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Guidance Document n°9

on the harmonised free allocation methodology for the EU ETS – 2024 revision

Sector-specific guidance

Final version issued on 22 April 2024,
with updates on 24 January 2025 following the revisions of the MRR (2018/2066)

The guidance does not represent an official position of the Commission and is not legally binding. However, this guidance aims to clarify the requirements established in the EU ETS Directive and the amendment to the FAR and is meant as a tool to assist with the understanding of those legally binding rules.

Table of contents

Introduction

This guidance document is part of a group of documents, which are intended to support Member States[1], and their Competent Authorities, in the consistent implementation throughout the Union of the allocation methodology for the second allocation period in Phase 4 of the EU ETS, following the revision of the EU ETS Directive[2] and the Delegated Regulation of the Commission 2019/331 on "Transitional Union-wide rules for harmonised free allocation of emission allowances pursuant to Article 10a of the EU ETS Directive" (FAR)[3,4], and the subsequent implementing acts. *Guidance Document 1 on General Guidance to the Allocation Methodology* provides an overview of the legislative background to the group of guidance documents. It also explains how the different guidance documents relate to each other and provides a glossary of important terminology used throughout the guidance[5].

This Guidance Document 9 gives the following information for each of the 52 product benchmarks:

- The name and number of the product benchmark, as well as the unit in which it is expressed and the associated Annex I activity;
- Its carbon leakage exposure based on (EU) 2019/708[6]
- Whether it is under the scope of CBAM based on (EU) 2023/956[7,8];
- The definition of its unit of production;
- The definition and explanation of the products covered;
- The definition and explanation of processes and emissions covered (see *Guidance Document 3 on data collection* for more information on system boundaries of product benchmarks);
- The determination of the historical activity level, in cases where a specific approach applies[9]).

[1] When the term 'Member States' is used in this Guidance Document, this includes the EFTA countries covered by the EU ETS as applicable.

[2] Directive (EU) 2023/959 of the European Parliament and of the Council of 10 May 2023 amending Directive 2003/87/EC establishing a system for greenhouse gas emission allowance trading within the Union and Decision (EU) 2015/1814 concerning the establishment and operation of a market stability reserve for the Union greenhouse gas emission trading system (Text with EEA relevance), PE/9/2023/REV/1, OJ L 130, 16.5.2023, p. 134–202, see: http://data.europa.eu/eli/dir/2023/959/oj

[3] FAR: https://eur-lex.europa.eu/eli/reg_del/2019/331/oj and https://eur-lex.europa.eu/eli/reg_del/2024/873/oj

[4] Note that this document only covers the transitional harmonised free allocation to industry under Article 10a of the EU ETS Directive. Any allocation under Article 10c ("Option for transitional free allocation for the modernisation of the energy sector") is outside the scope of this document.

[5] All Guidance Documents available at https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets/free-allocation_en#documentation

[6] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32019D0708

[7] To ensure consistency with CBAM, the CN codes version should be consistent with Annex I of the CBAM Regulation (EU) 2023/956, which refers to the CN codes under Regulation (EEC) No 2658/87.

[8] https://eur-lex.europa.eu/eli/reg/2023/956/oj

[9] i.e., HAL referred to in Annex III of the FAR.

Definition and explanation of products covered

One of the first important steps in the data collection is to check if product benchmarks apply to an installation. For this purpose, the products produced by the installation including the characteristics of the product, the composition of product mixes and/ or the fields of application need to be checked against the definition of the relevant product benchmark. This assessment is further described in *Guidance Document 3 on data collection*. PRODCOM codes can be a useful indicator for identification, however the selection of a benchmark should never solely rely on PRODCOM codes. It should be noted that, unless those are not available, PRODCOM 2010[10] codes are to be used as indicators in this context. This is because the Carbon Leakage List is based on NACE revision 2, with the corresponding PRODCOM 2010 version. This approach should be taken even if a more recent PRODCOM code with a different code value for the actual products is available and needs to be reported for statistical purposes. In this guidance, where possible, PRODCOM 2010 codes associated with benchmarks are listed in the relevant section, as well as in Annex A.

Carbon Leakage exposure

For each product benchmark listed, the carbon leakage exposure in years 2021-2030 is indicated as follows, based on Commission Delegated Decision 2019/708 of 15 February 2019:

- 'Yes' means that the product benchmark covers products that are deemed exposed to a significant risk of carbon leakage. In this case, the carbon leakage exposure factor (CLEF) to be used is 1;
- 'No' means that the product benchmark covers products that are not deemed exposed to a significant risk of carbon leakage. This is the case for only one of the product benchmarks. In this case, the CLEF of the relevant year is to be used.

Under the CBAM scope

For each product benchmark, the CBAM good status is indicated as follows, based on section 2 of Annex II of the "CBAM Implementing act"[11] and the relevant CN codes as given in the CBAM Regulation[12]:

- 'Yes' means that products produced within the boundaries of this product benchmark are considered CBAM goods (some specific cases are further explained in the relevant section). In this case, the CBAM factor of the relevant year is to be used;
- 'No' means that products produced within the boundaries of this product benchmark are not considered CBAM goods. In this case, the CBAM factor to be used is 1.

[10] The full 2010 list of PRODCOM codes can be found at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32010R0860&from=EN

[11] Commission Implementing Regulation (EU) 2023/1773 of 17 August 2023 laying down the rules for the application of Regulation (EU) 2023/956 of the European Parliament and of the Council as regards reporting obligations for the purposes of the carbon border adjustment mechanism during the transitional period, http://data.europa.eu/eli/reg_impl/2023/1773/oj

[12] Electricity is also listed as a CBAM good in Annex I of the CBAM Regulation only, but free allocation is not relevant in this case.

NACE, PRODCOM and CN codes

In principle, the eligibility assessment of (sub-) sectors included in the Carbon Leakage List is based on their NACE classification codes, though for a number of sub-sectors it is based on the more disaggregated PRODCOM classification codes.

NACE codes are 4-digit codes used to classify to which specific sector an installation belongs to, based on the activities carried out. The codes are taken from the Classification of Economic Activities in the European Community. The PRODCOM code is an 8-digit code which stands for the PRODucts of the European COMmunity Inquiry, and is governed by Regulation (EU) 2019/2152[13] . The product definitions are standardised across the EU to give comparability between Member States' data and the production of European aggregate data at product level. There is a direct relationship between the NACE and PRODCOM codes with the first 4 digits of the PRODCOM code matching the 4 digits of the NACE.

CN codes are Combined Nomenclature codes set for all customs declarations in the EU, as defined under Regulation (EEC) 2658/87[14]. As indicated on the Taxation and Customs Union website in the section on the Combined Nomenclature[15], *"every year, Annex I to the basic CN Regulation (Council Regulation (EEC) No 2658/87 on the tariff and statistical nomenclature and on the Common Customs Tariff) is updated and published as a stand-alone Regulation in the EU's Official Journal. Such updates take into account any changes that have been agreed at international level, either at the World Customs Organization (WCO) with regard to the Harmonised System (HS) nomenclature or within the framework of the World Trade Organization (WTO) with regard to conventional duty rates. Other changes may be required to reflect the evolution of, for example, commercial policy, technological or statistical requirements."*[16]

CN codes usually consist of 8 digits; where fewer digits are indicated, it means that all CN codes starting with those digits are covered, as is the case with PRODCOM codes.

Definition and explanation of processes and emissions covered

Double allocation in respect of the same emissions should be avoided. Double allocation could occur where system boundaries of benchmarks are not properly respected. Double counting occurs when processes covered by a product benchmark also receive allocation based on a fall-back approach or other product benchmark. The following examples provide some guidance:

Example A:

Emissions from safety flaring are always covered by product benchmarks. Therefore, no additional allocation for such safety flaring via fuel sub-installations (for details please consult *Guidance Document 8 on waste gases and process emissions*) must be granted.

[13] https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A32019R2152

[14] Consolidated version of the text dated 17/06/2023: http://data.europa.eu/eli/reg/1987/2658/2023-06-17

[15] https://taxation-customs.ec.europa.eu/customs-4/calculation-customs-duties/customs-tariff/combined-nomenclature_en

[16] The latest published version at the time of publication of this Guidance is the 2024 version, which can be found via this webpage: https://taxation-customs.ec.europa.eu/news/commission-publishes-2024-version-combined-nomenclature-2023-10-31_en

Caution is particularly important if the production of a benchmarked product involves the production of an intermediate product that is later used for the production of a benchmarked product. Whenever a product benchmark includes the production of intermediate products, the production of the intermediate products alone should not be allocated.

Example B:

The production of the intermediate product ethylene dichloride (EDC) is included in the VCM benchmark. The VCM benchmark should therefore not be applied to dedicated EDC plants that do not produce VCM. Such plants should not be allocated any free allowances, either using the VCM benchmark or using fall-back approaches. Alternatively, the EDC production might be granted free allocation based on applicable fall-back approaches if the same amount of free allowances is deducted from the free allocation given to the VCM producer.

Example C:

As for EDC and VCM, hydrogen used in the production of ammonia is not eligible for free allocation, as the emissions are already covered by the ammonia product benchmark. This is applicable to both integrated plants where hydrogen and ammonia are produced within the same plant as well as standalone hydrogen production, where the hydrogen is exported to a plant producing ammonia.

For the determination of free allocation based on product benchmarks, any import of measurable heat from heat production not covered by the ETS needs to be deducted (according to Article 21 of the FAR). Please consult section 2.3 of *Guidance Document 6 on cross-boundary heat flows* for details.

Preliminary allocation and determination of the historical activity level

The preliminary free allocation for a product benchmark sub-installation is calculated as follows:

$$F_{p,k} = BM_p \times HAL_p \times CLEF_{p,k} \times CBAM_{p,k}$$

Where:

$F_{p,k}$: Annual preliminary allocation for a product benchmark sub-installation in year k (expressed in EUAs).

BM_p: Benchmark for the relevant product (expressed in EUAs / unit of product).

HAL_p: Historical activity level, i.e., the median of annual production in the baseline period as determined and verified in the baseline data collection.

$CLEF_{p,k}$: Applicable Carbon Leakage Exposure Factor for product p in year k.

$CBAM_{p,k}$: Applicable Carbon Border Adjustment Mechanism factor for product p in year k.

For most product benchmarks, the historical activity level equals the median of annual production in the baseline period, as determined and verified in the baseline data collection. Some product benchmarks have specific approaches for the determination of the historical activity level, which are described in the corresponding sections.

As from 2026, in line with FAR Article 16(5), the flaring of waste gases resulting from processes covered by a product benchmark, except for safety flaring, and not used for the purpose of the production of measurable heat, non-measurable heat or electricity, will lead to a reduction of allocation. In this case, the preliminary annual allocation for the relevant product benchmark sub-installation will be reduced by the amount of annual historical emissions emitted from the flaring of these waste gases. *See Guidance Document 8 on waste gases and process emissions for more information on this topic.*

For product benchmarks defined on the basis of net saleable production, this should be interpreted as the quantity of product (e.g., paper) which can be theoretically sold, i.e., meeting the client specifications. “Marketable” should refer to a state of the product that is close to the production process, yet where clients could buy the product of the applicable product benchmark. Any waste returned to the process (including, e.g., scrubs and cuttings) should not be included in the historical activity level. Packaging and sleeves should not be included either, as they are not included in the production processes as defined in the respective sections here-after.

In all cases, to avoid any risk of double counting, care should be taken that any products returned into the same production process are deducted from annual activity levels, as appropriate in line with the production definitions laid down in Annex I of the EU ETS Directive and in the FAR.

1. Refinery products

Benchmark name:	**Refinery products**
Benchmark number:	1
Unit:	CO_2 weighted tonne (CWT)
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	No (CBAM factor to be used is 1)
Associated Annex I activity:	Refining of oil
Special provisions:	Provisions in Annexes II and III of the FAR PRODCOM 2010 not available, use PRODCOM 2004

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"Mix of refinery products with more 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"

Refineries with other product mixes referred to in the definition are the so-called atypical sites producing, e.g., mainly lubricants or bitumen. For these cases, allocation will be based on fall-back approaches. If hydrogen or synthesis gas is produced in an atypical site, the corresponding product benchmarks has to be applied.

The table below shows relevant products according to definitions in PRODCOM 2004 statistics. PRODCOM codes can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on PRODCOM codes reported in statistics.

Because no suitable PRODCOM 2010 codes exist for this benchmark, PRODCOM 2004 codes are used.

PRODCOM 2004 code	**Description**
23.20.11.40	Aviation gasoline
23.20.11.50	Motor gasoline, unleaded
23.20.11.70	Motor gasoline, leaded
23.20.12.00	Gasoline type jet fuel
23.20.13.50	Light naphtha
23.20.16.50	Medium naphtha
23.20.13.70	White spirit, industrial spirit

PRODCOM 2004 code	Description
23.20.14.00	Kerosene-type jet fuel and other kerosene
23.20.15.50	Derv fuel (diesel)
23.20.15.70	Heating gas-oil

Definition and explanation of processes and emissions covered

In FAR Annex I, point 2, referring to the 'definition of product benchmarks and system boundaries with collection of data on electricity consumption', the rules define the system boundaries of the refinery products product benchmark as follows:

"All processes of a refinery matching 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 purpose of data collection, the total electricity consumption within the system boundaries shall be considered."

CWT units are defined below, in the section "Determination of historical activity level".

The allocation for the process units pertaining to other sectors (e.g., petrochemicals) should be determined on the basis of other product benchmark (if available) or fall-back approaches (heat benchmark, fuel benchmark or process emissions approach).

In particular, steam cracker complexes are not included in the scope of the CWT methodology as they are treated as part of the chemical sector. Whenever a steam cracker is physically integrated into a refinery it does not give rise to any CWT contribution while the corresponding CO_2 emissions are subtracted from the amount of refinery emissions used in the CWT methodology.

Processes defined by the CWT methodology only receive allocation according to that approach if they are part of a refinery. When such processes occur outside of a refinery, most of them should receive allocation based on fall-back approaches. However, some can be covered by other product benchmarks; e.g., aromatics or hydrogen.

Processes defined by the CWT methodology that are part of the aromatics benchmark sub-installation but carried out within the refinery, should also be accounted for within the refinery products benchmark sub-installation as aromatics are included.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS or a non-ETS consumer. However, when heat is exported to a consumer covered by the ETS, the consumer will get free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of heat export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

Emissions related to safety flaring and other flaring of gases that are associated with the production are included in the benchmark, in particular:

1. Emissions from the combusted flared gas;
2. Emissions from the combustion of fuels necessary to operate a flare, which are of two types:
    a) The fuels necessary to keep a pilot flame running
    b) The fuels required to successfully combust the flared gas.

Determination of historical activity level

Although all refineries process crude oil to make a broadly similar range of products (LPG, gasolines, and kerosene, gasoil/diesel and fuels oils), they are all different in terms of types of process units, relative and absolute size. A refinery will use different routes with different CO_2 footprints to make a certain product, and production routes and products are interdependent, i.e., a refinery cannot produce only gasoline. Also, refineries with a relatively simple configuration unable to process certain heavy fractions forming part of their output, ship these substances to more complex refineries for further processing. As a result, energy consumption and CO_2 emissions do not readily correlate with simple indicators such as crude throughput, final product mix or the like.

The concept of CO_2 Weighted Tonne (CWT) overcomes this difficulty by defining the activity of a refinery not simply as input or output, but as a function of activity levels of the process units that are part of the refinery. Thereby the single product of the refinery is the CWT and its production has been calculated on the basis of defined generic process unit each of which has been weighted with an emission factor relative to crude distillation. That factor is denoted as the CWT factor and is representative of the CO_2 emission intensity at an average level of energy efficiency, for the same standard fuel type for each process unit for production, and for average process emissions of the process units. Additional corrections are applied for so-called off-sites[17] and electricity production/consumption.

The historical activity level in terms of CWT should be determined according to the formula below:

$$HAL_{CWT} = Median\left(1.0183 \times \sum_{i=1}^{n}\left(TP_{i,k} \times CWT_i\right) + 298 + 0.315 \times TP_{AD,k}\right)$$

Where:

$TP_{i,k}$: historical activity level of process unit *i* in year k of the baseline period as defined for the purpose of the CWT approach (see Table 2).

CWT_i : CWT factor for process unit *i* as defined by for the purpose of the CWT approach (see Table 2).

$TP_{AD,k}$: Throughput of the Atmospheric Crude Distillation in year k of the baseline period defined as fresh feed (kt) per year.

Table 1 shows the calculation of the basic historical activity level. The yellow cells require input data. Process units for the purpose of the CWT approach are called CWT ”functions”. Since not all CWT

[17] Off-sites are ancillary non-process facilities operating inside the refinery fence-line, e.g., tankage, blending, effluent treatment.

functions will be performed at a single refinery, the majority of yellow fields will have the value zero. It is recommended to use the calculation tool provided by CONCAWE for the benchmark data collection exercise and to copy the results into Sheet H of the baseline data collection template provided by the European Commission.

The appropriate measures of activity for a CWT function are shown in Table 1 and Table 2. With some exceptions, the activity is entered in kilotonnes per annum (kt/a) of either fresh feed (F) or product (P). Fresh feed is to be understood as water free and excluding slops processing.

The reported throughput must be the actual figure for the year, even if the unit was not in operation during the whole year (e.g., a new unit started-up during the year, or a unit was idle during part of the year). Figures must be generated from either actual flow measurements and/or refinery material balance records.

Accuracy

In order to meet the desired accuracy for CWT, throughputs must be entered in kt/a with a certain number of decimals depending on the magnitude of the CWT factor:

- For factors up to 1.99: 0 decimals
- For factors between 2.00 and 19.99: 1 decimal
- For factors between 20.00 and 99.99: 2 decimals
- For factors above 100.00: 3 decimals.

The following accuracy must be adhered to in the calculation of parameters that may be necessary to calculate direct and indirect emissions of the (sub)installation:

- Steam flows: ±5%
- Electricity production: ±5%
- Steam conditions: for steam enthalpies an accuracy of ±0.1 GJ/t is sufficient which is consistent with conditions accurate within ± 5°C and ± 5 bar. Note that these conditions are not used in the calculation in this document, but may nevertheless be needed in the calculation of the amount of imported and exported steam.

Table 1. Calculation of basic historic activity level in year k

CWT function	Historical level of activity			CWT factor		CWT
	Basis*	(kt in year k)		(-)		(kt in year k)
Atmospheric Crude Distillation	F	..	×	1.00	=	..
Vacuum Distillation	F	..	×	0.85	=	..
Solvent Deasphalting	F	..	×	2.45	=	..
Visbreaking	F	..	×	1.40	=	..
Thermal Cracking	F	..	×	2.70	=	..
Delayed Coking	F	..	×	2.20	=	..
Fluid Coking	F	..	×	7.60	=	..
Flexicoking	F	..	×	16.60	=	..
Coke Calcining	P	..	×	12.75	=	..
Fluid Catalytic Cracking	F	..	×	5.50	=	..
Other Catalytic Cracking	F	..	×	4.10	=	..
Distillate/Gasoil Hydrocracking	F	..	×	2.85	=	..
Residual Hydrocracking	F	..	×	3.75	=	..
Naphtha/Gasoline Hydrotreating	F	..	×	1.10	=	..
Kerosene/Diesel Hydrotreating	F	..	×	0.90	=	..
Residual Hydrotreating	F	..	×	1.55	=	..
VGO Hydrotreating	F	..	×	0.90	=	..
Hydrogen Production**	P	..	×	300.00	=	..
Catalytic Reforming	F	..	×	4.95	=	..
Alkylation	P	..	×	7.25	=	..
C4 Isomerisation	R	..	×	3.25	=	..
C5/C6 Isomerisation	R	..	×	2.85	=	..
Oxygenate Production	P	..	×	5.60	=	..
Propylene Production	F	..	×	3.45	=	..
Asphalt Manufacture	P	..	×	2.10	=	..
Polymer-Modified Asphalt Blending	P	..	×	0.55	=	..
Sulphur Recovery	P	..	×	18.60	=	..
Aromatic Solvent Extraction	F	..	×	5.25	=	..
Hydrodealkylation	F	..	×	2.45	=	..
TDP/TDA	F	..	×	1.85	=	..
Cyclohexane production	P	..	×	3.00	=	..
Xylene Isomerisation	F	..	×	1.85	=	..
Paraxylene Production	P	..	×	6.40	=	..
Metaxylene production	P	..	×	11.10	=	..
Phtalic anhydride production	P	..	×	14.40	=	..
Maleic anhydride production	P	..	×	20.80	=	..
Ethylbenzene production	P	..	×	1.55	=	..
Cumene production	P	..	×	5.00	=	..
Phenol production	P	..	×	1.15	=	..
Lube solvent extraction	F	..	×	2.10	=	..
Lube solvent dewaxing	F	..	×	4.55	=	..
Catalytic Wax Isomerisation	F	..	×	1.60	=	..
Lube Hydrocracking	F	..	×	2.50	=	..

CWT function	Historical level of activity			CWT factor		CWT
	Basis*	(kt in year k)		(-)		(kt in year k)
Wax Deoiling	P	..	×	12.00	=	..
Lub & Wax Hydrotreating	F	..	×	1.15	=	..
Solvent Hydrotreating	F	..	×	1.25	=	..
Solvent Fractionation	F	..	×	0.90	=	..
Mol sieve for C10+ paraffins	P	..	×	1.85	=	..
Partial Oxidation of Residual Feeds (POX) for fuel	SG	..	×	8.20	=	..
Partial Oxidation of Residual Feeds (POX) for Hydrogen or Methanol	SG	..	×	44.00	=	..
Methanol from syngas	P	..	×	-36.20	=	..
Air Separation	P (kNm^3O_2)	..	×	8.80	=	..
Fractionation for purchased NGL	F	..	×	1.00	=	..
Flue gas treatment	F (MNm^3)	..	×	0.10	=	..
Treatment and Compression of Fuel Gas for Product Sales	Elec. consumption (kW)	..	×	0.15	=	..
Seawater Desalination	P (km^3)	..	×	1.15	=	..
Sum						**HAL_{Basic}**
Historical activity level (= 1.0183 x HAL_{Basic} + 0.315 x TP_{AD} + 298) (for TD_{AD} see first line in table)	**HAL_{CWT}**					
* Measure for activity level: net fresh feed (F), reactor feed (R, includes recycle), product feed (P), Synthesis gas production for POX units (SG) ** Refers to 47 % Hydrogen - the calculation should be done in accordance with FAR Annex III No. 7 (see section 51), Hydrogen production refers to 100 % Hydrogen - the calculation is done by a simple standardisation to 100 % hydrogen instead of in accordance with FAR Annex III No. 6 used for the Hydrogen Benchmark.						

Table 2. Process unit distribution

Process Unit	Solomon Process ID	Solomon Process Type	Activity basis	CWT factor	Description	Typical feed(s)	Typical product(s)
Atmospheric Crude Distillation Mild Crude Unit Standard Crude Unit	CDU	MCU SCU	Fresh feed	1.00	Primary atmospheric distillation of crude oil and other feedstocks. The factor includes ancillary equipment such as crude desalter, naphtha splitting, gas plant and wet treatment of light streams for mercaptan removal. Some units may have more than one main distillation column. The classification between MCU and SCU unit depends on the TBP cut point of the bottom product. The unit is classified as an SCU if this cut point is >316°C, otherwise it is classified as an MCU.	Crude oil, other feedstocks	Full range of distillates from light gases to heavy gasoil, atmospheric residue
Vacuum Distillation Mild Vacuum Fractionation	VAC	MVU	Fresh feed	0.85	Distillation of atmospheric residues under vacuum. The process line up must include a heater. Some units may have more than one main distillation column.	Atmospheric residue	Vacuum gasoils, vacuum residue

Process Unit	Solomon Process ID	Solomon Process Type	Activity basis	CWT factor	Description	Typical feed(s)	Typical product(s)
Standard Vacuum Column Vacuum Fractionating Column		VAC VFR			VAC and MVU represent different levels of vacuum. VFR is typically used for lubes production and include a higher level of fractionation between distillate products.		
Vacuum Flasher Column		*VFL*	***n.c.***	***n.c.***	*Normally associated with a visbreaker (VBR) or a thermal cracker (TCR). It does not include a heater. Its contribution is included in the CWT factor of the VBR and TCR units*		
Heavy Feed Vacuum Unit		*HFV*	***n.c.***	***n.c.***	*Additional column taking feed from the bottom of an MVU. Its contribution is included in the generic CWT factor for VAC.*		
Solvent Deasphalting Conventional Solvent Supercritical Solvent	SDA	 CONV SCRT	Fresh feed	2.45	Separation of the lighter fraction of a vacuum or cracked residue by means of a solvent such as propane, butane or heavier.	Vacuum or cracked residue	Deasphalted oil (DAO), asphalt
Visbreaking	VBR		Fresh feed	1.40	Mild thermal cracking of residual feedstocks to produce some distillates and reduce the viscosity of the cracked residue. The different types represent different feedstocks and process configurations. May include a vacuum flasher (VFL).	Atmospheric or vacuum residue, asphalt	Full range of cracked distillates from light gases to heavy gasoil, cracked residue
Atmospheric Residuum (w/o a Soaker Drum)		VAR					
Atmospheric Residuum (with a Soaker Drum)		VARS					
Vacuum Bottoms Feed (w/o a Soaker Drum)		VBF					
Vacuum Bottoms Feed (with a Soaker Drum)		VBFS					
Thermal Cracking	TCR		Fresh feed	2.70	Thermal cracking of distillate feedstocks. May include a vacuum flasher (VFL). Units that combine visbreaking and distillate cracking generate a contribution for both processes based on the residue and the distillate throughput respectively.	Virgin vacuum or cracked gasoils	Full range of cracked distillates from light gases to heavy distillate
Coking	COK		Fresh feed		Severe thermal cracking of residual feedstocks producing coke as an intermediate or final process residue.	Vacuum residue, asphalt	Full range of cracked distillates from light gases to heavy gasoil, coke or low BTU gas
Delayed Coking		DC	Fresh feed	2.20	Semi-continuous process, similar in line-up to a VBR, where the heat of reaction is supplied by a fired heater. Coke is produced in alternate drums that are swapped at regular intervals. Coke is cut out of full coke drums and disposed of as a product. Facilities include coke handling and storage.		
Fluid Coking		FC	Fresh feed	7.60	Proprietary continuous process where the fluidised powder-like coke is transferred between the cracking reactor and the coke burning vessel and burned for process heat production. Surplus coke is drawn off and disposed of as a product.		
Flexicoking		FX	Fresh feed	16.60	Proprietary process incorporating a fluid coker and where the surplus coke is gasified to produce a so-called "low BTU gas" which is used to supply the refinery heaters.		

