heat when a fuel or material undergoes complete combustion with oxygen under standard conditions, less the heat of vaporisation of any water formed;

(31) ‘process emissions’ means greenhouse gas emissions other than combustion emissions occurring as a result of intentional and unintentional reactions between substances or their transformation, including the chemical or electrolytic reduction of metal ores, the thermal decomposition of substances and the formation of substances for use as product or feedstock;

(32) ‘commercial standard fuel’ means the internationally standardised commercial fuels that exhibit a 95 % confidence interval of not more than 1 % for their specified calorific value, including gas oil, light fuel oil, gasoline, lamp oil, kerosene, ethane, propane, butane, jet kerosene (jet A1 or jet A), jet gasoline (jet B) and aviation gasoline (AvGas);

(33) ‘batch’ means an amount of fuel or material representatively sampled and characterised, and transferred as one shipment or continuously over a specific period of time;

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(34) ‘mixed fuel’ means a fuel which contains at least two of the following:

(i) carbon stemming from biomass;

(ii) carbon stemming from a RFNBO or RCF;

(iii) carbon stemming from synthetic low-carbon fuels;

(iv) other fossil carbon;

or which contains both zero-rated carbon and other carbon.

(34a) ‘mixed aviation fuel’ means a fuel which contains at least two different neat fuels;

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(35) ‘mixed material’ means a material which contains both biomass and fossil carbon;

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(36) ‘preliminary emission factor’ means the assumed total emission factor of a fuel or material based on its total carbon content before multiplying it by the fossil fraction to produce the emission factor;

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(37) ‘fossil fraction’ means the ratio of fossil carbon to the total carbon content of a fuel or material, expressed as a fraction;

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(38) ‘biomass fraction’ means the ratio of carbon stemming from biomass to the total carbon content of a fuel or material, expressed as a fraction, independent of whether the biomass complies with the criteria of Article 38(5) of this Regulation;

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(38b) ‘zero-rated biomass fraction’ means the ratio of carbon stemming from biomass which complies with the criteria of Article 38(5) of this Regulation to the total carbon content of a fuel or material, expressed as a fraction;

(38c) ‘RFNBO or RCF fraction’ means the ratio of carbon stemming from an RFNBO or RCF to the total carbon content of a fuel, expressed as a fraction, independent of whether the RFNBO or RCF complies with the criteria of Article 39a(3) of this Regulation;

(38d) ‘zero-rated RFNBO or RCF fraction’ means the ratio of carbon stemming from an RFNBO or RCF that complies with the criteria of Article 39a(3) of this Regulation, to the total carbon content of a fuel, expressed as a fraction;

(38e) ‘zero-rated carbon fraction’ means:

(i) in case of a fuel, the sum of its zero-rated biomass fraction, its zero-rated synthetic low-carbon fraction and its zero-rated RFNBO or RCF fraction without double counting of any carbon;

(ii) in case of a material, its zero-rated biomass fraction.

(38f) ‘zero-rated carbon’ means carbon contained in a fuel or material that belongs to the zero-rated carbon fraction of that fuel or material;

(38g) ‘synthetic low-carbon fraction’ means the ratio of carbon stemming from synthetic low-carbon fuel to the total carbon content of a fuel, expressed as a fraction, independent of whether the synthetic low-carbon fuel complies with the criteria of Article 39a(4) of this Regulation;

(38h) ‘zero-rated synthetic low-carbon fraction’ means the ratio of carbon stemming from a synthetic low-carbon fuel that complies with the criteria of Article 39a(4) of this Regulation, to the total carbon content of a fuel;

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(39) ‘energy balance method’ means a method to estimate the amount of energy used as fuel in a boiler, calculated as the sum of utilisable heat and all relevant losses of energy by radiation, transmission and via the flue gas;

(40) ‘continuous emission measurement’ means a set of operations having the objective of determining the value of a quantity by means of periodic measurements, applying either measurements in the stack or extractive procedures with a measuring instrument located close to the stack, whilst excluding measurement methodologies based on the collection of individual samples from the stack;

(41) ‘inherent CO_2’ means CO_2 which is part of a source stream;

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(42) ‘fossil carbon’ means inorganic and organic carbon that is not zero-rated carbon;

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

(44) ‘mass and balance documentation’ means the documentation specified in international or national implementation of the standards and recommended practices (SARPs) laid down in Annex 6 to the Convention on International Civil Aviation, signed in Chicago on 7 December 1944 and specified in Section 3 of Subpart C of Annex IV to Commission Regulation (EU) No 965/2012 ([1]), or equivalent applicable international rules;

(45) ‘distance’ means the great-circle distance between the aerodrome of departure and the aerodrome of arrival, in addition to a fixed factor of 95 km;

(46) ‘aerodrome of departure’ means the aerodrome at which a flight constituting an aviation activity listed in Annex I to Directive 2003/87/EC begins;

(47) ‘aerodrome of arrival’ means the aerodrome at which a flight constituting an aviation activity listed in Annex I to Directive 2003/87/EC ends;

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(49) ‘fugitive emissions’ means irregular or unintended emissions from sources that are not localised, or too diverse or too small to be monitored individually;

(50) ‘aerodrome’ means aerodrome as defined in point 1(2) of the Annex to Decision 2009/450/EC;

(51) ‘aerodrome pair’ means a pair constituted by the aerodrome of departure and the aerodrome of arrival;

(52) ‘standard conditions’ means temperature of 273,15 K and pressure conditions of 101 325 Pa defining normal cubic metres (Nm^3);

(53) ‘storage site’ means storage site as defined in Article 3(3) of Directive 2009/31/EC;

([1]) Commission Regulation (EU) No 965/2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (OJ L 296, 25.10.2012, p. 1).

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

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(55) 'CO_2 transport' means the transport of CO_2 for geological storage in a storage site permitted under Directive 2009/31/EC;

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(56) 'geological storage of CO_2' means geological storage of CO_2 as defined in Article 3(1) of Directive 2009/31/EC;

(57) 'vented emissions' means emissions deliberately released from an installation by provision of a defined point of emission;

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

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(59) 'proxy data' means annual values which are empirically substantiated or derived from accepted sources and which an operator or regulated entity as defined in Article 3 of Directive 2003/87/EC uses to substitute the activity data, the released fuel amounts or the calculation factors for the purpose of ensuring complete reporting when it is not possible to generate all the required activity data, released fuel amounts or calculation factors in the applicable monitoring methodology;

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(60) 'water column' means water column as defined in Article 3(2) of Directive 2009/31/EC;

(61) 'leakage' means leakage as defined in Article 3(5) of Directive 2009/31/EC;

(62) 'storage complex' means storage complex as defined in Article 3 (6) of Directive 2009/31/EC;

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(63) 'CO_2 transport infrastructure' means an infrastructure as defined in Article 3(29) of Regulation (EU) 2024/1735;

(63b) 'CO_2 in transit' means any amount of transferred CO_2 in a CO_2 transport infrastructure that has not been transferred to another installation or CO_2 transport infrastructure within the same reporting period it was received;

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(64) 'fuel stream' means a fuel as defined in Article 3, point (af), of Directive 2003/87/EC, released for consumption through specific physical means, such as pipelines, trucks, rail, ships or fuel stations, and giving rise to emissions of relevant greenhouse gases as a result of its consumption by categories of consumers in sectors covered by Annex III to Directive 2003/87/EC;

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(65) ‘national fuel stream’ means the aggregation, per fuel type, of fuels streams of all regulated entities in the territory of a Member State;

(66) ‘scope factor’ means the factor between zero and one that is used to determine the share of a fuel stream that is used for combustion in sectors covered by Annex III to Directive 2003/87/EC;

(67) ‘released fuel amount’ means data on the amount of fuel as defined in Article 3, point (af), of Directive 2003/87/EC which is released for consumption and expressed as energy in terajoules, mass in tonnes or volume in normal cubic metres or the equivalent in litres, where appropriate, before application of a scope factor;

(68) ‘unit conversion factor’ means a factor converting the unit in which released fuel amounts are expressed, into amounts expressed as energy in terajoules, mass in tonnes or volume in normal cubic metres or the equivalent in litres, where appropriate, which comprises all relevant factors such as the density, the net calorific value or (for gases) the conversion from gross calorific value to net calorific value, as applicable;

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(69) ‘final consumer’ for the purposes of applying the definition of regulated entity, in accordance with Article 3(ae) of Directive 2003/87/EC, in this Regulation, means any natural or legal person that is the consumer of the fuel, whose annual fuel consumption does not exceed 1 tonne of CO_2;

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(70) ‘released for consumption’ for the purposes of this Regulation means the moment where the excise duty on a fuel, as defined in Article 3, point (af), of Directive 2003/87/EC, becomes chargeable in accordance with Articles 6(2) and (3) of Council Directive (EU) 2020/262 ([1]) or, where applicable, in accordance with Article 21(5) of Council Directive 2003/96/EC ([2]), unless the Member State has used the flexibility provided under Article 3 (ae), point (iv), of Directive 2003/87/EC, in which case it means the moment designated by the Member State as creating obligations under Chapter IVa of that Directive;

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(71) ‘non-CO_2 aviation effects’ means non-CO_2 aviation effects as defined in Article 3(v) of Directive 2003/87/EC;

([1]) Council Directive (EU) 2020/262 of 19 December 2019 laying down the general arrangements for excise duty (OJ L 58, 27.2.2020, p. 4).

([2]) Council Directive 2003/96/EC of 27 October 2003 restructuring the Community framework for the taxation of energy products and electricity (OJ L 283, 31.10.2003, p. 51).

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(72) 'CO_2(e) per flight' means the non-CO_2 aviation effects that warm the atmosphere, expressed as the equivalent amount of CO_2 emissions of the given flight;

(73) 'radiative forcing' means an imposed change of the planetary energy balance, measured in watts per square meter (W/m^2);

(74) 'efficacy' is the change in global mean temperature per unit radiative forcing exerted by the climate agent, relative to the response generated by a standard CO_2 forcing starting from the same initial climate state;

(75) 'CO_2(e) calculation model' means a model used to calculate the total climate impact of non-CO_2 aviation effects, in accordance with Annex IIIa Section 4 to this Regulation;

(76) 'weather-based approach' means Method C, as provided in Annex IIIa Section 4 to this Regulation, using primarily enhanced weather data, as well as flight information, trajectory, aircraft properties and fuel properties;

(77) 'location-based simplified approach' means Method D, as provided in Annex IIIa Section 4 to this Regulation, using primarily aircraft in-flight location-related data such as flight information, trajectory, but also basic weather data and aircraft properties;

(78) 'non-CO_2 aviation effects tracking system (NEATS)' means an information technology (IT) tool, that is provided by the Commission to aircraft operators, to accredited verifiers and to competent authorities for the purpose of facilitating and, to the extent possible, automating monitoring, reporting and verification of non-CO_2 aviation effects, in line with Article 14(5) of Directive 2003/87/EC;

(79) 'aircraft properties' means the category of information encompassing as a minimum and for each flight, the aircraft type, the engine(s) identifier(s) and the aircraft mass.

(80) 'aeroplane' means a power-driven heavier-than-air aircraft, which derives its lift in flight chiefly from aerodynamic reactions on surfaces which remain fixed under given conditions of flight.

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SECTION 2

General principles

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Article 4

Operators and aircraft operators shall carry out their obligations related to the monitoring and reporting of greenhouse gas emissions and non-CO_2 aviation effects under Directive 2003/87/EC in accordance with the principles laid down in Articles 5 to 9 of this Regulation.

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Article 5

Completeness

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Monitoring and reporting shall be complete and cover all process and combustion emissions from all emission sources and source streams belonging to activities listed in Annex I to Directive 2003/87/EC and other relevant activities included pursuant to Article 24 of that Directive, as well as associated activities included in the boundaries of the installation, and of all greenhouse gases specified in relation to those activities, while avoiding double-counting.

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Operators and aircraft operators shall take appropriate measures to prevent any data gaps within the reporting period.

Article 6

Consistency, comparability and transparency

1. Monitoring and reporting shall be consistent and comparable over time. To that end, operators and aircraft operators shall use the same monitoring methodologies and data sets, subject to changes and derogations approved by the competent authority.

2. Operators and aircraft operators shall obtain, record, compile, analyse and document monitoring data, including assumptions, references, activity data and calculation factors, in a transparent manner that enables the reproduction of the determination of emissions by the verifier and the competent authority.

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3. Aircraft operators shall obtain, record, compile, analyse and document monitoring data, including assumptions, references, activity data and calculation factors, in a transparent manner that enables the reproduction of the determination of non-CO_2 aviation effects per flight by the verifier and the competent authority.

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Article 7

Accuracy

Operators and aircraft operators shall ensure that emission determination is neither systematically nor knowingly inaccurate.

They shall identify and reduce any source of inaccuracies as far as possible.

They shall exercise due diligence to ensure that the calculation and measurement of emissions exhibit the highest achievable accuracy.

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Article 8

Operators and aircraft operators shall enable reasonable assurance of the integrity of emission and non-CO_2 aviation effects data to be reported. They shall determine emissions and non-CO_2 aviation effects using the appropriate monitoring methodologies set out in this Regulation.

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Reported emissions and non-CO_2 aviation effects data and related disclosures shall be free from material misstatement as defined in Article 3(6) of Commission Implementing Regulation (EU) 2018/2067 ([1]), avoid bias in the selection and presentation of information, and provide a credible and balanced account of an installation's or aircraft operator's emissions and non-CO_2 aviation effects.

In selecting a monitoring methodology, the improvements from greater accuracy shall be balanced against additional costs. Monitoring and reporting shall aim for the highest achievable accuracy, unless this is technically not feasible or incurs unreasonable costs.

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Article 9

Continuous improvement

Operators and aircraft operators shall take account of the recommendations included in the verification reports issued pursuant to Article 15 of Directive 2003/87/EC in their consequent monitoring and reporting.

Article 10

Coordination

Where a Member State designates more than one competent authority pursuant to Article 18 of Directive 2003/87/EC, it shall coordinate the work carried out by those authorities pursuant to this Regulation.

CHAPTER II

MONITORING PLAN

SECTION 1

General rules

Article 11

General obligation

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1. Each operator or aircraft operator shall monitor greenhouse gas emissions, and non-CO_2 aviation effects, on the basis of a monitoring plan approved by the competent authority in accordance with Article 12 of this Regulation, taking into account the nature and functioning of the installation or aviation activity to which it applies.

([1]) Commission Implementing Regulation (EU) 2018/2067 of 19 December 2018 on the verification of data and on the accreditation of verifiers pursuant to Directive 2003/87/EC of the European Parliament and of the Council (OJ L 334, 31.12.2018, p. 94, ELI: http://data.europa.eu/eli/reg_impl/2018/2067/oj).

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The monitoring plan shall be supplemented by written procedures which the operator or aircraft operator establishes, documents, implements and maintains for activities under the monitoring plan, as appropriate.

2. The monitoring plan referred to in paragraph 1 shall describe the instructions to the operator or aircraft operator in a logical and simple manner, avoiding duplication of effort and taking into account existing systems in place at the installation or used by the operator or aircraft operator.

Article 12

Content and submission of the monitoring plan

1. Each operator or aircraft operator shall submit a monitoring plan to the competent authority for approval.

The monitoring plan shall consist of a detailed, complete and transparent documentation of the monitoring methodology of a specific installation or aircraft operator and shall contain at least the elements laid down in Annex I.

Together with the monitoring plan, the operator or aircraft operator shall submit the following supporting documents:

(a) for installations, evidence for each major and minor source stream demonstrating compliance with the uncertainty thresholds for activity data and calculation factors, where applicable, for the applied tiers as defined in Annexes II and IV, and for each emission source demonstrating compliance with the uncertainty thresholds for the applied tiers as defined in Annex VIII, where applicable;

(b) the results of a risk assessment providing evidence that the proposed control activities and procedures for control activities are commensurate with the inherent risks and control risks identified.

2. Where Annex I refers to a procedure, an operator or aircraft operator shall establish, document, implement and maintain such a procedure separately from the monitoring plan.

The operator or aircraft operator shall summarise the procedures in the monitoring plan providing the following information:

(a) the title of the procedure;

(b) a traceable and verifiable reference for identification of the procedure;

(c) identification of the post or department responsible for implementing the procedure and for the data generated from or managed by the procedure;

(d) a brief description of the procedure, allowing the operator or aircraft operator, the competent authority and the verifier to understand the essential parameters and operations performed;

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(e) the location of relevant records and information;

(f) the name of the computerised system used, where applicable;

(g) a list of EN standards or other standards applied, where relevant.

The operator or aircraft operator shall make any written documentation of the procedures available to the competent authority upon request. The operator or aircraft operator shall also make them available for the purposes of verification pursuant to Implementing Regulation (EU) 2018/2067.

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Article 13

Standardised and simplified monitoring plans

1. Member States may allow operators and aircraft operators to use standardised or simplified monitoring plans, without prejudice to Article 12(3).

For that purpose, Member States may publish templates for those monitoring plans, including the description of data flow and control procedures referred to in Articles 58 and 59, based on the templates and guidelines published by the Commission.

2. Before the approval of any simplified monitoring plan, as referred to in paragraph 1, the competent authority shall carry out a simplified risk assessment as to whether the proposed control activities and procedures for control activities are commensurate with the inherent risks and control risks identified, and justify the use of such a simplified monitoring plan.

Member States may require the operator or aircraft operator to carry out the risk assessment pursuant to the previous subparagraph itself, where appropriate.

Article 14

Modifications of the monitoring plan

1. Each operator or aircraft operator shall regularly check whether the monitoring plan reflects the nature and functioning of the installation or aviation activity in accordance with Article 7 of Directive 2003/87/EC, and whether the monitoring methodology can be improved.

2. The operator or aircraft operator shall modify the monitoring plan, at least, in any of the following situations:

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(a) new emissions occur due to new activities being carried out or due to the use of new fuels or materials not yet contained in the monitoring plan;

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(aa) non-CO_2 aviation effects occur due to new activities carried out;

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(b) a change in the availability of data, due to the use of new types of measuring instrument, sampling methods or analysis methods, or for other reasons, leads to higher accuracy in the determination of emissions;

(c) data resulting from the monitoring methodology applied previously has been found to be incorrect;

(d) changing the monitoring plan improves the accuracy of the reported data, unless this is technically not feasible or incurs unreasonable costs;

(e) the monitoring plan is not in conformity with the requirements of this Regulation and the competent authority requests the operator or aircraft operator to modify it;

(f) it is necessary to respond to the suggestions for improvement of the monitoring plan contained in a verification report.

Article 15

Approval of modifications of the monitoring plan

1. The operator or aircraft operator shall notify the competent authority of any proposals for modification of the monitoring plan without undue delay.

However, the competent authority may allow the operator or aircraft operator to notify modifications of the monitoring plan that are not significant within the meaning of paragraphs 3 and 4 by 31 December of the same year.

2. Any significant modification of the monitoring plan within the meaning of paragraphs 3 and 4 shall be subject to approval by the competent authority.

Where the competent authority considers a modification not to be significant, it shall inform the operator or aircraft operator thereof without undue delay.

3. Significant modifications to the monitoring plan of an installation include:

(a) changes to the category of the installation where such changes require a change to the monitoring methodology or lead to a change of the applicable materiality level pursuant to Article 23 of Implementing Regulation (EU) 2018/2067;

(b) notwithstanding Article 47(8), changes regarding whether the installation is considered an ‘installation with low emissions’;

(c) changes to emission sources;

(d) a change from calculation-based to measurement-based methodologies, or *vice versa*, or from a fall-back methodology to a tier-based methodology for determining emissions or *vice versa*;

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(e) a change in the tier applied;

(f) the introduction of new source streams;

(g) a change in the categorisation of source streams – between major, minor or *de-minimis* source streams where such a change requires a change to the monitoring methodology;

(h) a change to the default value for a calculation factor, where the value is to be laid down in the monitoring plan;

(i) the introduction of new methods or changes to existing methods related to sampling, analysis or calibration, where this has a direct impact on the accuracy of emissions data;

(j) the implementation or adaption of a quantification methodology for emissions from leakage at storage sites.

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4. Significant modifications to the monitoring plans of an aircraft operator include:

(a) with regard to emissions:

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(i) a change of emission factor values laid down in the monitoring plan;

(ii) a change between calculation methods as laid down in Annex III, or a change from the use of a calculation method to the use of estimation methodology in accordance with Article 55 (2) or *vice versa*;

(iii) the introduction of new source streams;

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(iv) changes in the status of the aircraft operator as a small emitter within the meaning of Article 55(1) of this Regulation and whether the aircraft operator intends to use the simplification pursuant to Article 28a(4) of Directive 2003/87/EC.

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(b) with regard to the non-CO_2 aviation effects:

(i) (a change in the CO_2(e) calculation approach selected, as laid down in Article 56a(4) of this Regulation, notably in terms of IT tools to apply the CO_2(e) calculation models;

(ii) changes in the status of the aircraft operator as a small emitter within the meaning of Article 55(1) of this Regulation.

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Article 16

Implementation and record-keeping of modifications

1. Before receiving approval or information in accordance with Article 15(2), the operator or aircraft operator may carry out monitoring and reporting using the modified monitoring plan where it can reasonably assume that the proposed modifications are not significant, or where monitoring in accordance with the original monitoring plan would lead to incomplete emission data.

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In case of doubt, the operator or aircraft operator shall use in parallel both the modified and the original monitoring plan to carry out all monitoring and reporting in accordance with both plans, and it shall keep records of both monitoring results.

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2. Upon receipt of approval or information in accordance with Article 15(2), the operator or aircraft operator shall only use the data relating to the modified monitoring plan and carry out all monitoring and reporting using only the modified monitoring plan from the date from which that version of the monitoring plan is applicable.

3. The operator or aircraft operator shall keep records of all modifications of the monitoring plan. Each record shall contain:

(a) a transparent description of the modification;

(b) a justification for the modification;

(c) the date of notification of the modification to the competent authority pursuant to Article 15(1);

(d) the date on which the competent authority acknowledged receipt of the notification referred to in Article 15(1), where available, and the date of the approval or information referred to in Article 15(2);

(e) the starting date of implementation of the modified monitoring plan in accordance with paragraph 2 of this Article.

SECTION 2

Technical feasibility and unreasonable costs

Article 17

Technical feasibility

Where an operator or aircraft operator claims that applying a specific monitoring methodology is technically not feasible, the competent authority shall assess the technical feasibility taking the operator's or aircraft operator's justification into account. That justification shall be based on the operator or aircraft operator having technical resources capable of meeting the needs of a proposed system or requirement that can be implemented in the required time for the purposes of this Regulation. Those technical resources shall include the availability of the requisite techniques and technology.

Article 18

Unreasonable costs

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1. Where an operator or aircraft operator claims that applying a specific monitoring methodology would incur unreasonable costs, the competent authority shall assess whether the costs are unreasonable, taking into account the operator’s justification.

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The competent authority shall consider costs unreasonable where the cost estimate exceeds the benefit. To that end, the benefit shall be calculated by multiplying an improvement factor by a reference price of EUR 80 per allowance and costs shall include an appropriate depreciation period based on the economic lifetime of the equipment.

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2. When assessing the unreasonable nature of the costs with regard to the operator's choice of tier levels for activity data, the competent authority shall use as the improvement factor referred to in paragraph 1 the difference between the uncertainty currently achieved and the uncertainty threshold of the tier that would be achieved by the improvement multiplied by the average annual emissions caused by that source stream over the three most recent years.

In the absence of such data on the average annual emissions caused by that source stream over the three most recent years, the operator or aircraft operator shall provide a conservative estimate of the annual average emissions, with the exclusion of CO_2 stemming from ►M5 zero-rated carbon ◄ and before subtraction of transferred CO_2. For measuring instruments under national legal metrological control, the uncertainty currently achieved may be substituted by the maximum permissible error in service allowed by the relevant national legislation.

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For the purpose of this paragraph, Article 38(5) shall apply, provided that the relevant information on the sustainability and the greenhouse gas emissions saving criteria of biofuels, bioliquids and biomass fuels used for combustion is available to the operator.

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3. When assessing the unreasonable nature of the costs with regard to measures increasing the quality of reported emissions but without direct impact on the accuracy of activity data, the competent authority shall use an improvement factor of 1 % of the average annual emissions of the respective source streams in the three most recent reporting periods. Those measures may include:

(a) switching from default values to analyses to determine calculation factors;

(b) an increase of the number of analyses per source stream;

(c) where the specific measuring task does not fall under national legal metrological control, the substitution of measuring instruments with instruments complying with relevant requirements of legal metrological control of the Member State in similar applications, or to measuring instruments meeting national rules adopted pursuant to Directive 2014/31/EU of the European Parliament and of the Council ([1]) or Directive 2014/32/EU;

(d) shortening calibration and maintenance intervals of measuring instruments;

(e) improvements to data-flow activities and control activities that significantly reduce the inherent or control risk.

([1]) Directive 2014/31/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of non-automatic weighing instruments (OJ L 96, 29.3.2014, p. 107).

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4. Measures relating to the improvement of an installation's monitoring methodology shall not be deemed to incur unreasonable costs up to an accumulated amount of EUR 4 000 per reporting period. For installations with low emissions that threshold shall be EUR 1 000 per reporting period.

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CHAPTER III

MONITORING OF EMISSIONS FROM STATIONARY INSTALLATIONS

SECTION 1

General provisions

Article 19

Categorisation of installations, source streams and emission sources

1. For the purpose of monitoring emissions and determining the minimum requirements for tiers, each operator shall determine the category of its installation pursuant to paragraph 2, and, where relevant, of each source stream pursuant to paragraph 3 and of each emission source pursuant to paragraph 4.

2. The operator shall classify each installation in one of the following categories:

(a) a category A installation, where the average verified annual emissions in the trading period immediately preceding the current trading period, with the exclusion of CO_2 stemming from ►M5 zero-rated carbon ◄ and before subtraction of transferred CO_2, are equal to or less than 50 000 tonnes of $CO_{2(e)}$;

(b) a category B installation, where the average verified annual emissions of the trading period immediately preceding the current trading period, with the exclusion of CO_2 stemming from ►M5 zero-rated carbon ◄ and before subtraction of transferred CO_2, are more than 50 000 tonnes of $CO_{2(e)}$ and equal to or less than 500 000 tonnes of $CO_{2(e)}$;

(c) a category C installation, where the average verified annual emissions of the trading period immediately preceding the current trading period, with the exclusion of CO_2 stemming from ►M5 zero-rated carbon ◄ and before subtraction of transferred CO_2, are more than 500 000 tonnes of $CO_{2(e)}$.

By way of derogation from Article 14(2), the competent authority may allow the operator not to modify the monitoring plan where, on the basis of verified emissions, the threshold for the classification of the installation referred to in the first subparagraph is exceeded, but the operator demonstrates to the satisfaction of the competent authority that this threshold has not already been exceeded within the past five reporting periods and will not be exceeded again in subsequent reporting periods.

3. The operator shall classify each source stream in one of the following categories, comparing it against the sum of all absolute values of fossil CO_2 and $CO_{2(e)}$ corresponding to all source streams included in calculation-based methodologies and of all emissions of emission sources monitored using measurement-based methodologies, before subtraction of transferred CO_2:

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(a) minor source streams, where the source streams selected by the operator jointly account for less than 5 000 tonnes of fossil CO_2 per year or less than 10 %, up to a total maximum of 100 000 tonnes of fossil CO_2 per year, whichever is greater in terms of absolute value;

(b) *de minimis* source streams, where the source streams selected by the operator jointly account for less than 1 000 tonnes of fossil CO_2 per year or less than 2 %, up to a total maximum of 20 000 tonnes of fossil CO_2 per year, whichever is greater in terms of absolute value;

(c) major source streams, where the source streams do not fall within the categories referred to in points (a) and (b).

By way of derogation from Article 14(2), the competent authority may allow the operator not to modify the monitoring plan where, on the basis of verified emissions, the threshold for the classification of a source stream as a minor source stream or a *de minimis* source stream referred to in the first subparagraph is exceeded, but the operator demonstrates to the satisfaction of the competent authority that this threshold has not already been exceeded within the past five reporting periods and will not be exceeded again in subsequent reporting periods.

4. The operator shall classify each emission source for which a measurement-based methodology is applied in one of the following categories:

(a) minor emission sources, where the emission source emits less than 5 000 tonnes of fossil $CO_{2(e)}$ per year or less than 10 % of the installation's total fossil emissions, up to a maximum of 100 000 tonnes of fossil $CO_{2(e)}$ per year, whichever is greater in terms of absolute value;

(b) major emission sources, where the emission source does not classify as a minor emission source.

By way of derogation from Article 14(2), the competent authority may allow the operator not to modify the monitoring plan where, on the basis of verified emissions, the threshold for the classification of an emission source as a minor emission source referred to in the first subparagraph is exceeded, but the operator demonstrates to the satisfaction of the competent authority that this threshold has not already been exceeded within the past five reporting periods and will not be exceeded again in subsequent reporting periods.

5. Where the average annual verified emissions in the trading period immediately preceding the current trading period for the installation are not available or no longer representative for the purpose of paragraph 2, the operator shall use a conservative estimate of annual average emissions, with the exclusion of CO_2 stemming from ►**M5** zero-rated carbon ◄ and before subtraction of transferred CO_2, to determine the category of the installation.

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Article 20

Monitoring boundaries

1. Operators shall define the monitoring boundaries for each installation.

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Within those boundaries, the operator shall include all relevant greenhouse gas emissions from all emission sources and source streams belonging to activities carried out at the installation and listed in Annex I to Directive 2003/87/EC, and from activities and greenhouse gases included by the Member State in which the installation is situated, pursuant to Article 24 of that Directive.

The operator shall also include emissions from regular operations and abnormal events, including start-up, shut-down and emergency situations, over the reporting period, with the exception of emissions from mobile machinery for transportation purposes.

2. When determining the monitoring and reporting process, the operator shall include the sector-specific requirements laid down in Annex IV.

3. Where leakages from a storage complex within the meaning of Directive 2009/31/EC are identified and lead to emissions or release of CO_2 to the water column, they shall be considered as emission sources for the installation in question and shall be monitored in accordance with section 23 of Annex IV to this Regulation.

The competent authority may allow the exclusion of a leakage emission source from the monitoring and reporting process, once corrective measures pursuant to Article 16 of Directive 2009/31/EC have been taken and emissions or release into the water column from that leakage can no longer be detected.

Article 21

Choice of the monitoring methodology

1. For the monitoring of the emissions of an installation, the operator shall choose to apply either a calculation-based methodology or a measurement-based methodology, subject to specific provisions of this Regulation.

A calculation-based methodology shall consist in determining emissions from source streams on the basis of activity data obtained by means of measurement systems and additional parameters from laboratory analyses or default values. The calculation-based methodology may be implemented according to the standard methodology set out in Article 24 or the mass-balance methodology set out in Article 25.

A measurement-based methodology shall consist in determining emissions from emission sources by means of continuous measurement of the concentration of the relevant greenhouse gas in the flue gas and of the flue-gas flow, including the monitoring of CO_2 transfers between installations where the CO_2 concentration and the flow of the transferred gas are measured.

Where the calculation-based methodology is applied, the operator shall determine for each source stream, in the monitoring plan, whether the standard methodology or the mass-balance methodology is used, including the relevant tiers in accordance with Annex II.

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2. Subject to approval by the competent authority, the operator may combine standard methodology, mass-balance and measurement-based methodologies for different emission sources and source streams belonging to one installation, provided that neither gaps nor double counting concerning emissions occur.

3. Where sector-specific requirements laid down in Annex IV require the use of a specific monitoring methodology, the operator shall use that methodology or a measurement-based methodology. The operator may choose a different methodology only if it provides the competent authority with evidence that the use of the required methodology is technically not feasible or incurs unreasonable costs, or that the alternative methodology leads to a higher overall accuracy of emissions data.

Article 22

Monitoring methodology not based on tiers

By way of derogation from Article 21(1), the operator may use a monitoring methodology that is not based on tiers (hereinafter 'the fall-back methodology') for selected source streams or emission sources, provided that all of the following conditions are met:

(a) applying at least tier 1 under the calculation-based methodology for one or more major source streams or minor source streams and a measurement-based methodology for at least one emission source related to the same source streams is technically not feasible or would incur unreasonable costs;

(b) the operator assesses and quantifies each year the uncertainties of all parameters used for the determination of the annual emissions in accordance with the *ISO guide to the expression of uncertainty in measurement* (JCGM 100:2008) or another equivalent internationally accepted standard, and includes the results in the annual emissions report;

(c) the operator demonstrates to the satisfaction of the competent authority that by applying such a fall-back monitoring methodology, the overall uncertainty thresholds for the annual level of greenhouse gas emissions for the whole installation do not exceed 7,5 % for category A installations, 5,0 % for category B installations and 2,5 % for category C installations.

Article 23

Temporary changes to the monitoring methodology

1. Where it is for technical reasons temporarily not feasible to apply the monitoring plan as approved by the competent authority, the operator concerned shall apply the highest achievable tier, or a conservative no-tier approach if application of a tier is not achievable, until the conditions for application of the tier approved in the monitoring plan have been restored.

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The operator shall take all necessary measures to allow the prompt resumption of the application of the monitoring plan as approved by the competent authority.

2. The operator concerned shall notify the competent authority of the temporary change referred to in paragraph 1 to the monitoring methodology without undue delay to the competent authority, specifying:

(a) the reasons for deviating from the monitoring plan as approved by the competent authority;

(b) the details of the interim monitoring methodology that the operator is using to determine the emissions until the conditions for the application of the monitoring plan as approved by the competent authority have been restored;

(c) the measures the operator is taking to restore the conditions for the application of the monitoring plan as approved by the competent authority;

(d) the anticipated point in time when application of the monitoring plan as approved by the competent authority will be resumed.

SECTION 2

Calculation-based methodology

Subsection 1

General

Article 24

Calculation of emissions under the standard methodology

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1. Under the standard methodology, the operator shall calculate combustion emissions of each source stream by multiplying the activity data related to the amount of fuel combusted, expressed as terajoules based on net calorific value (NCV), by the corresponding emission factor, expressed as tonnes of CO_2 per terajoule (t CO_2/TJ) consistent with the use of NCV, and the corresponding oxidation factor.

1a. For the purpose of reporting memo-items, the operator shall also calculate for each source stream combusted and for fuels used as process input the following parameters which are defined by these calculations:

(i) the total preliminary emissions shall be calculated by multiplying the activity data related to the amount of fuel combusted, expressed as tonnes or normal cubic metres, by the corresponding preliminary emission factor and the corresponding oxidation factor;

(ii) biomass emissions shall be calculated by multiplying the total preliminary emissions by the biomass fraction;

(iii) zero-rated biomass emissions shall be calculated by multiplying the total preliminary emissions by the zero-rated biomass fraction;

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(iv) emissions from RFNBO, RCF or synthetic low-carbon fuels shall be calculated by multiplying the total preliminary emissions by the RFNBO or RCF fraction or the synthetic low-carbon fraction;

(v) emissions from zero-rated RFNBO, RCF or synthetic low-carbon fuels shall be calculated by multiplying the total preliminary emissions by the zero-rated RFNBO or RCF fraction or the zero-rated synthetic low-carbon fraction.

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2. The operator shall determine process emissions per source stream by multiplying the activity data related to the material consumption, throughput or production output, expressed in tonnes or normal cubic metres, by the corresponding emission factor, expressed in t CO_2/t or t CO_2/Nm^3, and the corresponding conversion factor.

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2a. For the purpose of reporting memo-items, the operator shall also calculate for each source stream relating to process emissions the following parameters which are defined by these calculations:

(i) The total preliminary emissions shall be calculated by multiplying the activity data related to the material consumption, throughput or production output, expressed in tonnes or normal cubic metres, by the corresponding emission factor, expressed in t CO_2/t or t CO_2/Nm^3, and the corresponding conversion factor;

(ii) Biomass emissions shall be calculated by multiplying the total preliminary emissions by the relevant biomass fraction;

(iii) Zero-rated biomass emissions shall be calculated by multiplying the total preliminary emissions by the relevant zero-rated biomass fraction.

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3. Where a tier 1 or tier 2 emission factor already includes the effect of incomplete chemical reactions, the oxidation factor or conversion factor shall be set to 1.

Article 25

Calculation of emissions under the mass balance methodology

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1. Under the mass balance methodology, the operator shall calculate the quantity of CO_2 corresponding to each source stream included in the mass balance by multiplying the activity data related to the amount of fuel, material or CO_2 transferred entering or leaving the boundaries of the mass balance, with the fuel's, material's or CO_2 transfer's carbon content multiplied by its fossil fraction and by 3,664 t CO_2/t C, applying Section 3 of Annex II to this Regulation.

1a. For the purpose of reporting memo-items, the operator shall also calculate for each source stream covered by the mass balance the following parameters which are defined by these calculations:

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(i) The total preliminary quantity of CO_2 shall be calculated by multiplying the activity data related to the amount of fuel or material entering or leaving the boundaries of the mass balance, with the fuel's or material's carbon content and by 3,664 t CO_2/t C;

(ii) The quantity of CO_2 relating to biomass shall be calculated by multiplying the total preliminary quantity of CO_2 by the biomass fraction;

(iii) The quantity of CO_2 relating to zero-rated biomass shall be calculated by multiplying the total preliminary quantity of CO_2 by the zero-rated biomass fraction;

(iv) If applicable, the quantity of CO_2 relating to RFNBO, RCF or synthetic low-carbon fuels shall be calculated by multiplying the total preliminary quantity of CO_2 by the RFNBO or RCF fraction or the synthetic low-carbon fraction;

(v) If applicable, the quantity of CO_2 relating to zero-rated RFNBO, RCF or synthetic low-carbon fuels shall be calculated by multiplying the total preliminary quantity of CO_2 by the zero-rated RFNBO or RCF fraction or the zero-rated synthetic low-carbon fraction.

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2. Notwithstanding Article 49, the emissions of the total process covered by the mass balance shall be the sum of the CO_2 quantities corresponding to all source streams covered by the mass balance. CO emitted to the atmosphere shall be calculated in the mass balance as emission of the molar equivalent amount of CO_2.

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3. Where the operator uses a mass balance in accordance with this Article, and zero-rated carbon is contained in input materials or fuels, and output materials contain carbon, the operator shall provide to the competent authority data on the zero-rated fraction of the carbon content of the output streams. The operator shall thereby provide evidence that the installation's total emissions are not systematically underestimated by the applied monitoring methodology and that the total mass of carbon corresponding to the zero-rated carbon fractions of the carbon contained in all relevant output materials, is not lower than the total mass of zero-rated fractions of the carbon contained in input materials and fuels.

For the purpose of the first subparagraph, Article 39, paragraphs 3 and 4 shall apply regarding the zero-rated biomass fraction of biogas and natural gas used as input.

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Article 26

Applicable tiers

1. When defining the relevant tiers for major and minor source streams in accordance with Article 21(1), to determine the activity data and each calculation factor, each operator shall apply the following:

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(a) at least the tiers listed in Annex V, in the case of a category A installation, or where a calculation factor is required for a source stream that is a commercial standard fuel;

(b) in other cases than those referred to in point (a), the highest tier as defined in Annex II.

However, for major source streams the operator may apply a tier one level lower than required in accordance with the first subparagraph for category C installations and up to two levels lower for category A and B installations, with a minimum of tier 1, where it shows to the satisfaction of the competent authority that the tier required in accordance with the first subparagraph is technically not feasible or incurs unreasonable costs.

The competent authority may, for a transitional period agreed with the operator, allow an operator to apply tiers for major source streams that are lower than those referred to in the second subparagraph, with a minimum of tier 1, provided that:

(a) the operator shows to the satisfaction of the competent authority that the tier required pursuant to the second subparagraph is technically not feasible or incurs unreasonable costs; and

(b) the operator provides an improvement plan indicating how and by when at least the tier required pursuant to the second subparagraph will be reached.

2. For minor source streams, the operator may apply a lower tier than required in accordance with the first subparagraph of paragraph 1, with a minimum of tier 1, where it shows to the satisfaction of the competent authority that the tier required in accordance with the first subparagraph of paragraph 1 is technically not feasible or incurs unreasonable costs.

3. For *de minimis* source streams, the operator may determine activity data and each calculation factor by using conservative estimates instead of using tiers, unless a defined tier is achievable without additional effort.

4. For the oxidation factor and conversion factor, the operator shall, as a minimum, apply the lowest tiers listed in Annex II.

5. Where the competent authority has allowed the use of emission factors expressed as t CO_2/t or t CO_2/Nm^3 for fuels, and for fuels used as process input or in mass balances in accordance with Article 25, the net calorific value may be monitored using a conservative estimate instead of using tiers, unless a defined tier is achievable without additional effort.

Subsection 2

Activity data

Article 27

Determination of activity data

1. The operator shall determine the activity data of a source stream in one of the following ways:

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(a) on the basis of continual metering at the process which causes the emissions;

(b) on the basis of aggregation of metering of quantities delivered separately, taking into account relevant stock changes.

2. For the purposes of point (b) of paragraph 1, the quantity of fuel or material processed during the reporting period shall be calculated as the quantity of fuel or material received during the reporting period, minus the quantity of fuel or material moved out of the installation, plus the quantity of fuel or material in stock at the beginning of the reporting period, minus the quantity of fuel or material in stock at the end of the reporting period.

Where it is technically not feasible or would incur unreasonable costs to determine quantities in stock by direct measurement, the operator may estimate those quantities on the basis of one of the following:

(a) data from previous years correlated with output for the reporting period;

(b) documented procedures and respective data in audited financial statements for the reporting period.

Where it is technically not feasible or would incur unreasonable costs to determine activity data for the entire calendar year, the operator may choose the next most appropriate day to separate one reporting year from the subsequent year, and reconcile accordingly to the calendar year required. The deviations involved for one or more source streams shall be clearly recorded, form the basis of a value representative for the calendar year, and be considered consistently in relation to the next year.

Article 28

Measurement systems under the operator's control

1. To determine activity data in accordance with Article 27, the operator shall use metering results based on measurement systems under its own control at the installation, provided that all of the following conditions are complied with:

(a) the operator must carry out an uncertainty assessment and ensures that the uncertainty threshold of the relevant tier level is met;

(b) the operator must ensure at least once a year and after each calibration of a measuring instrument that the calibration results multiplied by a conservative adjustment factor are compared with the relevant uncertainty thresholds. The conservative adjustment factor shall be based on an appropriate time series of previous calibrations of that or similar measuring instruments for taking into account the effect of uncertainty in service.

