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GUIDANCE DOCUMENT 5D: SECTOR-SPECIFIC GUIDANCE DOCUMENT ON IRON AND STEEL

Disclaimer: This guidance document is not legally binding and it is of an explanatory nature. Legal provisions of Union law take precedence over the contents of this document and should always be consulted. The authentic texts of the EU legal instruments are those published in the Official Journal of the European Union. This guidance was prepared by Commission services and does not represent an official position of the Commission. Only the Court of Justice of the European Union is competent to authoritatively interpret Union law.

VERSION HISTORY

Date	Version notes
14.08.2026	First Publication of this document for the definitive period.

CONTENTS

1 PREFACE

1.1 Structure and content of the guidance documents

This series of documents has been written to support stakeholders by explaining the requirements of the CBAM Regulation in a non-legislative language. This series of guidance documents should benefit a variety of stakeholders. A specific focus has been put on clarifying the **requirements for operators of installations producing CBAM goods outside of the EU for the definitive period**.

- **Guidance 1** provides an overview of the main changes to the CBAM methodology between the definitive period and the concluded transitional period. It also introduces the CBAM and an overview of the compliance cycle, roles and responsibilities, as well as milestones and deadlines for operators of installations outside the EU during the definitive period and explains the general exemptions from the CBAM.

- **Guidance 2** provides a quick guidance for the intended reader of this document, the operator of an installation producing CBAM goods. It provides a roadmap of the most important concepts of CBAM emissions monitoring and where to find more information in this series of documents.

- **Guidance 3** sets out the monitoring and reporting obligations and recommendations which are potentially applicable to any affected producer of CBAM goods.

- **Guidance 4** provides an overview of how the adjustment for free allocation is to be determined and what information is needed.

- **Guidance documents 5a, 5b, 5c, 5d, 5e and 5f** present an overview per sector of the production processes and value chains for goods that are included in the scope of the CBAM, as well as sector-specific monitoring and reporting considerations for each CBAM good where this is relevant. These sections are supplemented by examples for each sector.

The series of guidance documents is accompanied by an electronic template for information that should be used by installation operators to communicate information to the authorised CBAM declarants and CBAM Registry.

Presentation of numbers in EU documents

To align with EU legal documents, this guidance document uses the following convention when presenting numbers.

The decimal separator used to separate the integral part of a number from its fractional part is a comma, e.g.: 0,890

Thousands, and powers of 10^{3n} thereafter, are separated by a space, e.g.:

- fifteen thousand is written as 15 000
- fifteen million is written as 15 000 000

1.2 Reference regulations and legal acts

Several regulations and legal acts are referred to throughout this series of guidance documents. For ease of reading and to avoid ambiguity, simplified references are used when citing these acts.

- **CBAM Regulation**: Regulation (EU) 2023/956 and Regulation (EU) 2025/2083 amending Regulation (EU) 2023/956. Notably, where article numbers are given in this document without further specification, they always refer to the CBAM Regulation.

  It can be accessed at the following link (consolidated version):
  http://data.europa.eu/eli/reg/2023/956/2025-10-20

- **Methodology Act:** Commission Implementing Regulation (EU) 2025/2547, in legal texts referred to as "Implementing act pursuant to Article 7(7) of the CBAM Regulation".

  It can be accessed at the following link:
  http://data.europa.eu/eli/reg_impl/2025/2547/oj

- **Default Values Act**: Commission Implementing Regulation (EU) 2025/2621, in legal texts referred to as "Implementing act pursuant to Article 7(7) of the CBAM Regulation", also referred to as "default values determined in accordance with Annex IV to the CBAM Regulation".

  It can be accessed at the following link: **http://data.europa.eu/eli/reg_impl/2025/2621/oj**

- **Verification Principles Act**: Commission Implementing Regulation (EU) 2025/2546, in legal texts referred to as "Implementing act pursuant to Article 8(3) of the CBAM Regulation".

  It can be accessed at the following link:
  http://data.europa.eu/eli/reg_impl/2025/2546/oj

- **Accreditation & Verification Requirements Act**: Commission Delegated Regulation (EU) 2025/2551, in legal texts referred to as "Delegated act pursuant to Article 18(3) of the CBAM Regulation".

  It can be accessed at the following link: **http://data.europa.eu/eli/reg_del/2025/2551/oj**

- **Free Allocation Adjustment Act**: Commission Implementing Regulation (EU) 2025/2620, in legal texts referred to as "Implementing act pursuant to Article 31(2) of the CBAM Regulation".

  It can be accessed at the following link:
  http://data.europa.eu/eli/reg_impl/2025/2620/oj

For acronyms and definitions used in this document, please see **Annex B** and **Annex A**.

A series of icons are used throughout to help guide the reader:

Icon	Description of use
	Points to information of particular importance for operators of installations producing CBAM goods.
Simplified!	Highlights simplified approaches of the general requirements of the CBAM.
	Used where recommended improvements are presented.
	Used where other documents, templates or electronic tools are available from other sources.
	Points to examples given for the topics discussed in the surrounding text.

2 CBAM GOODS AND PRODUCTION ROUTES

This section provides guidance on industry-sector-specific rules that apply for the definitive period (from 2026 onwards), for iron and steel sector. It deals with the specification of products covered by the CBAM and the relevant production routes.

2.1 Foreword to sector-specific sections

The following sections provide an overview of the different production routes for the goods under the iron and steel sector in CBAM and provide sector specific guidance. Where goods to which the same functional unit applies are produced in one installation via different production routes, the embedded emissions shall be determined in accordance with the averaging rules applicable in the definitive period.

Additional information on the production processes of the goods can also be found in the BREF[1] documents for best available techniques (BAT).

Diagrams used in the following sections.

For the system boundary graphics presented in the sections below, the **following conventions** are applied:

- **Production processes** (for which monitoring of the direct emissions would take place) are shown as **rectangles with white background**.
- **Optional** processes (e.g. CCS/CCU) are shown in **blue** boxes. In particular, CCS/CCU would not be taken into account for developing default values, but where you (as an operator) use them, the related emissions or emission savings should be taken into account for determining actual embedded emissions in line with the CBAM Regulation and the Methodology Act.
- **Materials** which are considered to have no embedded emissions are shown in **pink** boxes, materials with embedded emissions (precursor materials and final products, i.e. goods under the CBAM) in **green** boxes. Simple goods are shown in **normal** font, complex goods in **bold** font. Materials which are **optional** are shown in boxes with a **blue dashed** outline and must be included where actually used at the installation.
- Input materials are presented without trying to be complete. This means that the focus is on materials which are relevant for demonstrating the differences between different production routes. As a consequence, less important input materials and in particular fuels are usually omitted in order to keep graphs simple.
- **Electricity** as input is shown only in cases where it is the main "precursor" of the process (i.e. in particular for electric arc furnaces and electrolysis processes). Electricity is shown in **light grey** boxes.

[1] BAT Reference document (BREF), BAT being "Best Available Techniques" as defined by the IED (Industrial Emissions Directive). Relevant BREF documents are those for: the production of cement; for iron and steel production; large volume inorganic chemicals (which includes fertilisers); for Chlor-alkali; and for non-ferrous metals (which includes both aluminium and ferro-alloys). All BREFs can be found at the European IPPC Bureau, under https://eippcb.jrc.ec.europa.eu/reference.

2.2 Iron and Steel sector goods and production routes

The textbox below signposts sector-specific sections in the Methodology Act, relevant for the CBAM definitive period (2026 onwards).

Methodology Act references:

- **Annex I** ("Mapping of CN codes to aggregated goods categories") to the Methodology Act
- **Annex I**, points 3.11 (Sintered ore), 3.12 (Ferro-manganese, Ferro-chromium, Ferro-nickel), 3.13 (Pig iron), 3.14 (DRI), 3.15 (Crude steel) and 3.16 (Iron or steel products), which define the functional unt, system boundaries and possible precursors for iron and steel sector goods.

2.2.1 Unit of production and embedded emissions

The quantity of declared iron and steel sector goods imported into the EU must be expressed in metric tonnes. As an operator, you must record the quantity of CBAM goods produced by your installation in each production process, for the purposes of reporting. For the purposes of determining embedded emissions on the basis of actual values, the 'reporting period' corresponds to the calendar year during which the good was produced. By default, the reporting period for goods imported into the EU is the calendar year of import (with the possibility to rebut this presumption where there is sufficient evidence of the actual time of production).

Industrial sector	**Iron and steel**
Production unit of goods	Tonnes (metric), reported separately for each type of sector goods, by installation or production process in the country of origin
Associated activities	Producing, melting or refining iron or steel or ferrous alloys; manufacture of semi-finished and basic steel products.
Relevant greenhouse gas	Carbon dioxide (CO_2)
Direct Emissions	Tonnes (metric) of CO_2e
Indirect Emissions	Quantity of electricity consumed (MWh), source and emissions factor used to calculate the indirect emissions in tonnes (metric) of CO_2 or CO_2e where relevant (i.e. for goods not listed in Annex II to the CBAM Regulation and/or for precursors whose embedded emissions include indirect emissions).

	During the transitional period, indirect emissions from electricity consumption were monitored and reported separately. In the definitive period, for iron and steel CBAM goods listed in Annex II ("Goods for which only direct emissions are taken into account") to the CBAM Regulation, only direct emissions are taken into account in their embedded emissions; indirect emissions of electricity are not included. For sintered ore (CN 2601 12 00) – not listed in Annex II to the CBAM Regulation, indirect emissions are to be included.
Unit for embedded emissions	Tonnes CO_2e emissions per tonne of goods, reported separately for each type of goods, by installation in the country of origin

During the transitional period, the iron and steel sector reported both direct and indirect emissions, with indirect emissions reported separately. In the definitive period, in line with Article 7(1) and Annex II ("List of goods for which only direct emissions are to be taken into account") to the CBAM Regulation and Article 3(2) of the Methodology Act, only direct emissions are taken into account when determining the embedded emissions of iron and steel CBAM goods (except for sintered ore). Where iron and steel goods listed in Annex II are used as precursors in the production of other CBAM goods, their indirect emissions are likewise not included in the embedded emissions of those complex goods, in accordance with the cross-sectoral rules in the Methodology Act.

Where iron and steel CBAM goods are complex goods produced using precursors (such as sintered ore, pig iron, DRI or ferro-alloys), the embedded emissions of the iron and steel goods must include the full embedded emissions of those precursors, including any indirect emissions of electricity associated with the precursors where relevant (i.e. where the precursor is not listed in Annex II to the CBAM Regulation), for example, hydrogen where used as a precursor. Where actual data are used for precursors produced outside the installation, such actual data may be used only where they are taken from a verification report. The verification report must be issued by a verifier having an accreditation valid at the time of issuing the verification report and for the sectoral scope required for the aggregated goods category of the precursor under consideration. The verification report must cover the reporting period during which the precursor was produced, otherwise, the relevant default values shall be used.

The following sections set out how the system boundaries of iron and steel sector goods should be defined and identify elements of the production process that must be included for the purposes of monitoring and reporting. Operators shall design and implement a monitoring plan and submit it in English. Records supporting monitoring and reporting shall be retained for at least 6 years. Where a claim is made that applying a specific determination methodology incurs unreasonable costs, the justification shall be set out in the monitoring plan and assessed against the reference price of EUR 80 per tonne of CO_2e and the accumulated limit of EUR 4 000 per year.

2.2.2 Definition and explanation of sector CBAM goods covered

The following Table 2-1 lists the relevant goods in scope for the CBAM definitive period in the iron and steel industry sector. The CN codes in the central column are the starting point for which 'production processes' are to be defined for the purpose of monitoring in line with Annex I to the CBAM Regulation and Annex I ("Mapping of CN codes to aggregated goods categories") to the Methodology Act. Where goods with different CN codes to which the same functional unit applies are produced using different production routes within an installation, a single production process shall be used encompassing all production routes.

Table 2-1: CBAM goods in the iron and steel sector[2]

Aggregated goods category	Product CN Code[3]	Description
Sintered Ore[4]	2601 12 00	Agglomerated iron ores and concentrates, other than roasted iron pyrites
Pig iron	7201	Pig iron and spiegeleisen[5] in pigs, blocks or other primary forms
	7205[6]	Some products under 7205 (Granules and powders, of pig iron, spiegeleisen, iron, or steel) may be covered here
Ferro-alloy: FeMn	7202 1	Ferro-manganese (FeMn)
Ferro-alloy: FeCr	7202 4	Ferro-chromium (FeCr)
Ferro-alloy: FeNi	7202 6	Ferro-nickel (FeNi)
DRI	7203	Ferrous products obtained by direct reduction of iron ore and other spongy ferrous products
Crude steel	7206, 7207, 7218 and 7224	7206 – Iron and non-alloy steel in ingots or other primary forms (excluding iron of heading 7203) 7207 – Semi-finished products of iron or non-alloy steel

2 Source: Annex I to the CBAM Regulation; Annex I ("Mapping of CN codes to aggregated goods categories") to the Methodology Act.

3 Where the CN codes indicated in this table consist of 4, 5 or 6 digits, all 8-digit CN codes sharing the same initial digits shall be considered included, unless otherwise specified.

4 This aggregated goods category includes all kinds of iron ore pellet production (for sale of pellets as well as for direct use in the same installation) and sinter production.

5 Pig iron containing alloy ferro-manganese.

6 Only some products of this CN code will qualify as "pig iron", while other goods of this code are classified as "iron or steel products".

Aggregated goods category	Product CN Code[3]	Description
		7218 – Stainless steel in ingots or other primary forms; semi-finished products of stainless steel
		7224 – Other alloy steel in ingots or other primary forms; semi-finished products of other alloy steel
Iron or steel products[7]	Includes: 7205, 7208-7217, 7219-7223, 7225-7229, 7301-7311, 7318 and 7326	7205 – Granules and powders, of pig iron, spiegeleisen, iron or steel (if not covered under category pig iron)
		7208 – Flat-rolled products of iron or non-alloy steel, of a width of 600 mm or more, hot-rolled, not clad, plated or coated
		7209 – Flat-rolled products of iron or non-alloy steel, of a width of 600 mm or more, cold-rolled (cold-reduced), not clad, plated or coated
		7210 – Flat-rolled products of iron or non-alloy steel, of a width of 600 mm or more, clad, plated or coated
		7211 – Flat-rolled products of iron or non-alloy steel, of a width of less than 600 mm, not clad, plated or coated
		7212 – Flat-rolled products of iron or non-alloy steel, of a width of less than 600 mm, clad, plated or coated
		7213 – Bars and rods, hot-rolled, in irregularly wound coils, of iron or non-alloy steel
		7214 – Other bars and rods of iron or non-alloy steel, not further worked than forged, hot-rolled, hot-drawn or hot-extruded, but including those twisted after rolling
		7215 – Other bars and rods of iron or non-alloy steel
		7216 – Angles, shapes and sections of iron or non-alloy steel
		7217 – Wire of iron or non-alloy steel
		7219 – Flat-rolled products of stainless steel, of a width of 600 mm or more
		7220 – Flat-rolled products of stainless steel, of a width of less than 600 mm
		7221 – Bars and rods, hot-rolled, in irregularly wound coils, of stainless steel
		7222 – Other bars and rods of stainless steel; angles, shapes and sections of stainless steel

[7] This aggregated goods category includes semi-finished and finished products.