Process Unit	Solomon Process ID	Solomon Process Type	Activity basis	CWT factor	Description	Typical feed(s)	Typical product(s)
Coke calcining	CALCIN		Product	12.75	Process whereby so-called "green coke" from a DC is stripped of residual light hydrocarbons by heating in a kiln to produced calcined coke.	Green coke	Waste gases, calcined coke
Vertical-Axis Hearth		HRTH					
Horizontal-Axis Rotary Kiln		KILN					
Fluid Catalytic Cracking	FCC		Fresh feed	5.5	Cracking of vacuum gasoil and residual feedstocks over a catalyst. The finely divided catalyst is circulated in a fluidised state from the reactor where it becomes coated with coke to the regenerator where coke is burned off. The hot regenerated catalyst returning to the reactor supplies the heat for the endothermic cracking reaction and for most of the downstream fractionation of cracked products. Splitting of the gasoline product has been included in the FCC CWT factor.	Vacuum gasoils, atmospheric residues, deasphalted oils	Full range of cracked distillates from light gases to heavy cracked distillate. Coke is not a product as it is fully combusted within the process.
Fluid Catalytic Cracking		FCC					
Mild Residuum Catalytic Cracking		MRCC					
Residual Catalytic Cracking		RCC					
Other catalytic cracking			Fresh feed	4.1			
Houdry Catalytic Cracking		HCC			Early catalytic cracking processes on fixed catalyst beds.	Vacuum gasoils	
Thermofor Catalytic Cracking		TCC					
Distillate/gasoil Hydrocracking	HYC		Fresh feed	2.85			
Mild Hydrocracking		HMD			Cracking of vacuum gasoils and cracked heavy distillates over a fixed catalyst bed, at high pressure and in the presence of hydrogen. The process combines cracking and hydrogenation reactions. HMD and HSD represent different severities resulting in different levels of conversion and hydrogen consumption. Higher severity generally requires higher operating pressures. In order to qualify for the HMD (or HSD) status a plant needs to comply with both of the following criteria: • Total operating reactor pressure: ≥ 70 barg • Conversion (defined as the % of feed material boiling over 350°C that is upgraded to lighter products): ≥20% mass on feed	Vacuum gasoils and cracked heavy distillates, deasphalted oils, hydrogen	Full range of hydrocracked distillates from light gases to gasoil, hydrocracked bottoms
Severe Hydrocracking		HSD					
Naphtha Hydrocracking		HNP			Special hydrocracking process for converting naphtha into C3-C4 hydrocarbons.	Naphtha, hydrogen	Saturated C3-C4 hydrocarbons
Residual Hydrocracking				3.75	Hydrocracking of residual feedstocks. Different Proprietary processes involve continuous or semi-continuous catalyst replenishment. The HYC unit must be designed to process feed containing at least 50%mass of vacuum residue (defined as boiling over 550°C) for it to qualify as a Residue HC unit (H-Oil, LC-Fining or Hycon).	Atmospheric or vacuum residues, hydrogen	Full range of hydrocracked distillates from light gases to vacuum gasoil,
H-Oil		HOL					
LC-Fining™ and Hycon		LCF					

Process Unit	Solomon Process ID	Solomon Process Type	Activity basis	CWT factor	Description	Typical feed(s)	Typical product(s)
							unconverted residue
Naphtha/Gasoline Hydrotreating	NHYT		Fresh feed	1.10	A number of processes involving treating and upgrading of naphtha/gasoline and lighter streams.		Various gasoline blending components
Benzene Saturation		BSAT			Selective hydrogenation of benzene in gasoline streams over a fixed catalyst bed at moderate pressure.	Various gasoline streams, hydrogen	
Desulfurization of C4–C6 Feeds		C4C6			Desulphurisation of light naphthas over a fixed catalyst bed, at moderate pressure and in the presence of hydrogen.	Light naphtha, hydrogen	
Conventional Naphtha H/T		CONV			Desulphurisation of virgin and cracked naphthas over a fixed catalyst bed at moderate pressure and in the presence of hydrogen. For cracked naphthas also involves saturation of olefins.	Virgin and cracked naphthas/ gasolines, hydrogen	
Diolefin to Olefin Saturation		DIO			Selective saturation of diolefins over a fixed catalyst bed, at moderate pressure and in the presence of hydrogen, to improve stability of thermally cracked and coker gasolines.	Thermally cracked or coker gasolines	
Diolefin to Olefin Saturation of Alkylation Feed		DIO			Selective saturation of diolefins in C4 streams for alkylation over a fixed catalyst bed, at moderate pressure and in the presence of hydrogen.	Thermally cracked or coker LPG streams, hydrogen	
Naphtha/Gasoline Hydrotreating (continued)						FCC gasoline cuts, hydrogen	
FCC gasoline hydrotreating with minimum octane loss		GOCT			Selective desulphurisation of FCC gasoline cuts with minimum olefins saturation, over a fixed catalyst bed, at moderate pressure and in the presence of hydrogen.		
Olefinic Alkylation of Thio S		OATS			A gasoline desulphurisation process in which thiophenes and mercaptans are catalytically reacted with olefins to produce higher-boiling sulphur compounds removable by distillation. Does not involve hydrogen.	FCC gasoline cuts	
S-Zorb™ Process		ZORB			Desulphurisation of naphtha/gasoline streams using a proprietary fluid-bed hydrogenation adsorption process in the presence of hydrogen.	Various naphthas/ gasolines	
Selective H/T of Pygas/Naphtha Pygas/Naphtha Desulfurization Selective H/T of Pygas/Naphtha		PYGC PYGD PYGS			Selective or non-selective desulphurisation of pyrolysis gasoline (by-product of light olefins production) and other streams over a fixed catalyst bed, at moderate pressure and in the presence of hydrogen.	Pyrolysis gasoline, hydrogen	
Reactor for Selective Hydrotreating		*RXST*	n.c.	n.c.	*Special configuration where a distillation/fractionation column containing a solid catalyst that converts diolefins in FCC gasoline to olefins or when the catalyst bed is in a preheat train reactor vessel in front of the column. Contribution for this configuration is included in the generic NHYT CWT factor.*		

Process Unit	Solomon Process ID	Solomon Process Type	Activity basis	CWT factor	Description	Typical feed(s)	Typical product(s)
Kerosene/Diesel Hydrotreating			Fresh feed	0.90	A number of processes involving treating and upgrading of kerosene and gasoil streams.	Kerosene, hydrogen	Kerosene blending components
Kerosene Hydrotreating	KHYT						
Aromatic Saturation		ASAT			Saturation of aromatic rings over a fixed catalyst bed at low or medium pressure and in the presence of hydrogen. This process includes the desulphurisation step which should therefore not be accounted for separately.		
Conventional H/T		CONV/KUS			Desulphurisation of virgin kerosene over a fixed catalyst bed at low or medium pressure and in the presence of hydrogen.		
Solvent aromatics hydrogenation					Aromatics saturation of kerosene cuts over a fixed catalyst bed at low or medium pressure and in the presence of hydrogen for solvent manufacture.		
Diesel Hydrotreating	DHYT						
Aromatic Saturation		ASAT			Saturation of aromatic rings over a fixed catalyst bed at low or medium pressure and in the presence of hydrogen. This process includes the desulphurisation step which should therefore not be accounted for separately.	Virgin and cracked gasoils, hydrogen	Gasoil blending components, small quantities of naphtha and lighter products
Conventional Distillate H/T		CONV			Desulphurisation of virgin and cracked gasoils over a fixed catalyst bed in the presence of hydrogen. CONV, DHS and DUS correspond to different depths of desulphurisation.		
High Severity Distillate H/T		DHS					
Ultra-High Severity H/T		DUS					
Middle Distillate Dewaxing		MDDW			Cracking of long paraffinic chains in gasoils to improve cold flow properties over a fixed catalyst bed at low or medium pressure and in the presence of hydrogen. This process includes the desulphurisation step which should therefore not be accounted for separately.		
S-Zorb™ Process		ZORB			Desulphurisation of gasoil using a proprietary absorbtion process. Does not involve hydrogen.	Gasoils	
Selective Hydrotreating of Distillates		DIST			Hydrotreatment of distillates for conversion of diolefins to olefins	Cracked gasoils	
Residual Hydrotreating	RHYT		Fresh feed	1.55	Desulphurisation of residues over a fixed catalyst bed at high pressure and in the presence of hydrogen. Results in a limited degree of conversion of the residue feed into lighter products.	Atmospheric and vacuum residues, hydrogen	Desulphurised residue and relatively small quantities of lighter hydrocarbon liquids and fuel gas
Desulfurization of Atmospheric Resid		DAR					
Desulfurization of Vacuum Resid		DVR					
VGO Hydrotreating (or cracking feed Hydrotreating)	VHYT		Fresh feed	0.90	Desulphurisation of vacuum gasoils usually destined to be used as FCC feed, over a fixed catalyst bed at medium or high pressure and in the presence of hydrogen. Although these processes involve some conversion of the VGO feed to lighter products, they generally operate at lower pressure, consume less hydrogen, require less sophisticated fractionation equipment and therefore are much less energy intensive than hydrocrackers.	Vacuum gasoils	Desulphurised vacuum gasoils and relatively small quantities of lighter hydrocarbon liquids
Hydrodesulphurisation/denitrification		VHDN					
Hydrodesulphurisation		VHDS					

Process Unit	Solomon Process ID	Solomon Process Type	Activity basis	CWT factor	Description	Typical feed(s)	Typical product(s)
							and fuel gas
Hydrogen production	HYG		Product	300.00			Hydrogen, CO_2
Gas feeds					Hydrogen production from light hydrocarbons through either steam reforming or partial oxidation. Includes hydrogen purification.	C1 to C4 hydrocarbons	
Steam Methane Reforming		HSM					
Partial Oxidation Units of Light Feeds		POX					
Steam Naphtha Reforming		HSN			Hydrogen production by steam reforming of naphtha.	Naphtha	
Hydrogen Purification	*H2PURE*			***n.c.***	*Purification of hydrogen-rich streams for use in hydrogen consuming units. These processes are not associated with a hydrogen-producing unit. The contribution of these processes is included in the offsites CWT.*		
Cryogenic Unit		*CRYO*					
Membrane Separation Unit		*PRSM*					
Pressure Swing Absorption Unit		*PSA*					
Catalytic Reforming (inc. AROMAX)	REF		Fresh feed	4.95	Improvement of the octane rating of naphtha by dehydrogenation of naphthenic rings and paraffin isomerisation over a noble metal catalyst at low pressure and high temperature. The process also produces hydrogen. RCR, RCY and RSR represent different configurations of the process. CWT factor includes contribution for special fractionation linked with reforming (naphtha and reformate splitters, DIP etc) on an average EU-27 basis.	Desulphurised naphtha	Reformate for gasoline blending or aromatics production, hydrogen
Continuous Regeneration		RCR					
Cyclic		RCY					
Semi-Regenerative		RSR					
AROMAX	U60				Special application of catalytic reforming for the specific purpose of producing light aromatics		
Alkylation/Polymerisation/Dimersol			Product	7.25	A range of processes transforming C3/C4 molecules into C7/C8 molecules over an acidic catalyst. CWT factor includes contribution for special fractionation linked with such processes and acid regeneration where applicable on an average EU-27 basis.		C6 to C8 high octane gasoline blending components
Alkylation with HF Acid	ALKY	AHF				C3 and C4 olefins, isobutane	
Alkylation with Sulfuric Acid		ASA					
Polymerization C3 Olefin Feed	POLY	PC3				C3 olefins	
Polymerization C3/C4 Feed		PMIX				C3/C4 hydrocarbons	
Dimersol	DIM					C3 olefins	
Sulphuric Acid Regeneration	*ACID*				*Contribution included in ALKY/POLY*		
C4 Isomerisation	C4ISOM		Reactor feed inc. recycle	3.25	Conversion of normal butane into isobutane over a fixed catalyst bed and in the presence of hydrogen at low to moderate pressure. CWT factor includes contribution for special fractionation linked with C4 isomerisation on an average EU-27 basis.	n-butane, hydrogen	iso-butane

Process Unit	Solomon Process ID	Solomon Process Type	Activity basis	CWT factor	Description	Typical feed(s)	Typical product(s)
C5/C6 Isomerisation	C5ISOM		Reactor feed inc. recycle	2.85	Conversion of normal paraffins into isoparaffins over a fixed catalyst bed and in the presence of hydrogen at low to moderate pressure. CWT factor applies to both once-through and recycle units and includes contribution for mole sieve separation and special fractionation linked with C5/C6 isomerisation on an average EU-27 basis.	Light virgin naphtha, hydrogen	Isomerate for gasoline blending
Mol sieve separation	*U18*	*ISOSIV*	*n.c.*	*n.c.*	*Contribution included in C5ISOM*		
Oxygenate production			Product	5.60	Production of ethers by reacting an alcohol with olefins		
MBTE Distillation Units MTBE Extractive Units	MTBE	DIST EXT				Methanol, isobutene	Oxygenates for gasoline blending
ETBE	ETBE					Ethanol, isobutene	
TAME	TAME					Methanol, C5 olefins	
Isooctene Production	IOCT				Combination of two isobutene molecules. Although this process does not produce oxygenates, it is included under the same CWT factor as it can be produced in virtually the same unit with very similar associated emissions.	Isobutene	Isooctene
Propylene Production Chemical Grade Polymer grade	C3S	 CHEM POLY	Fresh feed	3.45	Separation of propylene from other mostly olefinic C3/C4 molecules generally produced in an FCC. "Chemical" and "polymer" are two grades with different purities.	C3/C4 FCC cut	Propylene
Asphalt & Bitumen Manufacture	ASP		Product	2.10	This CWT function represents the equipment and processing required to produce asphalts and bitumen, including bitumen oxidation (mostly for road paving). Asphalt later modified with polymers is included.	Vacuum and cracked residues	Asphalts and bitumen
Polymer-Modified Asphalt Blending	U77		Product	0.55	Additional asphalt processing step to produce special polymer-modified grades. This CWT function is in addition to the previous one.	Asphalt, polymers	Polymer modified asphalt
Sulphur Recovery	SRU		Product	18.60	Partial oxidation of hydrogen sulphide into elemental sulphur. This CWT function represents the main process (Claus) and the tail gas units for enhanced recovery. It also includes hydrogen sulphide separation from refinery sour gas process streams using amines and amine regeneration.	Refinery sour gas process streams	Sulphur
AROMATICS							
Aromatics Solvent Extraction ASE: Extraction Distillation ASE: Liquid/Liquid Extraction ASE: Liq/Liq w/ Extr. Distillation	ASE	 ED LLE LLED	Fresh feed	5.25	Extraction of light aromatics from reformate and/or hydrotreated pyrolysis gasoline by means of a solvent. The CWT factor for this refinery function includes all columns and associated equipment required to purify individual aromatic products as well as solvent regeneration.	Reformate, hydrotreated pyrolysis gasoline	Mixed aromatics or purified benzene, toluene, mixed xylenes, C9+ aromatics, paraffinic raffinate
Benzene Column *Toluene Column*		*BZC* *TOLC*	*n.c.* *n.c.*	*n.c.* *n.c.*			

Process Unit	Solomon Process ID	Solomon Process Type	Activity basis	CWT factor	Description	Typical feed(s)	Typical product(s)
Xylene Rerun Column *Heavy Aromatics Column*		*XYLC* *HVYARO*	*n.c.* *n.c.*	*n.c.* *n.c.*	*The contribution of all columns and associated equipment required to purify individual aromatics is included in ASE.*		
Hydrodealkylation	HDA		Fresh feed	2.45	Dealkylation of toluene and xylenes into benzene over a fixed catalyst bed and in the presence of hydrogen at low to moderate pressure.	Toluene, Xylenes, hydrogen	Benzene
Toluene Disproportionation / Dealkylation	TDP		Fresh feed	1.85	Fixed-bed catalytic process for the conversion of toluene to benzene and xylene in the presence of hydrogen		
Cyclohexane production	CYC6		Product	3.00	Hydrogenation of benzene to cyclohexane over a catalyst at high pressure.	Benzene, hydrogen	Cyclohexane
Xylene Isomerisation	XYISOM		Fresh feed	1.85	Isomerisation of mixed xylenes to paraxylene	Mixed xylenes	Paraxylene-rich mixed xylenes
Paraxylene Production Paraxylene Adsorption Paraxylene Crystallization	PXYL	 ADS CRY	Product	6.40	Physical separation of para-xylene from mixed xylenes.	Paraxylene-rich mixed xylenes	Paraxylene, other mixed xylenes
Xylene Splitter *Orthoxylene Rerun Column*		*XYLS* *OXYLRC*			*The contribution of these columns and associated equipment is included in PXYL.*		
Metaxylene production	U82		Product	11.10	Production of metaxylene from mixed xylenes	Mixed xylenes	Metaxylene
Phthalic anhydride production			Product	14.40	Production of phthalic anhydride from orthoxylene and naphthalene	Orthoxylene, naphthalene	Phthalic anhydride
Maleic anhydride production			Product	20.80	Production of maleic anhydride by oxidation of n-butane or benzene	n-butane, benzene, oxygen	Maleic anhydride
Ethylbenzene production	EBZ		Product	1.55	Combination of benzene and ethylene	Benzene, ethylene	Ethylbenzene
Ethylbenzene Distillation		*EBZD*			*The contribution of this column and associated equipment is included in EBZ.*		
Cumene production	CUM		Product	5.00	Alkylation of benzene with propylene	Benzene, propylene	Cumene
Phenol production			Product	1.15	Production of phenol from benzene and propylene		
LUBRICANTS AND WAXES							
Lube Solvent Extraction Solvent is Furfural Solvent is NMP Solvent is Phenol Solvent is SO2	SOLVEX	 FUR NMP PHE SDO	Fresh feed	2.10	Solvent extraction of aromatic compounds from intermediate streams in the manufacture of base luboils. Includes solvent regeneration. Different Proprietary processes use different solvents.	Various luboil intermediate streams	Dearomatised intermediate luboil streams, aromatic extract
Lube Solvent Dewaxing Solvent is Chlorocarbon Solvent is MEK/Toluene Solvent is MEK/MIBK Solvent is Propane	SDWAX	 CHL MEK MIB PRP	Fresh feed	4.55	Solvent removal of long paraffinic chains (wax) from intermediate streams in the manufacture of luboils. Includes solvent regeneration. Different Proprietary processes use different solvents.	Various luboil intermediate streams	Dewaxed intermediate luboil streams, wax
Catalytic Wax Isomerisation	CDWAX		Fresh feed	1.60		Various luboil	Dewaxed intermedia

Process Unit	Solomon Process ID	Solomon Process Type	Activity basis	CWT factor	Description	Typical feed(s)	Typical product(s)
Catalytic Wax Isomerization and Dewaxing Selective Wax Cracking		ISO SWC			Catalytic breakdown of long paraffinic chains in intermediate streams in the manufacture of luboils.	intermediate streams	te luboil streams
Lube Hydrocracker Lube Hydrocracker w/ Multi-Fraction Distillation Lube Hydrocracker w/ Vacuum Stripper Lube H/F w/ Vacuum Stripper Lube H/T w/ Multi-Fraction Distillation Lube H/T w/ Vacuum Stripper	LHYC LHYFT	HCM HCS HFS HTM HTS	Fresh feed	2.50	Hydrocracking of heavy feedstocks for the manufacture of luboils	Vacuum Gas Oils	Full range of hydrocracked products from light gases to gasoil, luboil intermediate streams
Wax Deoiling Solvent is Chlorocarbon Solvent is MEK/Toluene Solvent is MEK/MIBK Solvent is Propane	WDOIL	 CHL MEK MIB PRP	Product	12.00	Solvent removal of lighter hydrocarbons from wax obtained from lube dewaxing (SDWAX)	Raw wax	Deoiled wax, light oil
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	 LHYFT WHYFT	 HFS HTM HTS HFS HTM HTS	Fresh feed	1.15	Hydrotreating of luboil fractions and wax for quality improvement	Luboil intermediate streams, wax, hydrogen	Hydrotreated luboil fractions, wax
SOLVENTS							
Solvent Hydrotreating	U1		Fresh feed	1.25	Hydrotreating of various distillate cuts for solvent manufacture	Distillate cuts, hydrogen	Hydrotreated solvent cuts
Solvent Fractionation	SOLVF		Fresh feed	0.90	Fractionation of various distillate cuts for solvent manufacture	Distillate cuts	Solvent cuts
Mol sieve for C10+ n-paraffins	U88		Product	1.85	Separation of heavy paraffins from kerosene/light gasoil cuts for solvent manufacture	Kerosenes /light gasoils	Solvent cuts
RESID GASIFICATION							
POX Syngas for Fuel	U73		Syngas	8.20	Production of synthesis gas by gasification (partial oxidation) of heavy residues. Includes syngas clean-up.	Heavy residues, oxygen	Syngas, CO_2
POX Syngas for Hydrogen or Methanol	U72		Syngas	44.00	Production of hydrogen by gasification of heavy residues and conversion of syngas to hydrogen via the shift reaction. Includes syngas clean up and CO_2 separation.	Heavy residues, oxygen, steam	Hydrogen, CO_2. Also, CO if methanol synthesis occurs

Process Unit	Solomon Process ID	Solomon Process Type	Activity basis	CWT factor	Description	Typical feed(s)	Typical product(s)
							downstream.
Methanol	U70		Product	-36.20	Recombination of CO_2 and hydrogen for methanol synthesis. *This factor can only be applied in combination with U72 above.*	Hydrogen, CO, CO_2	Methanol
Air Separation	U79		Oxygen (MN m^3/a)	8.80	Separation of air into its components including oxygen. Usually cryogenic but factor applies to all processes.	Air	Oxygen, other air components
MISCELLANEOUS							
Fractionation of Purchased NGL			Purchased Fresh feed	1.00	Fractionation of NGL (light liquid hydrocarbons obtained as by-product of natural gas production) into usable fractions. Includes all columns for production of separate cuts**, but only to the extent that they are used to fractionate purchases of NGL**.	NGL	Various light fractions
De-ethaniser	*DETH*		*n.c.*	*n.c.*	*The CWT factor refers to fresh NGL feed, therefore no separate contribution from individual columns*		
De-propaniser	*DPRO*		*n.c.*	*n.c.*			
De-butaniser	*DBUT*		*n.c.*	*n.c.*			
Special Fractionation					*These fractionation columns are found in various locations in refineries. Their contribution has been included in the CWT factors of appropriate units or in the offsite factor on a statistical basis. They therefore do not give rise to additional CWT.*		
De-ethaniser							
De propaniser							
De lsobutaniser		*DIB*					
De butaniser							
De isopentaniser		*DIP*					
De pentaniser							
De isohexaniser							
De hexaniser							
De isoheptaniser							
De heptaniser							
Naphtha Splitter							
Conventional Splitter		*CONV*					
Splitter with single Heartcut		*HC1*					
Splitter with two Heartcuts		*HC2*					
Standard Column with Heartcut Draw		*HCD*					
Alkylate Splitter							
Conventional Splitter		*CONV*					
Special Fractionation (continued)							
Splitter with single Heartcut		*HC1*					
Splitter with two Heartcuts		*HC2*					
Standard Column with Heartcut Draw		*HCD*					
Reformate Splitter							

Process Unit	Solomon Process ID	Solomon Process Type	Activity basis	CWT factor	Description	Typical feed(s)	Typical product(s)
Conventional Splitter *Splitter with single Heartcut* *Splitter with two Heartcuts* *Standard Column with Heartcut Draw*		*CONV* *HC1* *HC2* *HCD*					
Flue gas treatment	U35/U89		MNm^3/a	0.10	Desulphurisation and clean-up of flue gases from refinery heaters and boilers. Includes all such processes.	Refinery flue gases	Cleaned flue gases
Treatment and Compression of Fuel Gas for Sales	U31		Compressor power consumption (kW)	0.15	Treatment and compression of refinery fuel gas for sale to third party.	Refinery fuel gas	Treated refinery fuel gas
Seawater Desalination	DESAL		Product (Water)	1.15	Desalination of sea water. Includes all such processes.	Sea water	Desalinated water

2. Coke

Benchmark name:	**Coke**
Benchmark number:	2
Unit:	Tonnes of dry coke The amount of dry coke is the amount at the discharge of the coke oven or gas-works plant.
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	No (CBAM factor to be used is 1)
Associated Annex I activity:	Production of coke
Special provisions:	PRODCOM 2010 not available, use PRODCOM 2004

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"Coke-oven coke (obtained from the carbonization of coking coal, at high temperature) or gas-works coke (by-product of gas-works plants) expressed as 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."

The table below shows relevant products according to definitions in PRODCOM 2004 statistics. PRODCOM codes can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on classifications in statistics.

Because no suitable PRODCOM 2010 codes exist for this benchmark, PRODCOM 2004 codes are used.

PRODCOM 2004 code	**Description**
23.10.10.30	Coke-oven coke (obtained from the carbonisation of coking coal, at high temperature), gas-works coke (by-product of gas-works plants)

Definition and explanation of processes and emissions covered

The FAR defines the system boundaries as follows:

"All processes directly or indirectly linked to the process units

- *coke ovens,*
- *H_2S/NH3 incineration,*
- *coal preheating (defreezing),*
- *coke gas extractor,*

- *desulphurization 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."

Emissions related to the production of the consumed electricity are excluded from the system boundaries.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer[18] or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get free allocation only in case a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In case of export to non-ETS consumers, the heat exporter receives free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

[18] In this case, the allocation would go to the consumer of the heat. See Guidance document 6 on Cross-boundary heat flows for more information.

3. Agglomerated iron ore

Benchmark name:	**Agglomerated iron ore**
Benchmark number:	3
Unit:	Tonnes of agglomerated ore
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	Yes (CBAM factor of the relevant year is to be used)
Associated Annex I activity:	Metal ore (including sulphide ore) roasting or sintering, including pelletisation
Special provisions:	-

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"Agglomerated iron-bearing product containing iron ore fines, fluxes and possibly 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 processes. Expressed in tonnes of agglomerated ore as leaving the agglomerated iron ore production plant. Agglomerated iron ore returned to the production process is not to be considered as part of the product."

The reference product is merchant agglomerated iron ore sent to reduction furnace as leaving the agglomerated iron ore production plant. Where a significant screening operation is carried out at the reduction furnace, this amount should be corrected to take account of the screening ratio after the bunkers.

The table below shows relevant products according to definitions in PRODCOM 2010 statistics. PRODCOM codes can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on PRODCOM codes reported in statistics.

According to the NACE methodology, companies are classified under the code of their main activity. For this reason, activities such as sintering, coking of coal, casting, etc. are registered under NACE 24.10 when carried out in a steel plant.

PRODCOM code	**Description**
07.10.10.00	Iron ores and concentrates (excluding roasted iron pyrites)

Definition and explanation of processes and emissions covered

The FAR defines the system boundaries as follows:

"All processes directly or indirectly linked to the production of agglomerated iron ore are included."

Emissions related to the production of the consumed electricity are excluded from the system boundaries.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen). *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

4. Hot metal

Benchmark name:	**Hot metal**
Benchmark number:	4
Unit:	Tonnes of hot metal *Liquid iron at the exit point of the blast furnace or sponge iron at the exit point of a direct reduced iron reactor (for the calculation of HAL)*
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	Yes (CBAM factor of the relevant year is to be used)
Associated Annex I activity:	Production of iron or steel (primary or secondary fusion) including continuous casting, with a capacity exceeding 2,5 tonnes per hour
Special provisions:	-

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"Iron produced from iron ores for primary steelmaking including

a) 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, excluding liquid iron produced from sponge iron under b),

b) sponge iron at the exit point of a direct reduced iron reactor, and expressed in tonnes of sponge iron at the exit point of the direct reduced iron reactor. 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."

The liquid iron is considered to be the product of blast furnaces and sponge iron the product of direct reduced iron reactors. Within the given system boundaries, the benchmark also indirectly covers steel produced by the blast furnace route.

Similar products such as ferroalloys are not covered by this product benchmark.

This product benchmark refers to the hot metal in primary steel production rather than its end products. As such, there are no applicable PRODCOM codes for the benchmarked product. The broader PRODCOM codes for the steel sector do not differentiate between primary (hot metal benchmark) and secondary steel (for EAF carbon - refer to section 5, and for EAF high alloy steel - refer to section 6).

Definition and explanation of processes and emissions covered

The FAR defines the system boundaries as follows:

"All processes directly or indirectly linked to the process units

- *Blast furnace,*
- *Hot metal treatment units,*
- *Blast furnace blowers,*
- *Blast furnace hot stoves,*
- *Direct reduced iron reactor,*
- *Electric arc furnace and electric smelting furnace for sponge iron,*
- *Basic oxygen furnace,*
- *Secondary metallurgy units,*
- *Vacuum ladles,*
- *Casting units (including cutting),*
- *Slag treatment unit,*
- *Burden preparation,*
- *BF* [Blast furnace] *and other gas treatment units,*
- *Dedusting units,*
- *Scrap pre-heating,*
- *Coal drying for PCI* [pulverized coal injection]*,*
- *Vessels preheating stands,*
- *Casting ingots preheating stands,*
- *Compressed air production,*
- *Dust treatment unit (briquetting),*
- *Sludge treatment unit (briquetting),*
- *Steam injection in BF* [blast furnace] *unit,*
- *Steam generation plant,*
- *Converter BOF* [basic oxygen furnace] *gas cooling and*
- *Miscellaneous*

are included."

Emissions related to the production of the consumed electricity are excluded from the system boundaries.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the

ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

5. EAF carbon steel

Benchmark name:	**EAF carbon steel**
Benchmark number:	5
Unit:	Tonnes of crude secondary steel ex-caster
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	Yes (CBAM factor of the relevant year is to be used)
Associated Annex I activity:	Production of iron or steel (primary or secondary fusion) including continuous casting, with a capacity exceeding 2,5 tonnes per hour
Special provisions:	-

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"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 in tonnes of crude secondary steel ex-caster.

Steel produced from sponge iron already covered under the hot metal benchmark is not covered by this benchmark."

The relatively low surface quality and processability is due to alloy elements that have been carried over from the scrap input, and which cannot be simply separated from the steel. Hence, EAF carbon steels are used for products that have a relatively low sensitivity to the material quality, e.g., concrete reinforcing bars.

The terms "high surface quality" and "processability" are further defined in section 6.

Only to the extent that none of the criteria for the content of the metal alloying elements and the steel quality for high alloy steel are met, should the EAF carbon steel benchmark should be applied.