Where tier thresholds approved in accordance with Article 12 are exceeded or equipment found not to conform with other requirements, the operator shall take corrective action without undue delay and notify the competent authority thereof.

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2. When notifying a new monitoring plan or when it is relevant for a change to the approved monitoring plan, the operator shall provide the competent authority with the uncertainty assessment referred to in point (a) of paragraph 1.

The assessment shall cover the specified uncertainty of the applied measuring instruments, uncertainty associated with the calibration, and any additional uncertainty connected to how the measuring instruments are used in practice. The uncertainty assessment shall cover uncertainty related to stock changes where the storage facilities are capable of containing at least 5 % of the annual used quantity of the fuel or material considered. When carrying out the assessment, the operator shall take into account the fact that the stated values used to define tier uncertainty thresholds in Annex II refer to the uncertainty over the full reporting period.

The operator may simplify the uncertainty assessment by assuming that the maximum permissible errors specified for the measuring instrument in service or, where lower, the uncertainty obtained by calibration, multiplied by a conservative adjustment factor for taking into account the effect of uncertainty in service, are to be regarded as the uncertainty over the whole reporting period as required by the tier definitions in Annex II, provided that measuring instruments are installed in an environment appropriate for their use specifications.

3. Notwithstanding paragraph 2, the competent authority may allow the operator to use metering results based on measurement systems under its own control at the installation, where the operator provides evidence that the measuring instruments applied are subject to relevant national legal metrological control.

For that purpose, the maximum permissible error in service allowed by the relevant national legislation on legal metrological control for the relevant measuring task may be used as the uncertainty value without providing further evidence.

Article 29

Measurement systems outside the operator's own control

1. Where, based on a simplified uncertainty assessment, the use of measurement systems outside the operator's own control, as compared with the use of those within the operator's own control pursuant to Article 28, allows the operator to comply with at least as high a tier, gives more reliable results and is less prone to control risks, the operator shall determine the activity data from measurement systems outside its own control.

To that end, the operator may revert to one of the following data sources:

(a) amounts from invoices issued by a trade partner, provided that a commercial transaction between two independent trade partners takes place;

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(b) direct readings from the measurement systems.

2. The operator shall ensure compliance with the applicable tier pursuant to Article 26.

To that end, the maximum permissible error in service allowed by relevant legislation for national legal metrological control for the relevant commercial transaction may be used as uncertainty without providing further evidence.

Where the applicable requirements under national legal metrological control are less stringent than the applicable tier pursuant to Article 26, the operator shall obtain evidence on the applicable uncertainty from the trade partner responsible for the measurement system.

Subsection 3

Calculation factors

Article 30

Determination of calculation factors

1. The operator shall determine calculation factors either as default values or values based on analysis, depending on the applicable tier.

2. The operator shall determine and report calculation factors consistently with the state used for related activity data, referring to the fuel's or material's state in which the fuel or material is purchased or used in the emission-causing process, before it is dried or otherwise treated for laboratory analysis.

Where such an approach incurs unreasonable costs or where higher accuracy can be achieved, the operator may consistently report activity data and calculation factors referring to the state in which laboratory analyses are carried out.

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2a. The operator shall determine the biomass fraction only for mixed fuels or materials containing biomass. For other fuels or materials, the default value of 0 % for the biomass fraction of fossil fuels or materials shall be used, and a default value of 100 % biomass fraction for biomass fuels or materials consisting exclusively of biomass.

The operator shall determine the RFNBO or RCF fraction or the synthetic low-carbon fraction only for mixed fuels containing RFNBOs, RCFs or synthetic low-carbon fuels. For other fuels the default value of 0 % for the RFNBO or RCF fraction or the synthetic low-carbon fraction shall be used, and a default value of 100 % RFNBO or RCF fraction or synthetic low-carbon fraction for fuels consisting exclusively of RFNBOs, RCFs or synthetic low-carbon fuels.

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The operator shall determine the zero-rated biomass fraction, zero-rated RFNBO or RCF fraction and zero-rated synthetic low-carbon fraction only where the operator wants to make use of zero-rating.

3. Regarding the interdependency of composition-related calculation factors, the operator shall apply the following rules:

(i) Where a fuel or material contains biomass, the operator shall determine the biomass fraction in accordance with Article 39 of this Regulation.

(ii) Where the biomass fraction is not zero and where the operator wants to make use of zero-rating, the operator shall determine the zero-rated biomass fraction in accordance with Article 38(5) of this Regulation.

(iii) Where a fuel contains an RFNBO, RCF or synthetic low-carbon fuel, the operator shall determine the RFNBO or RCF fraction or the synthetic low-carbon fraction in accordance with Article 39a (1) and (2) of this Regulation.

(iv) Where the RFNBO or RCF fraction is not zero and where the operator wants to make use of zero-rating, the operator shall determine the zero-rated RFNBO or RCF fraction in accordance with Article 39a(3) of this Regulation.

(v) Where the synthetic low-carbon fraction is not zero and where the operator wants to make use of zero-rating, the operator shall determine the zero-rated synthetic low-carbon fraction in accordance with Article 39a(4) of this Regulation.

(vi) Where the zero-rated biomass fraction, the zero-rated RFNBO or RCF fraction or the zero-rated synthetic low-carbon fraction are not zero, the operator shall calculate the zero-rated fraction as the sum of zero-rated biomass fraction, zero-rated RFNBO or RCF fraction and zero-rated synthetic low-carbon fraction. The fossil fraction is the sum of all non-zero-rated fractions.

(vii) The operator shall calculate the emission factor as the preliminary emission factor multiplied by the fossil fraction.

For the purpose of point (vi), where the operator does not calculate the zero-rated fraction, the fossil fraction shall be 100 %.

By way of derogation from the first subparagraph, the operator may:

(i) determine the biomass fraction as identical to the zero-rated biomass fraction, if the latter is determined based on the mass balance pursuant to Article 30(1) of Directive (EU) 2018/2001;

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(ii) determine the RFNBO or RCF fraction as identical to the zero-rated RFNBO or RCF fraction, if the latter is determined based on the mass balance pursuant to Article 30(1) of Directive (EU) 2018/2001;

(iii) determine the synthetic low-carbon fraction as identical to the zero-rated synthetic low-carbon fraction, if the latter is determined based on the mass balance pursuant to Article 30(1) of Directive (EU) 2018/2001.

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Article 31

Default values for calculation factors

1. Where the operator determines calculation factors as default values, it shall use one of the following values, in accordance with the requirement of the applicable tier as set out in Annexes II and VI:

(a) standard factors and stoichiometric factors listed in Annex VI;

(b) standard factors used by the Member State for its national inventory submission to the Secretariat of the United Nations Framework Convention on Climate Change;

(c) literature values agreed with the competent authority, including standard factors published by the competent authority, which are compatible with factors referred to in point (b), but representative of more disaggregated sources of fuel streams;

(d) values specified and guaranteed by the supplier of a fuel or material where the operator can demonstrate to the satisfaction of the competent authority that the carbon content exhibits a 95 % confidence interval of not more than 1 %;

(e) values based on analyses carried out in the past, where the operator can demonstrate to the satisfaction of the competent authority that those values are representative for future batches of the same fuel or material.

2. The operator shall specify all default values used in the monitoring plan.

Where the default values change on an annual basis, the operator shall specify the authoritative applicable source of that value in the monitoring plan.

3. The competent authority may approve a change of default values for a calculation factor in the monitoring plan pursuant to Article 15(2) only where the operator provides evidence that the new default value leads to a more accurate determination of emissions.

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4. Upon application by the operator, the competent authority may allow that the net calorific value and emission factors of fuels are determined using the same tiers as required for commercial standard fuels provided that the operator submits, at least every three years, evidence that the 1 % interval for the specified calorific value has been met during the last three years.

5. Upon application by the operator, the competent authority may accept that the stoichiometric carbon content of a pure chemical substance be considered as meeting a tier that would otherwise require analyses carried out in accordance with Articles 32 to 35, if the operator can demonstrate to the satisfaction of the competent authority that using analyses would lead to unreasonable costs and that using the stoichiometric value will not lead to under-estimation of the emissions.

Article 32

Calculation factors based on analyses

1. 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.

2. Where online gas chromatographs or extractive or non-extractive gas analysers are used to determine emissions, the operator shall obtain the competent authority's approval for the use of such equipment. The equipment shall be used only with regard to composition data of gaseous fuels and materials. As minimum quality assurance measures, the operator shall ensure that an initial validation and annually repeated validations of the instrument are performed.

3. The result of any analysis shall be used only for the delivery period or batch of fuel or material for which the samples have been taken, and for which the samples were intended to be representative.

When determining a specific parameter, the operator shall use the results of all analyses made with regard to that parameter.

Article 33

Sampling plan

1. Where calculation factors are determined by analyses, the operator shall submit to the competent authority for approval, for each fuel or material a sampling plan in the form of a written procedure, which contains information on methodologies for the preparation of samples, including information on responsibilities, locations, frequencies and quantities, and methodologies for the storage and transport of samples.

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The operator shall ensure that the derived samples are representative for the relevant batch or delivery period and free of bias. 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 plan. The operator shall make the plan available for the purposes of verification pursuant to Implementing Regulation (EU) 2018/2067.

2. The operator shall, in agreement with the laboratory carrying out the analysis for the respective fuel or material and subject to the approval of the competent authority, adapt the elements of the sampling plan where analytical results indicate that the heterogeneity of the fuel or material significantly differs from the information on heterogeneity on which the original sampling plan for that specific fuel or material was based.

Article 34

Use of laboratories

1. The operator shall ensure that laboratories used to carry out analyses for the determination of calculation factors are accredited in accordance with EN ISO/IEC 17025, for the relevant analytical methods.

2. Laboratories not accredited in accordance with EN ISO/IEC 17025 may be used for the determination of calculation factors only where the operator can demonstrate to the satisfaction of the competent authority that access to laboratories referred to in paragraph 1 is technically not feasible or would incur unreasonable costs, and that the non-accredited laboratory meets requirements equivalent to EN ISO/IEC 17025.

3. The competent authority shall deem a laboratory to meet requirements equivalent to EN ISO/IEC 17025 within the meaning of paragraph 2 where the operator provides, to the extent feasible, in the form and to a similar level of detail required for procedures pursuant to Article 12(2), evidence in accordance with the second and the third sub-paragraph of this paragraph.

With respect to quality management, the operator shall produce 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 its personnel, procedures, documents and tasks in a reliable manner.

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. Such evidence shall cover at least the following elements:

(a) management of the personnel's competence for the specific tasks assigned;

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(b) suitability of accommodation and environmental conditions;

(c) selection of analytical methods and relevant standards;

(d) where applicable, management of sampling and sample preparation, including control of sample integrity;

(e) where applicable, development and validation of new analytical methods or application of methods not covered by international or national standards;

(f) uncertainty estimation;

(g) management of equipment, including procedures for calibration, adjustment, maintenance and repair of equipment, and record keeping thereof;

(h) management and control of data, documents and software;

(i) management 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;

(k) management of outsourced processes;

(l) management of assignments, customer complaints, and ensuring timely corrective action.

Article 35

Frequencies for analyses

1. The operator shall apply the minimum frequencies for analyses for relevant fuels and materials listed in Annex VII.

2. The competent authority may allow the operator to use a frequency that differs from those referred to in paragraph 1, where minimum frequencies are not available or where the operator demonstrates one of the following:

(a) 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 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;

(b) using the required frequency would incur unreasonable costs.

Where an installation operates for part of the year only, or where fuels or materials are delivered in batches that are consumed over more than one calendar year, the competent authority may agree with the operator a more appropriate schedule for analyses, provided that it results in a comparable uncertainty as under point (a) of the first subparagraph.

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Subsection 4

Specific calculation factors

Article 36

Emission factors for CO_2

1. The operator shall determine activity-specific emission factors for CO_2 emissions.

2. Emission factors of fuels, including those used as process input, shall be expressed as t CO_2/TJ.

The competent authority may allow the operator to use an emission factor for a fuel expressed as t CO_2/t or t CO_2/Nm^3 for combustion emissions, where the use of an emission factor expressed as t CO_2/TJ incurs unreasonable costs or where at least equivalent accuracy of the calculated emissions can be achieved by using such an emission factor.

3. For the conversion of the carbon content into the respective value of a CO_2 related emission factor or *vice versa*, the operator shall use the factor 3,664 t CO_2/t C.

Article 37

Oxidation and conversion factors

1. The operator shall use tier 1 as a minimum to determine oxidation or conversion factors. The operator shall use a value of 1 for oxidation or for a conversion factor where the emission factor includes the effect of incomplete oxidation or conversion.

However, the competent authority may require operators to always use tier 1.

2. Where several fuels are used within an installation and tier 3 is to be used for the specific oxidation factor, the operator may ask for the approval of the competent authority for one or both of the following:

(a) the determination of one aggregate oxidation factor for the whole combustion process and to apply it to all fuels;

(b) the attribution of the incomplete oxidation to one major source stream and use of a value of 1 for the oxidation factor of the other source streams.

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Where mixed fuels are used, the operator shall provide evidence that application of points (a) or (b) of the first subparagraph does not lead to an underestimation of emissions.

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Subsection 5

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Treatment of biomass, synthetic low-carbon fuels, RFNBO and RCF

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Article 38

Biomass source streams

1. The operator may determine the activity data of a ►M5 zero-rated carbon ◄ source stream without using tiers and providing analytical evidence regarding the ►M5 zero-rated carbon ◄ content, where that source stream consists exclusively of ►M5 zero-rated carbon ◄ and the operator can ensure that it is not contaminated with other materials or fuels.

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The emission factor of each fuel or material shall be calculated and reported as the preliminary emission factor, determined in accordance with Article 30, multiplied by the fossil fraction of the fuel or material.

3. Peat, xylite and fossil fractions of mixed fuels or materials shall not be considered biomass.

4. Where the ►M5 zero-rated biomass fraction ◄ of mixed fuels or materials is equal or higher than 97 %, or where, due to the amount of the emissions associated with the fossil fraction of the fuel or material, it qualifies as a *de minimis* source stream, the competent authority may allow the operator to apply no-tier methodologies, including the energy balance method, for determining activity data and relevant calculation factors.

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5. ►M5 Biofuels, bioliquids and biomass fuels shall fulfil the sustainability and the greenhouse gas emissions saving criteria laid down in paragraphs 2 to 7 and 10 of Article 29 of Directive (EU) 2018/2001, in order to be counted towards the zero-rated biomass fraction of a source stream. ◄

However, biofuels, bioliquids and biomass fuels produced from waste and residues, other than agricultural, aquaculture, fisheries and forestry residues are required to fulfil only the criteria laid down in Article 29 (10) of Directive (EU) 2018/2001. This subparagraph shall also apply to waste and residues that are first processed into a product before being further processed into biofuels, bioliquids and biomass fuels.

Electricity, heating and cooling produced from municipal solid waste shall not be subject to the criteria laid down in Article 29(10) of Directive (EU) 2018/2001.

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The criteria laid down in paragraphs 2 to 7 and 10 of Article 29 of Directive (EU) 2018/2001 shall apply irrespective of the geographical origin of the biomass.

Article 29(10) of Directive (EU) 2018/2001 shall apply to an installation as defined in Article 3(e) of Directive 2003/87/EC.

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The compliance with the criteria laid down in paragraphs 2 to 7 and 10 of Article 29 of Directive (EU) 2018/2001 shall be assessed in accordance with Articles 30 and 31(1) of that Directive. The criteria may also be considered complied with if the operator provides evidence for a purchase of a quantity of biofuel, bioliquid or biogas connected to the cancellation of the respective quantity in the Union Database set up pursuant to Article 31a or a national database set up by the Member State in accordance with Article 31a(5) of that Directive. In case of subsequent non-compliance regarding the proof of sustainability of the quantities cancelled in the aforementioned databases, the competent authority shall correct the verified emissions accordingly.

Where the biomass used does not comply with this paragraph, its carbon content shall be considered as fossil carbon.

Where according to the first to sixth subparagraphs of this paragraph, the criteria laid down in paragraphs 2 to 7 and 10 of Article 29 of Directive (EU) 2018/2001 do not apply to biomass, the zero-rated biomass fraction equals its biomass fraction.

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6. By way of derogation from paragraph 5, first subparagraph, Member States, or competent authorities as appropriate, may consider as fulfilled the sustainability and greenhouse gas emissions saving criteria referred to in that paragraph for biofuels, bioliquids and biomass fuels used for combustion from 1 January 2022 to 31 December 2022.

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Article 39

Determination of biomass and fossil fraction

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1. For fuels or materials containing biomass, the operator may either assume the absence of biomass and apply a default biomass fraction of 0 % or determine a biomass fraction in accordance with paragraph 2, applying tiers as defined in Section 2.4 of Annex II to this Regulation.

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2. Where, subject to the tier level required, the operator has to carry out analyses to determine the biomass fraction, it shall do so on the basis of a relevant standard and the analytical methods therein, provided that the use of that standard and analytical method are approved by the competent authority.

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Where, subject to the tier level required, the operator has to carry out analyses to determine the biomass fraction, but the application of the first subparagraph is technically not feasible or would incur unreasonable costs, the operator shall submit an alternative estimation method to determine the biomass fraction to the competent authority for approval. For fuels or materials originating from a production process with defined and traceable input streams, the operator may base the estimation on a material balance of fossil and biomass carbon entering and leaving the process.

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The Commission may provide guidelines on further applicable estimation methods.

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3. By way of derogation from paragraphs 1 and 2 of this Article and Article 30, except for the purposes of ►M5 Article 43(4b) ◄, the operator shall not use analyses or estimation methods in accordance with paragraph 2 of this Article to determine the biomass fraction of natural gas received from a gas grid to which biogas is added.

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The operator may determine that a certain quantity of natural gas from the gas grid is zero-rated biogas by using the methodology set out in paragraph 4. In this case, by way of derogation from Article 30(3), the operator shall consider the biomass fraction to be identical to the zero-rated biomass fraction.

4. The operator may determine the biomass fraction and identical zero-rated biomass fraction of biogas using purchase records of biogas of equivalent energy content, provided that the operator provides evidence to the satisfaction of the competent authority that:

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(a) there is no double counting of the same biogas quantity, in particular that the biogas purchased is not claimed to be used by anyone else, including through a disclosure of a guarantee of origin as defined in Article 2(12) of Directive (EU) 2018/2001;

(b) the operator and the producer of the biogas are connected to the same gas grid.

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For the purpose of demonstrating compliance with this paragraph, the operator may use the data recorded in a database set up by one or more Member States which enables tracing of transfers of biogas. Compliance with this paragraph may be considered demonstrated if the operator provides evidence for a purchase of a quantity of biogas connected to the cancellation of the respective quantity in the Union Database set up pursuant to Article 31a of Directive (EU) 2018/2001 or

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a national database set up by the Member States in accordance with Article 31a(5) of that Directive. In case of subsequent non-compliance regarding the proof of sustainability of the quantities cancelled in the aforementioned databases, the competent authority shall correct the verified emissions accordingly.

Article 39a

Determination of RFNBO or RCF or synthetic low-carbon fraction and zero-rated RFNBO or RCF or synthetic low-carbon fraction

1. For fuels or materials containing RFNBOs, RCFs or synthetic low-carbon fuels for which the operator cannot determine the RFNBO or RCF fraction or synthetic low-carbon fraction in accordance with paragraph 2, the operator shall assume the absence of RFNBO, RCF or synthetic low-carbon fuel and apply a default RFNBO or RCF fraction or synthetic low-carbon fraction of 0 %.

2. The operator shall determine the following calculation factors relating to the composition of fuels based on the mass balance pursuant to Article 30(1) of Directive (EU) 2018/2001:

(i) the zero-rated RFNBO or RCF fraction or zero-rated synthetic low-carbon fraction;

(ii) the RFNBO or RCF fraction or synthetic low-carbon fraction.

By way of derogation from the first subparagraph, if the operator does not want to make use of zero-rating, for the RFNBO or RCF fraction or the synthetic low-carbon fraction other approaches may be used such as a material balance of the blending or production process from which the fuel or material is obtained.

3. The carbon content of fuels qualifying as RFNBOs or RCFs under Directive (EU) 2018/2001 that comply with the greenhouse gas emissions saving criteria laid down in Article 29a of that Directive, shall be considered zero-rated.

The compliance with the criteria laid down in Article 29a of Directive (EU) 2018/2001 is to be assessed in accordance with Articles 30 and 31(1) of that Directive. The criteria may also be considered complied with if the operator provides evidence for a purchase of a quantity of RFNBOs or RCFs connected to the cancellation of the respective quantity in the Union Database set up pursuant to Article 31a of Directive (EU) 2018/2001, or a national database set up by the Member States in accordance with Article 31a(5) of that Directive. In case of subsequent non-compliance regarding the proof of sustainability of the quantities cancelled in the aforementioned databases, the Competent Authority shall correct the verified emissions accordingly.

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Where the RFNBO or RCF does not comply with the criteria referred to in the first subparagraph, its carbon content shall be considered as fossil carbon.

4. Synthetic low-carbon fuels shall be zero-rated when their carbon content has been subject to the prior surrendering of allowances under Directive 2003/87/EC, unless that captured carbon is zero-rated carbon as defined in Article 3(38f) of this Regulation.

The compliance with the criteria laid down in Article 29a(3) of Directive (EU) 2018/2001 is to be assessed in accordance with Articles 30 and 31(1) of that Directive. The criteria may also be considered complied with if the operator provides evidence for a purchase of a quantity of synthetic low-carbon fuels connected to the cancellation of the respective quantity in the Union Database set up pursuant to Article 31a of Directive (EU) 2018/2001, or a national database set up by the Member State in accordance with Article 31a (5) of that Directive. In case of subsequent non-compliance regarding the proof of sustainability of the quantities cancelled in the aforementioned databases, the Competent Authority shall correct the verified emissions accordingly.

In any other cases, the carbon content of synthetic low-carbon fuels shall be considered as fossil carbon.

5. The operator may determine the RFNBO or RCF fraction and identical zero-rated RFNBO or RCF fraction of natural gas where such fractions have been injected into a natural gas grid using purchase records of RFNBO or RCF of equivalent energy content, provided that the operator provides evidence to the satisfaction of the competent authority that:

(a) there is no double counting of the same RFNBO or RCF quantity, in particular that the RFNBO or RCF purchased is not claimed to be used by anyone else, including through a disclosure of a guarantee of origin as defined in Article 2(12) of Directive (EU) 2018/2001;

(b) the operator and the producer of the RFNBO or RCF are connected to the same gas grid.

Compliance with this paragraph may be considered demonstrated if the operator provides evidence for a purchase of a quantity of gaseous RFNBO or RCF connected to the cancellation of the respective quantity in the Union Database set up pursuant to Article 31a of Directive (EU) 2018/2001, or a national database set up by the Member States in accordance with Article 31a(5) of that Directive. In case of subsequent non-compliance regarding the proof of sustainability of the quantities cancelled in the aforementioned databases, the competent authority shall correct the verified emissions accordingly.

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SECTION 3

Measurement-based methodology

Article 40

Use of the measurement-based monitoring methodology

The operator shall use measurement-based methodologies for all emissions of nitrous oxide (N_2O) as laid down in Annex IV, and to quantify CO_2 transferred pursuant to Article 49.

In addition, the operator may use measurement-based methodologies for CO_2 emission sources where it can provide evidence that for each emission source the tiers required in accordance with Article 41 are complied with.

Article 41

Tier requirements

1. For each major emission source, the operator shall apply the following:

(a) in the case of a category A installation, at least the tiers listed in section 2 of Annex VIII;

(b) in other cases, the highest tier listed in section 1 of Annex VIII.

However, the operator may apply a tier one level lower than required in accordance with the first subparagraph for category C installations and up to two levels lower for category A and B installations, with a minimum of tier 1, where it shows to the satisfaction of the competent authority that the tier required in accordance with the first subparagraph is technically not feasible or incurs unreasonable costs.

2. For emissions from minor emission sources, the operator may apply a lower tier than required in accordance with the first subparagraph of paragraph 1, with a minimum of tier 1, where it shows to the satisfaction of the competent authority that the tier required in accordance with the first subparagraph of paragraph 1 is technically not feasible or incurs unreasonable costs.

Article 42

Measurement standards and laboratories

1. All measurements shall be carried out applying methods based on:

(a) EN 14181 (Stationary source emissions — Quality assurance of automated measuring systems);

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(b) EN 15259 (Air quality — Measurement of stationary source emissions — Requirements for measurement sections and sites and for the measurement objective, plan and report);

(c) other relevant EN standards, in particular EN ISO 16911-2 (Stationary source emissions — Manual and automatic determination of velocity and volume flow rate in ducts).

Where such standards are not available, the methods shall be based on suitable ISO standards, standards published by the Commission 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.

The operator shall consider all relevant aspects of the continuous measurement system, including the location of the equipment, calibration, measurement, quality assurance and quality control.

2. The operator shall ensure that laboratories carrying out measurements, calibrations and relevant equipment assessments for CEMS are accredited in accordance with EN ISO/IEC 17025 for the relevant analytical methods or calibration activities.

Where the laboratory does not have such accreditation, the operator shall ensure that equivalent requirements of Article 34(2) and (3) are met.

Article 43

Determination of emissions

1. The operator shall determine the annual emissions from an emission source over the reporting period by summing up over the reporting period all hourly values of the measured greenhouse gas concentration multiplied by the hourly values of the flue gas flow, where the hourly values shall be averages over all individual measurement results of the respective operating hour.

In the case of CO_2 emissions, the operator shall determine annual emissions on the basis of equation 1 in Annex VIII. CO emitted to the atmosphere shall be treated as the molar equivalent amount of CO_2.

In the case of nitrous oxide (N_2O), the operator shall determine annual emissions on the basis of the equation in subsection B.1 of section 16 of Annex IV.

2. Where several emission sources exist in one installation and cannot be measured as one emission source, the operator shall measure emissions from those sources separately and add the results to obtain the total emissions of the gas in question over the reporting period.

3. The operator shall determine the greenhouse gas concentration in the flue gas by continuous measurement at a representative point through one of the following:

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(a) direct measurement;

(b) in the case of high concentration in the flue gas, calculation of the concentration using an indirect concentration measurement applying equation 3 in Annex VIII and taking into account the measured concentration values of all other components of the gas stream as laid down in the operator's monitoring plan.

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4. Where relevant, the operator shall determine separately any CO2 amount stemming from biomass. For this purpose, the operator may use:

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(a) a calculation based approach, including approaches using analyses and sampling based on EN ISO 13833 (Stationary source emissions — Determination of the ratio of biomass (biogenic) and fossil-derived carbon dioxide — Radiocarbon sampling and determination);

(b) another method based on a relevant standard, including ISO 18466 (Stationary source emissions — Determination of the biogenic fraction in CO_2 in stack gas using the balance method);

(c) an estimation method published by the Commission.

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Where the method proposed by the operator involves continuous sampling from the flue gas stream, EN 15259 (Air quality — Measurement of stationary source emissions — Requirements for measurement sections and sites and for the measurement objective, plan and report) shall be applied. The sampling plan pursuant to Article 33 shall be commensurate with the frequency of analysis in accordance with Annex VII to this Regulation and ensure representativeness to cover the whole reporting year.

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For the purpose of this paragraph, Article 38(5) shall apply.

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Where the method proposed by the operator involves continuous sampling from the flue gas stream and the installation consumes natural gas from the grid, the operator shall subtract the CO_2 stemming from any biogas contained in the natural gas from the total measured CO_2 emissions. The biomass fraction of the natural gas shall be determined in accordance with Articles 32 to 35.

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4a. The operator shall use the biomass fraction determined in accordance with paragraph 4 as the zero-rated biomass fraction, if the following conditions are fulfilled for all fuels or materials leading to emissions to which the measurement-based methodology is applied:

(i) according to the first to sixth subparagraphs of Article 38(5) of this Regulation, the criteria laid down in paragraphs 2 to 7 and 10 of Article 29 of Directive (EU) 2018/2001 do not apply; or

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(ii) 100% of the biomass fraction of the used fuel or material are covered by the evidence relevant according to Article 38(5) of this Regulation.

The condition (ii) shall be deemed fulfilled for biogas monitored in accordance with Article 39(4) of this Regulation.

Where conditions (i) and (ii) are not fulfilled for fuels or materials leading to emissions to which the measurement-based methodology is applied, the operator shall determine the zero-rated biomass fraction for these fuels or materials using a calculation-based approach in accordance with Articles 24 to 39a of this Regulation.

4b. The operator may deduct from the total emissions of the emission source the emissions from zero-rated biomass determined in accordance with paragraph 4a of this Article.

Where the method proposed by the operator for the determination of the zero-rated biomass fraction involves continuous sampling from the flue gas stream and the installation consumes natural gas from the grid, the operator shall determine the physical CO_2 amount of the biogas used in accordance with Articles 32 to 35 of this Regulation and deduct the respective CO_2 amount from the zero-rated CO_2 determined in accordance with paragraph 4a of this Article.

4c. Where the operator uses zero-rated RFNBOs, RCFs or synthetic low-carbon fuels in a process for which the measurement-based methodology is applied, the operator may deduct from the total emissions the emissions from zero-rated RFNBOs, RCFs or synthetic low-carbon fuels.

The emissions from zero-rated RFNBOs, RCFs or synthetic low-carbon fuels shall be determined using a calculation-based approach in accordance with Articles 24 to 39a of this Regulation. They shall equal the activity data of the relevant fuel multiplied by the preliminary emission factor and the zero-rated RFNBO or RCF fraction or the zero-rated synthetic low-carbon fraction.

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5. The operator shall determine the flue gas flow for the calculation in accordance with paragraph 1 by one of the following methods:

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(a) calculation by means of a suitable material balance, taking into account all significant parameters on the input side, including for CO_2 emissions at least input material loads, input airflow and process efficiency, and on the output side, including at least the product output and the concentration of oxygen (O_2), sulphur dioxide (SO_2) and nitrogen oxides (NO_x);

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(b) determination by continuous flow measurement at a representative point.

Article 44

Data aggregation

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1. The operator shall calculate hourly averages for each parameter, including concentrations and flow, relevant for determining emissions

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or amounts of CO_2 transferred, using a measurement-based methodology by using all data points available for that specific hour.

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Where an operator can generate data for shorter reference periods without additional cost, the operator shall use those periods for the determination of the annual emissions in accordance with Article 43(1).

2. Where the continuous measurement equipment for a parameter is out of control, out of range or out of operation for part of the hour or reference period referred to in paragraph 1, the operator shall calculate the related hourly average *pro rata* to the remaining data points for that specific hour or shorter reference period, provided that at least 80 % of the maximum number of data points for a parameter are available.

Article 45(2) to (4) shall apply where fewer than 80 % of the maximum number of data points for a parameter are available.

Article 45

Missing data

1. Where a piece of measurement equipment within a CEMS is out of operation for more than five consecutive days in any calendar year, the operator shall inform the competent authority without undue delay and propose adequate measures to improve the quality of the CEMS in question.

2. Where a valid hour or shorter reference period in accordance with Article 44(1) of data cannot be provided for one or more parameters of the measurement-based methodology due to the equipment being out of control, out of range or out of operation, the operator shall determine values for substituting each missing hour of data.

3. Where a valid hour or shorter reference period of data cannot be provided for a parameter directly measured as concentration, the operator shall calculate a substitution value as the sum of an average concentration and twice the standard deviation associated with that average, using equation 4 in Annex VIII.

Where the reporting period is not applicable for determining such substitution values due to significant technical changes at the installation, the operator shall agree with the competent authority a representative timeframe for determining the average and standard deviation, where possible with a duration of one year.

4. Where a valid hour of data cannot be provided for a parameter other than concentration, the operator shall obtain substitute values of that parameter through a suitable mass balance model or an energy balance of the process. The operator shall validate the results by using the remaining measured parameters of the measurement-based methodology and data at regular working conditions, considering a time period of the same duration as the data gap.

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Article 46

Corroborating with calculation of emissions

The operator shall corroborate emissions determined by a measurement-based methodology, with the exception of N_2O emissions from nitric acid production and greenhouse gases transferred to a ►M5 CO_2 transport infrastructure ◄ or a storage site, by calculating the annual emissions of each greenhouse gas in question for the same emission sources and source streams.

The use of tier methodologies shall not be required.

SECTION 4

Special provisions

Article 47

Installations with low emissions

1. The competent authority may allow the operator to submit a simplified monitoring plan in accordance with Article 13, provided that it operates an installation with low emissions.

The first subparagraph shall not apply to installations carrying out activities for which N_2O is included pursuant to Annex I to Directive 2003/87/EC.

2. For the purposes of the first subparagraph of paragraph 1, an installation shall be considered an installation with low emissions where at least one of the following conditions is met:

(a) the average annual emissions of that installation reported in the verified emissions reports during the trading period immediately preceding the current trading period, with the exclusion of CO_2 stemming from ►M5 zero-rated carbon ◄ and before subtraction of transferred CO_2, were less than 25 000 tonnes of $CO_{2(e)}$ per year;

(b) the average annual emissions referred to in point (a) are not available or are no longer applicable because of changes to the installation's boundaries or changes to the operating conditions of the installation, but the annual emissions of that installation for the next five years, with the exclusion of CO_2 stemming from ►M5 zero-rated carbon ◄ and before subtraction of transferred CO_2, will be, based on a conservative estimation method, less than 25 000 tonnes of $CO_{2(e)}$ per year.

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3. The operator of an installation with low emissions shall not be required to submit the supporting documents referred to in the third subparagraph of Article 12(1), and shall be exempt from the requirement of submitting an improvement report as referred to in Article 69(4) in response to recommendations for improvement reported by the verifier in the verification report.

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4. By way of derogation from Article 27, the operator of an installation with low emissions may determine the amount of fuel or material by using available and documented purchasing records and estimated stock changes. The operator shall also be exempt from the requirement to provide the uncertainty assessment referred to in Article 28(2) to the competent authority.

5. The operator of an installation with low emissions shall be exempt from the requirement in Article 28(2) to include uncertainty related to stock changes in an uncertainty assessment.

6. By way of derogation from Articles 26(1) and 41(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 and for determining emissions by measurement-based methodologies, 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.

7. For the purpose of determining calculation factors on the basis of analyses in accordance with Article 32, the operator of an installation with low emissions may use any laboratory that is technically competent and able to generate technically valid results using the relevant analytical procedures, and provides evidence for quality assurance measures as referred to in Article 34(3).

8. Where an installation with low emissions subject to simplified monitoring exceeds the threshold referred to in paragraph 2 in any calendar year, its operator shall notify the competent authority thereof without undue delay.

The operator shall, without undue delay, submit a significant modification of the monitoring plan within the meaning of point (b) of Article 15(3), to the competent authority for approval.

However, the competent authority shall allow that the operator continues simplified monitoring provided that that operator demonstrates to the satisfaction of the competent authority that the threshold referred to in paragraph 2 has not already been exceeded within the past five reporting periods and will not be exceeded again from the following reporting period onwards.

Article 48

Inherent CO_2

1. Inherent CO_2 that is transferred into an installation, including that contained in natural gas, a waste gas (including blast furnace or coke oven gas) or in process inputs (including synthesis gas), shall be included in the emission factor for that source stream.

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2. Where inherent CO_2 originates from activities covered by Annex I to Directive 2003/87/EC or included pursuant to Article 24 of that Directive and is subsequently transferred out of the installation as part of a source stream to another installation and activity covered by that Directive, it shall not be counted as emissions of the installation

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where it originates. For the determination of the zero-rated biomass fraction, zero-rated RFNBO or RCF fraction or zero-rated synthetic low-carbon fraction of the inherent CO_2 in accordance with Article 39 of this Regulation, the operator of the transferring installation shall ensure the chosen monitoring methodology does not systematically underestimate the transferring installation's total emissions.

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However, where inherent CO_2 is emitted, or transferred out of the installation to entities not covered by that Directive, it shall be counted as emissions of the installation where it originates.

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3. The operators may determine quantities of inherent CO_2 transferred out of the installation both at the transferring and at the receiving installation. In that case, the quantities of respectively transferred and received inherent CO_2 and the corresponding zero-rated biomass fraction, zero-rated RFNBO or RCF fraction and zero-rated synthetic low-carbon fraction shall be identical.

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Where the quantities of transferred and received inherent CO_2 are not identical, the arithmetical average of both determined values shall be used in both the transferring and receiving installations' emissions reports, where the deviation between the values can be explained by the uncertainty of the measurement systems or the determination method. In such cases, the emissions report shall refer to the alignment of that value.

Where the deviation between the values cannot be explained by the approved uncertainty range of the measurement systems or the determination method, the operators of the transferring and receiving installations shall align the values by applying conservative adjustments approved by the competent authority.

Article 49

Transferred CO_2

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1. The operator shall subtract from the emissions of the installation any amount of CO_2 originating from the activities covered by Annex I to Directive 2003/87/EC that does not originate from zero-rated carbon and that is not emitted from the installation, but transferred out of the installation to any of the following installations:

(i) a capture installation for the purpose of transport and long-term geological storage in a storage site permitted under Directive 2009/31/EC;

(ii) a CO_2 transport infrastructure with the purpose of long-term geological storage in a storage site permitted under Directive 2009/31/EC;

(iii) a storage site permitted under Directive 2009/31/EC for the purpose of long-term geological storage.

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2. In its annual emissions report, the operator of the transferring installation shall provide the receiving installation's installation identification code recognised in accordance with the acts adopted pursuant to Article 19(3) of Directive 2003/87/EC, if the receiving installation is covered by that Directive. In all other cases, the operator of the transferring installation shall provide the name, address and contact information of a contact person for the receiving installation.

The first subparagraph shall also apply to the receiving installation with respect to the transferring installation's installation identification code.

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3. For the determination of the quantity of CO_2 transferred from one installation or CO_2 transport infrastructure to another installation or CO_2 transport infrastructure in accordance with paragraph 1, the operator shall apply, subject to the further provisions set out in Annex IV to this Regulation, either a calculation-based methodology, or a measurement-based methodology, in accordance with Articles 43, 44 and 45 of this Regulation.

Where the measurement-based methodology is applied the emission source shall correspond to the measurement point and the emissions shall be expressed as the quantity of CO_2 transferred.

4. When using a measurement-based methodology for determining the quantity of CO_2 transferred from one installation or CO_2 transport infrastructure to another, the operator shall apply the highest tier as defined in Section 1 of Annex VIII to this Regulation.

However, the operator may apply the next lower tier provided that it establishes that applying the highest tier as defined in Section 1 of Annex VIII to this Regulation is technically not feasible or incurs unreasonable costs.

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5. The operators may determine quantities of CO_2 transferred out of the installation both at the transferring and at the receiving installation. In such cases, Article 48(3) shall apply.

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6. In the case of the transfer of CO_2 to a capture installation resulting from materials or fuels containing a fraction of zero-rated carbon, the transferring installation shall only subtract from its reported emissions in accordance with paragraph 1 of this Article the quantity of CO_2 proportional to the fraction of carbon that does not originate from zero-rated carbon.

An operator of a CO_2 transport infrastructure or a storage site shall monitor emissions from leakage events, fugitive emissions and vented emissions from any CO_2 mentioned in the first sub-paragraph, including from CO_2 stemming from entities not carrying out activities listed in Annex I to Directive 2003/87/EC, and report emissions as if the CO_2 were fossil.

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7. The operator of a CO_2 transport infrastructure may include in the emissions reported in a given reporting period, any CO_2 in transit that has been transferred to another installation or CO_2 transport infrastructure no later than 31 January of the following year. The operator shall compile annually an inventory of the CO_2 entering and leaving the CO_2 transport infrastructure and report separately any CO_2 in transit.

Article 49a

Emissions permanently chemically bound in a product

1. The operator shall subtract from the emissions of the installation any amount of CO_2 originating from non-zero-rated carbon in activities covered by Annex I to Directive 2003/87/EC that is not emitted from the installation, but permanently chemically bound in a product listed in the Delegated Regulation adopted pursuant to Article 12(3b) of Directive 2003/87/EC.

In the case of CO_2 resulting from materials or fuels containing a fraction of zero-rated carbon, the operator shall only subtract from the emissions of the installation the quantity of CO_2 permanently chemically bound in a product listed in the Delegated Regulation adopted pursuant to Article 12(3b) of Directive 2003/87/EC proportional to the fraction of carbon that does not originate from zero-rated carbon.

2. For the determination of the quantity of CO_2 bound in a product meeting the specifications set out in paragraph 1, the operator shall either apply the standard methodology in accordance with Sections 2 and 4 of Annex II to this Regulation, or apply a mass balance in accordance with Article 25 of this Regulation using the fuels and materials entering and leaving the process in which the CO_2 is chemically bound as the relevant source streams for this calculation, while taking into account any combustion emissions related to the process. To this end, the highest tier as defined in Annex II to this Regulation shall be applied as specified in the same Annex for the activity the CO_2 arises from. However, the operator may apply the next lower tier provided that the operator demonstrates to the satisfaction of the competent authority that applying the highest tier as defined in Annex II to this Regulation is technically not feasible or incurs unreasonable costs.

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Article 50

Use or transfer of N_2O

1. Where N_2O originates from activities covered by Annex I to Directive 2003/87/EC for which that Annex specifies N_2O as relevant and an installation does not emit the N_2O but transfers it to another installation that monitors and reports emissions in accordance with this Regulation, it shall not be counted as emissions of the installation where it originates.

An installation that receives N_2O from an installation and activity in accordance with the first subparagraph shall monitor the relevant gas streams using the same methodologies, as required by this Regulation, as if the N_2O were generated within the receiving installation itself.

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However, where N_2O is bottled or used as a gas in products so that it is emitted outside the installation, or where it is transferred out of the installation to entities not covered by Directive 2003/87/EC, it shall be counted as emissions of the installation where it originates, except for quantities of N_2O in respect of which the operator of the installation where the N_2O originates can demonstrate to the competent authority that the N_2O is destroyed using suitable emissions abatement equipment.