Aggregated goods category	Product CN Code[3]	Description
		7223 – Wire of stainless steel
		7225 – Flat-rolled products of other alloy steel, of a width of 600 mm or more
		7226 – Flat-rolled products of other alloy steel, of a width of less than 600 mm
		7227 – Bars and rods, hot-rolled, in irregularly wound coils, of other alloy steel
		7228 – Other bars and rods of other alloy steel; angles, shapes and sections, of other alloy steel; hollow drill bars and rods, of alloy or non-alloy steel
		7229 – Wire of other alloy steel
		7301 – Sheet piling of iron or steel, whether or not drilled, punched or made from assembled elements; welded angles, shapes and sections, of iron or steel
		7302 – Railway or tramway track construction material of iron or steel, the following: rails, check-rails and rack rails, switch blades, crossing frogs, point rods and other crossing pieces, sleepers (cross-ties), fish- plates, chairs, chair wedges, sole plates (base plates), rail clips, bedplates, ties and other material specialised for jointing or fixing rails
		7303 – Tubes, pipes and hollow profiles, of cast iron
		7304 – Tubes, pipes and hollow profiles, seamless, of iron (other than cast iron) or steel
		7305 – Other tubes and pipes (for example, welded, riveted or similarly closed), having circular cross-sections, the external diameter of which exceeds 406,4 mm of iron or steel
		7306 – Other tubes, pipes and hollow profiles (for example, open seam or welded, riveted or similarly closed), of iron or steel
		7307 – Tube or pipe fittings (for example, couplings, elbows, sleeves), of iron or steel
		7308 – Structures (excluding prefabricated buildings of heading 9406) and parts of structures (for example, bridges and bridge-sections, lock- gates, towers, lattice masts, roofs, roofing frameworks, doors and windows and their frames and thresholds for doors, shutters, balustrades, pillars and columns), of iron or steel; plates, rods, angles, shapes, sections, tubes and the like, prepared for use in structures, of iron or steel

Aggregated goods category	Product CN Code[3]	Description
		7309 – Reservoirs, tanks, vats and similar containers for any material (other than compressed or liquefied gas), of iron or steel, of a capacity exceeding 300 l, whether or not lined or heat-insulated, but not fitted with mechanical or thermal equipment
		7310 – Tanks, casks, drums, cans, boxes and similar containers, for any material (other than compressed or liquefied gas), of iron or steel, of a capacity not exceeding 300 l, whether or not lined or heat-insulated, but not fitted with mechanical or thermal equipment
		7311 – Containers for compressed or liquefied gas, of iron or steel
		7318 – Screws, bolts, nuts, coach screws, screw hooks, rivets, cotters, cotter pins, washers (including spring washers) and similar articles, of iron or steel
		7326 – Other articles of iron or steel

The aggregated goods categories listed in Table 2-1 include both finished goods and precursor goods (intermediate products) that are consumed in the production of iron or steel products. The system boundaries specified in the Methodology Act do not mention explicitly which precursors are relevant for the production process. Therefore, Table 2-2 should help to identify the possible precursors by aggregated goods category and production route.

Table 2-2: Aggregated goods categories, their production routes and possible precursors

Aggregated Goods Category ***Production route***	**Precursors**
Sintered Ore	None
Ferro alloys (FeMn, FeCr, FeNi)	Sintered ore, if used in the process.
Pig iron *Blast furnace route* *Smelting reduction*	Hydrogen, sintered ore, ferro alloys, pig iron/DRI (the latter if obtained from other installations or production processes and used in the process).
Direct Reduced Iron (DRI)	Hydrogen, sintered ore, ferro alloys, pig iron/DRI (the latter if obtained from other installations or production processes and used in the process).
Crude steel *Basic oxygen steelmaking*	Ferro alloys, pig iron, DRI, crude steel (the latter if obtained from other installations or production processes and used in the process).

Aggregated Goods Category ***Production route***	**Precursors**
Electric arc furnace	
Iron or steel products	Ferro alloys, pig iron, DRI, crude steel, iron or steel products (if used in the process).

Not all precursors will apply in every case. For example, hydrogen may only become relevant in the future.

Note in particular that in some cases an aggregated goods category may be precursor for its own category. This is best explained by an example:

> **Example**: If an installation produces screws and nuts from steel rods, then the rods are the precursor, but both rods and screws and nuts are included in the same aggregated goods category (iron or steel products).
>
> The embedded emissions of the screws and nuts (whose CN codes share the first four digits, 7318) will be composed of the emissions of the production process (heat applied for making the rods workable, and for annealing of the final product) plus the embedded emissions of the steel rods. Note that this is important because the mass of the precursor rods and the mass of the final product screws and nuts will not be the same – if e.g. 20% of the original mass are cut away (and disposed of as scrap), 100 t precursor are required for 80 t of final product.

Some types of iron or steel product have been excluded from the scope of the CBAM. In particular, these include certain other types of ferro alloys under CN 7202[8] and CN 7204 – ferrous waste and scrap.

The production of iron and steel sector goods is by a number of different production processes and routes, outlined below.

2.2.3 Definition and explanation of relevant production processes and emissions covered

The system boundaries of precursors and basic iron and steel finished goods are distinct and may, under certain conditions, be added together to include all processes directly or indirectly linked to the production processes for these goods, including input activities to the process, and output activities from the process in line with the definitions of functional units, system boundaries and precursors for the iron and steel aggregated goods categories in Annex I, points 3.11 to 3.16, and the rules on attributing emissions to goods in Annex III of the Methodology Act. For the goods under the aggregated goods categories crude steel and iron or steel products, where different functional units that only differ in size or shape are produced with the same precursors in types, quantities and proportions, a single

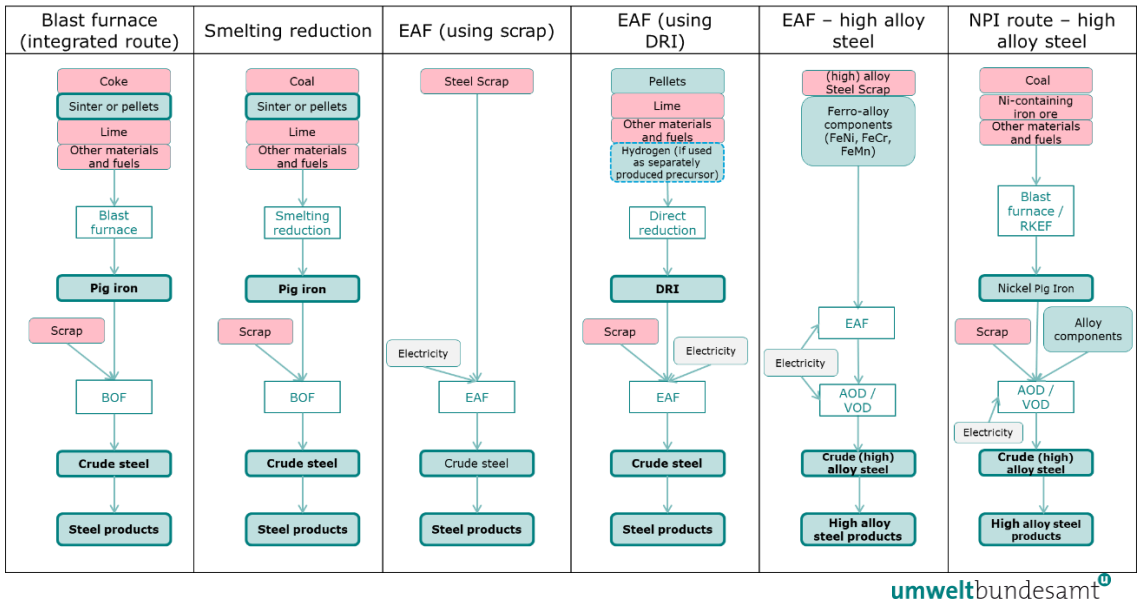
[8] Other ferro-alloys not covered by CBAM include ferro-silicon, ferro-silico-manganese, ferro-silico-chromium, ferro-molybdenum, ferro-tungsten and ferro-silico-tungsten etc.

multifunctional production process shall be defined for that group of goods and the relevant attribution rules shall apply.

Where iron and steel CBAM goods are complex goods and precursors are received (i) under a given CN code produced during different reporting periods and/or (ii) from multiple installations, embedded emissions shall, by default, be determined using the weighted-average rules, with deviation from the default allowed only where sufficient evidence supports more granular attribution to a specific installation or subset of installations.

In addition (where indirect emissions are relevant to precursors or other non-Annex II goods produced at the installation), where electricity is received from multiple sources, indirect emissions shall be determined, by default, using a weighted average of the emission factors of each electricity source (with a limited possibility to determine indirect emissions for a production process based only on one source or a subset of sources, where sufficient evidence is provided).

Figure 2-1: System boundaries and value chain for the production of iron or steel products.



Notes to figure:

- In this figure, the green boxes with a blue dashed outline (e.g. Hydrogen (if used as separately produced precursor)) represent optional precursors or process steps that are only included where they are actually used at the installation.
- Functional unit for iron and steel goods: tonnes of goods under the same CN code.
- Electricity (shown as a system-boundary input only in some cases in this figure): Electricity may be consumed in several production steps (e.g. EAF-based routes). Indirect emissions from electricity are not included in embedded emissions for iron and steel goods listed in Annex II to the CBAM Regulation (direct emissions only).
- Averaging across routes: Where goods with the same functional unit are produced via more than one production route within an installation, specific embedded emissions shall be determined using a weighted average across those routes.
- Precursors: Where iron and steel goods are complex goods, embedded emissions include the embedded emissions of precursors; where indirect emissions are relevant to a precursor (e.g., sintered ore), those indirect emissions are included in the final goods' embedded emissions even if the final iron/steel good is direct-only.

Where actual embedded emissions are calculated, the operator shall prepare an operator's emissions report and a summary thereof, and, where embedded emissions of electricity are calculated based on actual emissions, a declarant-specific addendum. The operator's emissions report shall be submitted in English.

The following Figure 2-1 provides an overview of the different production processes and process routes by which iron or steel CBAM goods are produced.

The production of precursor and finished goods is by a number of different process routes, outlined in the following sections. The relevant emissions that must be monitored for the iron and steel sector are detailed in section 3.1.1 of this document.

2.2.3.1 Sintered ore production process

This aggregated goods category includes all kinds of iron ore pellet production (for sale of pellets as well as for direct use in the same installation) and sinter production. Pelletisation and sintering are complementary process routes for preparing and agglomerating iron oxide raw materials for use in iron and steel making. In pelletisation, iron oxide raw materials are ground and combined with additives to form pellets, which are then thermally treated. In sintered ore production, iron oxide raw materials are mixed with coke breeze and other additives before the mixture is sintered together in a kiln, forming a porous material similar to clinker, called 'sinter'. Sinter is typically produced and used at the steelworks. Pellets may be produced at the steelworks or at a distance at mine sites.

Note that to the extent covered by CN code 2601 12 00, iron ores used as precursors for ferro-chromium (FeCr), ferro-manganese (FeMn) or ferro-nickel (FeNi) may also be covered by this aggregated goods category.

The Methodology Act (Annex I, point 3.11.2)) defines the system boundaries for direct emissions monitoring for the sintered ore production route, as encompassing:

> *" – All processes emitting CO_2 from process materials such as limestone and other carbonates or carbonate ores.*
>
> *– All processes emitting CO_2 from all fuels including coke, waste gases such as coke oven gas, blast furnace gas or converter gas; directly or indirectly linked to the production process, and materials used for flue gas cleaning."*

There are no other CBAM goods commonly used as precursors for this production process. Note that the system boundaries for sintered ore includes indirect emissions that result from electricity consumed by the production process for this good.

In line with the above definition of systems boundaries, the following production steps may be regarded as being within the system boundaries of iron ore pellet and sinter production:

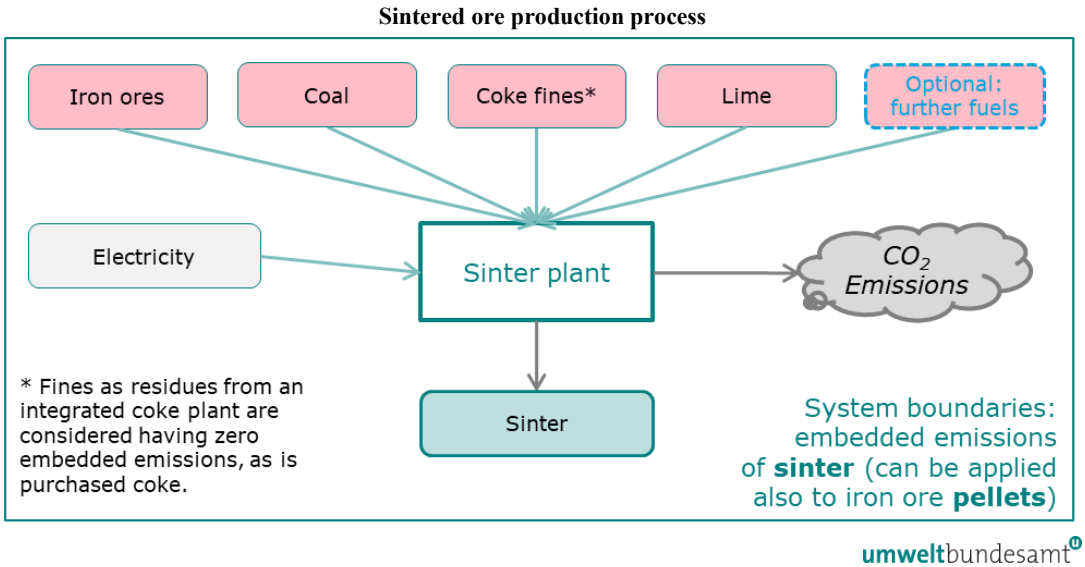
- Raw material handling and pre-treatment – drying and grinding of iron ore raw materials.
- Blending and mixing of raw materials – preparation of raw mixture for pellets and for sinter. Storage of raw mix in bunkers or hoppers at the start of the process.
- Iron ore pellets only – forming into pellets and thermal treatment, screening.

- Sintered ore only – raw material preparation, sintering in a furnace, followed by crushing, screening, conveying and cooling.

- Emissions control – in particular waste gas treatment.

The following *Figure 2-2* shows the system boundaries of the sinter (or iron ore pellets) production process.

Figure 2-2: System boundaries: embedded emissions of sintered ore (sinter and pellets)



Notes to figure:

- Electricity consumed by the production process is included in embedded emissions for this good.

2.2.3.2 Ferro-alloy FeMn, FeCr, and FeNi production processes

This process covers the production of the alloys ferro-manganese (FeMn), ferro-chromium (FeCr), ferro-nickel (FeNi), identified under CN codes 7202 1, 7202 4 and 7202 6. Other iron materials with significant alloy content such as spiegeleisen are not covered here. However, nickel pig iron (NPI) is included if the nickel content is greater than 10%; if nickel content is less than 10% then NPI is covered by the pig iron – blast furnace production route.

The different ferro-alloys are produced by reductive smelting with the addition of a reducing agent such as coke to the EAF, along with other additives. Different types of EAF may be used, depending on the ferro-alloy production process; Ferro-nickel has an additional calcination and pre-reduction production step prior to smelting. Following EAF smelting, liquid metal alloy is tapped and cast in moulds and the solidified metal is then crushed or granulated, depending on customer requirements.

The Methodology Act (Annex I, point 3.12.2) defines the system boundaries for direct emissions monitoring for ferro-alloys FeMn, FeCr and FeNi production processes, as encompassing:

> *" – All processes directly or indirectly linked to the production processes emitting CO_2 emissions caused by fuel inputs, irrespective of whether they are used for energetic or non-energetic use.*

– All processes directly or indirectly linked to the production processes emitting CO_2 emissions from process inputs such as limestone and from flue gas cleaning.

– All processes directly or indirectly linked to the production processes emitting CO_2 emissions from the consumption of electrodes or electrode pastes.

– Carbon remaining in the product or in slags or wastes is taken into account by using a mass balance method in accordance with point B.3.2 of Annex II to the Methodology Act."

No precursors are specified for this production process in Annex I, point 3.12 of the Methodology Act adopted under Article 7(7) of the CBAM Regulation.

Indirect emissions that result from electricity consumed by the production process were required to be monitored and reported during the transitional period. In the definitive period, indirect emissions are not taken into account in the embedded emissions of ferro-alloys for CBAM purposes, as indirect emissions are taken into account only for goods not listed in Annex II to the CBAM Regulation (Article 3(2) of the Methodology Act). Electricity may still be consumed in the production process and recorded for operational/energy balance purposes but is not included in embedded emissions for these goods where only direct emissions apply.

