Commission Delegated Regulation (EU) 2019/331 of 19 December 2018 determining transitional Union-wide rules for harmonised free allocation of emission allowances pursuant to Article 10a of Directive 2003/87/EC of the European Parliament and of the Council (Text with EEA relevance)

COMMISSION DELEGATED REGULATION (EU) 2019/331

of 19 December 2018

determining transitional Union-wide rules for harmonised free allocation of emission allowances pursuant to Article 10a of Directive 2003/87/EC of the European Parliament and of the Council

(Text with EEA relevance)

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a system for greenhouse gas emission allowance trading within the Union and amending Council Directive 96/61/EC[(1)], and in particular Article 10a(1) thereof,

Whereas:

(1) Directive 2003/87/EC sets out rules on how transitional free allocation of emission allowances should take place between 2021 and 2030.

(2) By Decision 2011/278/EU[(2)], the Commission laid down transitional Union-wide rules for harmonised free allocation of emission allowances pursuant to Article 10a of Directive 2003/87/EC. As Directive 2003/87/EC was substantially amended by Directive (EU) 2018/410 of the European Parliament and of the Council[(3)] and for reasons of clarity as regards the rules applicable between 2021 and 2030, Decision 2011/278/EU should be repealed and replaced.

(3) In accordance with Article 10a(1) of Directive 2003/87/EC, transitional Union-wide and fully-harmonised measures for the free allocation of emission allowances are to determine, to the extent feasible, *ex-ante* benchmarks so as to ensure that the free allocation of emission allowances takes place in a manner that provides incentives for reductions in greenhouse gas emissions and energy efficient techniques, by taking account of the most efficient techniques, substitutes, alternative production processes, high efficiency cogeneration, efficient energy recovery of waste gases, use of biomass and capture and storage of carbon dioxide, where such facilities are available. At the same time, those measures must not provide incentives to increase emissions. In order to reduce incentives to flare waste gases, other than for safety flaring, the number of allowances allocated free of charge for relevant sub-installations should be reduced by the historical emissions from waste gases flared, with the exception of safety flaring, and not used for the purpose of the production of measurable heat, non-measurable heat or electricity. However, taking into account the special treatment accorded by Article

10a(2) of Directive 2003/87/EC, and to provide for a transition, this reduction should only apply from 2026.

(4) For the purposes of the collection of data which are to form the basis for the adoption of the 54 benchmark values for free allocation between 2021 and 2030 by means of implementing acts to be adopted in accordance with Article 10a(2) of Directive 2003/87/EC, it is necessary to continue to provide definitions of the benchmarks, including the products and related processes, identical to those currently set out in Annex I to Decision 2011/278/EU, apart from certain improvements to legal clarity and linguistic improvements. Article 10a(2) of Directive 2003/87/EC provides that the implementing acts for the 54 benchmark values for free allocation between 2021 and 2030 should be determined using the starting points for determination of annual reduction rate for benchmark value update that were contained in Commission Decision 2011/278/EU as adopted on 27 April 2011. For reasons of clarity, those starting points should also be contained in an Annex to this Regulation.

(5) The data collection carried out prior to the allocation periods serves the purposes of determining the level of free allocation at installation level as well as providing data that will be used for the purposes of the implementing acts that will determine the 54 benchmark values that will apply between 2021 and 2030. Detailed data at sub-installation level need to be collected, as provided for in Article 11(1) of Directive 2003/87/EC.

(6) Given the economic relevance of transitional free allocation and the need for equal treatment of operators, it is important that data collected from operators and used for decisions on allocation and which will be used for the implementing acts determining the 54 benchmark values for free allocations between 2021 and 2030 are complete and consistent, and present the highest achievable accuracy. Verification by independent verifiers is an important measure for this purpose.

(7) The requirement to ensure the collection of high quality data and consistency with the monitoring and reporting of emissions within the scope of Directive 2003/87/EC is a joint responsibility of operators and Member States. For this purpose, specific rules for monitoring and reporting of activity levels, energy flows and emissions at sub-installation level should be provided for, taking duly into account the relevant provisions of Commission Regulation (EU) No 601/2012[(4)]. Data provided by industry and collected in accordance with these rules should be as accurate and high quality as possible and reflect the actual operations of installations, and be given due consideration for free allocation.

(8) The operator of an installation should start monitoring the data required in accordance with Annex IV as soon as this Regulation enters into force to ensure that data for the year 2019 can be collected in line with the provisions of this Regulation.

(9) To limit the complexity of the rules for monitoring and reporting of activity levels, energy flows and emissions at sub-installation level, it is appropriate not to apply a tiered approach.

(10) To ensure comparable data for the implementing acts that will determine the benchmark values applicable for free allocation between 2021 and 2030, it is necessary to lay down detailed rules for assigning activity levels, energy flows and emissions to sub-installations, consistent with guidance documents produced for the purpose of benchmark data collection for the 2013–2020 period.

(11) The monitoring methodology plan should describe the instructions to the operator in a logical and simple manner, avoiding duplication of effort and taking into account the existing systems in place at the installation. The monitoring methodology plan should cover the monitoring of activity levels, energy flows and emissions at sub-installation level and serve as a basis for the baseline data reports as well as the annual activity level reporting required for the purpose of adjusting transitional free allocation in accordance with Article 10a(20) of Directive 2003/87/EC. Where possible, the operator should make use of synergies with the monitoring plan approved in accordance with Regulation (EU) No 601/2012.

(12) The monitoring methodology plan should require approval by the competent authority in order to ensure consistency with the monitoring rules. Due to time constraints, approval by the competent authority should not be required for the baseline data report due for submission in 2019. In this case, verifiers should assess compliance of the monitoring methodology plan with the requirements set out in this Regulation. To limit administrative burden, only significant changes to the monitoring methodology plan should require approval by the competent authority.

(13) To ensure consistency between verification of annual emissions reports required by Directive 2003/87/EC and verification of reports submitted to apply for free allocation as well as to make use of synergies, it is appropriate to use the legal framework set by measures adopted pursuant to Article 15 of Directive 2003/87/EC.

(14) To facilitate the data collection from operators and the calculation of the emission allowances to be allocated by Member States, inputs, outputs and emissions of each installation should be assigned to the sub-installations. Operators should ensure that activity levels, energy flows and emissions are correctly attributed to the relevant sub-installations, respecting the hierarchy and mutual exclusivity of sub-installations, and that there are no overlaps between sub-installations. Where relevant, this division should take account of the production of products in sectors deemed to be exposed to a risk of carbon leakage as determined in accordance with Article 10b(5) of Directive 2003/87/EC.

(15) Member States should submit national implementation measures to the Commission by 30 September 2019. In order to promote equal treatment of installations and to avoid distortions of competition, these submissions should include all installations that will be included under the European Union Emissions Trading System (EU ETS) pursuant to Article 24 of Directive 2003/87/EC, in particular where allocations have previously taken place to such installations in respect of heat during the period between 2013 and 2020.

(16) In order to avoid any distortion of competition and to ensure an orderly functioning of the carbon market, operators should ensure that when determining the allocation of individual installations no double counting of material or energy flows and no double allocation take place. In this context, operators should pay particular attention to cases where a benchmarked product is produced in more than one installation, where more than one benchmarked product is produced in the same installation, and where intermediate products are exchanged across installation boundaries. Member States should check applications to this end.

(17) Article 10a(4) of Directive 2003/87/EC provides for free allocation for district heating and high efficiency cogeneration. In accordance with Article 10b(4) of that Directive, the carbon leakage factor applied to non-carbon leakage sub-installations is to decline in a linear manner from 30 % in 2026 to 0 % in 2030, except for district heating, and subject to review pursuant to Article 30 of the Directive. Due to this distinction introduced between district heating and all other heat eligible under heat benchmark sub-installations, a separate heat sub-installation for district heating needs to be introduced in order to provide a clear approach in terms of formulae and baseline data template requirements. District heating should include measurable heat used for the purpose of space heating and cooling of buildings or sites that are not covered by the EU ETS or for the production of domestic hot water.

(18) It is appropriate that the product benchmarks take account of the efficient energy recovery of waste gases and emissions related to their use. To that end, for the determination of the benchmark values for products of which the production generates waste gases, the carbon content of those waste gases should be taken into account to a large extent. Where waste gases are exported from the production process outside the system boundaries of the relevant product benchmark and combusted for the production of heat outside the system boundaries of a defined benchmarked process, related emissions should be taken into account by means of allocating additional emission allowances on the basis of the heat or fuel benchmark. In the light of the general principle that no emission allowances should be allocated for free in respect of any electricity production, to avoid undue distortions of competition on the markets for electricity supplied to industrial installations and taking into account the inherent carbon price in electricity, it is appropriate that, where waste gases are exported from the production process outside the system boundaries of the relevant product benchmark and combusted for the production of electricity, no additional allowances are allocated beyond the share of the carbon content of the waste gas accounted for in the relevant product benchmark.

(19) To avoid distortions of competition and to incentivise the use of waste gases, in the absence of information on the composition of relevant gas streams, CO_2 emissions occurring outside the system boundaries of a product benchmark sub-installation resulting from the reduction of metal oxides or similar processes should only be partially assigned to process emissions sub-installations if they are not emitted as result of the energy use of waste gases.

(20) Indirect emissions related to the production of electricity were considered for the determination of certain benchmark values in Decision 2011/278/EU, on the basis that direct emissions and indirect emissions from electricity production were to a certain extent interchangeable. Where those benchmarks apply, the indirect emissions of an installation should continue to be deducted applying the standard emissions factor that is also used for assessing sectors' exposure to potential carbon leakage as determined in accordance with Article 10b(5) of Directive 2003/87/EC. The relevant provisions should be kept under review, inter alia, with a view to enhancing equal treatment of activities producing the same product and for updating the reference year of 2015 for transitional free allocations between 2026 and 2030.

(21) Where measurable heat is exchanged between two or more installations, the free allocation of emission allowances should be based on the heat consumption of an installation and take account of the risk of carbon leakage, as appropriate. Thus, to ensure that the number of free emission allowances to be allocated is independent from the heat supply structure, emission allowances should be allocated to the heat consumer.

(22) The amount of allowances to be allocated free of charge to incumbent installations should be based on historical activity data. The historical activity levels should be based on the arithmetic mean activity during the baseline periods. The baseline periods are sufficiently long to ensure that they can be considered representative for the allocation periods which cover five calendar years as well. For new entrants, as defined in Article 3(h) of Directive 2003/87/EC, the determination of activity levels should be based on the activity level of the first calendar year of operation, after the year of the start of normal operation, as the activity level reported for a full year is considered more representative than a value for the first year of operation that could cover only a short period. Compared to the allocation period 2013 – 2020, due to the introduction of allocation adjustments in accordance with Article 10a(20) of Directive 2003/87/EC, there is no need to maintain the concept of significant capacity change.

(23) To ensure that the EU ETS delivers reductions over time, Directive 2003/87/EC provides for the Union-wide quantity of allowances to decrease in a linear manner. As regards electricity generators, according to Article 10a(4) of that Directive, a linear reduction factor is applied, using the year 2013 as a reference, unless the uniform cross-sectoral correction factor is applicable. The value of the linear reduction factor is increased to 2,2 % per year from 2021.

(24) For new entrants, the linear reduction factor is applied with the first year of the relevant allocation period as reference.

(25) The uniform cross-sectoral correction factor that is applicable in each year of the period from 2021 to 2025 and from 2026 to 2030 to installations that are not identified as electricity generators, and that are not new entrants, pursuant to Article 10a(5) of Directive 2003/87/EC, should be determined on the basis of the preliminary annual amount of emission allowances allocated free of charge over each allocation period, calculated for these installations pursuant to this Regulation, excluding the installations that are excluded by Member States from the EU ETS in accordance with Article 27 or 27a of that Directive. The resulting amount of free emission allowances allocated in

each year of the two periods should be compared with the annual amount of allowances that is calculated in accordance with Article 10a(5) and 10a(5a) of Directive 2003/87/EC for installations taking into account the relevant share of the annual Union-wide total quantity, as determined pursuant to Article 9 of that Directive, and the relevant amount of emissions that are only included in the EU ETS from 2021 to 2025 or 2026 to 2030, as appropriate.

(26) As operators apply for free allocation, they should be free to renounce their allocation, totally or partially, by submitting an application to the relevant competent authority at any time during the relevant allocation period. To maintain certainty and predictability, operators should not have the right to withdraw such an application for the same allocation period. Operators having renounced their allocation should continue to monitor and report the necessary data in order to be able to apply for free allocation in the following allocation period. They should also continue to monitor and report the emissions every year and surrender the relevant amount of allowances.

(27) To ensure equal treatment of installations, it is appropriate to lay down rules on mergers and splits of installations.

(28) To facilitate the data collection from operators and the calculation of the emission allowances to be allocated by Member States concerning new entrants it is appropriate to set rules for application for such installations.

(29) To ensure that no emission allowances are allocated free of charge to an installation that has ceased its operations, it is necessary to specify the conditions under which an installation is deemed to have ceased operations.

(30) Article 191(2) of the Treaty on the Functioning of the European Union requires that the Union policy on the environment be based on the principle that the polluter should pay and, on this basis, Directive 2003/87/EC provides for a transition to full auctioning over time. Avoiding carbon leakage justifies temporarily postponing full auctioning, and targeted free allocation of allowances to industry is justified in order to address genuine risks of increases in greenhouse gas emissions in third countries where industry is not subject to comparable carbon constraints, as long as comparable climate policy measures are not undertaken by other major economies. Furthermore, free allocation rules should incentivise emission reductions in line with the Union's commitment to reduce the overall greenhouse gas emissions by at least 40 % below 1990 levels by 2030. Incentives for emission reductions for activities that produce the same product should be enhanced.

(31) In line with the Commission's practice of consulting experts when preparing delegated acts, the Commission Expert Group on Climate Change Policy, consisting of experts from Member States, industry and other relevant organisations, including civil society, has been consulted on documents and provided comments and suggestions on various elements of the proposal, and met three times between May and July 2018.

(32) This Regulation should enter into force as a matter of urgency as operators are required to comply with its rules on baseline data reporting as of April or May 2019 as required by Article 10a(1) of Directive 2003/87/EC,

HAS ADOPTED THIS REGULATION:

CHAPTER I

General provisions

Article 1

Scope

This Regulation shall apply to the free allocation of emission allowances under Chapter III (Stationary installations) of Directive 2003/87/EC as regards the allocation periods as from 2021, with the exception of transitional free allocation of emission allowances for the modernisation of electricity generation pursuant to Article 10c of Directive 2003/87/EC.

Article 2

Definitions

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

(1) ‘incumbent installation’ means any installation carrying out one or more activities listed in Annex I to Directive 2003/87/EC or an activity included in the European Union Emissions Trading System (EU ETS) for the first time in accordance with Article 24 of that Directive, which obtained a greenhouse gas emission permit before or on:

(a) 30 June 2019 for the period 2021-2025,

(b) 30 June 2024 for the period 2026-2030;

(2) ‘product benchmark sub-installation’ means inputs, outputs and corresponding emissions relating to the production of a product for which a benchmark has been set in Annex I;

(3) ‘heat benchmark sub-installation’ means inputs, outputs and corresponding emissions not covered by a product benchmark sub-installation relating to the production other than produced from electricity, the import from an installation covered by the EU ETS, or both, of measurable heat which is:

(a) consumed within the installation's boundaries for the production of products, for the production of mechanical energy other than used for the production of electricity, for heating or cooling with the exception of the consumption for the production of electricity, or

(b) exported to an installation or other entity not covered by the EU ETS other than district heating with the exception of the export for the production of electricity;

(4) ‘district heating’ means the distribution of measurable heat for the purpose of heating or cooling of space or of production of domestic hot water, through a network, to

buildings or sites not covered by EU ETS with the exception of measurable heat used for the production of products and related activities or the production of electricity;

(5) 'district heating sub-installation' means inputs, outputs and corresponding emissions not covered by a product benchmark sub-installation relating to the production, the import from an installation covered by the EU ETS, or both, of measurable heat which is exported for the purposes of district heating;

(6) 'fuel benchmark sub-installation' means inputs, outputs and corresponding emissions not covered by a product benchmark sub-installation relating to the production of non-measurable heat by fuel combustion consumed for the production of products, for the production of mechanical energy other than used for the production of electricity, for heating or cooling with the exception of the consumption for the production of electricity, including safety flaring;

(7) 'measurable heat' means a net heat flow transported through identifiable pipelines or ducts using a heat transfer medium, such as, in particular, steam, hot air, water, oil, liquid metals and salts, for which a heat meter is or could be installed;

(8) 'heat meter' means a thermal energy meter (MI-004) within the meaning of Annex VI to Directive 2014/32/EU of the European Parliament and of the Council[5] or any other device to measure and record the amount of thermal energy produced based upon flow volumes and temperatures;

(9) 'non-measurable heat' means all heat other than measurable heat;

(10) 'process emissions sub-installation' means greenhouse gas emissions listed in Annex I to Directive 2003/87/EC other than carbon dioxide, which occur outside the system boundaries of a product benchmark listed in Annex I to this Regulation, or carbon dioxide emissions, which occur outside the system boundaries of a product benchmark listed in Annex I to this Regulation, as a direct and immediate result of any of the following processes and emissions stemming from the combustion of waste gases for the purpose of the production of measurable heat, non-measurable heat or electricity, provided that emissions that would have occurred from the combustion of an amount of natural gas, equivalent to the technically usable energy content of the combusted incompletely oxidised carbon, are subtracted:

(a) the chemical, electrolytic or pyrometallurgical reduction of metal compounds in ores, concentrates and secondary materials for a primary purpose other than the generation of heat;

(b) the removal of impurities from metals and metal compounds for a primary purpose other than the generation of heat;

(c) the decomposition of carbonates, excluding those for flue gas scrubbing for a primary purpose other than the generation of heat;

(d) chemical syntheses of products and intermediate products where the carbon bearing material participates in the reaction, for a primary purpose other than the generation of heat;

(e) the use of carbon containing additives or raw materials for a primary purpose other than the generation of heat;

(f) the chemical or electrolytic reduction of metalloid oxides or non-metal oxides such as silicon oxides and phosphates for a primary purpose other than the generation of heat;

(11) 'waste gas' means a gas containing incompletely oxidised carbon in a gaseous state under standard conditions which is a result of any of the processes listed in point (10), where 'standard conditions' means temperature of 273,15 K and pressure conditions of 101 325 Pa defining normal cubic metres (Nm^3) according to Article 3(50) of Regulation (EU) No 601/2012;

(12) 'start of normal operation' means the first day of operations;

(13) 'safety flaring' means the combustion of pilot fuels and highly fluctuating amounts of process or residual gases in a unit open to atmospheric disturbances which is explicitly required for safety reasons by relevant permits for the installation;

(14) 'baseline period' means the five calendar years preceding the time-limit for submission of data to the Commission pursuant to Article 11(1) of Directive 2003/87/EC;

(15) 'allocation period' means the five-year period starting from 1 January 2021 and each subsequent period of five years;

(16) '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;

(17) 'merger' means a fusion of two or more installations already holding greenhouse gas permits provided that they are technically connected, operate on the same site and the resulting installation is covered by one greenhouse gas permit;

(18) 'split' means a division of an installation into two or more installations that are covered by separate greenhouse gas permits and are run by different operators.

Article 3

National administrative arrangements

In addition to designating a competent authority or authorities in accordance with Article 18 of Directive 2003/87/EC, Member States shall make the appropriate administrative arrangements for the implementation of the rules of this Regulation.

CHAPTER II

Application, data reporting and monitoring rules

Article 4

Application for free allocation by operators of incumbent installations

1 The operator of an installation eligible for free allocation pursuant to Article 10a of Directive 2003/87/EC may submit to the competent authority an application for free allocation for an allocation period. That application shall be submitted before 30 May 2019 as regards the first allocation period and every five years thereafter.

Member States may set an alternative time-limit for the submission of such applications, which, however, may not be later or earlier than one month compared to the time-limit provided for in the first subparagraph.

2 An application for free allocation submitted pursuant to paragraph 1 shall be accompanied by the following particulars:

a a baseline data report verified as satisfactory in accordance with measures adopted pursuant to Article 15 of Directive 2003/87/EC containing data for the installation, and its sub-installations as specified in Article 10 and Annexes I and II to this Regulation, taking into account, for the calculation of historical activity levels for specific product benchmarks, Annex III to this Regulation, containing each parameter listed in Annex IV to this Regulation and covering the baseline period relating to the allocation period to which the application relates;

b the monitoring methodology plan which formed the basis for the baseline data report and the verification report, in accordance with Annex VI;

c a verification report issued in accordance with measures adopted pursuant to Article 15 of Directive 2003/87/EC on the baseline data report and, unless it has already been approved by the competent authority, on the monitoring methodology plan.