2. In its annual emissions report, the operator of the transferring installation shall provide the receiving installation's installation identification code recognised in accordance with the acts adopted pursuant to Article 19(3) of Directive 2003/87/EC, if relevant.

The first subparagraph shall also apply to the receiving installation with respect to the transferring installation's installation identification code.

3. To determine the quantity of N_2O transferred from one installation to another, the operator shall apply a measurement-based methodology, including in accordance with Articles 43, 44 and 45. The emission source shall correspond to the measurement point and the emissions shall be expressed as the quantity of N_2O transferred.

4. To determine the quantity of N_2O transferred from one installation to another, the operator shall apply the highest tier as defined in section 1 of Annex VIII for emissions of N_2O.

However, the operator may apply the next lower tier provided that it establishes that applying the highest tier as defined in section 1 of Annex VIII is technically not feasible or incurs unreasonable costs.

5. The operators may determine quantities of N_2O transferred out of the installation both at the transferring and at the receiving installation. In such cases, Article 48(3) shall apply *mutatis mutandis*.

CHAPTER IV

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MONITORING OF EMISSIONS AND NON-CO_2 EFFECTS FROM AVIATION

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Article 51

General provisions

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1. Each aircraft operator shall monitor and report emissions and non-CO_2 aviation effects from aviation activities for all flights included in Annex I to Directive 2003/87/EC that are performed by that aircraft operator during the reporting period and for which the aircraft operator is responsible.

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To that end, the aircraft operator shall attribute all flights to the calendar year according to the time of departure measured in Coordinated Universal Time.

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3. For the purpose of identifying the unique aircraft operator referred to in point (o) of Article 3 of Directive 2003/87/EC that is responsible for a flight, the call sign used for air traffic control purposes as laid down in item 7 of the flight plan, shall be used. The call sign shall determine the aircraft operator as follows:

(a) where the item 7 contains the ICAO designator for the aircraft operating agency, the unique aircraft operator shall be the aircraft operating agency that has been assigned that ICAO designator;

(b) where the item 7 contains the nationality or common mark, and registration mark of the aircraft that is explicitly listed in an air operator certificate (or equivalent) or in a document issued by a State and identifying the operator of the aircraft, then the unique aircraft operator shall be the legal or natural person that holds that air operator certificate (or equivalent) or that is stated in the document.

3a. Where the unique aircraft operator cannot be identified using the call sign as referred to in paragraph 3, the unique aircraft operator referred to in point (o) of Article 3 of Directive 2003/87/EC that is responsible for a flight, is the legal or natural person that has an employment or other contractual relationship with the captain of the flight.

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4. Where the identity of the aircraft operator is not known, the competent authority shall consider the owner of the aircraft as aircraft operator unless it proves the identity the aircraft operator responsible.

Article 52

Submission of monitoring plans

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1. At the latest four months before an aircraft operator commences aviation activities covered by Annex I to Directive 2003/87/EC, it shall submit to the competent authority a monitoring plan for the monitoring and reporting of emissions and non-CO_2 aviation effects in accordance with Article 12 of this Regulation.

By way of derogation from the first subparagraph, an aircraft operator that performs an aviation activity covered by Annex I to Directive 2003/87/EC, or monitors and reports non-CO_2 aviation effects, for the first time that could not be foreseen four months in advance of the activity shall submit a monitoring plan to the competent authority without undue delay, but no later than six weeks after performance of that activity. The aircraft operator shall provide adequate justification to the competent authority why a monitoring plan could not be submitted four months in advance of the activity.

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Where the administering Member State referred to in Article 18a of Directive 2003/87/EC is not known in advance, the aircraft operator shall without undue delay submit the monitoring plan when information on the competent authority of the administering Member State becomes available.

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Article 53

Monitoring methodology for emissions from aviation activities

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1. Each aircraft operator shall determine the annual CO_2 emissions from aviation activities by multiplying the annual consumption of each neat fuel (expressed in tonnes) by the respective emission factor.

For mixed aviation fuels, the aircraft operator shall determine the theoretical amount of each neat fuel from the total amount of that mixed aviation fuel and relevant composition data by applying the following:

(i) where a fuel contains biomass, the aircraft operator shall determine the biomass fraction in accordance with Article 54;

(ii) where a fuel contains an RFNBO, RCF or synthetic low-carbon fuel, the aircraft operator shall determine the RFNBO or RCF fraction or the synthetic low-carbon fraction in accordance with Article 54b;

(iii) where the RFNBO or RCF fraction or synthetic low-carbon fraction is not zero and where the aircraft operator wants to make use of zero-rating, the aircraft operator shall determine the zero-rated RFNBO or RCF fraction or the zero-rated synthetic low-carbon fraction in accordance with Article 54c;

(iv) where the zero-rated biomass fraction, the zero-rated RFNBO or RCF fraction or the zero-rated synthetic low-carbon fraction are not zero, the aircraft operator shall calculate the zero-rated fraction as the sum of zero-rated biomass fraction, zero-rated RFNBO or RCF fraction and zero-rated synthetic low-carbon fraction. The fossil fraction is the sum of all non-zero-rated fractions.

(v) the aircraft operator shall calculate the amount of each neat fuel as total amount of the mixed aviation fuel multiplied by the relevant fraction.

For the purpose of point (iv) of this paragraph, where the aircraft operator does not calculate the zero-rated fraction, the fossil fraction shall be 100 %.

1a. By way of derogation from paragraph 1, for the purpose of assessing emissions thresholds set out in Articles 55(1) and 55(2) of this Regulation, in Article 28a(4) of Directive 2003/87/EC and in the entry ‘Aviation’ of the table in Annex I to Directive 2003/87/EC, the aircraft operator shall determine the CO_2 emissions by multiplying the annual consumption of each fuel by its preliminary emissions factor.

1b. For the purpose of reporting pursuant to Article 3 of Commission Delegated Regulation (EU) 2019/1603 ([1]), the aircraft operator shall determine and report the emissions which result from multiplying the annual consumption of each fuel by its preliminary emission factor.

([1]) Commission Delegated Regulation (EU) 2019/1603 of 18 July 2019 supplementing Directive 2003/87/EC of the European Parliament and of the Council as regards measures adopted by the International Civil Aviation Organisation for the monitoring, reporting and verification of aviation emissions for the purpose of implementing a global market-based measure (OJ L 250, 30.9.2019, p. 10, ELI: http://data.europa.eu/eli/reg_del/2019/1603/oj).

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2. Each aircraft operator shall determine the fuel consumption for each flight and for each fuel, including fuel consumed by the auxiliary power unit. For that purpose, the aircraft operator shall use one of the methods laid down in section 1 of Annex III. The aircraft operator shall choose the method that provides for the most complete and timely data combined with the lowest uncertainty without incurring unreasonable costs.

3. Each aircraft operator shall determine the fuel uplift referred to in section 1 of Annex III based on one of the following:

(a) the measurement by the fuel supplier, as documented in the fuel delivery notes or invoices for each flight;

(b) data from aircraft onboard measurement systems recorded in the mass and balance documentation, in the aircraft technical log or transmitted electronically from the aircraft to the aircraft operator.

4. The aircraft operator shall determine fuel contained in the tank using data from aircraft onboard measurement systems and recorded in the mass and balance documentation, in the aircraft technical log or transmitted electronically from the aircraft to the aircraft operator.

5. Where the amount of fuel uplift or the amount of fuel remaining in the tanks is determined in units of volume, expressed in litres, the aircraft operator shall convert that amount from volume to mass by using density values. The aircraft operator shall use the fuel density (which may be an actual or a standard value of 0,8 kg per litre) that is used for operational and safety reasons.

The procedure for informing the use of actual or standard density shall be described in the monitoring plan along with a reference to the relevant aircraft operator documentation.

6. For the purposes of the calculation referred to in paragraph 1, the aircraft operator shall use the default emission factors set out in table 1 in Annex III.

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The aircraft operators shall use the default emissions factors set out in Table 1 in Annex III as the preliminary emission factor.

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For alternative aviation fuels other than biofuels, RFNBO, RCF or synthetic low-carbon fuels, the aircraft operator shall determine the emission factor in accordance with Article 32 of this Regulation. For such fuels, the net calorific value shall be determined and reported as a memo-item.

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7. By way of derogation from paragraph 6, the aircraft operator may, upon approval by the competent authority, derive the emission factor or the carbon content, on which it is based, or the net calorific value for commercially traded fuels from the purchasing records for the fuel in question, as provided by the fuel supplier, provided that those have been derived on the basis of internationally accepted standards and the emission factors listed in table 1 of Annex III cannot be applied.

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Article 53a

Reporting rules for the use of alternative aviation fuels

1. The aircraft operator shall monitor the amount of alternative aviation fuels used and report that amount as attributed to each flight or aerodrome pair.

2. Where the alternative aviation fuels are delivered to the aircraft in physically identifiable batches, the aircraft operator shall provide evidence to the satisfaction of the competent authority that the alternative aviation fuel is attributed to the flight immediately following the fuel uplift of that flight.

Where several subsequent flights are carried out without fuel uplift between these flights, the aircraft operator shall split the amount of the alternative fuel and assign it to these flights proportionally to the emissions from those flights calculated using the preliminary emission factor.

3. Where alternative aviation fuels cannot be physically attributed at an aerodrome to a specific flight, the aircraft operator shall attribute the fuel to its flights for which allowances have to be surrendered in accordance with Article 12(3) of Directive 2003/87/EC proportionally to the emissions from those flights departing from that aerodrome calculated using the preliminary emission factor.

In this regard, the aircraft operator must provide evidence to the satisfaction of the competent authority that the alternative aviation fuel was delivered to the fuelling system of the departure aerodrome in the reporting period, or 3 months before the start, or 3 months after the end, of that reporting period.

4. For the purpose of paragraphs 2 and 3, the aircraft operator shall provide evidence to the satisfaction of the competent authority that:

(i) the total amount of alternative aviation fuel claimed does not exceed the total fuel usage of that aircraft operator for flights for which allowances have to be surrendered in accordance with Article 12(3) of Directive 2003/87/EC, originating from the aerodrome at which the alternative aviation fuel is supplied;

(ii) the amount of alternative aviation fuel for flights for which allowances have to be surrendered in accordance with Article 12 (3) of Directive 2003/87/EC does not exceed the total quantity of alternative aviation fuel purchased from which the total quantity of alternative aviation fuels sold to third parties is subtracted;

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(iii) the ratio between alternative aviation fuels and fossil fuels attributed to flights aggregated per aerodrome pair does not exceed the maximum blending limit for that fuel type as certified according to a recognised international standard;

(iv) there is no double counting of the same quantity of alternative aviation fuel, in particular that the alternative aviation fuel purchased is not claimed to be used in an earlier report or by another aircraft operator, or in another carbon pricing system.

For the purpose of points (i) to (iii), any fuel remaining in tanks after a flight and before an uplift is assumed to be 100 % fossil fuel.

For the purpose of demonstrating compliance with the requirements referred to under point (iv), the aircraft operator may use the data recorded in the Union database set up in accordance with Article 31a of Directive (EU) 2018/2001 or a national database set up by the Member State in accordance with Article 31a(5) of that Directive.

Article 54

Determining the biomass fraction for biofuels

1. The aircraft operator shall determine the biomass fraction of mixed aviation fuels containing biofuels. The aircraft operator may either assume the absence of biofuel and apply a default fossil fraction of 100 % or determine a biofuel fraction in accordance with paragraphs 2 or 3. The aircraft operator shall use a default value of 100 % biomass fraction for neat biofuels.

By way of derogation from the first subparagraph, the aircraft operator using mixed aviation fuels containing biofuels may choose to monitor the biofuel content and fossil aviation fuel content as separate source streams if the evidence provided by the fuel suppliers allows such approach.

2. Where biofuels are physically mixed with fossil fuels and delivered to the aircraft in physically identifiable batches, the aircraft operator may carry out analyses in accordance with Articles 32 to 35 to determine the biomass fraction, on the basis of a relevant standard and the analytical methods set out in those Articles, provided that the use of that standard and those analytical methods is approved by the competent authority. Where the aircraft operator provides evidence to the competent authority that such analyses would incur unreasonable costs or are technically not feasible, the aircraft operator may base the estimation of the biofuel content on a material balance of blending fossil fuels and biofuels purchased. If the biomass fraction was determined using the mass balance pursuant to Article 30(1) of Directive (EU) 2018/2001, no evidence for unreasonable costs or technical feasibility shall be required.

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3. Where purchased biofuel batches are not physically delivered to a specific aircraft, the aircraft operator shall not use analyses to determine the biomass fraction of the fuels used. The aircraft operator may determine the biomass fraction using purchase records of biofuel of equivalent energy content.

Article 54a

Specific provisions for eligible aviation fuels

1. For the purpose of Article 3c(6) of Directive 2003/87/EC, the commercial aircraft operator shall establish, document, implement and maintain a written procedure in order to monitor any amounts of neat eligible aviation fuel (in tonnes) used for subsonic flights, and shall report the amounts of eligible aviation fuels claimed as a separate memo-item in its annual emission report.

2. For the purpose of paragraph 1, the aircraft operator shall ensure that any amount of eligible aviation fuel claimed is certified in accordance with Article 30 of Directive (EU) 2018/2001 or another certification accepted under Regulation 2023/2405. The competent authority may allow the aircraft operator to use the data recorded in the Union database set up in accordance with Article 31a of Directive (EU) 2018/2001 or a national database set up by the Member State in accordance with Article 31a(5) of that Directive. In case of subsequent non-compliance regarding the proof of sustainability of the quantities cancelled in the aforementioned databases, the Competent Authority shall correct the verified amounts of neat eligible aviation fuels accordingly.

3. For mixed aviation fuels, the aircraft operator may either assume the absence of eligible aviation fuel and apply a default fossil fraction of 100 % or determine the amount of neat eligible aviation fuel in accordance with paragraph 3a.

3a. The aircraft operator shall determine the amount of neat eligible aviation fuel as a sum of neat alternative fuels eligible under Article 3c (6) of Directive 2003/87/EC as determined in accordance with Article 53(1) of this Regulation. The neat eligible fuels shall be attributed to each flight or aerodrome pair in accordance with paragraphs 4 or 5.

4. Where eligible aviation fuels are delivered to the aircraft in physically identifiable batches, the aircraft operator shall provide evidence to the satisfaction of the competent authority that the eligible aviation fuel is attributed to the flight immediately following the fuel uplift of that flight.

Where several subsequent flights are carried out without fuel uplift between these flights, the aircraft operator shall split the amount of the eligible aviation fuels and assign it to these flights proportionally to the emissions from those flights calculated using the preliminary emission factor.

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5. Where eligible aviation fuels cannot be physically attributed at an aerodrome to a specific flight, the aircraft operator shall attribute the fuel to its flights for which allowances have to be surrendered in accordance with Article 12(3) of Directive 2003/87/EC and to its flights covered by Article 3c(8) of that Directive proportionally to the emissions from those flights departing from that aerodrome calculated using the preliminary emission factor.

For that purpose, the aircraft operator must provide evidence to the satisfaction of the competent authority that the eligible aviation fuel was delivered to the fuelling system of the departure aerodrome in the reporting period, or 3 months before the start, or 3 months after the end, of that reporting period.

6. For the purpose of paragraphs 4 and 5, the aircraft operator shall provide evidence to the satisfaction of the competent authority that:

(a) the total amount of eligible aviation fuel claimed does not exceed the total fuel usage of that aircraft operator for flights for which allowances have to be surrendered in accordance with Article 12(3) of Directive 2003/87/EC and for flights covered by Article 3c(8) of that Directive, originating from the aerodrome at which the eligible aviation fuel is supplied;

(b) the amount of eligible aviation fuel for flights for which allowances have to be surrendered in accordance with Article 12(3) of Directive 2003/87/EC and from flights covered by Article 3c(8) of that Directive does not exceed the total quantity of eligible aviation fuel purchased from which the total quantity of eligible aviation fuels sold to third parties is subtracted;

(c) the ratio between eligible aviation fuels and fossil fuels attributed to flights aggregated per aerodrome pair does not exceed the maximum blending limit for that fuel type as certified according to a recognised international standard;

(d) there is no double counting of the same quantity of eligible aviation fuel, in particular that the eligible aviation fuel purchased is not claimed to be used in an earlier report or by another aircraft operator, or in another carbon pricing system.

For the purpose of points (a), (b) and (c), any fuel remaining in tanks after a flight and before an uplift is assumed to be 100 % not eligible fuel.

For the purpose of demonstrating compliance with the requirements referred to under point (d), the aircraft operator may use the data recorded in the Union database set up in accordance with Article 31a of Directive (EU) 2018/2001 or a national database set up by the Member State in accordance with Article 31a(5) of that Directive.

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Article 54b

Determining the RFNBO, RCF or synthetic low-carbon fraction

1. The aircraft operator shall determine the RFNBO or RCF fraction or synthetic low-carbon fraction of mixed aviation fuels containing RFNBO, RCF or synthetic low-carbon fuel. The aircraft operator may either assume the absence of RFNBO, RCF or synthetic low-carbon fuel and apply a default fossil fraction of 100 %, or determine a RFNBO or RCF fraction or synthetic low-carbon fraction in accordance with paragraphs 2 or 3. The aircraft operator shall use a default value of 100 % RFNBO or RCF fraction, or 100 % synthetic low-carbon fraction, as applicable, for neat RFNBO or RCF or neat synthetic low-carbon fuel.

By way of derogation from the first subparagraph, the aircraft operator using mixed aviation fuels containing RFNBO, RCF or synthetic low-carbon fuel, may choose to monitor the RFNBO or RCF content or synthetic low-carbon content and other fossil aviation fuel content, as separate source streams if the evidence provided by the fuel suppliers allows such approach.

2. Where RFNBO, RCF or synthetic low-carbon fuel are physically mixed with fossil fuels and delivered to the aircraft in physically identifiable batches, the aircraft operator shall base the estimation of the RFNBO or RCF content or synthetic low-carbon content on a mass balance pursuant to Article 30(1) of Directive (EU) 2018/2001, reflecting the blending of fossil fuels and RFNBO, RCF or synthetic low-carbon fuel purchased.

3. Where purchased RFNBO, RCF or synthetic low-carbon fuel batches are not physically delivered to a specific aircraft, the aircraft operator may determine the RFNBO or RCF fraction or synthetic low-carbon fraction using purchase records of RFNBO, RCF or synthetic low-carbon fuel of equivalent energy content.

Article 54c

Conditions for zero-rating biofuels, RFNBO, RCF and synthetic low-carbon fuels by aircraft operators

1. The aircraft operator may count the biomass fraction of a mixed aviation fuel towards the zero-rated biomass fraction only to the extent that the biofuel content complies with the criteria set out in Article 38(5).

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2. The aircraft operator may count the RFNBO or RCF fraction of a mixed aviation fuel towards the zero-rated RFNBO or RCF fraction only to the extent that the RFNBO or RCF content complies with the criteria set out in Article 39a(3).

3. The aircraft operator may count the synthetic low-carbon fraction of a mixed aviation fuel towards the zero–rated synthetic low-carbon fraction only to the extent that the synthetic low-carbon content complies with the criteria set out in Article 39a(4).

4. The aircraft operator may claim zero-rated biofuels, zero-rated RFNBO or RCF and zero-rated synthetic low-carbon fuels only to the extent these zero-rated fuels comply with the maximum amount of fuel use determined in accordance with Article 53a of this Regulation, for flights for which allowances have to be surrendered in accordance with Article 12(3) of Directive 2003/87/EC.

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Article 55

Small emitters

1. Aircraft operators operating fewer than 243 flights per period for three consecutive four-month periods and aircraft operators operating flights with total annual emissions lower than 25 000 tonnes CO_2 per year shall be considered small emitters.

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2. By way of derogation from Article 53, small emitters and aircraft operators having total annual emissions lower than 3 000 tonnes of CO_2 from flights other than those referred to in Article 28a(1), point (a), and Article 3c(8) of Directive 2003/87/EC may estimate the fuel consumption based on distance per aerodrome pair using tools implemented by Eurocontrol or another relevant organisation, which can process all relevant air traffic information and avoid any underestimations of emissions.

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The applicable tools may only be used if they are approved by the Commission including the application of correction factors to compensate for any inaccuracies in the modelling methods.

3. By way of derogation from Article 12, a small emitter that intends to make use of any of the tools referred to in paragraph 2 of this Article may submit only the following information in the monitoring plan for emissions:

(a) information required pursuant to point 1 of section 2 of Annex I;

(b) evidence that the thresholds for small emitters set out in paragraph 1 of this Article are met;

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(c) the name of or reference to the tool as referred to in paragraph 2 of this Article that will be used for estimating the fuel consumption.

A small emitter shall be exempted from the requirement to submit the supporting documents referred to in the third subparagraph of Article 12(1).

4. Where an aircraft operator uses any of the tools referred to in paragraph 2 and exceeds the thresholds referred to in paragraph 1 during a reporting year, the aircraft operator shall notify the competent authority thereof without undue delay.

The aircraft operator shall, without undue delay, submit a significant modification of the monitoring plan within the meaning of point (iv) of Article 15(4)(a) to the competent authority for approval.

However, the competent authority shall allow that the aircraft operator continues to use a tool referred to in paragraph 2 provided that that aircraft operator demonstrates to the satisfaction of the competent authority that the thresholds referred to in paragraph 1 have not already been exceeded within the past five reporting periods and will not be exceeded again from the following reporting period onwards.

Article 56

Sources of uncertainty

1. The aircraft operator shall consider sources of uncertainty and their associated levels of uncertainty when selecting the monitoring methodology pursuant to Article 53(2).

2. The aircraft operator shall regularly perform suitable control activities, including cross-checks between the fuel uplift quantity as provided by invoices and the fuel uplift quantity indicated by on-board measurement, and take corrective action if notable deviations are observed.

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Article 56a

Calculation of CO_2 equivalent for non-CO_2 aviation effects

1. Each aircraft operator shall monitor the non-CO_2 aviation effects from its activities performed by aeroplanes equipped with jet engines in CO_2 equivalent (CO_2(e)) per flight.

2. The aircraft operator shall calculate the CO_2(e) per flight using the GWP metric, in particular GWP_{20}, GWP_{50} and GWP_{100}, resulting in CO_2(e) values for three-time horizons (20, 50, and 100 years) for each of the monitored flights.

3. The aircraft operator shall use efficacy as defined in this Regulation and in NEATS, to refine the GWP as referred to in paragraph 2 for calculating the CO_2(e) per flight unless the aircraft operator provides evidence to the competent authority that it is not possible to use efficacy.

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4. To calculate CO_2(e) per flight each aircraft operator shall apply a CO_2(e) calculation approach covering the following elements:

(a) the fuel-burn module and emissions-estimation module, as described in Annex IIIa, Section 3;

(b) Method C consisting of a weather-based approach and Method D consisting of a location-based simplified approach, as referred to in Annex IIIa, Section 4;

(c) a default values approach, used in case of data gaps, described in Annex IIIa, Section 5 and Annex IIIb.

Method C and method D shall be based on input data from the modules referred to in point (a) of this paragraph, data from the aircraft operator and relevant weather data from the aircraft operator or third party-sources.

5. Each aircraft operator shall use Method C to calculate CO_2(e) per flight.

6. By way of derogation from paragraph 5, small emitters, as defined in Article 55(1), may use Method D.

7. To apply the CO_2(e) calculation models to their flights, aircraft operators shall meet all the following conditions, either using NEATS, pursuant to Annex IIIa, Section 2, own and third-party IT tools, or a combination of NEATS and these tools:

(a) these tools comply with the requirements laid down in Annex IIIa, with regard to emission-estimation module in Section 3, 4 and 5 of that Annex;

(b) where enhanced weather data is needed as defined in Annex IIIa, these tools use the same common reference Numerical Weather Prediction (NWP) model and weather data, as the one provided through NEATS;

(c) these tools allow for and facilitate, for the purpose of verification, access to the monitored data in accordance with Annex IIIa, Section 4;

(d) these tools ensure the data monitored is securely stored for at least 2 years, with backup and recovery functions;

(e) these tools comply with the principles established by Article 75(1).

8. Where an aircraft operator plans to use tools referred to in paragraph 7, other than the fuel burn module, the aircraft operator shall first submit the technical specifications of the tools to the Commission. The Commission shall assess the specifications of the tools and, where these tools comply with the requirements in this Regulation, shall approve the tools. Once approved, the tools technical specifications and workflow shall be further described by the aircraft operator in the monitoring plan.

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Article 56b

Data monitoring

1. The aircraft operator shall monitor the data mentioned in Annex IIIa, Section 4.

2. The data monitored as referred to in paragraph 1 shall be sourced by the aircraft operator, including from flight data recorder equipment of the aircraft, where available.

3. By way of derogation from paragraph 2, the aircraft operator can choose to rely for the monitoring of some or all of the data, on the following:

(a) independent third-party sources such as Eurocontrol;

(b) NEATS, as described in Annex IIIa, Section 2.

4. Where data is missing and the aircraft operator has demonstrated that it is not capable of retrieving that data via NEATS or other methods, the aircraft operator shall use default values as provided in Annex IIIa, Section 5 and Annex IIIb.

5. The aircraft operators shall provide the verifier with access to all data that is necessary for the verification, including confidential data. Upon request of the aircraft operator the competent authority shall treat information provided by the aircraft operator as confidential.

6. Where it is not possible to use NEATS due to its unavailability, the aircraft operator shall monitor at a minimum the flight information and aircraft properties per flight. In such case the CO2(e) calculation per flight shall be performed at a later stage by the aircraft operator, at the latest, once NEATS is made available by the Commission.

7. Where it is not possible to use a common reference NWP model due to its unavailability in NEATS, the aircraft operator, shall, by way of derogation from Article 56a(5), use Method D. Once the common reference NWP model is made available, the aircraft operator shall use the appropriate method in line with Article 56a(5) and (6).

8. NEATS shall be updated as appropriate

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CHAPTER V

DATA MANAGEMENT AND CONTROL

Article 58

Data flow activities

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1. The operator or aircraft operator shall establish, document, implement and maintain written procedures for data flow activities for the monitoring and reporting of greenhouse gas emissions and

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non-CO_2 aviation effects and ensure that the annual emissions report resulting from data flow activities does not contain misstatements and is in conformance with the monitoring plan, those written procedures and this Regulation.

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2. Descriptions of written procedures for data flow activities in the monitoring plan shall at least cover the following elements:

(a) the items of information listed in Article 12(2);

(b) identification of the primary data sources;

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(c) each step in the data flow from primary data to annual emissions and non-CO_2 aviation effects which shall reflect the sequence and interaction between the data flow activities, including relevant formulas and data aggregation steps applied;

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(d) the relevant processing steps related to each specific data flow activity, including the formulas and data used to determine the emissions;

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(e) relevant electronic data processing and storage systems used and the interaction between such systems and other inputs, including manual input;

(f) the way outputs of data flow activities are recorded.

Article 59

Control system

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1. The operator or aircraft operator shall establish, document, implement and maintain an effective control system to ensure that the annual emissions report resulting from data flow activities does not contain misstatements and is in conformity with the monitoring plan and this Regulation.

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2. The control system referred to in paragraph 1 shall consist of the following:

(a) an operator's or aircraft operator's assessment of inherent risks and control risks based on a written procedure for carrying out the assessment;

(b) written procedures related to control activities that are to mitigate the risks identified.

3. Written procedures related to control activities as referred to in point (b) of paragraph 2 shall at least include:

(a) quality assurance of the measurement equipment;

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(b) quality assurance of the information technology system used for data flow activities, including process control computer technology;

(c) segregation of duties in the data flow activities and control activities, and management of necessary competencies;

(d) internal reviews and validation of data;

(e) corrections and corrective action;

(f) control of out-sourced processes;

(g) keeping records and documentation including the management of document versions.

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4. The operator or aircraft operator shall monitor the effectiveness of the control system, including by carrying out internal reviews and taking into account the findings of the verifier during the verification of annual emissions reports carried out pursuant to Implementing Regulation (EU) 2018/2067.

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Whenever the control system is found to be ineffective or not commensurate with the risks identified, the operator or aircraft operator shall seek to improve the control system and update the monitoring plan or the underlying written procedures for data flow activities, risk assessments and control activities as appropriate.

Article 60

Quality assurance

1. For the purposes of point (a) of Article 59(3), the operator shall 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.

Where components of the measuring systems cannot be calibrated, the operator shall identify those in the monitoring plan and propose alternative control activities.

When the equipment is found not to comply with required performance, the operator shall promptly take necessary corrective action.

2. With regard to continuous emission measurement systems, the operator shall apply quality assurance based on the standard Quality assurance of automated measuring systems (EN 14181), including parallel measurements with standard reference methods at least once per year, performed by competent staff.

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Where such quality assurance requires emission limit values (ELVs) as necessary parameters for the basis of calibration and performance checks, the annual average hourly concentration of the greenhouse gas shall be used as a substitute for such ELVs. Where the operator finds a non-compliance with the quality assurance requirements, including that recalibration has to be performed, it shall report that circumstance to the competent authority and take corrective action without undue delay.

Article 61

Quality assurance of information technology

For the purposes of point (b) of Article 59(3), the operator or aircraft operator shall ensure that the information technology system is designed, documented, tested, implemented, controlled and maintained in a way to process reliable, accurate and timely data in accordance with the risks identified in accordance with point (a) of Article 59(2).

The control of the information technology system shall include access control, control of back up, recovery, continuity planning and security.

Article 62

Segregation of duties

For the purposes of point (c) of Article 59(3), the operator or aircraft operator shall assign responsible persons for all data flow activities and for all control activities in a way to segregate conflicting duties. In the absence of other control activities, it shall ensure for all data flow activities commensurate with the identified inherent risks that all relevant information and data shall be confirmed by at least one person who has not been involved in the determination and recording of that information or data.

The operator or aircraft operator shall manage the necessary competencies for the responsibilities involved, including the appropriate assignment of responsibilities, training, and performance reviews.

Article 63

Internal reviews and validation of data

1. For the purposes of point (d) of Article 59(3) and on the basis of the inherent risks and control risks identified in the risk assessment referred to in point (a) of Article 59(2), the operator or aircraft operator shall review and validate data resulting from the data flow activities referred to in Article 58.

Such review and validation of the data shall at least include:

(a) a check as to whether the data are complete;

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(b) a comparison of the data that the operator or aircraft operator has obtained, monitored and reported over several years;

(c) a comparison of data and values resulting from different operational data collection systems, including the following comparisons, where applicable:

(i) a comparison of fuel or material purchasing data with data on stock changes and data on consumption for the applicable source streams;

(ii) a comparison of calculation factors that have been determined by analysis, calculated or obtained from the supplier of the fuel or material, with national or international reference factors of comparable fuels or materials;

(iii) a comparison of emissions obtained from measurement-based methodologies and the results of the corroborating calculation pursuant to Article 46;

(iv) a comparison of aggregated data and raw data.

2. The operator or aircraft operator shall, to the extent possible, ensure the criteria for rejecting data as part of the review and validation are known in advance. For that purpose the criteria for rejecting data shall be laid down in the documentation of the relevant written procedures.

Article 64

Corrections and corrective action

1. Where any part of the data flow activities referred to in Article 58 or control activities referred to in Article 59 is found not to function effectively, or to function outside boundaries that are set in documentation of procedures for those data flow activities and control activities, the operator or aircraft operator shall make appropriate corrections and correct rejected data while avoiding underestimation of emissions.

2. For the purpose of paragraph 1, the operator or aircraft operator shall at least proceed to all of the following:

(a) assessment of the validity of the outputs of the applicable steps in the data flow activities referred to in Article 58 or control activities referred to in Article 59;

(b) determination of the cause of the malfunctioning or error concerned;

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(c) Implementation of appropriate corrective action, including correcting any affected data in the emission report as appropriate.

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3. The operator or aircraft operator shall carry out the corrections and corrective actions pursuant to paragraph 1 of this Article such that they are responsive to the inherent risks and control risks identified in the risk assessment referred to in Article 59.

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Article 65

Out-sourced processes

Where the operator or aircraft operator outsources one or more data flow activities referred to in Article 58 or control activities referred to in Article 59, the operator or aircraft operator shall proceed to all of the following:

(a) check the quality of the outsourced data flow activities and control activities in accordance with this Regulation;

(b) define appropriate requirements for the outputs of the outsourced processes and the methods used in those processes;

(c) check the quality of the outputs and methods referred to in point (b) of this Article;

(d) ensure that outsourced activities are carried out such that those are responsive to the inherent risks and control risks identified in the risk assessment referred to in Article 59.

Article 66

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Treatment of data gaps for emissions reporting

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1. Where data relevant for the determination of the emissions of an installation are missing, the operator shall use an appropriate estimation method to determine conservative surrogate data for the respective time period and missing parameter.

Where the operator has not laid down the estimation method in a written procedure, it shall establish such a written procedure and submit to the competent authority for approval an appropriate modification of the monitoring plan in accordance with Article 15.

2. Where data relevant for the determination of an aircraft operator's emissions for one or more flights are missing, the aircraft operator shall use surrogate data for the respective time period calculated in accordance with the alternative method defined in the monitoring plan.

Where surrogate data cannot be determined in accordance with the first subparagraph of this paragraph, the emissions for that flight or those flights may be estimated by the aircraft operator from the fuel consumption determined by using a tool referred to in Article 55(2).

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Where the number of flights with data gaps referred to in the first two sub-paragraphs exceed 5 % of the annual flights that are reported, the aircraft operator shall inform the competent authority thereof without undue delay and shall take remedial action for improving the monitoring methodology.

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Article 67

Records and documentation

1. The operator or aircraft operator shall keep records of all relevant data and information, including information as listed in Annex IX, for at least 10 years.

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The documented and archived monitoring data shall allow for the verification of the annual emissions reports in accordance with Implementing Regulation (EU) 2018/2067. Data reported by the operator or aircraft operator contained in an electronic reporting and data management system set up by the competent authority may be considered to be retained by the operator or aircraft operator, if they can access those data.

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2. The operator or aircraft operator shall ensure that relevant documents are available when and where they are needed to perform the data flow activities and control activities.

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The operator or aircraft operator shall, upon request, make those documents available to the competent authority and to the verifier verifying the emissions report in accordance with Implementing Regulation (EU) 2018/2067.

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CHAPTER VI

REPORTING REQUIREMENTS

Article 68

Timing and obligations for reporting

1. The operator or aircraft operator shall submit to the competent authority by 31 March of each year an emissions report that covers the annual emissions in the reporting period and that is verified in accordance with Implementing Regulation (EU) 2018/2067.

However, competent authorities may require operators or aircraft operators to submit the verified annual emission report earlier than by 31 March, but by 28 February at the earliest.

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3. The annual emissions reports shall contain at least the information listed in Annex X.

4. Member States shall submit the verified annual emissions report of each installation for the incineration of municipal waste as referred to in Annex I to Directive 2003/87/EC to the Commission by 30 April of each year.

Where the Competent Authority has corrected the verified emissions after 30 April each year, Member States shall notify this correction to the Commission without undue delay.

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5. The aircraft operator shall submit to the competent authority under the same conditions as referred to in paragraph 1, a separate report as attachment to the annual emissions report, that covers the annual non-CO_2 aviation effects.

6. The separate report referred to in paragraph 5 shall contain at least the information listed in Annex X, Section 2a.

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Article 69

Reporting on improvements to the monitoring methodology

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1. Each operator shall regularly check whether the monitoring methodology applied can be improved.

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An operator of an installation shall submit to the competent authority for approval a report containing the information referred to in paragraph 2 or 3, where appropriate, by the following deadlines:

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(a) for a category A installation, by 30 June every 5 years;

(b) for a category B installation, by 30 June every 3 years;

(c) for a category C installation, by 30 June every 2 years.

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However, the competent authority may set an alternative date for submission of the report, but no later date than 30 September of the same year.

By way of derogation from the second and third subparagraphs, and without prejudice to the first subparagraph, the competent authority may approve, together with the monitoring plan or the improvement report, an extension of the deadline applicable pursuant to the second subparagraph, if the operator provides evidence to the satisfaction of the competent authority upon submission of a monitoring plan in accordance with Article 12 or upon notification of updates in accordance with Article 15, or upon submission of an improvement report in accordance with this Article, that the reasons for unreasonable costs or for improvement measures being technically not feasible will remain valid for a longer period of time. That extension shall take into account the number of years for which the operator provides evidence. The total time period between improvement reports shall not exceed three years for a category C installation, four years for a category B installation or five years for a category A installation.

2. Where the operator does not apply at least the tiers required pursuant to the first subparagraph of Article 26(1) to major source streams and minor source streams and pursuant to Article 41 to emission sources, the operator shall provide a justification as to why it is technically not feasible or would incur unreasonable costs to apply the required tiers.

However, where evidence is found that measures needed for reaching those tiers have become technically feasible and do not any more incur unreasonable costs, the operator shall notify the competent authority of appropriate modifications of the monitoring plan in accordance with Article 15, and submit proposals for implementing the related measures and its timing.

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3. Where the operator applies a fall-back monitoring methodology referred to in Article 22, the operator shall provide: a justification as to why it is technically not feasible or would incur unreasonable costs to apply at least tier 1 for one or more major or minor source streams.

However, where evidence is found that measures needed for reaching at least tier 1 for those source streams have become technically feasible and do not any more incur unreasonable costs, the operator shall notify the competent authority of appropriate modifications of the monitoring plan in accordance with Article 15 and submit proposals for implementing the related measures and its timing.

4. Where the verification report established in accordance with Implementing Regulation (EU) 2018/2067 states outstanding non-conformities or recommendations for improvements, in accordance with Articles 27, 29 and 30 of that Implementing Regulation, the operator or aircraft operator shall submit to the competent authority for approval a report by 30 June of the year in which that verification report is issued by the verifier. That report shall describe how and when the operator or aircraft operator has rectified or plans to rectify the non-conformities identified by the verifier and to implement recommended improvements.

The competent authority may set an alternative date for submission of the report as referred to in this paragraph, but no later date than 30 September of the same year. Where applicable, such report may be combined with the report referred to in paragraph 1 of this Article.

Where recommended improvements would not lead to an improvement of the monitoring methodology, the operator or aircraft operator shall provide a justification of why that is the case. Where the recommended improvements would incur unreasonable costs, the operator or aircraft operator shall provide evidence of the unreasonable nature of the costs.

5. Paragraph 4 of this Article shall not apply where the operator or aircraft operator has already resolved all non-conformities and recommendations for improvement and has submitted related modifications of the monitoring plan to the competent authority for approval in accordance with Article 15 of this Regulation before the date set pursuant to paragraph 4.

Article 70

Determination of emissions by the competent authority

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1. The competent authority shall make a conservative estimate of the emissions of an installation or aircraft operator and, where relevant, the non-CO_2 aviation effects of an aircraft operator in any of the following situations:

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(a) no verified annual emission report has been submitted by the operator or aircraft operator by the deadline required pursuant to Article 68(1);

(b) the verified annual emissions report referred to in Article 68(1) is not in compliance with this Regulation;

(c) the annual emissions report of an operator or aircraft operator has not been verified in accordance with Implementing Regulation (EU) 2018/2067.

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2. Where a verifier has stated, in the verification report pursuant to Implementing Regulation (EU) 2018/2067, the existence of non-material misstatements which have not been corrected by the operator or aircraft operator before issuing the verification report, the competent authority shall assess those misstatements, and make a conservative estimate of the emissions and non-CO_2 aviation effects of the installation or aircraft operator where appropriate. The competent authority shall inform the operator or aircraft operator whether and which corrections are required to the annual emissions report. The operator or aircraft operator shall make that information available to the verifier.

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3. Member States shall establish an efficient exchange of information between competent authorities responsible for approval of monitoring plans and competent authorities responsible for acceptance of annual emissions reports.

Article 71

Access to information

Emission reports held by the competent authority shall be made available to the public by that authority subject to national rules adopted pursuant to Directive 2003/4/EC of the European Parliament and of the Council ([1]). With regard to the application of the exception, as specified in Article 4(2)(d) of Directive 2003/4/EC, operators or aircraft operators may indicate in their reports what information they consider commercially sensitive.

Article 72

Rounding of data

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1. Total annual emissions of each of the greenhouse gases CO_2, N_2O and PFCs, as well as non-CO_2 aviation effects shall be reported as rounded tonnes of CO_2 or CO_2(e). The total annual emissions of the installation shall be calculated as the sum of the rounded values for CO_2, N_2O and PFCs.

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2. All variables used to calculate the emissions shall be rounded to include all significant digits for the purpose of calculating and reporting emissions.

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Article 73

Ensuring consistency with other reporting

Each activity listed in Annex I to Directive 2003/87/EC that is carried out by an operator or aircraft operator shall be labelled using the codes, where applicable, from the following reporting schemes:

([1]) Directive 2003/4/EC of the European Parliament and of the Council of 28 January 2003 on public access to environmental information and repealing Council Directive 90/313/EEC (OJ L 41, 14.2.2003, p.26).

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(a) the common reporting format for national greenhouse gas inventory systems, as approved by the respective bodies of the United Nations Framework Convention on Climate Change;

(b) the installation's identification number in the European pollutant release and transfer register in accordance with Regulation (EC) No 166/2006 of the European Parliament and of the Council [1];

(c) the activity of Annex I to Regulation (EC) No 166/2006;

(d) the NACE code in accordance with Regulation (EC) No 1893/2006 of the European Parliament and of the Council [2].

CHAPTER VII

INFORMATION TECHNOLOGY REQUIREMENTS

Article 74

Electronic data exchange formats

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1. Member States may require the operator and aircraft operator to use electronic templates or specific file formats for submission of monitoring plans and changes to the monitoring plan, as well as for submission of annual emissions reports, verification reports and improvement reports.

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Those templates or file format specifications established by the Member States shall, at least, contain the information contained in electronic templates or file format specifications published by the Commission.

2. When establishing the templates or file-format specifications referred to in the second subparagraph of paragraph 1, Member States may choose one or both of the following options:

(a) file-format specifications based on XML, such as the EU ETS reporting language published by the Commission for use in connection with advanced automated systems;

(b) templates published in a form usable by standard office software, including spreadsheets and word processor files.

[1] Regulation (EC) No 166/2006 of the European Parliament and of the Council of 18 January 2006 concerning the establishment of a European Pollutant Release and Transfer Register and amending Council Directives 91/689/EEC and 96/61/EC (OJ L 33, 4.2.2006, p. 1).