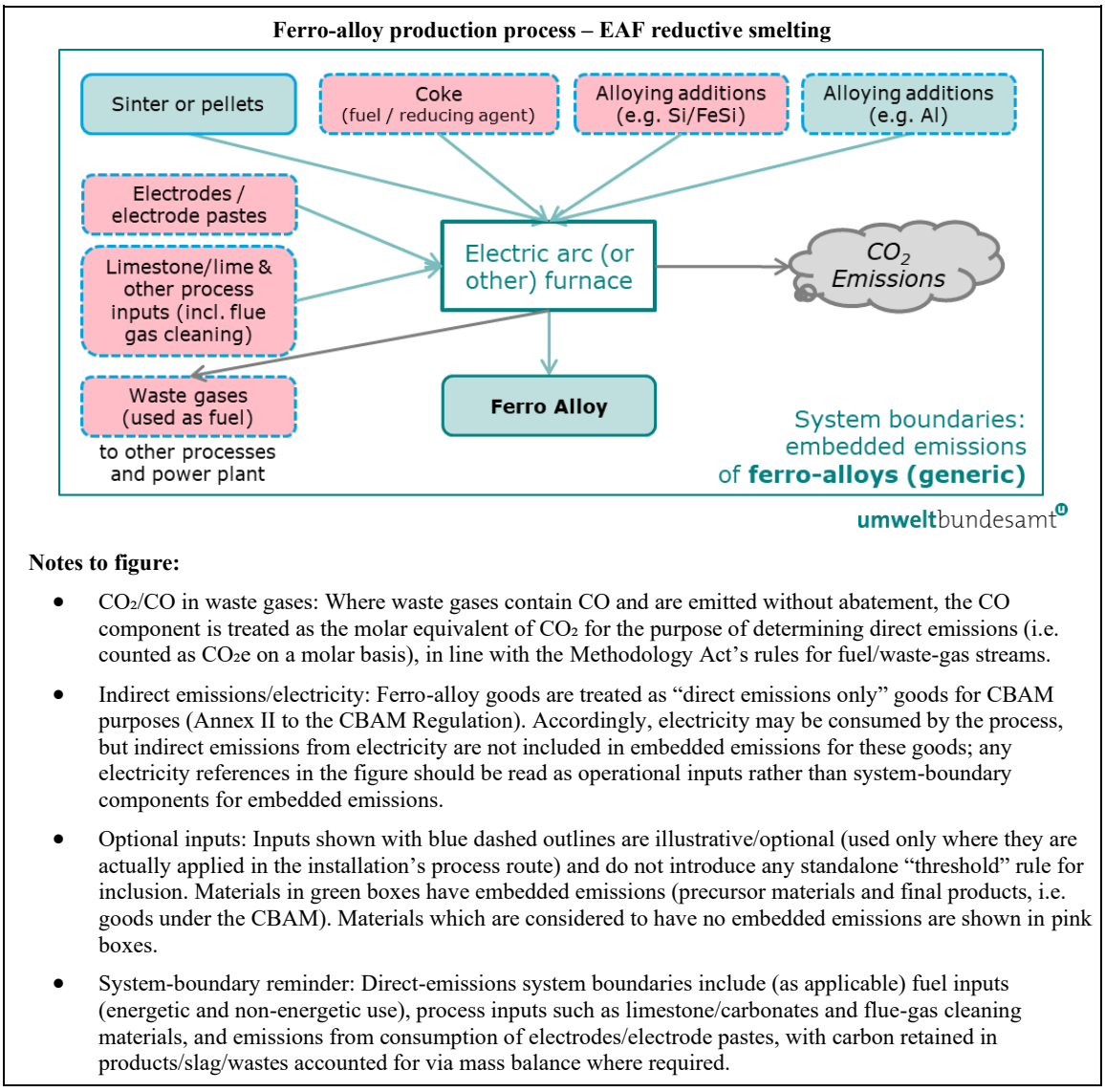
In line with the above definition of systems boundaries, the following production steps may be regarded as being within the system boundaries of ferro-alloy installations:

- Raw material handling and pre-treatment – pellets and sinter for FeMn and FeCr, calcination and pre-reduction in a rotary kiln for FeNi.
- EAF process – all steps for the EAF process, including charging, melting, primary refining and tapping of the primary furnace.
- Decarburisation and secondary metallurgy – if required to produce ferro-alloys with different carbon contents.
- Casting plant – including casting and cutting, casting ingots pre-heating stands.
- Crushing and granulation.
- Emissions control – for treating releases to air, water or ground, including dedusting units, post-combustion unit, slag handling.

The following *Figure 2-3* shows the system boundaries of the relevant ferro-alloy production processes.

The mass balance method is to be used to give a complete balance of the amount of carbon entering or leaving the EAF production process (carbon remaining in the ferro-alloy product, in wastes or in slag) in line with point B.3.2 of Annex II to the Methodology Act. For ferro-alloy CBAM goods listed in Annex II to the CBAM Regulation, only direct emissions are included in embedded emissions; indirect emissions from electricity consumption are not included.

Figure 2-3: System boundaries of Ferro-alloy production processes.



Notes to figure:

- CO_2/CO in waste gases: Where waste gases contain CO and are emitted without abatement, the CO component is treated as the molar equivalent of CO_2 for the purpose of determining direct emissions (i.e. counted as CO_2e on a molar basis), in line with the Methodology Act's rules for fuel/waste-gas streams.
- Indirect emissions/electricity: Ferro-alloy goods are treated as "direct emissions only" goods for CBAM purposes (Annex II to the CBAM Regulation). Accordingly, electricity may be consumed by the process, but indirect emissions from electricity are not included in embedded emissions for these goods; any electricity references in the figure should be read as operational inputs rather than system-boundary components for embedded emissions.
- Optional inputs: Inputs shown with blue dashed outlines are illustrative/optional (used only where they are actually applied in the installation's process route) and do not introduce any standalone "threshold" rule for inclusion. Materials in green boxes have embedded emissions (precursor materials and final products, i.e. goods under the CBAM). Materials which are considered to have no embedded emissions are shown in pink boxes.
- System-boundary reminder: Direct-emissions system boundaries include (as applicable) fuel inputs (energetic and non-energetic use), process inputs such as limestone/carbonates and flue-gas cleaning materials, and emissions from consumption of electrodes/electrode pastes, with carbon retained in products/slag/wastes accounted for via mass balance where required.

2.2.3.3 Pig iron – Blast furnace production route

The blast furnace production route produces liquid pig iron ("hot metal") that may be alloyed (e.g. spiegeleisen and nickel pig iron or NPI[9]) or non-alloyed. The main production unit for this production process is the blast furnace. Inputs into the blast furnace include iron ore pellets or sintered ore, fuels and other raw materials including those used as reducing agents. Inside the blast furnace iron oxide is reduced to iron metal. The hot metal produced is then tapped and is either cast or is directly converted to crude steel in a sequential step by the basic oxygen converter. This step is covered under a different production process, the crude steel – basic oxygen steelmaking production route.

The Methodology Act (Annex II, point 3.13.2.1, in conjunction with points B.3.2 and B.3.3 of Annex III) defines the system boundaries for direct emissions monitoring for the pig iron – Blast furnace production route, as encompassing:

[9] NPI is covered by this production process if the nickel content is lower than 10%, otherwise if more than 10% it is covered under the ferro-alloy production process.

" – All processes directly or indirectly linked to the production processes emitting CO_2 from fuels and reducing agents such as coke, coke dust, coal, fuel oils, plastic wastes, natural gas, wood wastes, charcoal, as well as from waste gases such as coke oven gas, blast furnace gas or converter gas.

– Where biomass is used, the provisions of Section B.3.3 of Annex II shall be taken into account.

– All processes directly or indirectly linked to the production processes emitting CO_2 from process materials such as limestone, magnesite, and other carbonates, carbonate ores; materials for flue gas cleaning.

– Carbon remaining in the product or in slags or wastes is taken into account by using a mass balance method in accordance with Section B.3.2 of Annex II."

Precursors (if used in the process) are: sintered ore; pig iron or DRI from other installations or production processes; ferro-alloys FeMn, FeCr, FeNi; and hydrogen, if used. Indirect emissions that result from electricity consumed by the production process were monitored and reported separately during the transitional period but are not taken into account in the embedded emissions of pig iron under the definitive-period CBAM rules.

In line with the above definition of systems boundaries, the following production steps may be regarded as being within the system boundaries of blast furnace installations:

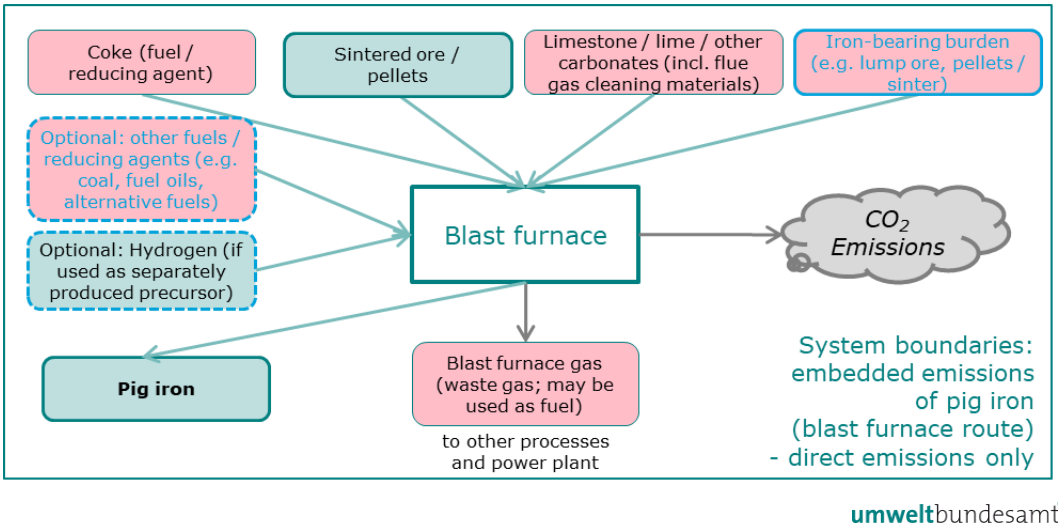
- Raw material handling and pre-treatment.
- Fuel storage and preparation – e.g. coal drying and preparation for pulverized coal injection (PCI), vessels preheating stands.
- Hot metal production – all steps for the blast furnace process resulting in liquid pig iron, the main unit being the Blast furnace, along with hot metal treatment units, blast furnace blowers, blast furnace hot stoves, compressed air production, steam injection in the blast furnace unit, steam generation plant, etc.
- Emissions control – for treating releases to air, water or ground, including slag treatment, waste gas treatment, dedusting units, dust briquetting.
- Miscellaneous not covered above.

The following *Figure 2-4* shows the system boundary for the blast furnace production route.

If all the liquid pig iron from the blast furnace is used by the oxygen steelmaking process to produce crude steel, the Methodology Act (Annex I, point 3.13.1) allows the operator to define a joint production process including crude steel, subject to the rules of Article 4, rather than monitoring pig iron production as a separate production process.

The mass balance method is to be used to give a complete balance of the amount of carbon entering or leaving the production process (carbon remaining in the product, or in wastes or slags). This method is defined in point B.3.2 of Annex II to the Methodology Act.

Figure 2-4: System boundaries of the Pig iron – Blast furnace production route.



Note to figure:

- Hydrogen is shown as an optional input where hydrogen is used as a reducing agent and is treated as a precursor in line with Annex I, point 3.13.2.1 of the Methodology Act.
- Indirect emissions from electricity are not included in embedded emissions for pig iron (direct emissions only), as pig iron is listed in Annex II to the CBAM Regulation; electricity may nevertheless be consumed and recorded for operational/energy balance purposes.
- Where blast furnace gas or other waste gases are used as fuels, the associated CO_2 emissions fall within the system boundaries as fuel-related emissions.

2.2.3.4 Pig iron – Smelting reduction production route

Smelting reduction produces pig iron from precursor sintered ore, iron ore pellets, or ironmaking residues, using different fuels and reducing agents. The process comprises two steps, the reduction of iron ore followed by melting to produce liquid pig iron / hot metal.

The Methodology Act (Annex I, point 3.13.2.2 ("Smelting reduction") to the Methodology Act) defines the system boundaries for direct emissions monitoring for the pig iron – smelting reduction production route, as encompassing:

> *" – All processes directly or indirectly linked to the production processes emitting CO_2 from fuels and reducing agents such as coke, coke dust, coal, fuel oils, plastic wastes, natural gas, wood wastes, charcoal, waste gases from the process or converter gas.*
>
> *– Where biomass is used, the provisions of point B.3.3 of Annex II shall be taken into account.*
>
> *– All processes directly or indirectly linked to the production processes emitting CO_2 from process materials such as limestone, magnesite, and other carbonates, carbonate ores; materials for flue gas cleaning.*
>
> *– Carbon remaining in the product or in slags or wastes is taken into account by using a mass balance method in accordance with point B.3.2 of Annex II."*

Precursors (if used in the process) are: sintered ore; pig iron or DRI from other installations or production processes; ferro-alloys FeMn, FeCr, FeNi; and hydrogen, if used. During the transitional period, indirect emissions that result from electricity consumed by the

production process also had to be monitored and reported. In the definitive period, indirect emissions are not taken into account for the calculation of embedded emissions of iron and steel CBAM goods listed in Annex II ("List of goods for which only direct emissions are to be taken into account") to the CBAM Regulation.

The mass balance method referred to above is used to give a complete balance of the amount of carbon entering or leaving the production process (including carbon remaining in the product, or in wastes or slags), in accordance with point B.3.2 of Annex III to the Methodology Act.

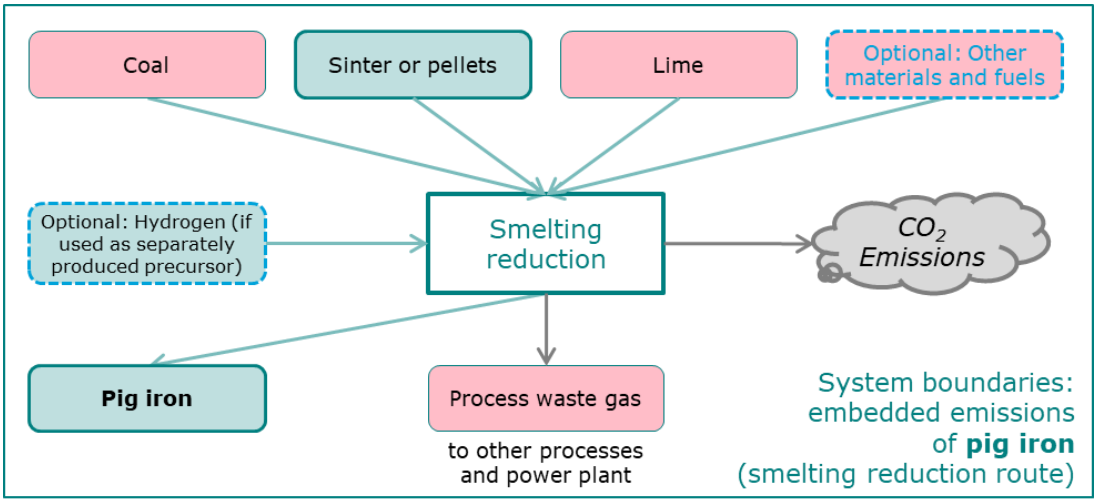
In line with the above definition of systems boundaries, the following production steps may be regarded as being within the system boundaries of smelting reduction installations:

- Raw material handling and pre-treatment.
- Fuel storage and preparation.
- Smelting reduction process – all steps for the smelting process, resulting in hot metal.
- Casting plant.
- Emissions control – in particular flue gas cleaning.

The following *Figure 2-5* shows the system boundaries of the smelting reduction process for producing pig iron.

The mass balance method is to be used to give a complete balance of the amount of carbon entering or leaving the production process (as carbon remaining in the product, or in wastes or slags) in accordance with point B.3.2 of Annex II to the Methodology Act.

Figure 2-5: System boundaries of the Pig iron – smelting reduction production route.



Note to figure:

- In this figure, the boxes with a blue dashed outline (e.g. Hydrogen (if used as separately produced precursor) and Optional: other materials and fuels) represent optional inputs that are included only where they are actually used at the installation.
- Functional unit for iron and steel goods: tonnes of goods under the same CN code.
- Electricity: Electricity may be consumed in smelting reduction operations (e.g. for auxiliaries) and may be recorded for energy balance; indirect emissions from electricity are not included in the embedded emissions for iron and steel goods listed in Annex II to the CBAM Regulation (direct emissions only).
- Precursors: Where pig iron is produced as a complex good using precursors, embedded emissions include the embedded emissions of those precursors in accordance with the rules on precursors in the Methodology Act; where indirect emissions are relevant to a precursor, those indirect emissions are included in the precursor's embedded emissions even if pig iron is direct-only.

2.2.3.5 Direct Reduced Iron (DRI) production process

Direct reduction involves the production of solid primary iron from high grade iron ores (pellets, sinter or concentrates). There are different technologies that may use different qualities of ores (which may require pelletisation or sintering) and different fuels and reducing agents (natural gas, diverse fossil fuels or biomass, hydrogen). The solid product is called direct reduced iron (DRI). Different types of DRI are produced, for example 'iron sponge' and hot briquetted iron (HBI). Some DRI is used directly as a feedstock in EAFs or for other downstream processes. It is expected that production routes using hydrogen will play a major role in decarbonising the steel industry in coming years.

The Methodology Act (Annex I, point 3.14 ("DRI (Direct Reduced Iron)") defines the system boundaries for direct emissions monitoring for the DRI production route, as encompassing:

> *" – All processes directly or indirectly linked to the production processes emitting CO_2 from fuels and reducing agents such as natural gas, fuel oils, waste gases from the process or converter gas, etc.*
>
> *– Where biogas or other forms of biomass are used, the provisions of point B.3.3 of Annex II shall be taken into account.*

– All processes directly or indirectly linked to the production processes emitting CO_2 from process materials such as limestone, magnesite, and other carbonates, carbonate ores; materials for flue gas cleaning.