Article 5

Application for free allocation by new entrants

1 Upon application by a new entrant, the Member State concerned shall determine on the basis of this Regulation the amount of allowances to be allocated free of charge to that operator's installation once it has started normal operation.

2 The operator shall divide the installation concerned in sub-installations in accordance with Article 10. The operator shall submit to the competent authority, in support of the application referred to in paragraph 1, all relevant information and a new entrant data report containing each parameter listed in sections 1 and 2 of Annex IV for each sub-installation separately, for the first calendar year after the start of normal operation, together with the monitoring methodology plan as referred to in Article 8 and the verification report issued in accordance with measures adopted pursuant to Article 15 of Directive 2003/87/EC, and shall specify to the competent authority the date of start of normal operation.

3 Where an application by a new entrant fulfils all the conditions laid down in paragraph 2, and follows the allocation rules laid down in Articles 17 to 22, the competent authority shall approve it, as well as the specified date of start of normal operation.

4 Competent authorities shall only accept data submitted pursuant to this Article that has been verified as satisfactory by a verifier, in accordance with the requirements set out in measures adopted pursuant to Article 15 of Directive 2003/87/EC.

Article 6

General obligation to monitor

The operator of an installation, applying for or receiving free allocation pursuant to Article 10a of Directive 2003/87/EC shall monitor the data to be submitted as listed in Annex IV to this Regulation, based on a monitoring methodology plan approved by the competent authority by 31 December 2020.

Article 7

Monitoring principles

1 Operators shall determine complete and consistent data and ensure that there are no overlaps between sub-installations and no double counting. Operators shall apply the determination methods laid down in Annex VII, exercise due diligence and use data sources representing highest achievable accuracy pursuant to section 4 of Annex VII.

2 By way of derogation from paragraph 1, the operator may use other data sources in accordance with sections 4.4 to 4.6 of Annex VII, if any of the following conditions is met:

a the use of most accurate data sources pursuant to section 4 of Annex VII is technically not feasible;

b the use of most accurate data sources pursuant to section 4 of Annex VII would incur unreasonable costs;

c based on a simplified uncertainty assessment identifying major sources of uncertainty and estimating their associated levels of uncertainty, the operator demonstrates to the satisfaction of the competent authority that the associated level of accuracy of the data source proposed by the operator is equivalent to or better than the level of accuracy of most accurate data sources pursuant to section 4 of Annex VII.

3 Operators shall keep complete and transparent records of all data listed in Annex IV, and supporting documents, for at least 10 years from the date of the submission of the application for free allocation. The operator shall, upon request, make those data and documents available to the competent authority and to the verifier.

Article 8

Content and submission of the monitoring methodology plan

1 The operator of an installation applying for free allocation pursuant to Articles 4(2)b and 5(2) shall draw up a monitoring methodology plan containing, in particular, a description of the installation and its sub-installations, the production processes and a detailed description of monitoring methodologies and data sources. The monitoring methodology plan shall comprise a detailed, complete and transparent documentation of all relevant data collection steps, and shall contain at least the elements laid down in Annex VI.

2 For each parameter listed in Annex IV, the operator shall select a monitoring method based on the principles laid down in Article 7 and on the methodological requirements laid down in Annex VII. Based on the risk assessment in accordance with Article 11(1) and control procedures referred to in Article 11(2), when selecting monitoring methods, the operator shall give preference to monitoring methods that give most reliable results, minimise the risk of data gaps, and are least prone to inherent risks, including control risks. The selected method shall be documented in the monitoring methodology plan.

3 Where Annex VI makes a reference to a procedure, and for the purposes of Article 12(3) of Regulation (EU) No 601/2012, the operator shall establish, document, implement and maintain such a procedure separately from the monitoring methodology plan. The operator shall make any written documentation of the procedures available to the competent authority upon request.

4 The operator shall submit the monitoring methodology plan to the competent authority for approval by the date set in Article 4(1). Member States may set an earlier time-limit for the submission of the monitoring methodology plan and may require the monitoring methodology plan to be approved by the competent authority before submission of an application for free allocation.

5 Where an operator applies for free allocation but has renounced it for a previous allocation period, the operator shall submit the monitoring methodology plan for approval not later than six months before the time-limit for submission of the application pursuant to Article 4(1).

Article 9

Changes to the monitoring methodology plan

1 The operator shall regularly check whether the monitoring methodology plan reflects the nature and functioning of the installation and whether it can be improved. To this end, the operator shall take account of any recommendations for improvements included in the relevant verification report.

2 The operator shall modify the monitoring methodology plan in any of the following situations:

a new emissions or activity levels occur due to new activities carried out or due to the use of new fuels or materials not yet contained in the monitoring methodology plan;

b the use of new measuring instrument types, new sampling or analysis methods or new data sources, or other factors, lead to higher accuracy in the determination of reported data;

c data resulting from the previously applied monitoring methodology has been found incorrect;

d the monitoring methodology plan is not, or no longer, in conformity with the requirements of this Regulation;

e it is necessary to implement recommendations for improvement of the monitoring methodology plan contained in a verification report.

3 The operator shall notify any intended modification of the monitoring methodology plan to the competent authority without undue delay. However, a Member State may allow the operator to notify, by 31 December of the same year or by another date set by the Member State, intended modifications of the monitoring methodology plan that are not significant within the meaning of paragraph 5.

4 Any significant modification of the monitoring methodology plan within the meaning of paragraph 5 shall be subject to approval by the competent authority. Where the competent authority considers that a modification that has been notified by the operator as significant is not significant, it shall inform the operator thereof.

5 The following modifications of the monitoring methodology plan of an installation shall be considered significant:

a modifications resulting from changes to the installation, in particular new sub-installations, changes to the boundaries of existing sub-installations or closures of sub-installations;

b a switch from a monitoring methodology laid down in sections 4.4 to 4.6 of Annex VII to another methodology laid down in those sections;

c the change of a default value or estimation method laid down in the monitoring methodology plan;

d changes requested by the competent authority to ensure conformity of the monitoring methodology plan with the requirements of this Regulation.

6 The operator shall keep records of all modifications of the monitoring methodology plan. In each record, the following shall be specified:

a a transparent description of the modification;

b a justification for the modification;

c the date of notification of the intended modification to the competent authority;

d the date of acknowledgement, by the competent authority, of the receipt of the notification referred to paragraph 3, where available, and the date of the approval or provision of information referred to in paragraph 4;

e the starting date of implementation of the modified monitoring methodology plan.

Article 10

Division into sub-installations

1 For the purposes of data reporting and of monitoring, the operator shall divide each installation eligible for the free allocation of emission allowances under Article 10a of Directive 2003/87/EC into sub-installations. For this purpose, the installation's inputs, outputs and emissions shall be assigned to one or more sub-installations by establishing, where relevant, a method for quantifying specific fractions of relevant inputs, outputs or emissions to be assigned to individual sub-installations.

2 For attributing the installation's inputs, outputs and emissions to sub-installations, the operator shall carry out the following steps in the descending order:

a if any of the products as specified for product benchmarks listed in Annex I are produced in the installation, the operator shall attribute the related inputs, outputs and emissions to the product benchmark sub-installations, as applicable, applying rules set out in Annex VII;

b if inputs, outputs and emissions qualifying for heat benchmark or district heating sub-installations are relevant at the installation, and do not qualify for any of the sub-installations referred to in point (a), the operator shall attribute them to heat benchmark sub-installations or to district heating sub-installation, as applicable, applying the rules set out in Annex VII;

c if inputs, outputs and emissions qualifying for fuel benchmark sub-installations are relevant at the installation, and do not qualify for any of the sub-installations referred to in points (a) or (b), the operator shall attribute them to fuel benchmark sub-installations, as applicable, applying the rules set out in Annex VII;

d if inputs, outputs and emissions qualifying for process emissions sub-installations are relevant at the installation, and do not qualify for any of the sub-installations referred to in points (a), (b) or (c), the operator shall attribute them to process emissions sub-installations, as applicable, applying the rules set out in Annex VII.

3 For heat benchmark sub-installations, fuel benchmark sub-installations and process emissions sub-installations, the operator shall clearly distinguish on the basis of NACE and PRODCOM codes whether or not the relevant process serves a sector or subsector deemed to be exposed to a significant risk of carbon leakage as determined in accordance with Article 10b(5) of Directive 2003/87/EC. In addition, the operator shall distinguish the amount of measurable heat which is exported for the purposes of district heating from the measurable heat which does

not serve a sector or subsector deemed to be exposed to a significant risk of carbon leakage as determined in accordance with Article 10b(5) of Directive 2003/87/EC.

Where at least 95 % of the activity level of the heat benchmark sub-installations, of the fuel benchmark sub-installations or of the process emissions sub-installations, serve sectors or subsectors deemed to be exposed to a significant risk of carbon leakage as determined in accordance with Article 10b(5) of Directive 2003/87/EC or where at least 95 % of the activity level of the heat benchmark sub-installations, of the fuel benchmark sub-installations or of the process emissions sub-installations serve sectors or subsectors not deemed to be exposed to a significant risk of carbon leakage, the operator is exempted from providing data allowing for the distinction in terms of carbon leakage exposure.

Where at least 95 % of the activity level of the district heating sub-installations or the heat benchmark sub-installations are attributable to one of these sub-installations, the operator may attribute the total activity level of these sub-installations to the one with the highest activity level.

4 Where an installation included in the EU ETS has produced and exported measurable heat to an installation or other entity not included in the EU ETS, the operator shall consider that the relevant process of the heat benchmark sub-installation for this heat does not serve a sector or subsector deemed to be exposed to a significant risk of carbon leakage as determined in accordance with Article 10b(5) of Directive 2003/87/EC, unless the operator provides evidence to the satisfaction of the competent authority that the consumer of the measurable heat belongs to a sector or subsector deemed to be exposed to a significant risk of carbon leakage as determined in accordance with Article 10b(5) of Directive 2003/87/EC.

For distinguishing measurable heat attributable to the district heating sub-installation, the operator shall provide evidence to the satisfaction of the competent authority that the measurable heat is exported to district heating.

5 By carrying out the division in accordance with paragraphs 1 and 2, the operator shall ensure all of the following:

a each of the installation's physical products is attributed to one sub-installation without any omission or double counting;

b 100 % of the quantity of all the installation's source streams and emissions as listed in the installation's monitoring plan approved in accordance with Regulation (EU) No 601/2012 are attributed to sub-installations without any omission or double counting, unless they relate to any process non-eligible for free allocation such as the production of electricity in the installation, flaring other than safety flaring which is not covered by a product benchmark sub-installation, or the production of measurable heat exported to other EU ETS installations;

c 100 % of the quantity of net measurable heat eligible for free allocation produced within the installation, or imported or exported by the installation, as well as quantities transferred between sub-installations, are attributed to sub-installations without any omission or double counting;

d for all measurable heat produced, imported or exported by sub-installations, it is documented whether the measurable heat was produced in a combustion process within an EU ETS installation, imported from other heat producing processes or imported from non-EU ETS entities;

e where electricity is produced within the installation, the quantities produced within product benchmark sub-installations are attributed to these sub-installations without any omission or double counting;

f for each product benchmark sub-installation where exchangeability of fuel and electricity is relevant in accordance with section 2 of Annex I, the relevant amount of electricity consumed is separately identified and attributed;

g where a sub-installation has outputs of carbon containing materials in the form of exported fuels, products, by-products, feedstocks for other sub-installations or installations, or waste gases, those outputs are attributed to sub-installations without any omission or double counting, if not covered by point (b);

h CO_2 emissions occurring outside the system boundaries of a product benchmark sub-installation resulting from processes listed in points (a) to (f) of Article 2(10) are assigned to a process emissions sub-installation to the extent that it can be demonstrated to the satisfaction of the competent authority that these emissions are direct and immediate results of any of the processes listed in Article 2(10) and that they do not result from the subsequent oxidation of incompletely oxidised carbon in a gaseous state under standard conditions;

i where CO_2 emissions from the combustion of waste gas not serving the purpose of the production of measurable heat, non-measurable heat or electricity occur outside the system boundaries of a product benchmark sub-installation as a result of the processes listed in points (a) to (f) of Article 2(10), 75 % of the quantity of the carbon content of the waste gas shall be considered as converted to CO_2, and assigned to a process emissions sub-installation;

j for avoiding any double counting, products of a production process returned into the same production process are deducted from annual activity levels, as appropriate in line with product definitions laid down in Annex I;

k where measurable heat is recovered from processes covered by a fuel benchmark sub-installation, for avoiding double counting, the relevant amount of net measurable heat divided by a reference efficiency of 90 % is subtracted from the fuel input. The recovery of heat from processes covered by a process emissions sub-installation is treated the same way.

Article 11

Control system

1 The operator shall identify sources of risks of errors in the data flow from primary data to final data in the baseline data report and shall establish, document, implement and maintain an effective control system to ensure that the reports resulting from data flow activities do not contain misstatements and are in conformity with the monitoring methodology plan and in compliance with this Regulation.

The operator shall make the risk assessment pursuant to the first subparagraph available to the competent authority upon request. The operator shall also make it available for the purposes of verification.

2 For the purpose of the first subparagraph of paragraph 1, the operator shall establish, document, implement and maintain written procedures for data flow activities as well as for control activities, and include references to those procedures in the monitoring methodology plan in accordance with Article 8(3).

3 Control activities referred to in paragraph 2 shall include, where applicable:

a quality assurance of the relevant measurement equipment;

b quality assurance of information technology systems ensuring that the relevant systems are designed, documented, tested, implemented, controlled and maintained in a way

that ensures processing reliable, accurate and timely data in accordance with the risks identified in accordance with paragraph 1;

c segregation of duties in the data flow activities and control activities, as well as 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.

4 For the purposes of paragraph 3(a), 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, and proportionate to the risks identified.

Where components of the measuring systems cannot be calibrated, the operator shall identify those in the monitoring methodology 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.

5 For the purposes of paragraph 3(d), the operator shall review and validate data resulting from the data flow activities referred to in paragraph 2.

Such review and validation of the data shall include:

a a check as to whether the data are complete;

b a comparison of the data that the operator has determined over the preceding baseline period and, in particular, consistency checks based on time series of greenhouse gas efficiency of each sub-installation;

c a comparison of data and values resulting from different operational data collection systems, in particular for production protocols, sales figures and stock figures of products to which product benchmarks relate;

d comparisons and completeness checks of data at installation and sub-installation level for ensuring that the requirements laid down in Article 10(5) are fulfilled.

6 For the purposes of paragraph 3(e), the operator shall ensure that, where data flow activities or control activities are found not to function effectively, or not to respect the rules set in the documentation of procedures for those activities, corrective action is taken and affected data is corrected without undue delay.

7 For the purposes of paragraph 3(f), where the operator outsources one or more data flow activities or control activities referred to in paragraph 1, the 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 as well as the methods used in those processes;

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

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 paragraph 1.

8 The 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 reports for the purposes of Article 4(2).

When the operator finds the control system ineffective or not commensurate with the risks identified, it shall seek to improve the control system and update the monitoring methodology plan or the underlying written procedures for data flow activities, risk assessments and control activities, as appropriate.

Article 12

Data gaps

1 Where for technical reasons it is temporarily not feasible to apply the monitoring methodology plan as approved by the competent authority, the operator shall apply a method based on alternative data sources listed in the monitoring methodology plan for the purpose of performing corroborative checks in accordance with Article 10(5), or, if such an alternative is not contained in the monitoring methodology plan, an alternative method which provides the highest achievable accuracy according to the generic data sources and their hierarchy laid down in section 4 of Annex VII, or a conservative estimation approach, until the conditions for application of the approved monitoring methodology plan have been restored.

The operator shall take all necessary measures to achieve a prompt application of the approved monitoring methodology plan.

2 Where data relevant for the baseline data report are missing, for which the monitoring methodology plan does not list alternative monitoring methods or alternative data sources for corroborating data or for closing the data gap, the operator shall use an appropriate estimation method for determining conservative surrogate data for the respective time period and missing parameter, in particular, based on best industry practice, recent scientific and technical knowledge, and shall provide due justification for the data gap and the use of those methods in an annex to the baseline data report.

3 Where a temporary deviation from the approved monitoring methodology plan occurs in accordance with paragraph 1, or where data relevant for the report referred to in Article 4(2)(a) or Article 5(2) are found to be missing, the operator shall without undue delay develop a written procedure for avoiding this type of data gap in the future and modify the monitoring methodology plan in accordance with Article 9(3). Furthermore, the operator shall assess whether and how the control activities referred to in Article 11(3) need to be updated and shall modify those control activities and the relevant written procedures, as appropriate.

Article 13

Use of electronic templates

Member States may require operators and verifiers to use electronic templates or specific file formats for the submission of baseline data reports, monitoring methodology plans and verification reports as referred to in Article 4(2) and of new entrant data reports, monitoring methodology plans and verification reports as referred to in Article 5(2).

CHAPTER III

Allocation rules

Article 14

National implementation measures

1 The list pursuant to Article 11(1) of Directive 2003/87/EC shall be submitted to the Commission using an electronic template provided by the Commission and shall identify all electricity generators, small installations that may be excluded from the EU ETS pursuant to Articles 27 and 27a of Directive 2003/87/EC and installations that will be included under the EU ETS pursuant to Article 24 of that Directive.

2 The list referred to in paragraph 1 shall contain the following information for each incumbent installation applying for free allocation:

a an identification of the installation and its boundaries using the installation identification code in the European Union Transaction Log (EUTL);

b activity information and information on eligibility for free allocation;

c an identification of each sub-installation of an installation;

d for each sub-installation, the annual activity level and annual emissions in each year of the relevant baseline period;

e for each sub-installation, information on whether it belongs to a sector or subsector deemed to be exposed to a significant risk of carbon leakage as determined in accordance with Article 10b(5) of Directive 2003/87/EC, including the PRODCOM codes of the products produced, where applicable;

f for each sub-installation, the data reported in accordance with Annex IV.

3 Upon receipt of the list referred to in paragraph 1, the Commission shall assess the inclusion of each installation in the list and the related data submitted in accordance with paragraph 2.

4 Where the Commission does not reject an installation's inclusion in that list, the data shall be used for the calculation of the revised benchmark values as referred to in Article 10a(2) of Directive 2003/87/EC.

5 Member States shall determine and notify the preliminary annual amounts per installation of free allowances, using the revised benchmark values for the relevant allocation period, as determined in accordance with Article 16(2) to (7) and Articles 19 to 22.

6 Once the preliminary annual amounts of free allowances for the relevant allocation period are notified, the Commission shall determine any factor established pursuant to Article 10a(5) of Directive 2003/87/EC by comparing the sum of the preliminary annual amounts of free allowances to installations in each year over the relevant allocation period with application of the factors as determined in Annex V to this Regulation with the annual amount of allowances that is calculated in accordance with Article 10a(5) and (5a) of Directive 2003/87/EC for installations, taking into account the relevant share of the annual Union-wide total quantity, as determined pursuant to Articles 10(1) and 10a(5) of Directive 2003/87/EC. The determination shall take into account inclusions pursuant to Article 24 and exclusions pursuant to Articles 27 and 27a of Directive 2003/87/EC, as appropriate.

7 Once the factor established pursuant to in Article 10a(5) of Directive 2003/87/EC is determined, the Member States shall determine and submit to the Commission the final annual

amount of emission allowances allocated free of charge for each year over the relevant allocation period in accordance with Article 16(8).

8 Upon request, each Member State shall make the reports received on the basis of Article 4(2) available to the Commission.

Article 15

Historical activity level for incumbent installations

1 Member States shall assess the baseline data reports and verification reports submitted in accordance with Article 4(2) to ensure conformity with the requirements of this Regulation. Where appropriate, the competent authority shall request corrections by the operators of any non-conformities or any errors, which impact on the determination of the historical activity levels. The competent authority may request operators to submit more data in addition to the information and documents to be provided in accordance with Article 4(2).

2 On the basis of the assessed baseline data reports and verification reports, Member States shall determine historical activity levels of each sub-installation and installation for the relevant baseline period. Member States may only decide to determine historical activity levels where data relating to an installation has been verified as satisfactory or if they are satisfied that the data gaps leading to the verifier's opinion are due to exceptional and unforeseeable circumstances that could not have been avoided even if all due care had been exercised.