The table below shows a non-exhaustive list of relevant products associated with EAF carbon steel products according to definitions in PRODCOM 2010 statistics. The PRODCOM products listed in the table below list refer to final products, however not to the product after casting, which is further transformed in the downstream process steps. This benchmark covers the cast steel and not the final products defined by the PRODCOM codes.

PRODCOM codes can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on PRODCOM codes reported in statistics. Furthermore, the PRODCOM codes for the steel sector do not distinguish between primary (hot metal benchmark, see section 4) and secondary steel (EAF carbon and EAF high alloy steel) and does not allow any differentiation between carbon and high alloy steel.

PRODCOM code	Description
24.10.21.10	Flat semi-finished products (of non-alloy steel)
24.10.21.21	Ingots, other primary forms and long semi-finished products for seamless tubes (of non-alloy steel)
24.10.21.22	Other ingots, primary forms and long semi-finished products including blanks (of non-alloy steel)

Definition and explanation of processes and emissions covered

In FAR Annex I, point 2, referring to the ”definition of product benchmarks and system boundaries with collection of data on electricity consumption”, the rules define the system boundaries of the EAF carbon steel product benchmark as follows:

“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 casting are not included.

For the purpose of data collection, the total electricity consumption within the system boundaries shall be considered.”

Processes downstream of casting include rolling and reheating for hot rolling.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

In order to avoid double counting of any sponge iron – which received free allocation under the hot metal benchmark – fed into the EAF, the amount of steel produced [t] should be reduced by an amount based on the proportion of iron arising from the sponge iron input as a share of the total iron input.

Example: Secondary steel is produced by an EAF. Sponge iron that already received free allocation under the hot metal benchmark accounts for 10% of the iron input in the EAF, and the remaining iron input comes from sources like iron scrap. The crude secondary steel ex-caster has a total iron content of 25 000 tonnes, which in this example should be lowered by 10%. This means 2 500 tonnes should be subtracted from the activity level reported for the EAF steel.

6. EAF high alloy steel

Benchmark name:	**EAF high alloy steel**
Benchmark number:	6
Unit:	Tonnes of crude secondary steel ex-caster
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	Yes (CBAM factor of the relevant year is to be used)
Associated Annex I activity:	Production of iron or steel (primary or secondary fusion) including continuous casting, with a capacity exceeding 2,5 tonnes per hour
Special provisions:	-

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"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.

Steel produced from sponge iron already covered under the hot metal benchmark is not covered by this benchmark."

According to this definition, all EAF steels with at least 8 mass-% of metallic alloying elements should be considered as "EAF high alloy steel". High alloy steel production needs ferro-alloys (ferro-chrome, ferro-nickel and others) as input in order to introduce the alloy elements to the product. They are introduced to improve the steel characteristics with respect to certain uses, e.g., added strength and wear resistance for tools and jet engines, weather resistance for bridges and containers, or their ferromagnetic properties for electric motors and transformers.

Furthermore, high quality steel for applications with high requirements on 'high surface quality' (to guarantee the absence of defects) and 'processability' (for downstream processes) are covered by this product benchmark. In this context, EAF steel should be regarded as high quality steel if at least one of the following criteria is met:

- hydrogen content max 0,0003%
- sulphur content max 0,003%
- phosphorus content max 0,01%
- micro cleanliness:
    - K3 (Oxide) < 40; K4 < 50 according to DIN 50602 (or any equivalent international standard)
    - sulfide: Athin 2,0; Aheavy 1,5 according to ISO 4967
    - oxide: Bthin 1,5; Bheavy 0,5 according to ISO 4967

- ASTME 45: procedure B, C, D max. 2
- SEP 1920: ultrasonic examination: core examination - KSR max. 2 mm

- macro cleanliness: blue shortness: max. 2,5 mm / dm^2

The alloy content criterion or the five criteria listed above must be applied to steel casts separately. Only amounts matching at least one of these criteria should be regarded as "high alloy steel" and aggregated on an annual basis for all years of the relevant baseline period. If this application of the criteria is not possible at cast level (smallest unit of production), it should be assessed at a higher level of aggregation, i.e., at the steel grade level (in this case average annual values could be considered for each grade separately).

Alternatively, steel could be regarded as of high surface quality and processability if for more than 10% of the production output one of the following technological non-destructive tests is required:

- Infrasound inspection following either ASTM E213 or EN 10246-6,7,14
- Magnetic Particles inspection following either ASTM E709 or EN 10246-12
- Dye Penetrant inspection following ASTM E165
- Electromagnetic Inspection
    a. Eddy Currents. ASTM E309
    b. Flux leakage. ASTM E570

To the extent that none of the criteria for the content of the metal alloying elements and the steel quality are met, the EAF carbon steel benchmark (see section 5) should be applied.

The table below shows a non-exhausting list of relevant products associated with EAF high alloy steel products according to definitions in PRODCOM 2010 statistics. The PRODCOM products listed in the table below list refer to final products, however not to the product after casting, which is further transformed in the downstream process steps. This benchmark covers the cast steel and not the final products defined by the PRODCOM codes.

PRODCOM codes can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on PRODCOM codes reported in statistics. Furthermore, the PRODCOM codes for the steel sector do not distinguish between primary (hot metal benchmark, see section 4) and secondary steel (EAF carbon and EAF high alloy steel) and does not allow to differentiate between carbon and high alloy steel.

PRODCOM code	**Description**
24.10.22.10	Flat semi-finished products (slabs) (of stainless steel)
24.10.22.21	Ingots, other primary forms and long semi-finished products for seamless tubes (of stainless steel)
24.10.22.22	Other ingots, primary forms and long semi-finished products including blanks (of stainless steel)
24.10.23.10	Flat semi-finished products (of alloy steel other than of stainless steel)

PRODCOM code	Description
24.10.23.21	Ingots, other primary forms and long semi-finished products for seamless tubes (of alloy steel other than of stainless steel)
24.10.23.22	Other ingots, primary forms and long semi-finished products including blanks (of alloy steel other than of stainless steel)

Definition and explanation of processes and emissions covered

In FAR Annex I, point 2, referring to the 'definition of product benchmarks and system boundaries with collection of data on electricity consumption', the rules define the system boundaries of the EAF high alloy steel product benchmark as follows:

"All processes directly or indirectly linked to the following 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*
- *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 purpose of data collection, the total electricity consumption within the system boundaries shall be considered."

Processes downstream of casting (outside the boundaries of this benchmark), include rolling and reheating for hot rolling.

For crude steel produced via the EAF route, direct CO_2 emissions result from fuel and carbon from electrodes and scrap that is oxidised in the electric arc furnace. As regards the production of high alloy steels, CO_2 emissions stem from ferro-alloys rather than from scrap. (Scrap grades usually fed in the EAF for this type of production have low carbon contents.)

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the

ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

In order to avoid double counting of any sponge iron – which received free allocation under the hot metal benchmark – fed into the EAF, the amount of steel produced [t] should be reduced by an amount based on the proportion of iron arising from the sponge iron input as a share of the total iron input.

Example: Secondary steel is produced by an EAF. Sponge iron that already received free allocation under the hot metal benchmark accounts for 10% of the iron input in the EAF, and the remaining iron input comes from sources like iron scrap. The crude secondary steel ex-caster has a total iron content of 25 000 tonnes, which in this example should be lowered by 10%. This means 2 500 tonnes should be subtracted from the activity level reported for the EAF steel.

7. Iron casting

Benchmark name:	**Iron casting**
Benchmark number:	7
Unit:	Tonnes of liquid iron
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	Based on the CN code of the products, some products fall under CBAM (in which case the CBAM factor of the relevant year is to be used), others not (in which case the CBAM factor to be used is 1). Therefore 2 sub-installations are possible: - "Iron casting, non-CBAM" - "Iron casting, CBAM"
Associated Annex I activity:	Production or processing of ferrous metals (including ferro-alloys) where combustion units with a total rated thermal input exceeding 20 MW are operated. Processing includes, inter alia, rolling mills, re-heaters, annealing furnaces, smitheries, foundries, coating and pickling
Special provisions:	-

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"Casted iron expressed as tonnes of liquid iron ready alloyed, skinned, and ready for casting."

This product benchmark refers to the intermediate product liquid iron and not to the final products of the casting process which are included in the NACE groups 24.51 and 24.52. Therefore, no PRODCOM codes are available for the benchmarked product.

However, the PRODCOM 2010 codes listed in the table below might help to identify processes using the benchmarked intermediate product.

PRODCOM code	**Description**
24.51.20.00	Tubes, pipes and hollow profiles of cast iron excluding tubes, pipes, hollow profiles made into identifiable parts of articles, such as sections of central heating radiators and machinery parts
24.51.30.30	Tube or pipe fittings, of non-malleable cast iron
24.51.30.50	Tube or pipe fittings of malleable cast iron
24.52.30.00	Tube or pipe fittings of cast steel
24.51.11.10	Malleable iron castings for land vehicles, piston engines and other machinery and mechanical appliances

PRODCOM code	Description
24.51.11.90	Parts for other utilisation (malleable iron casting)
24.51.12.10	Parts of land vehicles (nodular iron castings)
24.51.12.20	Ductile iron castings for transmission shafts, crankshafts, camshafts, cranks, bearing housings and plain shaft bearings (excluding for bearing housings incorporating ball or roller bearings)
24.51.12.40	Other parts of piston engines and mechanical engineering (nodular iron castings)
24.51.12.50	Ductile iron castings for machinery and mechanical appliances excluding for piston engines
24.51.12.90	Ductile iron castings for locomotives/rolling stock/parts, use other than in land vehicles, bearing housings, plain shaft bearings, piston engines, gearing, pulleys, clutches, machinery
24.51.13.10	Grey iron castings for land vehicles (excluding for locomotives or rolling stock, construction industry vehicles)
24.51.13.20	Grey iron castings for transmission shafts, crankshafts, camshafts, cranks, bearing housings and plain shaft bearings (excluding bearing housings incorporating ball or roller bearings)
24.51.13.40	Other parts of piston engines and mechanical engineering (cast iron: not ductile)
24.51.13.50	Grey iron castings for machinery and mechanical appliances excluding for piston engines
24.51.13.90	Grey iron castings for locomotives/rolling stock/parts, use other than in land vehicles, bearing housings, plain shaft bearings, piston engines, gearing, pulleys, clutches, machinery

Definition and explanation of processes and emissions covered

In FAR Annex I, point 2, referring to the 'definition of product benchmarks and system boundaries with collection of data on electricity consumption', the rules define the system boundaries of the iron casting product benchmark as follows:

"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 painting which are not covered by the system boundaries of this product benchmark.

For the purpose of data collection, only the electricity consumption of melting processes within the system boundaries shall be considered.”

The emissions related to ”melting electricity” are not eligible for free allocation.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

8. Pre-bake anode

Benchmark name:	**Pre-bake anode**
Benchmark number:	8
Unit:	Tonnes of pre-bake anode
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	No (CBAM factor to be used is 1)
Associated Annex I activity:	Production of primary aluminium or alumina
Special provisions:	-

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"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 1150°C. Söderberg anodes are not covered by this product benchmark"

The production of Söderberg anodes should be covered by fall-back approaches.

This product benchmark refers to an intermediate product rather than its end products. As such, there are no applicable PRODCOM codes for the benchmarked product.

Definition and explanation of processes and emissions covered

The FAR defines the system boundaries as follows:

"All processes directly or indirectly linked to the production of pre-bake anodes are included."

Emissions related to the production of the consumed electricity are excluded from the system boundaries.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

9. Aluminium

Benchmark name:	**Aluminium**
Benchmark number:	9
Unit:	Tonnes of unwrought non-alloy liquid aluminium Reference point for the measurement of the amount unwrought non-alloy liquid aluminium is between the electrolysis section and the holding furnace of the cast house before alloys and secondary aluminium are added.
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	Yes (CBAM factor of the relevant year is to be used)
Associated Annex I activity:	Production of primary aluminium or alumina
Special provisions:	-

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"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"

The table below shows relevant products according to definitions in PRODCOM 2010 statistics. PRODCOM codes can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on PRODCOM codes reported in statistics.

PRODCOM code	**Description**
24.42.11.30	Unwrought non-alloy aluminium (excluding powders and flakes)

Definition and explanation of processes and emissions covered

The FAR defines the system boundaries as follows:

"All processes directly or indirectly linked to the production step electrolysis are included. Emissions resulting from holding furnaces and casting, and emissions related anode productions are excluded."

These include in particular:

- CO_2 emissions resulting from the reaction between the carbon anode oxygen from the alumina
- CO_2 emissions resulting from the reaction of the carbon anode with other sources of oxygen, primarily from air
- All formed carbon monoxide is assumed to be converted to CO_2.

- Two PFCs, CF_4 and C_2F_6 emissions formed during brief upset conditions known as the “Anode Effect”, when aluminia levels drop to low and the electrolytic bath itself undergoes electrolysis.

Emissions related to the production and the consumption of electricity are excluded from the system boundaries, irrespective of where and how this electricity is produced.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

10. Grey cement clinker

Benchmark name:	**Grey cement clinker**
Benchmark number:	10
Unit:	Tonnes of grey cement clinker or tonnes of alternative hydraulic binder
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	Yes (CBAM factor of the relevant year is to be used)
Associated Annex I activity:	For the grey cement clinker: Production of cement clinker in rotary kilns with a production capacity exceeding 500 tonnes per day or in other furnaces with a production capacity exceeding 50 tonnes per day For the alternative hydraulic binder: Combustion of fuels in installations with a total rated thermal input exceeding 20 MW (except in installations for the incineration of hazardous or municipal waste)
Special provisions:	-

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"Grey cement clinker or alternative hydraulic binders for the production of cement, as total amount of hydraulic binder produced.

Products produced within the system boundaries of other product benchmarks or as by-products or waste of other production processes are not covered by this benchmark, including fly ash, blast-furnace slag, steel slag, silica fume, paper sludge."

Hydraulic binders are materials that harden with the addition of water. Through hydraulic bonding water is chemically bound into the mineral structure of the binder. Though the group of hydraulic binders is a broad one, they need to fulfil three criteria for allocation under the grey cement clinker benchmark:

- They need to meet product specifications suitable for use in cement production.
- They cannot be covered by another product benchmark within the ETS. An example for this would be lime, which is a hydraulic binder but emissions and allocation are already covered by the Lime or Dolime benchmark. To avoid double counting such products cannot be covered here even if they are used to produce cement.
- They cannot be by-products or waste from other production processes. This excludes for example paper sludge, blast-furnace slag or silica fume. As these are by-products of other processes and not the primary purpose of the process, they cannot be considered here.

Examples of alternative hydraulic binders under this benchmark are calcined clays, calcium aluminate cement binders, calcium sulfoaluminate cement binders, and alkali-activated cement binders.

The table below shows the relevant product according to the definition in PRODCOM 2010 statistics. PRODCOM codes can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on PRODCOM codes reported in statistics.

Note that this PRODCOM code also applies to the White cement clinker benchmark (see section 11). Cement clinker is main ingredient of some products under PRODCOM code 23.51.12.00 (Portland cement, aluminous cement, slag cement and similar hydraulic cements). While this code can be helpful in identifying cement clinker producing plants, it should be noted that only some of the PRODCOM 23.51.12.00 products fall under the cement clinker benchmarks.

PRODCOM code	Description
23.51.11.00	Cement clinker

Definition and explanation of processes and emissions covered

The FAR defines the system boundaries as follows:

"All processes directly or indirectly linked to the production of grey cement clinker or alternative hydraulic binders are included."

The emissions related to the production of grey cement clinker or alternative hydraulic binders include emissions from the calcination process and fuel-related emissions to provide thermal energy for the production process (including heat losses).

Any material that meets the specifications of cement clinker should be taken into account for the determination of the activity level. Therefore, any by-pass dust that meets those criteria and is or can be processed further into cement shall be taken into account. Any by-pass dust that does not meet those criteria and is, e.g., considered waste and disposed of should not be taken into account for the activity level.

However, all associated emissions have to be attributed to the clinker sub-installation because the by-pass dust constitutes a process directly or indirectly linked to the clinker production, regardless of its latter use.

Emissions related to the production of the consumed electricity are excluded from the system boundaries.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

11. White cement clinker

Benchmark name:	**White cement clinker**
Benchmark number:	11
Unit:	Tonnes of white cement clinker (as 100% clinker) or tonnes of alternative hydraulic binder
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	Yes (CBAM factor of the relevant year is to be used)
Associated Annex I activity:	For the white cement clinker: Production of cement clinker in rotary kilns with a production capacity exceeding 500 tonnes per day or in other furnaces with a production capacity exceeding 50 tonnes per day For the alternative hydraulic binder: Combustion of fuels in installations with a total rated thermal input exceeding 20 MW (except in installations for the incineration of hazardous or municipal waste)
Special provisions:	-

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"White cement clinker or alternative hydraulic binders 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 hydraulic binders (as 100% clinker/alternative hydraulic binders).

Products produced within the system boundaries of other product benchmarks or as by-product or waste of other production processes are not covered by this benchmark, including fly ash, blast-furnace slag, steel slag, silica fume, paper sludge."

In other words, cement clinker or alternative hydraulic binder need to fulfil all of the following quantitative criteria regarding the content of certain substances:

1. content Fe_2O_3 of equal or lower than 0.4 mass-%
2. content Cr_2O_3 of equal or lower than 0.003 mass-%
3. content Mn_2O_3 of equal or lower than 0.03 mass-%

The three criteria are to be applied to individual batches (smallest unit of production) of binder. Only amounts matching all these criteria can be regarded as "white cement clinker or alternative hydraulic binder" and should be aggregated on an annual basis for all years of the relevant baseline period. If the application of the criteria is not possible at batch level, the assessment should be carried out at a higher level of aggregation, but at least for the total annual production.

Alternatively, the three quantitative criteria for the composition should be regarded are met if the clinker or alternative hydraulic binder has a reflection (R_y) of at least 87% measured according to ISO 7724 (DIN 5033) using a $BaSO_4$ standard.

Furthermore, the definition of the white cement clinker benchmark refers to use as the main binding component for certain products. As the above list of application is comprehensive but not exhaustive and no quantitative thresholds are given, compliance with this criterion should simply be confirmed by the operator in the monitoring methodology plan associated with the baseline data collection template.

Where the criteria for the composition and applications are not met, the grey cement clinker benchmark should be applied.

Hydraulic binders are materials that harden with the addition of water. Through hydraulic bonding water is chemically bound into the mineral structure of the binder. Though the group of hydraulic binders is a broad one, they need to fulfil three criteria for allocation under the white cement clinker benchmark:

- They need to meet product specifications suitable for use in cement production.
- They cannot be covered by another product benchmark within the ETS. An example for this would be lime, which is a hydraulic binder but emissions and allocation are already covered by the Lime or Dolime benchmark. To avoid double counting such products cannot be covered here even if they are used to produce cement.
- They cannot be by-products or waste from other production processes. This excludes for example paper sludge, blast-furnace slag or silica fume. As these are by-products of other processes and not the primary purpose of the process, these cannot be considered here.

Examples of alternative hydraulic binders under this benchmark are calcined clays, calcium aluminate cement binders, calcium sulfoaluminate cement binders, and alkali-activated cement binders.

The table below shows relevant product according to definitions in PRODCOM 2010 statistics. These classifications can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on classifications in statistics.

Note that this PRODCOM code also applies to the Grey cement clinker benchmark (see section 10). Cement clinker is main ingredient of some products under PRODCOM code 23.51.12.00 (Portland cement, aluminous cement, slag cement and similar hydraulic cements). While this code can be helpful in identifying cement clinker producing plants, it should be noted that only some of the PRODCOM 23.51.12.00 products fall under the cement clinker benchmarks.

PRODCOM code	**Description**
23.51.11.00	Cement clinker

Definition and explanation of processes and emissions covered

The FAR defines the system boundaries as follows:

"All processes directly or indirectly linked to the production of white cement clinker or alternative hydraulic binders are included."

Any material that meets the specifications of cement clinker or alternative hydraulic binder should be taken into account for the determination of the activity level. Therefore, any by-pass dust that meets those criteria and is or can be processed further into cement shall be taken into account. Any by-pass dust that does not meet those criteria and is, e.g., considered waste and disposed of should not be taken into account for the activity level.

However, all associated emissions have to be attributed to the clinker sub-installation because the by-pass dust constitutes a process directly or indirectly linked to the clinker production, regardless of its latter use.

Emissions related to the production of the consumed electricity are excluded from the system boundaries.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen). *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

12. Lime

Benchmark name:	**Lime**
Benchmark number:	12
Unit:	Tonnes of standard pure lime The reference product standard pure lime is defined as lime with a free CaO content of 94.5%
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	No (CBAM factor to be used is 1)
Associated Annex I activity:	Production of lime or calcination of dolomite or magnesite in rotary kilns or in other furnaces with a production capacity exceeding 50 tonnes per day
Special provisions:	Provisions in Annex III of the revised FAR

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"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 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."

This product benchmark only covers quicklime which is sold on the market or used for purposes other than purification processes. Therefore, the production of lime for purification processes (e.g., in the sugar[19] sector) is not covered by this product benchmark.

The table below shows relevant products according to the definitions in PRODCOM 2010 statistics. PRODCOM codes can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on PRODCOM codes reported in statistics.

PRODCOM code	**Description**
23.52.10.33	Quicklime (or lime): Calcium oxide (CaO) produced by decarbonising limestone ($CaCO_3$)

[19] Note: following the revised definition of 'emissions' in Article 3(b) of the EU ETS Directive and the ensuing change of the system boundaries in section 10 of Annex IV of the Monitoring & Reporting Regulation, the amount of CO_2 stemming from limestone decomposition and bound during purification processes (e.g. in the sugar industry), can no longer be reported as zero but has to be reported as corresponding emissions as of 2026 (based on the monitoring in 2025). These emissions will be eligible under a process emissions sub-installation via the reporting of annual activity levels (= new process emissions sub-installation if such did not exist before).

Definition and explanation of processes and emissions covered
The FAR defines the system boundaries as follows:

"All processes directly or indirectly linked to the production of lime are included."

Emissions related to the production of the consumed electricity are excluded from the system boundaries.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

Figure 1 gives a graphical representation of the system boundaries.

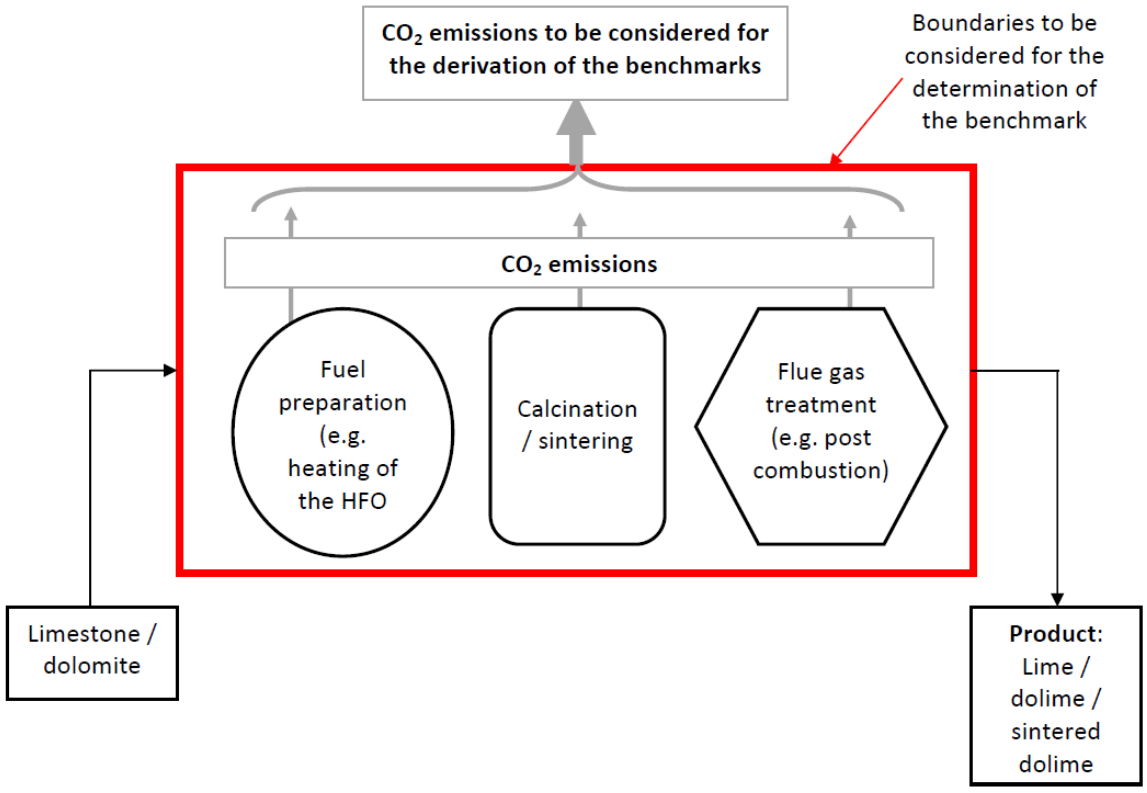

Figure 1. System boundaries (Sector Rule book for the development of CO_2 benchmarks for the European lime sector, 2010)

Determination of the historical activity level

Given the wide range of product qualities that can be achieved, the product benchmark for lime refers to a standard composition concerning calcium oxide and magnesium oxide. The historical activity level to be used in the determination of free allocation therefore needs to be corrected for the calcium oxide and magnesium oxide content of the produced lime:

$$HAL_{Lime,standard} = Median\left(\frac{785 \times m_{CaO,k} + 1092 \times m_{MgO,k}}{751.7} \times HAL_{lime,uncorrected,k}\right)$$

Where:

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

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

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

$HAL_{lime,uncorrected,k}$: Uncorrected historical activity level for lime production in year k expressed in tonnes of lime.

If possible, composition data should be based on applicable European standards such as EN 459-2, EN 12485 and EN ISO12677.

According to Annex VII of the FAR a data source of highest accuracy is the data in accordance with the monitoring plan approved under Regulation (EU) 2018/2066 (Monitoring & Reporting Regulation). Thus, if composition data is known for the Annual Emissions Report, this data should be used to determine the content of free CaO and MgO. However, even if emissions reporting (Monitoring & Reporting Regulation, Annex IV, section 10) is done via monitoring method A (input-based, e.g. limestone), the reported CO_2 emissions, including the known Ca and Mg content based on which those are determined, together with the amounts of product produced ('uncorrected' lime or dolime), lead to a distinct amount of free CaO/MgO in the lime/dolime.

In the case where method A is used and the free CaO and MgO contents are not measured so the ratio between free CaO and MgO is therefore not known: because higher free CaO / lower free MgO equal the same CO_2 emissions and vice versa the ratio between free CaO and free MgO can be estimated freely (estimates should however be based on actual Ca and Mg contents) as long as they stoichiometrically lead to the same amount of emitted CO_2. This can be ensured so long as the following equation is satisfied:

$$uncorrected\,(do)lime\,production\,[t] \cdot (0.785 \cdot free\,CaO\,[\%] + 1.092 \cdot free\,MgO\,[\%])$$

$$=$$

$$process\,emissions\,(t\,CO2)\,as\,per\,annual\,emissions\,report$$

Note: the provisions set out in Article 12(3b) of the Directive and the revision of the MRR will be taken into account when determining the lime benchmark value for 2026-2030 in order to ensure consistency between the monitoring rules and free allocation.

13. Dolime

Benchmark name:	**Dolime**
Benchmark number:	13
Unit:	Tonnes of standard pure dolime. Standard pure dolime, has a free CaO content of 57.4% and a free MgO content of 38.0%
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	No (CBAM factor to be used is 1)
Associated Annex I activity:	Production of lime or calcination of dolomite or magnesite in rotary kilns or in other furnaces with a production capacity exceeding 50 tonnes per day
Special provisions:	Provisions in Annex III of the FAR

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"Dolime or calcined dolomite as mixture of calcium and magnesium oxides produced by the decarbonation of dolomite ($CaCO_3.MgCO_3$) 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/cm³.*

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%."

The table below shows relevant 2010 PRODCOM code. PRODCOM codes can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on PRODCOM codes reported in statistics.

The definition covers the benchmarked product dolime, but also the products ultra-low carbon dolime and sintered dolime (see section 14) which have different characteristics and are not covered by this product benchmark.