– Carbon remaining in the product or in slags or wastes is taken into account by using a mass balance method in accordance with point B.3.2 of Annex II."

Precursors (if used in the process) are: sintered ore; hydrogen; pig iron or DRI from other installations or production processes; and ferro-alloys FeMn, FeCr, FeNi, if used. During the transitional period, indirect emissions that result from electricity consumed by the production process also had to be monitored and reported. In the definitive period, indirect emissions are not taken into account for the calculation of embedded emissions of iron and steel CBAM goods listed in Annex II to the CBAM Regulation.

In line with the above definition of systems boundaries, the following production steps may be regarded as being within the system boundaries of DRI installations:

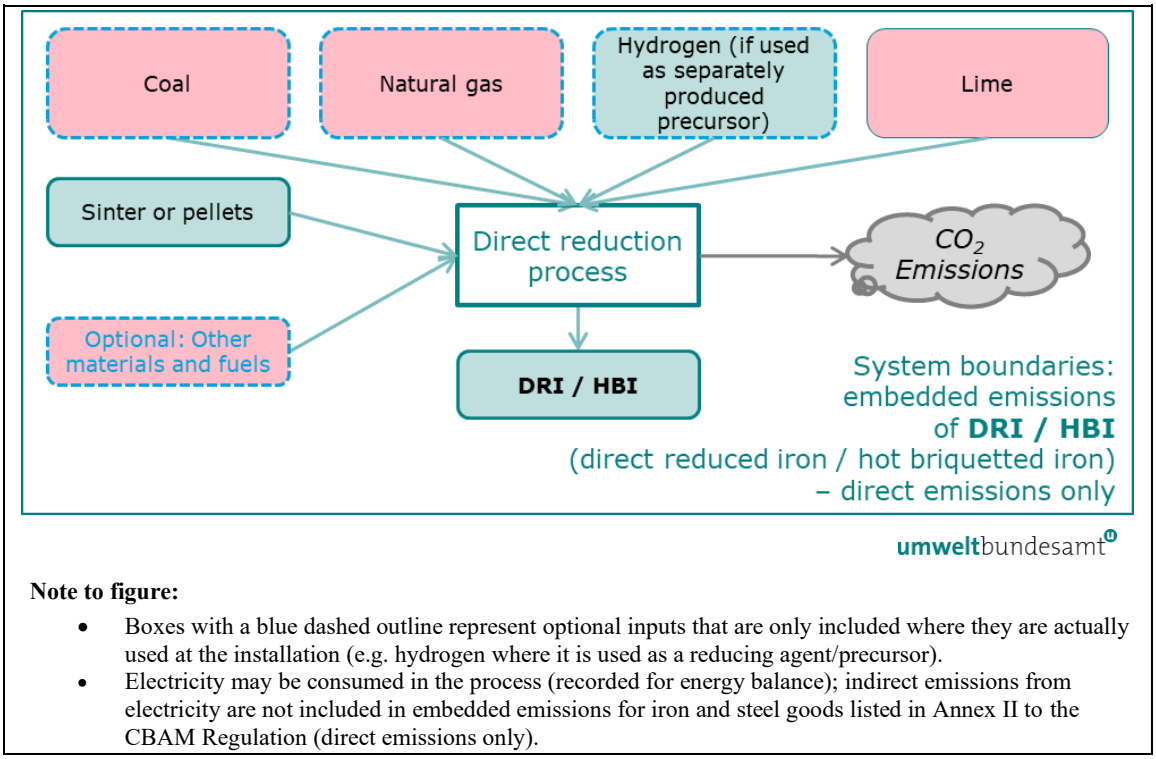
- Raw material handling and pre-treatment.
- Fuel storage and preparation – coal, natural gas or hydrogen etc.
- Direct reduction process for iron production – all steps for the DRI process, forming into hot briquetted iron (HBI) if applicable.
- Emissions control – in particular flue gas cleaning.

The following *Figure 2-6* shows the system boundaries of the relevant processes for DRI production. Although there are several different processes used in practice, the high-level system boundaries are very similar and can therefore be represented on a single diagram.

Note that where an installation does not sell or transfer DRI produced to other installations, a common production process including steelmaking may be defined, in line with Annex I, point 3.14.1 of the Methodology Act, so that emissions are monitored at the level of the joint production process rather than for DRI separately.

The mass balance method is to be used to give a complete balance of the amount of carbon entering or leaving the production process (as carbon remaining in the product, or in wastes or slags).

Figure 2-6: System boundaries of the DRI production process



Note to figure:

- Boxes with a blue dashed outline represent optional inputs that are only included where they are actually used at the installation (e.g. hydrogen where it is used as a reducing agent/precursor).
- Electricity may be consumed in the process (recorded for energy balance); indirect emissions from electricity are not included in embedded emissions for iron and steel goods listed in Annex II to the CBAM Regulation (direct emissions only).

2.2.3.6 Crude steel – Basic oxygen steelmaking production route

If the basic oxygen steelmaking production route starts with hot metal (liquid pig iron); the hot metal is directly converted to crude steel by the basic oxygen converter or furnace (BOF) as part of a continuous process. Following the converter, a steel decarburisation process by argon oxygen decarburisation (AOD) or vacuum oxygen decarburisation (VOD) may be performed, followed by various secondary metallurgical processes such as vacuum degassing to remove dissolved gases. Crude steel is then cast into its primary forms by continuous casting or ingot casting, which may be followed by hot-rolling or forging to obtain the semi-finished crude steel products (under CN codes 7207, 7218 and 7224).

The Methodology Act (Annex I, point 3.15.2.1) defines the system boundaries for direct emissions monitoring for the Crude steel – basic oxygen production route, as encompassing:

> *" – All processes directly or indirectly linked to the production processes emitting CO_2 from fuels such as coal, natural gas, fuel oils, waste gases such as blast furnace gas, coke oven gas or converter gas.*
>
> *– All processes directly or indirectly linked to the production processes emitting CO_2 from process materials such as limestone, magnesite, and other carbonates, carbonate ores; materials for flue gas cleaning."*
>
> *– Carbon entering the process in scrap, alloys, graphite etc. and carbon remaining in the product or in slags or wastes is taken into account by using a mass balance method in accordance with point B.3.2 of Annex II to the Methodology Act."*

Precursors (if used in the process) are: pig iron, DRI; ferro-alloys FeMn, FeCr, FeNi; and crude steel from other installations or production processes, if used. During the transitional period, indirect emissions that result from electricity consumed by the production process also had to be monitored and reported. In the definitive period, indirect emissions are not taken into account for the calculation of embedded emissions of iron and steel CBAM goods listed in Annex II to the CBAM Regulation.

In line with the above definition of systems boundaries, the following production steps may be regarded as being within the system boundaries of basic oxygen steelmaking installations:

- Basic oxygen converter or furnace (BOF).
- Decarburisation – AOD or VOD processes, where relevant.
- Secondary metallurgy and vacuum degassing.
- Casting plant – continuous casting or ingot casting, preheating equipment.
- Hot rolling or forging – where relevant, only primary hot-rolling and rough shaping by forging to obtain the semi-finished products.
- All necessary auxiliary activities – such as transfers, re-heating.
- Emissions control – in particular flue gas cleaning, dedusting units, slag handling.

Note that only primary hot-rolling and rough shaping by forging to obtain the semi-finished products under CN codes 7207, 7218 and 7224 are included in this aggregated goods category. All other rolling and forging processes are included in the aggregated goods category "iron or steel products".

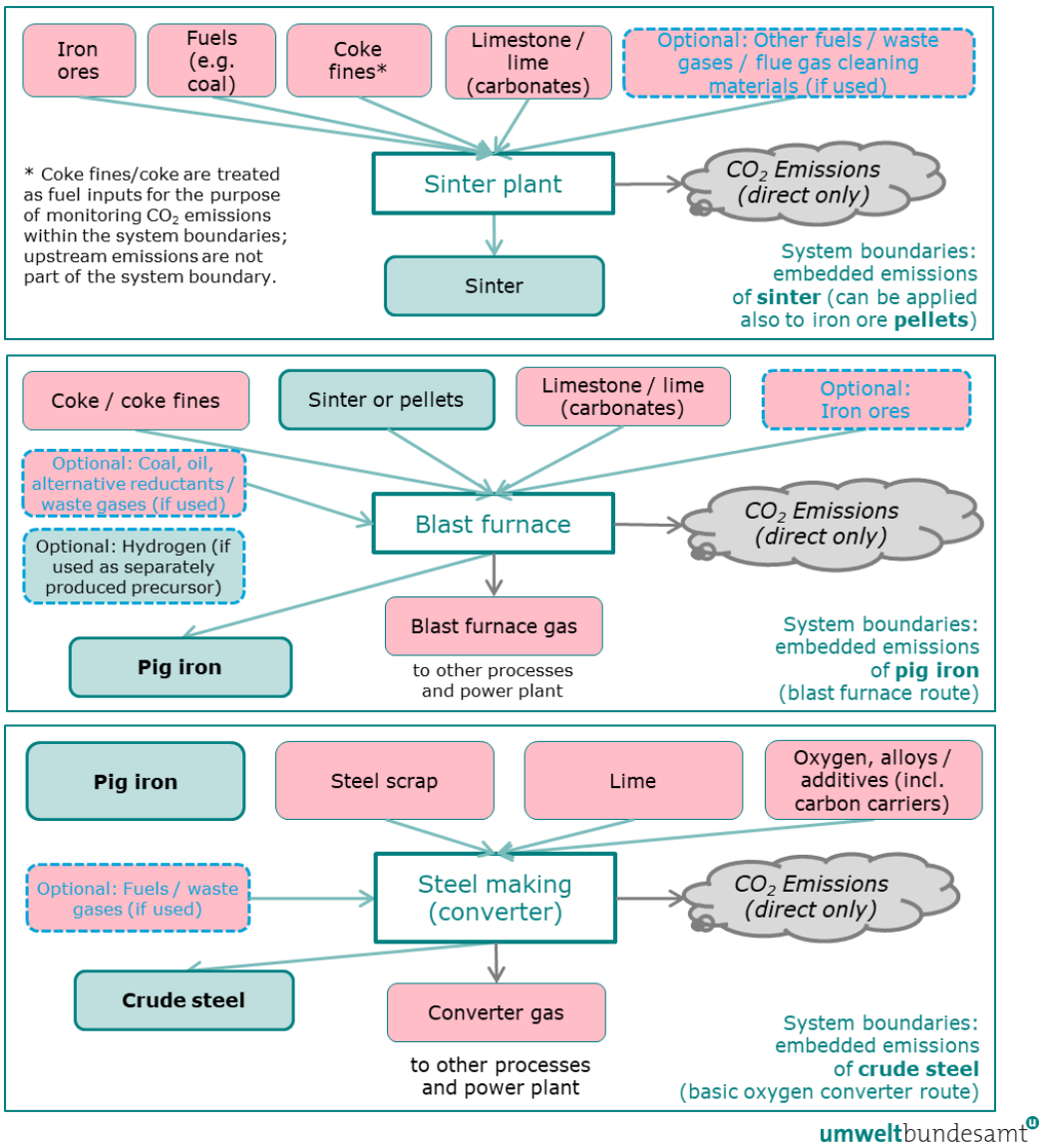
Where goods with the same functional unit are produced via more than one production route within an installation, specific embedded emissions shall be determined using a weighted average across those routes, in accordance with Article 4(6) of the Methodology Act.

In integrated steel plants, liquid pig iron that is directly charged to the oxygen converter is the product which separates the production process for pig iron (bottom left in *Figure 2-7* above) from the production process of crude steel (bottom right, above).

The integrated blast furnace / basic oxygen furnace (BF/BOF) steelmaking process is by far the most complex steel making process and is characterised by networks of interdependent material and energy flows between the various production units. Note that coke (top left) is treated as a raw material with no embedded emissions as a CBAM precursor (as coke is not a CBAM good) under the CBAM methodology; however, its use contributes to the installation's direct CO_2 emissions within the system boundaries.

When all the liquid pig iron from the blast furnace is used by the oxygen steelmaking process to produce crude steel, the Methodology Act allows the operator to define a joint production process for crude steel making, rather than monitoring the blast furnace production route as a separate production process, provided that the requirements of Article 4 and Annex III of the Methodology Act are met (see also Annex I, point 3.13.1, as applicable).

Figure 2-7: System boundaries of basic oxygen steelmaking and related processes.



Notes to the figure:

- For iron and steel CBAM goods listed in Annex II to the CBAM Regulation, embedded emissions are direct emissions only; indirect emissions from electricity are not included in embedded emissions for these goods. Electricity may be consumed operationally (e.g. for plant operation and energy balance) but is not part of the embedded emissions boundary where the good is direct-only.
- Optional inputs / steps (blue dashed outline): Boxes with a blue dashed outline represent optional inputs or process elements that are included only where they are actually used at the installation.
- Hydrogen as an optional precursor (where shown): Where "Hydrogen" is shown, it indicates that hydrogen, if used as a reducing agent/input in the relevant route at the installation, must be treated as a precursor for embedded-emissions accounting in line with the applicable sector-specific system boundary provisions in Annex I to the Methodology Act.
- Waste gases: Streams such as blast furnace gas and converter gas are shown as process waste gases. Where such gases are used as fuels, they fall within the fuel input boundary for direct emissions monitoring for the relevant production process.
- Functional unit: Functional unit for iron and steel goods is tonnes of goods under the same CN code.
- *BOF (mass balance): BOF indicates that, for the basic oxygen furnace route, carbon entering and leaving the process (including carbon in scrap and alloying/carbon-bearing additions, and carbon remaining in product, slags or wastes) is accounted for using a mass balance method as required by the applicable monitoring rules for the route.

- Averaging across routes within an installation: Where goods with the same functional unit are produced via more than one production route within an installation, specific embedded emissions are determined using a weighted average across those routes (to avoid selective reporting).
- Precursors and embedded emissions: Where iron and steel goods are complex goods, embedded emissions include the embedded emissions of precursors used. Where a precursor's embedded emissions include indirect emissions (only where indirect emissions are applicable to that precursor under the CBAM rules), those are included at the precursor level even if the final iron/steel good itself is direct-only.

The mass balance method is to be used to give a complete balance of the amount of carbon entering or leaving the production process (carbon remaining in steel product, or in wastes and slags). This method is defined in point B.3.2 of Annex III to that Methodology Act.

2.2.3.7 Crude steel – Electric Arc Furnace steelmaking production route

The direct smelting of materials which contain iron is usually performed in an electric arc furnace (EAF). Feedstocks for EAF routes are metallic iron; in particular ferrous scrap[10] and/or Direct Reduced Iron (DRI). Where significant amounts of DRI are used, one of the various EAF-DRI routes applies. Following EAF smelting, a steel decarburisation process by argon oxygen decarburisation (AOD) or vacuum oxygen decarburisation (VOD) may be performed, followed by various secondary metallurgical processes such as desulphurisation and vacuum degassing to remove dissolved gases. Electricity is the main energy input to the EAF.

The Methodology Act (Annex I, point 3.15.2.2 "Electric arc furnace") defines the system boundaries for direct emissions monitoring for the Crude steel – EAF production route, as encompassing:

> *" – All processes directly or indirectly linked to the production processes emitting CO_2 from fuels such as coal, natural gas, fuel oils, as well as from waste gases such as blast furnace gas, coke oven gas or converter gas.*
>
> *– All processes directly or indirectly linked to the production processes emitting CO_2 from the consumption of electrodes and electrode pastes.*
>
> *– All processes directly or indirectly linked to the production processes emitting CO_2 from process materials such as limestone, magnesite, and other carbonates, carbonate ores; materials for flue gas cleaning.*
>
> *– Carbon entering the process, e.g. in the form of scrap, alloys and graphite, and carbon remaining in the product or in slags or wastes is taken into account by using a mass balance method in accordance with Section B.3.2 of Annex II."*

Precursors (if used in the process) are: pig iron, DRI; ferro-alloys FeMn, FeCr, FeNi; and crude steel from other installations or production processes, if used. Indirect emissions resulting from electricity consumption may be monitored for operational/energy-balance purposes in line with the Methodology Act (see in particular Annex II, point D), but for iron and steel goods listed in Annex II to the CBAM Regulation they are not taken into account when determining embedded emissions for CBAM purposes in the definitive period. Where crude steel goods listed in Annex II to the CBAM Regulation include

[10] Where only post-consumer scrap is used, it is assumed to have zero embedded emissions.

precursors that are not listed in Annex II to that Regulation, the indirect emissions of those precursors are included in the embedded emissions of the crude steel good, in accordance with the cross-sectoral rules (Annex I, point 3.1) and the applicable precursor accounting rules. Where a precursor originates in the Union or in exempted countries/territories, its specific embedded emissions (direct and, where applicable, indirect) shall be counted as zero for the complex good calculation, in accordance with Annex III, Section B.