3 The product-related historical activity level shall, for each product for which a product benchmark has been determined as referred to in Annex I, refer to the arithmetic mean of annual historical production of that product in the installation concerned during the baseline period.

4 The heat-related historical activity level shall refer to the arithmetic mean of annual historical import from an installation covered by the EU ETS, production, or both, during the baseline period, of net measurable heat consumed within the installation's boundaries for the production of products, for the production of mechanical energy other than used for the production of electricity, for heating or cooling with the exception of the consumption for the production of electricity, or exported to an installation or other entity not covered by the EU ETS with the exception of the export for the production of electricity expressed as terajoule per year.

The district heating-related historical activity level shall refer to the arithmetic mean of annual historical import from an installation covered by the EU ETS, production, or both, during the baseline period, of measurable heat which is exported for the purposes of district heating expressed as terajoule per year.

5 The fuel-related historical activity level shall refer to the arithmetic mean of annual historical consumption of fuels used for the production of non-measurable heat consumed for the production of products, for the production of mechanical energy other than used for the production of electricity, for heating or cooling with the exception of the consumption for the production of electricity, including safety flaring, during the baseline period expressed as terajoule per year.

6 For process emissions, which occurred in relation with the production of products in the installation concerned during the baseline period, the process-related historical activity level shall refer to the arithmetic mean of annual historical process emissions expressed as tonnes of carbon dioxide equivalent.

7 For the purposes of the determination of the arithmetic mean values referred to in paragraphs 3 to 6, only calendar years during which the installation has been operating for at least one day shall be taken into account.

If a sub-installation has been operating for less than two calendar years during the relevant baseline period, the historical activity levels shall be the activity levels of the first calendar year of operation after the start of normal operation of this sub-installation.

If a sub-installation has not been operating for a calendar year after the start of normal operation during the baseline period, the historical activity level shall be determined when the activity level report after the first calendar year of operation is submitted.

8 By way of derogation from paragraph 3, Member States shall determine the product-related historical activity level for products to which the product benchmarks referred to in Annex III apply on the basis of the arithmetic mean of annual historical production according to the formulas set out in that Annex.

Article 16

Allocation at installation level for incumbent installations

1 Where the operator of an incumbent installation has submitted a valid application for free allocation in accordance with Article 4, the Member State concerned shall, based on the data collected in accordance with Article 14, calculate, for each year, the number of emission allowances allocated free of charge from 2021 onwards to that installation.

2 For the purpose of the calculation referred to in paragraph 1, Member States shall first determine the preliminary annual number of emission allowances allocated free of charge for each sub-installation separately, as follows:

a for product benchmark sub-installations, the preliminary annual number of emission allowances allocated free of charge for a given year shall correspond to the value of that product benchmark for the relevant allocation period, adopted in accordance with Article 10a(2) of Directive 2003/87/EC, multiplied by the relevant product-related historical activity level;

b for heat benchmark sub-installations, the preliminary annual number of emission allowances allocated free of charge for a given year shall correspond to the value of the heat benchmark for measurable heat for the relevant allocation period, adopted in accordance with Article 10a(2) of Directive 2003/87/EC, multiplied by the heat-related historical activity level for the consumption or export to non-ETS installations or other entities of measurable heat other than district heating;

c for district heating sub-installations, the preliminary annual number of emission allowances allocated free of charge for a given year shall correspond to the value of the heat benchmark for measurable heat for the relevant allocation period, adopted in accordance with Article 10a(2) of Directive 2003/87/EC, multiplied by the district heating-related historical activity level;

d for fuel benchmark sub-installations, the preliminary annual number of emission allowances allocated free of charge for a given year shall correspond to the value of the fuel benchmark for the relevant five-year period, adopted in accordance with Article 10a(2) of Directive 2003/87/EC, multiplied by the fuel-related historical activity level for the fuel consumed;

e for process emissions sub-installations, the preliminary annual number of emission allowances allocated free of charge for a given year shall correspond to the process-related historical activity level multiplied by 0,97.

If a sub-installation has been operating for less than one calendar year after the start of normal operation during the baseline period, the preliminary allocation for the relevant alloction period shall be determined after the historical activity level has been reported.

3 For the purpose of Article 10b(4) of Directive 2003/87/EC, the factors determined in Annex V to this Regulation shall be applied to the preliminary annual number of emission allowances allocated free of charge determined for each sub-installation pursuant to paragraph 2 of this Article for the year concerned where the processes in those sub-installations serve sectors or subsectors deemed not to be exposed to a significant risk of carbon leakage as determined in accordance with Article 10b(5) of Directive 2003/87/EC.

By way of derogation from the first subparagraph, for district heating sub-installations, the factor to be applied shall be 0,3.

4 Where the processes in the sub-installations referred to in paragraph 2 serve sectors or subsectors deemed to be exposed to a significant risk of carbon leakage as determined in accordance with Article 10b(5) of Directive 2003/87/EC, the factor to be applied shall be 1.

5 The preliminary annual number of emission allowances allocated free of charge for sub-installations that received measurable heat from sub-installations producing products covered by the nitric acid benchmark shall be reduced by the annual historical consumption of that heat during the relevant baseline periods, multiplied by the value of the heat benchmark for this measurable heat for the relevant allocation period, adopted in accordance with Article 10a(2) of Directive 2003/87/EC.

From 2026, the preliminary annual number of emission allowances allocated free of charge for product benchmark sub-installations for the relevant allocation period shall be reduced by the annual historical emissions stemming from waste gases flared, with the exception of safety flaring, and not used for the purpose of the production of measurable heat, non-measurable heat or electricity.

6 The preliminary annual amount of emission allowances allocated free of charge for each installation shall be the sum of all sub-installations' preliminary annual numbers of emission allowances allocated free of charge calculated in accordance with paragraphs 2 to 5.

Where an installation encompasses sub-installations producing pulp (short fibre kraft pulp, long fibre kraft pulp, thermo-mechanical pulp and mechanical pulp, sulphite pulp or other pulp not covered by a product benchmark) exporting measurable heat to other technically connected sub-installations, the preliminary amount of emission allowances allocated free of charge shall, without prejudice to the preliminary annual numbers of emission allowances allocated free of charge for other sub-installations of the installation concerned, only take into account the preliminary annual number of emission allowances allocated free of charge, to the extent that pulp products produced by this sub-installation are placed on the market and not processed into paper in the same or other technically connected installations.

7 When determining the preliminary annual amount of emission allowances allocated free of charge for each installation, Member States and operators shall ensure that emissions or activity levels are not double-counted and that the allocation is not negative. In particular, where an intermediate product that is covered by a product benchmark according to the definition of the respective system boundaries set out in Annex I is imported by an installation, emissions shall not be double-counted when determining the preliminary annual amount of emission allowances allocated free of charge for both installations concerned.

8 The final annual amount of emission allowances allocated free of charge for each incumbent installation, except for installations covered by Article 10a(3) of Directive 2003/87/

EC, shall be the preliminary annual amount of emission allowances allocated free of charge for each installation determined in accordance with paragraph 6 of this Article, multiplied by the factor as determined in accordance with Article 14(6) of this Regulation.

For installations covered by Article 10a(3) of Directive 2003/87/EC and eligible for the allocation of free emission allowances, the final annual amount of emission allowances allocated free of charge shall correspond to the preliminary annual amount of emission allowances allocated free of charge for each installation determined in accordance with paragraph 6 of this Article annually adjusted by the linear factor referred to in Article 9 of Directive 2003/87/EC, using the preliminary annual amount of emission allowances allocated free of charge for the installation concerned for 2013 as a reference, except for any year in which those allocations are adjusted in a uniform manner pursuant to Article 10a(5) of Directive 2003/87/EC.

By way of derogation from the second subparagraph, for any year for which the factor determined in accordance with Article 14(6) is lower than 100 %, for installations covered by Article 10a(3) of Directive 2003/87/EC and eligible for the allocation of free emission allowances, the final annual amount of emission allowances allocated free of charge shall correspond to the preliminary annual amount of emission allowances allocated free of charge for each installation determined in accordance with paragraph 6 of this Article, annually adjusted by the factor as determined in accordance with Article 14(6) of this Regulation.

9 For the purpose of the calculations referred to in paragraphs 1 to 8, the number of allowances for sub-installations and installations shall be expressed as the nearest integer.

Article 17

Historical activity level for new entrants

Member States shall determine historical activity levels of each new entrant and its sub-installations as follows:

(a) the product-related historical activity level shall be, for each product for which a product benchmark has been determined as referred to in Annex I to this Regulation or pursuant to Article 24 of Directive 2003/87/EC, the activity level of the first calendar year after the start of normal operation for the production of this product of the sub-installation concerned;

(b) the heat-related historical activity level shall be the activity level of the first calendar year after the start of normal operation for the import from an installation covered by the EU ETS, production, or both, of measurable heat consumed within the installation's boundaries for the production of products, for the production of mechanical energy other than used for the production of electricity, for heating or cooling with the exception of the consumption for the production of electricity, or exported to an installation or other entity not covered by the EU ETS with the exception of the export for the production of electricity;

(c) the district heating-related historical activity level shall be the activity level of the first calendar year after the start of normal operation for the import from an installation covered by the EU ETS, production, or both, of measurable heat which is exported for the purposes of district heating;

(d) the fuel-related historical activity level shall be the activity level of the first calendar year after the start of normal operation for the consumption of fuels used for the

production of non-measurable heat consumed for the production of products, for the production of mechanical energy other than used for the production of electricity, for heating or cooling with the exception of the consumption for the production of electricity, including safety flaring, of the installation concerned;

(e) the process emissions-related activity level shall be the activity level of the first calendar year after the start of normal operation for the production of process emissions of the process unit;

(f) By way of derogation from point (a), the product-related historical activity level for products to which the product benchmarks referred to in Annex III apply shall be the activity level of the first calendar year after the start of normal operation for the production of this product of the sub-installation concerned, determined according to the formulas set out in that Annex.

Article 18

Allocation to new entrants

1 For the purposes of the free allocation of emission allowances to new entrants, Member States shall calculate the preliminary annual number of emission allowances allocated free of charge as of the start of normal operation of the installation for each sub-installation separately, as follows:

a for each product benchmark sub-installation, heat benchmark sub-installation and fuel benchmark sub-installation, the preliminary annual number of emission allowances allocated free of charge for a given year shall correspond to the value of that benchmark for the relevant period multiplied by the relevant historical activity level;

b for each process emissions sub-installation, the preliminary annual number of emission allowances allocated free of charge for a given year shall correspond to the process-related historical activity level multiplied by 0,97.

Article 16(3), (4), (5) and (7) shall apply *mutatis mutandis* to the calculation of the preliminary annual number of emission allowances allocated free of charge to new entrants.

2 The preliminary annual number of emission allowances allocated free of charge for the calendar year where the start of normal operation occurs shall correspond to the value of the applicable benchmark value for each sub-installation multiplied by the activity level of that year.

3 The preliminary annual amount of emission allowances allocated free of charge for each installation shall be the sum of all sub-installations' preliminary annual numbers of emission allowances allocated free of charge calculated in accordance with paragraphs 1 and 2. The second subparagraph of Article 16(6) shall apply.

4 Member States shall notify to the Commission without delay the annual amount of emission allowances per installation allocated free of charge to new entrants.

Emission allowances from the new entrants reserve created pursuant to Article 10a(7) of Directive 2003/87/EC shall be allocated by the Commission on a first come, first served basis as from receipt of that notification.

The Commission may reject the preliminary annual amount of emission allowances allocated free of charge to a specific installation.

5 The final annual amount of emission allowances allocated free of charge shall correspond to the preliminary annual amount of emission allowances allocated free of charge for each installation determined in accordance with paragraphs 1 to 4 annually adjusted by the linear factor referred to in Article 9 of Directive 2003/87/EC, using the preliminary annual amount of emission allowances allocated free of charge for the installation concerned for the first year of the relevant allocation period as a reference.

6 For the purpose of the calculations referred to in paragraphs 1 to 5, the number of allowances for sub-installations and installations shall be expressed as the nearest integer.

Article 19

Allocation in respect of steam cracking

By way of derogation from Article 16(2)(a) and Article 18(1)(a), the preliminary annual number of emission allowances allocated free of charge for a product benchmark sub-installation relating to the production of high value chemicals ('HVC') shall correspond to the value of the steam cracking product benchmark for the relevant allocation period multiplied by the historical activity level determined in accordance with Annex III and multiplied by the quotient of the total direct emissions including emissions from net imported heat over the baseline period referred to in Article 15(2) or of the first calendar year after the start of normal operation referred to in Article 17(a), as appropriate, calculated in accordance with Article 22(2) and expressed as tonnes of carbon dioxide equivalent and the sum of these total direct emissions and the relevant indirect emissions over the baseline period referred to in Article 15(2) or of the first calendar year after the start of normal operation referred to in Article 17(a), as appropriate, calculated in accordance with Article 22(3). To the result of that calculation, 1,78 tonnes of carbon dioxide per ton of hydrogen times the mean historical production of hydrogen from supplemental feed expressed in tons of hydrogen, 0,24 tonnes of carbon dioxide per ton of ethylene times the mean historical production of ethylene from supplemental feed expressed in tons of ethylene, and 0,16 tonnes of carbon dioxide per ton of HVC times the mean historical production of other high value chemicals than hydrogen and ethylene from supplemental feed expressed in tons of HVC, shall be added.

Article 20

Allocation in respect of vinyl chloride monomer

By way of derogation from Article 16(2)(a) and Article 18(1)(a), the preliminary annual number of emission allowances allocated free of charge for a sub-installation relating to the production of vinyl chloride monomer ('VCM') shall correspond to the value of the VCM benchmark for the relevant allocation period multiplied by the historical activity level for VCM production expressed as tonnes and multiplied by the quotient of the direct emissions for the production of VCM including emissions from net imported heat over the baseline period referred to in Article 15(2) or of the first calendar year after the start of normal operation referred to in Article 17(a), as appropriate, calculated in accordance with Article 22(2), expressed as tonnes of carbon dioxide equivalent and the sum of those direct emissions and the hydrogen-related emissions for the production of VCM over the baseline period referred to in Article 15(2) or of the first calendar year after the start of normal operation referred to in Article 17(a), as appropriate, expressed as tonnes of carbon dioxide equivalent calculated on the basis of the historical heat

consumption stemming from hydrogen combustion expressed as terajoules times the value of the heat benchmark for the relevant allocation period.

Article 21

Heat flows between installations

Where a product-benchmark sub-installation encompasses measurable heat imported from an installation or other entity not included in the EU ETS, the preliminary annual number of emission allowances allocated free of charge for the product benchmark sub-installation concerned determined pursuant to Article 16(2)(a) or Article 18(1)(a), as appropriate, shall be reduced by the amount of heat historically imported from an installation or other entity not included in the EU ETS in the year concerned multiplied by the value of the heat benchmark for measurable heat for the relevant allocation period.

Article 22

Exchangeability of fuel and electricity

1 For each product benchmark sub-installation corresponding to a product benchmark defined in section 2 of Annex I with consideration of exchangeability of fuel and electricity, the preliminary annual number of emission allowances allocated free of charge shall correspond to the value of the relevant product benchmark for the relevant allocation period multiplied by the product-related historical activity level and multiplied by the quotient of the total direct emissions including emissions from net imported heat over the baseline period referred to in Article 15(2) or of the first calendar year after the start of normal operation referred to in Article 17(a), as appropriate, calculated in accordance with paragraph 2, expressed as tonnes of carbon dioxide equivalent and the sum of these total direct emissions and the relevant indirect emissions over the baseline period referred to in Article 15(2) or of the first calendar year after the start of normal operation referred to in Article 17(a), as appropriate, calculated in accordance with paragraph 3.

2 For the purposes of the calculation of emissions from net imported heat, the amount of measurable heat for the production of the product concerned imported from installations covered by the EU ETS during the baseline period referred to in Article 15(2) or of the first calendar year after the start of normal operation referred to in Article 17(a), as appropriate, shall be multiplied by the value of the heat benchmark for the relevant allocation period.

3 For the purposes of the calculation of indirect emissions, the relevant indirect emissions refer to the relevant electricity consumption as specified in the definition of processes and emissions covered in Annex I during the baseline period referred to in Article 15(2) or of the first calendar year after the start of normal operation referred to in Article 17(a), as appropriate, expressed in megawatt-hours for the production of the product concerned times 0,376 tonnes of carbon dioxide per megawatt-hour and expressed as tonnes of carbon dioxide.

Article 23

Changes to the allocation of an installation

1 Operators shall inform the relevant competent authority of any change related to the operation of an installation which has an impact on the installation's allocation. Member States

may set a time-limit for that notification and may require the use of electronic templates or specific file formats.

2 After assessing the relevant information, the competent authority shall submit to the Commission all relevant information, including the revised final annual amount of emission allowances allocated free of charge for the installation concerned.

The competent authority shall submit the relevant information pursuant to the first subparagraph using an electronic system operated by the Commission.

3 The Commission may reject the revised final annual amount of emission allowances allocated free of charge for the installation concerned.

4 The Commission shall adopt a Decision based on the notification received, shall inform the relevant competent authority and shall introduce the changes, where appropriate, into the Union Registry set up pursuant to Article 19 of Directive 2003/87/EC and the EUTL, referred to Article 20 of that Directive.

Article 24

Renunciation of free allocation of allowances

1 An operator that has been granted free allocation of allowances may renounce it in respect of all or certain sub-installations at any time during the relevant allocation period by submitting an application to the competent authority.

2 After assessing the relevant information, the competent authority shall submit to the Commission the revised final annual amount of emission allowances allocated free of charge for the installation concerned as described in Article 23(2).

The revised allocation shall concern the calendar years following the year of the application referred to in the paragraph 1.

3 The Commission shall adopt a Decision as regards the renunciation and shall follow the procedure referred to Article 23(4).

4 The operator shall have no right to withdraw its application referred to in paragraph 1 the same allocation period.

Article 25

Mergers and splits

1 The operators of new installations resulting from a merger or a split shall provide the following documentation to the competent authority, as appropriate:

a names, addresses and contact data of the operators of the previously separate or single installations;

b names, addresses and contact data of the operators of the newly formed installation;

c a detailed description of the boundaries of the installation parts concerned if applicable;

d the permit identifier and the identification code of the newly formed installation(s) in the Union Registry.

2 Installations resulting from mergers or splits shall submit to the competent authority the reports referred to in Article 4(2). If the installations before the merger or split were new

entrants, operators shall report to the competent authority the data from the start of normal operation.

3 Mergers or splits of installations, including splits within the same corporate group shall be assessed by the competent authority. The competent authority shall notify the Commission of the change of operators.

Based on the data received pursuant to paragraph 2, the competent authority shall determine the historical activity levels in the baseline period for each sub-installation of each newly formed installation after the merger or split. In the case that a sub-installation is split into two or more sub-installations, the historical activity level and allocation to the sub-installations after the split shall be based on the historical activity levels in the baseline period of the respective technical units of the installation before the split.

4 Based on the historical activity levels after the mergers or splits, the free allocation of allowances of the installations after mergers or splits shall correspond to the final amount of free allocation, before the mergers or splits.

5 The Commission shall review each allocation of allowances of the installations after mergers or splits and communicate the results of that assessment to the competent authority.

Article 26

Cessation of operations of an installation

1 An installation is deemed to have ceased operations where any of the following conditions is met:

a the relevant greenhouse gas emissions permit has been withdrawn, including if the installation no longer meets the thresholds of the activities listed in Annex I to Directive 2003/87/EC;

b the installation is no longer operating and it is technically impossible to resume operation.

2 Where an installation has ceased operation, the Member State concerned shall not issue emission allowances to it as of the year following the cessation of operations.

3 Member States may suspend the issuance of the emission allowances to installations that have suspended operations as long as it is not established whether they will resume operations.

CHAPTER IV

Final provisions

Article 27

Repeal of Decision 2011/278/EU

Decision 2011/278/EU is repealed with effect from 1 January 2021. However, it shall continue to apply to allocations relating to the period prior to 1 January 2021.

Article 28

Entry into force

This Regulation shall enter into force on the day following that of its publication in the *Official Journal of the European Union*.

This Regulation shall be binding in its entirety and directly applicable in all Member States.

Done at Brussels, 19 December 2018.