PRODCOM code	**Description**
23.52.30.30	Calcined and sintered dolomite, crude, roughly trimmed or merely cut into rectangular or square blocks or slabs

Definition and explanation of processes and emissions covered

The FAR defines the system boundaries as follows:

"All processes directly or indirectly linked to the production of dolime are included, in particular:

- *Fuel preparation*
- *Calcination/sintering and*
- *Flue gas treatment."*

Emissions related to the production of the consumed electricity are excluded from the system boundaries.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

Figure 2 gives a graphical representation of the system boundaries

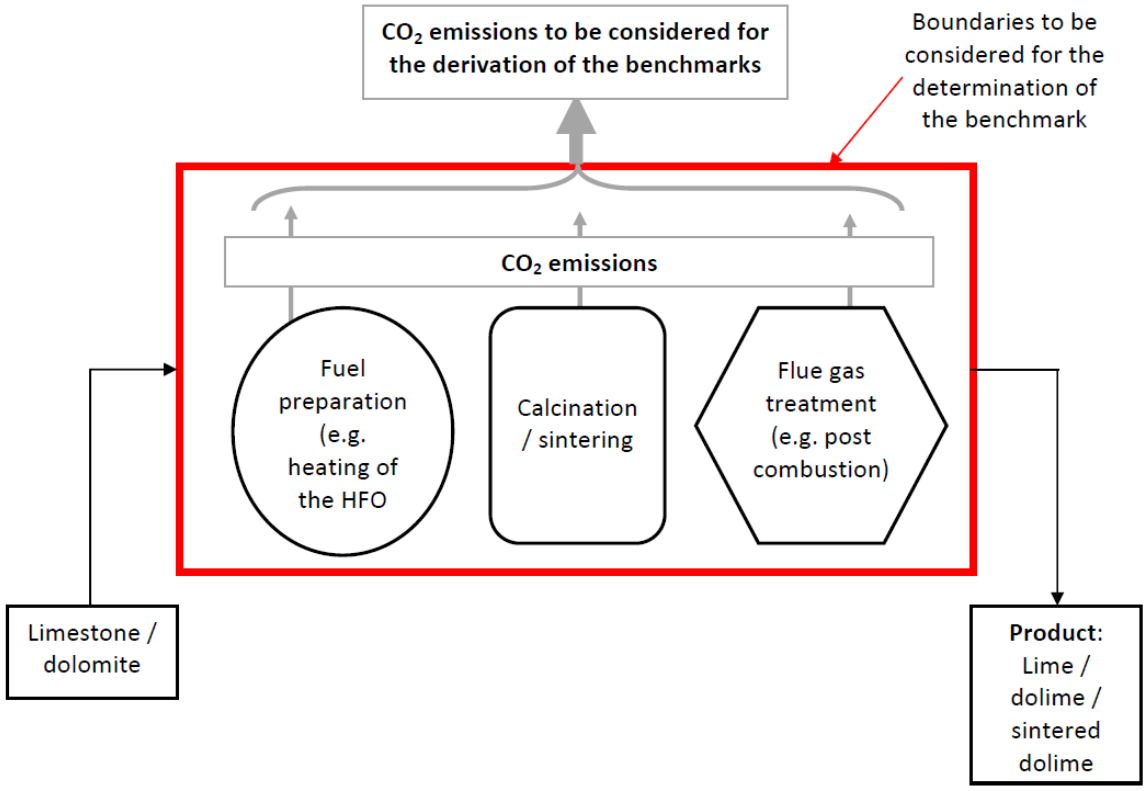

Figure 2. System boundaries (Sector Rule book for the development of CO_2 benchmarks for the European lime sector, 2010)

Determination of the historical activity level

Given the wide range of product qualities that can be achieved, the product benchmark for dolime refers to a standard composition concerning calcium oxide and magnesium oxide. The historical

activity level to be used in the determination of free allocation therefore needs to be corrected for the calcium oxide and magnesium oxide content of the produced dolime:

$$HAL_{dolime,standard} = Median\left(\frac{785 \times m_{CaO,k} + 1092 \times m_{MgO,k}}{865.6} \times HAL_{dolime,uncorrected,k}\right)$$

Where:

$HAL_{dolime,standard}$: 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 in mass-%.

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

$HAL_{dolime,uncorrected,k}$: uncorrected historical activity level for dolime production in year k expressed in tonnes of dolime.

If possible, composition data should be based on applicable European standards such as EN 459-2, EN 12485 and EN ISO12677.

For the determination of the free CaO and MgO contents, the same provisions as discussed at the end of the previous section 12 (lime) apply.

14. Sintered dolime

Benchmark name:	**Sintered dolime**
Benchmark number:	14
Unit:	Tonnes of sintered dolime (as saleable product)
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	No (CBAM factor to be used is 1)
Associated Annex I activity:	Production of lime or calcination of dolomite or magnesite in rotary kilns or in other furnaces with a production capacity exceeding 50 tonnes per day
Special provisions:	-

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"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/cm³. Expressed in tonnes of saleable sintered dolime."

This weight density threshold is used to distinguish Sintered dolime from Dolime. For sintered dolime no correction for the CaO and MgO contents is needed.

The table below shows the relevant PRODCOM 2010 code. PRODCOM codes can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on PRODCOM codes reported in statistics.

The definition covers the benchmarked product sintered dolime, but also the products ultra-low carbon dolime and ordinary dolime (see section 13) which have different characteristics and are not covered by this product benchmark.

PRODCOM code	**Description**
23.52.30.30	Calcined and sintered dolomite, crude, roughly trimmed or merely cut into rectangular or square blocks or slabs

Definition and explanation of processes and emissions covered

The FAR defines the system boundaries as follows:

"All processes directly or indirectly linked to the production of sintered dolime are included."

Emissions related to the production of the consumed electricity are excluded from the system boundaries.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a

consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

Figure 3 gives a graphical representation of the system boundaries.

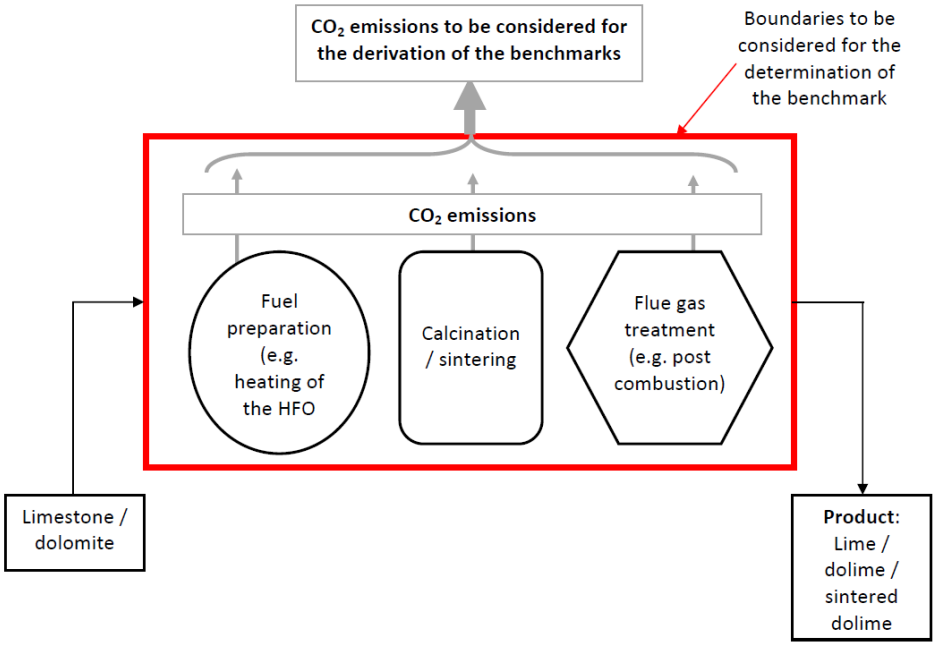

Figure 3. System boundaries (Sector Rule book for the development of CO_2 benchmarks for the European lime sector, 2010)

15. Float glass

Benchmark name:	**Float glass**
Benchmark number:	15
Unit:	Tonnes of glass exiting the lehr. 'Glass exiting the lehr' is to be understood as melted glass. Quantities of melted glass are calculated from the quantity of raw material input (e.g. silica, lime, soda, cullet) into the furnace after subtraction of the volatile gaseous emissions, i.e., CO_2, SO_2, H_2O, NO, etc.
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	No (CBAM factor to be used is 1)
Associated Annex I activity:	Manufacture of glass including glass fibre with a melting capacity exceeding 20 tonnes per day
Special provisions:	-

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"Float / ground / polish glass (as tonnes of glass exiting the lehr)."

The table below shows a list of relevant products associated with float glass according to definitions in PRODCOM 2010 statistics. PRODCOM codes can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on PRODCOM codes reported in statistics.

The PRODCOM products listed in the table above list refer to final products. However, this benchmark covers all the melted glass exiting the lehr and not the final products defined by the PRODCOM codes, which are processed from the molten glass in the downstream process steps. The quantities of molten glass can be calculated either based on the quantity of raw material (e.g. silica, lime, soda, cullet) used in the furnace, after subtraction of the volatile gaseous emissions (e.g., CO_2, SO_2, H_2O, NO), or determined by measuring the glass exiting the lehr.

PRODCOM code	**Description**
23.11.12.14	Non-wired sheets of float glass and surface ground or polished glass, having an absorbent or reflective layer, of a thickness ≤ 3.5 mm
23.11.12.17	Non-wired sheets of float glass and surface ground or polished glass, having an absorbent or reflective layer, of a thickness > 3.5 mm
23.11.12.30	Non-wired sheets, of float, surface ground or polished glass, coloured throughout the mass, opacified, flashed or merely surface ground
23.11.12.90	Other sheets of float/ground/polished glass, n.e.c.

Definition and explanation of processes and emissions covered

The FAR defines the system boundaries as follows:

"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."

In particular, the following production steps are included:

- Furnace (includes process emissions and associated pollution control equipment (incinerator, carbonate scrubber))
- Bath
- Lehr (a temperature-controlled kiln for annealing objects made of glass)
- Batch plant
- On-line coating
- Chemical reduction by fuel (DeNox)
- Oxygen generating plant
- Nitrogen and hydrogen generation plant
- Bath atmosphere plant (storage)

Emissions related to the production of the consumed electricity are excluded from the system boundaries.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

16. Bottles and jars of colourless glass

Benchmark name:	**Bottles and jars of colourless glass**
Benchmark number:	16
Unit:	Tonnes of packed product
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	No (CBAM factor to be used is 1)
Associated Annex I activity:	Manufacture of glass including glass fibre with a melting capacity exceeding 20 tonnes per day
Special provisions:	-

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"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."

Colourless glass is produced in a furnace where there is no deliberate addition of colour [into the furnace] either through the use of colouring agents as separate raw material (e.g., iron chromite ($Fe_2O_3.Cr_2O_3$), iron oxide (Fe_2O_3), titanium oxide, cobalt oxide) or coloured cullet to achieve a required specification. Colourless glass raw material batch may contain an incidental presence of external coloured cullet and decolourising agents.

Apart from the exclusion of extra-flint products (see FAR quote above), this definition is identical to the definition in PRODCOM 2010 statistics as shown in the table below. PRODCOM codes can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on PRODCOM codes reported in statistics.

PRODCOM code	**Description**
23.13.11.40	Bottles of colourless glass of a nominal capacity < 2.5 litres, for beverages and foodstuffs (excluding bottles covered with leather or composition leather, infant's' feeding bottles)

Definition and explanation of processes and emissions covered

The FAR defines the system boundaries as follows:

"All processes directly or indirectly linked to the production steps

- *materials handling*

- *melting*
- *forming*
- *downstream processing*
- *packaging and*
- *ancillary processes*

are included."

Emissions related to the production of the consumed electricity are excluded from the system boundaries

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

17. Bottles and jars of coloured glass

Benchmark name:	**Bottles and jars of coloured glass**
Benchmark number:	17
Unit:	Tonnes of packed product
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	No (CBAM factor to be used is 1)
Associated Annex I activity:	Manufacture of glass including glass fibre with a melting capacity exceeding 20 tonnes per day
Special provisions:	-

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"Bottles of coloured glass of a nominal capacity < 2.5 litres, for beverages and 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."

This definition is identical to the definition in PRODCOM 2010 statistics as shown in the table below. PRODCOM codes can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on PRODCOM codes reported in statistics.

PRODCOM code	**Description**
23.13.11.50	Bottles of coloured glass of a nominal capacity < 2.5 litres, for beverages and foodstuffs (excluding bottles covered with leather or composition leather, infant's feeding bottles)

Definition and explanation of processes and emissions covered

The FAR defines the system boundaries as follows:

"All processes directly or indirectly linked to the production steps

- *materials handling*
- *melting*
- *forming*
- *downstream processing,*
- *packaging*
- *ancillary processes*

are included"

Emissions related to the production of the consumed electricity are excluded from the system boundaries.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

18. Continuous filament glass fibre products

Benchmark name:	**Continuous filament glass fibre products**
Benchmark number:	18
Unit:	Tonnes of melted glass exiting the forehearth 'Melted glass exiting the forehearth' is to be understood as melted glass. Quantities of melted glass are calculated from the quantity of raw material input into the furnace after subtraction of the volatile gaseous emissions, i.e., CO_2, SO_2, H_2O, NO, etc.
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	No (CBAM factor to be used is 1)
Associated Annex I activity:	Manufacture of glass including glass fibre with a melting capacity exceeding 20 tonnes per day
Special provisions:	-

Definition and explanation of products covered
According to the FAR this product benchmark covers:

"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."

The table below shows relevant products associated with continuous filament glass fibre (CFGF) products according to definitions in PRODCOM 2010 statistics.

PRODCOM products 26.14.12.10 and 26.14.12.30 could also be covered by the benchmark for mineral wool. Therefore, it needs to be carefully analysed which product benchmark applies, in particular by considering the different applications of both benchmarked products (the mineral wool benchmarks applies only to products for thermal, acoustic and fire applications, see section 23).

The PRODCOM products listed in the table below refer to final products, however not to molten glass, which is an intermediate material output which is further transformed in the downstream process steps. This benchmark covers the molten glass and not the final products defined by the PRODCOM codes.

PRODCOM codes can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on PRODCOM codes reported in statistics.

PRODCOM code	**Description**
23.14.11.10	Glass fibre threads cut into lengths of at least 3 mm but ≤ 50 mm (chopped strands)

PRODCOM code	Description
23.14.11.30	Glass fibre filaments (including rovings)
23.14.11.50	Slivers; yarns and chopped strands of filaments of glass fibres (excluding glass fibre threads cut into lengths of at least 3 mm but ≤ 50 mm)
23.14.11.70	Staple glass fibre articles
23.14.12.10	Glass fibre mats (including of glass wool) (also used for Definition and explanation of products covered by the benchmark for Mineral Wool)
23.14.12.30	Glass fibre voiles (including of glass wool) (also used for Definition and explanation of products covered by the benchmark for Mineral Wool)
23.14.12.50	Nonwoven glass fibre webs; felts; mattresses and boards

Definition and explanation of processes and emissions covered

The FAR defines the system boundaries as follows:

"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 decarbonisation 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 regarded as utilities and are outside the system boundaries."

Figure 4 gives a graphical representation of the system boundaries. Supporting processes such as material handling are regarded as utilities and are not covered by the system boundaries of this product benchmark.

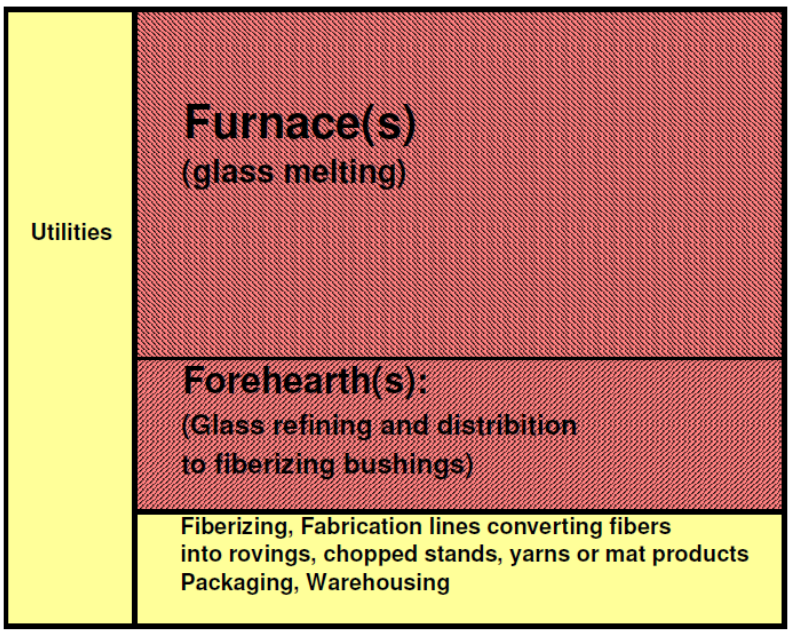

Figure 4. System boundaries; processes within the system boundaries are depicted red (dark shade) (Rule book for Continuous Filament Glass Fibre (CFGF), 2010)

This product benchmark includes the following emissions in particular:

- Direct CO_2 emissions associated with fossil fuel combustion of the process steps:
  - Glass melting in the furnaces
  - Glass refining and distribution through the forehearths to the fiberising bushings.
- Process CO_2 emissions resulting from the decarbonisation of the glass mineral raw materials during the melting process.

Emissions related to the production of the consumed electricity are excluded from the system boundaries

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

19. Facing bricks

Benchmark name:	**Facing bricks**
Benchmark number:	19
Unit:	Tonnes of facing bricks
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	No (CBAM factor to be used is 1)
Associated Annex I activity:	Manufacture of ceramic products by firing, in particular roofing tiles, bricks, refractory bricks, tiles, stoneware or porcelain, with a production capacity exceeding 75 tonnes per day
Special provisions:	-

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"Facing bricks with a density > 1000 kg/m^3 used for masonry based on EN 771-1, excluding pavers, clinker bricks and blue braised facing bricks."

Facing bricks are used for the outer leaf of buildings with cavity walls. Facing Bricks exist in different colours.

The table below shows relevant products according to definitions in PRODCOM 2010 statistics. PRODCOM codes can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on PRODCOM codes reported in statistics.

Note that this PRODCOM code also includes products such as clay blocks that are not covered by the definition of the benchmarked product.

PRODCOM code	**Description**
23.32.11.10	Non-refractory clay building bricks (excluding of siliceous fossil meals or earths)

Definition and explanation of processes and emissions covered

The FAR defines the system boundaries as follows:

"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."

Emissions related to the production of the consumed electricity are excluded from the system boundaries as well as emissions related to the fuel used for lorries and other vehicles to transport the clay and other raw material.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. *See* FAR *for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

20. Pavers

Benchmark name:	**Pavers**
Benchmark number:	20
Unit:	Tonnes of pavers as (net) saleable product
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	No (CBAM factor to be used is 1)
Associated Annex I activity:	Manufacture of ceramic products by firing, in particular roofing tiles, bricks, refractory bricks, tiles, stoneware or porcelain, with a production capacity exceeding 75 tonnes per day
Special provisions:	-

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"Clay bricks of any colour used for flooring according to EN 1344. Expressed in tonnes of pavers as net saleable product."

Pavers exist in different colours such as red, yellow, and blue braised. They are all covered by this product benchmark.

The table below shows relevant products according to definitions in PRODCOM 2010 statistics. PRODCOM codes can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on PRODCOM codes reported in statistics.

The PRODCOM product also covers roof tiles which are covered by as separate benchmark (see section 21).

PRODCOM code	**Description**
23.32.11.30	Non-refractory clay flooring blocks, support or filler tiles and the like (excluding of siliceous fossil meals or earths)

Definition and explanation of processes and emissions covered

The FAR defines the system boundaries as follows:

"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.“

Emissions related to the production of the consumed electricity are excluded from the system boundaries.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

21. Roof tiles

Benchmark name:	**Roof tiles**
Benchmark number:	21
Unit:	Tonnes of roof tiles (saleable production)
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	No (CBAM factor to be used is 1)
Associated Annex I activity:	Manufacture of ceramic products by firing, in particular roofing tiles, bricks, refractory bricks, tiles, stoneware or porcelain, with a production capacity exceeding 75 tonnes per day
Special provisions:	-

Definition and explanation of products covered
According to the FAR this product benchmark covers:

"Clay roofing tiles as defined in EN 1304:2005 excluding blue braised roof tiles and accessories. Expressed in tonnes of saleable roof tiles".

The table below shows relevant products according to definitions in PRODCOM 2010 statistics. PRODCOM codes can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on PRODCOM codes reported in statistics.

Accessories defined by PRODCOM 2010 code 23.32.12.70 should be excluded.

PRODCOM code	**Description**
23.32.12.50	Non-refractory clay roofing tiles
Excluding: 23.32.12.70	Non-refractory clay constructional products (including chimneypots, cowls, chimney liners and flue-blocks, architectural ornaments, ventilator grills, clay-lath; excluding pipes, guttering and the like)

Definition and explanation of processes and emissions covered

The FAR defines the system boundaries as follows:

"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."

Emissions related to the production of the consumed electricity are excluded from the system boundaries.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

22. Spray dried powder

Benchmark name:	**Spray dried powder**
Benchmark number:	22
Unit:	Tonnes of powder produced
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	No (CBAM factor to be used is 1)
Associated Annex I activity:	Manufacture of ceramic products by firing, in particular roofing tiles, bricks, refractory bricks, tiles, stoneware or porcelain, with a production capacity exceeding 75 tonnes per day
Special provisions:	-

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"Spray-dried powder for the production of dry-pressed wall and floor tiles. Expressed in tonnes of powder produced."

In this context, dry-pressed wall and floor tiles (PRODCOM 2010 codes starting with 23.31.10) are understood as thin slabs made from clay and/or other inorganic raw materials, generally used as coverings for floor and walls, glazed or unglazed.

There are no codified standards for this intermediate product.

Definition and explanation of processes and emissions covered

The FAR defines the system boundaries as follows:

"All processes directly or indirectly linked to the production of spray-dried powder are included."

Emissions related to the production of the consumed electricity are excluded from the system boundaries.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen). *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

23. Mineral wool

Benchmark name:	**Mineral wool**
Benchmark number:	23
Unit:	Tonnes of mineral wool (saleable product)
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	No (CBAM factor to be used is 1)
Associated Annex I activity:	Manufacture of mineral wool insulation material using glass, rock or slag with a melting capacity exceeding 20 tonnes per day
Special provisions:	-

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"Mineral wool insulation products for thermal, acoustic and fire applications manufactured using glass, rock or slag. Expressed in tonnes of mineral wool (saleable product)".

The table below shows relevant products according to definitions in PRODCOM 2010 statistics. PRODCOM codes can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on PRODCOM codes reported in statistics.

PRODCOM 2010 products 23.14.12.10 and 23.14.12.30 could also be covered by the benchmark for Continuous Filament Glass Fibre benchmark (see section 18). Therefore, it needs to be carefully analysed which product benchmark applies, in particular by considering the different applications of both benchmarked products (the mineral wool benchmarks applies only to products for thermal, acoustic and fire applications).

PRODCOM code	**Description**
23.14.12.10	Glass fibre mats (including of glass wool)
23.14.12.30	Glass fibre voiles (including of glass wool)
23.99.19.10	Slag wool, rock wool and similar mineral wools and mixtures thereof, in bulk, sheets or rolls

Definition and explanation of processes and emissions covered

In FAR Annex I, point 2, referring to the 'definition of product benchmarks and system boundaries with collection of data on electricity consumption', the rules define the system boundaries of the mineral wool product benchmark as follows:

"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 purpose of data collection, the total electricity consumption within the system boundaries shall be considered."

The latter emissions are not eligible for free allocation. The system boundaries do not include packaging.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

24. Plaster

Benchmark name:	**Plaster**
Benchmark number:	24
Unit:	Tonnes of stucco (saleable production) Stucco also known as 'Plaster of Paris' is hemi-hydrate plaster ($CaSO_4$.1/2H2O) produced by heating ('calcining') raw gypsum at 150°C to 165°C thereby removing three-quarters of chemically combined water.
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	No (CBAM factor to be used is 1)
Associated Annex I activity:	Drying or calcination of gypsum or production of plaster boards and other gypsum products, with a production capacity of calcined gypsum or dried secondary gypsum exceeding a total of 20 tonnes per day
Special provisions:	-

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"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 gypsum, are not covered by this product benchmark."

Plaster that is further processed to plasterboard is not covered by this benchmark but by the plasterboard benchmark (see section 26).

The table below shows relevant products according to definitions in PRODCOM 2010 statistics. PRODCOM codes can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on PRODCOM codes reported in statistics.

The definition of these products does not necessarily coincide with the product definition for the purpose of this benchmark: a benchmarked product may be covered by more than one PRODCOM code and vice versa.

PRODCOM code	**Description**
08.11.20.30	Gypsum and anhydrite
23.52.20.00	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)

PRODCOM code	Description
23.64.10.00	Factory made mortars

Definition and explanation of processes and emissions covered

The FAR defines the system boundaries as follows:

"All processes directly or indirectly linked to the production steps

- *Milling,*
- *Drying, and*
- *Calcining*

are included."

The plaster benchmark covers the same activities as the plasterboard benchmark (see next section 26), except board drying. The production of the intermediate product dried secondary gypsum (see section 25) is not covered by the plaster benchmark.

Emissions related to the production of the consumed electricity are excluded from the system boundaries.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

25. Dried secondary gypsum

Benchmark name:	**Dried secondary gypsum**
Benchmark number:	25
Unit:	Tonnes of dry secondary gypsum product
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	No (CBAM factor to be used is 1)
Associated Annex I activity:	Drying or calcination of gypsum or production of plaster boards and other gypsum products, with a production capacity of calcined gypsum or dried secondary gypsum exceeding a total of 20 tonnes per day
Special provisions:	-

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"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."

Dry secondary gypsum is an intermediate product in the production of plasters (see section 24) or plasterboard (see section 26). Dry secondary gypsum is produced by recycling:

- Secondary gypsum: a by-product of flue gas desulphurisation plants (FGD or DSG) produced by the power generation industry
- Waste generated by the factory due to rejects or damage that is recycled internally by the factory and not sent to landfill;
- Any waste material returned to the factory by the building sector;
- Any waste gypsum products received from demolition of existing buildings.
- Any other recycled material processed separately by the plant

The table below shows relevant product according to definition in PRODCOM 2010 statistics. PRODCOM codes can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on PRODCOM codes reported in statistics.

The definition of this product also covers the Plaster benchmark (see section 24).

PRODCOM code	**Description**
23.52.20.00	Plasters consisting of calcined gypsum or calcium sulphate (including for use in building, for use in dressing woven fabrics for surfacing paper, for use in dentistry)

Definition and explanation of processes and emissions covered

The FAR defines the system boundaries as follows:

"All processes directly or indirectly linked to the drying of secondary gypsum are included."

Emissions related to the production of the consumed electricity are excluded from the system boundaries.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

26. Plasterboard

Benchmark name:	**Plasterboard**
Benchmark number:	26
Unit:	Tonnes of stucco (saleable production) Stucco also known as 'Plaster of Paris' is hemi-hydrate plaster ($CaSO_4.1/2H_2O$) produced by heating ('calcining') raw gypsum at 150°C to 165°C thereby removing three-quarters of chemically combined water.
Carbon leakage exposure:	No (CLEF of the relevant year is to be used)
Under the CBAM scope:	No (CBAM factor to be used is 1)
Associated Annex I activity:	Drying or calcination of gypsum or production of plaster boards and other gypsum products, with a production capacity of calcined gypsum or dried secondary gypsum exceeding a total of 20 tonnes per day
Special provisions:	-

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"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."

The benchmark covers the products of based on plaster. The benchmark covers both faced and non-faced products, both reinforced and non-reinforced products, such as:

- Boards
- Sheets
- Panels
- Tiles,
- Similar articles of plaster/compositions
- Plasterboard
- Glass Reinforced Plasterboard
- Gypsum Blocks
- Gypsum Coving

- Gypsum Ceiling Tiles.

The benchmark excludes

- Articles agglomerated with plaster ornamented
- High-density fibreboards

The tonnes of stucco used to make the final product can be verified by using one or more of the following methods:

1. Measurement of the weight of stucco going into the mixer from the weigh belt feeding the mixer (in the gypsum industry the weigh belt is a highly calibrated measuring device with an accuracy of +/- 0.5%);
2. Calculation of the amount of stucco used to make the board from recipe data used to make each individual plasterboard product;
3. Measurement of the amount of stucco made in the separate calcination step;
4. Back calculation to the amount of raw gypsum material entering the plant (this is used for verification of the plant's mass balance).

The table below shows relevant products according to definitions in PRODCOM 2010 statistics. PRODCOM codes can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on PRODCOM codes reported in statistics.