[2] Regulation (EC) No 1893/2006 of the European Parliament and of the Council of 20 December 2006 establishing the statistical classification of economic activities NACE Revision 2 and amending Council Regulation (EEC) No 3037/90 as well as certain EC Regulations on specific statistical domains (OJ L 393, 30.12.2006, p. 1).

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Article 75

Use of automated systems

1. Where a Member State chooses to use automated systems for electronic data exchange based on file-format specifications in accordance with point (a) of Article 74(2), those systems shall ensure in a cost efficient way, through the implementation of technological measures in accordance with the current state of technology:

(a) integrity of data, preventing modification of electronic messages during transmission;

(b) confidentiality of data, through the use of security techniques, including encryption techniques, such that the data is only accessible to the party for which it was intended and that no data can be intercepted by unauthorised parties;

(c) authenticity of data, such that the identity of both the sender and receiver of data is known and verified;

(d) non-repudiation of data, such that one party of a transaction cannot deny having received a transaction nor can the other party deny having sent a transaction, by applying methods such as signing techniques, or independent auditing of system safeguards.

2. Any automated systems used by Member States based on file-format specifications in accordance with point (a) of Article 74(2) for communication between the competent authority, operator and aircraft operator, as well as verifier and national accreditation body within the meaning of Implementing Regulation (EU) 2018/2067, shall meet the following non-functional requirements, through implementation of technological measures in accordance with the current state of technology:

(a) access control, such that the system is only accessible to authorised parties and no data can be read, written or updated by unauthorised parties, through implementation of technological measures in order to achieve the following:

   (i) restriction of physical access to the hardware on which automated systems run through physical barriers;

   (ii) restriction of logical access to the automated systems through the use of technology for identification, authentication and authorisation;

(b) availability, such that data accessibility is ensured, even after significant time and the introduction of possible new software;

(c) audit trail, such that it is ensured that changes to data can always be found and analysed in retrospect.

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CHAPTER VIIa

MONITORING OF EMISSIONS FROM REGULATED ENTITIES

SECTION 1

General provisions

Article 75a

General principles

Articles 4, 5, 6, 7, 8, 9 and 10 of this Regulation shall apply to the emissions, regulated entities and allowances covered by Chapter IVa of Directive 2003/87/EC. For that purpose:

(a) any reference to operator and aircraft operator shall be read as if it were a reference to the regulated entity;

(b) any reference to process emissions shall not be applicable;

(c) any reference to source streams shall be read as if it were a reference to fuel streams;

(d) any reference to emissions source shall not be applicable;

(e) any reference to activities listed in Annex I to Directive 2003/87/EC shall be read as if it were a reference to activity referred to in Annex III to that Directive;

(f) any reference to Article 24 of Directive 2003/87/EC shall be read as if it were a reference to Article 30j of that Directive;

(g) any reference to activity data shall be read as if it were a reference to the released fuel amounts;

(h) any reference to calculation factors shall be read as if it were a reference to calculation factors and scope factor.

Article 75b

Monitoring plans

1. Article 11, Article 12(2), Articles 13 and 14, Article 15(1) and (2), and Article 16 shall apply. For that purpose:

(a) any reference to operator or aircraft operator shall be read as if it were a reference to the regulated entity;

(b) any reference to aviation activity shall be read as if it were a reference to the activity of the regulated entity.

2. At the latest 4 months before a regulated entity commences the activity covered by Annex III to Directive 2003/87/EC, it shall submit to the competent authority a monitoring plan for approval, unless the competent authority has set an alternative time limit for this submission.

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The monitoring plan shall consist of a detailed, complete and transparent documentation of the monitoring methodology of a specific regulated entity and shall contain at least the elements laid down in Annex I.

Together with the monitoring plan, the regulated entity shall submit the results of a risk assessment providing evidence that the proposed control activities and procedures for control activities are commensurate with the inherent risks and control risks identified.

3. In accordance with Article 15, significant modifications to the monitoring plan of a regulated entity include:

(a) changes to the category of the regulated entity where such changes require a change in the monitoring methodology or lead to a change of the applicable materiality level pursuant to Article 23 of Implementing Regulation (EU) 2018/2067;

(b) notwithstanding Article 75n, changes regarding whether the regulated entity is considered a ‘regulated entity with low emissions’;

(c) a change in the tier applied;

(d) the introduction of new fuel streams;

(e) a change in the categorisation of fuel streams – between major or de-minimis fuel streams where such a change requires a change to the monitoring methodology;

(f) a change to the default value for a calculation factor, where the value is to be laid down in the monitoring plan;

(g) a change in the default value for the scope factor;

(h) the introduction of new methods or changes to existing methods related to sampling, analysis or calibration, where this has a direct impact on the accuracy of emissions data.

Article 75c

Technical feasibility

Where a regulated entity claims that applying a specific monitoring methodology is technically not feasible, the competent authority shall assess the technical feasibility taking the regulated entity’s justification into account. That justification shall be based on the regulated entity having technical resources capable of meeting the needs of a proposed system or requirement that can be implemented in the required time for the purposes of this Regulation. Those technical resources shall include the availability of the requisite techniques and technology.

For the monitoring and reporting of historical emissions for the year 2024 in accordance with Article 30f(4) of Directive 2003/87/EC, Member States may exempt regulated entities from justifying that a specific monitoring methodology is not technically feasible.

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Article 75d

Unreasonable costs

1. Where a regulated entity claims that applying a specific monitoring methodology would incur unreasonable costs, the competent authority shall assess whether the costs are unreasonable, taking into account the regulated entity's justification.

The competent authority shall consider costs unreasonable where the cost estimate exceeds the benefit. To that end, the benefit shall be calculated by multiplying an improvement factor by a reference price of EUR 60 per allowance. The costs shall include an appropriate depreciation period based on the economic lifetime of the equipment.

2. Notwithstanding paragraph 1, the regulated entity shall consider costs of applying a specific monitoring methodology incurred by consumers of the released fuel streams, including by final consumers. For the purposes of this subparagraph, the regulated entity may apply conservative estimates of the costs.

For the monitoring and reporting of historical emissions for the year 2024 in accordance with Article 30f(4) of Directive 2003/87/EC, Member States may exempt regulated entities from justifying that a specific monitoring methodology would incur unreasonable costs.

3. When assessing the unreasonable nature of the costs with regard to the choice of tier levels for the regulated entity's released fuel amounts, the competent authority shall use as the improvement factor referred to in paragraph 1 the difference between the uncertainty currently achieved and the uncertainty threshold of the tier that would be achieved by the improvement multiplied by the average annual emissions caused by that fuel stream over the 3 most recent years.

In the absence of such data on the average annual emissions caused by that fuel stream over the three most recent years, the regulated entity shall provide a conservative estimate of the annual average emissions, with the exclusion of CO_2 stemming from ►M5 zero-rated fuels ◄. For measuring instruments under national legal metrological control, the uncertainty currently achieved may be substituted by the maximum permissible error in service allowed by the relevant national legislation.

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For the purpose of this paragraph, Article 38(5) and 39a(3) shall apply, provided that the relevant information on the sustainability and the greenhouse gas emissions saving criteria of zero-rated fuels used for combustion is available to the regulated entity.

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4. When assessing the unreasonable nature of the costs with regard to the choice of tier levels for the regulated entity's scope factor determination and with regard to measures increasing the data quality of

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reported emissions but without direct impact on the accuracy of data on released fuel amounts, the competent authority shall use an improvement factor of 1 % of the average annual emissions of the respective fuel streams in the three most recent reporting periods. The measures increasing the quality of reported emissions but without direct impact on the accuracy of data on released fuel amounts may include:

(a) switching from default values to analyses to determine calculation factors;

(b) an increase of the number of analyses per fuel stream;

(c) where the specific measuring task does not fall under national legal metrological control, the substitution of measuring instruments with instruments complying with relevant requirements of legal metrological control of the Member State in similar applications, or to measuring instruments meeting national rules adopted pursuant to Directive 2014/31/EU of the European Parliament and of the Council ([1]) or Directive 2014/32/EU;

(d) shortening calibration and maintenance intervals of measuring instruments;

(e) improvements to data-flow activities and control activities that significantly reduce the inherent or control risk;

(f) regulated entities switching to more accurate identification of the scope factor.

5. Measures relating to the improvement of a regulated entity's monitoring methodology shall not be deemed to incur unreasonable costs up to an accumulated amount of EUR 4 000 per reporting period. For regulated entities with low emissions that threshold shall be EUR 1 000 per reporting period.

Article 75e

Categorisation of regulated entities and fuel streams

1. For the purpose of monitoring emissions and determining the minimum requirements for tiers for the related calculation factors, each regulated entity shall determine its category pursuant to paragraph 2, and, where relevant, of each fuel stream pursuant to paragraph 3.

2. The regulated entity shall classify itself in one of the following categories:

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(a) a category A entity, where from 2027 to 2030 the average verified annual emissions in the 2 years preceding the reporting period before the application of the scope factor, with the exclusion of CO_2 stemming from zero-rated fuels, are equal to or less than 50 000 tonnes of CO_2(e);

(b) a category B entity, where from 2027 to 2030 the average verified annual emissions in the 2 years preceding the reporting period before the application of the scope factor, with the exclusion of CO_2 stemming from zero-rated fuels, are more than 50 000 tonnes of CO_2(e).

([1]) Directive 2014/31/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of non-automatic weighing instruments (OJ L 96, 29.3.2014, p. 107).

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From 2031 onwards, the category A and B entities referred to in points (a) and (b) of the first subparagraph shall be determined on the basis of the average verified annual emissions in the trading period immediately preceding the current trading period.

By way of derogation from Article 14(2), the competent authority may allow the regulated entity not to modify the monitoring plan where, on the basis of verified emissions, the threshold for the classification of the regulated entity referred to in the first subparagraph is exceeded, but the regulated entity demonstrates to the satisfaction of the competent authority that this threshold has not already been exceeded within the previous five reporting periods and will not be exceeded again in subsequent reporting periods.

3. The regulated entity shall classify each fuel stream in one of the following categories:

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(a) *de minimis* fuel streams, where the fuel streams selected by the regulated entity jointly account for less than 1 000 tonnes of fossil CO_2 per year before the application of the scope factor;

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(b) major fuel streams, where the fuel streams do not fall within the category referred to in point (a).

By way of derogation from Article 14(2), the competent authority may allow the regulated entity not to modify the monitoring plan where, on the basis of verified emissions, the threshold for the classification of a fuel stream as a de minimis fuel stream referred to in the first subparagraph is exceeded, but the regulated entity demonstrates to the satisfaction of the competent authority that this threshold has not already been exceeded within the past five reporting periods and will not be exceeded again in subsequent reporting periods.

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4. Where the average annual verified emissions used to determine category of the regulated entity as referred to in paragraph 2 are not available or no longer representative for the purpose of paragraph 2, the regulated entity shall use a conservative estimate of annual average emissions calculated before the application of the scope factor, with the exclusion of CO_2 stemming from zero-rated fuels, to determine the category of the regulated entity.

4a. By way of derogation from paragraphs 2, 3 and 4, before 2027, the competent authority may allow the regulated entity to classify itself and each fuel stream based on the emissions after the application of the scope factor, with the exclusion of CO_2 stemming from zero-rated fuels, where the regulated entity can demonstrate to the satisfaction of the competent authority that the scope factor applied for the classification will remain to be representative in the future years.

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Article 75f

Monitoring methodology

Each regulated entity shall determine the annual CO_2 emissions from activities referred to in Annex III to Directive 2003/87/EC by multiplying for each fuel stream the released fuel amount by the corresponding unit conversion factor, the corresponding scope factor and the corresponding emission factor.

The emission factor shall be expressed as tonnes of CO_2 per terajoule (t CO_2/TJ) consistent with the use of the unit conversion factor.

The competent authority may allow the use of emission factors for fuels expressed as tCO_2/t or tCO_2/Nm^3. In such cases, the regulated entity shall determine emissions by multiplying the released fuel amount, expressed as tonnes or normal cubic meters, by the corresponding scope factor and the corresponding emission factor.

Article 75g

Temporary changes to the monitoring methodology

1. Where it is for technical reasons temporarily not feasible to apply the monitoring plan as approved by the competent authority, the regulated entity concerned shall apply the highest achievable tier or, except for the scope factor, a conservative no-tier approach if application of a tier is not achievable, until the conditions for application of the tier approved in the monitoring plan have been restored.

The regulated entity shall take all necessary measures to allow the prompt resumption of the application of the monitoring plan as approved by the competent authority.

2. The regulated entity concerned shall notify the competent authority of the temporary change referred to in paragraph 1 to the monitoring methodology without undue delay to the competent authority, specifying:

(a) the reasons for deviating from the monitoring plan as approved by the competent authority;

(b) the details of the interim monitoring methodology that the regulated entity is using to determine the emissions until the conditions for the application of the monitoring plan as approved by the competent authority have been restored;

(c) the measures the regulated entity is taking to restore the conditions for the application of the monitoring plan as approved by the competent authority;

(d) the anticipated point in time when application of the monitoring plan as approved by the competent authority will be resumed.

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SECTION 2

Calculation-based methodology

Subsection 1

General

Article 75h

Applicable tiers for released fuel amounts and calculation factors

1. When defining the relevant tiers for major fuel streams, to determine the released fuel amounts and each calculation factor, each regulated entity shall apply the following:

(a) at least the tiers listed in Annex V, in the case of a category A entity, or where a calculation factor is required for a fuel stream that is a commercial standard fuel;

(b) in cases other than those referred to in point (a), the highest tier as defined in Annex IIa.

However, for released fuel amounts and calculation factors of major fuel streams the regulated entity may apply a tier up to two levels lower than required in accordance with the first subparagraph, with a minimum of tier 1, where it shows to the satisfaction of the competent authority that the tier required in accordance with the first subparagraph, or where applicable the next highest tier, is technically not feasible or incurs unreasonable costs.

2. For de minimis fuel streams, the regulated entity may determine released fuel amounts and each calculation factor by using conservative estimates instead of using tiers, unless a defined tier is achievable without additional effort.

For fuel streams referred to under the first subparagraph, the regulated entity may determine released fuel amounts based on invoices or purchase records, unless a defined tier is achievable without additional effort.

3. Where the competent authority has allowed the use of emission factors expressed as t CO_2/t or t CO_2/Nm^3 for fuels, the unit conversion factor may be monitored using a conservative estimate instead of using tiers, unless a defined tier is achievable without additional effort.

Article 75i

Applicable tiers for the scope factor

1. When defining the relevant tiers for fuel streams, to determine the scope factor, each regulated entity shall apply the highest tier as defined in Annex IIa.

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However, the regulated entity may apply a tier one level lower than required in accordance with the first subparagraph where it shows to the satisfaction of the competent authority that the tier required in accordance with the first subparagraph is technically not feasible, incurs unreasonable costs, or that methods listed in Article 75l(2), points (a) to (d), are not available.

If the second subparagraph is not applicable, the regulated entity may apply a tier two levels lower than required in accordance with the first subparagraph, with a minimum of tier 1, where it shows to the satisfaction of the competent authority that the tier required in accordance with the first subparagraph is technically not feasible, incurs unreasonable costs, or that, based on a simplified uncertainty assessment, the methods set out in lower tiers lead to a more accurate determination of whether the fuel is used for combustion in sectors covered by Annex III to Directive 2003/87/EC.

Where, for a fuel stream, the regulated entity uses more than one method listed in Article 75l(2), (3) and (4), it shall be required to show that the conditions of this paragraph are met only with respect to the share of the released fuel amount for which the lower tier method is requested.

2. For de minimis fuel streams, the regulated entity shall not be required to show that the conditions in paragraph 1 are met, unless a defined tier is achievable without additional effort.

Subsection 2

Released fuel amounts

Article 75j

Determination of released fuel amounts

1. The regulated entity shall determine the released fuel amounts of a fuel stream in one of the following ways:

(a) where the regulated entities and the fuel streams covered correspond to entities with reporting obligations under and energy products subject to national legislation transposing Directives 2003/96/EC and (EU) 2020/262, on the basis of the measurement methods used for the purposes of those acts when those methods are based on national metrological control;

(b) on the basis of aggregation of measurement of quantities at the point where the fuel streams are released for consumption;

(c) on the basis of continual measurement at the point where the fuel streams are released for consumption.

However, the competent authorities may require the regulated entities to use, where applicable, only the method referred to in the first subparagraph, point (a).

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2. Where it is technically not feasible or would incur unreasonable costs to determine released fuel amounts for the entire calendar year, and subject to the approval by the competent authority, the regulated entity may choose the next most appropriate day to separate one monitoring year from the subsequent year, and reconcile accordingly to the calendar year required. The deviations involved for one or more fuel streams shall be documented in the monitoring plan, clearly recorded, form the basis of a value representative for the calendar year, and be considered consistently in relation to the next year. The Commission may provide the relevant guidelines.

When determining the released fuel amounts in accordance with paragraph 1, point (b) and (c) of this Article, Articles 28 and 29 shall apply, with the exception of Article 28(2), second subparagraph, second sentence and third subparagraph. For that purpose, any reference to operator or installation is to be read as if it were a reference to the regulated entity.

The regulated entity may simplify the uncertainty assessment by assuming that the maximum permissible errors specified for the measuring instrument in service is to be regarded as the uncertainty over the whole reporting period as required by the tier definitions in Annex IIa.

3. By way of derogation from Article 75h, where the method referred to in point (a) of paragraph 1 of this Article is used, the regulated entity may determine the released fuel amounts without using tiers. The competent authorities shall report to the Commission by 30 June 2026 on the practical application and levels of uncertainty of the method referred to in that point.

Subsection 3

Calculation factors

Article 75k

Determination of calculation factors

1. Article 30, Article 31(1), (2) and (3) and Articles 32, 33, 34, and 35 shall apply. For that purpose:

(a) any reference to operator is to be read as if it were a reference to the regulated entity;

(b) any reference to activity data is to be read as if it were a reference to the released fuel amounts;

(c) any reference to fuels or materials is to be read as if it were a reference to fuels as defined in Article 3(af) of Directive 2003/87/EC;

(d) any reference to Annex II is to be read as if it were a reference to Annex IIa.

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2. The competent authority may require the regulated entity to determine the unit conversion factor and emission factor of fuels as defined in Article 3(af) of Directive 2003/87/EC using the same tiers as required for commercial standard fuels provided that, at the national or regional level, any of the following parameters exhibit a 95 % confidence interval of:

(a) below 2 % for net calorific value;

(b) below 2 % for emission factor, where the released fuel amounts are expressed as energy content.

Before application of this derogation, the competent authority shall submit for the approval of the Commission a summary of the method and data sources used to determine whether one of these conditions is met in the last 3 years and to ensure that the values used are consistent with the average values used by operators at the corresponding national or regional level. The competent authority may collect or request such evidence. At least every 3 years it shall review the values used and notify the Commission if there are any significant changes, taking into account the average of the values used by the operators at the corresponding national or regional level.

The Commission may regularly review the relevance of this provision and the conditions set in this paragraph in light of developments on the fuels market and European standardisation processes.

Article 75l

Determination of the scope factor

1. Where the released fuel amounts of a fuel stream are used only for combustion in sectors covered by Annex III to Directive 2003/87/EC, the scope factor shall be set at 1.

Where the released fuel amounts of a fuel stream are used only for combustion in sectors covered by Chapters II and III of Directive 2003/87/EC, with the exception of installations excluded under Article 27a of that Directive, the scope factor shall be set at zero, provided that the regulated entity demonstrates that double counting referred to in Article 30f(5) of Directive 2003/87/EC was avoided.

The regulated entity shall determine a scope factor for each fuel stream either by applying the methods referred to in paragraph 2, or a default value in accordance with paragraph 3, depending on the applicable tier.

2. The regulated entity shall determine the scope factor on the basis of one or more of the following methods, in accordance with the requirements of the applicable tier as set out in Annex IIa to this Regulation:

(a) methods based on the physical distinction of fuel flows, including methods based on the distinction of geographical region or based on the use of separate measuring instruments;

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(b) methods based on the chemical properties of fuels, which allow regulated entities to demonstrate that the relevant fuel can only be used for combustion in specific sectors, due to legal, technical or economic reasons;

(c) use of fiscal marker in accordance with Council Directive 95/60/EC ([1]);

(d) use of the verified annual emissions report referred to in Article 68 (1);

(e) chain of traceable contractual arrangements and invoices (‘chain of custody’), representing the whole supply chain from the regulated entity to the consumers, including final consumers;

(f) use of national markers or colours (dyes) for fuels, based on national legislation;

(g) indirect methods allowing an accurate differentiation of the end uses of the fuels at the time when they are released for consumption, such as sector-specific consumption profiles, typical ranges of capacity of consumers’ fuel consumption levels, and pressure levels such as those of gaseous fuels, provided that the use of that method is approved by the competent authority. The Commission may provide guidelines on applicable indirect methods.

3. Where subject to the required tiers, applying the methods listed in paragraph 2 is technically not feasible or would incur unreasonable costs, the regulated entity may use a default value of 1.

4. By way of derogation from paragraph 3, the regulated entity may apply a default value lower than 1, provided that:

(a) for the purposes of reporting emissions in the reporting years 2024 to 2026 the regulated entity demonstrates to the satisfaction of the competent authority that using default values lower than 1 leads to a more accurate determination of emissions, or

(b) for the purposes of reporting emissions in the reporting years as from 1 January 2027 the regulated entity demonstrates to the satisfaction of the competent authority that using default values lower than 1 leads to a more accurate determination of emissions and that at least one of the following conditions is met:

(i) the fuel stream is a de-minimis fuel stream;

(ii) the default value for the fuel stream is not lower than 0,95 for fuel uses in sectors covered by Annex III to Directive 2003/87/EC or not higher than 0,05 for fuel uses in sectors not covered by that Annex.

([1]) Council Directive 95/60/EC of 27 November 1995 on fiscal marking of gas oils and kerosene (OJ L 291, 6.12.1995, p. 46).

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5. Where, for a fuel stream, the regulated entity uses more than one method listed in paragraphs 2, 3 and 4, it shall determine the scope factor as the weighted average of the different scope factors resulting from the use of each method. For each method used, the regulated entity shall submit information on the type of method, the associated scope factor, released fuel amount and the code from the common reporting format for national greenhouse gas inventory systems, as approved by the respective bodies of the United Nations Framework Convention on Climate Change (Common Reporting Format (CRF) code), at the level of detail available.

6. By way of derogation from paragraph 1 of this Article and Article 75i, a Member State may require regulated entities to use a specific method referred to in paragraph 2 of this Article or a default value for a certain fuel type or in a certain region within their territory. The use of default values on national level shall be subject to the approval of the Commission.

When approving the default value in accordance with the first subparagraph, the Commission shall consider the appropriate level of harmonisation of methodologies between Member States, the balance between accuracy, administrative efficiency and cost pass-on implications for consumers, as well as possible risk of evasion of obligations under Chapter IVa of Directive 2003/87/EC.

Any default value for the national fuel stream used under this paragraph shall not be lower than 0,95 for fuel uses in sectors covered by Annex III to Directive 2003/87/EC or not higher than 0,05 for fuel uses in sectors not covered by that Annex.

7. The regulated entity shall specify the applied methods or default values in the monitoring plan.

Subsection 4

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Treatment of biomass synthetic low-carbon fuels, RFNBO and RCF

Article 75m

Release of fuel streams containing biomass, synthetic low-carbon fuels, RFNBO and RCF

1. Article 38, Article 39, paragraphs 1, 3 and 4, and Article 39a shall apply. For that purpose:

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(a) any reference to operator is to be read as if it were a reference to the regulated entity;

(b) any reference to activity data is to be read as if it were a reference to the released fuel amounts;

(c) any reference to source streams is to be read as if it were a reference to fuel streams;

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(d) any reference to Annex II is to be read as if it were a reference to Annex IIa;

(e) any reference to paragraph 39(2) is to be read as a reference to paragraph 3 of this Article.

2. Where Article 38(5) is applicable, the threshold derogations in accordance with Article 29(1), fourth subparagraph, of Directive (EU) 2018/2001 shall be taken into consideration, provided that the regulated entity can show the relevant evidence to the satisfaction of the competent authority. The Commission may provide guidelines on how to further apply these thresholds derogations.

3. Where, subject to the tier level required, the regulated entity has to carry out analyses to determine the ►M5 zero-rated carbon fraction ◄, it shall do so on the basis of a relevant standard and the analytical methods therein, provided that the use of that standard and analytical method are approved by the competent authority.

Where, subject to the tier level required, the regulated entity has to carry out analyses to determine the ►M5 zero-rated carbon fraction ◄, but the application of the first subparagraph is technically not feasible or would incur unreasonable costs, the regulated entity shall submit an alternative estimation method to determine the biomass fraction to the competent authority for approval.

SECTION 3

Other provisions

Article 75n

Regulated entities with low emissions

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1. The competent authority may consider a regulated entity to be a regulated entity with low emissions where at least one of the following conditions is met:

(a) from 2027 to 2030, the average verified annual emissions in the 2 years preceding the reporting period before the application of the scope factor, with the exclusion of CO_2 stemming from zero-rated fuels, were less than 1 000 tonnes of CO_2 per year;

(b) from 2031, the average annual emissions of that regulated entity reported in the verified emissions reports during the trading period immediately preceding the current trading period, calculated before the application of the scope factor and with the exclusion of CO_2 stemming from zero-rated fuels, were less than 1 000 tonnes of CO_2 per year;

(c) where the average annual emissions referred to in point (a) are not available or no longer representative for the purpose of point (a), but the annual emissions of that regulated entity for the next 5 years, calculated before the application of the scope factor and with the exclusion of CO_2 stemming from zero-rated fuels, will be, based on a conservative estimation method, less than 1 000 tonnes of CO_2(e) per year.

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1a. By way of derogation from paragraph 1, before 2027, the competent authority may consider a regulated entity to be a regulated entity with low emissions based on the emissions after the application of the scope factor, with the exclusion of CO_2 stemming from zero-rated fuels, where the regulated entity can demonstrate to the satisfaction of the competent authority that the scope factor applied for the classification will remain to be representative in the future years.

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2. The regulated entity with low emissions shall not be required to submit the supporting documents referred to in Article 12(1), third subparagraph.

3. By way of derogation from Article 75j, the regulated entity with low emissions may determine the amount of fuel released by using available and documented purchasing records and estimated stock changes.

4. By way of derogation from Articles 75h, the regulated entity with low emissions may apply as a minimum tier 1 for the purposes of determining released fuel amounts and calculation factors for all fuel streams, unless higher accuracy is achievable without additional effort for the regulated entity.

5. For the purpose of determining calculation factors on the basis of analyses in accordance with Article 32, the regulated entity with low emissions may use any laboratory that is technically competent and able to generate technically valid results using the relevant analytical procedures and provides evidence for quality assurance measures as referred to in Article 34(3).

6. Where a regulated entity with low emissions subject to simplified monitoring exceeds the threshold referred to in paragraph 2 in any calendar year, this regulated entity shall notify the competent authority thereof without undue delay.

The regulated entity shall, without undue delay, submit a significant modification of the monitoring plan within the meaning of Article 15 (3), point (b), to the competent authority for approval.

However, the competent authority shall allow that the regulated entity continues simplified monitoring provided that that regulated entity demonstrates to the satisfaction of the competent authority that the threshold referred to in paragraph 2 has not already been exceeded within the past five reporting periods and will not be exceeded again from the following reporting period onwards.

Article 75o

Data management and control

The provisions of Chapter V shall apply. In this regard, any reference to the/an operator shall be read as if it were a reference to the regulated entity.

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Article 75p

Annual emission reports

1. From 2026, the regulated entity shall submit to the competent authority by 30 April of each year an emissions report that covers the annual emissions in the reporting period and that is verified in accordance with Implementing Regulation (EU) 2018/2067.

In 2025, the regulated entity shall submit to the competent authority by 30 April an emissions report that covers the annual emissions in 2024. The competent authorities shall ensure that the information provided in that report is in accordance with the requirements of this Regulation.

However, competent authorities may require regulated entities to submit the annual emission reports referred to in this paragraph before 30 April, provided the report is submitted at the earliest 1 month after the deadline set out in Article 68(1).

2. The annual emissions reports referred to in paragraph 1 shall contain at least the information listed in Annex X.

Article 75q

Reporting on improvements to the monitoring methodology

1. Each regulated entity shall regularly check whether the monitoring methodology applied can be improved.

Regulated entities shall submit to the competent authority for approval a report containing the information referred to in paragraph 2 or 3, where appropriate, by the following deadlines:

(a) for a category A entity, by 31 July every 5 years;

(b) for a category B entity, by 31 July every 3 years;

(c) for any regulated entity that is using the default scope factor as referred to in Article 75l(3) and (4), by 31 July 2026.

However, the competent authority may set an alternative date for submission of the report, but no later date than 30 September of the same year and may approve, together with the monitoring plan or the improvement report, an extension of the deadline applicable pursuant to the second subparagraph, if the regulated entity provides evidence to the satisfaction of the competent authority upon submission of a monitoring plan in accordance with Article 75b or upon notification of updates in accordance with that Article, or upon submission of an improvement report in accordance with this Article, that the reasons for unreasonable costs or for improvement measures being technically not feasible will remain valid for a longer period of time. The extension shall take into account the number of years for which the regulated entity provides evidence. The total time period between improvement reports shall not exceed 4 years for a category B regulated entity or 5 years for a category A regulated entity.

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2. Where the regulated entity does not apply to major fuel streams at least the tiers required pursuant to the first subparagraph of Article 75h (1) and pursuant to Article 75i(1), the regulated entity shall provide a justification as to why it is technically not feasible or would incur unreasonable costs to apply the required tiers.

However, where evidence is found that measures needed for reaching those tiers have become technically feasible and do not any more incur unreasonable costs, the regulated entity shall notify the competent authority of appropriate modifications of the monitoring plan in accordance with Article 75b, and submit proposals for implementing the related measures and its timing.

3. Where the regulated entity applies a default scope factor as referred to in Article 75l(3) and (4), the regulated entity shall providea justification as to why it is technically not feasible or would incur unreasonable costs to apply any other method referred to in Article 75l(2) for one or more major or de minimis fuel streams.

However, where evidence is found that for those fuel streams it has become technically feasible and does not any more incur unreasonable costs to apply any other method referred to in Article 75l(2), the regulated entity shall notify the competent authority of appropriate modifications of the monitoring plan in accordance with Article 75b and submit proposals for implementing the related measures and its timing.

4. Where the verification report established in accordance with Implementing Regulation (EU) 2018/2067 states outstanding non-conformities or recommendations for improvements, in accordance with Articles 27, 29 and 30 of that Implementing Regulation, the regulated entity shall submit to the competent authority for approval a report by 31 July of the year in which that verification report is issued by the verifier. That report shall describe how and when the regulated entity has rectified or plans to rectify the non- conformities identified by the verifier and to implement recommended improvements.

The competent authority may set an alternative date for submission of the report as referred to in this paragraph, but no later date than 30 September of the same year. Where applicable, such report may be combined with the report referred to in paragraph 1 of this Article.

Where recommended improvements would not lead to an improvement of the monitoring methodology, the regulated entity shall provide a justification of why that is the case. Where the recommended improvements would incur unreasonable costs, the regulated entity shall provide evidence of the unreasonable nature of the costs.

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5. Paragraph 4 of this Article shall not apply where the regulated entity has already resolved all non-conformities and recommendations for improvement and has submitted related modifications of the monitoring plan to the competent authority for approval in accordance with Article 75b of this Regulation before the date set pursuant to paragraph 4 of this Article.

Article 75r

Determination of emissions by the competent authority

1. The competent authority shall make a conservative estimate of the emissions of a regulated entity, taking into account cost pass-on implications for consumers, in any of the following situations:

(a) no verified annual emission report has been submitted by the regulated entity by the deadline required pursuant to Article 75p;

(b) the verified annual emissions report referred to in Article 75p is not in compliance with this Regulation;

(c) the annual emissions report of a regulated entity has not been verified in accordance with Implementing Regulation (EU) 2018/2067.

2. Where a verifier has stated, in the verification report pursuant to Implementing Regulation (EU) 2018/2067, the existence of non-material misstatements which have not been corrected by the regulated entity before issuing the verification report, the competent authority shall assess those misstatements and, where appropriate, make a conservative estimate of the emissions of the regulated entity, taking into account cost pass-on implications for consumers. The competent authority shall inform the regulated entity whether and which corrections are required to the annual emissions report. The regulated entity shall make that information available to the verifier.

3. Member States shall establish an efficient exchange of information between competent authorities responsible for approval of monitoring plans and competent authorities responsible for acceptance of annual emissions reports.

Article 75s

Access to information and rounding of data

Article 71 and Article 72(1) and (2) shall apply. In this regard, any reference to operators or aircraft operators shall be read as a reference to the regulated entities.

Article 75t

Ensuring consistency with other reporting

For the purposes of reporting emissions of activities listed in Annex III to Directive 2003/87/EC:

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(a) the sectors in which the fuels as defined in Article 3, point (af), of Directive 2003/87/EC are released for consumption and are combusted shall be labelled using the CRF codes;

(b) the fuels as defined in Article 3, point (af), of Directive 2003/87/EC shall be labelled using the CN-codes in accordance with national legislation transposing Directives 2003/96/EC and 2009/30/EC, where relevant;

(c) to ensure consistency with reporting for tax purposes pursuant to national legislation transposing Directives 2003/96/EC and (EU) 2020/262, the regulated entity shall use, where relevant, the economic operator registration and identification number pursuant to Regulation (EU) No 952/2013 ([1]), the excise number pursuant to Regulation (EU) No 389/2012 ([2]) or the national excise registration and identification number issued by the relevant authority pursuant to national legislation transposing Directive 2003/96/EC, when reporting their contact details in the monitoring plan and emission report.

Article 75u

Information technology requirements

The provisions of Chapter VII shall apply. In this regard, any reference to operator and aircraft operator shall be read as if it were a reference to the regulated entity.

CHAPTER VIIb

HORIZONTAL PROVISIONS RELATED TO THE MONITORING OF EMISSIONS FROM REGULATED ENTITIES

Article 75v

Avoiding double counting through monitoring and reporting

1. Member States shall facilitate the efficient exchanges of information which enable the regulated entities to determine the end use of the fuel released for consumption.

2. Each operator shall, together with their verified emission report in accordance with Article 68(1), submit information in accordance with Annex Xa. Member States may require that operators make the relevant information listed in Annex Xa available to the regulated entity concerned earlier than 31 March of the reporting year.

3. Each regulated entity shall, together with their verified emission report in accordance with Article 75p(1), submit information on the consumers of the fuels it released for consumption as listed in Annex Xb.

4. Each regulated entity which releases fuel for combustion, in sectors covered by Chapter III of Directive 2003/87/EC, shall determine their emissions in the report referred to in Article 75p(1) of

([1]) Regulation (EU) No 952/2013 of the European Parliament and of the Council of 9 October 2013 laying down the Union Customs Code (OJ L 269, 10.10.2013, p. 1).

([2]) Regulation (EU) No 389/2012 of 2 May 2012 on administrative cooperation in the field of excise duties and repealing Regulation (EC) No 2073/2004 (OJ L 121, 8.5.2012, p. 1).

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this Regulation by using the information from operator's reports submitted in accordance with Annex Xa to this Regulation and by deducting the relevant amounts of fuels referred to in those reports. The amounts of fuels acquired but not used in the same year may only be deducted if the operator's verified emission report of the year following the reporting year confirms they have been used for activities referred to in Annex I to Directive 2003/87/EC. Otherwise, the difference shall be reflected in the verified emission reports of the regulated entity of that year.

5. Where the amounts of fuels used are deducted in the year following the reporting year, the deduction shall be established in the form of absolute emissions reductions, derived from multiplying the amount of fuels used by the operator by the corresponding emission factor in the monitoring plan of the regulated entity.

6. Where the regulated entity cannot establish that the fuels released for consumption are used for combustion in sectors subject to Chapter III of Directive 2003/87/EC, paragraphs 4 and 5 shall not apply.

7. Member States may require that the provisions of this Article which concern operators are also applied by aircraft operators.

Article 75w

Prevention of fraud and obligation to cooperate

1. In order to ensure the accurate monitoring and reporting of emissions covered by Chapter IVa of Directive 2003/87/EC, Member States shall establish measures against fraud and determine the penalties to be imposed in the event of fraud which are commensurate with their purpose and which have an adequate deterrent effect.

2. In addition to obligations established pursuant to Article 10, the competent authorities designated pursuant to Article 18 of Directive 2003/87/EC, shall cooperate and exchange information with competent authorities charged with supervision pursuant to national legislation transposing Directives 2003/96/EC and (EU) 2020/262, where relevant, for the purposes of this Regulation, including to detect infringements and impose penalties referred to in paragraph 1 or other corrective measures in accordance with Article 16 of Directive 2003/87/EC.

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CHAPTER VIII

FINAL PROVISIONS

Article 76

Amendments to Regulation (EU) No 601/2012

Regulation (EU) No 601/2012 is amended as follows:

(1) In Article 12(1), third subparagraph, point (a) is replaced by the following:

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‘(a) for installations, evidence for each major and minor source stream demonstrating compliance with the uncertainty thresholds for activity data and calculation factors, where applicable, for the applied tiers as defined in Annexes II and IV, as well as for each emission source demonstrating compliance with the uncertainty thresholds for the applied tiers as defined in Annex VIII, where applicable;’

(2) In Article 15, paragraph 4, subparagraph (a) is replaced by the following:

‘(a) with regard to the emission monitoring plan:

(i) a change of emission factor values laid down in the monitoring plan;

(ii) a change between calculation methods as laid down in Annex III, or a change from the use of a calculation method to the use of estimation methodology in accordance with Article 55(2) or *vice versa*;

(iii) the introduction of new source streams;

(iv) changes in the status of the aircraft operator as a small emitter within the meaning of Article 55(1) or with regard to one of the thresholds provided by Article 28a(6) of Directive 2003/87/EC;’

(3) Article 49 is replaced by the following:

‘Article 49

Transferred CO_2

1. The operator shall subtract from the emissions of the installation any amount of CO_2 originating from fossil carbon in activities covered by Annex I to Directive 2003/87/EC that is not emitted from the installation, but:

(a) transferred out of the installation to any of the following:

(i) a capture installation for the purpose of transport and long-term geological storage in a storage site permitted under Directive 2009/31/EC;

(ii) a transport network with the purpose of long-term geological storage in a storage site permitted under Directive 2009/31/EC;

(iii) a storage site permitted under Directive 2009/31/EC for the purpose of long-term geological storage;

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(b) transferred out of the installation and used to produce precipitated calcium carbonate, in which the used CO_2 is chemically bound.

2. In its annual emissions report, the operator of the transferring installation shall provide the receiving installation's installation identification code recognised in accordance with the acts adopted pursuant to Article 19(3) of Directive 2003/87/EC, if the receiving installation is covered by that Directive. In all other cases, the operator of the transferring installation shall provide the name, address and contact information of a contact person for the receiving installation.

The first subparagraph shall also apply to the receiving installation with respect to the transferring installation's installation identification code.

3. For the determination of the quantity of CO_2 transferred from one installation to another, the operator shall apply a measurement-based methodology, including in accordance with Articles 43, 44 and 45. The emission source shall correspond to the measurement point and the emissions shall be expressed as the quantity of CO_2 transferred.

For the purpose of point (b) of paragraph 1, the operator shall apply a calculation-based methodology.

4. For determining the quantity of CO_2 transferred from one installation to another, the operator shall apply the highest tier as defined in section 1 of Annex VIII.

However, the operator may apply the next lower tier provided that it establishes that applying the highest tier as defined in section 1 of Annex VIII is technically not feasible or incurs unreasonable costs.

For determining the quantity of CO_2 chemically bound in precipitated calcium carbonate, the operator shall use data sources representing highest achievable accuracy.

5. The operators may determine quantities of CO_2 transferred out of the installation both at the transferring and at the receiving installation. In such cases, Article 48(3) shall apply.'

(4) Article 52 is amended as follows:

(a) paragraph 5 is deleted;

(b) paragraph 6 is replaced by the following:

'6. Where the amount of fuel uplift or the amount of fuel remaining in the tanks is determined in units of volume, expressed in litres, the aircraft operator shall convert that amount from volume to mass by using density values. The aircraft operator shall use the fuel density (which may be an actual or a standard value of 0,8 kg per litre) that is used for operational and safety reasons.

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The procedure for informing the use of actual or standard density shall be described in the monitoring plan along with a reference to the relevant aircraft operator documentation.'

(c) paragraph 7 is replaced by the following:

'7. For the purposes of the calculation referred to in paragraph 1, the aircraft operator shall use the default emission factors set out in Table 2 in Annex III. For fuels not listed in that table, the aircraft operator shall determine the emission factor in accordance with Article 32. For such fuels, the net calorific value shall be determined and reported as a memo-item.'

(5) In Article 54, paragraph 2, subparagraph 1 is replaced by the following:

'2. By way of derogation from Article 52, small emitters may estimate the fuel consumption using tools implemented by Eurocontrol or another relevant organisation, which can process all relevant air traffic information and avoid any underestimations of emissions.'

(6) Article 55 is amended as follows:

(a) paragraph 1 is replaced by the following:

'1. The aircraft operator shall consider sources of uncertainty and their associated levels of uncertainty when selecting the monitoring methodology pursuant to Article 52(2).'

(b) paragraphs 2, 3 and 4 are deleted

(7) In Article 59, paragraph 1 is replaced by the following:

'For the purposes of point (a) of Article 58(3), the operator shall 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.

Where components of the measuring systems cannot be calibrated, the operator shall identify those in the monitoring plan and propose alternative control activities.

When the equipment is found not to comply with required performance, the operator shall promptly take necessary corrective action.'

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(8) In Article 65(2), a third subparagraph is added:

‘Where the number of flights with data gaps referred to in the first two sub-paragraphs exceed 5 % of the annual flights that are reported, the operator shall inform the competent authority thereof without undue delay and shall take remedial action for improving the monitoring methodology.’