For the Commission

The President

Jean-Claude JUNCKER

ANNEX I

Benchmarks

1. Definition of product benchmarks and system boundaries without consideration of exchangeability of fuel and electricity

Product benchmark	**Definition of products covered**	**Definition of processes and emissions covered (system boundaries)**	**Starting point for determination of annual reduction rate for benchmark value update(allowances/ t)**
Coke	Coke-oven coke (obtained from the carbonisation of coking coal, at high temperature) or gas-works coke (by-product of gas-works plants) expressed in tonnes of dry coke, determined at the discharge of the coke oven or gas-works plant. Lignite coke is not covered by this benchmark. Coking in refineries is not included but covered by the CWT methodology for refineries.	All processes directly or indirectly linked to the process units coke ovens, H_2S/ NH_3 incineration, coal preheating (defreezing), coke gas extractor, desulphurisation unit, distillation unit, steam generation plant, pressure control in batteries, biological water treatment, miscellaneous heating of by-products and hydrogen separator are included. Coke oven gas cleaning is included.	0,286
Sintered ore	Agglomerated iron-bearing product containing iron ore fines, fluxes and iron-containing recycling materials with the chemical and physical properties such as the level of basicity, mechanical strength and permeability required to deliver iron and necessary flux materials into iron ore reduction	All processes directly or indirectly linked to the process units sinter strand, ignition, feedstock preparation units, hot screening unit, sinter cooling unit, cold screening unit and steam generation unit are included.	0,171

	processes. Expressed in tonnes of sintered ore as leaving the sinter plant.		
Hot metal	Liquid iron saturated with carbon for further processing, considered as product of blast furnaces, and expressed in tonnes of liquid iron at the exit point of the blast furnace. Similar products such as ferroalloys are not covered by this product benchmark. Residual material and by-products are not to be considered as part of the product.	All processes directly or indirectly linked to the process units blast furnace, hot metal treatment units, blast furnace blowers, blast furnace hot stoves, basic oxygen furnace, secondary metallurgy units, vacuum ladles, casting units (including cutting), slag treatment unit, burden preparation, BF gas treatment unit, dedusting units, scrap pre-heating, coal drying for PCI, vessels preheating stands, casting ingots preheating stands, compressed air production, dust treatment unit (briquetting), sludge treatment unit (briquetting), steam injection in BF unit, steam generation plant, converter BOF gas cooling and miscellaneous are included.	1,328
Pre-bake anode	Anodes for aluminium electrolysis use consisting of petrol coke, pitch and normally recycled anodes, which are formed to shape specifically intended for a particular smelter and baked in anode baking ovens to a temperature of around 1 150 °C. Söderberg anodes are	All processes directly or indirectly linked to the production of pre-bake anodes are included.	0,324

	not covered by this product benchmark.		
Aluminium	Unwrought non-alloy liquid aluminium from electrolysis. Expressed in tonnes measured between the electrolysis section and the holding furnace of the cast house, before alloys and secondary aluminium are added.	All processes directly or indirectly linked to the production step electrolysis are included. Emissions resulting from holding furnaces and casting, and emissions related to anode productions are excluded.	1,514
Grey cement clinker	Grey cement clinker as total clinker produced.	All processes directly or indirectly linked to the production of grey cement clinker are included.	0,766
White cement clinker	White cement clinker for use as main binding component in the formulation of materials such as joint filers, ceramic tile adhesives, insulation, and anchorage mortars, industrial floor mortars, ready mixed plaster, repair mortars, and water-tight coatings with maximum average contents of 0,4 mass-% Fe_2O_3, 0,003 mass-% Cr_2O_3 and 0,03 mass-% Mn_2O_3. Expressed in tonnes of white cement clinker (as 100 % clinker).	All processes directly or indirectly linked to the production of white cement clinker are included.	0,987
Lime	Quicklime: calcium oxide (CaO) produced by the decarbonation of limestone ($CaCO_3$). Expressed in tonnes of ‘standard pure’ defined as lime with a free CaO	All processes directly or indirectly linked to the production of lime are included.	0,954

	content of 94,5 %. Lime produced and consumed in the same installation for purification processes is not covered by this product benchmark. The internal lime production of the pulp sector is already covered by the respective pulp benchmarks and is therefore not eligible for additional allocation based on the lime benchmark.		
Dolime	Dolime or calcined dolomite as mixture of calcium and magnesium oxides produced by the decarbonation of dolomite ($CaCO_3 \cdot MgCO_3$) with a residual CO_2 exceeding 0,25 %, a free MgO content between 25 % and 40 % and a bulk density of the commercial product below 3,05 g/cm^3. Dolime shall be expressed as 'standard pure dolime' quality with a free CaO content of 57,4 % and a free MgO content of 38,0 %.	All processes directly or indirectly linked to the production of dolime are included, in particular fuel preparation, calcination/sintering and flue gas treatment.	1,072
Sintered dolime	Mixture of calcium and magnesium oxides used solely for the production of refractory bricks and other refractory products with a minimum bulk density of 3,05 g/cm^3. Expressed in tonnes	All processes directly or indirectly linked to the production of sintered dolime are included.	1,449

	of saleable sintered dolime.		
Float glass	Float/ground/polish glass. (as tons of glass exiting the lehr).	All processes directly or indirectly linked to the production steps melter, refiner, working end, bath and lehr are included. Finishing workshops that can be physically separated from the upstream process, such as offline coating, laminating and toughening are excluded.	0,453
Bottles and jars of colourless glass	Bottles of colourless glass of a nominal capacity < 2,5 litres, produced in a furnace where there is no deliberate addition of colour for beverages and foodstuffs (excluding bottles covered with leather or composition leather; infant's feeding bottles) except extra-white flint products with an iron oxide content expressed as percent Fe_2O_3 by weight lower than 0,03 % and colour co-ordinates of L in the range 100 to 87, of a in the range 0 to – 5 and of b in the range 0 to 3 (using the CIELAB advocated by the Commission Internationale d'éclairage) expressed as tonnes of packed product.	All processes directly or indirectly linked to the production steps materials handling, melting, forming, downstream processing, packaging and ancillary processes are included.	0,382
Bottles and jars of coloured glass	Bottles of coloured glass of a nominal capacity < 2,5 litres, for beverages and	All processes directly or indirectly linked to the production steps materials	0,306

	foodstuffs (excluding bottles covered with leather or composition leather; infant's feeding bottles), not meeting the definition of the product benchmark for bottles and jars of colourless glass, expressed as tonnes of packed product.	handling, melting, forming, downstream processing, packaging and ancillary processes are included.	
Continuous filament glass fibre products	Melted glass for the production of continuous filament glass fibre products namely chopped strands, rovings, yarns and staple glass fibre and mats, expressed as tonnes of melted glass exiting the forehearth calculated from the quantity of raw material input into the furnace after subtraction of the volatile gaseous emissions. Mineral wool products for thermal, acoustic and fire insulation are not covered by this benchmark.	All processes directly or indirectly linked to the production processes glass melting in the furnaces and glass refining in the forehearths are included, in particular direct CO_2 emissions associated to these process CO_2 emissions resulting from the decarbonatisation of the glass mineral raw materials during the melting process. Downstream processes to convert the fibres into sellable products are not included in this product benchmark. Supporting processes such as material handling are ragarded as utilities and are outside the system boundaries.	0,406
Facing bricks	Facing bricks with a density > 1 000 kg/ m^3 used for masonry based on EN 771-1, excluding pavers, clinker bricks and blue braised facing bricks.	All processes directly or indirectly linked to the production processes raw material preparation, component mixing, forming and shaping of ware, drying of ware, firing of ware, product finishing and	0,139

		flue gas cleaning are included.	
Pavers	Clay bricks of any color used for flooring according to EN 1344. Expressed in tonnes of paves as net saleable product.	All processes directly or indirectly linked to the production processes raw material preparation, component mixing, forming and shaping of ware, drying of ware, firing of ware, product finishing and flue gas cleaning are included.	0,192
Roof tiles	Clay roofing tiles as defined in EN 1304:2005 excluding blue braised roof tiles and accessories. Expressed in tonnes of saleable roof tiles.	All processes directly or indirectly linked to the production processes raw material preparation, component mixing, forming and shaping of ware, drying of ware, firing of ware, product finishing and flue gas cleaning are included.	0,144
Spray dried powder	Spray-dried powder for the production of dry-pressed wall and floor tiles. Expressed in tonnes of powder produced.	All processes directly or indirectly linked to the production of spray-dried powder are included.	0,076
Plaster	Plasters consisting of calcined gypsum or calcium sulphate (including for use in building, for use in dressing woven fabrics or surfacing paper, for use in dentistry, for use in land remediation), in tonnes of stucco (saleable production). Alpha plaster, plaster that is further processed to plasterboard and the production of the intermediate product dried secondary	All processes directly or indirectly linked to the production steps milling, drying and calcining are included.	0,048

	gypsum are not covered by this product benchmark.		
Dried secondary gypsum	Dried secondary gypsum (synthetic gypsum produced as a recycled by-product of the power industry or recycled material from construction waste and demolition) expressed as tonnes of product.	All processes directly or indirectly linked to the drying of secondary gypsum are included	0,017
Short fibre kraft pulp	Short fibre kraft pulp is a wood pulp produced by the sulphate chemical process using cooking liquor, characterised by fibre lengths of 1 – 1,5 mm, which is mainly used for products which require specific smoothness and bulk, as tissue and printing paper, expressed as net saleable production in air dried tonnes, measured at the end of the production process, Air dry metric tonne of pulp meaning dry solids content of 90 %.	All processes which are part of the pulp production process (in particular the pulp mill, recovery boiler, pulp drying section and lime kiln and connected energy conversion units (boiler/CHP)) are included. Other activities on site that are not part of this process such as sawmilling activities, woodworking activities, production of chemicals for sale, waste treatment (treating waste onsite instead of offsite (drying, pelletising, incinerating, landfilling), PCC (precipitated calcium carbonate) production, treatment of odorous gases, and district heating are not included.	0,12
Long fibre kraft pulp	Long fibre kraft pulp is a wood pulp produced by the sulphate chemical process using cooking liquor, characterised	All processes which are part of the pulp production process (in particular the pulp mill, recovery boiler, pulp drying section and lime	0,06

	by fibre lengths of 3 – 3,5 mm, including bleached and unbleached pulp, expressed as net saleable production in air dried tonnes, measured at the end of the production process. Air dry metric tonne of pulp meaning dry solids content of 90 %.	kiln and connected energy conversion units (boiler/CHP)) are included. Other activities on site that are not part of this process such as sawmilling activities, woodworking activities, production of chemicals for sale, waste treatment (treating waste onsite instead of offsite (drying, pelletising, incinerating, landfilling), PCC (precipitated calcium carbonate) production, treatment of odorous gases, and district heating are not included.	
Sulphite pulp, thermo-mechanical and mechanical pulp	Sulphite pulp produced by a specific pulp making process, e.g. pulp produced by cooking wood chips in a pressure vessel in the presence of bisulphite liquor expressed as net saleable production in air dried metric tonnes measured at the end of the production process. Air dry metric tonne of pulp meaning dry solids contents of 90 %. Sulphite pulp can be either bleached or unbleached. Mechanical pulp grades: TMP (thermomechanical pulp) and groundwood as net saleable production in air dried metric tonnes measured	All processes which are part of the pulp production process (in particular the pulp mill, recovery boiler, pulp drying section and lime kiln and connected energy conversion units (boiler/CHP)) are included. Other activities on site that are not part of this process such as sawmilling activities, woodworking activities, production of chemicals for sale, waste treatment (treating waste onsite instead of offsite (drying, pelletising, incinerating, landfilling), PCC (precipitated calcium carbonate) production, treatment of odorous gases, and	0,02

	at the end of the production process. Air dry metric tonne of pulp meaning dry solids contents of 90 %. Mechanical pulp can be either bleached or unbleached. Not covered by this group are the smaller subgroups of semichemical pulp CTMP – chemi-thermomechanical pulp and dissolving pulp.	district heating are not included.	
Recovered paper pulp	Pulps of fibres derived from recovered (waste and scrap) paper or paperboard or of other fibrous cellulosic material expressed in tonnes of saleable production in air dried metric tonnes measured at the end of the production process. Air dry metric tonne of pulp meaning dry solids contents of 90 %. In case of pulp production, the production is defined as the total pulp produced including both pulp for internal delivery to a paper mill and market pulp.	All processes which are part of the production of pulp from recovered paper and connected energy conversion units (boiler/CHP)) are included. Other activities on site that are not part of this process such as sawmilling activities, woodworking activities, production of chemicals for sale, waste treatment (treating waste onsite instead of offsite (drying, pelletising, incinerating, landfilling), PCC (precipitated calcium carbonate) production, treatment of odorous gases, and district heating are not included.	0,039
Newsprint	Specific paper grade (in rolls or sheets) expressed as net saleable production in air dried tonnes, defined as paper with 6 % moisture content.	All processes which are part of the paper production process (in particular paper or board machine and connected energy conversion units (boiler/CHP) and	0,298

		direct process fuel use) are included. Other activities on site that are not part of this process such as sawmilling activities, woodworking activities, production of chemicals for sale, waste treatment (treating waste onsite instead of offsite (drying, pelletising, incinerating, landfilling), PCC (precipitated calcium carbonate) production, treatment of odorous gases, and district heating are not included.	
Uncoated fine paper	Uncoated fine paper, covering both uncoated mechanical and uncoated woodfree expressed as net saleable production in air dried tonnes, defined as paper with 6 % moisture content. 1. Uncoated woodfree papers covers papers suitable for printing or other graphic purposes made from a variety of mainly virgin fibre furnishes, with variable levels of mineral filler and	All processes which are part of the paper production process (in particular paper or board machine and connected energy conversion units (boiler/CHP) and direct process fuel use) are included. Other activities on site that are not part of this process such as sawmilling activities, woodworking activities, production of chemicals for sale, waste treatment (treating waste onsite instead of offsite (drying, pelletising, incinerating, landfilling), PCC (precipitated calcium carbonate) production, treatment of odorous gases, and district heating are not included.	0,318

	a range of finishing processes. 2. Uncoated mechanical papers cover the specific paper grades made from mechanical pulp, used for packaging or graphic purposes/ magazines.		
Coated fine paper	Coated fine paper covering both coated mechanical and coated woodfree papers expressed as net saleable production in air dried tonnes, defined as paper with 6 % moisture content.	All processes which are part of the paper production process (in particular paper or board machine and connected energy conversion units (boiler/CHP) and direct process fuel use) are included. Other activities on site that are not part of this process such as sawmilling activities, woodworking activities, production of chemicals for sale, waste treatment (treating waste onsite instead of offsite (drying, pelletising, incinerating, landfilling), PCC (precipitated calcium carbonate) production, treatment of odorous gases, and district heating are not included.	0,318
Tissue	Tissue papers, covering a wide range of tissue and other hygienic papers	All processes which are part of the paper production process (in particular paper	0,334

	for use in households or commercial and industrial premises such as toilet paper and facial tissues, kitchen towels, hand towels and industrial wipes, the manufacture of baby nappies, sanitary towels, etc. TAD - Through Air Dried Tissue is not part of this group. Expressed as tonnes of net saleable production of parent reel in air dried tonnes, defined as paper with 6 % moisture content.	or board machine and connected energy conversion units (boiler/CHP) and direct process fuel use) are included. Other activities on site that are not part of this process such as sawmilling activities, woodworking activities, production of chemicals for sale, waste treatment (treating waste onsite instead of offsite (drying, pelletising, incinerating, landfilling), PCC (precipitated calcium carbonate) production, treatment of odorous gases, and district heating are not included. The conversion of parent reel weight to finished products is not part of this product benchmark.	
Testliner and fluting	Testliner and fluting expressed as net saleable production in air dried tonnes defined as paper with 6 % moisture content. 1. Testliner covers types of paperboard that meet specific tests adopted by the packaging industry to qualify for use as the outer facing layer for	All processes which are part of the paper production process (in particular paper or board machine and connected energy conversion units (boiler/CHP) and direct process fuel use) are included. Other activities on site that are not part of this process such as sawmilling activities, woodworking activities, production of chemicals for sale, waste treatment (treating waste onsite instead of offsite	0,248

	corrugated board, from which shipping containers are made. 2. Fluting refers to the centre segment of corrugated shipping containers, being faced with linerboard (testliner/ kraftliner) on both sides. Fluting covers mainly papers made from recycled fibre but this group also holds paperboard that is made from chemical and semi-chemical pulp. Kraftliner is not inluded in this product benchmark.	(drying, pelletising, incinerating, landfilling), PCC (precipitated calcium carbonate) production, treatment of odorous gases, and district heating are not included.	
Uncoated carton board	Various uncoated products (expressed as net saleable production in air dried tonnes, defined as paper with 6 % moisture content) which may be single or multiply. Uncoated carton board is mainly	All processes which are part of the paper production process (in particular paper or board machine and connected energy conversion units (boiler/CHP) and direct process fuel use) are included. Other activities	0,237

	used for packaging applications which the main needed characteristic is strength and stiffness, and for which the commercial aspects as information carrier are of a second order of importance. Carton board is made from virgin and/or recovered fibres, has good folding properties, stiffness and scoring ability. It is mainly used in cartons for consumer products such as frozen food, cosmetics and for liquid containers; also known as solid board, folding box board, boxboard or carrier board or core board.	on site that are not part of this process such as sawmilling activities, woodworking activities, production of chemicals for sale, waste treatment (treating waste onsite instead of offsite (drying, pelletising, incinerating, landfilling), PCC (precipitated calcium carbonate) production, treatment of odorous gases, and district heating are not included.	
Coated carton board	This benchmark covers a wide range of coated products (expressed as net saleable production in air dried tonnes, defined as paper with 6 % moisture content) which may be single or multiply. Coated carton board is mainly used for commercial applications that need to bring commercial information printed on the packaging to the shelf in the store in applications such as food, pharma, cosmetics, and other. Carton board is made from virgin and/or recovered fibres, and has good folding properties,	All processes which are part of the paper production process (in particular paper or board machine and connected energy conversion units (boiler/CHP) and direct process fuel use) are included. Other activities on site that are not part of this process such as sawmilling activities, woodworking activities, production of chemicals for sale, waste treatment (treating waste onsite instead of offsite (drying, pelletising, incinerating, landfilling), PCC (precipitated calcium carbonate)	0,273

	stiffness and scoring ability. It is mainly used in cartons for consumer products such as frozen food, cosmetics and for liquid containers; also known as solid board, folding box board, boxboard or carrier board or core board.	production, treatment of odorous gases, and district heating are not included.	
Nitric acid	Nitric acid (HNO_3), to be recorded in tonnes HNO_3 (100 % purity).	All processes directly or indirectly linked to the production of the benchmarked product as well as the N_2O destruction process are included except the production of ammonia.	0,302
Adipic acid	Adipic acid to be recorded in tonnes of dry purified adipic acid stored in silos or packed in (big)bags. Salts and esters of adipic acid are not covered by this product benchmark.	All processes directly or indirectly linked to the production of the benchmarked product as well as the N_2O destruction process are included.	2,79
Vinyl chloride monomer (VCM)	Vinyl chloride (chloroethylene). Expressed in tonnes of vinyl chloride (saleable product, 100 % purity).	All processes directly or indirectly linked to the production steps direct chlorination, oxychlorination and EDC cracking to VCM are included. Direct chlorination refers to chlorination of ethylene. Oxychlorination refers to chlorination of ethylene with hydrogen chloride (HCl) and oxygen. The incineration of chlorinated hydrocarbons contained in the vent gases of EDC/ VCM production is included in the	0,204

		benchmark. The production of oxygen and compressed air used as raw materials in VCM manufacture are excluded from the benchmark.	
Phenol/acetone	Sum of phenol, acetone and the by-product alpha-methyl styrene as total production, expressed in tonnes of saleable product at 100 % purity.	All processes directly or indirectly linked to the production of phenol and acetone are included, in particular air compression, hydroperoxidation, cumene recovery from spent air, concentration & cleavage, production fractionation & purification, tar cracking, acetophenone recovery & purification, AMS recovery for export, AMS hydrogenation for ISB recycle, initial waste water purification (1st waste water stripper), cooling water generation (e.g., cooling towers), cooling water utilisation (circulation pumps),flare & incinerators (even if physically located OSB) as well as any support fuel consumption.	0,266
S-PVC	Polyvinyl chloride; not mixed with any other substances consisting of PVC particles with a mean size between 50 and 200 µm. Expressed in tonnes of S-PVC	All processes directly or indirectly linked to the production of S-PVC are included except the production of VCM.	0,085

	(saleable product, 100 % purity).		
E-PVC	Polyvinyl chloride; not mixed with any other substances consisting of PVC particles with a mean size between 0,1 and 3 μm. Expressed in tonnes of E-PVC (saleable product, 100 % purity).	All processes directly or indirectly linked to the production of E-PVC are included except the production of VCM.	0,238
Soda ash	Disodium carbonate, expressed in tonnes of soda ash as total gross production except dense soda ash obtained as by-product in a caprolactam production network.	All processes directly or indirectly linked to the process units brine purification, limestone calcination and milk of lime production, absorption of ammonia, precipitation of $NaHCO_3$, filtration or Separation of $NaHCO_3$ crystals from mother liquor, decomposition of $NaHCO_3$ to Na_2CO_3, recovery of ammonia and densification or production of dense soda ash are included.	0,843

If no other reference is given, all product benchmarks refer to 1 ton of product produced expressed as saleable (net) production and to 100 % purity of the substance concerned.