PRODCOM code	**Description**
23.62.10.50	Boards, sheets, panels, tiles, similar articles of plaster/compositions based on plaster, faced/reinforced with paper/paperboard only, excluding articles agglom. With plaster, ornamented
23.62.10.90	Boards, sheets, panels, tiles, similar articles of plaster/compositions based on plaster, not faced/reinforced with paper/paperboard only, excluding articles agglom. With plaster, ornamented

Definition and explanation of processes and emissions covered

In FAR Annex I, point 2, referring to the 'definition of product benchmarks and system boundaries with collection of data on electricity consumption', the rules define the system boundaries of the plasterboard product benchmark as follows:

"All processes directly or indirectly linked to the production steps

- *milling,*
- *drying,*
- *calcining, and*
- *board drying*

are included.

For the purpose of data collection, 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."

The plasterboard benchmark covers the same activities as the plaster benchmark, with the addition of board drying as an additional production step.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

27. Short fibre kraft pulp

Benchmark name:	**Short fibre kraft pulp**
Benchmark number:	27
Unit:	Net saleable production in Adt (Air Dried Tonnes) The production of an installation is defined as the net saleable production of air-dried metric tonnes (Adt) measured at the end of the production process. 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. Air dry metric tonne of pulp meaning dry solids content of 90%.
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	No (CBAM factor to be used is 1)
Associated Annex I activity:	Production of pulp from timber or other fibrous materials
Special provisions:	Special provision on allocation to integrated pulp & paper: activity levels only takes into account pulp that is placed on the market and not processed into paper.

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"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%."

Long fibre kraft pulp is not included in this benchmark (see section 28).

The use of air-dry metric tonnes is to take into account the fact that moisture content differs between installations, and to ensure a common comparable reference is used. An installation will typically have a dry solid content measure, and can calculate a 90% value in the following way: if for example the dry solid content is 92.8% and 1000t of pulp is produced, the atro (i.e., completely dry) production will be 928t. This can then be divided by 90% to obtain the amount of 90% dry mass, which will in this case be 1031t.

The table below show relevant products according to definitions in PRODCOM 2010 statistics. These classifications can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on classifications in statistics.

The listed PRODCOM code also covers the Long fibre kraft pulp benchmark (see section 28).

PRODCOM code	Description
17.11.12.00	Chemical wood pulp, soda or sulphate, other than dissolving grades

For all pulp production except recovered paper pulp, free allocation is only granted to pulp placed on the market and not processed into paper at the same installation or at a technically connected installation (FAR, Article 16(6)). This also applies to heat recovered from any pulp benchmark other than the recovered paper pulp benchmark.

Example: if a pulp mill produces 100 tonnes of pulp and only 1 Adt (Air Dried Tonne) is sold on the market, then only 1 Adt is eligible for free allocation under this benchmark. Note that this rule does not have any impact on the eligibility of the heat recovered and used or paper produced downstream.

It should be noted that any product produced that meets the product benchmark specifications should have a corresponding sub-installation. This means that even an installation not placing any of its pulp on the market must include a corresponding pulp sub-installation with an activity level equal to zero. Furthermore, the actual amount of total pulp produced and attributable emissions will need to be reported for the update of the pulp benchmark value.

Definition and explanation of processes and emissions covered

The FAR defines the system boundaries as follows:

"All processes which are part of the pulp production process (in particular

- *the pulp mill,*
- *recovery boiler,*
- *pulp drying section,*
- *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."

Emissions related to the production of the consumed electricity are excluded from the system boundaries.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

28. Long fibre kraft pulp

Benchmark name:	**Long fibre kraft pulp**
Benchmark number:	28
Unit:	Net saleable production in Adt (Air Dried Tonnes) The production of an installation is defined as the net saleable production of air-dried metric tonnes (Adt) measured at the end of the production process. 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. Air dry metric tonne of pulp meaning dry solids content of 90%.
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	No (CBAM factor to be used is 1)
Associated Annex I activity:	Production of pulp from timber or other fibrous materials
Special provisions:	Special provision on allocation to integrated pulp & paper: activity levels only takes into account pulp that is placed on the market and not further processed into paper.

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"Long fibre kraft pulp is a wood pulp produced by the sulphate chemical process using cooking liquor, characterised 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%."

The product group encompasses the production of both bleached and unbleached (brown) pulp. Bleached pulp is particularly used for graphic papers, tissue and carton boards. Unbleached pulp is commonly used in products for which strength is important, such as packaging paper, liner for corrugated board, wrappings, sack and bag papers, envelopes and other unbleached speciality papers.

Short fibre kraft pulp is not included in this benchmark (see section 27).

For more information on how to calculate air dried tonnes, see section 27.

The table below show relevant products according to definitions in PRODCOM 2010 statistics. These classifications can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on classifications in statistics.

The listed PRODCOM code also covers the Short fibre kraft pulp benchmark (see section 27).

PRODCOM code	**Description**
17.11.12.00	Chemical wood pulp, soda or sulphate, other than dissolving grades

For all pulp production except recovered paper pulp, free allocation is only granted to pulp placed on the market and not processed into paper at the same installation or at a technically connected installation (FAR, Article 16(6)). This also applies to heat recovered from any pulp benchmark other than the recovered paper pulp benchmark.

Example: if a pulp mill produces 100 tonnes of pulp and only 1 Adt (Air Dried Tonne) is sold on the market, then only 1 Adt is eligible for free allocation under this benchmark. Note that this rule does not have any impact on the eligibility of the heat recovered and used or paper produced downstream.

It should be noted that any product produced that meets the product benchmark specifications should have a corresponding sub-installation. This means that even an installation not placing any of its pulp onto the market must include a corresponding pulp sub-installation with an activity level equal to zero. Furthermore, the actual amount of total pulp produced and attributable emissions will need to be reported for the update of the pulp benchmark value.

Definition and explanation of processes and emissions covered

The FAR defines the system boundaries as follows:

"All processes which are part of the pulp production process (in particular:

- *the pulp mill,*
- *recovery boiler,*
- *pulp drying section,*
- *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."

Emissions related to the production of the consumed electricity are excluded from the system boundaries.

Typically, unbleached Kraft pulp production is integrated with kraftliner production. Care should therefore be taken that no double allocation occurs (see sub-section “Definition and explanation of processes and emissions covered” of the Introduction).

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen). *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

29. Sulphite pulp, thermo-mechanical and mechanical pulp

Benchmark name:	**Sulphite pulp, thermo-mechanical and mechanical pulp**
Benchmark number:	29
Unit:	Net saleable production in Adt (Air Dried Tonnes) The production of an installation is defined as the net saleable production of air-dried metric tonnes (Adt) measured at the end of the production process. 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. Air dry metric tonne of pulp meaning dry solids content of 90%.
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	No (CBAM factor to be used is 1)
Associated Annex I activity:	Production of pulp from timber or other fibrous materials
Special provisions:	Special provision on allocation to integrated pulp & paper: activity levels only takes into account pulp that is placed on the market and not processed into paper.

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"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 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."

For more information on how to calculate air dried tonnes, see section 27.

The following types of pulp are included in this benchmark:

- Bleached or unbleached sulphite pulp produced by the sulphite pulping process
- Bleached or unbleached mechanical pulp grades: thermomechanical pulp (TMP) and groundwood pulp

The following sub-types are excluded from this benchmark and will receive allocation based on fall-back approaches:

- Semichemical pulp

- Chemithermomechanical pulp (CTMP)
- Dissolving pulp

The table below show relevant products according to definitions in PRODCOM 2010 statistics. These classifications can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on classifications in statistics.

PRODCOM code	**Description**
17.11.13.00	Chemical wood pulp, sulphite, other than dissolving grades
PRODCOM code partially covered by product benchmark 29	**Descriptions**
17.11.14.00	*Part covered:* Mechanical wood pulp *Part **not** covered:* Semi-chemical wood pulp (this part is not covered by any product benchmark). Pulps of fibrous cellulosic material other than wood (this part is covered by the product benchmark Recovered paper pulp, see section 30).

For all pulp production except recovered paper pulp, free allocation is only granted to pulp placed on the market and not processed into paper at the same installation or at a technically connected installation (FAR, Article 16(6)). This also applies to heat recovered from any pulp benchmark other than the recovered paper pulp benchmark.

Example: if a pulp mill produces 100 tonnes of pulp and only 1 Adt (Air Dried Tonne) is sold on the market, then only 1 Adt is eligible for free allocation under this benchmark. Note that this rule does not have any impact on the eligibility of the heat recovered and used or paper produced downstream.

It should be noted that any product produced that meets the product benchmark specifications should have a corresponding sub-installation. This means that even an installation not placing any of its pulp on the market must include a corresponding pulp sub-installation with an activity level equal to zero. Furthermore, the actual amount of total pulp produced and attributable emissions will need to be reported for the update of the pulp benchmark value.

Definition and explanation of processes and emissions covered

The FAR defines the system boundaries as follows:

"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."

Emissions related to the production of the consumed electricity are excluded from the system boundaries.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

30. Recovered paper pulp

Benchmark name:	**Recovered paper pulp**
Benchmark number:	30
Unit:	Net saleable production in Adt (Air Dried Tonnes). The production of an installation is defined as the net saleable production of air-dried metric tonnes (Adt) measured at the end of the production process. Air dry metric tonne of pulp meaning dry solids content of 90%. In case of pulp production, production is defined as the total pulp produced including both pulp for internal delivery to a paper mill and market pulp. The produced recovered paper pulp will in most cases be transported from the pulper to the paper machine in the form of a slurry. It has to be calculated back to Adt. The production amount can either be defined by measuring the amount of pulp from the pulper (if meters in place) or by calculation from the recovered paper input minus impurities removed or from a full mass balance.
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	No (CBAM factor to be used is 1)
Associated Annex I activity:	Production of pulp from timber or other fibrous materials
Special provisions:	-

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"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."

For more information on how to calculate air dried tonnes, see section 27.

The table below shows relevant products according to definitions in PRODCOM 2010 statistics. PRODCOM classifications can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on classifications in statistics.

Both deinked and non-deinked recycled pulp are covered by the benchmark.

PRODCOM code partially covered by product benchmark 30	Description
17.11.14.00	*Part covered:* Pulps of fibrous cellulosic material other than wood *Part **not** covered:* Semi-chemical wood pulp (this part is not covered by any product benchmark). Mechanical wood pulp (this part is covered by the product benchmark Sulphite pulp, thermo-mechanical and mechanical pulp, see section 29).

Definition and explanation of processes and emissions covered

The FAR defines the system boundaries as follows:

"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."

Emissions related to the production of the consumed electricity are excluded from the system boundaries.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.

31. Newsprint

Benchmark name:	**Newsprint**
Benchmark number:	31
Unit:	Net saleable production in Adt (Air Dried Tonnes) The production is defined as the net saleable production of air-dried metric tonnes (Adt) measured at the end of the production process. Air dry metric tonne of paper is defined as paper with 6% moisture content.
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	No (CBAM factor to be used is 1)
Associated Annex I activity:	Production of paper or cardboard with a production capacity exceeding 20 tonnes per day
Special provisions:	-

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"Specific paper grade (in rolls or sheets) expressed as net saleable production in air dried tonnes, defined as paper with 6% moisture content."

For more information on how to calculate air dried tonnes, see section 27.

Those papers are used for printing newspapers produced from groundwood and/or mechanical pulp or recycled fibres or any percentage of combinations of the two.

Weights usually range from 40 to 52 g/m² but can be as high as 65 g/m².

Newsprint is machine-finished or slightly calendered, white or slightly coloured and is used in reels for letterpress, offset or flexo-printing.

The table below shows relevant products according to definitions in PRODCOM 2010 statistics. These classifications can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on classifications in statistics.

PRODCOM 2007 code	**Description**
17.12.11.00	Newsprint in rolls or sheets

Definition and explanation of processes and emissions covered

The FAR defines the system boundaries as follows:

"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."

Emissions related to the production of the consumed electricity are excluded from the system boundaries.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

In integrated mills that produce both pulp and paper, a newsprint producing sub-installation may use excess heat from the pulp production process. This has no effect on the allocation to the newsprint producing sub-installation.

32. Uncoated fine paper

Benchmark name:	**Uncoated fine paper**
Benchmark number:	32
Unit:	Net saleable production in Adt (Air Dried Tonnes) Air dry metric tonne of paper is defined as paper with 6% moisture content.
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	No (CBAM factor to be used is 1)
Associated Annex I activity:	Production of paper or cardboard with a production capacity exceeding 20 tonnes per day
Special provisions:	-

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"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 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."*

The uncoated woodfree papers includes most office papers, such as business forms, copier, computer, stationery and book papers.

For more information on how to calculate air dried tonnes, see section 27.

The table below show relevant products according to definitions in PRODCOM 2010 statistics. These classifications can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on classifications in statistics.

PRODCOM code	**Description**
17.12.12.00	Hand-made paper and paperboard in rolls or sheets (excluding newsprint)
17.12.13.00	Paper and paperboard used as a base for photo-sensitive, heat-sensitive or electro-sensitive paper; carbonising base paper; wallpaper base
17.12.14.10	Graphic paper, paperboard: mechanical fibres ≤ 10%, weight < 40 g/m²
17.12.14.35	Graphic paper, paperboard: mechanical fibres ≤ 10%, weight 4802.55 ≥ 40 g/m² but ≤ 150 g/m², in rolls

PRODCOM code	Description
17.12.14.39	Graphic paper, paperboard: mechanical fibres ≤ 10%, weight ≥ 40 g/m² but ≤ 150 g/m², sheets
17.12.14.50	Graphic paper, paperboard: mechanical fibres ≤ 10%, weight > 150 g/m²
17.12.14.70	Graphic paper, paperboard: mechanical fibres > 10%

Definition and explanation of processes and emissions covered

The FAR defines the system boundaries as follows:

"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."

Emissions related to the production of the consumed electricity are excluded from the system boundaries.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

In integrated mills that produce both pulp and paper, an uncoated fine paper producing sub-installation may use excess heat from the pulp production process. This has no effect on the allocation to the uncoated fine paper producing sub-installation.

33. Coated fine paper

Benchmark name:	**Coated fine paper**
Benchmark number:	33
Unit:	Net saleable production in Adt (Air Dried Tonnes) Air dry metric tonne of paper is defined as paper with 6% moisture content.
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	No (CBAM factor to be used is 1)
Associated Annex I activity:	Production of paper or cardboard with a production capacity exceeding 20 tonnes per day
Special provisions:	-

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"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."

For more information on how to calculate air dried tonnes, see section 27.

More specifically coated fine paper covers:

1. Coated woodfree papers made of fibres produced mainly by a chemical pulping process which are coated in process for different applications and are also known as coated freesheet. This group focuses mainly on publication papers.
2. Coated mechanical papers made from mechanical pulp, used for graphic purposes/magazines. The group is also known as coated groundwood.

The table below show relevant saleable products also according to definitions in PRODCOM 2010 statistics. These classifications can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on classifications in statistics.

PRODCOM code	**Description**
17.12.73.35	Coated base for paper, for photo-, heat-, electro-sensitive paper, weight <= 150 g/m², m.f. <= 10%
17.12.73.37	Coated paper, for writing, printing, graphic purposes (excluding coated base, weight <= 150 g/m²)

PRODCOM code	Description
17.12.73.60	Light-weight coated paper for writing, printing, graphic purposes, m.f. > 10%
17.12.73.75	Other coated mech. graphic paper for writing, printing, graphic purposes, m.f. > 10%, rolls
17.12.73.79	Other coated mech. graphic paper for writing, printing, graphic purposes, m.f. > 10%, sheets
17.12.76.00	Carbon paper, self-copy paper and other copying or transfer paper, in rolls or sheets

Definition and explanation of processes and emissions covered

The FAR defines the system boundaries as follows:

"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."

Emissions related to the production of the consumed electricity are excluded from the system boundaries.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. *See FAR for a*

definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.

In integrated mills that produce both pulp and paper, a coated fine paper producing sub-installation may use excess heat from the pulp production process. This has no effect on the allocation to the coated fine paper producing sub-installation.

34. Tissue

Benchmark name:	**Tissue**
Benchmark number:	34
Unit:	Net saleable production of parent reel in Adt (Air Dried Tonne) Air dry metric tonne of paper is defined as paper with 6% moisture content.
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	No (CBAM factor to be used is 1)
Associated Annex I activity:	Production of paper or cardboard with a production capacity exceeding 20 tonnes per day
Special provisions:	-

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"Tissue papers, covering a wide range of tissue and other hygienic papers 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."

For more information on how to calculate air dried tonnes, see section 27.

Not all production process steps are included for the manufacture of each product (see below for definitions and explanation of processes covered). The conversion of parent reel to finished products is not part of this product benchmark.

The table below show relevant saleable products according to definitions in PRODCOM 2010 statistics. These classifications can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on classifications in statistics.

PRODCOM code	Description
17.12.20.30	Cellulose wadding for household or sanitary purposes, in rolls of a width > 36 cm or in rectangular (including square sheets) with at least one side > 36 cm in an unfolded state
17.12.20.55	Creped paper and webs of cellulose fibres for household/ sanitary purposes, in rolls, width > 36 cm, rectangular sheets min. one side > 36cm in unfolded state, weight <= 25 g/m²/ply
17.12.20.57	Creped paper and webs of cellulose fibres for household/sanitary purposes, in rolls, width > 36 cm, rectangular sheets min. one side > 36 cm in unfolded state, weight > 25 g/m²/ply
17.12.20.90	Paper stock for household: others
17.22.11.20	Toilet paper
17.22.11.40	Handkerchiefs and cleansing or facial tissues of paper pulp, paper, cellulose wadding or webs of cellulose fibres
17.22.11.60	Hand towels of paper pulp, paper, cellulose wadding or webs of cellulose fibres
17.22.11.80	Tablecloths and serviettes of paper pulp, paper, cellulose wadding or webs of cellulose fibres
17.22.12.20	Sanitary towels, tampons and similar articles of paper pulp, paper, cellulose wadding or webs of cellulose fibres
17.22.12.30	Napkins and napkin liners for babies and similar sanitary articles of paper pulp, paper, cellulose wadding or webs of excluding toilet paper, sanitary towels, tampons and similar articles
17.22.12.50	Articles of apparel and clothing accessories of paper pulp; paper; cellulose wadding or webs of cellulose fibres (excluding handkerchiefs, headgear)
17.22.12.90	Household, sanitary or hospital articles of paper, etc, n.e.c.

Definition and explanation of processes and emissions covered

The FAR defines the system boundaries as follows:

"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.

The conversion of parent reel to finished products is not part of this product benchmark."

Emissions related to the production of the consumed electricity are excluded from the system boundaries.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen). *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

In integrated mills that produce both pulp and paper, a tissue producing sub-installation may use excess heat from the pulp production process. This has no effect on the allocation to the tissue producing sub-installation.

35. Testliner and fluting

Benchmark name:	**Testliner and fluting**
Benchmark number:	35
Unit:	Net saleable production in Adt (Air Dried Tonne) Air dry metric tonne of paper is defined as paper with 6% moisture content.
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	No (CBAM factor to be used is 1)
Associated Annex I activity:	Production of paper or cardboard with a production capacity exceeding 20 tonnes per day
Special provisions:	-

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"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 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 semichemical pulp.*

Kraftliner is not included in this product benchmark."

Testliner is made primarily from fibres obtained from recycled fibres.

Kraftliner is included in product benchmark Uncoated carton board.

For more information on how to calculate air dried tonnes, see section 27.

The table below show relevant products according to definitions in PRODCOM 2010 statistics. These classifications can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on classifications in statistics.

PRODCOM code	**Description**
17.12.33.00	Semi-chemical fluting
17.12.34.00	Recycled fluting and other fluting
17.12.35.20	Uncoated testliner (recycled liner board), weight ≤ 150 g/m², in rolls or sheets

PRODCOM code	Description
17.12.35.40	Uncoated testliner (recycled liner board), weight > 150 g/m², in rolls or sheets

Definition and explanation of processes and emissions covered

The FAR defines the system boundaries as follows:

"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."

Emissions related to the production of the consumed electricity are excluded from the system boundaries.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

In integrated mills that produce both pulp and paper, a testliner/fluting producing sub-installation may use excess heat from the pulp production process. This has no effect on the allocation to the testliner/fluting producing sub-installation.

36. Uncoated carton board

Benchmark name:	**Uncoated carton board**
Benchmark number:	36
Unit:	Net saleable production in Adt (Air Dried Tonnes) Air dry metric tonne of paper is defined as paper with 6% moisture content.
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	No (CBAM factor to be used is 1)
Associated Annex I activity:	Production of paper or cardboard with a production capacity exceeding 20 tonnes per day
Special provisions:	-

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"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 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 carton 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."*

For more information on how to calculate air dried tonnes, see section 27.

The table below show relevant products according to definitions in PRODCOM 2010 statistics. These classifications can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on classifications in statistics.

PRODCOM code	**Description**
17.12.31.00	Uncoated, unbleached kraftliner in rolls or sheets (excluding for writing, printing or other graphic purposes, punch card stock and punch card tape paper)
17.12.32.00	Uncoated kraftliner in rolls or sheets (excluding unbleached, for writing; printing or other graphic purposes, punch card stock and punch card tape paper
17.12.42.60	Other uncoated paper and paperboard, in rolls or sheets, weight > 150 g/m² and < 225 g/m² (excluding products of HS 4802, fluting paper, testliner, sulphite wrapping paper, filter or felt paper and paperboard)

PRODCOM code	Description
17.12.42.80	Other uncoated paper and paperboard, in rolls or sheets, weight ≥ 225 g/m² (excluding products of HS 4802, fluting paper, testliner, sulphite wrapping paper, filter or felt paper and paperboard)
17.12.51.10	Uncoated, inside grey paperboard
17.12.59.10	Other uncoated paperboard

Definition and explanation of processes and emissions covered

The FAR defines the system boundaries as follows:

"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."

Emissions related to the production of the consumed electricity are excluded from the system boundaries.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen). *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

In integrated mills that produce both pulp and paper, an uncoated carton board producing sub-installation may use excess heat from the pulp production process. This has no effect on the allocation to the uncoated carton board producing sub-installation.

37. Coated carton board

Benchmark name:	**Coated carton board**
Benchmark number:	37
Unit:	Air Dried Tonnes (Adt) The production of an installation is expressed as the net saleable production of air-dried metric tonnes measured at the end of the production process. Air dry metric tonne of paper is defined as paper with 6% moisture content.
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	No (CBAM factor to be used is 1)
Associated Annex I activity:	Production of paper or cardboard with a production capacity exceeding 20 tonnes per day
Special provisions:	-

Definition and explanation of products covered
According to the FAR this product benchmark covers:

"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, 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."

For more information on how to calculate air dried tonnes, see section 27.

Coated carton board products are mainly used:

- for commercial applications that need to provide commercial information printed on the packaging going onto the shelf in the store
- for cartons for consumer products such as frozen food, cosmetics and for liquid containers.

Carton board products have the following characteristics:

- They are made from virgin and/or recovered fibres
- They have good folding properties, stiffness and scoring ability.
- They are also known as solid board, folding box board, boxboard or carrier board or core board.
- They may be single or multiple layers

The table below show relevant products according to definitions in PRODCOM 2010 statistics. These classifications can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on classifications in statistics.

PRODCOM code	Description
17.12.75.00	Kraft paperboard (other than that of a kind used for writing, printing or other graphic purposes), coated with kaolin or with other inorganic substances
17.12.77.55	Bleached paper and paperboard in rolls or sheets, coated, impregnated or covered with plastics weighing > 150 g/m² (excluding adhesives)
17.12.77.59	Paper and paperboard in rolls or sheets, coated, impregnated or covered with plastics (excluding adhesives, bleached and weighing > 150 g/m²)
17.12.78.20	Kraft paper and paperboard, coated on one or both sides with kaolin or other inorganic substances, in rolls or in square or rectangular sheets, of any size (excluding that for writing, printing or other graphic purposes; paper and paperboard bleached uniformly in the mass and containing > 95% chemically processed wood fibres by weight in relation to the total fibre content)
17.12.78.50	Multi-ply paper and paperboard, coated, others
17.12.79.53	Multi-ply paper and paperboard, coated, of which each layer in bleached
17.12.79.55	Multi-ply paper and paperboard, coated, with 1 bleached outer layer

Definition and explanation of processes and emissions covered

The FAR defines the system boundaries as follows:

"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."

Emissions related to the production of the consumed electricity are excluded from the system boundaries.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

In integrated mills that produce both pulp and paper, a coated carton board producing sub-installation may use excess heat from the pulp production process. This has no effect on the allocation to the coated carton board producing sub-installation.

38. Carbon black

Benchmark name:	**Carbon black**
Benchmark number:	38
Unit:	Tonnes of furnace carbon black (saleable unit, purity >96%)
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	No (CBAM factor to be used is 1)
Associated Annex I activity:	Production of carbon black involving the carbonisation of organic substances such as oils, tars, cracker and distillation residues with a production capacity exceeding 50 tonnes per day
Special provisions:	-

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"Furnace carbon black, expressed in tonnes of furnace carbon black, saleable product, purity above 96%. Gas- and lamp black products are not covered by this benchmark."

Carbon black is pure elemental carbon (>96%) in the form of colloidal particles that are produced by incomplete combustion or thermal decomposition of gaseous or liquid hydrocarbons under controlled conditions.

Table 3 and Figure 5 below show key characteristics of carbon blacks and primary particle diameters, respectively. These characteristics should be used to decide if the carbon black product benchmark applies or not.

Table 3. Characteristics of carbon blacks; Carbon black for the purpose of the product benchmark corresponds to furnace black (Rulebook for Carbon Black, 2010)

		Lamp black	Degussa gas black	Furnace black
Nitrogen surface area	m^2/g	16–24	90–500	15–450
Iodine adsorption	mg/g	23–33	n.a.	15–450
Particle size (arithm. mean)	nm	110–120	10–30	10–80
OAN	ml/100g	100–120	n.a.	40–200
Oil absorption (FP)	g/100g	250–400	220–1100	200–500
Jetness	M_V	200–220	230–300	210–270
Tinting strength		25–35	90–130	60–130
Volatile matter	%	1–2.5	4–24	0.5–6
pH (**)		6–9	4–6	6–10

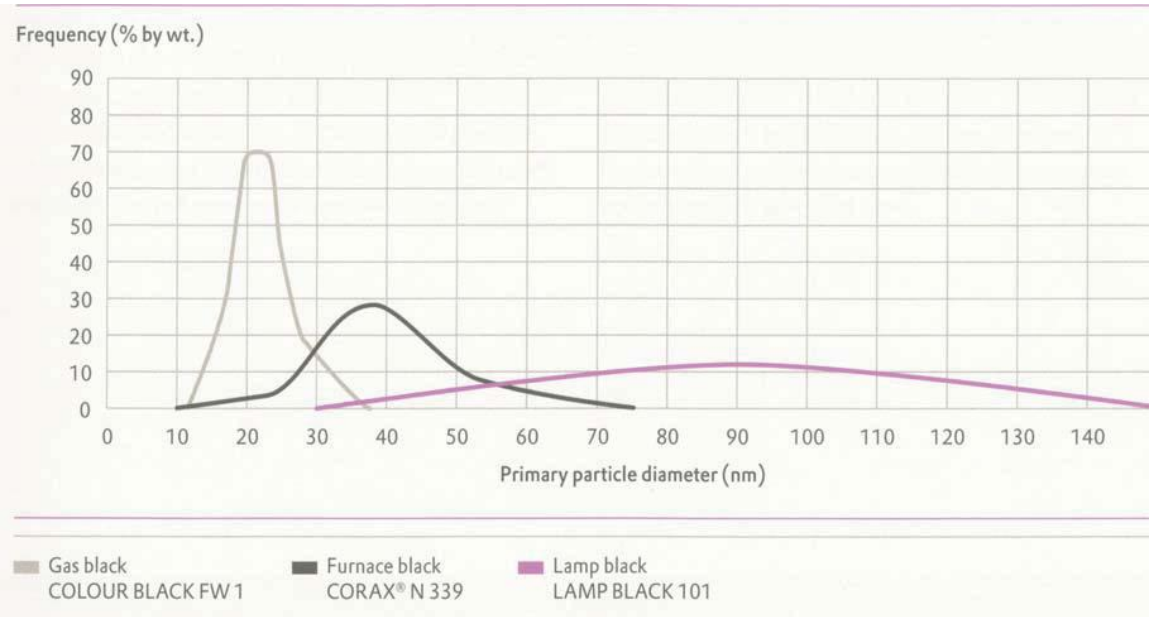

Figure 5. Primary particle diameters of carbon blacks (Rule book for Carbon Black, 2010)

The table below shows relevant products according to definitions in PRODCOM 2010 statistics. PRODCOM codes can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on PRODCOM codes reported in statistics.

The PRODCOM 2010 product does not only cover the benchmarked product but also gas- and lamp black.