(9) In Annex I, section 2 is amended as follows:

(a) point (2)(b)(ii) is replaced by the following:

‘(ii) procedures for the measurement of fuel uplifts and fuel in tanks, a description of the measuring instruments involved and the procedures for recording, retrieving, transmitting and storing information regarding measurements, as applicable;’

(b) point (2)(b)(iii) is replaced by the following:

‘(iii) the method for the determination of density, where applicable;’

(c) point (2)(b)(iv) is replaced by the following:

‘(iv) justification of the chosen monitoring methodology, in order to ensure lowest levels of uncertainty, according to Article 55 (1);’

(d) point (2)(d) is deleted

(e) point (2)(f) is replaced by the following:

‘(f) a description of the procedures and systems for identifying, assessing and handling data gaps pursuant to Article 65(2).’

(10) In Annex III, section 2 is deleted.

(11) Annex IV is amended as follows:

(a) in section 10, subsection B, the fourth paragraph is deleted;

(b) in section 14, subsection B, the third paragraph is deleted.

(12) Annex IX is amended as follows:

(a) section 1, point (2) is replaced by the following:

‘Documents justifying the selection of the monitoring methodology and the documents justifying temporal or non-temporal changes of monitoring methodologies and, where applicable, tiers approved by the competent authority;’

(b) section 3, point (5) is replaced by the following:

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‘(5) Documentation on the methodology for data gaps where applicable, the number of flights where data gaps occurred, the data used for closing the data gaps, where they occurred, and, where the number of flights with data gaps exceeded 5 % of flights that were reported, reasons for the data gaps as well as documentation of remedial actions taken.’

(13) In Annex X, section 2 is amended as follows:

(a) point (7) is replaced by the following:

‘(7) The total number of flights per State pair covered by the report;’

(b) the following point is added below point (7):

‘(7a) Mass of fuel (in tonnes) per fuel type per State pair;’

(c) point (10)(a) is replaced by the following:

‘(a) the number of flights expressed as percentage of annual flights for which data gaps occurred; and the circumstances and reasons for data gaps that apply;’

(d) point (11)(a) is replaced by the following:

‘(a) the number of flights expressed as percentage of annual flights (rounded to the nearest 0,1 %) for which data gaps occurred; and the circumstances and reasons for data gaps that apply;’

Article 77

Repeal of Regulation (EU) No 601/2012

1. Regulation (EU) No 601/2012 is repealed with effect from 1 January 2021.

References to the repealed Regulation shall be construed as references to this Regulation and read in accordance with the correlation table in Annex XI.

2. The provisions of Regulation (EU) No 601/2012 shall continue to apply to the monitoring, reporting and verification of emissions and, where applicable, activity data, occurring prior to 1 January 2021.

Article 78

Entry into force and application

This Regulation shall enter into force on the day following that of its publication in the *Official Journal of the European Union*.

It shall apply from 1 January 2021.

However, Article 76 shall apply from 1 January 2019 or the date of entry into force of this Regulation, whichever is the later.

This Regulation shall be binding in its entirety and directly applicable in all Member States.

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ANNEX I

Minimum content of the monitoring plan (Article 12(1))

1. MINIMUM CONTENT OF THE MONITORING PAN FOR INSTALLATIONS

The monitoring plan for an installation shall contain at least the following information:

(1) general information on the installation:

(a) a description of the installation and activities carried out by the installation to be monitored, containing a list of emissions sources and source streams to be monitored for each activity carried out within the installation and meeting the following criteria:

(i) the description must be sufficient for demonstrating that neither data gaps nor double counting of emissions occur;

(ii) a simple diagram of the emission sources, source streams, sampling points and metering equipment must be added where requested by the competent authority or where such diagram simplifies describing the installation or referencing emission sources, source streams, measuring instruments and any other parts of the installation relevant for the monitoring methodology including data flow activities and control activities;

(b) a description of the procedure for managing the assignment of responsibilities for monitoring and reporting within the installation, and for managing the competences of responsible personnel;

(c) a description of the procedure for regular evaluation of the monitoring plan's appropriateness, covering at least the following:

(i) checking the list of emissions sources and source streams, ensuring completeness of the emission sources and source streams and that all relevant changes in the nature and functioning of the installation will be included in the monitoring plan;

(ii) assessing compliance with the uncertainty thresholds for activity data and other parameters, where applicable, for the applied tiers for each source stream and emission source;

(iii) assessing potential measures for improvement of the monitoring methodology applied;

(d) a description of the written procedures of the data flow activities pursuant to Article 58, including a diagram where appropriate for clarification;

(e) a description of the written procedures for the control activities established pursuant to Article 59;

(f) where applicable, information on relevant links with activities undertaken in the framework of the Community eco-management and audit scheme (EMAS) established pursuant to Regulation (EC) No 1221/2009 of the European Parliament and of the Council ([1]), systems covered by harmonised standard ►M4 ISO 14001:2015 ◄ and other environmental management systems including information on procedures and controls with relevance to greenhouse gas emissions monitoring and reporting;

([1]) OJ L 342, 22.12.2009, p. 1.

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(g) the version number of the monitoring plan and the date from which that version of the monitoring plan is applicable;

(h) the category of the installation;

(2) a detailed description of the calculation-based methodologies where applied, consisting of the following:

(a) a detailed description of the calculation-based methodology applied, including a list of input data and calculation formulae used, a list of the tiers applied for activity data and all relevant calculation factors for each of the source streams to be monitored;

(b) where applicable and where the operator intends to make use of simplification for minor and de-minimis source streams, a categorisation of the source streams into major, minor and de-minimis source streams;

(c) a description of the measurement systems used, and their measurement range, specified uncertainty and exact location of the measuring instruments to be used for each of the source streams to be monitored;

(d) where applicable, the default values used for calculation factors indicating the source of the factor, or the relevant source, from which the default factor will be retrieved periodically, for each of the source streams;

(e) where applicable, a list of the analysis methods to be used for the determination of all relevant calculation factors for each of the source streams, and a description of the written procedures for those analyses;

(f) where applicable, a description of the procedure underpinning the sampling plan for the sampling of fuel and materials to be analysed, and the procedure used to revise the appropriateness of the sampling plan;

(g) where applicable, a list of laboratories engaged in carrying out relevant analytical procedures and, where the laboratory is not accredited as referred to in Article 34(1) a description of the procedure used for demonstrating the compliance with equivalent requirements in accordance with Article 34(2) and (3);

(3) where a fall-back monitoring methodology is applied in accordance with Article 22, a detailed description of the monitoring methodology applied for all source streams or emission sources, for which no tier methodology is used, and a description of the written procedure used for the associated uncertainty analysis to be carried out;

(4) a detailed description of the measurement-based methodologies, where applied, including the following:

(a) a description of the measurement method including descriptions of all written procedures relevant for the measurement and the following:

(i) any calculation formulae used for data aggregation and used to determine the annual emissions of each emission source;

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(ii) the method for determining whether valid hours or shorter reference periods for each parameter can be calculated, and for substitution of missing data in accordance with Article 45;

(b) a list of all relevant emission points during typical operation, and during restrictive and transition phases, including breakdown periods or commissioning phases, supplemented by a process diagram where requested by the competent authority;

(c) where flue gas flow is derived by calculation, a description of the written procedure for that calculation for each emission source monitored using a measurement-based methodology;

(d) a list of all relevant equipment, indicating its measurement frequency, operating range and uncertainty;

(e) a list of applied standards and of any deviations from those standards;

(f) a description of the written procedure for carrying out the corroborating calculations in accordance with Article 46, where applicable;

(g) a description of the method, how CO_2 stemming from ►**M5** zero-rated fuels ◄ is to be determined and subtracted from the measured CO_2 emissions, and of the written procedure used for that purpose, where applicable;

(h) where applicable and where the operator intends to make use of simplification for minor emission sources, a categorisation of the emission sources into major and minor emission sources;

(5) in addition to elements listed in point 4, a detailed description of the monitoring methodology where N_2O emissions are monitored, where appropriate in the form of description of the written procedures applied, including a description of the following:

(a) the method and parameters used to determine the quantity of materials used in the production process and the maximum quantity of material used at full capacity;

(b) the method and parameters used to determine the quantity of product produced as an hourly output, expressed as nitric acid (100 %), adipic acid (100 %), caprolactam, glyoxal and glyoxylic acid per hour respectively;

(c) the method and parameters used to determine the N_2O concentration in the flue gas from each emission source, its operating range, and its uncertainty, and details of any alternative methods to be applied where concentrations fall outside the operating range and the situations when this may occur;

(d) the calculation method used to determine N_2O emissions from periodic, unabated sources in nitric acid, adipic acid, caprolactam, glyoxal and glyoxylic acid production;

(e) the way in which or the extent to which the installation operates with variable loads, and the manner in which the operational management is carried out;

(f) the method and any calculation formulae used to determine the annual N_2O emissions and the corresponding $CO_{2(e)}$ values of each emission source;

(g) information on process conditions that deviate from normal operations, an indication of the potential frequency and the duration of such conditions, as well as an indication of the volume of the N_2O emissions during the deviating process conditions such as abatement equipment malfunction;

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(6) a detailed description of the monitoring methodology as far as perfluorocarbons from primary aluminium production are monitored, where appropriate in the form of a description of the written procedures applied, including the following:

(a) where applicable, the dates of measurement for the determination of the installation-specific emission factors SEF_{CF4} or OVC, and F_{C2F6}, and a schedule for future repetitions of that determination;

(b) where applicable, the protocol describing the procedure used to determine the installation-specific emission factors for CF_4 and C_2F_6, showing also that the measurements have been and will be carried out for a sufficiently long time for measured values to converge, but at least for 72 hours;

(c) where applicable, the methodology for determining the collection efficiency for fugitive emissions at installations for primary aluminium production;

(d) a description of cell type and type of anode;

(7) a detailed description of the monitoring methodology where transfer of inherent CO_2 as part of a source stream in accordance with Article 48, transfer of CO_2 in accordance with Article 49, or transfer of N_2O in accordance with Article 50 are carried out, where appropriate in the form of a description of the written procedures applied, including the following:

(a) where applicable, the location of equipment for temperature and pressure measurement in a ►M5 CO_2 transport infrastructure ◄;

(b) where applicable, procedures for preventing, detecting and quantification of leakage events from ►M5 CO_2 transport infrastructure ◄;

(c) in the case of ►M5 CO_2 transport infrastructure ◄, procedures effectively ensuring that CO_2 is transferred only to installations which have a valid greenhouse gas emission permit, or where any emitted CO_2 is effectively monitored and accounted for in accordance with Article 49;

(d) identification of the receiving and transferring installations according to the installation identification code recognised in accordance with ►M4 Regulation (EU) 2019/1122 ([1]) ◄;

(e) where applicable, a description of continuous measurement systems used at the points of transfer of CO_2 or N_2O between installations transferring CO_2 or N_2O or the determination method in accordance with Articles 48, 49 or 50;

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(f) where applicable, a description of the conservative estimation method used for determining the zero-rated fraction and zero-rated RFNBO or RCF fraction of inherent or transferred CO_2 in accordance with Articles 48, 49 or 49a;

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(g) where applicable, quantification methodologies for emissions or CO_2 released to the water column from potential leakages as well as the applied and possibly adapted quantification methodologies for actual emissions or CO_2 released to the water column from leakages, as specified in section 23 of Annex IV;

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(8) a detailed description of the monitoring methodology where CO_2 is chemically bound in accordance with Article 49a, where appropriate in the form of a description of the written procedures applied, including the following:

([1]) Commission Delegated Regulation (EU) 2019/1122 of 12 March 2019 supplementing Directive 2003/87/EC of the European Parliament and of the Council as regards the functioning of the Union Registry (OJ L 177, 2.7.2019, p. 3).

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(a) the procedures for determining whether or not a product in which the CO2 is permanently chemically bound in accordance with Article 49a(1) of this Regulation, meets the requirements set out in the delegated Regulation pursuant to Article 12(3b) of Directive 2003/87/EC and the types of uses of those products;

(b) a description of the calculation methodology for determining the CO_2 amounts permanently chemically bound in accordance with Article 49a(2).

(9) where applicable, a description of the procedure used to assess if zero-rated source streams comply with Article 38(5) or 39a(3) or 39a(4);

(9a) where applicable, a description of the procedure used to determine zero-rated biogas quantities based on purchase records in accordance with Article 39(4), or zero-rated RFNBO or RCF quantities in accordance with Article 39a(5);

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(10) Where applicable, by 31 December 2026, a description of the procedure used to submit information as described in Article 75v(2).

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2. ►M4 MINIMUM CONTENT OF MONITORING PLANS FOR AVIATION ◄

1. The monitoring plan shall contain the following information for all aircraft operators:

(a) the identification of the aircraft operator, call sign or other unique designator used for air traffic control purposes, contact details of the aircraft operator and of a responsible person at the aircraft operator, contact address, the administering Member State, the administering competent authority;

(b) an initial list of aircraft types in its fleet operated at the time of the submission of the monitoring plan and the number of aircraft per type, and an indicative list of additional aircraft types expected to be used including, where available, an estimated number of aircraft per type as well as the source streams (fuel types) associated with each aircraft type;

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(c) a description of procedures, systems and responsibilities used to update the completeness of the list of emission sources over the monitoring year for the purpose of ensuring the completeness of monitoring and reporting of the emissions and non-CO_2 aviation effects of owned aircraft as well as leased-in aircraft;

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(d) a description of the procedures used to monitor the completeness of the list of flights operated under the unique designator by aerodrome pair, and the procedures used for determining whether flights are covered by Annex I to Directive 2003/87/EC for the purpose of ensuring completeness of flights and avoiding double counting;

(e) a description of the procedure for managing and assigning responsibilities for monitoring and reporting, and for managing the competences of responsible personnel;

(f) a description of the procedure for regular evaluation of the monitoring plan's appropriateness, including any potential measures for the improvement of the monitoring methodology and related procedures applied;

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(g) a description of the written procedures of the data flow activities as required by Article 58, including a diagram, where appropriate, for clarification;

(h) a description of the written procedures for the control activities established under Article 59;

(i) where applicable, information on relevant links with activities undertaken in the framework of EMAS, systems covered by harmonised standard ►M4 ISO 14001:2015 ◄ and other environmental management systems, including information on procedures and controls with relevance to greenhouse gas emissions monitoring and reporting;

(j) the version number of the monitoring plan and the date from which that version of the monitoring plan is applicable;

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(k) confirmation if the aircraft operator intends to use any of the tools referred to in Article 55(2) of this Regulation and whether the aircraft operator intends to use the simplification pursuant to Article 28a(4) of Directive 2003/87/EC;

(l) where applicable, a description of the procedure used to assess if zero-rated biofuel, RFNBO, RCF, or synthetic low-carbon fuel comply with Article 54c of this Regulation;

(m) where applicable, a description of the procedure used to determine quantities of alternative aviation fuels in accordance with Article 53 (1) and to ensure the reported neat fuels comply with the conditions set out in Article 53a of this Regulation;

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(n) where applicable, a description of the procedure used to assess if eligible aviation fuel complies with Article 54a(2);

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(o) where applicable a description of the procedure used to determine eligible aviation fuel quantities in accordance with Article 54a(3) and to ensure the reported fuels comply with the conditions set out in Article 54a(4) and 54a(5) of this Regulation.

(p) a confirmation on whether the aircraft operator operates any flights under Article 56a(1);

(q) a confirmation on whether the aircraft operator intends to use only NEATS to determine the non-CO_2 aviation effects, or if it intends to use, for all or part of the monitored data, own or third party IT tools as described in Article 56a(7).

2. For the purpose of monitoring emissions, the monitoring plan shall contain the following information for aircraft operators which are not small emitters in accordance with Article 55(1) or which do not intend to use a small emitter tool in accordance with Article 55(2):

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(a) a description of the written procedure to be used for defining the monitoring methodology for additional aircraft types which an aircraft operator expects to use;

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(b) a description of the written procedures for monitoring fuel consumption in every aircraft, including:

(i) the chosen methodology (Method A or Method B) for calculating the fuel consumption; and where the same method is not applied for all aircraft types, a justification for that methodology, as well as a list specifying which method is used under which conditions;

(ii) procedures for the measurement of fuel uplifts and fuel in tanks, a description of the measuring instruments involved and the procedures for recording, retrieving, transmitting and storing information regarding measurements, as applicable;

(iii) the method for the determination of density, where applicable;

(iv) justification of the chosen monitoring methodology, in order to ensure lowest levels of uncertainty, according to Article 56 (1);

(c) a list of deviations for specific aerodromes from the general monitoring methodology as described in point (b) where it is not possible for the aircraft operator due to special circumstances to provide all the required data for the required monitoring methodology;

(d) emission factors used for each fuel type, or in the case of alternative fuels, the methodologies for determining the emission factors, including the methodology for sampling, methods of analysis, a description of the laboratories used and of their accreditation and/or of their quality assurance procedures;

(e) a description of the procedures and systems for identifying, assessing and handling data gaps pursuant to Article 66(2).

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3. For the purpose of monitoring non-CO_2 aviation effects, the monitoring plan shall contain, as relevant, the following information for aircraft operators not using only NEATS to determine the non-CO_2 aviation effects:

(a) description of the fuel burn and emission estimation module, the CO_2 (e) calculation model and associated IT tools that the aircraft operators intends to use;

(b) a description and a flowchart of the monitoring process of data relative to the CO_2(e) calculation model as described in Annex IIIa, Section 4 to this Regulation;

(c) a description of the written procedure for ensuring that appropriate data is used to input into the CO_2(e) calculation models in accordance with Annex IIIa to this Regulation and that climate effects of all non-CO_2 agents on a per flight basis are taken into account;

(d) a description of the written procedure for identifying and assessing data gaps and applying the default values described in Annex IIIa, Section 5 and Annex IIIb to this Regulation, to complete the data gaps.

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4. MINIMUM CONTENT OF THE MONITORING PLANS FOR REGULATED ENTITIES

The monitoring plan for regulated entities shall contain at least the following information:

(1) general information on the regulated entity:

(a) the identification of the regulated entity, contact details including address, and where relevant the economic operator registration and identification number pursuant to Regulation (EU) No 952/2013, the excise number pursuant to Regulation (EU) No 389/2012 or the national excise registration and identification number issued by the relevant authority pursuant to national legislation transposing Directive 2003/96/EC, used for reporting for tax purposes pursuant to national legislation transposing Directives 2003/96/EC and (EU) 2020/262;

(b) a description of the regulated entity, containing a list of fuel streams to be monitored, the means through which the fuel streams are released for consumption, the end use(s) of the fuel stream released for consumption including the CRF code, at the level of aggregation available, and meeting the following criteria:

(i) the description is to be sufficient for demonstrating that neither data gaps nor double counting of emissions occur;

(ii) a simple diagram of the information referred to in point (b), first subparagraph, describing the regulated entity, the fuel streams, the means through which the fuels as defined in Article 3(af) of Directive 2003/87/EC are released for consumption, measuring instruments and any other parts of the regulated entity relevant for the monitoring methodology including data flow activities and control activities;

(iii) where the regulated entities and the fuel streams covered correspond to entities with reporting obligations under and fuels subject to national legislation transposing Directive 2003/96/EC or 2009/30/EC, a simple diagram of the measurement methods used for the purposes of those acts;

(iv) where applicable, a description of any deviations from the start and end of the monitoring year in accordance with Article 75j (2);

(c) a description of the procedure for managing the assignment of responsibilities for monitoring and reporting within the regulated entity, and for managing the competences of responsible personnel;

(d) a description of the procedure for regular evaluation of the monitoring plan's appropriateness, covering at least the following:

(i) checking the list of fuel streams, ensuring completeness and that all relevant changes in the nature and functioning of the regulated entity will be included in the monitoring plan;

(ii) assessing compliance with the uncertainty thresholds for released fuel amounts and other parameters, where applicable, for the applied tiers for each fuel stream;

(iii) assessing potential measures for improvement of the monitoring methodology applied, in particular the method for determining the scope factor;

(e) a description of the written procedures of the data flow activities pursuant to Article 58, including a diagram where appropriate for clarification;

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(f) a description of the written procedures for the control activities established pursuant to Article 59;

(g) where applicable, information on relevant links between the regulated entity's activity listed in Annex III to Directive 2003/87/EC and reporting for tax purposes pursuant reporting to national legislation transposing Directives 2003/96/EC and (EU) 2020/262;

(h) the version number of the monitoring plan and the date from which that version of the monitoring plan is applicable;

(i) the category of the regulated entity;

(2) a detailed description of the calculation-based methodologies, consisting of the following:

(a) for each fuel stream to be monitored, a detailed description of the calculation-based methodology applied, including a list of input data and calculation formulae used, the methods to determine the scope factor, a list of the tiers applied for released fuel amounts, all relevant calculation factors, the scope factor and, at the level of aggregation known, the CRF-codes of the end use(s) of fuel stream released for consumption;

(b) where the regulated entity intends to make use of simplification for de-minimis fuel streams, a categorisation of the fuel streams into major and de-minimis fuel streams;

(c) a description of the measurement systems used, and their measurement range, uncertainty and location of the measuring instruments to be used for each of the fuel streams to be monitored;

(d) where applicable, the default values used for calculation factors indicating the source of the factor, or the relevant source, from which the default factor will be retrieved periodically, for each of the fuel streams;

(e) where applicable, a list of the analysis methods to be used for the determination of all relevant calculation factors for each of the fuel streams, and a description of the written procedures for those analyses;

(f) where applicable, a description of the procedure explaining the sampling plan for the sampling of fuels to be analysed, and the procedure used to revise the appropriateness of the sampling plan;

(g) where applicable, a list of laboratories engaged in carrying out relevant analytical procedures and, where the laboratory is not accredited as referred to in Article 34(1) a description of the procedure used for demonstrating the compliance with equivalent requirements in accordance with Article 34(2) and (3);

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(3) Where applicable, a description of the procedure used to assess if zero-rated fuel streams comply with Article 38(5), or 39a(3), or 39a(4) and, where relevant, Article 75m(2) of this Regulation;

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(4) where applicable, a description of the procedure used to determine biogas quantities based on purchase records in accordance with Article 39(4);

(5) where applicable, a description of the procedure used to submit information as described in Article 75v(3) and receive information pursuant to Article 75v(2).

▼B

ANNEX II

Tier definitions for calculation-based methodologies related to installations (Article 12(1))

1. DEFINITION OF TIERS FOR ACTIVITY DATA

The uncertainty thresholds in Table 1 shall apply to tiers relevant to activity data requirements in accordance with point (a) of Article 28(1) and the first subparagraph of Article 29(2), and Annex IV, of this Regulation. The uncertainty thresholds shall be interpreted as maximum permissible uncertainties for the determination of source streams over a reporting period.

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Where Table 1 does not include activities listed in Annex I to Directive 2003/87/EC and the mass balance set out in Article 25 of this Regulation is not applied, the operator shall use the tiers listed in Table 1 under 'Combustion of fuels and fuels used as process input' for those activities.

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Table 1

Tiers for activity data (maximum permissible uncertainty for each tier)

Activity/source stream type	Parameter to which the uncertainty is applied	Tier 1	Tier 2	Tier 3	Tier 4
Combustion of fuels and fuels used as process input					
Commercial standard fuels	Amount of fuel [t] or [Nm^3]	± 7,5 %	± 5 %	± 2,5 %	± 1,5 %
Other gaseous and liquid fuels	Amount of fuel [t] or [Nm^3]	± 7,5 %	± 5 %	± 2,5 %	± 1,5 %
▼M4 Solid fuels, excluding waste	Amount of fuel [t]	± 7,5 %	± 5 %	± 2,5 %	± 1,5 %
Waste	Amount of fuel [t]	± 7,5 %	± 5 %	± 2,5 %	± 1,5 %
▼B Flaring	Amount of flare gas [Nm^3]	± 17,5 %	± 12,5 %	± 7,5 %	
Scrubbing: carbonate (Method A)	Amount carbonate consumed [t]	± 7,5 %			
Scrubbing: gypsum (Method B)	Amount gypsum produced [t]	± 7,5 %			
Scrubbing: urea	Amount urea consumed	± 7,5 %			
▼M5 **Refining of oil**					
▼B Catalytic cracker regeneration (*)	Uncertainty requirements apply separately for each emission source	± 10 %	± 7,5 %	± 5 %	± 2,5 %

▼B

Activity/source stream type	Parameter to which the uncertainty is applied	Tier 1	Tier 2	Tier 3	Tier 4
Production of coke					
Mass balance methodology	Each input and output material [t]	± 7,5 %	± 5 %	± 2,5 %	± 1,5 %
Metal ore roasting and sintering					
Carbonate input and process residues	Carbonate input material and process residues [t]	± 5 %	± 2,5 %		
Mass balance methodology	Each input and output material [t]	± 7,5 %	± 5 %	± 2,5 %	± 1,5 %
Production of iron and steel					
Fuel as process input	Each mass flow into and from the installation [t]	± 7,5 %	± 5 %	± 2,5 %	± 1,5 %
Mass balance methodology	Each input and output material [t]	± 7,5 %	± 5 %	± 2,5 %	± 1,5 %
Production of cement clinker					
Kiln input based (Method A)	Each relevant kiln input [t]	± 7,5 %	± 5 %	± 2,5 %	
Clinker output (Method B)	Clinker produced [t]	± 5 %	± 2,5 %		
CKD	CKD or bypass dust [t]	n.a. (**)	± 7,5 %		
Non-carbonate carbon	Each raw material [t]	± 15 %	± 7,5 %		
Production of lime and calcination of dolomite and magnesite					
Carbonates and other process materials (Method A)	Each relevant kiln input [t]	± 7,5 %	± 5 %	± 2,5 %	
Alkali earth oxide (Method B)	Lime produced [t]	± 5 %	± 2,5 %		
Kiln dust (Method B)	Kiln dust [t]	n.a. (**)	± 7,5 %		

▼B

Activity/source stream type	Parameter to which the uncertainty is applied	Tier 1	Tier 2	Tier 3	Tier 4
Manufacture of glass and mineral wool					
Carbonates and other process materials (input)	Each carbonate raw material or additives associated with CO_2 emissions [t]	± 2,5 %	± 1,5 %		
Manufacture of ceramic products					
Carbon inputs (Method A)	Each carbonate raw material or additive associated with CO_2 emissions [t]	± 7,5 %	± 5 %	± 2,5 %	
Alkali oxide (Method B)	Gross production including rejected products and cullet from the kilns and shipment [t]	± 7,5 %	± 5 %	± 2,5 %	
Scrubbing	Dry $CaCO_3$ consumed [t]	± 7,5 %			
Production of pulp and paper					
Make up chemicals	Amount of $CaCO_3$ and Na_2CO_3 [t]	± 2,5 %	± 1,5 %		
Production of carbon black					
Mass balance methodology	Each input and output material [t]	± 7,5 %	± 5 %	± 2,5 %	± 1,5 %
Production of ammonia					
Fuel as process input	Amount fuel used as process input [t] or [Nm^3]	± 7,5 %	± 5 %	± 2,5 %	± 1,5 %
Production of hydrogen and synthesis gas					
Fuel as process input	Amount fuel used as process input for hydrogen production [t] or [Nm^3]	± 7,5 %	± 5 %	± 2,5 %	± 1,5 %
Mass balance methodology	Each input and output material [t]	± 7,5 %	± 5 %	± 2,5 %	± 1,5 %
Production of bulk organic chemicals					
Mass balance methodology	Each input and output material [t]	± 7,5 %	± 5 %	± 2,5 %	± 1,5 %

▼B

Activity/source stream type	Parameter to which the uncertainty is applied	Tier 1	Tier 2	Tier 3	Tier 4
Production or processing of ferrous and non-ferrous metals, including secondary aluminium					
Process emissions	Each input material or process residue used as input material in the process [t]	± 5 %	± 2,5 %		
Mass balance methodology	Each input and output material [t]	± 7,5 %	± 5 %	± 2,5 %	± 1,5 %

▼M5

Primary aluminium or alumina production

▼B

Mass balance methodology	Each input and output material [t]	± 7,5 %	± 5 %	± 2,5 %	± 1,5 %
PFC emissions (slope method)	primary aluminium production in [t], anode effect minutes in [number anode effects/cell day] and [anode effect minutes/ occurrence]	± 2,5 %	± 1,5 %		
PFC emissions (overvoltage method)	primary aluminium production in [t], anode effect overvoltage [mV] and current efficiency [-]	± 2,5 %	± 1,5 %		

▼M5

CO_2 capture, transfer and geological storage in storage site permitted under Directive 2009/31/EC

Mass balance of CO_2 transferred	CO_2 transferred into or out from an installation, transport infrastructure or storage site, vented, leaked or fugitive emissions [t]	± 7,5 %	± 5 %	± 2,5 %	± 1,5 %
CO_2 venting, leakage, and fugitive emissions	CO_2 vented, leaked or from fugitive emissions [t]	± 17,5 %	± 12,5 %	± 7,5 %	

▼B

(*) For monitoring emissions from catalytic cracker regeneration (other catalyst regeneration and flexi-cokers) in mineral oil refineries, the required uncertainty is related to the total uncertainty of all emissions from that source.

(**) Amount [t] of CKD or bypass dust (where relevant) leaving the kiln system over a reporting period estimated using industry best practice guidelines.

2. DEFINITION OF TIERS FOR CALCULATION FACTORS FOR COMBUSTION EMISSIONS

Operators shall monitor CO_2 emissions from all types of combustion processes taking place under all activities as listed in Annex I to Directive 2003/87/EC or included in the Union system under Article 24 of that Directive using the tier definitions laid down in this section. ►M1 Where fuels or combustible materials which give rise to CO_2 emissions are used as a process input, section 4 of this Annex shall apply. ◄ Where fuels form part of a mass balance in accordance with Article 25(1) of this Regulation, the tier definitions for mass balances in section 3 of this Annex apply.

For process emissions from related exhaust gas scrubbing tier definitions according to sections 4 and 5 of this Annex shall be used, as applicable.

2.1 **Tiers for emission factors**

▼M5

Where a biomass fraction, or RFNBO or RCF fraction or synthetic low-carbon fraction is determined for a mixed fuel or material, the tiers defined shall relate to the preliminary emission factor. For fossil fuels and materials, the tiers shall relate to the emission factor.

▼B

Tier 1: The operator shall apply one of the following:

(a) the standard factors listed in section 1 of Annex VI;

(b) other constant values in accordance with point (e) of Article 31(1), where no applicable value is contained in section 1 of Annex VI.

Tier 2a: The operator shall apply country specific emission factors for the respective fuel or material in accordance with points (b) and (c) of Article 31(1) or values in accordance with point (d) of Article 31(1).

Tier 2b: The operator shall derive emission factors for the fuel based on one of the following established proxies, in combination with an empirical correlation as determined at least once per year in accordance with Articles 32 to 35 and 39:

(a) density measurement of specific oils or gases, including those common to the refinery or steel industry;

(b) net calorific value for specific coal types.

The operator shall ensure that the correlation satisfies the requirements of good engineering practice and that it is applied only to values of the proxy which fall into the range for which it was established.

Tier 3: The operator shall apply one of the following:

(a) determination of the emission factor in accordance with the relevant provisions of Articles 32 to 35;

(b) the empirical correlation as specified for Tier 2b, where the operator demonstrates to the satisfaction of the competent authority that the uncertainty of the empirical correlation 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.

2.2 **Tiers for net calorific value (NCV)**

Tier 1: The operator shall apply one of the following:

(a) the standard factors listed in section 1 of Annex VI;

(b) other constant values in accordance with point (e) of Article 31(1), where no applicable value is contained in section 1 of Annex VI.

Tier 2a: The operator shall apply country specific factors for the respective fuel in accordance with point (b) or (c) of Article 31(1) or values in accordance with point (d) of Article 31(1).

Tier 2b: For commercially traded fuels the net calorific value as derived from the purchasing records for the respective fuel provided by the fuel supplier shall be used provided it has been derived based on accepted national or international standards.

Tier 3: The operator shall determine the net calorific value in accordance with Article 32 to 35.

2.3 **Tiers for oxidation factors**

Tier 1: The operator shall apply an oxidation factor of 1.

Tier 2: The operator shall apply oxidation factors for the respective fuel in accordance with point (b) or (c) of Article 31(1).

▼B

Tier 3: For fuels, the operator shall derive activity-specific factors based on the relevant carbon contents of ashes, effluents and other wastes and by-products, and other relevant incompletely oxidised gaseous forms of carbon emitted except CO. Composition data shall be determined in accordance with Article 32 to 35.

▼M5

2.4 **Tiers for biomass fraction**

Tier 1: The operator shall apply an applicable value published by the competent authority or the Commission, or values in accordance with Article 31(1).

Tier 2: The operator shall apply an estimation method approved in accordance with the second subparagraph of Article 39(2).

Tier 3a: The operator shall apply analyses in accordance with the first subparagraph of Article 39(2), and in accordance with Articles 32 to 35.

Tier 3b: For fuels originating from a production process with defined and traceable input streams, the operator may base the estimation on a material balance of fossil and biomass carbon entering and leaving the process, such as the mass balance system in accordance with Article 30(1) of Directive (EU) 2018/2001.

Where an operator assumes a fossil fraction of 100 % in accordance with Article 39(1) of this Regulation, no tier shall be assigned for the biomass fraction.

2.5 **Tiers for RFNBO or RCF fraction or synthetic low-carbon fraction**

Tier 1: The operator shall determine the RFNBO or RCF fraction or synthetic low-carbon fraction based on the mass balance system in accordance with Article 30(1) of Directive (EU) 2018/2001.

Where an operator assumes a fossil fraction of 100% in accordance with Article 39a(1) of this Regulation, no tier shall be assigned for the RFNBO or RCF fraction or synthetic low-carbon fraction.

▼B

3. DEFINITION OF TIERS FOR CALCULATION FACTORS FOR MASS BALANCES

Where an operator uses a mass balance in accordance with Article 25, it shall use the tier definitions of this section.

3.1 **Tiers for carbon content**

The operator shall apply one of the tiers listed in this point. For deriving the carbon content from an emission factor, the operator shall use the following equations:

(a) for emission factors expressed as t CO_2/TJ : $C = (EF \times NCV) / f$

(b) for emission factors expressed as t CO_2/t : $C = EF / f$

In those formulae, C is the carbon content expressed as fraction (tonne carbon per tonne product), EF is the emission factor, NCV is the net calorific value, and f is the factor laid down in Article 36(3).

▼M5

Where a biomass fraction or RFNBO or RCF fraction or synthetic low-carbon fraction is determined for a mixed fuel or material, the tiers defined shall relate to the total carbon content. The biomass fraction of the carbon shall be determined using the tiers defined in Section 2.4 of this Annex. The RFNBO or RCF fraction or synthetic low-carbon fraction of the carbon shall be determined using the tiers defined in Section 2.5 of this Annex.

▼B

Tier 1: The operator shall apply one of the following:

(a) the carbon content derived from standard factors listed in Annex VI sections 1 and 2;

(b) other constant values in accordance with point (e) of Article 31(1), where no applicable value is contained in Annex VI sections 1 and 2.

Tier 2a: The operator shall derive the carbon content from country specific emission factors for the respective fuel or material in accordance with point (b) or (c) of Article 31(1) or values in accordance with point (d) of Article 31(1).

▼M5

Tier 2b: The operator shall derive the carbon content from emission factors for the fuel based on one of the following established proxies in combination with an empirical correlation as determined at least once per year in accordance with Articles 32 to 35 of this Regulation:

▼B

(a) density measurement of specific oils or gases common, for example, to the refinery or steel industry;

(b) net calorific value for specific coals types.

The operator shall ensure that the correlation satisfies the requirements of good engineering practice and that it is applied only to values of the proxy which fall into the range for which it was established.

Tier 3: The operator shall apply one of the following:

(a) determination of the carbon content in accordance with the relevant provisions of Articles 32 to 35;

(b) the empirical correlation as specified for Tier 2b, where the operator demonstrates to the satisfaction of the competent authority that the uncertainty of the empirical correlation 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.

3.2 **Tiers for net calorific values**

The tiers defined in section 2.2 of this Annex shall be used.

3.3 **Tiers for biomass fraction**

The tiers defined in section 2.4 of this Annex shall be used.

▼M5

3.4 **Tiers for RFNBO or RCF fraction or synthetic low-carbon fraction**

The tiers defined in Section 2.5 of this Annex shall be used.

▼M1

4. DEFINITION OF TIERS FOR THE CALCULATION FACTORS FOR CO_2 PROCESS EMISSIONS

For all CO_2 process emissions, in particular for emissions from the decomposition of carbonates and from process materials containing carbon other than in form of carbonates, including urea, coke and graphite, where they are monitored using the standard methodology in accordance with Article 24(2), the tiers defined in this section for the applicable calculation factors shall be applied.

▼M1

In case of mixed materials which contain inorganic as well as organic forms of carbon, the operator may choose:

— to determine a total preliminary emission factor for the mixed material by analysing the total carbon content, and using a conversion factor and – if applicable – biomass fraction and net calorific value related to that total carbon content; or

— to determine the organic and inorganic contents separately and treat them as two separate source streams.

For emissions from the decomposition of carbonates, the operator may choose for each source stream one of the following methods:

(a) **Method A** (Input based): The emission factor, conversion factor and activity data are related to the amount of material input into the process.

(b) **Method B** (Output based): The emission factor, conversion factor and activity data are related to the amount of output from the process.

For other CO_2 process emissions, the operator shall apply only method A.

▼M5

By way of derogation from the provisions in this section and the following sub-sections, operators may rate process emissions from materials as zero, provided those materials meet all the following conditions:

(i) do not meet the definitions of RFNBOs or RCFs or synthetic low-carbon fuels;

(ii) were produced in another installation covered by Directive 2003/87/EC;

(iii) CO_2 was chemically bound to produce the materials;

(iv) the installation that emitted the CO_2 in point (iii), included this CO_2 in its annual emissions report;

(v) do not meet the specification of a product that is listed in the delegated Regulation adopted pursuant to Article 12(3b) of Directive 2003/87/EC.

▼M1

4.1. **Tiers for the emission factor using Method A**

Tier 1: The operator shall apply one of the following:

(a) the standard factors listed in Annex VI section 2 Table 2 in case of carbonate decomposition, or in Tables 1, 4 or 5 for other process materials;

(b) other constant values in accordance with point (e) of Article 31(1), where no applicable value is contained in Annex VI.

▼M1

Tier 2: The operator shall apply a country specific emission factor in accordance with point (b) or (c) of Article 31(1), or values in accordance with point (d) of Article 31(1).

Tier 3: The operator shall determine the emission factor in accordance with Articles 32 to 35. Stoichiometric ratios as listed in section 2 of Annex VI shall be used to convert composition data into emission factors, where relevant.

4.2. **Tiers for the conversion factor using Method A**

Tier 1: A conversion factor of 1 shall be used.

Tier 2: Carbonates and other carbon leaving the process shall be considered by means of a conversion factor with a value between 0 and 1. The operator may assume complete conversion for one or several inputs and attribute unconverted materials or other carbon to the remaining inputs. The additional determination of relevant chemical parameters of the products shall be carried out in accordance with Articles 32 to 35.

4.3. **Tiers for the emission factor using Method B**

Tier 1: The operator shall apply one of the following:

(a) the standard factors listed in Annex VI section 2 Table 3.

(b) other constant values in accordance with point (e) of Article 31(1), where no applicable value is contained in Annex VI.

Tier 2: The operator shall apply a country specific emission factor in accordance with point (b) or (c) of Article 31(1), or values in accordance with point (d) of Article 31(1).

Tier 3: The operator shall determine the emission factor in accordance with Articles 32 to 35. Stoichiometric ratios referred to in Annex VI section 2 Table 3 shall be used to convert composition data into emission factors assuming that all of the relevant metal oxides have been derived from respective carbonates. For this purpose the operator shall take into account at least CaO and MgO, and shall provide evidence to the competent authority as to which further metal oxides relate to carbonates in the raw materials.

4.4. **Tiers for the conversion factor using Method B**

Tier 1: A conversion factor of 1 shall be used.

Tier 2: The amount of non-carbonate compounds of the relevant metals in the raw materials, including return dust or fly ash or other already calcined materials, shall be reflected by means of conversion factors with a value between 0 and 1 with a value of 1 corresponding to a full conversion of raw material carbonates into oxides. The additional determination of relevant chemical parameters of the process inputs shall be carried out in accordance with Articles 32 to 35.

4.5. **Tiers for the net calorific value (NCV)**

If relevant, the operator shall determine the net calorific value of the process material using the tiers defined in section 2.2 of this Annex. NCV is considered not relevant for *de minimis* source streams or where the material is not itself combustible without other fuels being added. If in doubt, the operator shall seek confirmation by the competent authority on whether NCV has to be monitored and reported.

▼M1

4.6. **Tiers for the biomass fraction**

If relevant, the operator shall determine the biomass fraction of the carbon contained in the process material, using the tiers defined in section 2.4 of this Annex.

▼M5

4.7. **Tiers for the RFNBO or RCF fraction or synthetic low-carbon fraction**

The tiers defined in Section 2.5 of this Annex shall be used.

▼M1

_____

▼M4

ANNEX IIa

Tier definitions for calculation-based methodologies related to regulated entities

1. DEFINITION OF TIERS FOR RELEASED FUEL AMOUNTS

The uncertainty thresholds in Table 1 shall apply to tiers relevant to released fuel amounts' requirements in accordance with Article 28(1), point (a), and Article 29(2), first subparagraph. The uncertainty thresholds shall be interpreted as maximum permissible uncertainties for the determination of fuel streams over a reporting period.

Table 1

Tiers for released fuel amounts (maximum permissible uncertainty for each tier)

Fuel stream type	Parameter to which the uncertainty is applied	Tier 1	Tier 2	Tier 3	Tier 4
Combustion of fuels					
Commercial standard fuels	Amount of fuel [t] or [Nm^3] or [TJ]	±7,5 %	±5 %	±2,5 %	±1,5 %
Other gaseous and liquid fuels	Amount of fuel [t] or [Nm^3] or [TJ]	±7,5 %	±5 %	±2,5 %	±1,5 %
Solid fuels	Amount of fuel [t] or [TJ]	±7,5 %	±5 %	±2,5 %	±1,5 %

2. DEFINITION OF TIERS FOR CALCULATION FACTORS AND THE SCOPE FACTOR

Regulated entities shall monitor CO_2 emissions from all types of fuels released for consumption in sectors listed in Annex III to Directive 2003/87/EC or included in the Union system under Article 30j of that Directive using the tier definitions laid down in this section.