All definitions of processes and emissions covered (system boundaries) include flares where they occur.

2. Definition of product benchmarks and system boundaries with consideration of exchangeability of fuel and electricity

Product benchmark	**Definition of products covered**	**Definition of processes and emissions covered (system boundaries)**	**Starting point for determination of annual reduction rate for benchmark value update(allowances/ t)**
Refinery products	Mix of refinery products with more	All processes of a refinery matching	0,0295

	than 40 % light products (motor spirit (gasoline) including aviation spirit, spirit type (gasoline type) jet fuel, other light petroleum oils/ light preparations, kerosene including kerosene type jet fuel, gas oils) expressed as CO_2 weighted tonne (CWT). Refineries with other product mixes are not covered by this product benchmark.	the definition of one of the CWT process units as well as ancillary non-process facilities operating inside the refinery fence-line such as tankage, blending, effluent treatment, etc. are included. Lube oils and bitumen processing units located in mainstream refineries are also included in the refinery CWT and emissions envelope. Process units pertaining to other sectors, such as petrochemicals, are sometimes physically integrated with the refinery. Such process units and their emissions are excluded from the CWT approach. For the determination of indirect emissions, the total electricity consumption within the system boundaries shall be considered.	
EAF carbon steel	Steel containing less than 8 % metallic alloying elements and tramp elements to such levels limiting the use to those applications where no high surface quality and processability is required and if none of the criteria for the content of the metal alloying elements and the steel quality for high alloy steel are met. Expressed	All processes directly or indirectly linked to the process units electric arc furnace, secondary metallurgy, casting and cutting, post-combustion unit, dedusting unit, vessels heating stands, casting ingots preheating stands, scrap drying and scrap preheating are included. Processes downstream of	0,283

	in tonnes of crude secondary steel ex-caster.	casting are not included. For the determination of indirect emissions, the total electricity consumption within the system boundaries shall be considered.	
EAF high alloy steel	Steel containing 8 % or more metallic alloying elements or where high surface quality and processability is required. Expressed in tonnes of crude secondary steel ex-caster.	All processes directly or indirectly linked to the process units electric arc furnace, secondary metallurgy, casting and cutting, post-combustion unit, dedusting unit, vessels heating stands, casting ingots preheating stands, slow cooling pit, scrap drying and scrap preheating are included. The process units FeCr converter and cryogenic storage of industrial gases are not included. Processes downstream of casting are not included. For the determination of indirect emissions, the total electricity consumption within the system boundaries shall be considered.	0,352
Iron casting	Casted iron expressed as tonnes of liquid iron ready alloyed, skinned, and ready for casting.	All processes directly or indirectly linked to the process steps melting shop, casting shop, core shop and finishing are included. The process step ‘finishing’ refers to operations like fettling but not general matching, heat treatment or	0,325

		painting which are not covered by the system boundaries of this product benchmark. For the determination of indirect emissions, only the electricity consumption of melting processes within the system boundaries shall be considered.	
Mineral wool	Mineral wool insulation products for thermal, acoustic and fire applications manufactured using glass, rock or slag. Expressed in tonnes of mineral wool (saleable product).	All processes directly or indirectly linked to the production steps melting, fiberizing and injection of binders, curing and drying and forming are included. For the determination of indirect emissions, the total electricity consumption within the system boundaries shall be considered.	0,682
Plasterboard	The benchmark covers boards, sheets, panels, tiles, similar articles of plaster/ compositions based on plaster, (not) faced/reinforced with paper/paperboard only, excluding articles agglomerated with plaster, ornamented (in tonnes of stucco, saleable product). High-density gypsum fibreboards are not covered by this product benchmark.	All processes directly or indirectly linked to the production steps milling, drying, calcining and board drying are included. For the determination of indirect emissions, only the electricity consumption of heat pumps applied in the drying stage shall be considered. The production of the intermediary product dried secondary gypsum is not covered by this benchmark.	0,131
Carbon black	Furnace carbon black, expressed in tonnes of furnace carbon black, saleable	All processes directly or indirectly linked to the production of furnace carbon black	1,954

	product, purity above 96 %. Gas- and lamp black products are not covered by this benchmark.	as well as finishing, packaging and flaring are included. For the determination of indirect emissions, the total electricity consumption within the system boundaries shall be considered. Exchangeability factor should be calculated considering electricity driven devices like pumps and compressors with a rated power of 2 MW or more.	
Ammonia	Ammonia (NH_3), expressed in tonnes produced, 100 % purity.	All processes directly or indirectly linked to the production of the ammonia and the intermediate product hydrogen are included. Ammonia production from other intermediate products is not covered. For the determination of indirect emissions, the total electricity consumption within the system boundaries shall be considered.	1,619
Steam cracking	Mix of high value chemicals (HVC) expressed in tonnes as total mass of acetylene, ethylene, propylene, butadiene, benzene and hydrogen exported out of the cracker perimeter excluding HVC from supplemental feed (hydrogen, ethylene, other HVC) with an ethylene content in	All processes directly or indirectly linked to the production of high value chemicals as purified product or intermediate product with concentrated content of the respective HVC in the lowest tradable form (raw C4, unhydrogenated pygas) are included except C4 extraction (butadiene plant),	0,702

	the total product mix of at least 30 mass-percent and a content of HVC, fuel gas, butenes and liquid hydrocarbons of together at least 50 mass-percent of the total product mix	C4-hydrogenation, hydrotreating of pyrolysis gasoline & aromatics extraction and logistics/storage for daily operation. For the determination of indirect emissions, the total electricity consumption within the system boundaries shall be considered.	
Aromatics	Mix of aromatics expressed as CO_2 weighted tonne (CWT)	All processes directly or indirectly linked to the aromatics sub-units pygas hydrotreater, benzene/toluene/ xylene (BTX) extraction, TDP, HDA, xylene isomerisation, P-xylene units, cumene production and Cyclo-hexane production are included. For the determination of indirect emissions, the total electricity consumption within the system boundaries shall be considered.	0,0295
Styrene	Styrene monomer (vinyl benzene, CAS number: 100-42-5). Expressed in tonnes of styrene (saleable product).	All processes directly or indirectly linked to the production of styrene as well as the intermediate product ethylbenzene (with the amount used as feed for the styrene production) are included. For installations producing both propylene oxide and styrene monomer, the facilities exclusively dedicated to propylene and	0,527

		propylene oxide unit operations are excluded from this benchmark, and shared facilities are covered in proportion to the production in tonnes of the styrene monomer production. For the determination of indirect emissions, the total electricity consumption within the system boundaries shall be considered.	
Hydrogen	Pure hydrogen and mixtures of hydrogen and carbon monoxide having a hydrogen content >= 60 % volume fraction of total contained hydrogen plus carbon monoxide based on the aggregation of all hydrogen- and carbon-monoxide-containing product streams exported from the sub-installation concerned expressed as tonnes of 100 % pure hydrogen, as net saleable product.	All relevant process elements directly or indirectly linked to the production of hydrogen and the separation of hydrogen and carbon monoxide are included. These elements lie between: a) the point(s) of entry of hydrocarbon feedstock(s) and, if separate, fuel(s); b) the points of exit of all product streams containing hydrogen and/or carbon monoxide; c) the point(s) of entry or exit of import or export heat. For the determination of indirect emissions, the total electricity consumption within the system	8,85

		boundaries shall be considered.	
Synthesis gas (syngas)	Mixtures of hydrogen and carbon monoxide having a hydrogen content < 60 % volume fraction of total contained hydrogen plus carbon monoxide based on the aggregation of all hydrogen- and carbon-monoxide-containing product streams exported from the sub-installation concerned. Expressed in tonnes of synthesis gas referred to 47 volume-percent hydrogen as net saleable product.	All relevant process elements directly or indirectly linked to the production of syngas and the separation of hydrogen and carbon monoxide are included. These elements lie between: a) the point(s) of entry of hydrocarbon feedstock(s) and, if separate, fuel(s) b) the points of exit of all product streams containing hydrogen and/or carbon monoxide c) the point(s) of entry or exit of import or export heat For the determination of indirect emissions, the total electricity consumption within the system boundaries shall be considered.	0,242
Ethylene oxide/ ethylene glycols	The ethylene oxide/ethylene glycol benchmark covers the products ethylene oxide (EO, high purity), monoethylene glycol (MEG, standard grade + fiber grade (high purity)), diethylene glycol	All processes directly or indirectly linked to the process units EO production, EO purification and glycol section are included. The total electricity consumption (and the related indirect emissions) within the system boundaries	0,512

	(DEG), triethylene glycol (TEG). The total amount of products is expressed in terms of tonnes of EO-equivalents (EOE), which are defined as the amount of EO (in mass) that is embedded in one mass unit of the specific glycol.	is covered by this product benchmark.	

If no other reference is given, all product benchmarks refer to 1 ton of product produced expressed as saleable (net) production and to 100 % purity of the substance concerned.

All definitions of processes and emissions covered (system boundaries) include flares where they occur.

3. Heat and fuel benchmarks

Benchmark	**Starting point for determination of annual reduction rate for benchmark value update(allowances/TJ)**
Heat benchmark	62,3
Fuel benchmark	56,1

ANNEX II

Specific product benchmarks

1. Refineries benchmark: CO_2 weighted tonne (CWT) functions

CWT function	**Description**	**Basis (kt/a)**[a]	**CWT factor**
Atmospheric Crude Distillation	Mild Crude Unit, Standard Crude Unit	F	1,00
Vacuum Distillation	Mild Vacuum Fractionation, Standard Vacuum Column, Vacuum Fractionating Column Vacuum distillation factor also includes average energy and emissions for Heavy Feed Vacuum (HFV) unit. Since this is always in	F	0,85

a Net fresh feed (F), Reactor feed (R, includes recycle), Product feed (P), Synthesis gas production for POX units (SG)

	series with the Mild Vacuum Unit (MVU), HFV capacity is not counted separately.		
Solvent Deasphalting	Conventional Solvent, Supercritical Solvent	F	2,45
Visbreaking	Atmospheric Residuum (w/o a Soaker Drum), Atmospheric Residuum (with a Soaker Drum), Vacuum Bottoms Feed (w/o a Soaker Drum), Vacuum Bottoms Feed (with a Soaker Drum) Visbreaking factor also includes average energy and emissions for Vacuum Flasher Column (VAC VFL) but capacity is not counted separately.	F	1,40
Thermal Cracking	Thermal cracking factor also includes average energy and emissions for Vacuum Flasher Column (VAC VFL) but capacity is not counted separately.	F	2,70
Delayed Coking	Delayed Coking	F	2,20
Fluid Coking	Fluid Coking	F	7,60
Flexicoking	Flexicoking	F	16,60
Coke Calcining	Vertical-Axis Hearth, Horizontal-Axis Rotary Kiln	P	12,75
Fluid Catalytic Cracking	Fluid Catalytic Cracking, Mild Residuum Catalytic Cracking, Residual Catalytic Cracking	F	5,50

a Net fresh feed (F), Reactor feed (R, includes recycle), Product feed (P), Synthesis gas production for POX units (SG)

Other Catalytic Cracking	Houdry Catalytic Cracking, Thermofor Catalytic Cracking	F	4,10
Distillate/Gasoil Hydrocracking	Mild Hydrocracking, Severe Hydrocracking, Naphtha Hydrocracking	F	2,85
Residual Hydrocracking	H-Oil, LC-Fining™ and Hycon	F	3,75
Naphtha/Gasoline Hydrotreating	Benzene Saturation, Desulfurisation of C4–C6 Feeds, Conventional Naphtha H/T, Diolefin to Olefin Saturation, Diolefin to Olefin Saturation of Alkylation Feed, FCC Gasoline hydrotreating with minimum octane loss, Olefinic Alkylation of Thio S, S-Zorb™ Process, Selective H/T of Pygas/Naphtha, Pygas/Naphtha Desulfurisation, Selective H/T of Pygas/Naphtha Naphtha hydrotreating factor includes energy and emissions for Reactor for Selective H/T (NHYT/RXST) but capacity is not counted separately.	F	1,10
Kerosene/Diesel Hydrotreating	Aromatic Saturation, Conventional H/T, Solvent aromatics hydrogenation, Conventional Distillate H/T, High Severity Distillate H/T, Ultra-High Severity H/T, Middle Distillate Dewaxing, S-Zorb™	F	0,90

a Net fresh feed (F), Reactor feed (R, includes recycle), Product feed (P), Synthesis gas production for POX units (SG)

	Process, Selective Hydrotreating of Distillates		
Residual Hydrotreating	Desulfurisation of Atmospheric Residuum Desulfurisation of Vacuum Residuum	F	1,55
VGO Hydrotreating	Hydrodesulphurisation/ denitrification, Hydrodesulphurisation	F	0,90
Hydrogen Production	Steam Methane Reforming, Steam Naphtha Reforming, Partial Oxidation Units of Light Feeds Factor for hydrogen production includes energy and emissions for purification (H2PURE), but capacity is not counted separately.	P (referred to 100 % hydrogen)	300,00
Catalytic Reforming	Continuous Regeneration, Cyclic, Semi-Regenerative, AROMAX	F	4,95
Alkylation	Alkylation with HF Acid, Alkylation with Sulfuric Acid, Polymerisation C3 Olefin Feed, Polymerisation C3/ C4 Feed, Dimersol Factor for alkylation/ polymerisation includes energy and emissions for acid regeneration (ACID), but capacity is not counted separately.	P	7,25
C4 Isomerisation	C4 Isomerisation Factor also includes energy and emissions related to average EU27 special fractionation (DIB)	R	3,25

a Net fresh feed (F), Reactor feed (R, includes recycle), Product feed (P), Synthesis gas production for POX units (SG)

	correlated with C4 isomerisation.		
C5/C6 Isomerisation	C5/C6 Isomerisation Factor also includes energy and emissions related to average EU27 special fractionation (DIH) correlated with C5 isomerisation.	R	2,85
Oxygenate Production	MBTE Distillation Units, MTBE Extractive Units, ETBE, TAME, Isooctene Production	P	5,60
Propylene Production	Chemical Grade, Polymer grade	F	3,45
Asphalt Manufacture	Asphalt & Bitumen Manufacture Production figure should include Polymer-Modified Asphalt. CWT factor includes blowing	P	2,10
Polymer-Modified Asphalt Blending	Polymer-Modified Asphalt Blending	P	0,55
Sulphur Recovery	Sulphur Recovery Factor for sulfur recovery includes energy and emissions for tail gas recovery (TRU) and H2S Springer Unit (U32), but capacity is not counted separately.	P	18,60
Aromatic Solvent Extraction	ASE: Extraction Distillation, ASE: Liquid/Liquid Extraction, ASE: Liq/Liq w/Extr. Distillation CWT factor cover all feeds including Pygas after hydrotreatment. Pygas hydrotreating should be accounted	F	5,25

a Net fresh feed (F), Reactor feed (R, includes recycle), Product feed (P), Synthesis gas production for POX units (SG)

	under naphtha hydrotreatment.		
Hydrodealkylation	Hydrodealkylation	F	2,45
TDP/TDA	Toluene Disproportionation/ Dealkylation	F	1,85
Cyclohexane production	Cyclohexane production	P	3,00
Xylene Isomerisation	Xylene Isomerisation	F	1,85
Paraxylene production	Paraxylene Adsorption, Paraxylene Crystallisation Factor also includes energy and emissions for Xylene Splitter and Orthoxylene Rerun Column.	P	6,40
Metaxylene production	Metaxylene production	P	11,10
Phtalic anhydride production	Phtalic anhydride production	P	14,40
Maleic anhydride production	Maleic anhydride production	P	20,80
Ethylbenzene production	Ethylbenzene production Factor also includes energy and emissions for Ethylbenzene distillation.	P	1,55
Cumene production	Cumene production	P	5,00
Phenol production	Phenol production	P	1,15
Lube solvent extraction	Lube solvent extraction: Solvent is Furfural, Solvent is NMP, Solvent is Phenol, Solvent is SO_2	F	2,10
Lube solvent dewaxing	Lube solvent dewaxing: Solvent is Chlorocarbon, Solvent is MEK/ Toluene, Solvent is	F	4,55

a Net fresh feed (F), Reactor feed (R, includes recycle), Product feed (P), Synthesis gas production for POX units (SG)

	MEK/MIBK, Solvent is propane		
Catalytic Wax Isomerisation	Catalytic Wax Isomerisation and Dewaxing, Selective Wax Cracking	F	1,60
Lube Hydrocracker	Lube Hydrocracker w/Multi-Fraction Distillation, Lube Hydrocracker w/ Vacuum Stripper	F	2,50
Wax Deoiling	Wax Deoiling: Solvent is Chlorocarbon, Solvent is MEK/ Toluene, Solvent is MEK/MIBK, Solvent is Propane	P	12,00
Lube/Wax Hydrotreating	Lube H/F w/Vacuum Stripper, Lube H/ T w/Multi-Fraction Distillation, Lube H/ T w/Vacuum Stripper, Wax H/F w/Vacuum Stripper, Wax H/T w/Multi-Fraction Distillation, Wax H/T w/Vacuum Stripper	F	1,15
Solvent Hydrotreating	Solvent Hydrotreating	F	1,25
Solvent Fractionation	Solvent Fractionation	F	0,90
Mol sieve for C10+ paraffins	Mol sieve for C10+ paraffins	P	1,85
Partial Oxidation of Residual Feeds (POX) for Fuel	POX Syngas for Fuel	SG (referred to 47 % hydrogen)	8,20
Partial Oxidation of Residual Feeds (POX) for Hydrogen or Methanol	POX Syngas for Hydrogen or Methanol, POX Syngas for Methanol Factor includes energy and emissions for CO Shift and H2 Purification (U71) but capacity is not counted separately.	SG (referred to 47 % hydrogen)	44,00

a Net fresh feed (F), Reactor feed (R, includes recycle), Product feed (P), Synthesis gas production for POX units (SG)

Methanol from syngas	Methanol	P	– 36,20
Air Separation	Air Separation	P (MNm^3 O_2)	8,80
Fractionation of purchased NGL	Fractionation of purchased NGL	F	1,00
Flue gas treatment	DeSOx and deNOx	F (MNm^3)	0,10
Treatment and Compression of Fuel Gas for Sales	Treatment and Compression of Fuel Gas for Sales	kW	0,15
Seawater Desalination	Seawater Desalination	P	1,15

a Net fresh feed (F), Reactor feed (R, includes recycle), Product feed (P), Synthesis gas production for POX units (SG)

2. Aromatics benchmark: CWT functions

CWT function	**Description**	**Basis (kt/a)**[a]	**CWT factor**
Naphtha/gasoline hydrotreater	Benzene Saturation, Desulfurisation of C4–C6 Feeds, Conventional Naphtha H/T, Diolefin to Olefin Saturation, Diolefin to Olefin Saturation of Alkylation Feed, FCC Gasoline hydrotreating with minimum octane loss, Olefinic Alkylation of Thio S, S-Zorb™ Process, Selective H/T of Pygas/Naphtha, Pygas/Naphtha Desulfurisation, Selective H/T of Pygas/Naphtha. Naphtha hydrotreating factor includes energy and emissions for Reactor for Selective H/T (NHYT/RXST) but capacity is not counted separately.	F	1,10
Aromatic solvent extraction	ASE: Extraction Distillation, ASE:	F	5,25

a Net fresh feed (F), Product feed (P)

	Liquid/Liquid Extraction, ASE: Liq/Liq w/Extr. Distillation CWT factor cover all feeds including Pygas after hydrotreatment. Pygas hydrotreating should be accounted under naphtha hydrotreatment.		
TDP/TDA	Toluene Disproportionation/ Dealkylation	F	1,85
Hydrodealkylation	Hydrodealkylation	F	2,45
Xylene isomerisation	Xylene Isomerisation	F	1,85
Paraxylene production	Paraxylene Adsorption, Paraxylene Crystallisation Factor also includes energy and emissions for Xylene Splitter and Orthoxylene Rerun Column.	P	6,40
Cyclohexane production	Cyclohexane production	P	3,00
Cumene production	Cumene production	P	5,00

a Net fresh feed (F), Product feed (P)

ANNEX III

Historical activity level for specific benchmarks referred to in Articles 15(8) and 17(f)

1. The product-related historical activity level for the baseline period for products to which the refinery product benchmark as referred to in Annex I applies on the basis of the different CWT functions, their definitions, the basis for throughput as well as the CWT factors as listed in Annex II, shall be determined according to the following formula:

$$HAL_{CWT} = ARITHMETIC\ MEAN\left(1{,}0183 \times \sum_{i=1}^{n}\left(TP_{i,k} \times CWT_i\right) + 298 + 0{,}315 \times TP_{AD,k}\right)$$

whereby:

HAL_{CWT}	:	historical activity level expressed as CWT
$TP_{i,k}$	:	throughput of the CWT function i in year k of the baseline period
CWT_i	:	CWT factor of the CWT function i
$TP_{AD,k}$	:	throughput of the CWT function ‘Atmospheric Crude Distillation’ in year k of the baseline period

2. The product-related historical activity level for the baseline period for products to which the lime product benchmark as referred to in Annex I applies shall be determined according to the following formula:

$$HAL_{lime,standard} = ARITHMETIC\ MEAN\left(\frac{785 \times m_{CaO,k} + 1092 \times m_{MgO,k}}{751,7} \times HAL_{lime,uncorrected,k}\right)$$

whereby:

$HAL_{lime,standard}$: historical activity level for lime production expressed in tons of standard pure lime

$m_{CaO,k}$: content of free CaO in the produced lime in year k of the baseline period expressed as mass-%

In case no data on the content of free CaO is available, a conservative estimate not higher than 85 % shall be applied.