PRODCOM code	Description
20.13.21.30	Carbon (carbon blacks and other forms of carbon, n.e.c.)

Definition and explanation of processes and emissions covered

In FAR Annex I, point 2, referring to the ”definition of product benchmarks and system boundaries with collection of data on electricity consumption”, the rules define the system boundaries of the carbon black product benchmark as follows:

“All processes directly or indirectly linked to the production of furnace carbon black as well as finishing, packaging and flaring are included.

For the purpose of data collection, the total electricity consumption within the system boundaries shall be considered.

However, only electricity driven devices like pumps and compressors with a rated power of 2 MW or more should be considered.”

In particular the following emissions are included:

- CO_2 emissions related due to combustion of the tail gas. An oxidation factor of 100% is assumed for tail gas combustion. Emissions due to flaring of tail gas from the furnace black production are also included in the system boundaries.
- CO_2 emissions due to the combustion of fuels used e.g., for co-firing in dryers and production of heat as well as for keeping the flare in standby.
- Emissions related to purchased heat (e.g., steam, hot water, hot air) from external suppliers. Heat in this context always means net heat, e.g., steam energy minus energy of condensate return.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

Emissions related to safety flaring and other flaring of gases that are associated with the production are included, in particular:

1. Emissions from the combusted flared gas;
2. Emissions from the combustion of fuels necessary to operate a flare, which are of two types:
    a) The fuels necessary to keep a pilot flame running
    b) The fuels required to successfully combust the flared gas.

39. Nitric acid

Benchmark name:	**Nitric acid**
Benchmark number:	39
Unit:	Tonnes of HNO_3 of 100% purity Nitric acid is produced in different concentrations: - weak acid 30-65 mass-% HNO_3 - strong acid 70 mass-% or more The production needs to be divided by nitric acid content in mass-% to obtain the production to be used in the determination of the historical activity level.
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	Yes (CBAM factor of the relevant year is to be used)
Associated Annex I activity:	Production of nitric acid
Special provisions:	Measurable heat delivered to other sub-installations is to be treated as non-eligible for allocation.

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"Nitric acid (HNO_3), to be recorded in tonnes HNO_3 (100% purity)."

The table below shows the relevant product according to the definition in PRODCOM 2010 statistics. PRODCOM codes can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on PRODCOM codes reported in statistics.

The product only matches with the definition of the benchmarked product insofar it covers nitric acid.

PRODCOM code	**Description**
20.15.10.50	Nitric acid; sulphonitric acids

Definition and explanation of processes and emissions covered

The FAR defines the system boundaries as follows:

"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."

The production of ammonia as well as the production of the consumed electricity are excluded from the system boundaries.

No additional allocation must be granted for the export or use of heat arising from the nitric acid production.

Preliminary allocation

A special situation exists if a sub-installation receives measurable heat from sub-installations producing nitric acid[20]. In that case, the preliminary allocation for the heat receiving sub-installation needs to be reduced by:

$$\textit{Reduction in preliminary allocation} = BM_H x HAL_{H,HeatFromNitricAcid}$$

Where:

BM_H: heat benchmark (expressed in EUAs/TJ)

$HAL_{H,HeatFromNitricAcid}$: annual historical import from a sub-installation producing nitric acid during the baseline period

[20] Art.16(5) of the FAR: "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. "

40. Adipic acid

Benchmark name:	**Adipic acid**
Benchmark number:	40
Unit:	Tonnes of dry purified adipic acid stored in silos or packed in (big) bags
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	No (CBAM factor to be used is 1)
Associated Annex I activity:	Production of adipic acid
Special provisions:	-

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"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."

Purified adipic acid is the standard commercial grade which is suitable for all typical applications such as monomer for nylon production, raw material for production of polyester polyols, food industry, lubricants or plasticisers.

The table below shows the relevant product according to the definition in PRODCOM 2010 statistics. PRODCOM codes can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on PRODCOM codes reported in statistics.

PRODCOM code	**Description**
20.14.33.85	Adipic acid; its salts and esters

Definition and explanation of processes and emissions covered

The FAR defines the system boundaries as follows:

"All processes directly or indirectly linked to the production of the benchmarked product as well as the N_2O destruction process are included."

In particular, this means that the following emissions are covered:

- CO_2 & N_2O emission direct from assets:
  - Adipic acid manufacturing unit
  - N_2O abatement unit
- CO_2 emission from direct energy Fuels used for N_2O abatement unit
- CO_2 emission from indirect CO_2:

- Net steam production (steam consumption minus steam recovery) for adipic acid manufacturing and N_2O abatement unit.

- CO_2 emissions from the processing of and handling of the side products Glutaric acid and Succinic acid

Emissions related to the production and the consumption of electricity are excluded from the system boundaries, irrespective of where and how this electricity is produced. Manufacture of KA-oil and nitric acid are also excluded.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

Based on the above defined scope, Figure 6 illustrates which emissions are covered by the adipic acid benchmark. All emissions highlighted in yellow are covered. Descriptions of these emissions are provided in the text below the figure.

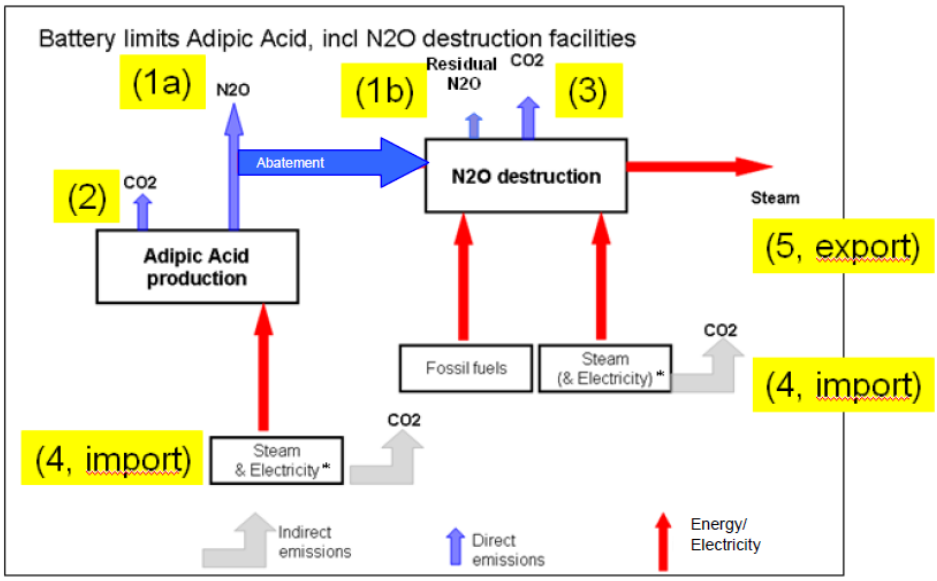

Figure 6. Emissions covered by the product benchmark for adipic acid (emissions defined by yellow field are covered; descriptions of those field are provided in the text (Rule book for Adipic Acid, 2010); *Emissions related to the production of consumed electricity are not included in the system boundaries

Where:

(1a) Direct N_2O emission when the adipic acid waste gas stream is not connected to the N_2O abatement unit (classically calculated from chemical N_2O-emission factor x Adipic acid produced during this time, with 1 N_2O = 310 CO_2eq)

(1b) Direct N_2O emission after abatement (classically N_2O residual concentration is measured, with 1 N_2O = 310 CO_2eq)

(2) Direct CO_2 emission coming from adipic acid synthesis. In this box all unit operations of the adipic acid plant are:

- Oxidation Reaction and off gas treatment
- Crude grade Adipic acid crystallisation and separation
- Adipic acid re-crystallisation(s) and separation
- Adipic acid drying and cooling, conveying and storing
- Dry Adipic acid packaging and delivery
- Dewatering of the nitric acid mother liquor
- By-products purge and catalyst recovery
- Nitric acid work-up systems
- Storage of (volatile) raw materials, intermediates, and final products

(3) Direct CO_2 emission coming from fuels used in the N_2O abatement unit (specific emission factor x quantity of fuel)

(4) Indirect CO_2 emission coming from steam consumed with (5) steam export credited (net steam = difference between import and export 4-5)

41. Ammonia

Benchmark name:	**Ammonia**
Benchmark number:	41
Unit:	Tonnes of ammonia produced as saleable (net) production and 100% purity.
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	Yes (CBAM factor of the relevant year is to be used)
Associated Annex I activity:	Production of ammonia
Special provisions:	-

Definition and explanation of products covered
According to the FAR this product benchmark covers:

"Ammonia (NH_3), expressed in tonnes produced, 100% purity.

Ammonia produced from hydrogen produced by chloralkali electrolysis or by chlorate production is not covered by this benchmark."

The table below shows relevant products according to definitions in PRODCOM 2010 statistics. PRODCOM codes can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on PRODCOM codes reported in statistics.

The definition of these products does not necessarily coincide with the product definition for the purpose of this benchmark: a benchmarked product may be covered by more than one PRODCOM code and vice versa.

PRODCOM code	**Description**
20.15.10.75	Anhydrous ammonia

Definition and explanation of processes and emissions covered

In FAR Annex I, point 2, referring to the "definition of product benchmarks and system boundaries with collection of data on electricity consumption", the rules define the system boundaries of the ammonia product benchmark as follows:

"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 purpose of data collection, the total electricity consumption within the system boundaries shall be considered."

The system boundary of an ammonia installation is defined to be all activities within the plant battery limit as well as processes outside the battery limit that are associated with steam and electricity import or export to the ammonia installation. The production of the intermediate product hydrogen is also covered. Ammonia production from other intermediate products (such as syngas) is

not covered by this product benchmark. Indirect emissions from electricity consumption are not included in the system boundaries and not eligible for free allocation.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

The figure below shows the energy inputs and emissions associated with ammonia production. The production process leads to direct CO_2 emissions and to CO_2 that is used as feedstock in chemical production processes. Both emissions are included in the system boundaries. CO_2 emissions due to the production of consumed steam are included in the system boundaries.

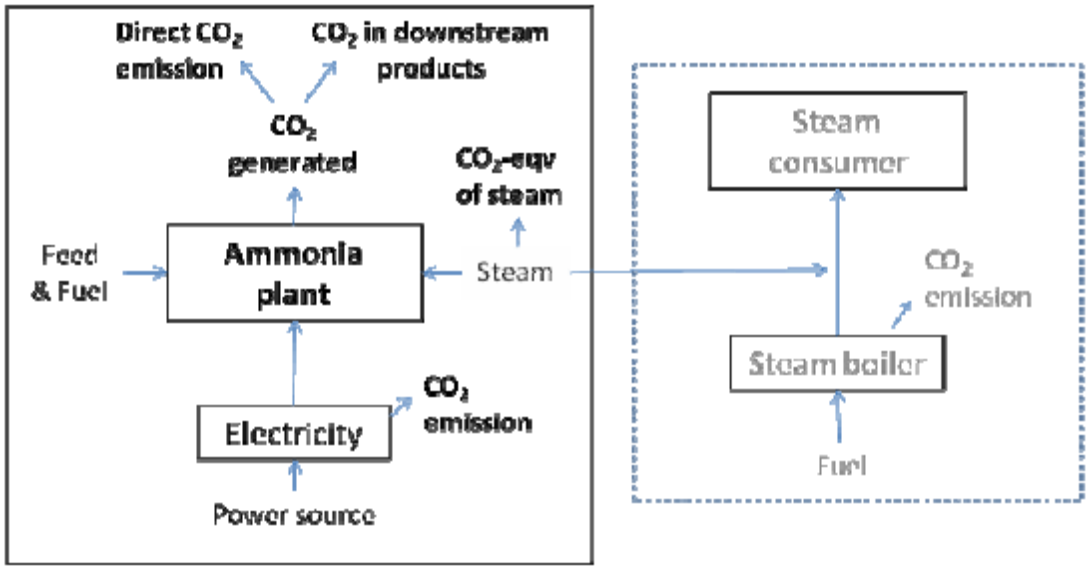

Figure 7. Energy inputs and emissions related to ammonia production. The emissions related to electricity production and consumption are not eligible for free allocation (Rule book for Ammonia, 2010).

42. Steam cracking (high value chemicals)

Benchmark name:	**Steam cracking**
Benchmark number:	42
Unit:	Tonnes of acetylene, ethylene, propylene, butadiene, benzene and hydrogen
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	No (CBAM factor to be used is 1)
Associated Annex I activity:	Production of bulk organic chemicals by cracking, reforming, partial or full oxidation or by similar processes, with a production capacity exceeding 100 tonnes per day
Special provisions:	Provisions in Annex III of the FAR

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"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 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."

In other words, the following chemicals can be part of the mix of high value chemicals (HVC):

- Acetylene
- Ethylene
- Propylene
- Butadiene
- Benzene
- Hydrogen (chemical grade hydrogen, that is separate from CH_4)

A product mix of these chemicals only matches the definition of this product benchmark if two conditions are fulfilled:

1. The ethylene content is at least 30 mass-percent of the total product mix[21] *and*
2. The product mix has a content of HVC, fuel gas, butenes and liquid hydrocarbons of together at least 50 mass-percent of the total product mix.

[21] This refers to the total HVC.

The benchmark excludes HVC from supplemental feed (hydrogen, ethylene, other HVC) that receive allocation on specific emission factors (see calculation of the preliminary allocation below).

Definition and explanation of processes and emissions covered

In FAR Annex I, point 2, referring to the ”definition of product benchmarks and system boundaries with collection of data on electricity consumption”, the rules define the system boundaries of the steam cracking (HVC) product benchmark as follows:

“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), C4-hydrogenation, hydrotreating of pyrolysis gasoline & aromatics extraction and logistics/storage for daily operation. For the purpose of data collection, the total electricity consumption within the system boundaries shall be considered. “

All processes directly or indirectly linked to the production of the following products are included:

- High value chemicals as purified product
- Intermediate product with concentrated content of the respective HVC in the lowest tradable form (raw C4, unhydrogenated pygas)

Included in the benchmarking are all equipment, which are necessary to produce the HVC as purified product or intermediate product with concentrated content of the respective HVC in the lowest tradable form (raw C4, unhydrogenated pygas), in particular:

- Acetylene hydrogenation or if installed, acetylene extraction
- Ethylene splitter
- Propylene splitter
- Hydrogen (pressure swing adsorption)
- Cooling water tower & cooling pumps
- Continuous gas to cracker flare is included. Flaring is considered as a safety device.
- Metathesis add-on units
- Cracking furnace
- Primary fractionator
- Quench

Furthermore, any utility which carries out processes directly or indirectly linked to HVC production is to be considered as included in the system boundaries of the product benchmark. This includes demineralised water, cooling water, instrument air, caustic regeneration, as well as pre-treatment of gaseous feedstocks. Similarly, all associated emissions have to be attributed to the product benchmark sub-installation

The following processes are excluded:

- C4 extraction (butadiene plant)
- C4-hydrogenation
- hydrotreating of pyrolysis gasoline & aromatics extraction
- logistics/storage for daily operation

Figure 8 gives a graphical representation of the covered processes.

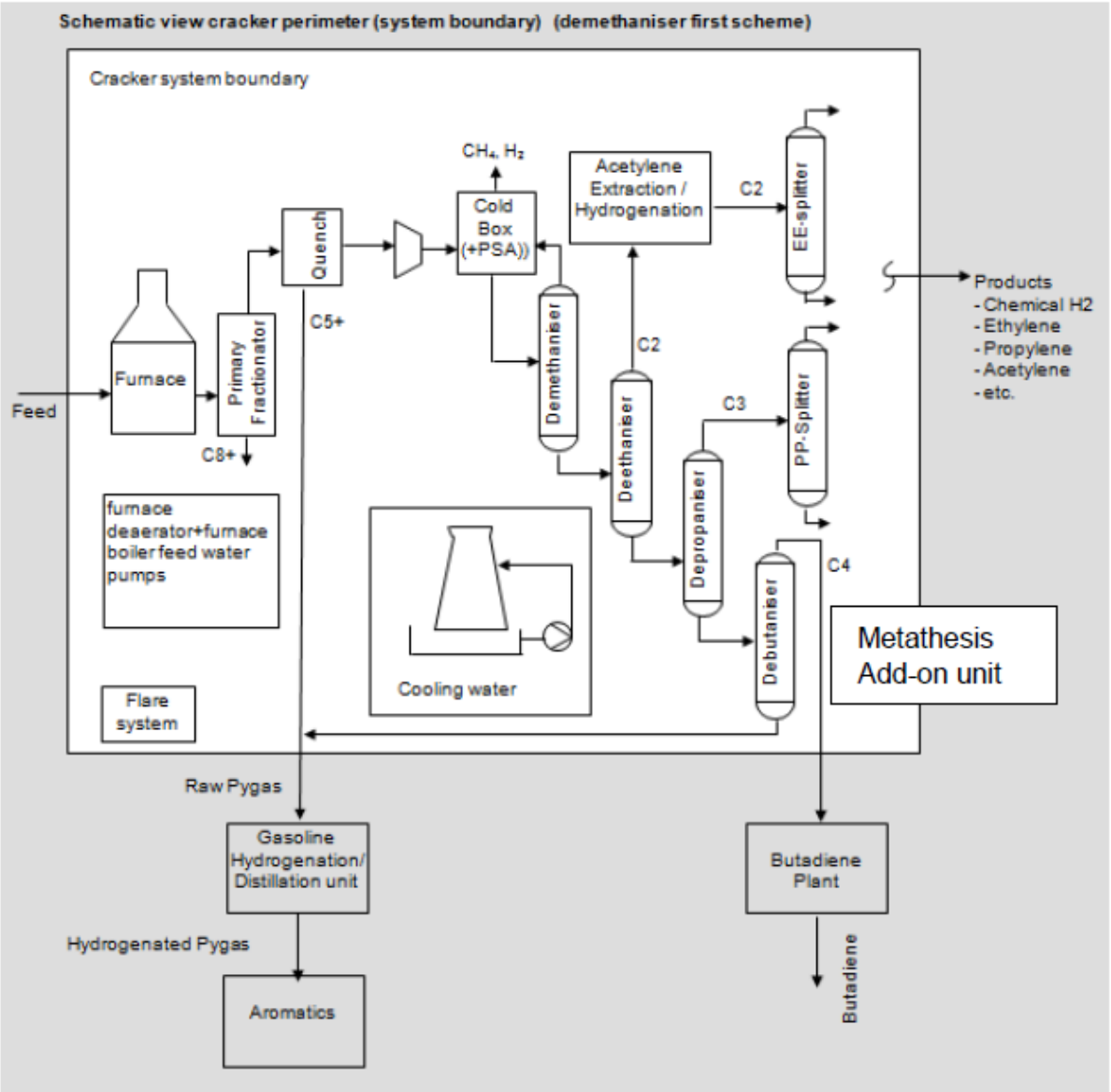

Figure 8. System boundaries of steam cracking benchmark (Rule book for Steam Cracking, 2010)

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. *See FAR for a*

definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.

Emissions related to safety flaring and other flaring of gases that are associated with the production are included, in particular:

1. Emissions from the combusted flared gas;
2. Emissions from the combustion of fuels necessary to operate a flare, which are of two types:
    a. The fuels necessary to keep a pilot flame running
    b. The fuels required to successfully combust the flared gas.

Preliminary allocation

The steam cracking benchmark does not cover the products made from so-called supplemental feed (high value chemicals that are not produced in the main process) as well as the related emissions. HVC products from supplemental feed are however considered for free allocation using specific emission factors.

Considering the above, the preliminary allocation for steam cracking should be determined by using the following specific formula:

$$F_{p,k} = [BM_{SteamCracking} \times median\left(HAL_{HVC,total,k} - HSF_{H,k} - HSF_{E,k} - HSF_{O,k}\right) + 1.78 \times median\left(HSF_{H,k}\right) + 0.24 \times median\left(HSF_{E,k}\right) + 0.16 \times median\left(HSF_{O,k}\right)] \times CLEF_{p,k}$$

Where:

$F_{p,k}$:	Annual preliminary allocation for a product benchmark sub-installation performing the process of steam cracking in year k (expressed in EUAs).
$BM_{SteamCracking}$:	Benchmark for steam cracking (expressed in EUAs / unit of product).
$CLEF_{p,k}$:	Applicable Carbon Leakage Exposure Factor for product p in year k.
$HAL_{HVC,total,k}$:	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 production of hydrogen from supplemental feed in year k of the baseline period expressed in tonnes of hydrogen.
$HSF_{E,k}$:	Historical production of ethylene from supplemental feed in year k of the baseline period expressed in tonnes of ethylene.
$HSF_{O,k}$:	Historical production of other high value chemicals from supplemental feed in year k of the baseline period expressed in tonnes of HVC. In this context, other high value chemicals are understood as the sum of acetylene, propylene, butadiene and benzene.

43. Aromatics

Benchmark name:	**Aromatics**
Benchmark number:	43
Unit:	CO_2 weighted tonne (CWT)
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	No (CBAM factor to be used is 1)
Associated Annex I activity:	Production of bulk organic chemicals by cracking, reforming, partial or full oxidation or by similar processes, with a production capacity exceeding 100 tonnes per day
Special provisions:	Provisions in Annexes II and III of the FAR

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"Mix of aromatics expressed as CO_2 weighted tonne (CWT)"

The table below shows relevant products according to definitions in PRODCOM 2010 statistics. These classifications can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on classifications in statistics.

Note that further PRODCOM coded products might be covered by this benchmark.

PRODCOM code	**Description**
20.59.56.70	Mixed alkylbenzenes, mixed alkylnaphthalenes other than HS 2707 or 2902
20.14.12.13	Cyclohexane
20.14.12.23	Benzene
20.14.12.25	Toluene
20.14.12.43	o-Xylene
20.14.12.45	p-Xylene
20.14.12.47	m-Xylene and mixed xylene isomers
20.14.12.60	Ethylbenzene
20.14.12.70	Cumene
20.14.12.90	Biphenyl, terphenyls, vinyltoluenes, cyclic hydrocarbons excluding cyclanes, cyclenes, cycloterpenes, benzene, toluene, xylenes, styrene, ethylbenzene, cumene, naphthalene, anthracene
20.14.73.20	Benzol (benzene), toluol (toluene) and xylol (xylenes)

PRODCOM code	Description
20.14.73.40	Naphthalene and other aromatic hydrocarbon mixtures (excluding benzole, toluole, xylole)

Definition and explanation of processes and emissions covered

In FAR Annex I, point 2, referring to the "definition of product benchmarks and system boundaries with collection of data on electricity consumption", the rules define the system boundaries of the aromatics product benchmark as follows:

"All processes directly or indirectly linked to 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 purpose of data collection, the total electricity consumption within the system boundaries shall be considered."

Indirect emissions from electricity consumption are not eligible for free allocation.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

Processes defined by the CWT methodology only receive allocation according to that approach if they are part of the aromatics benchmark sub-installation. When such processes occur outside those boundaries, most of them should receive allocation based on fall-back approaches. Some can however be covered by other product benchmarks; e.g., refinery or hydrogen.

Emissions related to safety flaring and other flaring of gases that are associated with the production are included, in particular:

1. Emissions from the combusted flared gas;

2. Emissions from the combustion of fuels necessary to operate a flare, which are of two types:

    a) The fuels necessary to keep a pilot flame running

    b) The fuels required to successfully combust the flared gas.

Determination of historical activity level

The concept of CO_2 weighted tonne (CWT) is used for the determination of the historical activity level. The concept of CWT defines the activity of a production process not simply as input or output, but as a function of activity levels of different process levels. This concept was initially developed to determine the allocation for refineries (see section 1). In order to ensure a level playing field for the production of aromatics in refineries and chemical plants, the free allocation of emission allowances for aromatics should be based on the CWT approach.

The historical activity level in terms of CWT should be determined as follows:

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

Where:

$TP_{i,k}$: historical activity level of process unit *i* in year k as defined for the purpose of the CWT approach

CWT_i : CWT factor for process unit *i* as defined by for the purpose of the CWT approach (see Table 4 below).

Table 4 provides a calculation of the historical activity level for a certain year. The yellow cells require input data. Process units for the purpose of the CWT approach are called CWT ”functions”.

Not all CWT functions will be performed in every installation. For some CWT functions, the historical level of activity will therefore be zero.

The appropriate measures of activity for a CWT function are shown in Table 4 and Table 5. This measure can be the annual mass (expressed in kt/year) of net fresh feed (F), or product feed (P). Fresh feed is to be understood as water free and excluding slops processing.

The reported throughput must be the actual figure for the year, even if the unit was not in operation during the whole year (e.g., new unit started-up during the year, unit idle during part of the year). Figures must be generated from either actual flow measurements and/or material balance records.

Accuracy

In order to meet the desired accuracy for CWT, throughputs must be entered in kt/a with a certain number of decimals depending on the magnitude of the CWT factor:

- For factors up to 1.99: 0 decimals
- For factors between 2.00 and 19.99: 1 decimal
- For factors between 20.00 and 99.99: 2 decimals
- For factors above 100.00: 3 decimals.

The following accuracy must be adhered to in the calculation of parameters that may be necessary to calculate direct and indirect emissions of the (sub)installation:

- Steam flows: ±5%
- Electricity production: ±5%
- Steam conditions: for steam enthalpies an accuracy of ±0.1 GJ/t is sufficient which is consistent with conditions accurate within ± 5 ºC and ± 5 bar. Note that these conditions are not used in the calculation in this document, but may nevertheless be needed in the calculation of the amount of imported and exported steam.