2.1. **Tiers for emission factors**

Where a biomass fraction is determined for a mixed fuel, the tiers defined shall relate to the preliminary emission factor. For fossil fuels, the tiers shall relate to the emission factor.

▼M5

Where a RFNBO or RCF fraction or synthetic low-carbon fraction is determined for a mixed fuel, the tiers defined shall relate to the preliminary emission factor.

▼M4

Tier 1: The regulated entity shall apply one of the following:

(a) the standard factors listed in section 1 of Annex VI;

(b) other constant values in accordance with Article 31(1), point (e), where no applicable value is contained in section 1 of Annex VI.

Tier 2a: The regulated entity shall apply country specific emission factors for the respective fuel in accordance with Article 31(1), points (b) and (c).

Tier 2b: The regulated entity shall derive emission factors for the fuel based on net calorific value for specific coal types, in combination with an empirical correlation as determined at least once per year in accordance with Articles 32 to 35 and 75m.

▼M4

The regulated entity shall ensure that the correlation satisfies the requirements of good engineering practice and that it is applied only to values of the proxy which fall into the range for which it was established.

Tier 3: The regulated entity shall apply one of the following:

(a) determination of the emission factor in accordance with the relevant provisions of Articles 32 to 35;

(b) the empirical correlation as specified for Tier 2b, where the regulated entity demonstrates to the satisfaction of the competent authority that the uncertainty of the empirical correlation does not exceed 1/3 of the uncertainty value to which the regulated entity has to adhere with regard to the released fuel amounts determination of the relevant fuel.

2.2. **Tiers for unit conversion factor**

Tier 1: The regulated entity shall apply one of the following:

(a) the standard factors listed in section 1 of Annex VI;

(b) other constant values in accordance with Article 31(1), point (e), where no applicable value is contained in section 1 of Annex VI.

Tier 2a: The regulated entity shall apply country specific factors for the respective fuel in accordance with Article 31(1), point (b) or (c).

Tier 2b: For commercially traded fuels the unit conversion factor as derived from the purchasing records for the respective fuel shall be used provided it has been derived based on accepted national or international standards.

Tier 3: The regulated entity shall determine the unit conversion factor in accordance with Articles 32 to 35.

2.3. **Tiers for biomass fraction**

Tier 1: The regulated entity shall apply an applicable value published by the competent authority or the Commission, or values in accordance with Article 31(1).

Tier 2: The regulated entity shall apply an estimation method approved in accordance with Article 75m(3), second subparagraph.

Tier 3a: The regulated entity shall apply analyses in accordance with Article 75m(3), first subparagraph, and in accordance with Articles 32 to 35.

Where a regulated entity assumes a fossil fraction of 100 % in accordance with Article 39(1), no tier shall be assigned for the biomass fraction.

Tier 3b: For fuels originating from a production process with defined and traceable input streams, the regulated entity may base the estimation on a mass balance of fossil and biomass carbon entering and leaving the process, such as the mass balance system in accordance with Article 30 (1) of Directive (EU) 2018/2001.

▼M5

2.3a **Tiers for RFNBO or RCF fraction or synthetic low-carbon fraction**

Tier 1: The operator shall determine RFNBO or RCF fraction or synthetic low-carbon fraction based on the mass balance system in accordance with Article 30(1) of Directive (EU) 2018/2001.

▼M5

Where an operator assumes a fossil fraction of 100 % in accordance with Article 39a(1) of this Regulation, no tier shall be assigned for the RFNBO or RCF fraction or synthetic low-carbon fraction.

▼M4

2.4. **Tiers for the scope factor**

Tier 1: The regulated entity shall apply a default value in accordance with Article 75l(3) or (4).

Tier 2: The regulated entity shall apply methods in accordance with Article 75l(2), points (e) to (g).

Tier 3: The regulated entity shall apply methods in accordance with Article 75l(2), points (a) to (d).

▼B

ANNEX III

▼M5

Monitoring methodologies for emissions from aviation (Article 53)

▼B

1. CALCULATION METHODOLOGIES FOR THE DETERMINATION OF GHGS IN THE AVIATION SECTOR

Method A:

The operator shall use the following formula:

Actual fuel consumption for each flight [t] = Amount of fuel contained in aircraft tanks once fuel uplift for the flight is complete [t] – Amount of fuel contained in aircraft tanks once fuel uplift for subsequent flight is complete [t] + Fuel uplift for that subsequent flight [t]

Where there is no fuel uplift for the flight or subsequent flight, the amount of fuel contained in aircraft tanks shall be determined at block-off for the flight or subsequent flight. In the exceptional case that an aircraft performs activities other than a flight, including undergoing major maintenance involving the emptying of the tanks, after the flight for which fuel consumption is being monitored, the aircraft operator may substitute the quantity ‘Amount of fuel contained in aircraft tanks once fuel uplift for subsequent flight is complete + Fuel uplift for that subsequent flight’ with the ‘Amount of fuel remaining in tanks at the start of the subsequent activity of the aircraft’, as recorded by technical logs.

Method B:

The operator shall use the following formula:

Actual fuel consumption for each flight [t] = Amount of fuel remaining in aircraft tanks at block-on at the end of the previous flight [t] + Fuel uplift for the flight [t] - Amount of fuel contained in tanks at block-on at the end of the flight [t]

The moment of block-on may be considered equivalent to the moment of engine shut down. Where an aircraft does not perform a flight previous to the flight for which fuel consumption is being monitored, the aircraft operator may substitute the quantity ‘Amount of fuel remaining in aircraft tanks at block-on at the end of the previous flight’ with the ‘Amount of fuel remaining in aircraft tanks at the end of the previous activity of the aircraft’, as recorded by technical logs.

2. EMISSION FACTORS FOR STANDARD FUELS

▼M4

Table 1

Fossil aviation CO_2 factors (preliminary emission factors)

Fuel	Emission factor (t CO_2/t fuel)
Aviation gasoline (AvGas)	3,10
Jet gasoline (Jet B)	3,10
Jet kerosene (Jet A1 or Jet A)	3,16

▼B

3. CALCULATION OF GREAT CIRCLE DISTANCE

Distance [km] = Great Circle Distance [km] + 95 km

The Great Circle Distance shall be the shortest distance between any two points on the surface of the Earth, which shall be approximated using the system referred to in Article 3.7.1.1 of Annex 15 to the Chicago Convention (WGS 84).

The latitude and longitude of aerodromes shall be taken either from aerodrome location data published in Aeronautical Information Publications (AIP) in compliance with Annex 15 to the Chicago Convention or from a source using AIP data.

Distances calculated by software or by a third party may also be used, provided that the calculation methodology is based on the formula set out in this section, AIP data and WGS 84 requirements.

▼M5

ANNEX IIIa

Monitoring methodologies for non-CO_2 aviation effects (Article 56a)

1. DEFINITIONS RELATED TO NON-CO_2 AVIATION EFFECTS

1. ‘flight information’ means at the minimum the call sign as provided in Article 51 of this Regulation, the day and time of departure and arrival of the flight, expressed in Coordinated Universal Time (UTC) and the ICAO codes and/or the International Air Transport Association's (IATA) location identifiers for origin and destination airports allowing for unique identification of the given flight;

2. ‘flight phase information’ means the split of data (e.g. aircraft 4D position, fuel flow) according to operational flight phases (take-off, climb, cruise, etc.);

3. ‘operation flight envelope’ means the boundaries of altitude, aircraft speed, and load factor for each flight phase;

4. ‘true airspeed’ means the speed of the aircraft relative to the air mass through which it is flying, in meters per second (m/s);

5. ‘aircraft 4D position’ means the four-dimensional position of an aircraft defined by its latitude, in decimal degree; longitude, in decimal degree; and altitude, in pressure altitude, at any given moment of time between beginning and end of the flight;

6. ‘time stamp’ means a snapshot of data (e.g. aircraft 4D position, fuel flow) that corresponds to any given moment of time, in seconds, during flight and that is to be considered together with time interval;

7. ‘time interval’ means the time, in seconds, between two-time stamps during the flight, not exceeding 60 seconds;

8. ‘latest flight plan’ means the latest flight plan available and acknowledged by relevant air navigation service for a given flight, before it takes place. The latest flight plan can be the Eurocontrol’s Regulated Tactical Flight Model (RTFM), or alternatively, the Eurocontrol’s Filed Tactical Flight Model (FTFM) or equivalent in terms of data accuracy;

9. ‘flown flight trajectory’ means the trajectory followed by the aircraft from its point of origin (departure) to its destination (arrival), constituted by all the time stamps, recorded during the flight. The flown flight trajectory can be sourced from the flight data recorder equipment or third-party. Its accuracy should be equivalent, where possible, to Eurocontrol’s Current Tactical Flight Model (CTFM);

10. ‘flight data recorder equipment’ a specialized electronic device installed on the aircraft for the purpose of recording various parameters and events during flight operations. These parameters may include but are not limited to flight control inputs, aircraft performance information, engine data, navigation information.

11. ‘three-dimensional radiative variables’ means number of variables such as radiative flux density, radiative heating rates, that describe how radiation varies across space, including the Earth’s surface and atmosphere, and how it changes over time;

▼M5

12. ‘pressure’ means the force, in Pascals (Pa), exerted by the weight of the air in the atmosphere above a given point where the aircraft is situated at any given moment of time during flight taking into account three-dimensional radiative variables;

13. ‘air ambient temperature’ means the temperature of the air, in Kelvin (K), surrounding an aircraft at any given moment of time during the flight and given for three-dimensional radiative variables;

14. ‘specific humidity’ means the ratio of water vapor per kilogram of total air mass (kg/kg) surrounding an aircraft at any given moment of time during flight and given for three-dimensional radiative variables;

15. ‘International Standard Atmosphere (ISA)’ means a standard against which to compare the actual atmosphere at any point and time, based on the specific values of pressure, density, and temperature at mean sea level, each of which decreases with increase in height;

16. ‘basic weather data’ means the category of information encompassing for each flight, at least the pressure, the air ambient temperature and the specific humidity, used in the fuel burn and emission estimation modules. Here, these values can be estimated, at the minimum, through standardised, altitude-dependent correction and/or be based on third party post-operational observations;

17. ‘relative humidity over ice’ means the concentration of water vapour, in percentage, present in the air compared to its concentration at the saturation point of ice;

18. ‘eastward and northward wind’ means the horizontal speed of air moving towards the East or North, in meters per second, at any given moment of time during flight and given for three-dimensional radiative variables;

19. ‘vertical velocity’ means the speed of air motion in the upward or downward direction (in Pa/s), where negative values of vertical velocity indicate upward motion. It is necessary to calculate, e.g., advection and wind shear;

20. ‘specific cloud ice water content’ means the mass of cloud ice particles per kilogram of the total mass of moist air (kg/kg) surrounding an aircraft at any given moment of time during flight and given for three-dimensional radiative variables;

21. ‘geopotential’ means the gravitational field strength experienced by an aircraft at different altitudes, at any given moment of time during flight, in square meters per squared second (m^2/s^2) and given for three-dimensional radiative variables;

22. ‘outgoing longwave radiation’ means the total radiation emitted to the space by earth atmosphere system, in W/m^2, at any given moment of time during flight and given for three-dimensional radiative variables;

23. ‘reflected solar radiation’ means the portion of sunlight that is reflected back into space by the Earth’s surface, clouds, aerosols, and other atmospheric particles, in W/m^2, at any given moment of time during flight and given for three-dimensional radiative variables;

24. ‘solar direct radiation’ means the portion of sunlight that reaches the Earth’s surface directly from the Sun without being scattered or reflected by the atmosphere or clouds, in W/m^2, at any given moment of time during flight and given for three-dimensional radiative variables;

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25. ‘common reference Numerical Weather Prediction (NWP) model’ refers to a computational system utilised in meteorology, comprising algorithms and mathematical formulations implemented in software, designed to simulate, and forecast atmospheric conditions over a defined spatial and temporal domain (spatial grid). In the case of the enhanced weather data, a common reference NWP model is provided by the Commission through NEATS;

26. ‘enhanced weather data’ means the category of information encompassing for each flight, the pressure, the air ambient temperature, the specific humidity, the relative humidity over ice, the eastward and northward wind, the vertical velocity, the specific cloud ice water content, the geopotential, the outgoing longwave, reflected solar and solar direct radiation, taken as input from a common reference NWP model, provided by the Commission through NEATS;

27. ‘engine identifier’ means the aircraft engine unique identifier number as contained in the ICAO engine emissions databank, or equivalent, allowing to unequivocally identify the engines attached to the aircraft, through internationally recognized standardised lists;

28. ‘aircraft mass’ means the mass in kilogrammes of the aircraft along the trajectory, which equals to subtracting from the take-off mass the fuel burn during flight at any given moment of time. If the aircraft mass is not available, it can be approximated based on either the take-off mass or the load factor, and either the given fuel flow or the fuel flow as calculated by an aircraft performance simulation using the fuel burn module;

29. ‘take-off mass’ means the aircraft mass at beginning of the take-off run, including everything and everyone carried at that moment, in kilograms. It is used to approximate the aircraft mass if the latter is not provided. If the take-off mass is not available, it can be approximated based on the load factor;

30. ‘maximum take-off mass’ is the maximum mass, in kilograms, at which the pilot of an aircraft is allowed to take off, as specified by the aircraft manufacturer;

31. ‘maximum payload mass’ is the maximum mass of passengers and related baggage, mass of cargo, including mail and hand luggage, that can be transported by an aircraft. Values for maximum payload can be retrieved by the applied fuel burn module;

32. ‘load factor’ means the weight of passengers, cargo and baggage, including mail and hand luggage, expressed as fraction of the maximum payload mass. The load factor is used to approximate the take-off mass if the latter is not provided. If the load factor is not available, a conservative default value shall be used, in accordance with Annex IIIa, Section 5;

33. ‘fuel flow’ means the mass of fuel in kilograms that passes through the aircraft fuel system and into the aircraft’s engines per second during the flight. It can be modeled during flight planning, measured in-flight, or estimated through fuel burn module;

34. ‘aircraft engine efficiency’ means the percentage of useful thrust generated by an aircraft engine relative to the energy input from fuel;

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35. ‘aircraft performance’ means the category of information encompassing fuel flow and aircraft engine efficiency by all-time stamps;

36. ‘hydrogen per carbon (H/C) ratio of fuel per flight’ means the number of hydrogen atoms (H) per carbon atom (C) per molecule of the fuel used per flight;

37. ‘aromatic content of the fuel per flight’ means the percentage of aromatic hydrocarbons present in the fuel used per flight;

38. ‘flight fuel properties’ means the category of information encompassing for each flight the hydrogen per carbon ratio, aromatic content, and the net calorific value of the fuel on board;

2. NON-CO_2 AVIATION EFFECTS TRACKING SYSTEM (NEATS)

NEATS is provided by the Commission to aircraft operators, to accredited verifiers and to competent authorities for the purpose of facilitating and, to the extent possible, automating monitoring, reporting and verification of non-CO_2 aviation effects, in order to minimise any administrative burden.

NEATS is aligned with the principles established in Article 75(1) of this Regulation and provides a dedicated and secured user interface per aircraft operator, verifier and competent authority.

Monitoring:

NEATS streamlines the monitoring process as it incorporates directly, or gives access to, available third-party collected flight trajectories and weather data allowing to minimise monitoring by aircraft operators to aircraft properties, as well as to fuel properties, where needed, as defined in Annex IIIa, Section 1 or to render it fully automatic depending on use of default values.

NEATS incorporates the CO_2(e) calculation approaches as listed in paragraph 4 of Article 56a of this Regulation and provides a common reference NWP model, where enhanced weather data is needed (Method C). This results into the calculation of CO_2(e) per flight as part of the monitored data.

Reporting:

NEATS streamlines the reporting exercise referred to in Article 68(5) of this Regulation. The tool generates automatically the XML table referred to in Annex X, Section 2a(9) to this Regulation at the end of each reporting year, minimising administrative burden associated with reporting.

Verification:

NEATS streamlines the verification and cross-checks done respectively by the verifier and the competent authority. It provides the means to verify a CO_2(e) per flight, while protecting confidential data.

Data storage:

NEATS allows to store all the data (from aircraft operators and from third parties), securely encoding and protecting from release confidential data, where such data is uploaded by the aircraft operator on NEATS, as long as it is identified as confidential by the aircraft operator.

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Transparency:

NEATS relies on state-of-art models to calculate the CO_2(e) for non-CO_2 effects. Aircraft operators may develop their own or use third-party tools, provided they comply with the requirements laid down in this Annex.

NEATS shall feed into a public website summarising the non-confidential data and CO_2(e) per flight and per aircraft operator.

3. FUEL BURN AND EMISSION ESTIMATION MODULES FOR NON-CO_2 AVIATION EFFECTS

Fuel burn module:

The fuel burn module is based on a kinetic approach to aircraft performance modelling, which enables to accurately predict aircraft trajectories and the associated fuel consumption over the entire operation flight envelope and in all phases of a flight. The model processes the theoretical fundamentals to compute aircraft performance parameters, including information on drag, lift, weight, thrust, fuel consumption, as well as the speeds for the climb, cruise, and descent phases of an aircraft, assuming normal aircraft operations. In addition, aircraft-specific coefficients are key data inputs for the computation of the flight trajectory planning of specific aircraft types.

Emission-estimation module:

The emission-estimation module enables to compute aircraft engine emissions of NOx, HC, and CO by means of correlation equations without proprietary airplane and engine performance models along with proprietary engine emissions characterisations. This module applies exhaust emission indices (EIs) from the ICAO engine type certification under predefined reference conditions on the ground and estimates the corresponding EIs during flight conditions assuming international standard atmosphere (ISA) conditions using correction factors for differences in the ISA conditions of temperature, pressure and humidity.

4. CO_2(e) CALCULATION MODELS FOR NON-CO_2 AVIATION EFFECTS

General criteria:

In the CO_2(e) calculation models, the aircraft operator shall consider the climate effects of all non-CO_2 agents on a per flight basis including flight trajectories (flight plan and flown flight trajectories), as well as aircraft and flight fuel properties. The emissions from each flight shall be accounted for as pulse emissions. When applying the CO_2(e) calculation models, flight trajectory-dependent aircraft emission data shall be used to calculate all the following elements:

(a) composition changes;

(b) temporal evolution of radiative forcing caused by composition changes;

(c) near surface temperature changes caused by flight trajectory-dependent aircraft emissions.

Administrative and computational efforts shall be kept low to ensure feasibility for all stakeholders. The model(s) shall be transparent and suitable for operational use.

Depending on the model, there are two types of requirement lists:

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Method C:

For the weather-based approach, detailed climate effects of all aircraft non-CO_2 emissions at a specific location and time shall be considered taking into account current weather information to calculate climate-optimised four-dimensional trajectories for individual flight planning. To allow detailed accounting of the climate effects with regards to current atmospheric conditions, different aircraft, propulsion types, as well as fuel properties shall explicitly be considered in the models. Estimates for the formation, life cycle and contrail climate effects for single flights as well as the residence times for the emitted H_2O and NO_x and their impact on the atmospheric composition shall be included. For being able to output advanced information for use in daily flight planning, the model(s) shall be computationally efficient.

Each aircraft operators shall monitor the following data per flight:

(a) flight information;

(b) flight trajectory, defined at the minimum, as the latest flight plan;

(c) enhanced weather data;

(d) aircraft properties;

(e) (optional) aircraft performance information. Planned fuel flow is to be used preferentially, in order to align with the latest flight plan data available;

(f) flight fuel properties.

Method D:

For the location-based simplified approach, the aircraft operator shall use climate response model(s) to estimate the impact of all non-CO_2 effects per flight on a climatological basis. The tool(s) shall be used to assess the climate benefit of general routing options, while accounting for general differences in aircraft, propulsion types and fuel properties through their physical parameterisations. The CO_2(e) calculated with the location-based simplified approach shall average out any large deviations for individual flights over a longer period of time. The model(s) should ensure reduced efforts in data need, computation, and handling, as compared to the model(s) for the weather-based approach.

By way of derogation of Method C, small emitters, as defined in Article 55 (1) of this Regulation, may monitor the following data per flight:

(a) flight information;

(b) flight trajectory, defined by the flown flight trajectory;

(c) basic weather data;

(d) aircraft properties;

(e) (optional) aircraft performance information along the flight;

(f) (optional) flight fuel properties.

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5. USE OF DEFAULT VALUES FOR NON-CO_2 AVIATION EFFECTS

Subject to further scrutiny by the competent authority and the Commission, the use of default values shall always result in higher CO_2(e) per flight compared to what can be obtained with monitored data.

1. Flight trajectory:

   (a) For the purpose of applying Method C, the latest flight plan shall be provided. If the RTFM, or equivalent, is not available, the FTFM, or equivalent shall be used as default. In such case, where data by time stamp is not available, it can be calculated by linear interpolation of measured data stemming from the two measurement times closest before and after the time stamp under consideration, within the same flight phase, provided it results in homogenous flight trajectory for the given flight phase, especially the cruise phase.

   (b) For the purpose of applying Method D:

      (i) the flown flight trajectory shall always be provided. If the CTFM, or equivalent, is not available, the RTFM or FTFM can be used.

      (ii) where data by time stamp is not available, it can be calculated by linear interpolation of measured data stemming from the two measurement times closest before and after the time stamp under consideration, within the same flight phase, provided it results in homogenous flight trajectory for the given flight phase, especially the cruise phase.

2. Aircraft properties:

   (a) Engine identifier: where no engine identifier or equivalent, is provided, conservative default values per aircraft type, as defined in Annex IIIb to this Regulation, shall be used.

   (b) Aircraft mass: if the aircraft mass is not provided, the aircraft operator can simulate the aircraft mass by using the take-off mass. If neither the aircraft mass, nor the take-off mass are available, the load factor can be used to approximate the take-off mass. If no load factor is provided, a default value of 1 is used.

3. Aircraft performance:

   Fuel flow: if the fuel flow is not provided from the flight data recorder equipment, the aircraft operator can use other means to derive the fuel flow, in line with Annex IIIa, Section 1 to this Regulation defining fuel flow, taking into account the thrust which depends on the aircraft's mass and true airspeed.

4. Flight fuel properties:

   If no flight fuel properties are provided, the upper limits of Jet A-1 fuel according to the ASTM Standard Specification for Aviation Turbine Fuels, are assumed:

   (a) Aromatic content: 25 % volume;

   (b) Sulphur: 0,3 % mass;

   (c) Naphthalene: 3,0 % volume.

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ANNEX IIIb

Conservative default engine identifiers per aircraft type

ICAO	**First UID**
A148	13ZM003
A19N	01P22PW163
A20N	01P22PW163
A21N	01P20CM132
A306	1PW048
A30B	1GE007
A310	1PW027
A318	7CM049
A319	1IA001
A320	1IA001
A321	3IA008
A332	4PW067
A333	4PW067
A337	3RR029
A338	04P24RR146
A339	02P23RR141
A343	2CM015
A346	8RR045
A358	01P18RR125
A359	01P21RR125
A35K	01P21RR125
A388	9EA001
A3ST	1GE021
AN72	1ZM001
B38M	01P20CM138
B39M	01P20CM138
B463	1TL003
B701	1PW001
B703	1PW001
B721	1PW008
B731	01P20CM138
B732	1PW008

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ICAO	**First UID**
B733	1CM007
B734	1CM007
B735	1CM007
B736	3CM031
B737	2CM015
B738	2CM015
B739	3CM034
B741	8PW088
B742	1RR011
B743	1PW029
B744	1RR010
B748	13GE157
B74S	8PW088
B752	1RR011
B753	3RR034
B762	1PW026
B763	5GE085
B764	5GE085
B772	3GE060
B773	2RR024
B77L	01P21GE217
B77W	01P21GE217
B778	01P21GE217
B779	01P21GE217
B788	02P23RR138
B789	02P23RR138
B78X	02P23RR138
BCS1	16PW111
BCS3	16PW111
C550	1PW037
C560	1PW037
C650	1AS002
C680	7PW077
C68A	7PW077
C700	01P18HN013

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ICAO	**First UID**
C750	6AL024
CL30	11HN003
CL35	01P14HN011
CL60	10GE130
CRJ2	01P05GE189
CRJ7	01P11GE202
CRJ9	01P08GE190
CRJX	01P08GE193
E135	01P10AL033
E145	6AL006
E170	01P08GE197
E190	10GE130
E195	10GE130
E290	04P20PW200
E295	04P20PW201
E35L	6AL006
E545	11HN003
E550	01P14HN016
E55P	01P14HN016
E75L	01P08GE197
E75S	01P08GE197
F100	1RR020
F2TH	01P07PW146
F900	1AS001
FA10	1AS002
FA50	1AS002
FA7X	03P16PW192
FA8X	03P15PW193
G280	01P11HN012
GA5C	01P22PW142
GA6C	01P22PW141
GALX	7PW077
GL5T	4BR004
GL7T	21GE185
GLEX	4BR004

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ICAO	**First UID**
GLF4	11RR048
GLF5	4BR004
GLF6	4BR004
H25B	1AS001
H25C	7PW077
HA4T	01P07PW146
IL62	1KK001
IL86	1KK003
LJ35	1AS001
LJ45	1AS002
LJ55	1AS002
MD11	5GE085
MD90	1IA001
RJ85	1TL004
SU95	01P11PJ004
T154	1KK001

▼B

ANNEX IV

Activity-specific monitoring methodologies related to installations (Article 20(2))

1. SPECIFIC MONITORING RULES FOR EMISSIONS FROM COMBUSTION PROCESSES

A. **Scope**

Operators shall monitor CO_2 emissions from all types of combustion processes taking place under all activities as listed in Annex I to Directive 2003/87/EC or included in the Union system under Article 24 of that Directive including the related scrubbing processes using the rules laid down in this Annex. Any emissions from fuels used as process input shall be treated like combustion emissions with regard to monitoring and reporting methodologies, without prejudice to other classifications applied to emissions.

The operator shall not monitor and report emissions from internal combustion engines for transportation purposes. The operator shall assign all emissions from the combustion of fuels at the installation to the installation, regardless of exports of heat or electricity to other installations. The operator shall not assign emissions associated with the production of heat or electricity that is imported from other installations to the importing installation.

The operator shall include at least the following emission sources: boilers, burners, turbines, heaters, furnaces, incinerators, calciners, kilns, ovens, dryers, engines, fuel cells, chemical looping combustion units, flares, thermal or catalytic post-combustion units, and scrubbers (process emissions) and any other equipment or machinery that uses fuel, excluding equipment or machinery with combustion engines that are used for transportation purposes.

B. **Specific monitoring rules**

The emissions from combustion processes shall be calculated in accordance with Article 24(1), unless the fuels are included in a mass balance in accordance with Article 25. The tiers defined in section 2 of Annex II shall apply. In addition, process emissions from flue gas scrubbing shall be monitored using the provisions laid down in subsection C.

For emissions from flares special requirements shall apply, as laid down in subsection D of this section.

Combustion processes taking place in gas processing terminals may be monitored using a mass balance in accordance with Article 25.

C. **Flue gas scrubbing**

C.1 *Desulphurisation*

Process CO_2 emissions from the use of carbonate for acid gas scrubbing from the flue gas stream shall be calculated in accordance with Article 24(2) on the basis of carbonate consumed, Method A as follows, or gypsum produced, Method B as follows. The following applies by way of derogation from section 4 of Annex II.

Method A: Emission factor

Tier 1: The emission factor shall be determined from stoichiometric ratios as laid down in section 2 of Annex VI. The determination of the amount of $CaCO_3$ and $MgCO_3$ or other carbonates in the relevant input material shall be carried out using industry best practice guidelines.

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Method B: Emission factor

Tier 1: The emission factor shall be the stoichiometric ratio of dry gypsum ($CaSO_4 \times 2H_2O$) to CO_2 emitted: 0,2558 t CO_2/t gypsum.

Conversion Factor:

Tier 1: A conversion factor of 1 shall be used.

C.2 *De-NO_x*

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By way of derogation from section 4 of Annex II, process CO_2 emissions from the use of urea for scrubbing of the flue gas stream shall be calculated in accordance with Article 24(2) applying the following tiers.

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Emission factor:

Tier 1: The determination of the amount of urea in the relevant input material shall be carried out using industry best practice guidelines. The emission factor shall be determined using a stoichiometric ratio of 0,7328 t CO_2/t urea.

Conversion Factor:

Only tier 1 shall be applicable.

D. **Flares**

When calculating emissions from flares the operator shall include routine flaring and operational flaring (trips, start-up and shutdown as well as emergency relieves). The operator shall also include inherent CO_2 in accordance with Article 48.

By way of derogation from section 2.1 of Annex II, tiers 1 and 2b for the emission factor shall be defined as follows:

Tier 1: The operator shall use a reference emission factor of 0,00393 t CO_2/Nm^3 derived from the combustion of pure ethane used as a conservative proxy for flare gases.

Tier 2b: Installation-specific emission factors shall be derived from an estimate of the molecular weight of the flare stream, using process modelling based on industry standard models. By considering the relative proportions and the molecular weights of each of the contributing streams, a weighted annual average figure shall be derived for the molecular weight of the flare gas.

By way of derogation from section 2.3 of Annex II, only tiers 1 and 2 shall be applied for the oxidation factor in the case of flares.

2. ►M5 REFINING OF OIL AS LISTED IN ANNEX I TO DIRECTIVE 2003/87/EC ◄

A. **Scope**

The operator shall monitor and report all CO_2 emissions from combustion and production processes as occurring in refineries.

The operator shall include at least the following potential sources of CO_2 emissions: boilers, process heaters/treaters, internal combustion engines/turbines, catalytic and thermal oxidisers, coke calcining kilns, firewater pumps, emergency/standby generators, flares, incinerators, crackers, hydrogen production units, Claus process units, catalyst regeneration (from catalytic cracking and other catalytic processes) and cokers (flexi-coking, delayed coking).

▼B

B. **Specific monitoring rules**

The monitoring of mineral oil refining activities shall be carried out in accordance with section 1 of this Annex for combustion emissions including flue gas scrubbing. The operator may choose to use the mass balance methodology in accordance with Article 25 for the whole refinery or individual process units such as heavy oil gasification or calcinations plants. Where combinations of standard methodology and mass balance are used, the operator shall provide evidence to the competent authority demonstrating the completeness of emissions covered, and that no double counting of emissions occurs.

Emissions from dedicated hydrogen production units shall be monitored in accordance with section 19 of this Annex.

By way of derogation from Article 24 and 25, emissions from catalytic cracker regeneration, other catalyst regeneration and flexi-cokers shall be monitored using a mass balance, taking into account the state of the input air and the flue gas. All CO in the flue gas shall be accounted for as CO_2, applying the mass relation: t CO_2 = t CO * 1,571. The analysis of input air and flue gases and the choice of tiers shall be in accordance with the provisions of Articles 32 to 35. The specific calculation methodology shall be approved by the competent authority.

3. PRODUCTION OF COKE AS LISTED IN ANNEX I TO DIRECTIVE 2003/87/EC

A. **Scope**

The operator shall include at least the following potential sources of CO_2 emissions: raw materials (including coal or petroleum coke), conventional fuels (including natural gas), process gases (including blast furnace gas – BFG), other fuels and waste gas scrubbing.

B. **Specific monitoring rules**

For the monitoring of emissions from the production of coke, the operator may choose to use a mass balance in accordance with Article 25 and section 3 of Annex II, or the standard methodology in accordance with Article 24 and sections 2 and 4 of Annex II.

4. METAL ORE ROASTING AND SINTERING AS LISTED IN ANNEX I TO DIRECTIVE 2003/87/EC

A. **Scope**

The operator shall include at least the following potential sources of CO_2 emissions: raw materials (calcination of limestone, dolomite and carbonatic iron ores, including $FeCO_3$), conventional fuels (including natural gas and coke/coke breeze), process gases (including coke oven gas – COG, and blast furnace gas – BFG), process residues used as input material including filtered dust from the sintering plant, the converter and the blast furnace, other fuels and flue gas scrubbing.

▼M1

B. **Specific monitoring rules**

For the monitoring of emissions from metal ore roasting, sintering or pelletisation, the operator may choose to use a mass balance in accordance with Article 25 and section 3 of Annex II or the standard methodology in accordance with Article 24 and sections 2 and 4 of Annex II.

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5. ►M5 PRODUCTION OF IRON AND STEEL AS LISTED IN ANNEX I TO DIRECTIVE 2003/87/EC ◄

A. **Scope**

The operator shall include at least the following potential sources of CO_2 emissions: raw materials (calcination of limestone, dolomite and carbonatic iron ores, including $FeCO_3$), conventional fuels (natural gas, coal and coke), reducing agents (including coke, coal and plastics), process gases (coke oven gas – COG, blast furnace gas – BFG and basic oxygen furnace gas – BOFG), consumption of graphite electrodes, other fuels and waste gas scrubbing.

B. **Specific monitoring rules**

For the monitoring of emissions from production of ►M5 iron ◄ and steel, the operator may choose to use a mass balance in accordance with Article 25 and section 3 of Annex II, or the standard methodology in accordance with Article 24 and sections 2 and 4 of Annex II, at least for a part of the source streams, avoiding any gaps or double counting of emissions.

By way of derogation from section 3.1 of Annex II, tier 3 for the carbon content is defined as follows:

Tier 3: The operator shall derive the carbon content of input or output stream following Articles 32 to 35 in respect to the representative sampling of fuels, products and by-products, the determination of their carbon contents and biomass fraction. The operator shall base the carbon content of products or semi-finished products on annual analyses following Articles 32 to 35 or derive the carbon content from mid-range composition values as specified by relevant international or national standards.

6. PRODUCTION OR PROCESSING OF FERROUS AND NON-FERROUS METALS AS LISTED IN ANNEX I TO DIRECTIVE 2003/87/EC

A. **Scope**

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The operator shall not apply the provisions in this section for the monitoring and reporting of CO_2 emissions from the production of iron and steel and primary aluminium.

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The operator shall consider at least the following potential emission sources for CO_2 emissions: conventional fuels; alternative fuels including plastics granulated material from post shredder plants; reducing agents including coke, graphite electrodes; raw materials including limestone and dolomite; carbon containing metal ores and concentrates; and secondary feed materials.

B. **Specific monitoring rules**

Where carbon stemming from fuels or input materials used at this installation remains in the products or other outputs of the production, the operator shall use a mass balance in accordance with Article 25 and section 3 of Annex II. Where this is not the case the operator shall calculate combustion and process emission separately using the standard methodology in accordance with Article 24 and sections 2 and 4 of Annex II.

Where a mass balance is used, the operator may choose to include emissions from combustion processes in the mass balance or to use the standard methodology in accordance with Article 24 and section 1 of this Annex for a part of the source streams, avoiding any gaps or double counting of emissions.

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7. ►M5 CO_2 EMISSIONS FROM PRODUCTION OR PROCESSING OF PRIMARY ALUMINIUM OR ALUMINA AS LISTED IN ANNEX I TO DIRECTIVE 2003/87/EC ◄

A. **Scope**

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The operator shall apply the provisions of this section to the monitoring and reporting of CO_2 emissions from the production of alumina (Al_2O_3), the production of electrodes for primary aluminium smelting, including stand-alone plants for the production of such electrodes, and the consumption of electrodes during electrolysis.

The operator shall consider at least the following potential sources for CO_2 emissions: fuels for the production of heat or steam, Al_2O_3 production, electrode production, reduction of Al_2O_3 during electrolysis which is related to electrode consumption, and use of soda ash or other carbonates for waste gas scrubbing.

▼B

The associated emissions of perfluorocarbons – PFCs, resulting from anode effects, including fugitive emissions, shall be monitored in accordance with section 8 of this Annex.

B. **Specific monitoring rules**

The operator shall determine CO_2 emissions from the production or processing of primary aluminium using the mass balance methodology in accordance with Article 25. The mass balance methodology shall consider all carbon in inputs, stocks, products and other exports from the mixing, forming, baking and recycling of electrodes as well as from electrode consumption in electrolysis. Where pre-baked anodes are used, either separate mass balances for production and consumption may be applied, or one common mass balance taking into account both production and consumption of electrodes. In the case of Søderberg cells, the operator shall use one common mass balance.

For emissions from combustion processes the operator may choose to include them in the mass balance or to use the standard methodology in accordance with Article 24 and section 1 of this Annex at least for a part of the source streams, avoiding any gaps or double counting of emissions.

8. PFC EMISSIONS FROM PRODUCTION OR PROCESSING OF PRIMARY ALUMINIUM AS LISTED IN ANNEX I TO DIRECTIVE 2003/87/EC

A. **Scope**

The operator shall apply the following for emissions of perfluorocarbons (PFCs) resulting from anode effects including fugitive emissions of PFCs. For associated CO_2 emissions, including emissions from electrode production, the operator shall apply section 7 of this Annex. The operator shall furthermore calculate PFC emissions not related to anode effects based on estimation methods in accordance with industry best practice, and any guidelines published by the Commission for this purpose.

B. **Determination of PFC emissions**

PFC emissions shall be calculated from the emissions measurable in a duct or stack (‘point source emissions’) as well as fugitive emissions using the collection efficiency of the duct:

PFC emissions (total) = PFC emissions (duct) / collection efficiency

The collection efficiency shall be measured when the installation-specific emission factors are determined. For its determination the most recent version of the guidance mentioned under Tier 3 of section 4.4.2.4 of the 2006 IPCC Guidelines shall be used.

▼B

The operator shall calculate emissions of CF_4 and C_2F_6 emitted through a duct or stack using one of the following methods:

(a) Method A where the anode effect minutes per cell-day are recorded;

(b) Method B where the anode effect overvoltage is recorded.

Calculation Method A – Slope Method:

The operator shall use the following equations for determining PFC emissions:

$$CF_4 \text{ emissions } [t] = AEM \times (SEF_{CF4}/1\,000) \times Pr_{Al}$$

$$C_2F_6 \text{ emissions } [t] = CF_4 \text{ emissions} \times F_{C2F6}$$

Where:

AEM = Anode effect minutes / cell-day;

SEF_{CF4} = Slope emission factor [(kg CF_4 / t Al produced) / (anode effect minutes / cell-day)]. Where different cell-types are used, different SEF may be applied as appropriate;

Pr_{Al} = Annual production of primary Aluminium [t];

F_{C2F6} = Weight fraction of C_2F_6 (t C_2F_6 / t CF_4).

The anode effect minutes per cell-day shall express the frequency of anode effects (number anode effects / cell-day) multiplied by the average duration of anode effects (anode effect minutes / occurrence):

$$AEM = \text{frequency} \times \text{average duration}$$

Emission factor: The emission factor for CF_4 (slope emission factor, SEF_{CF4}) expresses the amount [kg] of CF_4 emitted per tonne of aluminium produced per anode effect minute / cell-day. The emission factor (weight fraction F_{C2F6}) of C_2F_6 expresses the amount [t] of C_2F_6 emitted proportionate to the amount [t] of CF_4 emitted.

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

Tier 2: The operator shall use installation-specific emission factors for CF_4 and C_2F_6 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 ([1]). The emission factor shall also take into account emissions related to non-anode effects. The operator shall determine each emission factor with a maximum uncertainty of ± 15 %.

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.

([1]) International Aluminium Institute; The Aluminium Sector Greenhouse Gas Protocol; October 2006;US Environmental Protection Agency and International Aluminium Institute; Protocol for Measurement of Tetrafluoromethane (CF4) and Hexafluoroethane (C2F6) Emissions from Primary Aluminum Production; April 2008.

▼B

Table 1

Technology-specific emission factors related to activity data for the slope method.

Technology	Emission factor for CF_4 (SEF_{CF4}) [(kg CF_4/t Al) / (AE-Mins/ cell-day)]	Emission factor for C_2F_6 (F_{C2F6}) [t C_2F_6/ t CF_4]
Centre Worked Prebake (CWPB)	0,143	0,121
Vertical Stud Søderberg (VSS)	0,092	0,053

Calculation Method B – Overvoltage Method:

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

$$CF_4 \text{ emissions [t]} = OVC \times (AEO/CE) \times Pr_{Al} \times 0{,}001$$

▼M1

$$C_2F_6 \text{ emissions [t]} = CF_4 \text{ emissions} \times F_{C2F6}$$

▼B

Where:

OVC = Overvoltage coefficient (‘emission factor’) expressed as kg CF_4 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_{Al} = Annual production of primary Aluminium [t];

▼M1

F_{C2F6} = Weight fraction of C_2F_6 (t C_2F_6/t CF_4);

▼B

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_4 (‘overvoltage coefficient’ OVC) shall express the amount [kg] of CF_4 emitted per tonne of aluminium produced per millivolt overvoltage [mV]. The emission factor of C_2F_6 (weight fraction F_{C2F6}) shall express the amount [t] of C_2F_6 emitted proportionate to the amount [t] of CF_4 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_4 [(kg CF_4 / t Al) / (mV)] and C_2F_6 [t C_2F_6/ t CF_4] 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.

▼B

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.

Table 2

Technology-specific emission factors related to overvoltage activity data.

Technology	Emission factor for CF_4 [(kg CF_4/t Al) / mV]	Emission factor for C_2F_6 [t C_2F_6/ t CF_4]
Centre Worked Prebake (CWPB)	1,16	0,121
Vertical Stud Søderberg (VSS)	N.A.	0,053

C. **Determination of $CO_{2(e)}$ emissions**

The operator shall calculate $CO_{2(e)}$ emissions from CF_4 and C_2F_6 emissions as follows, using the global warming potentials listed in Annex VI section 3 Table 6:

PFC emissions [t $CO_{2(e)}$] = CF_4 emissions [t] × GWP_{CF4} + C_2F_6 emissions [t] × GWP_{C2F6}

9. PRODUCTION OF CEMENT CLINKER AS LISTED IN ANNEX I TO DIRECTIVE 2003/87/EC

▼M1

A. **Scope**

The operator shall include at least the following potential sources of CO_2 emissions: calcination of limestone in the raw materials, conventional fossil kiln fuels, alternative fossil-based kiln fuels and raw materials, biomass kiln fuels (biomass wastes), non-kiln fuels, non-carbonate carbon content of limestone and shales and raw materials used for waste gas scrubbing.