$m_{MgO,k}$: content of free MgO in the produced lime in year k of the baseline period expressed as mass-%

In case no data on the content of free MgO is available, a conservative estimate not higher than 0,5 % shall be applied.

$HAL_{lime,uncorrected,k}$: uncorrected historical activity level for lime production in year k of the baseline period expressed in tonnes of lime

3. The product-related historical activity level for the baseline period for products to which the dolime product benchmark as referred to in Annex I applies shall be determined according to the following formula:

$$HAL_{dolime,standard} = ARITHMETIC\ MEAN\left(\frac{785 \times m_{CaO,k} + 1092 \times m_{MgO,k}}{865,6} \times HAL_{dolime,uncorrected,k}\right)$$

whereby:

$HAL_{dolime,standard}$: historical activity level for dolime production expressed in tonnes of standard pure dolime

$m_{CaO,k}$: content of free CaO in the produced dolime in year k of the baseline period expressed as mass-%

In case no data on the content of free CaO is available, a conservative estimate not higher than 52 % shall be applied.

$m_{MgO,k}$: content of free MgO in the produced dolime in year k of the baseline period expressed as mass-%

In case no data on the content of free MgO is available, a conservative estimate not higher than 33 % shall be applied.

$HAL_{dolime,uncorrected,k}$: uncorrected historical activity level for dolime production in year k of the baseline period expressed in tonnes of lime

4. The product-related historical activity level for the baseline period for products to which the steam cracking product benchmark as referred to in Annex I applies shall be determined according to the following formula:

$$HAL_{HVC,net} = ARITHMETIC\ MEAN\left(HAL_{HVC,total,k} - HSF_{H,k} - HSF_{E,k} - HSF_{O,k}\right)$$

whereby:

$HAL_{HVC,net}$: historical activity level for high value chemicals net of high value chemicals produced from supplemental feed expressed in tonnes of HVC

$HAL_{HVC,total,k}$: historical activity level for total high value chemicals production in year k of the baseline period expressed in tonnes of HVC

$HSF_{H,k}$: historical supplemental feed of hydrogen in year k of the baseline period expressed in tonnes of hydrogen

$HSF_{E,k}$: historical supplemental feed of ethylene in year k of the baseline period expressed in tonnes of ethylene

$HSF_{O,k}$: historical supplemental feed of other high value chemicals than hydrogen and ethylene in year k of the baseline period expressed in tonnes of HVC

5. The product-related historical activity level for the baseline period for products to which the aromatics product benchmark as referred to in Annex I applies on the basis of the different CWT functions, their definitions, the basis for throughput as well as the CWT factors as listed in Annex II shall be determined according to the following formula:

$$HAL_{CWT} = ARITHMETIC\ MEAN\left(\sum_{i=1}^{n}\left(TP_{i,k} \times CWT_i\right)\right)$$

whereby:

HAL_{CWT} : historical activity level expressed as CWT

$TP_{i,k}$: throughput of the CWT function i in year k of the baseline period

CWT_i : CWT factor of the CWT function i

6. The product-related historical activity level for the baseline period for products to which the hydrogen product benchmark as referred to in Annex I applies shall be determined according to the following formula:

$$HAL_{H2} = ARITHMETIC\ MEAN\left(HAL_{H2+CO,k} \times \left(1 - \frac{1-VF_{H2,k}}{0{,}4027}\right) \times 0{,}00008987\frac{t}{Nm^3}\right)$$

whereby:

HAL_{H2} : historical activity level for hydrogen production referred to 100 % hydrogen

$VF_{H2,k}$: historical production volume fraction of pure hydrogen in the total volume of hydrogen and carbon monoxide in year k of the baseline period

$HAL_{H2+CO,k}$: historical activity level for hydrogen production referred to historical hydrogen content expressed as norm cubic meters per year referring to 0 °C and 101,325 kPa in year k of the baseline period

7. The product-related historical activity level for the baseline period for products to which the synthesis gas (syngas) product benchmark as referred to in Annex I applies shall be determined according to the following formula:

$$HAL_{syngas} = ARITHMETIC\ MEAN\left(HAL_{H2+CO,k} \times \left(1 - \frac{0{,}47-VF_{H2,k}}{0{,}6863}\right) \times 0{,}0007047\frac{t}{Nm^3}\right)$$

whereby:

HAL_{syngas} : historical activity level for synthesis gas production referred to 47 % hydrogen

$VF_{H2,k}$: historical production volume fraction of pure hydrogen in the total volume of hydrogen and carbon monoxide in year k of the baseline period

$HAL_{H2+CO,k}$: historical activity level for synthesis gas production referred to historical hydrogen content expressed as norm cubic meters per year referring to 0 °C and 101,325 kPa in year k of the baseline period

8. The product-related historical activity level for the baseline period for products to which the ethylene oxide/ethylene glycols product benchmark as referred to in Annex I applies shall be determined according to the following formula:

$$HAL_{EO/CG} = ARITHMETIC\ MEAN(\sum_{i=1}^{n}(HAL_{i,k} \times CF_{EOE,i}))$$

whereby:

$HAL_{EO/EG}$: historical activity level for ethylene oxide/ethylene glycols production expressed in tonnes of ethylene oxide equivalents

$HAL_{i,k}$: historical activity level for the production of the ethylene oxide or glycol i in year k of the baseline period expressed in tonnes

$CF_{EOE,i}$ conversion factor for the ethylene oxide or glycol i relative to ethylene oxide

Following conversion factors shall be applied:

Ethylene oxide: 1,000

Monoethylene glycol: 0,710

Diethylene glycol: 0,830

Triethylene glycol: 0,880

ANNEX IV

Parameters for baseline data collection

Without prejudice to the power of the competent authority to request additional particulars in accordance with Article 15(1), operators shall submit for the purposes of the baseline data report, the following data at installation and sub-installation level for all calendar years of the relevant baseline period. For new entrants, the data report shall cover the data listed in sections 1 and 2 at installation and sub-installation level.

1. GENERAL INSTALLATION DATA

1.1. **Identification of the installation and the operator**

This item contains at least the following information:

(a) Name and address of the installation;

(b) Installation identifier used in the Union Registry;

(c) Permit identifier and issue date of the first greenhouse gas (GHG) emission permit the installation received pursuant to Article 6 of Directive 2003/87/EC;

(d) Permit identifier and date of the most recent GHG permit, if applicable;

(e) Name and address of the operator, contact information of an authorised representative and of a primary contact person, if different.

1.2. **Verifier information**

This item contains at least the following information:

(a) Name and address of the verifier, contact information of an authorised representative and of a primary contact person, if different;

(b) Name of the national accreditation body which accredited the verifier;

(c) Registration number issued by the national accreditation body.

1.3. **Activity information**

This item contains at least the following information:

(a) List of activities pursuant to Annex I to Directive 2003/87/EC carried out in the installation;

(b) The installation's NACE code (revision 2) in accordance with Regulation (EC) No 1893/2006 of the European Parliament and of the Council[6];

(c) Whether the installation falls under one or more categories which may be excluded from the EU ETS pursuant to Article 27 or Article 27a of Directive 2003/87/EC:
- Emissions lower than 25 000 t $CO_{2(e)}$ per year and, where applicable, rated thermal input lower than 35 MW;
- Hospital;
- Emissions lower than 2 500 t $CO_{2(e)}$ per year;
- Operated less than 300 hours per year.

1.4. **Eligibility for free allocation**

This item contains at least the following information:

(a) Whether the installation is an electricity generator pursuant to Article 3(u) of Directive 2003/87/EC;

(b) Whether the installation is used for capture of CO_2, pipeline transport of CO_2 or is it a storage site permitted under Directive 2009/31/EC of the European Parliament and of the Council[7];

(c) Whether the installation produces heat not used for electricity production.

1.5. **List of sub-installations**

This item contains a list of all sub-installations at the installation.

1.6. **List of connections to other EU ETS installations or non-ETS entities for the transfer of measurable heat, intermediate products, waste gases or CO_2 for use in that installation or permanent geological storage**

This item contains at least the following information for each connected installation or entity:

(a) Name of installation or entity connected;

(b) Type of connection (import or export: measurable heat, waste gases, CO_2);

(c) Is the installation or entity itself under the scope of the EU ETS?
- If yes, Registry ID and Permit ID, contact person;
- If no, name and address of entity, contact person.

2. DETAILED ANNUAL DATA FOR EACH YEAR IN THE BASELINE PERIOD

2.1. **Detailed annual verified emissions data at installation level**

This item contains at least the following information:

(a) For each source stream: Activity data, calculation factors used, fossil emissions, emissions from biomass, in case of fuels (including if used as process input) energy input calculated from the Net Calorific Value (NCV);

(b) For each emission source for which continuous emission monitoring systems have been used: fossil emissions, emissions from biomass, annual hourly average of GHG concentration and flue gas flow; in case of CO_2: proxy data for energy input associated with the emissions;

(c) Where a fall-back approach in accordance with Article 22 of Regulation (EU) No 601/2012 is used, the fossil and biomass emissions determined, proxy data for energy input associated with the emissions, if applicable;

(d) The amount of transferred CO_2 imported and/or exported.

Member States may choose to allow operators to report only aggregated emission figures.

2.2. **Annual emissions per sub-installation**

This item contains a complete balance of emissions, identifying the quantity of emissions attributable to each sub-installation.

2.3. **Annual installation-wide balance of heat import, production, consumption and export**

This item contains at least the following information:

(a) The total amount of energy input used in the installation contained in fuels;

(b) If applicable, the energy content of imported waste gases;

(c) If applicable, the amount of energy in fuels exported to other directly technically connected EU ETS installations or non-ETS entities;

(d) If applicable, the energy content of waste gases exported to other EU ETS installations or non-ETS entities;

(e) The amount of energy input from fuels used for electricity production;

(f) The amount of energy input from fuels attributed to fuel benchmark sub-installations (reported separately for carbon leakage and non-carbon leakage fuel benchmark sub-installation);

(g) The amount of fuel input used for production of measurable heat;

(h) Total amount of measurable heat produced in the installation;

(i) Net amount of measurable heat imported from installations covered by the EU ETS;

(j) Net amount of measurable heat imported from installations and entities not covered by the EU ETS;

(k) Net amount of measurable heat consumed for electricity production within the installation;

(l) Net amount of measurable heat consumed for product benchmark sub-installations within the installation;

(m) Net amount of measurable heat exported to EU ETS installations;

(n) Net amount of measurable heat exported to installations or entities not covered by the EU ETS;

(o) Net amount of measurable heat exported for the purpose of district heating;

(p) Net amount of measurable heat attributable to heat benchmark sub-installations (reported separately for carbon leakage and non- carbon leakage heat benchmark and district heating sub-installations);

(q) The amount of heat losses, if not already included in the data referred to in points (a) to (p).

2.4. **Annual attribution of energy to sub-installations**

This item contains at least the following information:

(a) Amount of energy input from fuels, including their respective emissions factor, to:
- each product benchmark sub-installation;
- each heat benchmark and district heating sub-installation;
- each fuel benchmark sub-installation;

(b) Amount of measurable heat imported:
- by each product benchmark sub-installation;
- from nitric acid product benchmark sub-installations;
- from sub-installations producing pulp;

(c) Amount of measurable heat exported by:
- each product benchmark sub-installation.

2.5. **Annual installation-wide balance of electricity import, production, consumption and export**

This item contains at least the following information:

(a) Total amount of electricity produced from fuels;

(b) Total amount of other electricity produced;

(c) Total amount of electricity imported from the grid or from other installations;

(d) Total amount of electricity exported to the grid or to other installations;

(e) Total amount of electricity consumed in the installation;

(f) For electricity consumption within product benchmark sub-installations, which are listed in part 2 of Annex I, the amount of electricity consumed that qualifies as exchangeable.

Points (a) to (e) only have to be reported by installations that produce electricity.

2.6. **Further annual data for sub-installations**

This item contains at least the following information:

(a) The amount of measurable heat attributed to sub-installation imported from non-EU ETS entities or processes;

(b) If applicable, for each sub-installation, a list of products produced within the boundaries of the sub-installation, including their codes under the PRODCOM list

referred to in Article 2(2) of Council Regulation (EEC) No 3924/91[8], based on NACE-4 codes referred to Regulation (EC) No 1893/2006 of the European Parliament and of the Council[9] (NACE rev. 2) and the amount of production. PRODCOM shall be at least as disaggregated as the related sub-sector identification in delegated acts adopted pursuant to Article 10b(5) of Directive 2003/87/EC;

(c) By way of derogation from point (b), for the carbon leakage heat benchmark sub-installation, in case of export of measurable heat to installations or entities not covered by the EU ETS, the NACE-4 codes (NACE rev. 2) of those installations or entities;

(d) If applicable and available to the operator, for each sub-installation, the emission factor of the fuel mix related to the measurable heat imported or exported;

(e) If applicable, for each sub-installation, the quantity and emission factor of waste gases imported and exported;

(f) If applicable, for each sub-installation, the energy content (net calorific value) of the waste gases imported and exported.

2.7. **Annual activity data for product benchmark sub-installations**

This item contains at least the following information:

(a) Annual production data of the product as specified in Annex I, in the unit listed in that Annex;

(b) A list of products produced within the boundaries of the sub-installation, including their PRODCOM codes (based on NACE rev. 2). PRODCOM shall be at least as disaggregated as the related sub-sector identification in delegated acts adopted pursuant to Article 10b(5) of Directive 2003/87/EC;

(c) Amount of transferred CO_2 imported from or exported to other sub-installations, installations or other entities;

(d) Amount of export or import of intermediate products covered by product benchmark sub-installations;

(e) If applicable, for the refinery or aromatics product benchmark sub-installations, the annual throughput for each CWT function as specified in Annex II;

(f) If applicable, for the lime or dolime product benchmark sub-installations, the uncorrected annual production quantity and the annual average values for m_{CaO} and m_{MgO} in accordance with Annex III;

(g) If applicable, for the steam cracking product benchmark sub-installation, the total annual HVC production and the quantity of supplementary feed expressed as amounts of hydrogen, ethylene and other HVC;

(h) If applicable, for the hydrogen or synthesis gas product benchmark sub-installations, the annual amount of hydrogen or synthesis gas production referred to hydrogen content expressed as norm cubic meters per year referring to 0 °C and 101,325 kPa and the annual production volume fraction of pure hydrogen in the hydrogen/carbon monoxide mixture;

(i) If applicable, for the ethylene oxide/ethylene glycols product benchmark sub-installation, the annual production levels of ethylene oxide, monoethylene glycol, diethylene glycol and triethylene glycol;

(j) If applicable, for the vinyl chloride monomer product benchmark sub-installation, the heat consumed stemming from hydrogen consumption;

(k) If applicable, for the short fibre kraft pulp, long fibre kraft pulp, thermo-mechanical pulp and mechanical pulp, sulphite pulp product benchmark sub-installations or other pulp not covered by a product benchmark sub-installation, the annual production level of the respective pulp and the annual amount of pulp placed on the market and not processed into paper in the same or other technically connected installations;

(l) If applicable, the amount, energy content and emission factor of waste gases produced within the system boundaries of the respective product benchmark sub-installation and flared within or outside the system boundaries of that product benchmark sub-installation, with the exception of safety flaring, and not used for the purpose of the production of measurable heat, non-measurable heat or electricity.

3. DATA FOR BENCHMARK UPDATE

3.1. **Annual data for product benchmark sub-installations**

This item contains at least the following information for each year of the baseline period:

(a) A list of products produced within the boundaries of the sub-installation, including their PRODCOM codes (NACE rev. 2);

(b) Activity level;

(c) Attributed emissions with the exception of emissions linked to the import of measurable heat from other sub-installations, installations or other entities;

(d) Amount of measurable heat imported from other sub-installations, installations or other entities including the emission factor, if known;

(e) Amount of measurable heat exported to other sub-installations, installations or other entities;

(f) Amount, energy content and emission factor of waste gases imported from other sub-installations, installations or other entities;

(g) Amount, energy content and emission factor of waste gases produced;

(h) Amount, energy content and emission factor of waste gases exported to other sub-installations, installations or other entities;

(i) Quantity of electricity consumed which qualifies as exchangeable, in case of benchmarks which are listed in part 2 of Annex I;

(j) Quantity of electricity produced;

(k) Amount of transferred CO_2 imported from other sub-installations, installations or other entities;

(l) Amount of transferred CO_2 exported to other sub-installations, installations or other entities;

(m) Export or import of intermediate products covered by product benchmarks (yes/no) and a description of the type of intermediate product, if applicable;

(n) Quantity of supplementary feed expressed as amounts of hydrogen, ethylene and other HVC, in case of the steam cracking product benchmark;

(o) Heat consumed stemming from hydrogen consumption, in case of the for vinyl chloride monomer product benchmark.

3.2. **Annual data for heat benchmark sub-installations and district heating sub-installations**

This item contains at least the following information for each year of the baseline period:

(a) Quantity of net measurable heat produced within each heat benchmark sub-installation or district heating sub-installation;

(b) Emissions attributed to production of measurable heat;

(c) Activity level of the sub-installation;

(d) Quantity of measurable heat produced, imported from and exported to other sub-installations, installations or other entities;

(e) Quantity of electricity produced.

3.3. **Annual data for fuel benchmark sub-installations**

This item contains at least the following information for each year of the baseline period:

(a) Activity level;

(b) Attributed emissions.