In line with the above definition of systems boundaries, the following production steps may be regarded as being within the system boundaries of EAF steelmaking installations – all relevant activities and production units, such as:

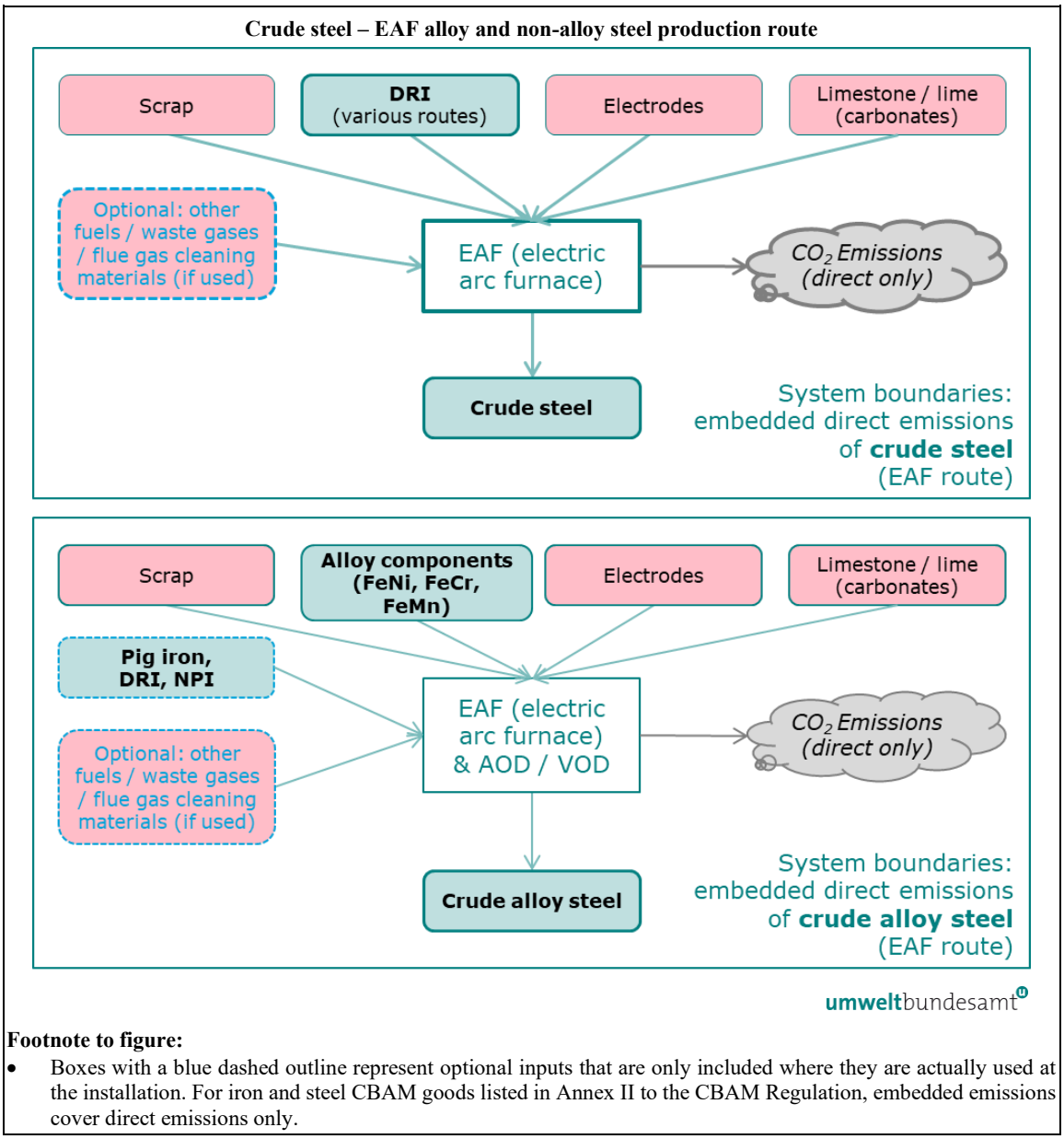
- Raw material handling and pre-treatment– scrap drying and pre-heating of raw materials.
- EAF process – all steps for the EAF process, including charging, melting, primary refining and steel and slag tapping of the primary furnace.
- Decarburisation – AOD or VOD processes, where relevant.
- Secondary metallurgy and vacuum degassing.
- Casting plant – continuous casting or ingot casting, preheating equipment.
- Hot rolling or forging – where relevant, only primary hot-rolling and rough shaping by forging to obtain the semi-finished products.
- All necessary auxiliary activities – such as transfers, heating of equipment, re-heating.
- Emissions control – in particular flue gas cleaning, dedusting units, slag handling.

Note that only primary hot-rolling and rough shaping by forging to obtain the semi-finished products under CN codes 7207, 7218 and 7224 are included in this aggregated goods category. All other rolling and forging processes are included in the aggregated goods category “iron or steel products”.

There are several different EAF production routes, for crude steel and crude alloy steel, which are broadly similar and are shown jointly in Figure 2-8**.**

The mass balance method is to be used to give a complete balance of the amount of carbon entering or leaving the EAF production process (carbon remaining in steel, in wastes and in slag). This method is defined in point B.3.2 of Annex III to the Commission Methodology Act.

Figure 2-8: System boundaries: embedded direct emissions of crude steel (EAF route).



Footnote to figure:

- Boxes with a blue dashed outline represent optional inputs that are only included where they are actually used at the installation. For iron and steel CBAM goods listed in Annex II to the CBAM Regulation, embedded emissions cover direct emissions only.

2.2.3.8 Iron or steel products production process

Iron or steel products are produced from the further processing of crude steel, semi-finished products, as well as other final steel products by all kinds of forming and finishing steps, including: re-heating, re-melting, casting, hot rolling, cold rolling, forging, pickling, annealing, coating, galvanizing, wire drawing, plating, cutting, welding and finishing.

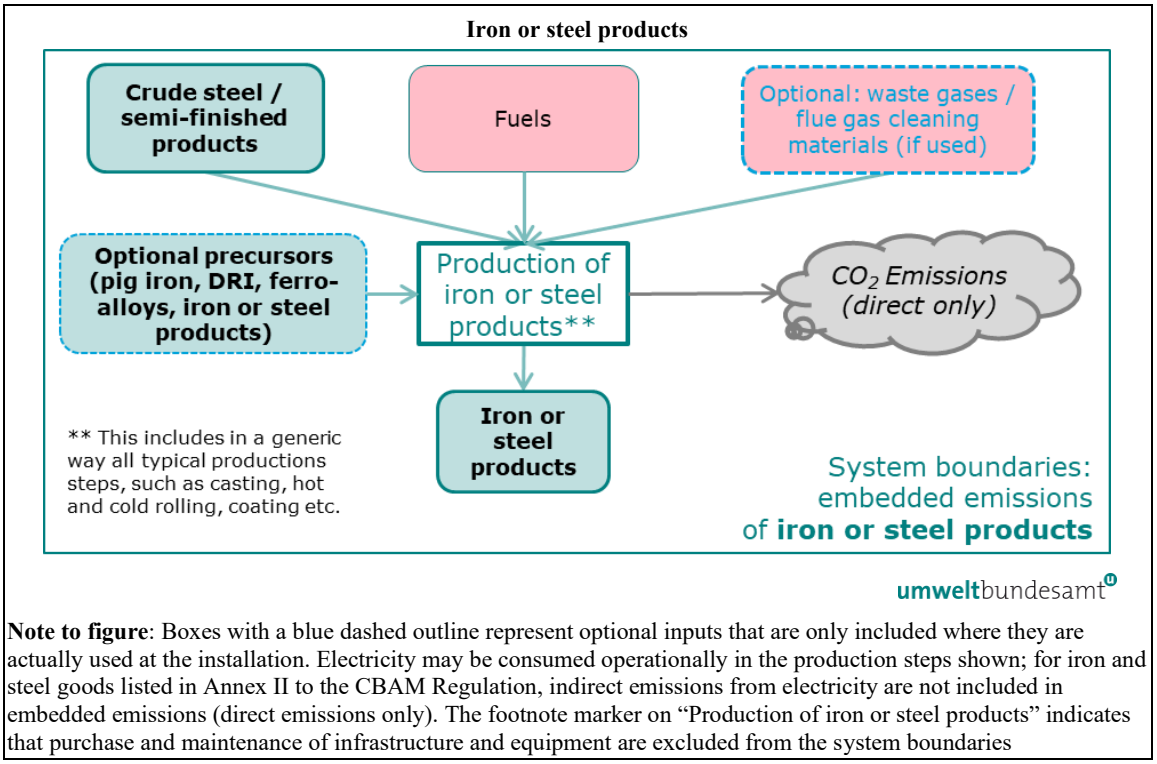
The Methodology Act (Annex I, point 3.16 "Iron or steel products") defines the system boundaries for direct emissions monitoring for the iron or steel products production route, as encompassing:

> *" – All processes directly or indirectly linked to the production processes emitting CO_2 emissions from combustion of fuels and process emissions from flue gas treatment, including re-heating, re-melting, casting, hot rolling, cold rolling, forging, annealing, coating, galvanizing, wire drawing, pickling and excluding the*

following processes: plating, cutting, welding and finishing of iron or steel products."

Purchase and maintenance of infrastructure and equipment are not included within the system boundaries.

Figure 2-9: System boundaries of the iron or steel products production process (direct emissions)



Note to figure: Boxes with a blue dashed outline represent optional inputs that are only included where they are actually used at the installation. Electricity may be consumed operationally in the production steps shown; for iron and steel goods listed in Annex II to the CBAM Regulation, indirect emissions from electricity are not included in embedded emissions (direct emissions only). The footnote marker on "Production of iron or steel products" indicates that purchase and maintenance of infrastructure and equipment are excluded from the system boundaries

Precursors (if used in the process) are: crude steel; pig iron, DRI; ferro-alloys FeMn, FeCr, FeNi; and other iron or steel products. Indirect emissions resulting from electricity consumption may be monitored in line with the Methodology Act (see in particular Annex II, point D), but for iron and steel goods listed in Annex II to the CBAM Regulation they are not taken into account when determining embedded emissions for CBAM purposes in the definitive period. Where iron or steel products are complex goods produced using precursors, the embedded emissions of the iron or steel products include the embedded emissions of those precursors, including any indirect emissions of electricity associated with the precursors where relevant (i.e. where the precursor is not listed in Annex II to the CBAM Regulation), in line with the cross-sectoral rules.

In line with the above definition of systems boundaries, the following production steps may be regarded as being within the system boundaries of iron or steel products:

- Raw material preparation – including pre-heating, re-melting and alloying.
- Forming processes for iron or steel products – all forming process steps, including casting, hot and cold rolling, shaping by forging, wire drawing.
- Pickling, annealing, coating, galvanizing.
- Emissions control – for treating releases to air, water or ground.

Figure 2-9 shows the system boundaries from crude steel to basic steel products.

3 IRON AND STEEL SECTOR - SPECIFIC REQUIREMENTS

The textbox below signposts sector-specific sections in the Methodology Act, relevant for the CBAM definitive period.

Methodology Act references:

- **Annex I, point 3** – Functional unit and system boundaries. Sub-sections 3.11 to 3.16 (iron and steel sector aggregated goods categories)
- **Annex II, section G** – Standard factors used in the monitoring of direct emissions at installation level, including: Table 1: fuel emission factors related to NCV and net calorific values per mass of fuel, Table 3: stoichiometric emission factor for process emissions from carbonate decomposition, Table 5: Emission factors for process emissions from other process materials (production of iron or steel, and processing of ferrous metals).
- **Annex IV**, **point 2** – Sector-specific parameters to be included in the operator's emissions report.

3.1 Sector-specific requirements for monitoring and reporting

Direct and indirect embedded emissions should be monitored in line with the methodology set out in the Methodology Act.

3.1.1 Emissions monitoring

Relevant emissions that must be monitored and reported for the iron and steel sector are:

- Carbon dioxide emissions (direct) from the fuel combustion process including waste or off-gases such as blast furnace gas (BFG), from stationary units only (excludes emissions from any mobile machinery such as vehicles).

- Carbon dioxide emissions (direct) from the process, resulting from the reduction of iron and steel by reducing agents such as coke or natural gas, from the thermal decomposition of carbonate raw materials[11], from the carbon content of scrap or alloys, graphite[12] or other carbon containing materials entering the process.

- Carbon dioxide emissions (direct) resulting from the production of measurable heating (e.g. steam) and cooling that is consumed within the system boundaries of the production process, regardless of the location of the production of the heat (i.e. from on-site generation or from imports from off-site).

- Carbon dioxide emissions (direct) resulting from emissions control (e.g. from carbonate raw materials such as soda ash used for acidic flue gas cleaning). This is included for any good where this is applicable.

Direct emissions from the different source streams above are not reported separately but are added together to result in the total direct emissions for the installation or production process.

[11] Such as limestone, dolomite and carbonatic iron ores, including $FeCO_3$.

[12] Such as graphite blocks used inside the blast furnace, or electrodes or electrode pastes.

In deriving total direct emissions, carbon remaining in aggregated iron and steel goods such as pig iron, DRI, crude steel or iron alloys, or in slags or wastes, is also taken into account by using a mass balance method.

Indirect emissions from electricity consumed must be reported separately from direct emissions. Note that for the iron and steel sector indirect emissions must be reported only for the aggregated good category 'sintered ore', but these have to be included in the embedded emissions of the complex goods for which the sintered ore is used as precursor.

Installations that only carry out excluded processes for iron or steel products

Where the installation only carries out processes excluded from the system boundaries (see section 3.16 of Annex I to the Methodology Act), verification obligations still apply if operators want to use actual values. Notably, the verification process will have to establish the following:

- That the installation only operates within the list of excluded processes
- Whether the production process carried out on the installation changed the specific embedded emissions of the goods:
    - for instance, in an installation where only cutting occurs, to compute embedded emissions of precursors, operators shall use the mass of precursors as **entering the production process** (before cutting), even if emissions from cutting activities will not be accounted for in embedded emissions of the complex good (see point B of Annex III to the Methodology Act). This means that SEE will increase, even if no emissions need to be reported for CBAM purposes.
- That embedded emissions of precursors, whether based on default values or actual values, are correctly calculated. For instance, the origin of precursors needs to be verified (to establish zero-rating if produced in the EU or exempted territories; to justify the use of the appropriate country-specific default values where relevant; to check that verification reports exist for precursors where relevant).

As the installation needs to be verified, the operator will have to establish a monitoring plan. In this case, the monitoring plan might be very concise given the absence of process emissions, combustion emissions, and indirect emissions. Emissions from excluded process steps do not have to be included in the monitoring plan as a source stream and do not have to be reported in the operator's emissions report.

3.1.2 Additional rules

Attribution of emissions

Given the complexity of production processes in the iron and steel sector, **during the definitive period** installations producing two or more goods from the groups sintered ore, pig iron, FeMn, FeCr, FeNi, DRI, crude steel, iron or steel products, may monitor and report embedded emissions defining **one joint production process**, or '**bubble'**, for all the products from these groups covered, if none of the precursors produced within the installation are sold separately.

Simplified!

3.1.3 Additional reporting parameters

The following Table 3-1 lists out the additional information that needs to be provided by you as an operator to importers, in your emissions data communication to them.

Table 3-1: Additional iron and steel sector parameters requested in the CBAM declaration

Aggregated good category	Reporting requirement
Sintered Ore	– N.a. (not applicable)
Pig Iron	– The main reducing agent used. – Mass % of Mn, Cr, Ni, total of other alloy elements.
FeMn Ferro-Manganese	– Mass % of Mn and carbon.
FeCr – Ferro-Chromium	– Mass % of Cr and carbon.
FeNi – Ferro-Nickel	– Mass % of Ni and carbon.
DRI (Direct Reduced Iron)	– The main reducing agent used. – Mass % of Mn, Cr, Ni, total of other alloy elements.
Crude steel	– The main reducing agent of the precursor, if known. – Mass % of Mn, Cr, Ni, total of other alloy elements. – Tonnes scrap used for producing 1 t crude steel. – % of scrap that is pre-consumer scrap.
Iron or steel products	– The main reducing agent used in precursor production, if known. – Mass % of Mn, Cr, Ni, total of other alloy elements. – Tonnes scrap used for producing 1 t of the product. – % of scrap that is pre-consumer scrap.