Table 4. Calculation of historical activity level in year k

CWT function	Historical level of activity			CWT factor		CWT
	Basis*	(kt in year k)		(-)		(kt in year k)
Naphtha/Gasoline hydrotreater	F	..	×	1.10	=	..
Aromatic Solvent Extraction	F	..	×	5.25	=	..
TDP/TDA	F	..	×	1.85	=	..
Hydrodealkylation	F	..	×	2.45	=	..
Xylene Isomerisation	F	..	×	1.85	=	..
Paraxylene production	P	..	×	6.40	=	..
Cyclohexane production	P	..	×	3.00	=	..
Cumene production	P	..	×	5.00	=	..
Historical activity level in year k (sum of CWT of processes)						$HAL_{CWT,k}$

* Measure for activity level: net fresh feed (F) or product feed (P)

Table 5. Process unit distribution

Process Unit	Solomon Process ID	Solomon Process Type	Activity basis	CWT factor	Description	Typical feed(s)	Typical product(s)
Naphtha/Gasoline Hydrotreating	NHYT		Fresh feed	1.10	A number of processes involving treating and upgrading of naphtha/gasoline and lighter streams.		Various gasoline blending components
Benzene Saturation		BSAT			Selective hydrogenation of benzene in gasoline streams over a fixed catalyst bed at moderate pressure.	Various gasoline streams, hydrogen	
Desulfurization of C4–C6 Feeds		C4C6			Desulphurisation of light naphthas over a fixed catalyst bed, at moderate pressure and in the presence of hydrogen.	Light naphtha, hydrogen	
Conventional Naphtha H/T		CONV			Desulphurisation of virgin and cracked naphthas over a fixed catalyst bed at moderate pressure and in the presence of hydrogen. For cracked naphthas also involves saturation of olefins.	Virgin and cracked naphthas/gasolines, hydrogen	
Diolefin to Olefin Saturation		DIO			Selective saturation of diolefins over a fixed catalyst bed, at moderate pressure and in the presence of hydrogen, to improve stability of thermally cracked and coker gasolines.	Thermally cracked or coker gasolines	
Diolefin to Olefin Saturation of Alkylation Feed		DIO			Selective saturation of diolefins in C4 streams for alkylation over a fixed catalyst bed, at moderate pressure and in the presence of hydrogen.	Thermally cracked or coker LPG streams, hydrogen	
FCC gasoline hydrotreating with minimum octane loss		GOCT			Selective desulphurisation of FCC gasoline cuts with minimum olefins saturation, over a fixed catalyst bed, at moderate pressure and in the presence of hydrogen.	FCC gasoline cuts, hydrogen	
Olefinic Alkylation of Thio S		OATS			A gasoline desulphurisation process in which thiophenes and mercaptans are catalytically reacted with olefins to produce higher-boiling sulphur compounds removable by distillation. Does not involve hydrogen.	FCC gasoline cuts	

Process Unit	Solomon Process ID	Solomon Process Type	Activity basis	CWT factor	Description	Typical feed(s)	Typical product(s)
S-Zorb™ Process		ZORB			Desulphurisation of naphtha/gasoline streams using a proprietary fluid-bed hydrogenation adsorption process in the presence of hydrogen.	Various naphthas/gasolines	
Selective H/T of Pygas/Naphtha Pygas/Naphtha Desulfurization Selective H/T of Pygas/Naphtha		PYGC PYGD PYGS			Selective or non-selective desulphurisation of pyrolysis gasoline (by-product of light olefins production) and other streams over a fixed catalyst bed, at moderate pressure and in the presence of hydrogen.	Pyrolysis gasoline, hydrogen	
Reactor for Selective Hydrotreating		*RXST*	n.c.	n.c.	*Special configuration where a distillation/fractionation column containing a solid catalyst that converts diolefins in FCC gasoline to olefins or when the catalyst bed is in a preheat train reactor vessel in front of the column. Contribution for this configuration is included in the generic NHYT CWT factor.*		
Aromatics Solvent Extraction (ASE) ASE: Extraction Distillation ASE: Liquid/Liquid Extraction ASE : Liq/Liq w/ Extr. Distillation	ASE	 ED LLE LLED	Fresh feed	5.25	Extraction of light aromatics from reformate and/or hydrotreated pyrolysis gasoline by means of a solvent. The CWT factor for this refinery function includes all columns and associated equipment required to purify individual aromatic products as well as solvent regeneration. CWT factor cover all feeds including Pygas after hydrotreatment. Pygas hydrotreating should be accounted under naphtha hydrotreatment.	Reformate, hydrotreated pyrolysis gasoline	Mixed aromatics or purified benzene, toluene, mixed xylenes, C9+ aromatics, paraffinic raffinate
Benzene Column *Toluene Column* *Xylene Rerun Column* *Heavy Aromatics Column*		*BZC* *TOLC* *XYLC* *HVYARO*	*n.c.* *n.c.* *n.c.* *n.c.*	*n.c.* *n.c.* *n.c.* *n.c.*	*The contribution of all columns and associated equipment required to purify individual aromatics is included in ASE.*		
Hydrodealkylation	HDA		Fresh feed	2.45	Dealkylation of toluene and xylenes into benzene over a fixed catalyst bed and in the presence of hydrogen at low to moderate pressure.	Toluene, Xylenes, hydrogen	Benzene
Toluene Disproportionation / Dealkylation (TDP/TDA)	TDP		Fresh feed	1.85	Fixed-bed catalytic process for the conversion of toluene to benzene and xylene in the presence of hydrogen		
Cyclohexane production	CYC6		Product	3.00	Hydrogenation of benzene to cyclohexane over a catalyst at high pressure.	Benzene, hydrogen	Cyclohexane

Process Unit	Solomon Process ID	Solomon Process Type	Activity basis	CWT factor	Description	Typical feed(s)	Typical product(s)
Xylene Isomerisation	XYISOM		Fresh feed	1.85	Isomerisation of mixed xylenes to paraxylene	Mixed xylenes	Paraxylene-rich mixed xylenes
Paraxylene Production Paraxylene Adsorption Paraxylene Crystallization	PXYL	 ADS CRY	Product	6.40	Physical separation of para-xylene from mixed xylenes.	Paraxylene-rich mixed xylenes	Paraxylene, other mixed xylenes
Xylene Splitter *Orthoxylene Rerun Column*		*XYLS* *OXYLRC*			*The contribution of these columns and associated equipment is included in PXYL.*		
Cumene production	CUM		Product	5.00	Alkylation of benzene with propylene	Benzene, propylene	Cumene

44. Styrene

Benchmark name:	**Styrene**
Benchmark number:	44
Unit:	Tonnes of styrene (saleable product)
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	No (CBAM factor to be used is 1)
Associated Annex I activity:	Production of bulk organic chemicals by cracking, reforming, partial or full oxidation or by similar processes, with a production capacity exceeding 100 tonnes per day
Special provisions:	-

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"Styrene monomer (vinyl benzene, CAS number: 100-42-5). Expressed in tonnes of styrene (saleable product)."

The table below shows relevant products according to definitions in PRODCOM 2010 statistics. PRODCOM codes can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on PRODCOM codes reported in statistics.

PRODCOM code	**Description**
20.14.12.50	Styrene

Definition and explanation of processes and emissions covered

In FAR Annex I, point 2, referring to the "definition of product benchmarks and system boundaries with collection of data on electricity consumption", the rules define the system boundaries of the styrene product benchmark as follows:

"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 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 purpose of data collection, the total electricity consumption within the system boundaries shall be considered."

Installation boundaries include ethylbenzene and styrene production and all related equipment needed to produce these materials, such as raw material purification, product purification, waste water and waste gas treatment facilities, loading facilities and other directly related areas normally included in the plant production area including cooling water facilities, instrument air supply and nitrogen supply. Energy for these services is taken into account, whether supplied directly by the styrene producer or purchased from an on-site supplier.

In general, styrene monomer (SM) can be produced via two process routes: via dehydrogenation (conventional) and via the Propylene Oxide – Styrene Monomer (PO-SM) route. In the PO-SM route, a split of emissions is needed between SM related sections (included in product benchmark), PO related sections (excluded from product benchmark) and a section related to both PO and SM, "the oxidation section". The product benchmark covers 50% of the energy consumption of the oxidation section (a large EB recycle stream is included), 100% of the energy consumption related to the SM sections (including EB recovery, MBA distillation, hydrogenation and dehydration) and 0% of the energy consumption related to the PO section (including epoxidation, propylene distillation and PO purification).

For installations producing both propylene oxide and styrene monomer, the facilities exclusively dedicated to propylene and propylene oxide unit operations are excluded from this product benchmark.

Shared facilities such as for waste treatment are covered by the styrene benchmark insofar deemed appropriate. For instance, if a waste water facility treats 30% waste water from styrene production and 70% waste water from other facilities on the same site, then 30% of the direct emissions for the waste water facility are covered by styrene production.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

45. Phenol/acetone

Benchmark name:	**Phenol/ acetone**
Benchmark number:	45
Unit:	Tonnes of phenol, acetone and the byproduct alphamethyl styrene (saleable product, 100% purity)
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	No (CBAM factor to be used is 1)
Associated Annex I activity:	Production of bulk organic chemicals by cracking, reforming, partial or full oxidation or by similar processes, with a production capacity exceeding 100 tonnes per day
Special provisions:	-

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"Sum of phenol, acetone and the byproduct alpha-methyl styrene as total production, expressed in tonnes of saleable product at 100% purity."

Phenol and acetone are covered by the 2010 PRODCOM code listed in the table below. PRODCOM codes can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on PRODCOM codes reported in statistics.

The production of phenol salts is not covered by this benchmark.

PRODCOM code	**Description**
20.14.24.10	Monophenols
20.14.62.11	Acetone

Definition and explanation of processes and emissions covered

The FAR defines the system boundaries as follows:

"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 [alpha-methylstyrene] recovery for export*
- *AMS hydrogenation for ISB [inside system boundaries] 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 [outside system boundaries]) as well as*
- *Any support fuel consumption."*

Emissions related to the production of the consumed electricity are excluded from the system boundaries.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

Emissions related to safety flaring and other flaring of gases that are associated with the production are included, in particular:

1. Emissions from the combusted flared gas;
2. Emissions from the combustion of fuels necessary to operate a flare, which are of two types:
    a) The fuels necessary to keep a pilot flame running
    b) The fuels required to successfully combust the flared gas.

46. Ethylene oxide (EO)/ethylene glycols (EG)

Benchmark name:	**Ethylene oxide/ ethylene glycols**
Benchmark number:	46
Unit:	Tonnes of EO-equivalents (EOE), defined as the amount of EO (in mass) that is embedded in one mass unit of any of the specific glycols defined under this benchmark
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	No (CBAM factor to be used is 1)
Associated Annex I activity:	Production of bulk organic chemicals by cracking, reforming, partial or full oxidation or by similar processes, with a production capacity exceeding 100 tonnes per day
Special provisions:	Provisions in Annex III of the FAR

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"The ethylene oxide/ ethylene glycol benchmark covers the products

- *Ethylene oxide (EO, high purity)*
- *Monoethylene glycol (MEG, standard grade + fibre grade (high purity))*
- *Diethylene glycol (DEG)*
- *Triethylene glycol (TEG)*

The total amount of products is expressed in terms 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."

In installations, product ratios ranging from "EO-only" to "EG-only" can be encountered.

The table below shows relevant products according to the definitions in PRODCOM 2010 statistics. PRODCOM codes can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on PRODCOM codes reported in statistics.

Other polyether alcohols covered by PRODCOM 20.16.40.15 are not covered by this benchmark.

PRODCOM code	**Description**
20.14.63.73	Oxirane (ethylene oxide)
20.14.23.10	Ethylene glycol (ethanediol)
20.14.63.33	2,2-Oxydiethanol (diethylene glycol; digol)
20.16.40.15	Polyethylene glycols and other polyether alcohols, in primary forms

Definition and explanation of processes and emissions covered

In FAR Annex I, point 2, referring to the ”definition of product benchmarks and system boundaries with collection of data on electricity consumption”, the rules define the system boundaries of the ethylene oxide (EO)/ethylene glycols (EG) product benchmark as follows:

“All processes directly or indirectly linked to the process units EO production, EO purification and glycol section are included. For the purpose of data collection, the total electricity consumption within the system boundaries shall be considered.”

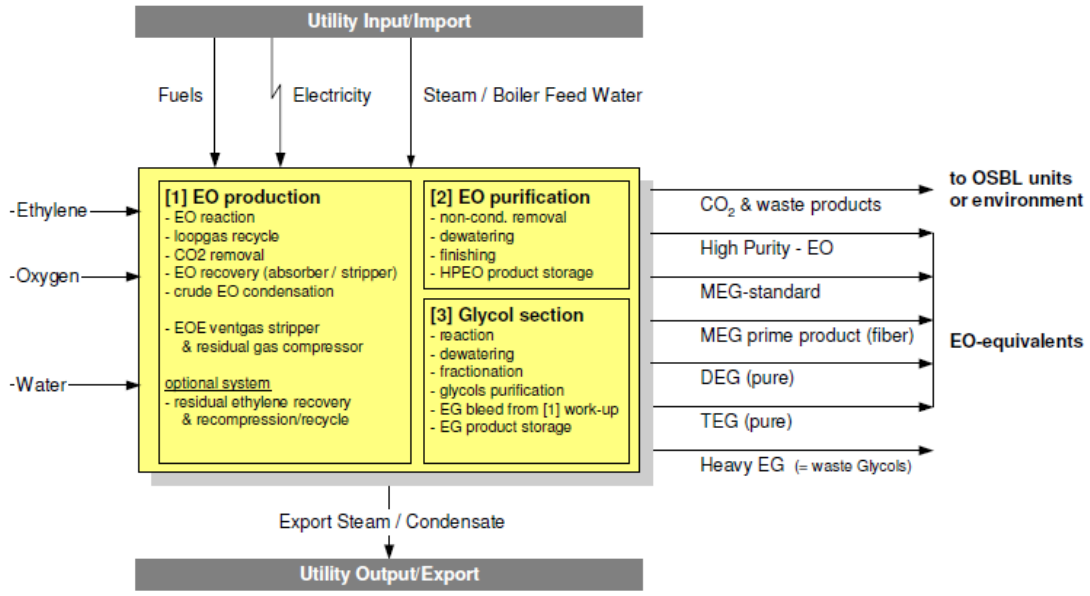

Figure 9: Inputs and outputs of EO and EG units that are covered by the benchmark. (PDC (2010), Rule Book for the Ethylene Oxide and Derivatives Sector)

The following process systems are included in the perimeter for the EO-EG benchmark[22],[23]:

Unit-1

- EO reaction
- Loop gas recycle
- CO_2 removal
- EO recovery (absorber/stripper)
- Crude EO condensation

also included is:

- If the cooling water generation system is inside the EO-EG system boundary, the energy use of cooling water generation allocated to UNIT-1

[22] If process systems are shared with other systems (outside the EO-EG system boundary), e.g., shared cooling water systems, only their CO_2 emission allocated to EO-EG production is taken into account.

[23] Here and below: PDC (2010), Rule Book for the Ethylene Oxide and Derivatives Sector

- Electricity consumption of air coolers
- Energy use during start-up periods (e.g., start-up boilers) allocated to UNIT-1
- EOE vent gas scrubber & residual gas recycle compressor
- Residual ethylene recovery & recompression/recycle (if such a system is present)

Unit-2

- Non-condensables removal
- Dewatering
- Finishing
- HPEO product cooling (bringing & keeping HPEO to storage conditions)

also included is:

- Energy use during start-up periods allocated to UNIT-2
- Electricity consumption of air coolers
- If the cooling water generation system is inside the EO-EG system boundary, the energy use of cooling water generation allocated to UNIT-UNIT-2
- Electricity consumption of a refrigeration system that produces a cold-utility to bring & to keep HPEO product at storage temperature.

Unit-3

- Reaction
- Dewatering
- Fractionation
- Glycols purification
- Work-up/handling of the EG bleed originating from UNIT-1 work-up

also included is:

- Energy use during start-up periods allocated to UNIT-3
- Electricity consumption of air coolers
- If the cooling water generation system is inside the EO-EG system boundary, the energy use of cooling water generation allocated to UNIT-UNIT-3

Processes included in the overall system boundary encompassing all units are:

- Direct heat flows due to "process-to-process" heat-integration between UNIT-1, UNIT-2 and/or UNIT-3
- Direct heat flows due to "process-to-process" heat-integration between the EO-EG system and an OSBL system
- Storage of end-products

The system boundary does not include:

- Direct fuel consumption for incineration
- Energy use for (waste)water treatment

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

Emissions related to safety flaring and other flaring of gases that are associated with the production are included, in particular:

1. Emissions from the combusted flared gas;
2. Emissions from the combustion of fuels necessary to operate a flare, which are of two types:
    a) The fuels necessary to keep a pilot flame running
    b) The fuels required to successfully combust the flared gas.

Determination of historical activity level

The unit of product is defined as EO-equivalents: the amount of EO (in mass) that is embedded in one mass unit of any of the specific glycols defined under the next heading. The following formula is to be used to determine the historical activity level in terms of EO-equivalents:

$$HAL_{EO/EG} = Median\left(\sum_{i=1}^{n}\left(HAL_{i,k} \times CF_{EOE,i}\right)\right)$$

Where:

$HAL_{EO/EG}$: 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 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. The following conversion factors need to be applied:

- Ethylene oxide: 0.926
- Monoethylene glycol: 0.717
- Diethylene glycol: 1,174
- Triethylene glycol: 1,429

47. Vinyl chloride monomer (VCM)

Benchmark name:	**Vinyl chloride monomer**
Benchmark number:	47
Unit:	Tonnes of vinyl chloride (saleable product, 100% purity)
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	No (CBAM factor to be used is 1)
Associated Annex I activity:	Production of bulk organic chemicals by cracking, reforming, partial or full oxidation or by similar processes, with a production capacity exceeding 100 tonnes per day
Special provisions:	Article 20 of the FAR

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"Vinyl chloride (chloroethylene). Expressed in tonnes of vinyl chloride (saleable product, 100% purity)."

The table below shows relevant products according to definitions in PRODCOM 2010 statistics. PRODCOM codes can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on PRODCOM codes reported in statistics.

PRODCOM code	**Description**
20.14.13.71	Vinyl chloride (chloroethylene)

Definition and explanation of processes and emissions covered

The FAR defines the system boundaries as follows:

"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 benchmark.

The production of oxygen and compressed air used as raw materials in VCM manufacture are excluded from the benchmark."

Emissions related to the production of the consumed electricity are excluded from the system boundaries.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

Emissions related to safety flaring and other flaring of gases that are associated with the production are included, in particular:

1. Emissions from the combusted flared gas;
2. Emissions from the combustion of fuels necessary to operate a flare, which are of two types:
    a) The fuels necessary to keep a pilot flame running
    b) The fuels required to successfully combust the flared gas.

Preliminary allocation

In the production of VCM, hydrogen can be used to some extent as a fuel substituting conventional fuels such as natural gas, thus reducing the direct emission of the combustion process. Considering the very high greenhouse gas intensity of hydrogen production, the VCM benchmark value accounts for the use of hydrogen as if it was natural gas.[24]

[24] Art.20 of the FAR: "By way of derogation from Article 16(2), point (a) and Article 18(1), point (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, calculated on the basis of the historical net heat import expressed as terajoules times the value of the heat benchmark for the relevant allocation period, 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 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 where the start of normal operation occurs 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."

48. S-PVC

Benchmark name:	**S-PVC**
Benchmark number:	48
Unit:	Tonnes of S-PVC (saleable product, 100% purity)
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	No (CBAM factor to be used is 1)
Associated Annex I activity:	Production of bulk organic chemicals by cracking, reforming, partial or full oxidation or by similar processes, with a production capacity exceeding 100 tonnes per day
Special provisions:	-

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"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 (saleable product, 100% purity)."

The table below shows the relevant product according to the definition in PRODCOM 2010 statistics. PRODCOM codes can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on PRODCOM codes reported in statistics.

Note that PRODCOM code 20.16.30.10 also covers the E-PVC benchmark (see section 49).

PRODCOM code	**Description**
20.16.30.10	Polyvinyl chloride, not mixed with any other substances, in primary forms.

Definition and explanation of processes and emissions covered

The FAR defines the system boundaries as follows:

"All processes directly or indirectly linked to the production of S-PVC are included except the production of VCM."

Emissions related to the production of the consumed electricity are excluded from the system boundaries.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. *See FAR for a*

definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.

49. E-PVC

Benchmark name:	**E-PVC**
Benchmark number:	49
Unit:	Tonnes of E-PVC (saleable product, 100% purity)
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	No (CBAM factor to be used is 1)
Associated Annex I activity:	Production of bulk organic chemicals by cracking, reforming, partial or full oxidation or by similar processes, with a production capacity exceeding 100 tonnes per day
Special provisions:	-

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"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)."

The table below shows relevant products according to definitions in PRODCOM 2010 statistics. PRODCOM codes can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on PRODCOM codes reported in statistics.

Note that PRODCOM code 20.16.30.10 also covers the S-PVC benchmark (see section 48).

PRODCOM code	**Description**
20.16.30.10	Polyvinyl chloride, not mixed with any other substances, in primary forms

Definition and explanation of processes and emissions covered

The FAR defines the system boundaries as follows:

"All processes directly or indirectly linked to the production of E-PVC are included except the production of VCM."

Emissions in the production process of E-PVC usually arise from the use of steam, cooling, and fuels (light fuel oil, natural gas).

Emissions related to the production of the consumed electricity are excluded from the system boundaries.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the

heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

50. Hydrogen

Benchmark name:	**Hydrogen**
Benchmark number:	50
Unit:	Tonnes of hydrogen (100% purity as net saleable production)
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	Some products fall under CBAM (in which case the CBAM factor of the relevant year is to be used), others not (in which case the CBAM factor to be used is 1). Therefore 2 sub-installations are possible: - "Hydrogen, CBAM" - "Hydrogen, non-CBAM"
Associated Annex I activity:	Production of hydrogen (H_2) and synthesis gas with a production capacity exceeding 5 tonnes per day
Special provisions:	Provisions in Annex III of the FAR

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"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.

Hydrogen used for ammonia production is not covered by this benchmark but under the ammonia benchmark.

Hydrogen produced by chloralkali electrolysis or by chlorate production or released from chemical conversion from hydrogen carriers used to transport hydrogen from production facilities is not covered by this benchmark."

The following products are covered by the benchmark for hydrogen:

- Pure hydrogen
- Mixtures of hydrogen and carbon monoxide having a hydrogen content >=60% volume fraction of the total amount of hydrogen plus carbon monoxide. These mixtures are called synthesis gases or syngases, and differ from each other with regards to the hydrogen share in the total synthesis gas. The total amount of hydrogen plus carbon monoxide referred to is the sum of all hydrogen and carbon monoxide in all containing product streams exported from the installation.

Other mixtures of hydrogen and carbon monoxide (i.e., mixture having a hydrogen content <60% volume fraction of the total amount of hydrogen plus carbon monoxide) are not covered by the product benchmark for hydrogen, but by the product benchmark for synthesis gas (see section 51).

Furthermore, hydrogen produced by electrolysis of water is covered by this benchmark.

The table below shows the relevant product according to the definition in PRODCOM 2010 statistics. PRODCOM codes can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on PRODCOM codes reported in statistics.

PRODCOM code	Description
20.11.11.50	Hydrogen

Where mixtures with fluctuating hydrogen content are produced, or multiple saleable mixtures of different hydrogen contents are produced and sold in parallel, the system boundaries should be set to define sub-installations as close to reality as possible. For example:

- Production line A produces pure hydrogen for the market: here the operator should establish the Hydrogen, CBAM sub-installation and include all related amounts in the corresponding activity level;
- Production line B produces and sells mixtures of H_2/CO of 50:50 vol% between 00:00 and 13:00 each day and a 70:30 between 13:01 and 23:59. The amounts produced during the 70:30 campaigns mix should be included under a Hydrogen, non-CBAM sub-installation, while the amounts with the 50:50 mix should be reported under the "Syngas" benchmark (see next section).

Definition and explanation of processes and emissions covered

In FAR Annex I, point 2, referring to the 'definition of product benchmarks and system boundaries with collection of data on electricity consumption', the rules define the system boundaries of the hydrogen product benchmark as follows:

"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 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 purpose of data collection, the total electricity consumption within the system boundaries shall be considered."

The system boundaries are visualised in Figure 10. In line with the above definition, the following production steps should in particular be regarded as being within the system boundaries:

- Chemical conditioning of feed
- H_2/CO generation with associated combustion air fans
- Water-gas shift (if present)

- Separation & purification functions as present: cryogenic (including liquid CO recycle duty); adsorption; absorption; membrane
- Related cooling and process water pumping duty.

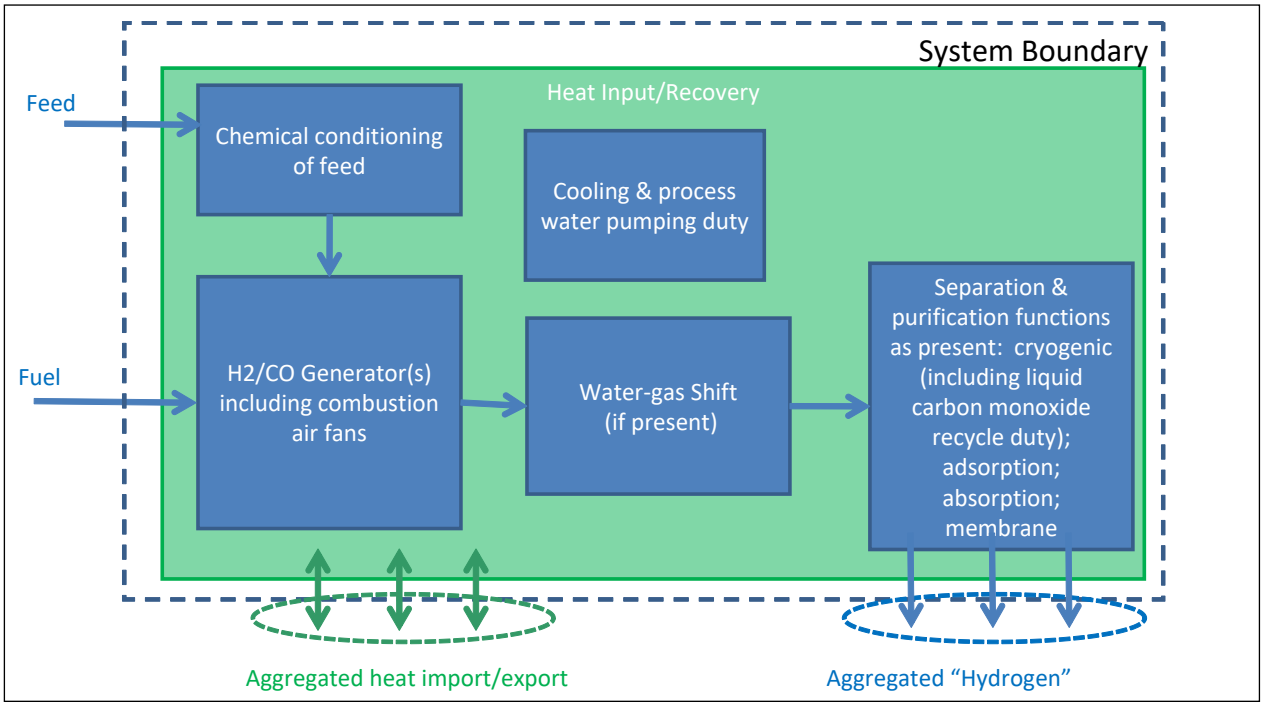

Figure 10. System boundaries of the hydrogen product benchmark (Sector Rule book for hydrogen and syngas, 2010)

The production of hydrogen that is covered by another product benchmark, e.g., the refinery products or syngas benchmark, cannot be covered by the hydrogen benchmark. In particular, this is the case for hydrogen extracted from a waste gas that is produced in a process covered by product benchmark as most product benchmarks include *"all processes directly or indirectly linked to the production"*.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

Determination of historical activity level

In order to ensure a level playing field between production of pure hydrogen and production of mixtures of hydrogen with carbon monoxide, the historic activity levels are corrected adding the theoretical additional stoichiometric equivalent of hydrogen produced under full water-gas shift

reaction to the actual amount of hydrogen produced. The historical activity level to be used in the determination of free allocation should therefore be determined as follows:

$$HAL_{H2} = MEDIAN\left(\left(HAL_{H2,act} + HAL_{H2,WGS}\right) \cdot \frac{Em_{act}}{Em_{act} + Em_{WGS}}\right)$$

$$Em_{act} = DirEm_{act} - Heat_{export,act} \cdot BM_{heat}$$

$$Em_{WGS} = CO_{WGS} \cdot \frac{M_{CO2}}{M_{CO}} - Heat_{export,WGS} \cdot BM_{heat}$$

Where:

HAL_{H2}	Historical activity level for hydrogen production referred to 100% hydrogen
$HAL_{H2,act}$:	Actual hydrogen production (referred to 100% hydrogen)
$HAL_{H2,WGS}$:	additional hydrogen production under theoretical complete water gas shift (WGS) reaction, calculated via the stoichiometric ratio as $HAL_{CO,\ act}$ x 0,071967 t H_2/tCO for the WGS reaction
$HAL_{CO,act}$:	Actual carbon monoxide production (referred to 100% CO)
Em_{act}:	Emissions related to actual hydrogen production
Em_{WGS}:	Additional emissions related to hydrogen production from theoretical complete WGS reaction
$DirEm_{act}$:	Actual direct emissions excluding heat-related emissions, prior to any CO_2 further subject to carbon capture and geological storage or carbon capture and use for products listed in the forthcoming delegated acts pursuant to Article 12(3b) of the EU ETS Directive. For emissions stemming from biomass, the emissions shall be calculated as the energy content from biomass multiplied with the emission factor of natural gas instead of the actual emissions
$Heat_{export,act}$:	Actual net heat export
BM_{heat}:	The value of the heat benchmark for measurable heat for the relevant allocation period
CO_{WGS}:	The amount of CO produced prior to the additional theoretical conversion into CO_2 via the WGS reaction
M_{CO2}:	Molecular mass of CO_2 (44,01 g/mol)
M_{CO}:	Molecular mass of CO (28,01 g/mol)
$Heat_{export,WGS}$:	Theoretical additional net heat export after full WGS reaction assuming 99,5 % heat recovery, calculated via the reaction enthalpy of the WGS reaction (-20,439 GJ/t H_2 produced) multiplied with $HAL_{H2,WGS}$ and with the 99,5 % efficiency of recovery

Note that in cases where the denominator "Em_{act}+Em_{WGS}" is zero (e.g. where H_2 is produced via electrolysis without any emissions), the term $\frac{Em_{act}}{Em_{act}+Em_{WGS}}$should be set to "1".

51. Synthesis gas

Benchmark name:	**Synthesis gas**
Benchmark number:	51
Unit:	Tonnes of synthesis gas referred to 47% hydrogen as net saleable production
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	No[25] (CBAM factor to be used is 1)
Associated Annex I activity:	Production of hydrogen (H_2) and synthesis gas with a production capacity exceeding 25 tonnes per day
Special provisions:	Provisions in Annex III of the FAR

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"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."

Other mixtures of hydrogen and carbon monoxide (i.e., mixture having a hydrogen content ≥60% volume fraction of the total amount of hydrogen plus carbon monoxide) are not covered by the product benchmark for synthesis gas, but by the product benchmark for hydrogen.

For the calculation of the historical activity levels, the hydrogen content needs to be at least 38.37% (volume fraction of the total amount of hydrogen plus carbon monoxide). For synthesis gases with lower hydrogen contents, the synthesis gas benchmark cannot be applied.

The production of synthesis gas belongs to NACE code 20.11 and table below shows the PRODCOM 2010 for hydrogen. There is no single PRODCOM code for carbon monoxide (20.11.12.90 is inorganic oxygen compounds of non-metals) or synthesis gas. Note that the listed PRODCOM code also applies to the Hydrogen benchmark (section 50).