ANNEX V

Factors applicable for reducing free allocation pursuant to Article 10b(4) of Directive 2003/87/EC

Year	Value of the factor
2021	0,300
2022	0,300
2023	0,300
2024	0,300
2025	0,300
2026	0,300
2027	0,225
2028	0,150
2029	0,075
2030	0,000

ANNEX VI

Minimum content of the monitoring methodology plan

The monitoring methodology plan shall contain at least the following information:

1. General information on the installation:

   (a) Information for identifying the installation and the operator, including the Installation identifier used in the Union Registry;

   (b) Information identifying the version of the monitoring methodology plan, the date of approval by the competent authority and the date from which it is applicable;

   (c) A description of the installation, including in particular a description of the main processes carried out, a list of emissions sources, a flow diagram and a plan of the installation which allow an understanding of the main material and energy flows;

   (d) A diagram which contains at least the following information:
   - The technical elements of the installation, identifying emissions sources as well as heat producing and consuming units;
   - All energy and material flows, in particular the source streams, measurable and non-measurable heat, electricity where relevant, and waste gases;
   - The points of measurement and metering devices;
   - Boundaries of the sub-installations, including the split between sub-installation serving sectors deemed to be exposed to a significant risk of carbon leakage and sub-installations serving other sectors, based on NACE rev. 2 or PRODCOM;

   (e) A list and description of connections to other EU ETS installations or non-ETS entities for the transfer of measurable heat, intermediate products, waste gases or CO_2 for use in that installation or permanent geological storage, including the name and address and a contact person of the connected installation or entity, and its unique identifier in the Union Registry, if applicable;

   (f) A reference to the procedure for managing the assignment of responsibilities for monitoring and reporting within the installation, and for managing the competences of responsible personnel;

   (g) A reference to the procedure for regular evaluation of the monitoring methodology plan's appropriateness in accordance with Article 9(1); this procedure shall in particular ensure that monitoring methods are in place for all data items listed in Annex IV which are relevant at the installation, and that most accurate available data sources in accordance with section 4 of Annex VII are used;

   (h) A reference to the written procedures of the data flow activities and of control activities pursuant to Article 11(2), including diagrams where appropriate for clarification.

2. Information on sub-installations:

(a) For each sub-installation, a reference to the procedure for keeping track of the products produced and their PRODCOM codes;

(b) System boundaries of each sub-installation, describing clearly which technical units are included, a description of the processes carried out and which input materials and fuels, which products and outputs are attributed to which sub-installation; in case of complex sub-installations, a separate detailed flow diagram shall be included for those sub-installations;

(c) A description of parts of installations which serve more than one sub-installation, including heat supply systems, jointly used boilers and CHP units;

(d) For each sub-installation, where relevant, the description of methods to assign parts of installations which serve more than one sub-installation and their emissions to the respective sub-installations.

3. Monitoring methods at installation level:

(a) A description of the methods used to quantify the installation-wide balance of heat import, production, consumption and export;

(b) The method used for ensuring that data gaps and double counting are avoided.

4. Monitoring methods at sub-installation level:

(a) A description of the methods used to quantify its direct emissions including, where applicable, the method for quantifying the absolute amount or percentage of source streams or emissions monitored by measurement-based methodologies in accordance with Regulation (EU) No 601/2012 attributed to the sub-installation, where applicable;

(b) A description of the methods used to attribute and to quantify the amounts and emission factors of energy input from fuels, of export of energy contained in fuels, where applicable;

(c) A description of the methods used to attribute and to quantify the amounts and, if available, emission factors of measureable heat import, export, consumption and production, where applicable;

(d) A description of the methods used to quantify the amounts of electricity consumption and production, and the exchangeable part of consumption, where applicable;

(e) A description of the methods used to attribute and to quantify the amounts, energy contents and emission factors of waste gas import, export, consumption and production, where applicable;

(f) A description of the methods used to attribute and to quantify the amounts of transferred CO_2 imported or exported, where applicable;

(g) For each product benchmark sub-installation, a description of the methods used to quantify the annual production of the product as specified in Annex I including, if applicable, additional parameters required as provided for in Articles 19 and 20 and Annexes II and III;

The descriptions of the methods used to quantify parameters to be monitored and reported shall include, where relevant, calculation steps, data sources, calculation formulae, relevant calculation factors including unit of measurement, horizontal and vertical checks for corroborating data, procedures underpinning sampling plans, measurement equipment used with reference to the relevant diagram and a description how they are installed and maintained and list of laboratories engaged in carrying out relevant analytical procedures. Where relevant, the description shall include the result of the simplified uncertainty assessment referred to in Article 7(2)(c). For each relevant calculation formula, the plan shall contain one example using real data.

ANNEX VII

Data monitoring methods

1. SCOPE

This Annex lays down methods for determining data required for reporting the data listed in Annex IV at installation level, as well as rules for attribution of these data to sub-installations, with the exception of data monitored in accordance with a monitoring plan approved by the competent authority pursuant to Regulation (EU) No 601/2012. Data determined in accordance with Regulation (EU) No 601/2012 shall be used under this Regulation where relevant.

2. DEFINITIONS

'Data set' for the purposes of this Annex means one type of data, either at installation level or sub-installation level as relevant in the circumstances, as any of the following:

(a) the amount of fuels or materials consumed or produced by a process as relevant for the calculation-based monitoring methodology, expressed in terajoules, mass in tonnes, or for gases as volume in normal cubic metres, as appropriate, including for waste gases;

(b) a calculation factor as used by Regulation (EU) No 601/2012 (i.e. composition of a material or fuel or waste gas);

(c) net quantity of measurable heat, and the relevant parameters required for determining this quantity, in particular:
- mass flow of heat transfer medium, and
- enthalpy of transmitted and returned heat transfer medium, as specified by composition, temperature, pressure and saturation;

(d) quantities of non-measurable heat, specified by the relevant quantities of fuels used for producing the heat, and the net calorific value (NCV) of the fuel mix;

(e) quantities of electricity;

(f) quantities of CO_2 transferred between installations.

'Determination methodology' means either of the following:

(a) a methodology of identifying, collecting and processing data already available at the installation for data sets of historical data or;

(b) a monitoring methodology for a specific data set based on an approved monitoring methodology plan.

In addition, the definitions of 'source stream', 'emission source', 'inherent risk', 'control risk' and 'emission factor' as set in Article 3 of Regulation (EU) No 601/2012 shall apply.

3. GENERAL METHODS

3.1. **Applicable methods**

The operator shall determine data for the purpose of compiling a baseline data report in accordance with point (a) of Article 4(2) using methods contained in this Annex. Where this Annex does not describe applicable methods for determining a specific data set, the operator shall apply a suitable method, subject to the approval by the competent authority of the monitoring methodology plan in accordance with Article 6. A method shall be deemed suitable where the operator ensures that any metering, analyses, sampling, calibrations and validations for the determination of the specific data set 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.

3.2. **Approach to attributing data to sub-installations**

1. Where data for a specific data set are not available for each sub-installation, the operator shall propose an appropriate method for determining the required data for each individual sub-installation, except for cases referred to in the second and third subparagraphs of Article 10(3). For this purpose, either of the following principles shall be applied depending on which principle yields more accurate results:

(a) where different products are produced one after the other in the same production line, inputs, outputs and corresponding emissions shall be attributed sequentially based on the usage time per year for each sub-installation;

(b) inputs, outputs and corresponding emissions shall be attributed based on the mass or volume of individual products produced or estimates based on the ratio of free reaction enthalpies of the chemical reactions involved or based on another suitable distribution key that is corroborated by a sound scientific methodology.

2. Where several measurement instruments of different quality are contributing to measurement results, either of the following methods shall be used for splitting installation-level data on quantities of materials, fuels, measurable heat or electricity to sub-installations:

(a) Determination of the split based on a determination method, such as sub-metering, estimate, correlation, used equally for each sub-installation. Where the sum of the sub-installation data is different from the data determined separately for the installation, a uniform 'reconciliation factor' shall be applied for uniform correction to meet the total figure of the installation as follows:

$RecF = D_{Inst} / \Sigma D_{SI}$	(Equation 1)

where RecF is the reconciliation factor, DInst is the data value determined for the installation as a whole, and DSI are the data values for the different sub-installations. The data for each sub-installation are then corrected as follows:

$D_{SI,corr} = D_{SI} \times RecF$	(Equation 2)

(b) If only one sub-installation's data are unknown or of lower quality than the data of other sub-installations, known sub-installation data may be subtracted from the total installation data. This method is preferred only for sub-installations which contribute smaller quantities to the installation's allocation.

3.3. **Measurement instruments or procedures not under the operator's control**

The operator may make use of measurement systems or analytical procedures outside the operator's own control:

(a) where the operator does not have their own measurement instrument or analytical procedure available for the determination of a specific data set;

(b) where determination of a data set by the operator's own measurement instruments or analytical procedures is technically not feasible or would incur unreasonable costs;

(c) where the operator demonstrates to the satisfaction of the competent authority that the measurement system or analytical procedure outside the operator's control gives more reliable results and is less prone to control risks.

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;

(b) direct readings from the measurement systems;

(c) use of empirical correlations provided by a competent and independent body, such as equipment suppliers, engineering providers or accredited laboratories.

3.4. **Indirect determination methods**

Where no direct metering or analysis approach is available for a required data set, in particular for cases where net measurable heat is going into different production processes, the operator shall propose the use of an indirect determination method, such as:

(a) calculation based on a known chemical or physical process, using appropriate accepted literature values for the chemical and physical properties of substances involved, appropriate stoichiometric factors and thermodynamic properties such as reaction enthalpies, as appropriate;

(b) calculation based on the installation's design data such as the energy efficiencies of technical units or calculated energy consumption per unit of product;

(c) correlations based on empirical tests for determining estimation values for the required data set from non-calibrated equipment or data documented in production protocols. For this purpose the operator shall ensure that the correlation satisfies the requirements of good engineering practice and that it is applied only to determine values which fall into the range for which it was established. The operator shall evaluate the validity of such correlations at least once a year.

4. SELECTION OF DETERMINATION METHODOLOGIES AND DATA SOURCES REPRESENTING HIGHEST ACHIEVABLE ACCURACY

4.1. **Technical feasibility**

Where an operator claims that applying a specific determination methodology is technically not feasible, the competent authority shall assess the technical feasibility taking the operator's

justification into account. That justification shall be based on the 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 availability of required techniques and technology.

4.2. **Unreasonable costs**

Where an operator claims that applying a specific determination methodology incurs unreasonable costs, the competent authority shall assess the unreasonable nature of the costs, taking into account the operator's justification.

The competent authority shall consider costs unreasonable where the operator's cost estimation exceeds the benefit of a specific determination methodology. To that end, the benefit shall be calculated by multiplying an improvement factor with a reference price of EUR 20 per allowance and costs shall include an appropriate depreciation period based on the economic lifetime of the equipment, where applicable.

The improvement factor shall be 1 % of the most recently determined sub-installation's annual allocation free of charge. By way of derogation from this calculation method, the competent authority may allow operators to determine the improvement factor as 1 % of the affected CO_2 equivalent. The affected CO_2 equivalent shall be one the following, depending on the parameter for which the improvement of methodology is considered:

(a) In the case of a fuel or material containing carbon, including waste gases, the emissions that would result if the carbon contained in the annual quantity of the fuel or material were converted into CO_2;

(b) In the case of emissions monitored by a measurement-based methodology, the annual emissions of the respective emission source;

(c) In the case of measurable heat, the respective annual amount of measurable heat multiplied by the heat benchmark;

(d) In the case of non-measurable heat, the respective annual amount of non-measurable heat multiplied by the fuel benchmark;

(e) In the case of electricity, the respective annual amount of electricity multiplied by the factor specified in Article 22(3);

(f) In the case of the quantity of a product for which a product benchmark applies, the sub-installation's preliminary annual number of emission allowances allocated free of charge determined in accordance with Article 16(2) for the first year of the respective allocation period. Where the relevant benchmark has not yet been determined in accordance with Article 10a(2) of Directive 2003/87/EC, the respective benchmark specified in Annex I to this Regulation shall be used.

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 2 000 per year. For installations with low emissions in accordance with Article 47 of Regulation (EU) No 601/2012 that threshold shall be EUR 500 per year.

4.3. **Process**

To determine the most accurate available data sources, the operator shall select the most accurate data sources which are technically feasible and do not incur unreasonable costs, and which ensure a clear data flow with lowest inherent risk and control risk (referred to hereinafter as

'primary data sources'). The operator shall use the primary data sources for the purpose of compiling the baseline data report.

To the extent feasible without incurring unreasonable costs, for the purpose of the control system in accordance with Article 11, the operator shall strive to identify and use additional data sources or methods for determining data which allow corroboration of the primary data sources (referred to hereinafter as 'corroborating data sources'). The selected corroborating data sources, if any, shall be documented in the written procedures referred to in Article 11(2) and in the monitoring methodology plan.

For selecting the primary data sources, the operator shall compare all available data sources for the same data set using the generic data sources listed in sections 4.4 to 4.6, and use one of the highest ranked data sources that are considered as most accurate data sources. Only if any of the derogations in accordance with Article 7(2) apply, other data sources may be used. In such case, the next highest ranked data source shall be applied unless it is technically not feasible, would incur unreasonable costs or another data source has equivalent or lower level of associated uncertainty. Where needed, further data sources can be considered.

For selecting the corroborating data sources, the operator shall compare all available data sources for the same data set using the generic data sources listed in sections 4.4 to 4.6, and use an available data source other than the most accurate available data source.

For selecting data sources in order to determine all the data required in accordance with Annex IV, the operator shall proceed for the following main types of data sets as follows:

(a) For the determination of quantities of products, fuels and other materials the operator shall take into account the generic data sources and their hierarchy laid down in section 4.4 of this Annex;

(b) For the determination of quantities of energy flows (measurable or non-measurable heat, electricity) the operator shall take into account the generic data sources and their hierarchy laid down in section 4.5 of this Annex;

(c) For the determination of properties of products, fuels and other materials, the operator shall take into account the generic data sources and their hierarchy laid down in section 4.6 of this Annex.

For the purpose of improving the monitoring methodology plan, the operator shall check regularly and at least once per year, whether new data sources have become available. In case such new data sources are considered more accurate in accordance with the ranking described in sections 4.4 to 4.6, they shall be applied and the monitoring methodology plan shall be changed in accordance with Article 9.

4.4. **Selecting data sources for quantification of materials and fuels**

The following generic data sources shall be used selecting most accurate available data sources for quantifying amounts (expressed as tonnes or Nm^3) of materials, fuels, waste gases or products entering or leaving the installation, or any sub-installation:

(a) Methods in accordance with the monitoring plan approved under Regulation (EU) No 601/2012;

(b) Readings of measuring instruments subject to national legal metrological control or measuring instruments compliant with the requirements of Directive 2014/31/EU of the European Parliament and of the Council[10] or Directive 2014/32/EU of the European Parliament and of the Council[11] for direct determination of a data set;

(c) Readings of measuring instruments under the operator's control for direct determination of a data set not falling under point (b);

(d) Readings of measuring instruments not under the operator's control for direct determination of a data set not falling under point (b);

(e) Readings of measuring instruments for indirect determination of a data set, provided that an appropriate correlation between the measurement and the data set in question is established in line with section 3.4;

(f) Other methods, in particular for historical data or where no other data source can be identified by the operator as available.

For selecting data sources for the purpose of Article 7(1), only the data sources listed in points (a) and (b) of the first paragraph are considered representing most accurate data sources while the data source referred to in point (a) of that paragraph shall be used to the extent that it covers the respective data set. The data sources referred to in points (c) to (f) of the first paragraph are considered less accurate in the descending hierarchical order from point (c) to point (f).

4.5. **Selecting data sources for quantification of energy flows**

The following generic data sources shall be used for selecting most accurate available data sources quantifying amounts, expressed as TJ or GWh, of measurable heat or electricity entering or leaving the installation, or any sub-installation:

(a) Readings of measuring instruments subject to national legal metrological control or measuring instruments compliant with the requirements of the Directive 2014/31/EU or Directive 2014/32/EU for direct determination of a data set;

(b) Readings of measuring instruments under the operator's control for direct determination of a data set not falling under point a;

(c) Readings of measuring instruments not under the operator's control for direct determination of a data set not falling under point a;

(d) Readings of measuring instruments for indirect determination of a data set, provided that an appropriate correlation between the measurement and the data set in question is established in line with section 3.4 of this Annex;

(e) Calculation of a proxy for the determining net amounts of measurable heat in accordance with method 3 of section 7.2;

(f) Other methods, in particular for historical data or where no other data source can be identified by the operator as available.

For selecting data sources for the purpose of Article 7(1), only the data source referred to in point (a) of the first paragraph is considered representing most accurate data sources. The data sources referred to in points (b) to (f) of the first paragraph are considered less accurate in the descending hierarchical order from point (b) to point (f).

For situations where no information is available for some parameters (such as temperature and amount of condensate returned) required to determine net flows of measurable heat, the provisions of section 7 are to be applied. In accordance with section 7, several parameters need to be determined in order to result in annual net amounts of measurable heat. Therefore the overall result for the annual net amount of heat should be considered the purpose of the simplified uncertainly assessment in accordance with point (c) of Article 7(2) for the for selection of the

methods referred to in points (b) to (f) of the first paragraph when deviating from the selection of data sources representing most accurate data sources.

4.6. **Selecting data sources for properties of materials**

The following generic data sources shall be used selecting most accurate available data sources for determining properties such as moisture or purity of the substance, carbon content, net calorific value, biomass content, etc. of products, materials, fuels or waste gases as inputs or outputs of the installation or sub-installation:

(a) Methods for determining calculation factors in accordance with the monitoring plan approved under Regulation (EU) No 601/2012;

(b) Laboratory analyses in accordance with section 6.1 of this Annex;

(c) Simplified laboratory analyses in accordance with section 6.2 of this Annex;

(d) Constant values based on one of the following data sources:
- standard factors used by the Member State for its national inventory submission to the Secretariat of the United Nations Framework Convention on Climate Change;
- literature values agreed with the competent authority, including standard factors published by the competent authority, which are compatible with factors referred to under the previous sub-item, but they are representative of more disaggregated sources of fuel streams;
- 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) Constant values based on one of the following data sources:
- standard factors and stoichiometric factors listed in Annex VI to Regulation (EU) No 601/2012 or listed in the Intergovernmental Panel on Climate Change (IPCC) guidelines;
- 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;
- Other values based on scientific evidence.

For selecting data sources for the purpose of Article 7(1), only the data sources referred to in points (a) and (b) of the first paragraph are considered representing most accurate data sources while data source referred to in point (a) of that paragraph shall be used to the extent that it covers the respective data set. The data sources referred to in points (c) to (e) of the first paragraph are considered less accurate in the descending hierarchical order from point (c) to point (e).

5. METHODS FOR DETERMINING ANNUAL QUANTITIES OF MATERIALS AND FUELS

Where the operator has to determine annual quantities of fuels or materials, including products relating to product benchmark sub-installations, the operator shall determine such quantities at installation level or for each relevant sub-installation, as required, in one of the following ways:

(a) based on continual metering at the process where the material is consumed or produced;

(b) based on aggregation of metering of quantities separately delivered or produced taking into account relevant stock changes.

For the purposes of point (b) of the first paragraph, the quantity of fuel or material consumed during the calendar year at the installation or sub-installation shall be calculated as the quantity of fuel or material imported during the calendar year, minus the quantity of fuel or material exported, plus the quantity of fuel or material in stock at the beginning of the calendar year, minus the quantity of fuel or material in stock at the end of the calendar year.

For the purposes of point (b) of the first paragraph, the quantity of product or other material exported during the calendar year shall be calculated as the quantity of product or material exported during the reporting period, minus the quantity imported or recycled into the process, minus the quantity of product or material in stock at the beginning of the calendar year, plus the quantity of product or material in stock at the end of the calendar year.

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 based on one of the following:

(a) data from previous years and correlated with appropriate activity levels for the reporting period;

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

Where the determination of quantities of products, materials or fuels for the entire calendar year is technically not feasible or would incur unreasonable costs, the operator may choose the next most appropriate day to separate a reporting year from the following one, and reconcile accordingly to the calendar year required. The deviations involved for one or more product, material or fuel 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.

6. REQUIREMENTS FOR LABORATORY ANALYSES AND RELATED SAMPLING

6.1. **Requirements for laboratory analyses**

Where the operator needs to carry out laboratory analyses for determining properties (including moisture, purity, concentration, carbon content, biomass fraction, net calorific value, density) of products, materials, fuels or waste gases, or for establishing correlations between parameters for the purpose of indirect determination of required data, the analyses shall be carried out in accordance with Articles 32 to 35 of Regulation (EU) No 601/2012, using an approved sampling plan for ensuring that samples are representative for the batch to which they relate. Where Annex VII to Regulation (EU) No 601/2012 does not provide an appropriate minimum frequency of analyses for a particular product, material or fuel, the operator shall propose a suitable analysis frequency for approval by the competent authority based on information on the heterogeneity of the product, material or fuel.

6.2. **Simplified requirements for certain laboratory analyses**

Where the operator provides evidence to the satisfaction of the competent authority that analyses in accordance with section 6.1 are technically not feasible or would incur unreasonable costs, the operator shall carry out the required analyses based on industry best practice, or use established proxies, in combination with an empirical correlation to an easier accessible parameter, determined at least once per year in accordance with section 6.1.