You need to ensure that you collect all the parameters necessary for your CBAM goods and communicate them to the importers of your goods. The importer will need to report the additional parameters in their annual CBAM declaration for the relevant reporting period.

4 WORKED EXAMPLES FOR THE IRON AND STEEL SECTORS

4.1 Example 1 – integrated steel works and conversion to iron or steel products.

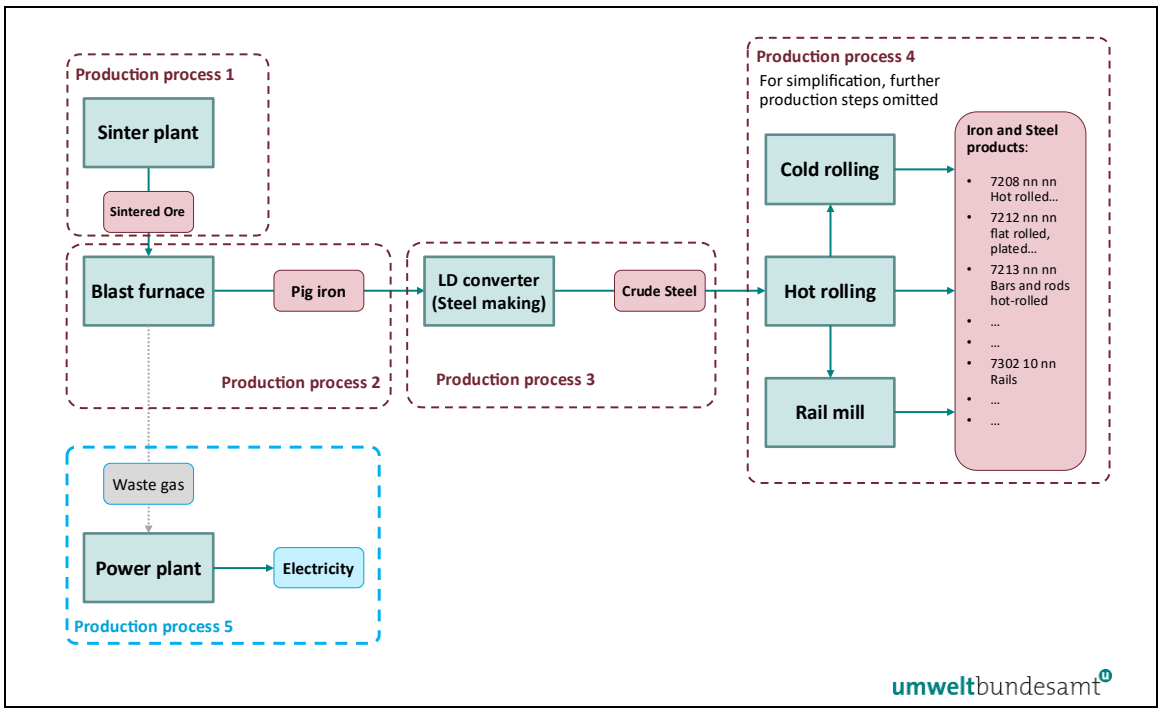
The following worked example shows how specific embedded emissions are derived for iron and steel sector goods, produced by the blast furnace/basic oxygen furnace (BOF)

route. The resulting embedded emissions of imports into the EU are then calculated at the end of the example for reporting by the importer in their annual CBAM declaration for the relevant reporting period.

In this example for integrated steel making, the installation produces five products, each of which is treated as a separate production process, as each is a separate category of CBAM aggregated good. It is assumed that only CN codes related to carbon steel are produced, which allows limiting the number of production.

The diagram below gives an outline view of the installation and shows the system boundaries as a red (and blue) hatched line for each production process. The physical units carrying out each production process have been grouped under 'Sinter plant', 'Blast furnace', 'LD converter', and under forming as 'Cold rolling, Hot rolling, Rail mill' and 'Power plant'; relevant inputs and outputs have been identified for each production process.

Figure 4-1: Example for carbon steel production, blast furnace route – Overview



The five relevant production processes defined above, and elaborated further in the diagrams below are:

- Production process 1 – sinter[13] (aggregated goods category 'sintered ore') produced in a sinter plant. The system boundaries of this production process have been defined as including inputs of raw materials (iron ore), fuels (coke fines) and electrical energy. The sintered ore output from the process is a precursor for production process 2.

[13] CN 26011200 – Agglomerated iron ores and concentrates (excl. roasted iron pyrites)

- Production process 2 – pig iron[14] (hot metal) produced by a blast furnace. The system boundaries of this production process have been defined as including inputs of raw materials lime, coke (which is not a CBAM good, and therefore no precursor, and is treated as having zero embedded emissions for the purposes of this calculation), precursor sintered ore (which has embedded emissions), fuels/reducing agents including coke and plastics waste from households (i.e. a mixed waste fraction containing some biomass). Because indirect emissions are not relevant for pig iron, electrical energy is included only for completeness purposes (its monitoring helps establishing the complete energy balance and is included as 'recommended improvement'). The pig iron output from the process is a precursor for production process 3.

- Production process 3 – crude steel produced by the LD (basic oxygen) converter steelmaking route. The system boundaries of this production process have been defined as including inputs of raw materials lime and steel scrap (which is no CBAM good and therefore treated as having zero embedded emissions for the purposes of this calculation), precursor pig iron (which has embedded emissions), fuels (natural gas), and (like in process 2, only for completeness reasons) electrical energy. The crude steel output from the process is a precursor for production process 4.

- Production process 4 – iron or steel products produced by different forming processes (hot rolling, cold rolling and rail mill)[15] to give basic products such as bars, rods, rails and other rolled products. The system boundaries of this production process have been defined as including inputs of crude steel (which has embedded emissions), fuels (natural gas), and (for completeness purposes only) electrical energy. Outputs from the production process are all within the same aggregated goods category 'iron or steel products' (complex goods produced from the different precursors produced) that are sold.

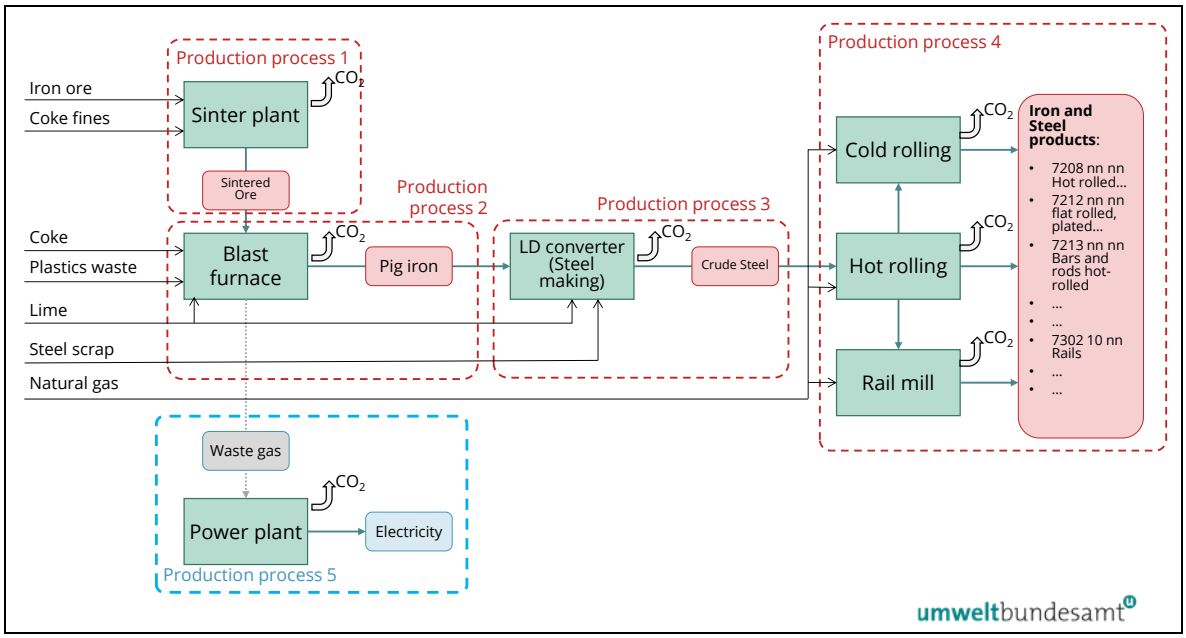
- Production process 5 – electricity produced from waste gas from blast furnace (production process 2). Blast furnace gas is transferred from production process 2 to production process 5 and energy is recovered through the generation of electricity, used for processes 1 to 4, contributing to the indirect emissions of those processes, where relevant.

The *second diagram (Figure 4-2) identifies* the different source streams as inputs into the production processes, giving rise to direct emissions.

[14] CN 7201nnnn (no further distinction seems necessary for the example)

[15] Some of the possible CN codes are given in the graphs. Only carbon steel is produced.

Figure 4-2: *Example for carbon steel production, blast furnace route – Direct emissions and related source streams*

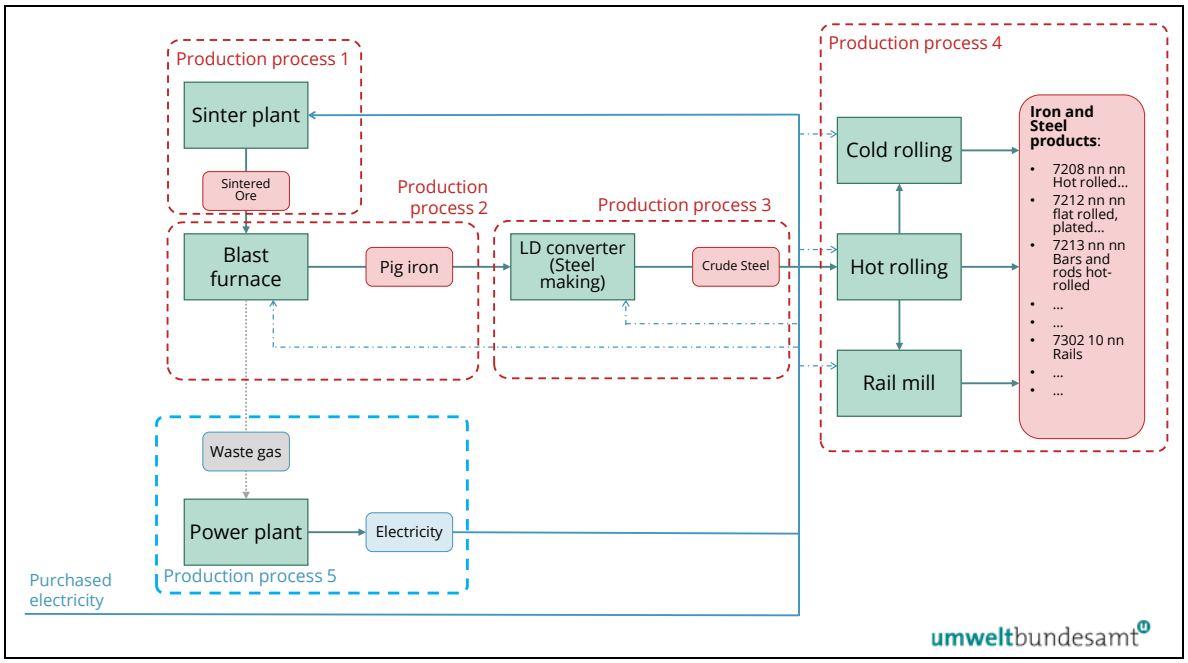


Direct emissions arise from the combustion of fuels (coke fines, plastic wastes, natural gas) and from the waste gas (blast furnace gas) used for power generation, and from process emissions from coke[16] as reducing agent and the thermal decomposition of carbonate-containing materials (such as lime) and from releases of carbon contained within the different iron and steel materials.

The third diagram (Figure 4-3) below shows by the blue line which electricity flows need to be monitored for indirect emissions, resulting from the consumption of electricity produced in the installation and purchased from the grid, consumed by production process 1. The additional electricity monitoring "for completeness only" as outlined above is shown by dashed blue lines.

[16] Coke can also be treated as fuel, although it is primarily used as reducing agent. However, reporting it like a fuel, i.e. including its NCV, has the advantage that it can be included in an energy balance for consistency checking.

Figure 4-3: Example for carbon steel production, blast furnace route – Indirect emissions monitoring (electricity flows) The light blue dashed lines are only monitored for completeness (recommended improvement). The solid blue line represents the essential monitoring requirement for indirect emissions.



Some of the waste gas (blast furnace gas) that is produced by production process 2 is recovered as a fuel for generating electricity through production process 5. This electricity is used within the installation, thereby reducing the amount of imported grid electricity that is required. The assumption in this example is that the produced electricity is 100% consumed within the installation, but does not cover the complete electricity demand of the installation. Therefore, for indirect emissions calculation, a weighted average from the emission factor of the self-produced electricity and the grid electricity has to be calculated. As the indirect emissions have to be monitored only for the production process 'sintered ore', that process could theoretically consume exclusively electricity from own production. However, the operator would have to provide specific evidence to the verifier that this is the case (Article 9 of the Methodology Act). For the example we assume the more realistic case, i.e. the average electricity mix is used evenly across all production processes.

Given the **complexity** of production processes in the iron and steel sector, installations producing complex goods using precursors from their own installation's production (in this example: sintered ore, pig iron, DRI, crude steel and iron or steel products) are permitted to monitor and report embedded emissions by defining one joint production process or **'bubble',** for all the iron and steel aggregated goods categories covered, provided that the precursors produced are wholly used to make the finished iron or steel products.

Figure 4-4: Example for *carbon steel production, blast furnace route – complete monitoring approach. All parameters in red font need to be monitored.*

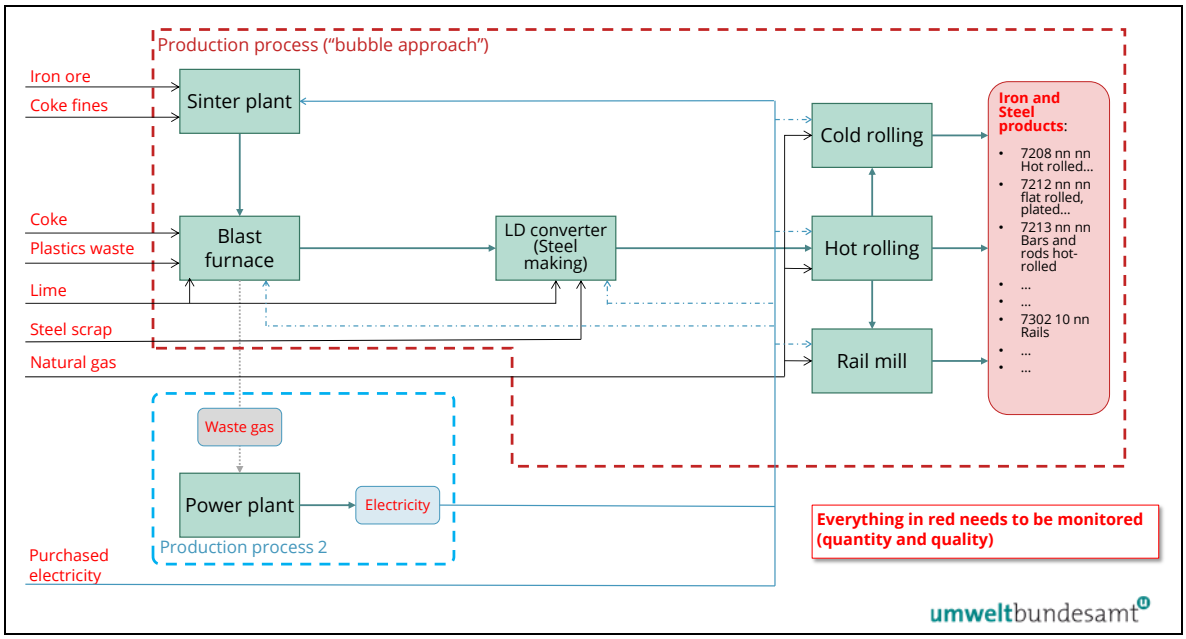


Figure 4-4 provides a complete monitoring approach for all source streams, for the example installation. In this figure a single bubbled system boundary has been drawn around production processes 1 to 4, for iron or steel products. Within the bubble, direct emissions for this production route result from:

- Fuel combustion – direct emissions from the combustion of fossil fuels and waste gases.
- Process emissions – direct emissions resulting from the thermal decomposition of carbonates, reductants (coke) and from the carbon content of iron and steel materials, including scrap.
- Indirect emissions from the electrical energy consumed by the joint production process is monitored, but the amount of electricity for the sinter plant has to be singled out, as it is the only product for which indirect emissions are relevant in this example.