▼B

B. **Specific monitoring rules**

Emissions from combustion shall be monitored in accordance with section 1 of this Annex. Process emissions from raw meal components shall be monitored in accordance with section 4 of Annex II based on the carbonate content of the process input (calculation Method A) or on the amount of clinker produced (calculation Method B). In case of Method A, carbonates to be taken into account shall at least include $CaCO_3$, $MgCO_3$ and $FeCO_3$. In case of Method B, the operator shall take into account at least CaO and MgO, and shall provide evidence to the competent authority as to which extent further carbon sources have to be taken into account.

▼M1

CO_2 emissions related to dust removed from the process and non-carbonate carbon in the raw materials shall be added in accordance with subsections C and D of this section.

▼B

Calculation Method A: Kiln Input Based

Where cement kiln dust (CKD) and bypass dust leave the kiln system the operator shall not consider the related raw material as process input, but calculate emissions from CKD in accordance with subsection C.

▼B

Unless the raw meal is characterised, the operator shall apply the uncertainty requirements for activity data separately to each of the relevant carbon-bearing kiln inputs, avoiding double counting or omissions from returned or by-passed materials. Where activity data is determined based on the clinker produced, the net amount of raw meal may be determined by means of a site-specific empirical raw meal/clinker ratio. That ratio shall be updated at least once per year applying industry best practice guidelines.

Calculation Method B: Clinker Output Based

The operator shall determine activity data as the clinker production [t] over the reporting period in one of the following ways:

(a) by direct weighing of clinker;

(b) based on cement deliveries, by material balance taking into account dispatch of clinker, clinker supplies as well as clinker stock variation, using the following formula:

clinker produced [t] = ((cement deliveries [t] – cement stock variation [t]) × clinker / cement ratio [t clinker / t cement]) – (clinker supplied [t]) + (clinker dispatched [t]) – (clinker stock variation [t]).

The operator shall either derive the clinker / cement ratio for each of the different cement products based on the provisions of Articles 32 to 35 or calculate the ratio from the difference of cement deliveries and stock changes and all materials used as additives to the cement including by-pass dust and cement kiln dust.

By way of derogation from section 4 of Annex II, tier 1 for the emission factor shall be defined as follows:

Tier 1: The operator shall apply an emission factor of 0,525 t CO_2/t clinker.

C. **Emissions Related to Discarded Dust**

The operator shall add CO_2 emissions, from bypass dust or cement kiln dust (CKD) leaving the kiln system, corrected for a partial calcination ratio of CKD calculated as process emissions in accordance with Article 24(2). By way of derogation from section 4 of Annex II, tiers 1 and 2 for the emission factor shall be defined as follows:

Tier 1: The operator shall apply an emission factor of 0,525 t CO_2/t dust.

Tier 2: The operator shall determine the emission factor (EF) at least once annually following Articles 32 to 35 and using the following formula:

$$EF_{CKD} = \left(\frac{EF_{Cli}}{1 + EF_{Cli}} \cdot d \right) / \left(1 - \frac{EF_{Cli}}{1 + EF_{Cli}} \cdot d \right)$$

Where:

EF_{CKD} = Emission factor of partially calcined cement kiln dust [t CO_2/t CKD];

EF_{Cli} = Installation-specific emission factor of clinker [t CO_2/t clinker];

d = Degree of CKD calcination (released CO_2 as % of total carbonate CO_2 in the raw mix).

Tier 3 for the emission factor is not applicable.

▼B

D. **Emissions from non-carbonate carbon in raw meal**

The operator shall determine the emissions from non-carbonate carbon at least from limestone, shale or alternative raw materials (for example, fly ash) used in the raw meal in the kiln in accordance with Article 24(2).

▼M1

By way of derogation from section 4 of Annex II, the following tier definitions for the emission factor shall apply:

Tier 1: The content of non-carbonate carbon in the relevant raw material shall be estimated using industry best practice guidelines.

Tier 2: The content of non-carbonate carbon in the relevant raw material shall be determined at least annually following the provisions of Article 32 to 35.

By way of derogation from section 4 of Annex II, the following tier definitions for the conversion factor shall apply:

Tier 1: A conversion factor of 1 shall be applied.

Tier 2: The conversion factor shall be calculated applying industry best practice.

▼B

10. PRODUCTION OF LIME OR CALCINATION OF DOLOMITE OR MAGNESITE AS LISTED IN ANNEX I TO DIRECTIVE 2003/87/EC

▼M4

A. **Scope**

The operator shall include at least the following potential sources of CO_2 emissions: calcination of limestone, dolomite or magnesite in the raw materials, non-carbonate carbon in raw materials, conventional fossil kiln fuels, alternative fossil-based kiln fuels and raw materials, biomass kiln fuels (biomass wastes) and other fuels.

▼M5

Where the burnt lime and the CO_2 stemming from the limestone are used for purification processes, the CO_2 shall be considered emitted, unless the CO_2 is bound in a product that satisfies the conditions set out in Article 49a (1) of this Regulation.

▼M4

B. **Specific monitoring rules**

Emissions from combustion shall be monitored in accordance with section 1 of this Annex. Process emissions from carbonates in raw materials shall be monitored in accordance with section 4 of Annex II. Carbonates of calcium and magnesium shall be always taken into account. Other carbonates and non- carbonate carbon in the raw material shall be taken into account, whenever they are relevant for emission calculation.

For the input-based methodology, carbonate content values shall be adjusted for the respective moisture and gangue content of the material. In the case of magnesia production, other magnesium bearing minerals than carbonates shall be taken into account, as appropriate.

Double counting or omissions resulting from returned or by-pass material shall be avoided. When applying Method B, lime kiln dust shall be considered a separate source stream where relevant.

▼M1

C. **Emissions from non-carbonate carbon in raw materials**

The operator shall determine the emissions from non-carbonate carbon at least from limestone, shale or alternative raw materials in the kiln in accordance with Article 24(2).

▼M1

By way of derogation from section 4 of Annex II, the following tier definitions for the emission factor shall apply:

Tier 1: The content of non-carbonate carbon in the relevant raw material shall be estimated using industry best practice guidelines.

Tier 2: The content of non-carbonate carbon in the relevant raw material shall be determined at least annually following the provisions of Article 32 to 35.

By way of derogation from section 4 of Annex II, the following tier definitions for the conversion factor shall apply:

Tier 1: A conversion factor of 1 shall be applied.

Tier 2: The conversion factor shall be calculated applying industry best practice.

▼B

11. MANUFACTURE OF GLASS, GLASS FIBRE OR MINERAL WOOL INSULATION MATERIAL AS LISTED IN ANNEX I TO DIRECTIVE 2003/87/EC

A. **Scope**

The operator shall apply the provisions in this section also to installations for the production of water glass and stone/rock wool.

The operator shall include at least the following potential sources of CO_2 emissions: decomposition of alkali- and alkali earth carbonates as the result of melting the raw material, conventional fossil fuels, alternative fossil-based fuels and raw materials, biomass fuels (biomass wastes), other fuels, carbon containing additives including coke, coal dust and graphite, post-combustion of flue gases and flue gas scrubbing.

▼M4

B. **Specific monitoring rules**

Emissions from combustion, including flue gas scrubbing, shall be monitored in accordance with section 1 of this Annex. Process emissions from non-carbonate raw materials, including coke, graphite and coal dust, shall be monitored in accordance with section 4 of Annex II. Carbonates to be taken into account include at least $CaCO_3$, $MgCO_3$, Na_2CO_3, $NaHCO_3$, $BaCO_3$, Li_2CO_3, K_2CO_3, and $SrCO_3$. Only Method A shall be used.

By way of derogation from section 4 of Annex II, the following tier definitions for the emission factor of carbonate-containing raw materials shall apply.

Tier 1: Stoichiometric ratios as listed in section 2 of Annex VI shall be used. The purity of relevant input materials shall be determined by means of industry best practice.

Tier 2: The determination of the amount of relevant carbonates in each relevant input material shall be carried out in accordance with Articles 32 to 35.

By way of derogation from section 4 of Annex II for the conversion factor, only tier 1 shall be applicable for all process emissions from carbonate and non-carbonate containing raw materials.

▼B

12. MANUFACTURE OF CERAMIC PRODUCTS AS LISTED IN ANNEX I TO DIRECTIVE 2003/87/EC

▼M1

A. **Scope**

The operator shall include at least the following potential sources of CO_2 emissions: kiln fuels, calcination of limestone/dolomite and other carbonates in the raw material, limestone and other carbonates for reducing air pollutants and other flue gas cleaning, fossil/biomass additives used to induce porosity including polystyrol, residues from paper production or sawdust, non-carbonate carbon content in the clay and other raw materials.

▼B

B. **Specific monitoring rules**

▼M1

Emissions from combustion including flue gas scrubbing shall be monitored in accordance with section 1 of this Annex. Process emissions from raw meal components and additives shall be monitored in accordance with section 4 of Annex II. For ceramics based on purified or synthetic clays the operator may use either Method A or Method B. For ceramic products based on unprocessed clays and whenever clays or additives with significant non-carbonate carbon content are used, the operator shall use Method A. Carbonates of calcium shall be always taken into account. Other carbonates and non-carbonate carbon in the raw material shall be taken into account, where they are relevant for emission calculation.

▼B

Activity data for input materials for Method A may be determined by a suitable back-calculation based on industry best practice and approved by the competent authority. Such back-calculation shall take into account what metering is available for dried green products or fired products, and appropriate data sources for moisture of clay and additives and annealing loss (loss on ignition) of the materials involved.

By way of derogation from section 4 of Annex II, the following tier definitions for emission factors for process emissions of raw materials containing carbonates shall apply:

Method A (Input based):

Tier 1: A conservative value of 0,2 tonnes $CaCO_3$ (corresponding to 0,08794 tonnes of CO_2) per tonne of dry clay shall be applied for the calculation of the emission factor instead of results of analyses. All inorganic and organic carbon in the clay material shall be considered as included in this value. Additives shall be considered as not included in this value.

Tier 2: An emission factor for each source stream shall be derived and updated at least once per year using industry best practice reflecting site-specific conditions and the product mix of the installation.

Tier 3: The determination of the composition of the relevant raw materials shall be carried out in accordance with Articles 32 to 35. Stoichiometric ratios as listed in section 2 of Annex VI shall be used to convert composition data into emission factors, where relevant.

Method B (Output based):

Tier 1: A conservative value of 0,123 tonnes of CaO (corresponding to 0,09642 tonnes of CO_2) per tonne of product shall be applied for the calculation of the emission factor instead of the results of analyses. All inorganic and organic carbon in the clay material shall be considered as included in this value. Additives shall be considered as not included in this value.

Tier 2: An emission factor shall be derived and updated at least once per year using industry best practice reflecting site-specific conditions and the product mix of the installation.

Tier 3: The determination of the composition of the products shall be carried out in accordance with Articles 32 to 35. Stoichiometric ratios referred to in Annex VI section 2 Table 3 shall be used to convert composition data into emission factors assuming that all of the relevant metal oxides have been derived from respective carbonates, where relevant.

By way of derogation from section 1 of this Annex, for the scrubbing of flue gases the following tier for the emission factor shall apply:

▼B

Tier 1: The operator shall apply the stoichiometric ratio of $CaCO_3$ as shown in section 2 of Annex VI.

For scrubbing, no other tier and no conversion factor shall be used. Double counting from used limestone recycled as raw material in the same installation shall be avoided.

13. PRODUCTION OF GYPSUM PRODUCTS AND PLASTER BOARDS AS LISTED IN ANNEX I TO DIRECTIVE 2003/87/EC

A. **Scope**

The operator shall include at least CO_2 emissions from all types of combustion activities.

B. **Specific monitoring rules**

Emissions from combustion shall be monitored in accordance with section 1 of this Annex.

14. PULP AND PAPER PRODUCTION AS LISTED IN ANNEX I TO DIRECTIVE 2003/87/EC

A. **Scope**

The operator shall include at least the following potential sources of CO_2 emissions: boilers, gas turbines, and other combustion devices producing steam or power, recovery boilers and other devices burning spent pulping liquors, incinerators, lime kilns and calciners, waste gas scrubbing and fuel-fired dryers (such as infrared dryers).

B. **Specific monitoring rules**

The monitoring of emissions from combustion including flue gas scrubbing shall be carried out in accordance with section 1 of this Annex.

Process emissions from raw materials used as make-up chemicals, including at least limestone or soda ash, shall be monitored by Method A in accordance with section 4 of Annex II. CO_2 emissions from the recovery of limestone sludge in pulp production shall be assumed to be recycled biomass CO_2. Only the amount of CO_2 proportional to the input from make-up chemicals shall be assumed to give rise to fossil CO_2 emissions.

For emissions from make-up chemicals, the following tier definitions for the emission factor shall apply:

Tier 1: Stoichiometric ratios as listed in section 2 of Annex VI shall be used. The purity of relevant input materials shall be determined by means of industry best practice. The derived values shall be adjusted in accordance with the moisture and gangue content of the applied carbonate materials.

Tier 2: The determination of the amount of relevant carbonates in each relevant input material shall be carried out in accordance with Articles 32 to 35. Stoichiometric ratios as listed in section 2 of Annex VI shall be used to convert composition data into emission factors, where relevant.

For the conversion factor, only tier 1 shall be applicable.

▼B

15. PRODUCTION OF CARBON BLACK AS LISTED IN ANNEX I TO DIRECTIVE 2003/87/EC

A. **Scope**

The operator shall include at least all fuels for combustion and all fuels used as process material as sources for CO_2 emissions.

B. **Specific monitoring rules**

The monitoring of emissions from carbon black production may be monitored either as a combustion process, including flue gas scrubbing, in accordance with section 1 of this Annex or using a mass balance in accordance with Article 25 and section 3 of Annex II.

16. DETERMINATION OF NITROUS OXIDE (N_2O) EMISSIONS FROM NITRIC ACID, ADIPIC ACID, CAPROLACTAM, GLYOXAL AND GLYOXYLIC ACID PRODUCTION AS LISTED IN ANNEX I TO DIRECTIVE 2003/87/EC

A. **Scope**

Each operator shall consider for each activity from which N_2O emissions result, all sources emitting N_2O from production processes, including where N_2O emissions from production are channelled through any abatement equipment. This includes any of the following:

(a) nitric acid production – N_2O emissions from the catalytic oxidation of ammonia and/or from the NO_x/N_2O abatement units;

(b) adipic acid production – N_2O emissions including from the oxidation reaction, any direct process venting and/or any emissions control equipment;

(c) glyoxal and glyoxylic acid production – N_2O emissions including from the process reactions, any direct process venting and/or any emissions control equipment;

(d) caprolactam production – N_2O emissions including from the process reactions, any direct process venting and/or any emissions control equipment.

These provisions shall not apply to any N_2O emissions from the combustion of fuels.

B. **Determination of N_2O emissions**

B.1. *Annual N_2O emissions*

The operator shall monitor emissions of N_2O from nitric acid production using continuous emissions measurement. The operator shall monitor emissions of N_2O from adipic acid, caprolactam, glyoxal and glyoxylic acid production using a measurement-based methodology for abated emissions and a calculation-based method (based on a mass balance methodology) for temporary occurrences of unabated emissions.

For each emission source where continuous emissions measurement is applied, the operator shall consider the total annual emissions to be the sum of all hourly emissions using equation 1 given in section 3 of Annex VIII.

B.2. *Hourly N_2O emissions*

The operator shall calculate annual average hourly N_2O emissions for each source where continuous emission measurement is applied using equation 2 given in section 3 of Annex VIII.

▼B

The operator shall determine hourly N_2O concentrations in the flue gas from each emission source using a measurement-based methodology at a representative point, after the NO_x/N_2O abatement equipment, where abatement is used. The operator shall apply techniques capable of measuring N_2O concentrations of all emission sources during both abated and unabated conditions. Where uncertainties increase during such periods, the operator shall take them into account in the uncertainty assessment.

The operator shall adjust all measurements to a dry gas basis where required and report them consistently.

B.3. *Determination of flue gas flow*

The operator shall use the methods for monitoring flue gas flow set out in Article 43(5) of this Regulation for measuring the flue gas flow for N_2O emissions monitoring. For nitric acid production, the operator shall apply the method in accordance with point (a) of Article 43(5) unless it is technically not feasible. In that case and upon approval by the competent authority, the operator shall apply an alternative method, including by a mass balance methodology based on significant parameters such as ammonia input load, or determination of flow by continuous emissions flow measurement.

The flue gas flow shall be calculated in accordance with the following formula:

$$V_{\text{flue gas flow}}\ [Nm^3/h] = V_{\text{air}} * (1 - O_{2,\ \text{air}}) / (1 - O_{2,\ \text{flue gas}})$$

Where:

V_{air} = Total input air flow in Nm^3/h at standard conditions;

$O_{2,\ air}$ = Volume fraction of O_2 in dry air [= 0,2095];

$O_{2,\ flue\ gas}$ = Volume fraction of O_2 in the flue gas.

The V_{air} shall be calculated as the sum of all air flows entering the nitric acid production unit.

The operator shall apply the following formula, unless stated otherwise in its monitoring plan:

$$V_{air} = V_{prim} + V_{sec} + V_{seal}$$

Where:

V_{prim} = Primary input air flow in Nm^3/h at standard conditions;

V_{sec} = Secondary input air flow in Nm^3/h at standard conditions;

V_{seal} = Seal input air flow in Nm^3/h at standard conditions.

The operator shall determine V_{prim} by continuous flow measurement before the mixing with ammonia takes place. The operator shall determine V_{sec} by continuous flow measurement, including where the measurement is before the heat recovery unit. For V_{seal} the operator shall consider the purged airflow within the nitric acid production process.

For input air streams accounting for cumulatively less than 2,5 % of the total air flow, the competent authority may accept estimation methods for the determination of that air flow rate proposed by the operator based on industry best practices.

▼B

The operator shall provide evidence through measurements under normal operating conditions that the flue gas flow measured is sufficiently homogeneous to allow for the proposed measurement method. Where non-homogeneous flow is confirmed through these measurements, the operator shall take that into account when determining appropriate monitoring methods and when calculating the uncertainty in the N_2O emissions.

The operator shall adjust all measurements to a dry gas basis and report them consistently.

B.4. *Oxygen (O_2) concentrations*

The operator shall measure the oxygen concentrations in the flue gas where necessary for calculating the flue gas flow in accordance with subsection B.3 of this section of Annex IV. In doing so, the operator shall comply with the requirements for concentration measurements within Article 41(1) and (2). In determining the uncertainty of N_2O emissions, the operator shall take the uncertainty of O_2 concentration measurements into account.

The operator shall adjust all measurements to a dry gas basis where required and report them consistently.

B.5. *Calculation of N_2O emissions*

For specific periods of unabated emissions of N_2O from adipic acid, caprolactam, glyoxal and glyoxylic acid production, including unabated emissions from venting for safety reasons and when abatement plant fails, and where continuous emissions monitoring of N_2O is technically not feasible, the operator shall subject to the approval of the specific methodology by the competent authority calculate N_2O emissions using a mass balance methodology. For this purpose the overall uncertainty shall be similar to the result of applying the tier requirements of Article 41(1) and (2). The operator shall base the calculation method on the maximum potential emission rate of N_2O from the chemical reaction taking place at the time and the period of the emission.

The operator shall take the uncertainty in any calculated emissions for a specific emission source into account in determining the annual average hourly uncertainty for the emission source.

B.6. *Determination of activity production rates*

Production rates shall be calculated using daily production reports and hours of operation.

B.7. *Sampling rates*

Valid hourly averages or averages for shorter reference periods shall be calculated in accordance with Article 44 for:

(a) concentration of N_2O in the flue gas;

(b) total flue gas flow where this is measured directly and where required;

(c) all gas flows and oxygen concentrations necessary to determine the total flue gas flow indirectly.

C. **Determination of annual CO_2 equivalent – $CO_{2(e)}$**

The operator shall convert the total annual N_2O emissions from all emissions sources, measured in tonnes to three decimal places, to annual $CO_{2(e)}$ in rounded tonnes, using the following formula and the GWP values in Annex VI section 3:

$$CO_{2(e)}\ [t] = N_2O_{annual}[t] \times GWP_{N2O}$$

Where:

▼B

N_2O_{annual} = total annual N_2O emissions, calculated according to equation 1 given in section 3 of Annex VIII.

The total annual $CO_{2(e)}$ generated by all emission sources and any direct CO_2 emissions from other emission sources included under the greenhouse gas permit shall be added to the total annual CO_2 emissions generated by the installation and shall be used for reporting and surrendering allowances.

Total annual emissions of N_2O shall be reported in tonnes to three decimal places and as $CO_{2(e)}$ in rounded tonnes.

17. PRODUCTION OF AMMONIA AS LISTED IN ANNEX I TO DIRECTIVE 2003/87/EC

A. **Scope**

The operator shall include at least the following potential emission sources for CO_2 emissions: combustion of fuels supplying the heat for reforming or partial oxidation, fuels used as process input in the ammonia production process (reforming or partial oxidation), fuels used for other combustion processes including for the purpose of producing hot water or steam.

B. **Specific monitoring rules**

For monitoring of emissions from combustion processes and from fuels used as process inputs, the standard methodology in accordance with Article 24 and section 1 of this Annex shall be applied.

▼M5

Where CO_2 from ammonia production is used as feedstock for the production of urea or other chemicals, or transferred out of the installation for any use not covered by Article 49(1) of this Regulation, the related amount of CO_2 shall be considered as emitted by the installation producing the CO_2 , unless the CO_2 is bound in a product that satisfies the conditions set out in Article 49a(1) of this Regulation.

▼B

18. PRODUCTION OF BULK ORGANIC CHEMICALS AS LISTED IN ANNEX I TO DIRECTIVE 2003/87/EC

A. **Scope**

The operator shall take into account at least the following sources of CO_2 emissions: cracking (catalytic and non-catalytic), reforming, partial or full oxidation, similar processes which lead to CO_2 emissions from carbon contained in hydrocarbon based feedstock, combustion of waste gases and flaring, and the burning of fuel in other combustion processes.

B. **Specific monitoring rules**

Where the production of bulk organic chemicals is technically integrated in a mineral oil refinery, the operator of that installation shall apply the relevant provisions of section 2 of this Annex.

Notwithstanding the first subparagraph, the operator shall monitor emissions from combustion processes where the fuels used do not take part in or stem from chemical reactions for the production of bulk organic chemicals using the standard methodology in accordance with Article 24 and section 1 of this Annex. In all other cases, the operator may choose to monitor the emissions from bulk organic chemicals production by mass balance methodology in accordance with Article 25 or the standard methodology in accordance with Article 24. Where using the standard methodology, the operator shall provide evidence to the competent authority that the chosen methodology covers all relevant emissions that would also be covered by a mass-balance methodology.

▼B

For the determination of the carbon content under Tier 1, the reference emission factors as listed in Table 5 in Annex VI shall be applied. For substances not listed in Table 5 of Annex VI or other provisions of this Regulation, the operator shall calculate the carbon content from the stoichiometric carbon content in the pure substance and the concentration of the substance in the input or output stream.

19. PRODUCTION OF HYDROGEN AND SYNTHESIS GAS AS LISTED IN ANNEX I TO DIRECTIVE 2003/87/EC

A. **Scope**

The operator shall include at least the following potential emission sources for CO_2 emissions: fuels used in the hydrogen or synthesis gas production process (reforming or partial oxidation), and fuels used for other combustion processes including for the purpose of producing hot water or steam. Synthesis gas produced shall be considered as source stream under the mass balance methodology.

B. **Specific monitoring rules**

For monitoring of emissions from combustion processes and from fuels used as process inputs in hydrogen production, the standard methodology in accordance with Article 24 and section 1 of this Annex shall be used.

For the monitoring of emissions from the production of synthesis gas, a mass balance in accordance with Article 25 shall be used. For emissions from separate combustion processes, the operator may choose to include them in the mass balance or to use the standard methodology in accordance with Article 24 at least for a part of the source streams, avoiding any gaps or double counting of emissions.

Where hydrogen and synthesis gas are produced at the same installation, the operator shall calculate CO_2 emissions using either separate methodologies for hydrogen and for synthesis gas as outlined in the first two paragraphs of this subsection, or using one common mass balance.

20. PRODUCTION OF SODA ASH AND SODIUM BICARBONATE AS LISTED IN ANNEX I TO DIRECTIVE 2003/87/EC

A. **Scope**

The emission sources and source streams for CO_2 emissions from installations for the production of soda ash and sodium bicarbonate shall include:

(a) fuels used for combustion processes, including fuels used for the purpose of producing hot water or steam;

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(b) raw materials, including vent gas from calcination of limestone;

(c) waste gases from washing or filtration steps after carbonation.

B. **Specific monitoring rules**

Emissions from combustion processes, including flue gas scrubbing shall be monitored in accordance with Section 1 of this Annex. Process emissions from raw material components and additives shall be monitored in accordance with Section 4 of Annex II to this Regulation.

Intermediary CO_2 for the production of soda ash shall be considered as emitted by the installation producing the CO_2, unless the CO_2 is bound in a product that satisfies the conditions set out in Article 49a(1) of this Regulation.

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21. DETERMINATION OF GREENHOUSE GAS EMISSIONS FROM CO_2 CAPTURE ACTIVITIES FOR THE PURPOSES OF TRANSPORT AND GEOLOGICAL STORAGE IN A STORAGE SITE PERMITTED UNDER DIRECTIVE 2009/31/EC

A. **Scope**

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CO_2 capture shall be performed either by a dedicated installation receiving CO_2 by transfer from one or more other installations, or by the same installation carrying out the activities producing the captured CO_2 under the same greenhouse gas emissions permit. All parts of the installation related to CO_2 capture, and transfer to a CO_2 transport infrastructure or to a site for geological storage of CO_2 greenhouse gas emissions, including any functionally connected ancillary facilities, such as CO_2 intermediate storage, booster, liquefaction, gasification, purification stations or heaters, shall be included in the greenhouse gas emissions permit and accounted for in the associated monitoring plan. In the case of the installation carrying out other activities covered by Directive 2003/87/EC, the emissions of those activities shall be monitored in accordance with the other relevant sections of this Annex.

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The operator of a CO_2 capture activity shall at least include the following potential sources of CO_2 emission:

(a) CO_2 transferred to the capture installation;

(b) combustion and other associated activities at the installation that are related to the capture activity, including fuel and input material use.

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B. **Quantification of transferred and emitted CO_2 amounts**

B.1. *Installation level quantification*

Each operator shall calculate the emissions by taking into account the potential CO_2 emissions from all emission relevant processes at the installation, as well as the amount of CO_2 captured and transferred to the CO_2 infrastructure, using the following formula:

$$E_{captureinstallation} = T_{input} + E_{withoutcapture} - T_{forstorage}$$

Where:

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

T_{input} = Amount of CO_2 transferred to the capture installation, determined either based on one or more source streams as in a mass balance methodology in accordance with Article 25 or based on a measurement-based methodology in accordance with Article 40 to 46 and Article 49 of this Regulation.

$E_{without\ capture}$ = Emissions of the installation assuming the CO_2 were not captured, meaning the sum of the emissions from all other activities at the installation, monitored in accordance with relevant sections of Annex IV, including Method B in Section 22 of Annex IV to this Regulation for any functionally connected ancillary facilities;

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$T_{for\ storage}$ = Amount of CO_2 transferred to a CO_2 transport infrastructure or a storage site, determined either based on one or more source streams as in a mass balance methodology in accordance with Article 25 or based on a measurement-based methodology in accordance with Article 40 to 46 and Article 49 of this Regulation.

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

In cases of stand-alone capture installations, the operators of these installations shall take into consideration the following:

(a) the operator shall consider $E_{without\ capture}$ to represent the amount of emissions that occur from other sources than the CO_2 transferred to the installation for capture. The operator shall determine those emissions in accordance with this Regulation;

(b) by way of derogation from the monitoring methodology described in this section, the operator may monitor the emissions of the installation by using Method B as described in Section 22 of Annex IV to this Regulation.

In the case of stand-alone capture installations, the operator of the installation transferring CO_2 to the capture installation shall deduct the amount T_{input} from the emissions of its installation based either as one or more source streams as in a mass balance methodology in accordance with Article 25 or based on a measurement-based methodology in accordance with Article 49 of this Regulation.

B.2. *Determination of transferred CO_2*

Each operator shall determine the amount of CO_2 transferred from and to the capture installation based either as one or more source streams as in a mass balance methodology in accordance with Article 25 or based on a measurement-based methodology in accordance Articles 40 to 46 and Article 49 of this Regulation.

22. DETERMINATION OF GREENHOUSE GAS EMISSIONS FROM THE TRANSPORT OF CO_2 FOR GEOLOGICAL STORAGE IN A STORAGE SITE PERMITTED UNDER DIRECTIVE 2009/31/EC

A. **Scope**

The boundaries for monitoring and reporting emissions from CO_2 transport shall be laid down in the CO_2 transport infrastructure's greenhouse gas emissions permit, including all ancillary facilities functionally connected to the transport infrastructure, such as CO_2 intermediate storage, booster, liquefaction, gasification, purification stations or heaters. Each transport infrastructure shall have a minimum of one start point and one end point, each connected to other installations or CO_2 transport infrastructure carrying out one or more of the activities: capture, transport or geological storage of CO_2. Start and end points may be set at bifurcations of the transport infrastructure and at cross national borders. Start and end points as well as the installations or CO_2 transport infrastructure they are connecting to, shall be laid down in the greenhouse gas emissions permit.

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Each operator of a CO_2 transport infrastructure shall consider at least the following potential emission sources for CO_2 emissions: combustion and other processes at installations functionally connected to the transport infrastructure including booster stations and liquefaction stations; combustion units, including internal combustion units in CO_2 transport vehicles, to the extent emissions are not subject to surrender obligations related to activities listed in Annexes I or III to Directive 2003/87/EC in that same reporting year; fugitive emissions from the transport infrastructure; vented emissions from the transport infrastructure; and emissions from leakage incidents in the transport infrastructure.

CO_2 transported for purposes other than for geological storage in a storage site permitted under Directive 2009/31/EC shall not be part of the boundaries for monitoring and reporting emissions by the CO_2 transport infrastructure. In cases where the same infrastructure is used for the transport of CO_2 for multiple purposes, including for geological storage in a storage site permitted under Directive 2009/31/EC, in a manner where the different consignments cannot be distinguished, the operator of a CO_2 transport infrastructure shall indicate this in the greenhouse gas emissions permit and establish a method for recording and documenting the volumes of CO_2 transported for purposes other for geological storage in a storage site permitted under Directive 2009/31/EC. The operator of a CO_2 transport infrastructure shall monitor emissions resulting from the total volume of CO_2 transported but shall report as emitted the share of the emissions corresponding to the volume of CO_2 transported for geological storage in a storage site permitted under Directive 2009/31/EC divided by total volume of CO_2 transported.

B. **Quantification Methodologies for CO_2**

The CO_2 transport infrastructure operator shall determine emissions using one of the following methods:

(a) Method A (overall mass balance of all input and output streams) set out in subsection B.1;

(b) Method B (monitoring of emission sources individually) set out in subsection B.2.

The operator shall apply Method B unless the operator can demonstrate to the competent authority that the application of Method A will lead to more reliable results with lower uncertainty of the overall emissions, using best available technology and knowledge at the time of the application for the greenhouse gas emissions permit and approval of the monitoring plan, without incurring unreasonable costs. Where Method B is applied, each operator shall demonstrate to the satisfaction of the competent authority that the overall uncertainty for the annual level of greenhouse gas emissions for the operator's transport infrastructure does not exceed 7,5 %.

The operator of a CO_2 transport infrastructure using Method B shall not add CO_2 received from another installation or CO_2 transport infrastructure permitted in accordance with Directive 2003/87/EC to its calculated level of emissions, and shall not subtract from its calculated level of emissions any CO_2 transferred to another installation or CO_2 transport infrastructure permitted in accordance with Directive 2003/87/EC.

Each operator of a CO_2 transport infrastructure shall use Method A for the validation of the results of Method B at least once annually. For that validation, the operator may use lower tiers for the application of Method A.

B.1. **Method A**

Each operator shall determine emissions in accordance with the following formula:

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$$\text{Emissions [t } CO_2\text{]} = E_{\text{transport infrastructure}} + \Sigma i T_{IN,i} - \Sigma i T_{OUT,i} - \Delta E_{\text{in transit}}$$

Where:

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

$E_{\text{transport infrastructure}}$ = Amount of CO_2 [t CO_2] from the transport infrastructure's own activity, meaning not emissions stemming from the CO_2 transported, but being emitted from combustion or other processes functionally connected to the transport infrastructure, monitored in accordance with the relevant sections of Annex IV to this Regulation;

$T_{IN,i}$ = Amount of CO_2 transferred to the transport infrastructure at entry point *i*, determined either based on one or more source streams as in a mass balance methodology in accordance with Article 25 or based on a measurement-based methodology in accordance with Articles 40 to 46 and Article 49 of this Regulation.

$T_{OUT,i}$ = Amount of CO_2 transferred out of the transport infrastructure at exit point i, determined either based on one or more source streams as in a mass balance methodology in accordance with Article 25 or based on a measurement-based methodology in accordance with Articles 40 to 46 and Article 49 of this Regulation.

$\Delta E_{\text{in transit}}$ = Amount of CO_2 transferred to the transport infrastructure at entry point *i*, that is not transferred to another installation or CO2 transport infrastructure in the same reporting period but by the deadline indicated in Article 49(7) of this Regulation in the year after the reporting period. Corresponding amounts shall not be taken into account for $T_{OUT,i}$ for the subsequent reporting period.

B.2. **Method B**

Each operator shall determine emissions considering all processes relevant to emissions at the installation as well as the amount of CO_2 captured and transferred to the transport infrastructure using the following formula:

$$\text{Emissions [t } CO_2\text{]} = E_{\text{fugitive}} + E_{\text{vented}} + E_{\text{leakage events}} + E_{\text{transport infrastructue}}$$

Where:

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

E_{fugitive} = Amount of fugitive emissions [t CO_2] from CO_2 transported in the transport infrastructure, including from seals, valves, intermediate compressor stations and intermediate storage facilities;

E_{vented} = Amount of vented emissions [t CO_2] from CO_2 transported in the transport infrastructure;

$E_{\text{leakage events}}$ = Amount of CO_2 [t CO_2] transported in the transport infrastructure, which is emitted as the result of the failure of one or more components of the transport infrastructure;

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$E_{transport\ infrastructure}$ = Amount of CO_2 [t CO_2] from the transport infrastructure's own activity, meaning not emissions stemming from the CO_2 transported, but being emitted from combustion or other processes functionally connected to the transport infrastructure, monitored in accordance with the relevant sections of Annex IV to this Regulation.

B.2.1. *Fugitive emissions from the transport infrastructure*

The operator of a CO_2 transport infrastructure shall consider fugitive emissions from at least any of the following types of equipment:

(a) seals;

(b) measurement devices;

(c) valves;

(d) intermediate compressor stations;

(e) intermediate storage facilities including those mounted onto CO_2 transport vehicles.

The operator shall determine average emission rates *ER* (expressed in g CO_2/unit time) per piece of equipment per occurrence where fugitive emissions can be anticipated at the beginning of operation, and by the end of the first reporting year in which the transport infrastructure is in operation at the latest. The operator shall review those rates at least every 5 years in the light of the best available techniques and knowledge.

The operator shall calculate fugitive emissions by multiplying the number of pieces of equipment in each category by the emission rate and adding up the results for the single categories as shown in the following equation:

$$Fugitive\ Em\ [tCO_2] = \left(\sum_{Category} ER\left[gCO_2/occurr\right] \bullet N_{occur}\right)/10^6$$

The number of occurrences (N_{occurr}) shall be the number of pieces of the given equipment per category, multiplied by the number of time units per year.

B.2.2. *Emissions from leakage events*

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

B.2.3. *Vented emissions*

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

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23. GEOLOGICAL STORAGE OF CO_2 IN A STORAGE SITE PERMITTED UNDER DIRECTIVE 2009/31/EC

A. **Scope**

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The competent authority shall base the boundaries for monitoring and reporting of emissions from geological storage of CO_2 on the delimitation of the storage site and storage complex as specified in the permit pursuant to Directive 2009/31/EC, as well as all ancillary facilities functionally connected to the storage complex, such as CO_2 intermediate storage, booster, liquefaction, gasification, purification stations or heaters. Where leakages from the storage complex are identified and lead to emissions or release of CO_2 into the water column, the operator shall immediately carry out all the following:

(a) notify the competent authority;

(b) include the leakage as a source stream or an emission source for the respective installation;

(c) monitor and report the emissions.

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Only when corrective measures in accordance with Article 16 of Directive 2009/31/EC have been taken and emissions or release into the water column from that leakage can no longer be detected shall the operator delete the respective leakage as emission source from the monitoring plan and no longer monitor and report those emissions.

Each operator of a geological storage activity shall consider at least the following potential emission sources for CO_2 overall: fuel use by associated booster stations and other combustion activities including on-site power plants; venting from injection or enhanced hydrocarbon recovery operations; fugitive emissions from injection; breakthrough CO_2 from enhanced hydrocarbon recovery operations; and leakages.

B. **Quantification of CO_2 emissions**

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The operator of the geological storage activity shall not add CO_2 received from another installation to its calculated level of emissions, and shall not subtract from its calculated level of emissions any CO_2 which is geologically stored in the storage site or which is transferred to another installation. The operator shall monitor emissions from any ancillary facilities functionally connected to the storage complex in accordance with the provisions set out in Section 22 of Annex IV to this Regulation.

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B.1. *Vented and fugitive emissions from injection*

The operator shall determine emissions from venting and fugitive emissions as follows:

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

Where:

V CO_2 = amount of CO_2 vented;

F CO_2 = amount of CO_2 from fugitive emissions.

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Each operator shall determine V CO_2 either as one or more source streams as in a mass balance methodology in accordance with Article 25 or by using a measurement-based methodology in accordance with Articles 41 to 46 of this Regulation. By way of derogation from the first sentence and upon approval by the competent authority, the operator may include in the

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monitoring plan an appropriate methodology for determining V CO_2 based on industry best practice, where the application of monitoring methodologies referred to in the first sentence would incur unreasonable costs or the operator can demonstrate that the methodology based on industry best practice allows the amounts to be determined with at least the same accuracy as measurement-based methodologies.

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The operator shall consider F CO_2 as one source, meaning that the uncertainty requirements associated with the tiers in accordance with section 1 of Annex VIII are applied to the total value instead of the individual emission points. Each operator shall provide in the monitoring plan an analysis regarding potential sources of fugitive emissions, and provide a suitable documented methodology to calculate or measure the amount of F CO_2, based on industry best practice guidelines. For the determination of F CO_2 the operator may use data collected in accordance with Article 32 to 35 and Annex II(1.1)(e) to (h) of Directive 2009/31/EC for the injection facility, where they comply with the requirements of this Regulation.

B.2. *Vented and fugitive emissions from enhanced hydrocarbon recovery operations*

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Each operator shall consider at least the following potential additional emission sources from enhanced hydrocarbon recovery (EHR):

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(a) the oil-gas separation units and gas recycling plant, where fugitive emissions of CO_2 could occur;

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

(c) the CO_2 purge system, to avoid high concentrations of CO_2 extinguishing the flare.

Each operator shall determine fugitive emissions or vented CO_2 in accordance with subsection B.1 of this section of Annex IV.

Each operator shall determine emissions from the flare stack in accordance with subsection D of section 1 of this Annex, taking into account potential inherent CO_2 in the flare gas in accordance with Article 48.

B.3. *Leakage from the storage complex*

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

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

Where:

L CO_2 = the mass of CO_2 emitted or released per calendar day due to the leakage in accordance with all of the following:

(a) for each calendar day for which leakage is monitored, each operator shall calculate L CO_2 as the average of the mass leaked per hour [t CO_2/h] multiplied by 24;

(b) each operator shall determine the mass leaked per hour in accordance with the provisions in the approved monitoring plan for the storage site and the leakage;

(c) for each calendar day prior to commencement of monitoring, the operator shall take the mass leaked per day to equal the mass leaked per day for the first day of monitoring ensuring no under-estimation occurs;

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T_{start} = the latest of:

(a) the last date when no emissions or release of CO_2 into the water column from the source under consideration were reported;

(b) the date the CO_2 injection started;

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

T_{end} = the date by which corrective measures in accordance with Article 16 of Directive 2009/31/EC have been taken and emissions or release of CO_2 into the water column can no longer be detected.

The competent authority shall approve and allow the use of other methods for the quantification of emissions or release of CO_2 into the water column from leakages where the operator can show to the satisfaction of the competent authority that such methods lead to a higher accuracy than the methodology set out in this subsection.

The operator shall quantify the amount of emissions leaked from the storage complex for each of the leakage events with a maximum overall uncertainty over the reporting period of 7,5 %. Where the overall uncertainty of the applied quantification methodology exceeds 7,5 %, each operator shall apply an adjustment, as follows:

$$CO_{2,Reported}\ [t\ CO_2] = CO_{2,Quantified}\ [t\ CO_2] \times (1 + (Uncertainty_{System}\ [\%]/100) - 0{,}075)$$

Where:

$CO_{2,Reported}$ = the amount of CO_2 to be included in the annual emission report with regards to the leakage event in question;

$CO_{2,Quantified}$ = the amount of CO_2 determined through the used quantification methodology for the leakage event in question;

$Uncertainty_{System}$ = the level of uncertainty associated with the quantification methodology used for the leakage event in question.