7. RULES FOR DETERMINING NET MEASURABLE HEAT

7.1. **Principles**

All specified amounts of measurable heat shall always refer to *net* amount of measurable heat, determined as the heat content (enthalpy) of the heat flow transmitted to the heat consuming process or external user minus the heat content of the return flow.

Heat consuming processes necessary for operating the heat production and distribution, such as deaerators, make-up water preparation, and regular blow offs, shall be taken into account in the efficiency of the heat system and can therefore not be considered heat consuming processes eligible for allocation.

Where the same heat medium is used by several consecutive processes and its heat is consumed starting from different temperature levels, the quantity of heat consumed by each heat consuming process shall be determined separately, unless the processes fall within the same sub-installation. Re-heating of the transfer medium between consecutive heat consuming processes should be treated like additional heat production.

Where heat is used to provide cooling via an absorption cooling process, that cooling process shall be considered as the heat consuming process.

7.2. **Methodologies for determining net amounts of measurable heat**

For the purpose of selecting data sources for quantification of energy flows in accordance with section 4.5, following methodologies for determining net amounts of measurable heat shall be considered:
Method 1: Using measurements

Under this method, the operator measures all relevant parameters, in particular temperature, pressure, state of the transmitted as well as the returned heat medium. The state of the medium in case of steam shall refer to its saturation or degree of superheating. The operator furthermore measures the (volumetric) flow rate of the heat transfer medium. Based on the measured values, the operator determines the enthalpy and the specific volume of the heat transfer medium using suitable steam tables or engineering software.

The mass flow rate of the medium is calculated as

$\dot{m} = \dot{V} / v$	(Equation 3)

Where ṁ is the mass flow rate in kg/s, V is the volumetric flow rate in m^3/s and v is the specific volume in m^3/kg.

As the mass flow rate is considered the same for transmitted and returned medium, the heat flow rate is calculated using the difference in enthalpy between the transmitted flow and the return, as follows:

$\dot{Q} = (h_{flow} - h_{return}) \cdot \dot{m}$	(Equation 4)

Where Q is the heat flow rate in kJ/s, h_{flow} is the enthalpy of the transmitted flow in kJ/kg, h_{return} is the enthalpy of the return flow in kJ/kg, and ṁ is the mass flow rate in kg/s.

In case of steam or hot water used as heat transfer medium, where the condensate is not returned, or where it is not feasible to estimate the enthalpy of the returned condensate, the operator shall determine h_{return} based on a temperate of 90 °C.

If the mass flow rates are known to be not identical, the following shall apply:

— Where the operator provides evidence to the satisfaction of the competent authority that condensate remains in the product (e.g. in 'life steam injection' processes), the respective amount of condensate enthalpy is not deducted;

— Where heat transfer medium is known to be lost (e.g. due to leakages or sewering), an estimate for the respective mass flow shall be deducted from the mass flow of the transmitted heat transfer medium.

For determining the annual net heat flow from the above data, the operator shall – subject to the measurement equipment and data processing available, use one of the following methods:

— Determine annual average values for the parameters determining the annual average enthalpy of the transmitted and returned heat medium, and multiply with the total annual mass flow, using equation 4;

— Determine hourly values of the heat flow and sum up those values over the annual total operating time of the heat system. Subject to the data processing system, hourly values may be substituted by other time intervals as appropriate.

Method 2: Using documentation

The operator determines net amounts of measurable heat based on documents in accordance with section 4.6 of this Annex, provided that heat quantities provided in such documents are based on metering, or on reasonable estimation methods in accordance with section 3.4 of this Annex.

Method 3: Calculation of a proxy based on measured efficiency

The operator determines amounts of net measurable heat based on the fuel input and the measured efficiency related to the heat production:

$Q = \eta_H \cdot E_{IN}$	(Equation 5)
$E_{IN} = \Sigma\, AD_i \cdot NCV_i$	(Equation 6)

Where Q is the amount of heat expressed in TJ, η_H is the measured efficiency of heat production, E_{IN} is the energy input from fuels, AD_i are the annual activity data (i.e. quantities consumed) of fuels i, and NCV_i the net calorific values of fuels i.

The value of η_H is either measured by the operator over a reasonably long period, which sufficiently takes into account different load states of the installation or taken from the manufacturer's documentation. In that regard the specific part load curve is to be taken into account by using an annual load factor:

$L_F = E_{IN}/E_{Max}$	(Equation 7)

Where L_F is the load factor, E_{IN} the energy input as determined using Equation 6 over the calendar year, and E_{Max} the maximum fuel input if the heat producing unit had been running at 100 % nominal load for the full calendar year.

The efficiency should be based on a situation in which all condensate is returned. A temperature of 90 °C should be assumed for the returned condensate.

Method 4: Calculating a proxy based on the reference efficiency

This method is identical to method 3, but using a reference efficiency of 70 % ($\eta_{Ref,H}$ = 0,7) in Equation 5.

7.3. Distinguishing district heating, EU ETS and non-ETS heat

Where an installation imports measurable heat, the operator shall determine separately the quantity of heat coming from installations covered by the EU ETS, and heat imported from non-EU ETS entities. Where an installation consumes measurable heat exported from a nitric acid product benchmark sub-installation, the operator shall determine that amount of heat consumed separately from other measurable heat.

Where an installation exports measurable heat, the operator shall determine separately the quantity of heat exported to installations covered by the EU ETS, and heat exported to non-EU ETS entities. Furthermore, the operator shall determine separately quantities of heat qualifying as district heating.

8. RULES FOR ASSIGNING FUELS AND EMISSIONS OF COMBINED HEAT AND POWER PRODUCTION (CHP) FOR THE PURPOSE OF UPDATING BENCHMARK VALUES

This section applies to situations where an operator, for the purpose of updating benchmark values, has to attribute inputs, outputs and emissions of cogeneration units to sub-installations.

For the purposes of this section, 'cogeneration' is used as defined in point (30) of Article 2 of Directive 2012/27/EU of the European Parliament and of the Council[(12)].

The emissions of a cogeneration unit are determined as

$Em_{CHP} = \Sigma\ AD_i \cdot NCV_i \cdot EF_i + Em_{FGC}$	(Equation 8)

Where Em_{CHP} are the annual emissions of the cogeneration unit expressed as t CO_2, AD_i are the annual activity data (i.e. quantities consumed) of fuels *i* used for the CHP unit expressed in tonnes or Nm^3, NCV_i the net calorific values of fuels *i* expressed as TJ/t or TJ/Nm^3, and EF_i the emission factors of fuels *i* expressed in t CO_2/TJ. Em_{FGC} are process emissions from flue gas cleaning expressed in t CO_2.

The energy input to the CHP unit is calculated in accordance with Equation 6. The respective annual average efficiencies of heat production and electricity (or mechanical energy, if applicable) production are calculated as follows:

$\eta_{heat} = Q_{net}/E_{IN}$	(Equation 9)
$\eta_{el} = E_{el}/E_{IN}$	(Equation 10)

Where η_{heat} (dimensionless) is the annual average efficiency of heat production, Q_{net} is the annual net amount of heat produced by the cogeneration unit expressed as TJ as determined in accordance with section 7.2, $E_{IN}$the energy input as determined using Equation 6 expressed as TJ, η_{el} (dimensionless) is the annual average efficiency of electricity production, and E_{el} the net annual electricity production of the cogeneration unit, expressed as TJ.

Where the operator provides evidence to the satisfaction of the competent authority that the determination of the efficiencies η_{heat} and η_{el} is technically not feasible or would incur unreasonable costs, values based on technical documentation (design values) of the installation

shall be used. If no such values are available, conservative default values of η_{heat} = 0,55 and η_{el} = 0,25 should be used.

The attribution factors for heat and electricity from CHP are calculated as

$F_{CHP,Heat} = \frac{\eta_{heat}/\eta_{ref,heat}}{\eta_{heat}/\eta_{ref,heat}+\eta_{el}/\eta_{ref,el}}$	(Equation 11)
$F_{CHP,El} = \frac{\eta_{el}/\eta_{ref,el}}{\eta_{heat}/\eta_{ref,heat}+\eta_{el}/\eta_{ref,el}}$	(Equation 12)

Where $F_{CHP,Heat}$ is the attribution factor for heat and $F_{CHP,El}$ is the attribution factor for electricity (or mechanical energy, if applicable), both expressed without dimension $\eta_{ref,\ heat}$ is the reference efficiency for heat production in a stand-alone boiler, and $\eta_{ref,el}$ the reference efficiency of electricity production without cogeneration. For the reference efficiencies the operator shall apply the appropriate fuel-specific values from the Commission Delegated Regulation (EU) 2015/2402[(13)] without application of the correction factors for avoided grid losses in Annex IV to that Regulation.

For attributing the energy input or emissions of the cogeneration unit to the production of heat and electricity (or mechanical energy, if applicable), the operator shall multiply the total energy input or emissions with the respective attribution factor for heat or electricity.

The specific emission factor of the CHP-related measurable heat to be used for the attribution of heat-related emissions to sub-installations in accordance with section 10.1.2 is calculated as

$EF_{CHP,Heat} = Em_{CHP} \cdot F_{CHP,Heat}/Q_{net}$	(Equation 13)

Where $EF_{CHP,\ heat}$ is the emission factor for the production of measurable heat in the cogeneration unit expressed as t CO_2/TJ.

9. PROCEDURE FOR TRACKING PRODCOM CODES OF PRODUCTS

For the purpose of correct attribution of data to sub-installations, the operator shall maintain a list of all products produced at the installation and their applicable PRODCOM codes, based on NACE rev. 2. Based on this list, the operator shall:

— Attribute products and their annual production figures to product benchmark sub-installations in accordance with product definitions provided in Annex I where appropriate;

— Take this information into account for attributing inputs, outputs and emissions separately to sub-installations related to sectors exposed to a significant risk of carbon leakage or not exposed to such risk, in accordance with Article 10.

To this end the operator shall establish, document, implement and maintain a procedure for regular checking whether the products produced in the installation confirm with the PRODCOM codes applied when setting up the monitoring methodology plan. This procedure shall furthermore contain provisions to identify if the installation produces a new product for the first time, and to ensure that the operator determines the applicable PRODCOM code for the new product, add it to the list of products and attributes related inputs, outputs and emissions to the appropriate sub-installation.

10. RULES FOR DETERMINING EMISSIONS AT SUB-INSTALLATION LEVEL FOR THE PURPOSE OF UPDATING BENCHMARK VALUES

10.1. **Emissions at sub-installation level**

For the purpose of Article 10, the operator shall attribute the installation's total emissions to sub-installations applying, where applicable, the provisions of sections 3.2 and 10.1.1 to 10.1.5 of this Annex.

10.1.1. *Direct attribution of source streams or emission sources*

1. Emissions of source streams or emission sources serving only one sub-installation are attributed to that sub-installation in full. Where the operator uses a mass balance, outgoing source streams shall be subtracted in accordance with Article 25 of Regulation (EU) No 601/2012. For avoiding double counting, source streams which are converted into waste gases, with the exception of waste gases produced and fully consumed within the same product benchmark sub-installation, shall not be attributed using this approach.

2. Only where source streams or emission sources serve more than one sub-installation, the following approaches for attribution of emissions apply:

— Emissions from source streams or emission sources used for the production of measurable heat shall be attributed to sub-installations in accordance with section 10.1.2;

— Where waste gases are not used within the product benchmark sub-installation in which it is produced, the emissions stemming from waste gases shall be attributed in accordance with section 10.1.5;

— Where the amounts of source streams attributable to sub-installations are determined by metering before the use in the sub-installation, the operator shall apply the appropriate methodology in accordance with section 3.2.

— Where emissions from source streams or emission sources cannot be attributed in accordance with other approaches, they shall be attributed using correlated parameters, which have already been attributed to sub-installations in accordance with section 3.2. For that purpose, the operator shall attribute source stream amounts and their respective emissions proportionally to the ratio in which those parameters are attributed to sub-installations. Appropriate parameters include the mass of products produced, mass or volume of fuel or material consumed, amount of non-measurable heat produced, operating hours, or known equipment efficiencies.

10.1.2. *Emissions attributable to measurable heat*

Where the sub-installation consumes measurable heat produced within the installation, the operator shall determine, where applicable, the heat-related emissions using one of the following methods.

1. For measurable heat produced from the combustion of fuels within the installation except heat produced by cogeneration, the operator determines the emission factor of the relevant fuel mix and calculates emissions attributable to the sub-installation as

$Em_{Q,sub\text{-}inst} = EF_{mix} \cdot Q_{consumed,sub\text{-}inst} / \eta$	(Equation 14)

Where $Em_{Q,sub\text{-}inst}$ is the heat-related emissions of the sub-installation in t CO_2, EF_{mix} is the emission factor of the respective fuel mix expressed as t CO_2/TJ including emissions from flue gas cleaning, where applicable, $Q_{consumed,sub\text{-}inst}$ is the amount of measurable heat consumed in the sub-installation expressed in TJ, and η is the efficiency of the heat production process.

EF_{mix} is calculated as

$EF_{mix} = (\Sigma\ AD_i \cdot NCV_i \cdot EF_i + Em_{FGC}) / (\Sigma\ AD_i \cdot NCV_i)$	(Equation 15)

Where AD_i are the annual activity data (i.e. quantities consumed) of fuels *i* used for the measurable heat production expressed in tonnes or Nm^3, NCV_i the net calorific values of fuels *i* expressed as TJ/t or TJ/Nm^3, and EF_i the emission factors of fuels *i* expressed in t CO_2/TJ. Em_{FGC} are process emissions from flue gas cleaning expressed in t CO_2.

Where a waste gas is part of the fuel mix used, the emission factor of that waste gas is adjusted before calculating EF_{mix} in accordance with point (b) of section 10.1.5 of this Annex.

2. For measurable heat produced in cogeneration units where fuels are combusted within the installation, the operator determines the emission factor of the relevant fuel mix and calculates emissions attributable to the sub-installation as

$Em_{Q,CHP,sub\text{-}inst} = EF_{CHP,Heat} \cdot Q_{cons,CHP,sub\text{-}inst}$	(Equation 16)

Where $Em_{Q,CHP,sub\text{-}inst}$ is the CHP-heat-related emissions of the sub-installation in t CO_2, $EF_{CHP,Heat}$ is the emission factor of the heat part of the cogeneration unit as determined in accordance with section 8 expressed as t CO_2/TJ including emissions from flue gas cleaning, where applicable, and $Q_{cons,CHP,sub\text{-}inst}$ is the amount of measurable heat produced by cogeneration within the installation and consumed in the sub-installation expressed in TJ.

Where a waste gas is part of the fuel mix used in the cogeneration unit, the emission factor of that waste gas is adjusted before calculating $EF_{CHP,Heat}$ in accordance with point (b) of section 10.1.5.

3. Where measurable heat is recovered from processes covered by a product benchmark sub-installation, a fuel benchmark sub-installation or a process emission sub-installation, the operator shall report those amounts of heat as being transferred between the relevant sub-installations in the baseline data report in accordance with point (a) of Article 4(2).

4. Where measurable heat is imported from other installations covered by the EU ETS or from installations or entities not covered by the EU ETS, the emission factor related to the production of that heat shall be reported, if available.

5. The operator shall attribute zero emissions to measurable heat produced from electricity, but report the related amounts of measurable heat in the baseline data report in accordance with point (a) of Article 4(2).

10.1.3. *Attribution of emissions related to heat losses*

Where losses of measurable heat are determined separately from the amounts used in sub-installations, in order to satisfy the criterion in accordance with point (c) of Article 10(5), the operator shall add emissions in relation to a proportionate quantity of heat losses to the emissions

of all sub-installations in which measurable heat produced in the installation is used, using emission factors determined in accordance with section 10.1.2 of this Annex.

10.1.4. *Attribution of emissions related to non-measurable heat*

In order to attribute emissions related to the use of non-measurable heat that is not included in a product benchmark sub-installation, the operator shall attribute the relevant source streams or emission sources to sub-installations in accordance with section 10.1.1, using the relevant emission factors. The operator shall attribute only fuels and source streams related to process emissions from flue gas cleaning to uses of non-measurable heat.

Where a waste gas is part of the fuel mix used, the emission factor of that waste gas is adjusted before attributing its emissions to non-measurable heat use, in accordance with point (b) of section 10.1.5.

10.1.5. *Attribution of emission for the production and use of waste gases*

The emissions from waste gases are split into two parts, except where they are used in the same product benchmark sub-installation where they are produced, as follows:

(a) An amount of emissions assigned to the production of the waste gas is attributed under the product benchmark sub-installation where the waste gas is produced.

This amount is calculated as follows:

$Em_{WG} = V_{WG} \cdot NCV_{WG} \cdot (EF_{WG} - EF_{NG} \cdot Corr_n)$	(Equation 17)

Where Em_{WG} is the amount of emissions assigned to the production of the waste gas, V_{WG} is the volume of waste gas produced expressed as Nm^3 or t, NCV_{WG} is the net calorific value of the waste gas expressed as TJ/Nm^3 or TJ/t, EF_{WG} is the emission factor of the waste gas expressed as t CO_2/TJ, EF_{NG} is the emission factor of natural gas (56,1 t CO_2/TJ), and $Corr_\eta$ is a factor that accounts for the difference in efficiencies between the use of waste gas and the use of the reference fuel natural gas. The default value of this factor is equal to 0,667.

(b) An amount of emissions assigned to the consumption of the waste gas is attributed to the product benchmark sub-installation, heat benchmark sub-installation, district heating sub-installation or fuel benchmark sub-installation, where it is consumed. This amount is determined by multiplying the amount and calorific value of the waste gas with the value of the heat or fuel benchmark, as applicable.

10.2. **Attributed emissions to sub-installations**

The operator shall determine the attributed emissions of each sub-installation as a sum of:

(a) emissions related to source streams relevant for the sub-installation determined in accordance with section 10.1.1, as applicable;

(b) emissions attributable to measurable heat consumed in the sub-installation determined in accordance with sections 10.1.2 and 10.1.3, as applicable;

(c) emissions attributable to non-measurable heat consumed in the sub-installation determined in accordance with section 10.1.4, as applicable;

(d) emissions attributable to the production or use of waste gases in the sub-installation determined in accordance with section 10.1.5, as applicable.

In this calculation, the operator shall ensure that neither omissions nor double counting of source streams occur.

The operator shall also determine the difference between the total emissions of the installation and the sum of attributed emissions of all sub-installations relevant at the installation. If applicable, the operator shall identify all processes contributing to this difference and corroborate the plausibility of the attribution by estimating the emissions associated with these processes, in particular with source streams used for electricity production and for flaring other than safety flaring.

(**1**) OJ L 275, 25.10.2003, p. 32.

(**2**) Commission Decision 2011/278/EU of 27 April 2011 determining transitional Union-wide rules for harmonised free allocation of emission allowances pursuant to Article 10a of Directive 2003/87/EC of the European Parliament and of the Council (OJ L 130, 17.5.2011, p. 1).

(**3**) Directive (EU) 2018/410 of the European Parliament and of the Council of 14 March 2018 amending Directive 2003/87/EC to enhance cost-effective emission reductions and low-carbon investments, and Decision (EU) 2015/1814 (OJ L 76, 19.3.2018, p. 3).

(**4**) Commission Regulation (EU) No 601/2012 of 21 June 2012 on the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council (OJ L 181, 12.7.2012, p. 30).

(**5**) 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).

(**6**) 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).

(**7**) Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009 on the geological storage of carbon dioxide and amending Council Directive 85/337/EEC, European Parliament and Council Directives 2000/60/EC, 2001/80/EC, 2004/35/EC, 2006/12/EC, 2008/1/EC and Regulation (EC) No 1013/2006 (OJ L 140, 5.6.2009, p. 114).

(**8**) Council Regulation (EEC) No 3924/91 of 19 December 1991 on the establishment of a Community survey of industrial production (OJ L 374, 31.12.1991, p. 1).

(**9**) 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).

(**10**) 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).

(**11**) 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).

(**12**) Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC (OJ L 315, 14.11.2012, p. 1).

(**13**) Commission Delegated Regulation (EU) 2015/2402 of 12 October 2015 reviewing harmonised efficiency reference values for separate production of electricity and heat in application of Directive 2012/27/EU of the European Parliament and of the Council and repealing Commission Implementing Decision 2011/877/EU (OJ L 333, 19.12.2015, p. 54).