The inputs and outputs highlighted in red text are the parameters that would need to be monitored by the operator in order to attribute emissions and determine direct specific embedded emissions for the bubbled process.

For both direct and indirect emissions, monitoring encompasses both aspects, quantitative (activity data) and qualitative (calculation factors). The activity levels for the different goods produced would also need to be monitored. However, applying the bubble approach, interim products (precursors), in this example sintered ore, pig iron and crude steel, do not have to be monitored. Furthermore, quantities fuels used in more than one of the production processes, do not have to be split by use levels in the production process. The only exception is the monitoring of electricity used in the production of sintered ore.

Given the complexity of the installation with its different source streams and material flows, the mass balance method is used to give a complete balance of the amount of carbon

entering and leaving the installation. In applying this method, the CO_2 quantities relevant for each source stream are calculated based on the carbon content (CC) in each material, without distinguishing fuels and process materials. Non-emitted carbon leaving the installation in products and residues instead of being emitted is also taken into account, by defining output source streams, which have negative activity data, highlighted in red text in Table 4-1.

Table 4-1: Example calculation for carbon steel production, blast furnace route – Mass balance for the installation's direct emissions. AD = Activity data, CC = carbon content.

Consumption levels	**AD (t)**	**CC**	**Bio fraction**	**Emissions (t CO_2)[17]**	**Comments**
Coke fines	50 000	88,0%		161 216,0	
Iron ores	5 600 000	0,023%		4 719,2	
Coke	2 200 000	88,0%		7 093 504,0	
Plastic wastes	70 000	68,4%	16%	147 270,8	Biomass fraction[18] = 28 052 t CO_2 (zero-rated)
Scrap (external)	800 000	0,210%		6 155,5	
Scrap (internal)	200 000	0,180%		1 319,0	
Lime calcined	280 000	0,273%		2 800,0	
Natural gas	170 000	75,0%		467 160,0	
Other inputs	40 000	10,0%		14 656,0	
Sum				**7 898 800,6**	
Carbon in outputs	AD (t)	CC		**"Emissions" (negative) (t CO_2)**	
Steel	-4 800 000	0,180%		-31 657,0	
Slags	-1 000 000	0,030%		-1 099,0	
Sum				**-32 756,2**	
Total direct emissions of the installation				**7 866 044,4**	

In Table 4-1 above, the carbon content (CC) of the different input and output source streams is converted into its CO_2 equivalent, including for scrap from different sources. Emissions from biomass in the mixed plastic waste (assuming this is derived from MSW) is zero-rated for emissions. Total direct emissions, net of carbon in outputs, is then calculated.

Total indirect emissions must then be calculated, along with a correction for waste gas from direct emissions that has been used to generate electricity. The following assumptions have been made for the purposes of this example.

[17] Factor 3,664 t CO_2 / t C

[18] Calculated above as 70 000 x 68,4% x 16% x 3,664 t CO_2 / t carbon = 28 052 t CO_2

Table 4-2: Carbon steel, blast furnace route – Calculation of the installation's indirect emissions

Installation's Indirect Emissions
Assumptions: – All electricity in the total plant uses the same average fuel mix consisting of the grid factor (assumption: installation is situated in South Korea) and self-generated electricity from blast furnace waste gas. – 40% of produced waste gas used for electricity production (35% efficiency). – This covers 75% of electricity consumption, the rest comes from the grid. – Emission factor for waste gas is based on equivalent natural gas, but lower efficiency than in other natural gas power plants (EF = 0,576 t CO_2 /MWh). – Grid emission factor = 0,475 t CO_2 / MWh (looked up in the Default Values Act, Annex II for Korea). Weighted emissions factor of consumed electricity at installation: **0,551 t CO_2 / MWh.** Total electricity consumption of installation: 1 658 844 MWh / year. **Total indirect emissions of the installation: 977 059 t CO_2 / year.** However, indirect emissions are relevant **only for the sinter plant**: the electricity consumption for its production is determined to be 241 111 MWh, which translates into indirect emissions of 132 797 t CO_2 / year, or **0,0237 t CO_2 / t sinter.**

Indirect emissions are calculated by multiplying the activity data by the relevant emission factor. As a general principle, the relevant emission factor is the default value for the country where the installation is located, as provided by the Commission. Where the electricity consumed for the production of a specific production process (here: sintered ore) is partially self-generated and partially purchased from the grid, a weighted emission factor shall be calculated based on the sources of electricity. The example above follows this logic, where 75% of the electricity consumed comes from own generation using waste gas, while the remaining 25% is purchased from the grid. Only if the operator can provide evidence to the verifier that all the electricity consumed for a specific the production (like sintered ore) is generated from a selected electricity source (e.g. the power plant using waste gases), the emission factor for that power plant may be used. However, in the example above, the more likely case is applied where the same electricity mix applies to the whole installation.

To avoid double counting of emissions from waste gas used to generate electricity, it is necessary to make a deduction from direct emissions. The activity data for waste gas is calculated from electricity generated, using the information on fuel input and generation efficiency given above, as follows:

- Electricity generated from waste gas: 1 244 133 MWh (measured)
- Total waste gas fuel input: 1 244 133 / 0,35 efficiency = 3 554 666 MWh
- Converted to TJ: 3 544 666 * 0,0036 = 12 800 TJ

The amount to deduct from direct emissions for waste gas used to generate electricity is calculated in Table 4-3 below.

Table 4-3: Example calculation, carbon steel, blast furnace route – installations' total direct emissions corrected for waste gas deduction

				t CO_2 / year	Comment
Total direct emissions of the installation				7 866 044	From Table 4-1 above
	AD (TJ)	EF (Nat. Gas) t CO_2 / GJ	Corr. factor		
Deduction for Waste gases	-12 800	56,1	0,667	– 478 959	Deduction for waste gas used to generate electricity
Total direct emissions of the production process for crude steel products				**7 387 085**	**Revised total direct emissions**

Next, Table 4-4 gives example activity level data for goods produced in the example installation during the reporting period.

Table 4-4: Example activity levels for goods produced in the reporting period

Products	**Activity Level (AL)**	**Units**
Precursors		
Sintered ore	5 600 000	t / year ([19])
Pig Iron	4 000 000	t / year
Crude steel	5 000 000	t / year
Iron or steel products		
Sheets	3 500 000	t / year
Bars	800 000	t / year
Rails	500 000	t / year
Total goods produced	**4 800 000**	**t / year**
Internal scrap	200 000	t / year

Using the total direct and indirect emissions data from Table 4-2 and Table 4-3, and production data from Table 4-4, direct and indirect specific embedded emissions are then calculated for iron or steel products, as follows (Table 4-5).

Table 4-5: Example calculation, specific embedded emissions SEE under the simplified / "bubble" approach for iron or steel products

Total amount of goods produced (steel products)	4 800 000	t / year
Total direct emissions of the production process for steel products	7 387 085	t CO_2 / year
Total indirect emissions of the 'sintered ore' process	132 797	t CO_2 / year
Specific direct embedded emissions	1,539	t CO_2 / steel product
Specific indirect embedded emissions	0,028	t CO_2 / t steel product
Specific total embedded emissions	**1,567**	**t CO_2 / t steel product**

[19] For a simplified calculation in the example, it is assumed that 1 t ore is used for 1 t of sinter. In reality, additives (lime, etc.) and returned fines from other process of the installation would result in a different value.

Note: The whole 'bubble' production process is formally a 'multifunctional process', with the goods under the different CN codes being 'co-products' (i.e. simultaneously produced in the same process). This means that formally, a 'per mass' attribution approach to the different goods (with functional units being tonnes of each separate good) would have to be carried out at the end of the calculation. However, as all tonnes of good per CN code are weighted with the same factor (the physical unit 'tonne'), there is nothing more to calculate.

Calculation of free allocation adjustments

Table 4-6 presents the step-by-step calculation of the (year-independent preliminary) SEFA values. For this purpose, for each of the complex goods, M_i are determined for each precursor using the production data determined in the course of the monitoring of embedded emissions, as given in the example above. Secondly, the CBAM benchmark (BM) values applicable for each production process have to be determined in Column A in section 5 of the Annex to the Free Allocation Adjustment Act. The 'remarks' column in Table 4-6 clarifies which corresponding CN code was used for the look-up. The SEFA values printed in bold font are the results of the calculation. Only for comparison, the CBAM BM value from column B in the Free Allocation Adjustment Act is given. It is the default value that would have to be used by the authorised CBAM declarant if the operator did not report actual data.

Table 4-6: Calculation of the specific free allocation of each product of the example installation (carbon steel, blast furnace route). "BM Col.A" means the value from column A in section 5 of the Annex to the Free Allocation Adjustment Act.

Product / precursor	BM col. A t CO_2 / t	M_i t / t	SEFA t CO_2 / t	BM Col. B t CO_2 / t	Remarks
Sinter	0,086				CN 2601 12 00
Pig Iron	1,089				CN 7201 10 19
Sinter	0,086	1,400			
Pig Iron			**1,209**	1,210	
Crude steel	0,188				CN 7207 11 11
Pig iron	1,209	0,800			
Crude steel			**1,156**	1,364	(C) = blast furnace route
Sheets	0,044				CN 7208 nn nn
Crude steel	1,156	1,042			
Sheets			**1,248**	1,370	(C)
Bars	0,038				CN 7213 nn nn
Crude steel	1,156	1,042			
Bars			**1,242**	1,364	(C)
Rails	0,057				CN 7302 10 nn
Crude steel	1,156	1,042			
Rails			**1,261**	1,383	(C)

Note: The SEFA values still need adjustment for the reporting. For the example, it is assumed that the import takes place in **year 2027** (CBAM factor = 95,0%, CSCF = 1).

Therefore, the calculation gives. E.g. for the rails:
$SEFA_{g,2027} = CBAM_y \cdot CSCF_y \cdot SEFA_g$ = 0,95 × 1,00 × 1,261 = 1,198 t CO_2 / t

As a last step, the **CBAM reporting obligation** for these iron or steel products into the EU can then be determined. For example, for the import of **10 000 tonnes** of iron or steel products e.g. **rails,** taking place **in 2027**:

- **Definitive period:**
    - Direct embedded emissions = 10 000 t × 1,539 t CO_2 / t = 15 390 t CO_2
    - Indirect embedded emissions = 10 000 t × 0,028 t CO_2 / t = 280 t CO_2

    Total: 15 670 t CO_2

    Minus Free Allocation adjustment: = 10 000 t × 1,198 t CO_2 / t = **11 980 t CO_2**

    (Further deduction could be made if a carbon price was paid in the country of production – outside the scope of this guidance).

    Total CBAM obligation to be covered by the authorised declarant with CBAM certificates: 15 670 – 11 980 = **3 690 certificates**

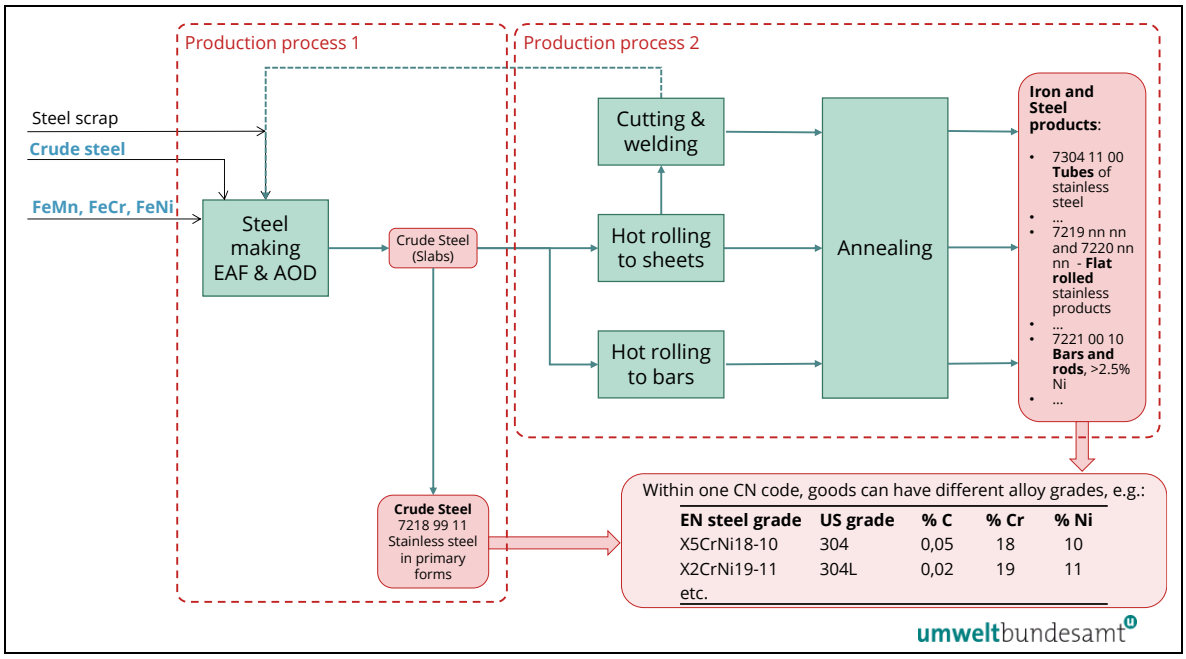
4.2 Example 2 – EAF and conversion to iron or steel products

The following example shows how specific embedded emissions are derived for crude steel and iron or steel products, produced by the EAF route. The resulting embedded emissions of imports into the EU are then calculated at the end of the example for reporting by the importer in their annual CBAM declaration for the relevant reporting period.

In this example for the EAF steel making route, the installation produces products falling under two aggregated goods categories, each of which is treated as a separate production process. It is assumed that only stainless steel of Nickel content >2,5% is produced, although some variation of alloy grades is observed. Nevertheless, all CN codes within each of steel type may be aggregated into joint production processes.

Figure 4-5 gives an outline view of the installation and shows the system boundaries as a red hatched line for each production process. The physical units carrying out each production process have been grouped under ‘Steel making EAF & AOD’, and under forming as ‘Cutting and welding’, ‘hot rolling to sheets, to bars and annealing’; and relevant inputs and outputs have been identified for each production process.

Figure 4-5: Example installation producing stainless steel from EAF route – Overview



The two relevant production processes defined above, and elaborated further in the diagrams below are:

- Production process 1 – crude steel produced by the EAF/AOD steel making route as slabs, of different alloy grades. The system boundaries of this production process have been defined as including inputs of steel scrap from production process 2 (steel that is cut off during the production of pipes), precursors crude steel and alloys, fuels (natural gas), graphite electrodes and other additives. The crude steel output from the process is both sold and is a precursor for production process 2. Due to the sale of precursor, the bubble approach is not allowed for this example installation.

- Production process 2 – iron or steel products, of different alloy grades, produced by different forming processes giving basic products such as tubes (cutting, rolling and welding), bars and rods (hot rolling and annealing) and sheets. The system boundaries of this production process have been defined as including inputs of crude steel (which has embedded emissions) and fuels (natural gas)[20]. Outputs from the production process are finished iron or steel products that are sold.

The second diagram (Figure 4-6) identifies the different source streams as inputs into the production processes, giving rise to direct emissions. There is no need to monitor electricity consumption / indirect emissions. However, if any precursors have been produced using sintered ore, the respective indirect emissions are carried over into the final products (this is not displayed in the example here separately, as default values are used

[20] In line with point 3.16 of Annex I to the Methodology Act, "*plating, cutting, welding and finishing of iron or steel products*" are excluded regarding their emissions. However, as such steps may be part of the actual way of making the listed steel goods, they are first to be included in the consideration of system boundaries, and only the respective emissions to be omitted.

for the purchased precursors, and only "total" embedded emissions are used as default values).

Direct emissions arise from the combustion of fuels (natural gas) and from process emissions from graphite electrodes, other additives and from releases of carbon contained within the different iron and steel materials.