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ANNEX V

▼M4

Minimum tier requirements for calculation-based methodologies involving category A installations referred to in Article 19(2), point (a), and category A entities referred to in Article 75e(2), point (a), and calculation factors for commercial standard fuels used by category B and C installations referred to in Article 19(2), points (b) and (c), and category B entities referred to in Article 75e(2), point (b)

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Table 1

Minimum tiers to be applied for calculation-based methodologies in the case of category A installations and in the case of calculation factors for commercial standard fuels for all installations in accordance with point (a) of Article 26(1)

Activity/Source stream type	Activity data		Emission factor (*)	Compositio-n data (carbon content) (*)	Oxidation factor	Conversion factor
	Amount of fuel or material	Net calorific value				
Combustion of fuels						
Commercial standard fuels	2	2a/2b	2a/2b	n.a.	1	n.a.
Other gaseous and liquid fuels	2	2a/2b	2a/2b	n.a.	1	n.a.
▼M4 Solid fuels, excluding waste	1	2a/2b	2a/2b	n.a.	1	n.a.
Waste	1	2a/2b	2a/2b	n.a.	1	n.a.
▼B Mass balance methodology for Gas Processing Terminals	1	n.a.	n.a.	1	n.a.	n.a.
Flares	1	n.a.	1	n.a.	1	n.a.
Scrubbing (carbonate)	1	n.a.	1	n.a.	n.a.	1
Scrubbing (gypsum)	1	n.a.	1	n.a.	n.a.	1
Scrubbing (urea)	1	1	1	n.a.	1	n.a.
▼M5 **Refining of oil**						
▼B Catalytic cracker regeneration	1	n.a.	n.a.	n.a.	n.a.	n.a.
Production of coke						
Mass balance	1	n.a.	n.a.	2	n.a.	n.a.
Fuel as process input	1	2	2	n.a.	n.a.	n.a.
Metal ore roasting and sintering						
Mass balance	1	n.a.	n.a.	2	n.a.	n.a.
Carbonate input	1	n.a.	1	n.a.	n.a.	1
Production of iron and steel						
Mass balance	1	n.a.	n.a.	2	n.a.	n.a.
Fuel as process input	1	2a/2b	2	n.a.	n.a.	n.a.

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Activity/Source stream type	Activity data		Emission factor (*)	Compositio-n data (carbon content) (*)	Oxidation factor	Conversion factor
	Amount of fuel or material	Net calorific value				
Production or processing of ferrous and non-ferrous metals, including secondary aluminium						
Mass balance	1	n.a.	n.a.	2	n.a.	n.a.
Process emissions	1	n.a.	1	n.a.	n.a.	1

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Primary aluminium or alumina production

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Mass balance for CO_2 emissions	1	n.a.	n.a.	2	n.a.	n.a.
PFC emissions (slope method)	1	n.a.	1	n.a.	n.a.	n.a.
PFC emissions (overvoltage method)	1	n.a.	1	n.a.	n.a.	n.a.
Production of cement clinker						
Kiln input based (Method A)	1	n.a.	1	n.a.	n.a.	1
Clinker output (Method B)	1	n.a.	1	n.a.	n.a.	1
CKD	1	n.a.	1	n.a.	n.a.	n.a.
Non-carbonate carbon input	1	n.a.	1	n.a.	n.a.	1
Production of lime and calcination of dolomite and magnesite						
Carbonates (Method A)	1	n.a.	1	n.a.	n.a.	1
Other process inputs	1	n.a.	1	n.a.	n.a.	1
Alkali earth oxide (Method B)	1	n.a.	1	n.a.	n.a.	1
Manufacture of glass and mineral wool						
Carbonate inputs	1	n.a.	1	n.a.	n.a.	n.a.
Other process inputs	1	n.a.	1	n.a.	n.a.	1
Manufacture of ceramic products						
Carbon inputs (Method A)	1	n.a.	1	n.a.	n.a.	1
Other process inputs	1	n.a.	1	n.a.	n.a.	1
Alkali oxide (Method B)	1	n.a.	1	n.a.	n.a.	1
Scrubbing	1	n.a.	1	n.a.	n.a.	n.a.

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Activity/Source stream type	Activity data		Emission factor (*)	Compositio-n data (carbon content) (*)	Oxidation factor	Conversion factor
	Amount of fuel or material	Net calorific value				
Production of gypsum and plasterboard: see combustion of fuels						
Production of pulp and paper						
Make up chemicals	1	n.a.	1	n.a.	n.a.	n.a.
Production of carbon black						
Mass balance methodology	1	n.a.	n.a.	1	n.a.	n.a.
Production of ammonia						
Fuel as process input	2	2a/2b	2a/2b	n.a.	n.a.	n.a.
Production of bulk organic chemicals						
Mass balance	1	n.a.	n.a.	2	n.a.	n.a.
Production of hydrogen and synthesis gas						
Fuel as process input	2	2a/2b	2a/2b	n.a.	n.a.	n.a.
Mass balance	1	n.a.	n.a.	2	n.a.	n.a.
Production of soda ash and sodium bicarbonate						
Mass balance	1	n.a.	n.a.	2	n.a.	n.a.

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CO_2 capture, transfer and geological storage in storage site permitted under Directive 2009/31/EC

Mass balance of CO_2 transferred	2	n.a.	n.a.	2	n.a.	n.a.
CO_2 venting, leakage, and fugitive emissions	2	n.a.	n.a.	2	n.a.	n.a.

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('n.a.' means 'not applicable')

(*) Tiers for the emission factor relate to the preliminary emission factor, and carbon content relates to the total carbon content. For mixed materials, the biomass fraction must be determined separately. Tier 1 shall be the minimum tier to be applied for the biomass fraction in the case of category A installations and in the case of commercial standard fuels for all installations in accordance with point (a) of Article 26(1).

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Table 2

Minimum tiers to be applied for calculation-based methodologies in the case of category A entities and in the case of calculation factors for commercial standard fuels for regulated entities in accordance with Article 75e(2), point (a)

Fuels stream type	Amount of fuel released	Unit conversion factor	Emission factor (*)
Commercial standard fuels	2	2a/2b	2a/2b
Other gaseous and liquid fuels	2	2a/2b	2a/2b
Solid fuels	1	2a/2b	2a/2b

(*) Tiers for the emission factor relate to the preliminary emission factor. For mixed materials, the biomass fraction shall be determined separately. Tier 1 shall be the minimum tier to be applied for the biomass fraction in the case of category A entities and in the case of commercial standard fuels for all regulated entities in accordance with Article 75e(2), point (a)

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ANNEX VI

Reference values for calculation factors (Article 31(1)(a))

1. FUEL EMISSION FACTORS RELATED TO NET CALORIFIC VALUES (NCV)

Table 1

Fuel emission factors related to net calorific value (NCV) and net calorific values per mass of fuel.

Fuel type description	Emission factor (t CO_2/TJ)	Net calorific value (TJ/Gg)	Source
Crude oil	73,3	42,3	IPCC 2006 GL
Orimulsion	77,0	27,5	IPCC 2006 GL
Natural gas liquids	64,2	44,2	IPCC 2006 GL
Motor gasoline	69,3	44,3	IPCC 2006 GL
Kerosene (other than jet kerosene)	71,9	43,8	IPCC 2006 GL
Shale oil	73,3	38,1	IPCC 2006 GL
Gas/Diesel oil	74,1	43,0	IPCC 2006 GL
Residual fuel oil	77,4	40,4	IPCC 2006 GL
Liquefied petroleum gases	63,1	47,3	IPCC 2006 GL
Ethane	61,6	46,4	IPCC 2006 GL
Naphtha	73,3	44,5	IPCC 2006 GL
Bitumen	80,7	40,2	IPCC 2006 GL
Lubricants	73,3	40,2	IPCC 2006 GL
Petroleum coke	97,5	32,5	IPCC 2006 GL
Refinery feedstocks	73,3	43,0	IPCC 2006 GL
Refinery gas	57,6	49,5	IPCC 2006 GL
Paraffin waxes	73,3	40,2	IPCC 2006 GL
White spirit and SBP	73,3	40,2	IPCC 2006 GL

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Fuel type description	Emission factor (t CO_2/TJ)	Net calorific value (TJ/Gg)	Source
Other petroleum products	73,3	40,2	IPCC 2006 GL
Anthracite	98,3	26,7	IPCC 2006 GL
Coking coal	94,6	28,2	IPCC 2006 GL
Other bituminous coal	94,6	25,8	IPCC 2006 GL
Sub-bituminous coal	96,1	18,9	IPCC 2006 GL
Lignite	101,0	11,9	IPCC 2006 GL
Oil shale and tar sands	107,0	8,9	IPCC 2006 GL
Patent fuel	97,5	20,7	IPCC 2006 GL
Coke oven coke and lignite coke	107,0	28,2	IPCC 2006 GL
Gas coke	107,0	28,2	IPCC 2006 GL
Coal tar	80,7	28,0	IPCC 2006 GL
Gas works gas	44,4	38,7	IPCC 2006 GL
Coke oven gas	44,4	38,7	IPCC 2006 GL
Blast furnace gas	260	2,47	IPCC 2006 GL
Oxygen steel furnace gas	182	7,06	IPCC 2006 GL
Natural gas	56,1	48,0	IPCC 2006 GL
Industrial wastes	143	n.a.	IPCC 2006 GL
Waste oils	73,3	40,2	IPCC 2006 GL
Peat	106,0	9,76	IPCC 2006 GL
Wood/wood waste	—	15,6	IPCC 2006 GL
Other primary solid biomass	—	11,6	IPCC 2006 GL (only NCV)
Charcoal	—	29,5	IPCC 2006 GL (only NCV)
Biogasoline	—	27,0	IPCC 2006 GL (only NCV)

▼B

Fuel type description	Emission factor (t CO_2/TJ)	Net calorific value (TJ/Gg)	Source
Biodiesels	—	27,0	IPCC 2006 GL (only NCV)
Other liquid biofuels	—	27,4	IPCC 2006 GL (only NCV)
Landfill gas	—	50,4	IPCC 2006 GL (only NCV)
Sludge gas	—	50,4	IPCC 2006 GL (only NCV)
Other biogas	—	50,4	IPCC 2006 GL (only NCV)
Waste tyres	85,0 ([1])	n.a.	WBCSD CSI
▼M4 Municipal waste (non-biomass fraction)	91,7	n.a.	IPCC 2006 GL
▼B Carbon monoxide	155,2 ([2])	10,1	J. Falbe and M. Regitz, Römpp Chemie Lexikon, Stuttgart, 1995
Methane	54,9 ([3])	50,0	J. Falbe and M. Regitz, Römpp Chemie Lexikon, Stuttgart, 1995

([1]) This value is the preliminary emission factor, i.e. before application of a biomass fraction, if applicable.
([2]) Based on NCV of 10,12 TJ/t
([3]) Based on NCV of 50,01 TJ/t

2. EMISSION FACTORS RELATED TO PROCESS EMISSIONS

Table 2

Stoichiometric emission factor for process emissions from carbonate decomposition (Method A)

Carbonate	Emission factor [t CO_2/ t Carbonate]
$CaCO_3$	0,440
$MgCO_3$	0,522
Na_2CO_3	0,415
$BaCO_3$	0,223
Li_2CO_3	0,596
K_2CO_3	0,318
$SrCO_3$	0,298
$NaHCO_3$	0,524
$FeCO_3$	0,380

▼B

Carbonate	Emission factor [t CO_2/ t Carbonate]
General	Emission factor = [$M(CO_2)$] / {Y * [M(x)] + Z *[$M(CO_3^{2-})$]} X = metal M(x) = molecular weight of X in [g/mol] $M(CO_2)$ = molecular weight of CO_2 in [g/mol] $M(CO_3^{2-})$ = molecular weight of CO_3^{2-} in [g/mol] Y = stoichiometric number of X Z = stoichiometric number of CO_3^{2-}

Table 3

Stoichiometric emission factor for process emissions from carbonate decomposition based on alkali earth oxides (Method B)

Oxide	Emission factor [t CO_2/ t Oxide]
CaO	0,785
MgO	1,092
BaO	0,287
general: X_YO_Z	Emission factor = [$M(CO_2)$] / {Y * [M(x)] + Z * [M(O)]} X = alkali earth or alkali metal M(x) = molecular weight of X in [g/mol] $M(CO_2)$ = molecular weight of CO_2 [g/mol] M(O) = molecular weight of O [g/mol] Y = stoichiometric number of X = 1 (for alkali earth metals) = 2 (for alkali metals) Z = stoichiometric number of O = 1

Table 4

Emission factors for process emissions from other process materials (production of iron and steel, and processing of ferrous metals) ([1])

Input or output material	Carbon content (t C/t)	Emission factor (t CO_2/t)
Direct reduced iron (DRI)	0,0191	0,07
EAF carbon electrodes	0,8188	3,00
EAF charge carbon	0,8297	3,04
Hot briquetted iron	0,0191	0,07
Oxygen steel furnace gas	0,3493	1,28

([1]) IPCC 2006 Guidelines for National Greenhouse Gas Inventories

▼B

Input or output material	Carbon content (t C/t)	Emission factor (t CO_2/t)
Petroleum coke	0,8706	3,19
Pig iron	0,0409	0,15
Iron / iron scrap	0,0409	0,15
Steel / steel scrap	0,0109	0,04

Table 5

Stoichiometric emission factors for process emissions from other process materials (Bulk organic chemicals) ([1])

Substance	Carbon content (t C/t)	Emission factor (t CO_2 / t)
Acetonitril	0,5852	2,144
Acrylonitrile	0,6664	2,442
Butadiene	0,888	3,254
Carbon black	0,97	3,554
Ethylene	0,856	3,136
Ethylene dichloride	0,245	0,898
Ethylene glycol	0,387	1,418
Ethylene oxide	0,545	1,997
Hydrogen cyanide	0,4444	1,628
Methanol	0,375	1,374
Methane	0,749	2,744
Propane	0,817	2,993
Propylene	0,8563	3,137
Vinyl chloride monomer	0,384	1,407

([1]) IPCC 2006 Guidelines for National Greenhouse Gas Inventories

▼B

3. GLOBAL WARMING POTENTIALS FOR NON-CO_2 GREENHOUSE GASES

▼M1

Table 6

Global warming potentials

Gas	Global warming potential
N_2O	265 t $CO_{2(e)}$/t N_2O
CF_4	6 630 t $CO_{2(e)}$/t CF_4
C_2F_6	11 100 t $CO_{2(e)}$/t C_2F_6

▼B

ANNEX VII

Minimum frequency of analyses (Article 35)

Fuel/material	Minimum frequency of analyses
Natural gas	At least weekly
▼M5 CO_2 transferred	At least weekly
Flue gas for the purpose of Article 43 (4)	Every 50 000 tonnes of total CO_2, but at least once a month
▼B Other gases, in particular synthesis gas and process gases such as refinery mixed gas, coke oven gas, blast-furnace gas, convertor gas, oilfield and gasfield gas	At least daily — using appropriate procedures at different parts of the day
Fuel oils (for example light, medium, heavy fuel oil, bitumen)	Every 20 000 tonnes of fuel and at least six times a year
Coal, coking coal, coke, petroleum coke, peat	Every 20 000 tonnes of fuel/material and at least six times a year
Other fuels	Every 10 000 tonnes of fuel and at least four times a year
Untreated solid waste (pure fossil or mixed biomass/fossil)	Every 5 000 tonnes of waste and at least four times a year
Liquid waste, pre-treated solid waste	Every 10 000 tonnes of waste and at least four times a year
Carbonate minerals (including limestone and dolomite)	Every 50 000 tonnes of material 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 materials (primary, intermediate and final product)	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

▼B

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)

In case of CO_2, the uncertainty is to be applied to the total amount of CO_2 measured. Where the biomass fraction is determined using a measurement based methodology, the same tier definition as for CO_2 shall be applied to the biomass fraction.

	Tier 1	Tier 2	Tier 3	Tier 4
CO_2 emission sources	± 10 %	± 7,5 %	± 5 %	± 2,5 %
N_2O emission sources	± 10 %	± 7,5 %	± 5 %	N.A.
CO_2 transfer	± 10 %	± 7,5 %	± 5 %	± 2,5 %

2. MINIMUM TIER REQUIREMENTS FOR CATEGORY A INSTALLATIONS

Table 2

Minimum tiers to be applied by category A installations for measurement-based methodologies in accordance with point (a) of Article 41(1)

Greenhouse gas	Minimum tier level required
CO_2	2
N_2O	2

3. DETERMINATION OF GHGS USING MEASUREMENT-BASED METHODOLOGIES

Equation 1: Calculation of annual emissions in accordance with Article 43 (1):

$$GHG\ Em_{total}\ [t] = \sum_{i=1}^{HoursOp} GHG\ conc_{hourly,i} \cdot V_{hourly,i} \cdot 10^{-6}[t/g]$$

Equation 2: Determination of average hourly emissions:

$$GHG\ Em_{average}\ [kg/h] = \frac{GHG\ Em_{total}}{HoursOp} \cdot 10^{3}[kg/t]$$

Equation 2a: Determination of average hourly GHG concentration for the purpose of reporting in accordance with point 9(b) of Annex X, section 1:

$$GHG\ conc_{average}\ [g/Nm^3] = \frac{GHG\ Em_{total}}{\sum_{i=1}^{HoursOp} V_{hourly,i}} \cdot 10^{6}[g/t]$$

▼B

Equation 2b: Determination of average hourly flue gas flow for the purpose of reporting in accordance with point 9(b) of Annex X, section 1:

$$Flow_{average}\ [Nm^3/h] = \frac{\sum_{i=1}^{HoursOp} V_{hourly,i}}{HoursOp}$$

Equation 2c: Calculation of annual emissions for the purpose of the annual emission report in accordance with point 9(b) of Annex X, section 1:

$$GHG\ Em_{total}\ [t] = GHG\ conc_{average} \cdot Flow_{average} \cdot HoursOp \cdot 10^{-6}[t/g]$$

The following abbreviations are used in Equations 1 to 2c:

The index i refers to the individual operating hour. Where an operator uses shorter reference periods in accordance with Article 44(1), that reference period shall be used instead of hours for these calculations.

$GHG\ Em_{total}$ = total annual GHG emissions in tonnes

$GHG\ conc_{hourly,\ i}$ = hourly concentrations of GHG emissions in g/Nm^3 in the flue gas flow measured during operation for hour *i*;

$V_{hourly,\ i}$ = flue gas volume in Nm^3 for hour *i (i.e. integrated flow over the hour or shorter reference period)*;

$GHG\ Em_{average}$ = annual average hourly emissions in kg/h from the source;

HoursOp = total number of hours for which the measurement-based methodology is applied, including the hours for which data has been substituted in accordance with Article 45(2) to (4);

$GHG\ conc_{average}$ = annual average hourly concentrations of GHG emissions in g/Nm^3;

$Flow_{average}$ = annual average flue gas flow in Nm^3/h.

4. CALCULATION OF THE CONCENTRATION USING INDIRECT CONCENTRATION MEASUREMENT

Equation 3: Calculation of the concentration

$$GHG\ concentration\ [\%] = 100\% - \sum_i Concentration\ of\ component\ i\ [\%]$$

5. SUBSTITUTION FOR MISSING CONCENTRATION DATA FOR MEASUREMENT-BASED METHODOLOGIES

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

$$C^*_{subst} = \overline{C} + 2\sigma c_{\_}$$

Where:

$\overline{C}$ = 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;

$\sigma_{C\_}$ = the best estimate of the standard deviation of the concentration of the specific parameter over the whole reporting or, where specific circumstances applied when data loss occurred, an appropriate period reflecting the specific circumstances.

▼M4

ANNEX IX

Minimum data and information to be retained in accordance with Article 67(1)

Operators, aircraft operators and regulated entities shall retain at least the following:

1. COMMON ELEMENTS FOR INSTALLATIONS, AIRCRAFT OPERATORS AND REGULATED ENTITIES

   (1) The monitoring plan approved by the competent authority;

   (2) Documents justifying the selection of the monitoring methodology and the documents justifying temporal or non-temporal changes of monitoring methodologies and, where applicable, tiers approved by the competent authority;

   (3) All relevant updates of monitoring plans notified to the competent authority in accordance with Article 15, and the competent authority's replies;

   (4) All written procedures referred to in the monitoring plan, including the sampling plan where relevant, the procedures for data flow activities and the procedures for control activities;

   (5) A list of all versions used of the monitoring plan and all related procedures;

   (6) Documentation of the responsibilities in connection to the monitoring and reporting;

   (7) The risk assessment performed by the operator, aircraft operator or regulated entity, where applicable;

   (8) The improvement reports in accordance with Article 69;

   (9) The verified annual emission report;

   (10) The verification report;

   (11) Any other information that is identified as required for the verification of the annual emissions report.

2. ►M5 SPECIFIC ELEMENTS FOR STATIONARY INSTALLATIONS ◄

   (1) The greenhouse gas emissions permit, and any updates thereof;

   (2) Any uncertainty assessments, where applicable;

   (3) For calculation-based methodologies applied in installations:

      (a) the activity data used for any calculation of the emissions for each source stream, categorised according to process and fuel or material type;

      (b) a list of all default values used as calculation factors, where applicable;

      (c) the full set of sampling and analysis results for the determination of calculation factors;

      (d) documentation about all ineffective procedures corrected and correction action taken in accordance with Article 64;

      (e) any results of calibration and maintenance of measuring instruments.

▼M4

(4) For measurement-based methodologies in installations, the following additional elements:

(a) documentation justifying the selection of a measurement-based methodology;

(b) the data used for the uncertainty analysis of emissions from each emission source, categorised according to process;

(c) the data used for the corroborating calculations and results of the calculations;

(d) a detailed technical description of the continuous measurement system including the documentation of the approval from the competent authority;

(e) raw and aggregated data from the continuous measurement system, including documentation of changes over time, the log-book on tests, down-times, calibrations, servicing and maintenance;

(f) documentation of any changes to the continuous measurement system;

(g) any results of the calibration and maintenance of measuring instruments;

(h) where applicable, the mass or energy balance model used for the purpose of determining surrogate data in accordance with Article 45(4) and underlying assumptions;

(5) Where a fall-back methodology as referred to in Article 22 is applied, all data necessary for determining the emissions for the emission sources and source streams for which that methodology is applied, as well as proxy data for activity data, calculation factors and other parameters which would be reported under a tier methodology;

(6) ►M5 For primary aluminium or alumina production, the following additional elements: ◄

(a) documentation of results from measurement campaigns for the determination of the installation specific emission factors for CF_4 and C_2F_6;

(b) documentation of the results of the determination of the collection efficiency for fugitive emissions;

(c) all relevant data on primary aluminium production, anode effect frequency and duration or overvoltage data;

(7) For CO_2 capture, transport and geological storage activities, where applicable, the following additional elements:

(a) documentation of the amount of CO_2 injected into the storage complex by installations carrying out geological storage of CO_2;

▼M5

(b) representatively aggregated pressure and temperature data from a transport infrastructure;

▼M4

(c) a copy of the storage permit, including the approved monitoring plan, pursuant to Article 9 of Directive 2009/31/EC;

(d) the reports submitted in accordance with Article 14 of Directive 2009/31/EC;

(e) reports on the results of the inspections carried out in accordance with Article 15 of Directive 2009/31/EC;

▼M4

(f) documentation on corrective measures taken in accordance with Article 16 of Directive 2009/31/EC.

▼M5

(8) For CO_2 permanently chemically bound, where applicable, the following additional elements:

(a) documentation of the amount of CO_2 permanently chemically bound;

(b) the types of products the CO_2 was chemically bound, their amounts produced and the respective uses of the products;

▼M4

3. SPECIFIC ELEMENTS FOR AVIATION ACTIVITIES

(1) A list of aircraft owned, leased-in and leased-out, and necessary evidence for the completeness of that list; for each aircraft the date when it is added to or removed from the aircraft operator's fleet;

(2) A list of flights covered in each reporting period including, for each flight, the ICAO designator of the two aerodromes, and necessary evidence for the completeness of that list;

(3) Relevant data used for determining the fuel consumption and emissions;

▼M5

(4) For the purposes of monitoring emission, documentation on the methodology for data gaps where applicable, the number of flights where data gaps occurred, the data used for closing the data gaps, where they occurred, and, where the number of flights with data gaps exceeded 5 % of flights that were reported, reasons for the data gaps as well as documentation of remedial actions taken;

(5) For the purpose of monitoring and reporting of non-CO_2 aviation effects, all data monitored by the aircraft operator pursuant to Article 56b(2) of this Regulation, where such data is used to calculate the CO_2(e) per flight in accordance with the method referred to in Article 56a of this Regulation;

(6) For the purpose of monitoring non-CO_2 aviation effects and where the aircraft operator does not use NEATS, the number of flights where data gaps occurred and appropriate default values used of Annex IIIa, Section 5 and Annex IIIb to this Regulation for closing the data gaps.

▼M4

4. SPECIFIC ELEMENTS FOR REGULATED ENTITIES

(1) A list of fuel streams in each reporting period and necessary evidence for completeness of that list, including the categorisation of fuel streams;

(2) the means through which the fuels as defined in Article 3, point (af) of Directive 2003/87/EC are released for consumption and where available, the types of intermediate consumers, where this would not cause disproportionate administrative burden;

(3) the type of end use, including the relevant CRF code of the final sectors in which the fuel as defined in Article 3, point (af), of Directive 2003/87/EC is consumed, at the level of aggregation available;

▼M4

(4) relevant data used for determining the released fuel amounts for each fuel stream;

(5) a list of default values used and calculation factors, where applicable;

(6) the scope factor for each fuel stream, including an identification of each final consumption sector and all relevant underlying data for this identification;

(7) the tiers applicable including justifications for deviation from required tiers;

(8) the full set of sampling and analysis results for the determination of calculation factors;

(9) documentation about all ineffective procedures corrected and correction action taken in accordance with Article 64;

(10) any results of calibration and maintenance of measuring instruments;

(11) a list of installations to which fuel as defined in Article 3 (af) of Directive 2003/87/EC is released for consumption, including names, address and permit number and released fuel amounts supplied to those installations for the reporting periods.

▼B

ANNEX X

Minimum content of Annual Reports (Article 68(3))

1. ►M5 ANNUAL EMISSION REPORTS OF STATIONARY INSTALLATIONS ◄

The annual emission report of an installation shall at least contain the following information:

▼M4

(1) Data identifying the installation, as specified in Annex IV to Directive 2003/87/EC, and its unique permit number except for installations for the incineration of municipal waste;

▼B

(2) Name and address of the verifier of the report;

(3) The reporting year;

(4) Reference to and version number of the latest approved monitoring plan and the date from which it is applicable, as well as reference to and version number of any other monitoring plans relevant for the reporting year;

(5) Relevant changes in the operations of an installation and changes as well as temporary deviations that occurred during the reporting period to the monitoring plan approved by the competent authority; including temporal or permanent changes of tiers, reasons for those changes, starting date for the changes, and starting and ending dates of temporal changes;

(6) Information for all emissions sources and source streams consisting of at least:

▼M5

(a) the total emissions expressed as t CO_2(e), including CO_2 from biomass source streams which do not comply with Article 38(5) of this Regulation, or from RFNBO or RCF source streams which do not comply with Article 39a(3) of this Regulation, or from synthetic low-carbon fuels source streams which do not comply with Article 39a(4) of this Regulation;

▼B

(b) where greenhouse gases other than CO_2 are emitted, the total emissions expressed as t;

(c) whether the measurement or the calculation methodology referred to in Article 21 is applied;

(d) the tiers applied;

(e) activity data:

(i) in the case of fuels the amount of fuel (expressed as tonnes or Nm^3) and the net calorific value (GJ/t or GJ/ Nm^3) reported separately;

(ii) for all other source streams the amount expressed as tonnes or Nm^3;

▼M5

(f) emission factors, expressed in accordance with the requirements set out in Article 36(2) of this Regulation; biomass fraction; zero-rated biomass fraction, RFNBO or RCF fraction, zero-rated RFNBO or RCF fraction, synthetic low-carbon fraction, zero-rated synthetic low-carbon fraction, oxidation and conversion factors, expressed as dimensionless fractions;

▼B

(g) where emission factors for fuels are related to mass or volume instead of energy, values determined pursuant to Article 26(5) for the net calorific value of the respective source stream;

▼M4

(h) where a source stream is a type of waste, the relevant waste codes pursuant to Commission Decision 2014/955/EU ([1]);

▼M5

(7) Where a mass balance methodology is applied, the mass flow, and carbon content for each source stream into and out of the installation; biomass fraction, zero-rated biomass fraction, RFNBO or RCF fraction, zero-rated RFNBO or RCF fraction, synthetic low-carbon fraction, zero-rated synthetic low-carbon fraction, and net calorific value, where relevant;

▼B

(8) Information to be reported as memo items, consisting of at least:

▼M5

(a) amounts of biomass and of zero-rated biomass combusted or amounts of RFNBO or RCF and of zero-rated RFNBO or RCF combusted, or amounts of synthetic low-carbon fuels and of zero-rated synthetic low-carbon fuels combusted, expressed in TJ, or employed in processes, expressed in t or Nm^3;

(b) CO_2 emissions from biomass and from zero-rated biomass or emissions from RFNBO or RCF and from zero-rated RFNBO or RCF, or emissions from synthetic low-carbon fuels and of zero-rated synthetic low-carbon fuels expressed in t CO_2, where measurement-based methodology is used to determine emissions;

(c) a proxy for the net calorific value of the biomass or RFNBO or RCF or synthetic low-carbon fuels source streams used as fuel, where relevant;

(d) emissions, amounts and energy content of biomass fuels and bioliquids combusted or RFNBO or RCF combusted, or synthetic low-carbon fuels combusted expressed in t and TJ, and information that zero-rated biomass fuels and bioliquids or RFNBO or RCF or synthetic low-carbon fuels comply with Article 38(5) or Article 39a(3) or Article 39a(4) of this Regulation;

(e) CO_2 or N_2O transferred to an installation or received from an installation and any CO_2 in transit, where Article 49 or 50 of this Regulation is applicable, expressed in t CO_2(e);

▼B

(f) inherent CO_2 transferred to an installation or received from an installation, where Article 48 is applicable, expressed in t CO_2;

(g) where applicable, the name of the installation and its identification code as recognised in accordance with the acts adopted pursuant to Article 19(3) of Directive 2003/87/EC:

(i) of the installation(s) to which CO_2 or N_2O is transferred in accordance with points (e) and (f) of this point (8);

([1]) Commission Decision 2014/955/EU of 18 December 2014 amending Decision 2000/532/EC on the list of waste pursuant to Directive 2008/98/EC of the European Parliament and of the Council (OJ L 370, 30.12.2014, p. 44).

▼B

(ii) of the installation(s) from which CO_2 or N_2O is received in accordance with points (e) and (f) of this point (8);

Where that installation does not have such identification code, the name and address of the installation as well as relevant contact information of a contact person shall be provided.

(h) transferred CO_2 from biomass, expressed in t CO_2;

▼M5

(i) amount of CO_2 chemically bound in product in accordance with Article 49a(1) of this Regulation, expressed in t CO_2;

(j) the types and amounts of products produced in which CO_2 was chemically bound in accordance with Article 49a(1) of this Regulation, expressed in t of product.

▼B

(9) Where a measurement methodology is applied:

(a) where CO_2 is measured as the annual fossil CO_2-emissions and the annual CO_2-emissions from biomass use;

(b) the hours of operation of the continuous emission measurement system (CEMS), the measured greenhouse gas concentrations and the flue gas flow expressed as an annual hourly average, and as an annual total value;

▼M5

(c) where applicable, a proxy for the energy content from fossil fuels and materials and from biomass used as fuels and materials as well as from RFNBO or RCF or synthetic low-carbon fuels.

▼B

(10) Where a methodology referred to in Article 22 is applied, all data necessary for determining the emissions for the emission sources and source streams for which that methodology is applied, as well as proxy data for activity data, calculation factors and other parameters which would be reported under a tier methodology;

(11) Where data gaps have occurred and have been closed by surrogate data in accordance with Article 66(1):

(a) the source stream or emission source to which each data gap applies;

(b) the reasons for each data gap;

(c) the starting and ending date and time of each data gap;

(d) the emissions calculated based on surrogate data;

(e) where the estimation method for surrogate data has not yet been included in the monitoring plan, a detailed description of the estimation method including evidence that the methodology used does not lead to an underestimation of emissions for the respective time period;

(12) Any other changes in the installation during the reporting period with relevance for that installation's greenhouse gas emissions during the reporting year;

(13) Where applicable, the production level of primary aluminium, the frequency and average duration of anode effects during the reporting period, or the anode effect overvoltage data during the reporting period, as well as the results of the most recent determination of the installation-specific emission factors for CF_4 and C_2F_6 as outlined in Annex IV, and of the most recent determination of the collection efficiency of the ducts.

Emissions occurring from different emission sources, or source streams of the same type of a single installation belonging to the same type of activity may be reported in an aggregate manner for the type of activity.

▼B

Where tiers have been changed within a reporting period, the operator shall calculate and report emission as separate sections of the annual report for the respective parts of the reporting period.

Operators of CO_2 storage sites may use simplified emission reports after closure of the storage site in accordance with Article 17 of Directive 2009/31/EC containing at least the elements listed under points 1 to 5, provided the greenhouse gas emissions permit contains no emission sources.

2. ANNUAL EMISSION REPORTS OF AIRCRAFT OPERATORS

The emission report for an aircraft operator shall at least contain the following information:

(1) Data identifying the aircraft operator as set out by Annex IV to Directive 2003/87/EC, and the call sign or other unique designators used for air traffic control purposes, as well as relevant contact details;

(2) Name and address of the verifier of the report;

(3) The reporting year;

(4) Reference to and version number of the latest approved monitoring plan and the date from which it is applicable, reference to and version number of other monitoring plans relevant for the reporting year;

(5) Relevant changes in the operations and deviations from the approved monitoring plan during the reporting period;

(6) The aircraft registration numbers and types of aircraft used in the period covered by the report to perform the aviation activities covered by Annex I to Directive 2003/87/EC carried out by the aircraft operator;

(7) The total number of flights per State pair covered by the report;

▼M5

(8) Mass of neat fuel (in tonnes) per fuel type per State pair, including information on all of the following:

(a) Whether the alternative aviation fuel is zero-rated in compliance with Article 54c of this Regulation;

(b) Whether the fuel is an eligible aviation fuel;

(c) For eligible aviation fuels, the fuel type as defined in Article 3c(6) of Directive 2003/87/EC;

(9) Total CO_2 emissions in tonnes of CO_2 using the preliminary emission factor as well as the emission factor disaggregated by the Member State of departure and arrival;

▼B

(10) Where emissions are calculated using an emission factor or carbon content related to mass or volume, proxy data for the net calorific value of the fuel;

▼B

(11) Where data gaps have occurred and have been closed by surrogate data in accordance with Article 66(2):

(a) the number of flights expressed as percentage of annual flights (rounded to the nearest 0,1 %) for which data gaps occurred; and the circumstances and reasons for data gaps that apply;

(b) the estimation method for surrogate data applied;

(c) the emissions calculated based on surrogate data;

▼M5

(12) Memo-items:

(a) amount of alternative aviation fuels used during the reporting year (in tonnes) listed per fuel type, and whether the fuels comply with Article 54c of this Regulation;

(b) the net calorific value of alternative fuels;

▼M4

(12a) Total amount of eligible aviation fuels used during the reporting year (in tonnes) listed per fuel type as per Article 3c(6) of Directive 2003/87/EC;

▼M5

(13) As an annex to the annual emission report, the aircraft operator shall include annual emissions and annual numbers of flights per aerodrome pair. If applicable, the amount of alternative aviation fuel and eligible aviation fuel (in tonnes) shall be indicated per aerodrome pair. Upon request of the operator the competent authority shall treat that information as confidential.

2a. ANNUAL NON-CO_2 AVIATION EFECTS REPORTS OF AIRCRAFT OPERATORS

For non-CO_2 aviation effects, the separate report as referred to in Article 68 (5) of this Regulation shall at least contain the following information:

(1) Data identifying the aircraft operator, and the call sign or other unique designators used for air traffic control purposes, as well as relevant contact details;

(2) Name and address of the verifier of the report;

(3) The reporting year;

(4) Reference to and version number of the latest approved monitoring plan and the date from which it is applicable, reference to and version number of other monitoring plans relevant for the reporting year;

(5) Relevant changes in the operations and deviations from the approved monitoring plan during the reporting period;

▼M5

(6) The aircraft registration numbers and types of aircraft used in the period covered by the report to perform the aviation activities covered by Annex I to Directive 2003/87/EC carried out by the aircraft operator;

(7) The total number of flights per State pair covered by the report;

(8) The sum of CO_2(e) of the monitored flights of the aircraft operator per aerodrome pair, expressed in the climate metrics provided in Article 56a(2) of this Regulation.

(9) A XML table containing per flight and as defined in Annex IIIa, Section 1 to this Regulation, flight information, aircraft type, engine identifier and CO_2(e), expressed in the climate metrics provided in Article 56a(2) of this Regulation;

(10) If the aircraft operator is not using NEATS to calculate the CO_2(e), but own or third-party IT tools as referred to in Article 56a(7)(b) of this Regulation, a description of how efficacy is applied in those tools, in line with this Regulation and NEATS, to refine the GWP. If efficacy was not applied in the tools, the aircraft operator shall provide a description explaining the reasons for not applying efficacy.

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4. ANNUAL EMISSION REPORTS OF REGULATED ENTITIES

The annual emission report of a regulated entity shall at least contain the following information:

(1) Data identifying the regulated entity, as specified in Annex IV to Directive 2003/87/EC, and its unique greenhouse gas permit number;

(2) Name and address of the verifier of the report;

(3) The reporting year;

(4) Reference to and version number of the latest approved monitoring plan and the date from which it is applicable, as well as reference to and version number of any other monitoring plans relevant for the reporting year;

(5) Relevant changes in the operations of the regulated entity and changes as well as temporary deviations that occurred during the reporting period to the monitoring plan approved by the competent authority; including temporal or permanent changes of tiers, reasons for those changes, starting date for the changes, and starting and ending dates of temporal changes;

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(6) Information for all fuel streams consisting of at least:

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(a) the total emissions expressed as t CO_2, including CO_2 from biomass fuel streams which do not comply with Article 38(5) of this Regulation, or from RFNBO or RCF source streams which do not comply with Article 39a(3) of this Regulation, or from synthetic low-carbon fuels source streams which do not comply with Article 39a(4) of this Regulation;

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(b) the tiers applied;

(c) released fuel amounts, (expressed as tonnes, Nm^3 or TJ,) and the unit conversion factor, expressed in appropriate units, reported separately, where applicable;

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(d) emission factors, expressed in accordance with the requirements set out in Article 75f of this Regulation; biomass fraction, zero-rated biomass fraction, RFNBO or RCF fraction, zero-rated RFNBO or RCF fraction, synthetic low-carbon fraction, zero-rated synthetic low-carbon fraction expressed as dimensionless fractions;

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(e) where emission factors for fuels are related to mass or volume instead of energy, values determined pursuant to Article 75h(3) for the unit conversion factor of the respective fuel stream;

(f) the means through which the fuel is released for consumption;

(g) the end use(s) of the fuel stream released for consumption including the CRF code, at the level of detail available;

(h) the scope factor, expressed as dimensionless fraction, up to three decimal points. Where, for a fuel stream, more than one method is used to determine the scope factor, the information on the type of method, the associated scope factor, the released fuel amount and the CRF code at the level of detail available;

(i) where the scope factor is zero pursuant to Article 75l(1):

(i) A list of all entities covered by Chapters II and III of Directive 2003/87/EC identified by their name, address and, where applicable, unique permit number;

(ii) The released fuel amounts supplied to each entity covered by Chapters II and III of Directive 2003/87/EC for the relevant reporting period, expressed as t, Nm^3, or TJ, as well as the corresponding emissions.

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(7) Information to be reported as memo items, consisting of at least:

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(a) a proxy for the net calorific value of the biomass, RFNBO or RCF or synthetic low-carbon fuels fuel streams, where relevant;

(b) emissions, amounts and energy content of biofuels, bioliquids, biomass fuels, RFNBOs and RCFs, synthetic low-carbon fuels released for consumption, expressed in t and TJ, and information whether they comply with Article 38(5) or 39a(3) or 39a(4) of this Regulation;

▼M4

(8) Where data gaps have occurred and have been closed by surrogate data in accordance with Article 66(1):

(a) the fuel stream to which each data gap applies;

(b) the reasons for each data gap;

(c) the starting and ending date and time of each data gap;

(d) the emissions calculated based on surrogate data;

(e) where the estimation method for surrogate data has not yet been included in the monitoring plan, a detailed description of the estimation method including evidence that the methodology used does not lead to an underestimation of emissions for the respective time period;

(9) Any other changes in the regulated entity during the reporting period with relevance for that regulated entity's greenhouse gas emissions during the reporting year.

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ANNEX Xa

Reports on fuel suppliers and fuel use of stationary installations and, where relevant, aircraft operators and shipping companies

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Together with the information contained in the annual emission report pursuant to Annex X to this Regulation, the operator shall submit the following information for each purchased fuel as defined in Article 3, point (af) of Directive 2003/87/EC:

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(a) name, address and unique permit number of the fuel supplier which is registered as regulated entity. In cases where the fuel supplier is not a regulated entity, the operators shall submit, where available, a list of all suppliers of fuels, from direct fuel suppliers up to the regulated entity, including their name, address and unique permit number;

(b) the types and amounts of fuels acquired from each supplier referred to in point (a) during the relevant reporting period;

(c) the amount of fuel used for activities referred to in Annex I to Directive 2003/87/EC from each fuel supplier during the relevant reporting period.

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ANNEX Xb

Reports on released fuels by regulated entities

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Together with the information contained in the annual emission report pursuant to Annex X to this Regulation, the regulated entity shall submit the following information for each purchased fuel as defined in Article 3, point (af), of Directive 2003/87/EC:

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(a) name, address and unique permit number of the operator and, where relevant, the aircraft operator and shipping company, to whom the fuel is released. In other cases where the fuel is meant for end use in sectors covered by Annex I to Directive 2003/87/EC the regulated entity shall submit, where available, a list of all consumers of fuels, from direct buyer down to the operator, including their name, address and unique permit number, where this would not cause disproportionate administrative burden;

(b) the types and amounts of fuels sold to each buyer referred to in point (a) during the relevant reporting period.

(c) the amount of fuel used for activities referred to in Annex I to Directive 2003/87/EC for each buyer referred to in point (a) during the relevant reporting period..

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ANNEX XI

Correlation table

Commission Regulation (EU) No 601/2012	This Regulation
Article 1 to 49	Article 1 to 49
—	Article 50
Article 50 to 67	Article 51 to 68
Article 68	—
Article 69 to 75	Article 69 to 75
—	Article 76
Article 76 to 77	Article 77 to 78
Annex I to X	Annex I to X
—	Annex XI