PRODCOM code	**Description**
20.11.11.50	Hydrogen

[25] The BM51 – Synthesis gas is currently not affected, if the hydrogen contained in the gas is used for producing non-CBAM goods such as Methanol. (Annex II of the CBAM Implementing act, Section 3.6.1 clarifies: "*Only the production of pure hydrogen or mixtures of hydrogen with nitrogen usable in ammonia production shall be considered. Not covered are the production of synthesis gas or of hydrogen within refineries or organic chemical installations, where hydrogen is exclusively used within those plants and not used for the production of goods listed in Annex I to Regulation (EU) 2023/956* [the CBAM Regulation]."

Definition and explanation of processes and emissions covered

In FAR Annex I, point 2, referring to the ”definition of product benchmarks and system boundaries with collection of data on electricity consumption”, the rules define the system boundaries of the synthesis gas product benchmark as follows:

“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 purpose of data collection, the total electricity consumption within the system boundaries shall be considered.”

The system boundaries are visualised in Figure 11. In line with the definition above, the following production steps should in particular be regarded as being within the system boundaries:

- Chemical conditioning of feed
- H_2/CO generation with associated combustion air fans
- Water-gas shift (if present)
- Separation & purification functions as present: cryogenic (including liquid CO recycle duty); adsorption; absorption; membrane
- Related cooling and process water pumping duty.

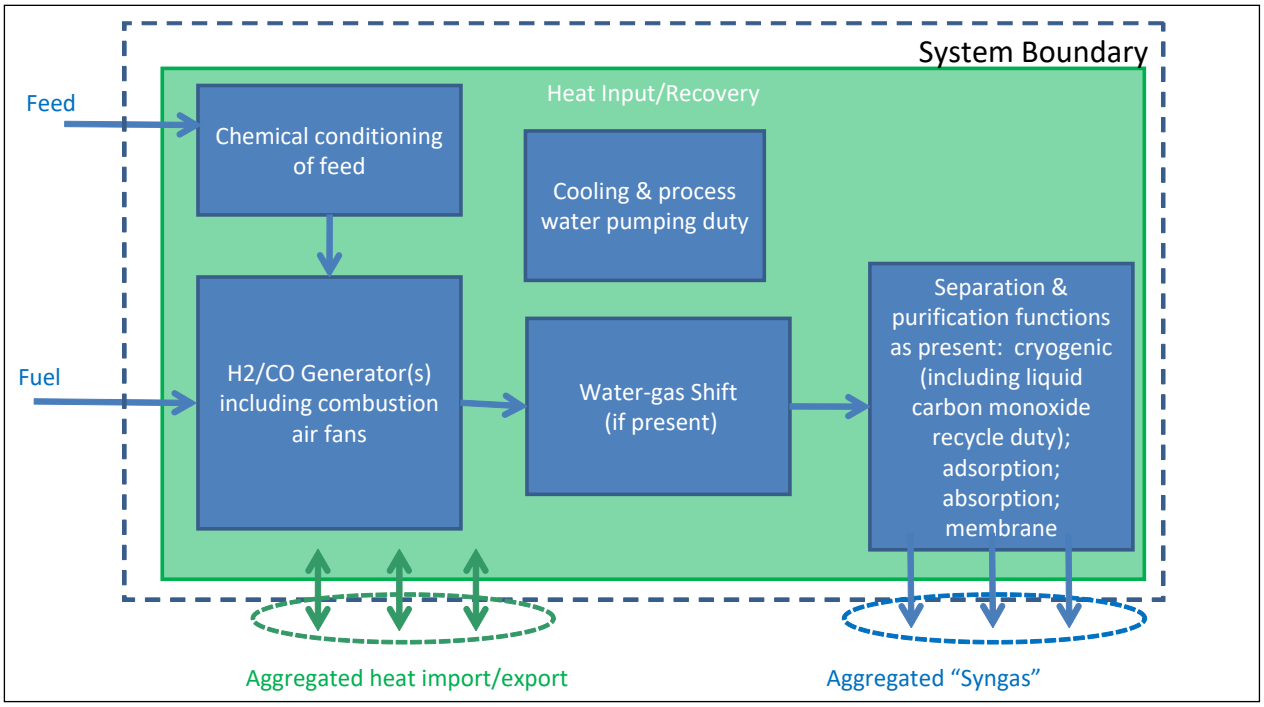

Figure 11. System boundaries of the synthesis gas product benchmark (Sector Rule book for hydrogen and syngas, 2010)

Indirect emissions from electricity consumption are not eligible for free allocation.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

Determination of historical activity level

In order to ensure a level playing field for the production of synthesis gas in refineries and chemical plants, the free allocation of emission allowances for synthesis production has been brought in line with the CWT approach for refineries by referring to a defined volumetric concentration of hydrogen. The historical activity level to be used in the determination of free allocation should be determined as follows:

$$HAL_{Syngas} = Median\left(HAL_{H2+CO,k} \times \left(1 - \frac{0.47 - VF_{H2,k}}{0.0863}\right) \times 0.0007047\right)$$

Where:

HAL_{Syngas} : Historical activity level for synthesis gas production referred to 47% hydrogen.

$HAL_{H2+CO,k}$: Historical activity level for synthesis gas production referred to historical hydrogen content expressed in norm cubic meters per year referring to 0°C and 101.325 kPa in year k of the baseline period.

$VF_{H2,k}$: Historical production volume fraction of pure hydrogen in year k of the baseline period.

52. Soda ash

Benchmark name:	**Soda ash**
Benchmark number:	52
Unit:	Tonnes of soda ash (as total gross production)
Carbon leakage exposure:	Yes (CLEF to be used is 1)
Under the CBAM scope:	No (CBAM factor to be used is 1)
Associated Annex I activity:	Production of soda ash (Na_2CO_3) and sodium bicarbonate ($NaHCO_3$)
Special provisions:	-

Definition and explanation of products covered

According to the FAR this product benchmark covers:

"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."

The table below shows relevant products according to definitions in PRODCOM 2010 statistics. PRODCOM codes can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on PRODCOM codes reported in statistics.

PRODCOM code	**Description**
20.13.43.10	Disodium carbonate

Definition and explanation of processes and emissions covered

The FAR defines the system boundaries as follows:

"All processes directly or indirectly linked to the process units

- *brine purification,*
- *limestone calcination and milk of lime production,*
- *carbon dioxide reactors,*
- *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."

Emissions related to the production of the consumed electricity are excluded from the system boundaries.

The export of measurable heat (steam, hot water, etc.) is not covered by this product benchmark and might be eligible for free allocation, regardless of whether heat is exported to an ETS consumer or a consumer not covered by the ETS. However, when heat is exported to a consumer covered by the ETS, the consumer will get the free allocation only where a heat benchmark is applied (allocation for heat is already covered by the product benchmark). In the case of export to non-ETS consumers, the heat exporter receives the free allocation and up to four sub-installations based on the heat benchmark (including a possible district heating sub-installation) should be foreseen. *See FAR for a definition of measurable heat and Guidance Document 6 on Cross-Boundary Heat Flows for guidance on this topic.*

Note: following the revised definition of 'emissions' in Article 3(b) of the EU ETS Directive and the ensuing change of the system boundaries for soda ash as stipulated in section 20 of Annex IV of the Monitoring & Reporting Regulation, the amount of CO_2 bound in soda ash will have to be reported as emitted as of 2026 (based on the monitoring during 2025). To this end, the methodology for the update of the soda ash benchmark applicable for 2026-2030 will be revised by adding the corresponding emissions (stoichiometric value of 0,415 tCO_2/t soda ash) to the Phase 3 benchmark value and to each installation's GHG intensity in 2021/2022.

For the year 2025, a similar update of the benchmark will be made, following the calculations described in recital 3 of Commission Implementing Regulation (EU) 2021/447.

Annex A List of PRODCOM codes per benchmark and comparison to the 2019 version of Guidance Document 9

This annex lists the most relevant changes to the 2019 version of Guidance Document 9 in the current, 2024 version, including the PRODCOM codes per benchmark

The main changes compared to the previous version of this Guidance Document can be categorised as follows:

- Where the update of the allocation rules had an impact on the free allocation calculation, this has been reflected in the description of each product benchmark, in particular the deletion of the exchangeability rule, the change from arithmetic mean to median, and the inclusion of CBAM.
- Benchmark definitions have been updated in line with Annex I of the revised FAR (including products, processes and emissions covered).
- The rule defined in FAR Article 16(5) relating to the flaring of waste gases, and which applies from 2026, has been reflected in the formulae calculating free allocation, where deemed relevant.
- Some elements relating to GD9 that had previously been published in FAQs have been added.

The table below lists the PRODCOM 2010[26] codes that have been identified per product benchmark. This list is not exhaustive for all benchmarks.

PRODCOM codes can be useful in identifying and defining products. As a general guideline, the identification of the products should never solely rely on PRODCOM codes reported in statistics.

[26] The full 2010 list of PRODCOM codes can be found at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32010R0860&from=EN

Benchmark name	BM number	PRODCOM code 2010	Could also be covered by:	PRODCOM description	PRODCOM code 2004
Refinery products	1	None, use PRODCOM 2004		Aviation gasoline	**23.20.11.40**
	1	None, use PRODCOM 2004		Motor gasoline, unleaded	**23.20.11.50**
	1	None, use PRODCOM 2004		Motor gasoline, leaded	**23.20.11.70**
	1	None, use PRODCOM 2004		Gasoline type jet fuel	**23.20.12.00**
	1	None, use PRODCOM 2004		Light naphtha	**23.20.13.50**
	1	None, use PRODCOM 2004		Medium naphtha	**23.20.16.50**
	1	None, use PRODCOM 2004		White spirit, industrial spirit	**23.20.13.70**
	1	None, use PRODCOM 2004		Kerosene-type jet fuel and other kerosene	**23.20.14.00**
	1	None, use PRODCOM 2004		Derv fuel (diesel)	**23.20.15.50**
	1	None, use PRODCOM 2004		Heating gas-oil	**23.20.15.70**
Coke	2	None, use PRODCOM 2004		Coke-oven coke (obtained from the carbonisation of coking coal, at high temperature), gas-works coke (by-product of gas-works plants)	**23.10.10.30**
Agglomerated iron ore	3	**07.10.10.00**		Iron ores and concentrates (excluding roasted iron pyrites)	
	3	**Partially includes NACE rev2.0 24.10**		Manufacture of basic iron and steel and of ferro-alloys	
Hot metal	4	No associated PRODCOM codes available			
EAF carbon steel	5	**24.10.21.10**		Flat semi-finished products (of non-alloy steel)	
	5	**24.10.21.21**		Ingots, other primary forms and long semi-finished products for seamless tubes (of non-alloy steel)	
	5	**24.10.21.22**		Other ingots, primary forms and long semi-finished products including blanks (of non-alloy steel)	
EAF high alloy steel	6	**24.10.23.10**		Flat semi-finished products (of alloy steel other than of stainless steel)	
	6	**24.10.23.21**		Ingots, other primary forms and long semi-finished products for seamless tubes (of alloy steel other than of stainless steel)	
	6	**24.10.23.22**		Other ingots, primary forms and long semi-finished products (of alloy steel other than of stainless steel)	
	6	**24.10.22.10**		Flat semi-finished products (slabs) (of stainless steel)	

Benchmark name	BM number	PRODCOM code 2010	Could also be covered by:	PRODCOM description	PRODCOM code 2004
	6	**24.10.22.21**		Ingots, other primary forms and long semi-finished products for seamless tubes (of stainless steel)	
	6	**24.10.22.22**		Other ingots, primary forms and long semi-finished products (of stainless steel)	
Iron casting	7	**Partially includes NACE rev2.0 24.51**		Manufacture of cast iron tubes	
	7	**Partially includes NACE rev2.0 24.52**		Casting of iron	
	7	**24.51.20.00**		Tubes, pipes and hollow profiles of cast iron excluding tubes, pipes, hollow profiles made into identifiable parts of articles, such as sections of central heating radiators and machinery parts	
	7	**24.51.30.30**		Tube or pipe fittings, of non-malleable cast iron	
	7	**24.51.30.50**		Tube or pipe fittings of malleable cast iron	
	7	**24.52.30.00**		Tube or pipe fittings of cast steel	
	7	**24.51.11.10**		Malleable iron castings for land vehicles, piston engines and other machinery and mechanical appliances	
	7	**24.51.11.90**		Parts for other utilisation (malleable iron casting)	
	7	**24.51.12.10**		Parts of land vehicles (nodular iron castings)	
	7	**24.51.12.20**		Ductile iron castings for transmission shafts, crankshafts, camshafts, cranks, bearing housings and plain shaft bearings (excluding for bearing housings incorporating ball or roller bearings)	
	7	**24.51.12.40**		Other parts of piston engines and mechanical engineering (nodular iron castings)	
	7	**24.51.12.50**		Ductile iron castings for machinery and mechanical appliances excluding for piston engines	
	7	**24.51.12.90**		Ductile iron castings for locomotives/rolling stock/parts, use other than in land vehicles, bearing housings, plain shaft bearings, piston engines, gearing, pulleys, clutches, machinery	

Benchmark name	BM number	PRODCOM code 2010	Could also be covered by:	PRODCOM description	PRODCOM code 2004
	7	**24.51.13.10**		Grey iron castings for land vehicles (excluding for locomotives or rolling stock, construction industry vehicles)	
	7	**24.51.13.20**		Grey iron castings for transmission shafts, crankshafts, camshafts, cranks, bearing housings and plain shaft bearings (excluding bearing housings incorporating ball or roller bearings)	
	7	**24.51.13.40**		Other parts of piston engines and mechanical engineering (cast iron: not ductile)	
	7	**24.51.13.50**		Grey iron castings for machinery and mechanical appliances excluding for piston engines	
	7	**24.51.13.90**		Grey iron castings for locomotives/rolling stock/parts, use other than in land vehicles, bearing housings, plain shaft bearings, piston engines, gearing, pulleys, clutches, machinery	
Pre-bake anode	8	No associated PRODCOM codes available			
Aluminium	9	**24.42.11.30**		Unwrought non-alloy aluminium (excluding powders and flakes)	
Grey cement clinker	10	**23.51.11.00**	BM11	Cement clinker	
White cement clinker	11	**23.51.11.00**	BM10	Cement clinker	
Lime	12	**23.52.10.33**		Quicklime	
Dolime	13	**23.52.30.30**	BM14	Calcined and sintered dolomite, crude, roughly trimmed or merely cut into rectangular or square blocks or slabs	
Sintered dolime	14	**23.52.30.30**	BM13	Calcined and sintered dolomite, crude, roughly trimmed or merely cut into rectangular or square blocks or slabs	
Float glass	15	**23.11.12.14**		Non-wired sheets, of float, surface ground or polished glass, having an absorbent or reflective layer, of a thickness <= 3.5 mm	
	15	**23.11.12.17**		Non-wired sheets, of float, surface ground or polished glass, having an absorbent or reflecting layer, not otherwise worked, of a thickness > 3.5 mm	

Benchmark name	BM number	PRODCOM code 2010	Could also be covered by:	PRODCOM description	PRODCOM code 2004
	15	**23.11.12.30**		Non-wired sheets, of float, surface ground or polished glass, coloured throughout the mass, opacified, flashed or merely surface ground	
	15	**23.11.12.90**		Other sheets of float/ground/polished glass, n.e.c.	
Bottles and jars of colourless glass	16	**23.13.11.40**		Bottles of colourless glass of a nominal capacity < 2.5 litres, for beverages and foodstuffs (excluding bottles covered with leather or composition leather, infant's feeding bottles)	
Bottles and jars of coloured glass	17	**23.13.11.50**		Bottles of coloured glass of a nominal capacity < 2.5 litres, for beverages and foodstuffs (excluding bottles covered with leather or composition leather, infant's feeding bottles)	
Continuous filament glass fibre products	18	**23.14.11.10**		Glass fibre threads cut into lengths of at least 3 mm but <= 50 mm (chopped strands)	
	18	**23.14.11.30**		Glass fibre filaments (including rovings)	
	18	**23.14.11.50**		Slivers; yarns and chopped strands of filaments of glass fibres (excluding glass fibre threads cut into lengths of at least 3 mm but <= 50 mm)	
	18	**23.14.11.70**		Staple glass fibre articles	
	18	**23.14.12.10**	BM23	Glass fibre mats (including of glass wool)	
	18	**23.14.12.30**	BM23	Glass fibre voiles (including of glass wool)	
	18	**23.14.12.50**		Nonwoven glass fibre webs; felts; mattresses and boards	
Facing bricks	19	**23.32.11.10**		Non-refractory clay building bricks (excluding of siliceous fossil meals or earths)	
Pavers	20	**23.32.11.30**		Non-refractory clay flooring blocks, support or filler tiles and the like (excluding of siliceous fossil meals or earths)	
Roof tiles	21	**23.32.12.50**		Non-refractory clay roofing tiles	
	21	**Excluded from BM21: 23.32.12.70**		Non-refractory clay constructional products (including chimneypots, cowls, chimney liners and flue-blocks, architectural	

Benchmark name	BM number	PRODCOM code 2010	Could also be covered by:	PRODCOM description	PRODCOM code 2004
				ornaments, ventilator grills, clay-lath; excluding pipes, guttering and the like)	
Spray dried powder	22	**No PRODCOM code for this intermediate product but is associated with 23.31.10**		Ceramic tiles and flags	
Mineral wool	23	**23.14.12.10**	BM18	Glass fibre mats (including of glass wool)	
	23	**23.14.12.30**	BM18	Glass fibre voiles (including of glass wool)	
	23	**23.99.19.10**		Slag wool, rock wool and similar mineral wools and mixtures thereof, in bulk, sheets or rolls	
Plaster	24	**08.11.20.30**		Gypsum and anhydrite	
	24	**23.52.20.00**	BM25	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)	
	24	**23.64.10.00**		Factory made mortars	
Dried secondary gypsum	25	**23.52.20.00**	BM24	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)	
Plasterboard	26	**23.62.10.50**		Boards, sheets, panels, tiles and similar articles of plaster or of compositions based on plaster, faced or reinforced with paper or paperboard only (excluding articles agglomerated with plaster, ornamented)	
	26	**23.62.10.90**		Boards, sheets, panels, tiles and similar articles of plaster or of compositions based on plaster, not faced or reinforced with paper or paperboard only (excluding articles agglomerated with plaster, ornamented)	
Short fibre kraft pulp	27	**17.11.12.00**	BM28	Chemical wood pulp, soda or sulphate, other than dissolving grades	
Long fibre kraft pulp	28	**17.11.12.00**	BM27	Chemical wood pulp, soda or sulphate, other than dissolving grades	
	29	**17.11.13.00**		Chemical wood pulp, sulphite, other than dissolving grades	

Benchmark name	BM number	PRODCOM code 2010	Could also be covered by:	PRODCOM description	PRODCOM code 2004
Sulphite pulp, thermo-mechanical and mechanical pulp	29	**17.11.14.00**		Part of PRODCOM covered: Mechanical wood pulp	
	29	17.11.14.00	BM30	Part of PRODCOM **not** covered: semi-chemical wood pulp; pulps of fibrous cellulosic material other than wood	
Recovered paper pulp	30	**17.11.14.00**		Part of PRODCOM covered: pulps of fibrous cellulosic material other than wood	
	30	17.11.14.00	BM29	Part of PRODCOM **not** covered: Mechanical wood pulp; semi-chemical wood pulp	
Newsprint	31	**17.12.11.00**		Newsprint in rolls or sheets	
Uncoated fine paper	32	**17.12.12.00**		Hand-made paper and paperboard in rolls or sheets (excluding newsprint)	
	32	**17.12.13.00**		Paper and paperboard used as a base for photo-sensitive, heat-sensitive or electro-sensitive paper; carbonising base paper; wallpaper base	
	32	**17.12.14.10**		Graphic paper, paperboard: mechanical fibres <= 10%, weight < 40 g/m²	
	32	**17.12.14.35**		Graphic paper, paperboard: mechanical fibres <= 10%, weight >= 40 g/m² but <= 150 g/m², in rolls	
	32	**17.12.14.39**		Graphic paper, paperboard: mechanical fibres <= 10%, weight >= 40 g/m² but <= 150 g/m², sheets	
	32	**17.12.14.50**		Graphic paper, paperboard: mechanical fibres <= 10%, weight > 150 g/m²	
	32	**17.12.14.70**		Graphic paper, paperboard: mechanical fibres > 10%	
Coated fine paper	33	**17.12.73.35**		Coated base for paper..., for photo-, heat-, electro-sensitive paper, weight <= 150 g/m², m.f. <= 10%	
	33	**17.12.73.37**		Coated paper, for writing, printing, graphic purposes (excluding coated base, weight <= 150 g/m²)	

Benchmark name	BM number	PRODCOM code 2010	Could also be covered by:	PRODCOM description	PRODCOM code 2004
	33	**17.12.73.60**		Light-weight coated paper for writing, printing, graphic purposes, m.f. > 10%	
	33	**17.12.73.75**		Other coated mech. graphic paper for writing, printing, graphic purposes, m.f. > 10%, rolls	
	33	**17.12.73.79**		Other coated mech. graphic paper for writing, printing, graphic purposes, m.f. > 10%, sheets	
	33	**17.12.76.00**		Carbon paper, self-copy paper and other copying or transfer paper, in rolls or sheets	
Tissue	34	**17.12.20.30**		Cellulose wadding for household or sanitary purposes, in rolls of a width > 36 cm or in rectangular (including square sheets) with at least one side > 36 cm in an unfolded state	
	34	**17.12.20.55**		Creped paper and webs of cellulose fibres for household/ sanitary purposes, in rolls, width > 36 cm, rectangular sheets min. one side > 36cm in unfolded state, weight <= 25 g/m²/ply	
	34	**17.12.20.57**		Creped paper and webs of cellulose fibres for household/sanitary purposes, in rolls, width > 36 cm, rectangular sheets min. one side > 36 cm in unfolded state, weight > 25 g/m²/ply	
	34	**17.12.20.90**		Paper stock for household: others	
	34	**17.22.11.20**		Toilet paper	
	34	**17.22.11.40**		Handkerchiefs and cleansing or facial tissues of paper pulp, paper, cellulose wadding or webs of cellulose fibres	
	34	**17.22.11.60**		Hand towels of paper pulp, paper, cellulose wadding or webs of cellulose fibres	
	34	**17.22.11.80**		Tablecloths and serviettes of paper pulp, paper, cellulose wadding or webs of cellulose fibres	
	34	**17.22.12.20**		Sanitary towels, tampons and similar articles of paper pulp, paper, cellulose wadding or webs of cellulose fibres	
	34	**17.22.12.30**		Napkins and napkin liners for babies and similar sanitary articles of paper pulp, paper, cellulose wadding or webs of excluding toilet paper, sanitary towels, tampons and similar articles	

Benchmark name	BM number	PRODCOM code 2010	Could also be covered by:	PRODCOM description	PRODCOM code 2004
	34	**17.22.12.50**		Articles of apparel and clothing accessories of paper pulp; paper; cellulose wadding or webs of cellulose fibres (excluding handkerchiefs, headgear)	
	34	**17.22.12.90**		Household, sanitary or hospital articles of paper, etc, n.e.c.	
Testliner and fluting	35	**17.12.33.00**		Semi-chemical fluting	
	35	**17.12.34.00**		Recycled fluting and other fluting	
	35	**17.12.35.20**		Uncoated testliner (recycled liner board), weight <= 150 g/m², in rolls or sheets	
	35	**17.12.35.40**		Uncoated testliner (recycled liner board), weight > 150 g/m², in rolls or sheets	
Uncoated carton board	36	**17.12.31.00**		Uncoated, unbleached kraftliner in rolls or sheets (excluding for writing, printing or other graphic purposes, punch card stock and punch card tape paper)	
	36	**17.12.32.00**		Uncoated kraftliner in rolls or sheets (excluding unbleached, for writing; printing or other graphic purposes, punch card stock and punch card tape paper	
	36	**17.12.42.60**		Other uncoated paper and paperboard, in rolls or sheets, weight > 150 g/m² and < 225 g/m² (excluding products of HS 4802, fluting paper, testliner, sulphite wrapping paper, filter or felt paper and paperboard)	
	36	**17.12.42.80**		Other uncoated paper and paperboard, in rolls or sheets, weight >= 225 g/m² (excluding products of HS 4802, fluting paper, testliner, sulphite wrapping paper, filter or felt paper and paperboard)	
	36	**17.12.51.10**		Uncoated, inside grey paperboard	
	36	**17.12.59.10**		Other uncoated paperboard	
Coated carton board	37	**17.12.75.00**		Kraft paperboard (other than that of a kind used for writing, printing or other graphic purposes), coated with kaolin or with other inorganic substances	

Benchmark name	BM number	PRODCOM code 2010	Could also be covered by:	PRODCOM description	PRODCOM code 2004
	37	**17.12.77.55**		Bleached paper and paperboard in rolls or sheets, coated, impregnated or covered with plastics weighing > 150 g/m² (excluding adhesives)	
	37	**17.12.77.59**		Paper and paperboard in rolls or sheets, coated, impregnated or covered with plastics (excluding adhesives, bleached and weighing > 150 g/m²)	
	37	**17.12.78.20**		Kraft paper and paperboard, coated on one or both sides with kaolin or other inorganic substances, in rolls or in square or rectangular sheets, of any size (excluding that for writing, printing or other graphic purposes; paper and paperboard bleached uniformly in the mass and containing > 95% chemically processed wood fibres by weight in relation to the total fibre content)	
	37	**17.12.78.50**		Multi-ply paper and paperboard, coated, others	
	37	**17.12.79.53**		Multi-ply paper and paperboard, coated, of which each layer in bleached	
	37	**17.12.79.55**		Multi-ply paper and paperboard, coated, with 1 bleached outer layer	
Carbon black	38	**20.13.21.30**		Carbon (carbon blacks and other forms of carbon, n.e.c.)	
Nitric acid	39	**20.15.10.50**		Nitric acid; sulphonitric acids	
Adipic acid	40	**20.14.33.85**		Adipic acid; its salts and esters	
Ammonia	41	**20.15.10.75**		Anhydrous ammonia	
Steam cracking	42	No associated PRODCOM codes available			
Aromatics	43	**20.59.56.70**		Mixed alkylbenzenes, mixed alkylnaphthalenes other than HS 2707 or 2902	
	43	**20.14.12.13**		Cyclohexane	
	43	**20.14.12.23**		Benzene	
	43	**20.14.12.25**		Toluene	
	43	**20.14.12.43**		o-Xylene	
	43	**20.14.12.45**		p-Xylene	

Benchmark name	BM number	PRODCOM code 2010	Could also be covered by:	PRODCOM description	PRODCOM code 2004
	43	**20.14.12.47**		m-Xylene and mixed xylene isomers	
	43	**20.14.12.60**		Ethylbenzene	
	43	**20.14.12.70**		Cumene	
	43	**20.14.12.90**		Other cyclic hydrocarbons	
	43	**20.14.73.20**		Benzol (benzene), toluol (toluene) and xylol (xylenes)	
	43	**20.14.73.40**		Naphthalene and other aromatic hydrocarbon mixtures (excluding benzole, toluole, xylole)	
Styrene	44	**20.14.12.50**		Styrene	
Phenol/ acetone	45	**20.14.24.10**		Monophenols	
	45	**20.14.62.11**		Acetone	
Ethylene oxide/ ethylene glycols	46	**20.14.63.73**		Oxirane (ethylene oxide)	
	46	**20.14.23.10**		Ethylene glycol (ethanediol)	
	46	**20.14.63.33**		2,2-Oxydiethanol (diethylene glycol; digol)	
	46	**20.16.40.15**		Polyethylene glycols and other polyether alcohols, in primary forms	
Vinyl chloride monomer	47	**20.14.13.71**		Vinyl chloride (chloroethylene)	
S-PVC	48	**20.16.30.10**	BM49	Polyvinyl chloride, not mixed with any other substances, in primary forms	
E-PVC	49	**20.16.30.10**	BM48	Polyvinyl chloride, not mixed with any other substances, in primary forms	
Hydrogen	50	**20.11.11.50**	BM51	Hydrogen	
Synthesis gas	51	**20.11.11.50**	BM50	Hydrogen	
	51	**20.11.12.90**		Inorganic oxygen compounds of non-metals (excluding sulphur trioxide (sulphuric anhydride); diarsenic trioxide, nitrogen oxides, silicon dioxide, sulphur dioxide, carbon dioxide)	
Soda ash	52	**20.13.43.10**		Disodium carbonate	