Figure 4-6: Example installation producing stainless steel from EAF route – source streams relevant for direct emissions monitoring with a calculation-based approach

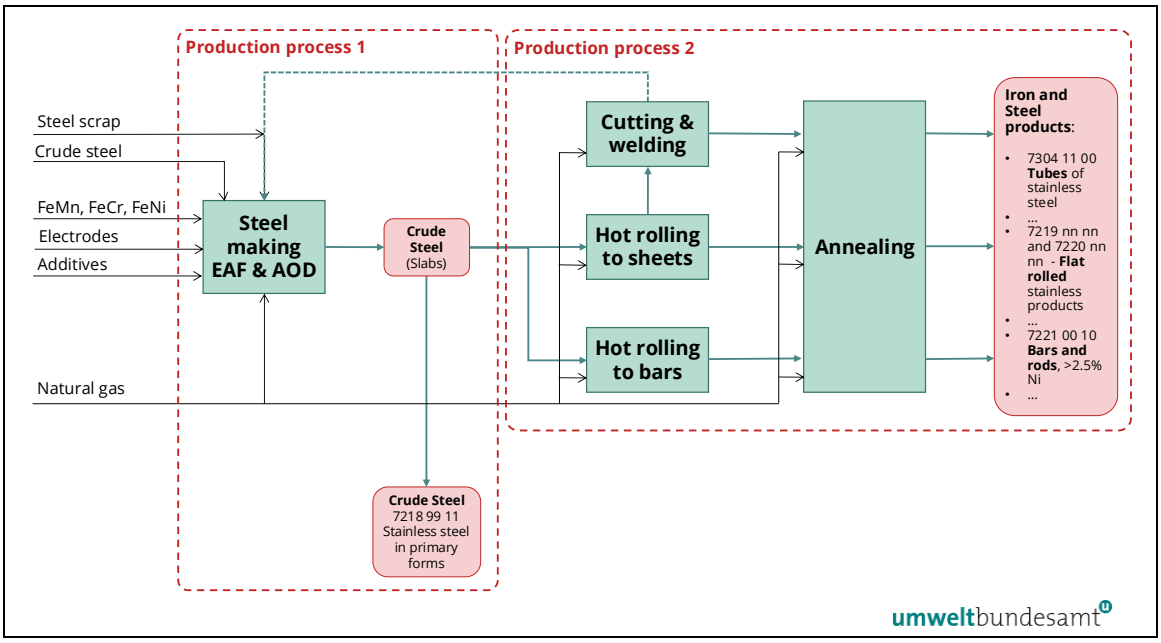
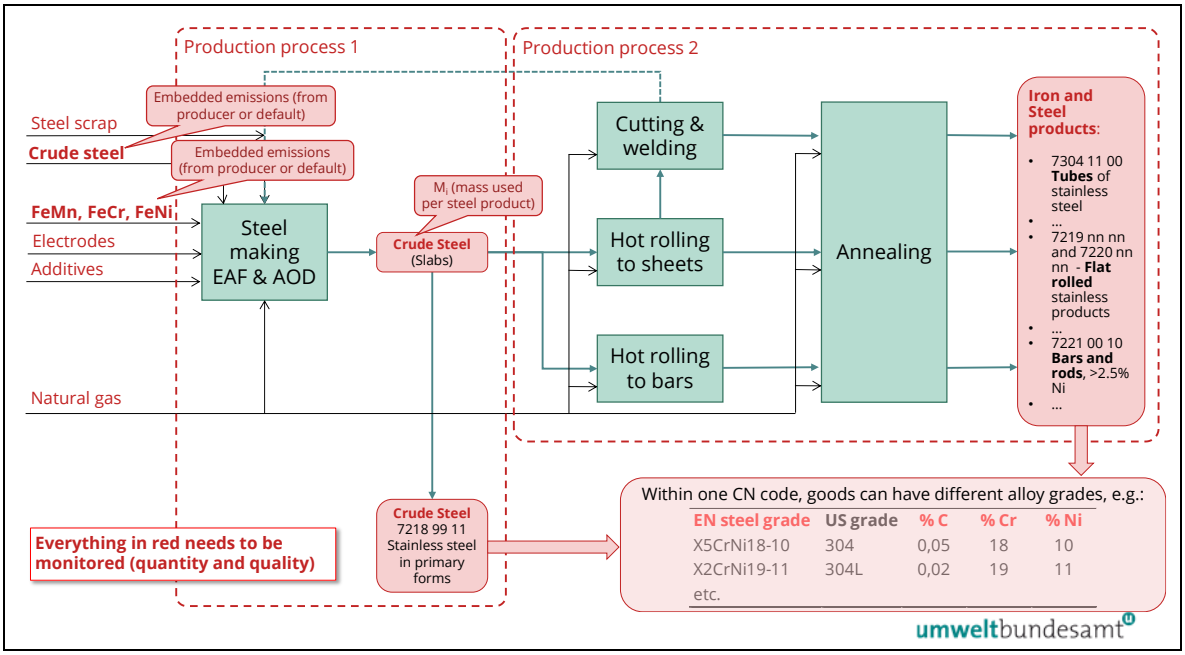


Figure 4-7: Example installation producing stainless steel via the EAF route – complete monitoring approach. All information in red font needs monitoring.



The third diagram (Figure 4-7), provides a complete monitoring approach for all source streams, for the example installation.

In the first example for iron and steel, a 'bubble' approach was used, as all precursors produced by the installation are wholly used in the production of the finished iron and steel goods. However, this approach is not available to the operator in this example, as some of the crude stainless steel precursor produced by production process 1 is diverted and is sold before it reaches production process 2. Therefore, specific embedded emissions have to be separately derived for each production process at this installation.

The inputs and outputs highlighted in red text in Table 4-7 are the parameters that should be monitored by the operator in order to attribute emissions and determine direct specific embedded emissions for both processes. Monitoring encompasses both aspects, quantitative (activity data) and qualitative (calculation factors). In case of purchased precursors it includes the specific embedded emissions.

Like in example 1, given the complexity of the installation and different source streams and material flows, the mass balance method is used to give a complete balance of the amount of carbon entering and leaving the installation. In applying this method, the CO_2 quantities relevant for each source stream are calculated based on the carbon content (CC) in each material, without distinguishing fuels and process materials. Non-emitted carbon leaving the installation in products instead of being emitted is also taken into account by defining output source streams, which have negative activity data, highlighted in red text in Table 4-7.

Table 4-7: EAF installation, example consumption levels – mass balance method

Consumption levels	**AD (t)**	**CC**	**EF**	**NCV (GJ/t)**	**Emissions (t CO_2) [21]**	**Assumptions / comments**
Steel scrap (market)	1 345 000	0,08%			3 942,5	Converted to CO_2
Natural gas	163 806		56,1	48	441 096.9	IPCC values; EF as t CO_2 / TJ
Graphite electrodes	4 468	81,9%			13 407,6	IPCC values
Various additives	89 360		0,45		40 212,0	Limestone, others omitted; EF [t CO_2/t]
Crude steel (purchased)	80 540	0,15%			442,6	
FeNi (28% Ni)	346 773	1,5%			19 058,6	
FeCr (52% Cr)	331 213	5,2%			63 105,4	
FeMn (65% Mn)	60 595	2,8%			6 216,6	
Sum					**587 482,3**	
Carbon in outputs	AD	CC			**Emissions (negative)**	
Steel	-2 140 000	0,180%			-14 114	Steel AL is net of scrap[22]
Slags	-107 232	0,030%			-118	
Sum					**-14 232**	
Total direct emissions of the installation					**573 251**	**t CO_2 / year**

[21] Factor 3,664 t CO_2 / t carbon

[22] i.e. after deduction of scrap amounts

In Table 4-7, the carbon content (CC) of different input and output source streams is converted to the CO_2 equivalent and total direct emissions, net of carbon contained in the outputs (steel and slag from the process) is calculated.

The next Table 4-8 summarises firstly the activity levels of the two production processes. Secondly, it shows how natural gas and emissions are attributed to process 2. Energy and emissions data are calculated using the specific energy consumption (SEC) values for bars, sheets and pipes. The balance of direct emissions is then attributed to production process 1, in the lower part of the table.

Table 4-8: EAF installation, example calculation of embedded emissions by production process and product (Note: SEC = Specific energy consumption)

Production levels	Tonnes	EAF/AOD and (Hot) rolling energy consumption Natural gas GJ / t	Comment
Slabs	2 234 000	0,31	**Process 1** – tonnes produced, EAF
Slabs to market	1 007 000		
Bars to market	456 000	5,4	**Process 2** – SEC values used to attribute energy and emissions.
Sheets	771 000	4,45	**Process 2** – SEC values used to attribute energy and emissions.
Sheets to market	221 000		
Sheets to pipes	550 000		
Pipes	456 000	2,8	**Process 2** – SEC values used to attribute energy and emissions.
Scrap (internal recycling)	94 000		Scrap from sheet to pipe conversion (cut-off steel).
Split of emissions		**Direct Emissions (t CO_2)**	
Process 1 (EAF / AOD)		171 005	
Process 2 (rolling etc.)		402 245	
Total		**573 251**	

No embedded emissions are attributed to steel scrap from production process 2, which is used internally to process 1.

Using the data on the allocation of attributed emissions between the two production processes, in Table 4-8, specific embedded emissions are then calculated for each CBAM product in the following two tables, for direct emissions. At this stage, the embedded emissions of precursors (purchased steel and alloys in process 1, crude steel in process 2) have to be added.

Table 4-9 calculates direct specific embedded emissions for crude steel slabs. At this point, embedded emissions of precursors are required. In the example it is assumed that the installation is situated in the United States (USA), and the production takes place in the year 2027. All precursors are assumed to be received from US installations, but no verified emissions reports are available. Consequently, the default values listed in Annex I to the Default Values Act with the mark-up for the year 2027 need to be looked up. Data used in these calculations are:

- Emissions at the installation for process 1 – determined above.
- Embedded emissions of precursors consumed by process 1 – calculated below, for precursors crude steel and alloys purchased.
- The Activity Level for crude steel slabs in the reporting period. The activity level is the sum of sold slabs and slabs used in process 2.

Table 4-9: EAF installation, example calculation of total embedded emission – Process 1 (Crude steel / slabs)

Precursors	**SEE (t CO_2/t)**	**Consumption (t)**	**direct em. (t CO_2)**
Crude steel[23]	3,864	80 540	311 207
FeNi (28% Ni)[24]	4,176	346 773	1 448 124
FeCr (52% Cr)[25]	2,280	331 213	934 021
FeMn (65% Mn)[26]	2,028	60 595	122 887
Calculation of Total Embedded Emissions of Slabs (process 1)			
Activity Level for process 1 (slabs)		2 234 000	
Emissions at installation			171 005
Embedded emissions of precursors consumed (from totals above)			2 816 238
Total embedded emissions			2 987 243
Specific embedded emissions (t CO_2 / t slab)			**1,337**

The calculation for process 2 could be done in a similar way as for process 1. However, for the sake of guidance, Table 4-10 presents the calculation of specific embedded emissions for complex goods (iron or steel products) by way of using only specific embedded emissions and specific attributed emissions of the 2nd process, i.e. by omitting the activity level and total emissions of the 2nd production process.

Table 4-10: EAF installation, example calculation of embedded emissions of complex goods. Process 2 – steel products

Total tonnes produced:		
Bars to market	456 000	t
Sheets to market	221 000	t
Pipes	456 000	t

[23] CN 72189110 – Semi-finished products of stainless steel, of rectangular "other than square" cross-section, containing by weight >= 2,5% nickel

[24] CN 720260 – Ferro-nickel

[25] CN 72024110 – Ferro-chromium, containing by weight > 4% but <= 6% carbon

[26] CN 72021120 – Ferro-manganese, containing by weight > 2% carbon, with a granulometry <= 5 mm and a manganese content by weight > 65%

Total steel products	**1 133 000**	t
Consumption precursor (slabs)	**1 227 000**	t
Mass slabs (crude steel) consumed per t:	**1,083**	t / t
		Direct (t CO_2)
Mass ratio (M_i) precursor	1,083	
SEE_i of precursor		1,337
Emissions per tonne product process 2		0,355
Specific embedded emissions SEE (t CO_2 / t steel product)		**1,783**

When calculating the total embedded emissions of final steel products in process 2 above, the **mass ratio (M_i)** of the precursor is taken account. This is the mass of crude steel slabs consumed per tonne of steel products produced, and is calculated as:

- Mass slabs / mass steel products: 1 227 000 / 1 133 000 = **1,083** (as above). The SEE_i values of the precursor are then adjusted by this ratio i.e.:

- For SEE_i (precursor): 1,337 x 1,083 = 1,448.

Total direct specific embedded emissions of the complex steel product are then calculated, as presented in the table above.

Calculation of free allocation adjustments

Table 4-11 presents the step-by-step calculation of the (year-independent preliminary) SEFA values. For this purpose, for each of the complex goods, M_i are determined for each precursor using the production data determined in the curse of the monitoring of embedded emissions, as given in the example above. Secondly, the CBAM benchmark (BM) values applicable for each production process have to be determined in Column A in section 5 of the Annex to the Free Allocation Adjustment Act. For purchased precursors for which the producer does not provide actual data (as is the case in this example), values have to be taken from column B of that Annex in order to ensure that the precursors' precursors are correctly accounted for. In line with the example of calculating embedded emissions, the assumption is that the production takes place in the year 2027. Therefore, if there is a choice between values with note "(1)" or "(2)", the look-up must take the value for "(1)", which refers to the period 2026-27. For later years, the value with "(2)" would have to be chosen.

The remark column in Table 4-11 clarifies which corresponding CN code was used for the look-up. The SEFA values printed in bold font are the results of the calculation. Only for comparison, the CBAM BM value from column B in the Free Allocation Adjustment Act is given. It is the default value that would have to be used by the authorised CBAM declarant if the operator did not report actual data.

Table 4-11: Calculation of the specific free allocation of each product of the example installation (stainless steel, EAF/scrap route). "BM Col.A" means the value from column A in section 5 of the Annex to the Free Allocation Adjustment Act.

Product / precursor	**BM col. A t CO_2 / t**	***M_i*** **t / t**	**SEFA t CO_2 / t**	**BM Col. B t CO_2 / t**	**Remarks**
Production process	0,128				CN 72189110
Precursors:					
Crude steel purchased	1,189	0,036			CN 72189110
FeNi (28% Ni)	2,390	0,155			CN 72026000
FeCr (52% Cr)	1,142	0,148			CN 72024110
FeMn (65% Mn)	1,361	0,027			CN 72021120
Crude steel slabs to market			**0,748**	1,189	CN 72189110
production process	0,057				CN 7304 11 00
Precursor:					
Crude steel slabs	0,748	1,083			
Steel products (e.g. pipes)			**0,867**	1,173	CN 7304 11 00

Note: The SEFA values still need adjustment for the reporting period For the example, it is assumed that the import takes place in **year 2027** (CBAM factor = 95,0%, CSCF = 1).

Therefore, the calculation gives. E.g. for the stainless pipes:
$SEFA_{g,2027} = CBAM_y \cdot CSCF_y \cdot SEFA_g$ = 0,95 × 1,00 × 0,867 = 0,824 t CO_2 / t

Using the above approach, the CBAM reporting obligation for the import of crude steel slabs and other steel products into the EU during the definitive period may then be determined; for example, for the import of 100 tonnes of product e.g. steel pipe:

- **Definitive period:**
    - Direct embedded emissions = 100 × 1,783 = 178,3 t CO_2

      Minus Free Allocation adjustment: = 100 t × 0,824 t CO_2 / t = 82,4 t CO_2

      (Further deduction could be made if a carbon price was paid in the country of production – outside the scope of this guidance)
    - **Total CBAM obligation** to be covered by the authorised declarant with CBAM certificates: 178,3 – 82,4 = **95,9 certificates**

4.3 Example 3 – production of screws and nuts from purchased steel rods

This is an example typical for many non-integrated manufacturing of steel products, which may be similarly applicable in other sectors such as aluminium production. In this example, the installation purchases precursors that contribute the majority of the embedded emissions, while its own process contributes little to the total embedded emissions.

For the example it is assumed that the installation purchases steel rods of two qualities (both covered by the CBAM themselves):

- Carbon steel rods with the embedded emissions as determined in Example 1; and
- Stainless steel rods with embedded emissions as determined in Example 2.

The production process involves:

- Hot rolling of the rods to wires of different diameters;
- Cutting and forging of the wires to screws;
- Cutting and forging of wires following by drilling / machining to nuts.

These processes consume natural gas and electricity, although the latter does not need to be monitored and reported in the definitive period of CBAM. Therefore, the installation itself has only direct emissions. However, the majority of the embedded emissions stem from the precursors. As the process involves cutting and machining, significant amounts of scrap are produced. In line with the rules of the Methodology Act, the scrap is attributed zero embedded emissions. Because of the production of scrap, the weight of the precursor used exceeds the weight of the final products. The factor m_i is > 1.

In the example installation, only one aggregated goods category is produced (screws and nuts of different alloy grades), but due to the different steel grades, the products fall under different CN codes and, therefore, have to be reported separately. The following two groups of products can be addressed in separate production processes:

Process	CN code	Descriptions
1	73181290	Wood screws of iron or steel other than stainless (excl. coach screws)
	73181491	Spaced-thread screws of iron or steel other than stainless
	73181499	Self-tapping screws of iron or steel other than stainless (excl. spaced-thread screws and wood screws)
	73181558	Screws and bolts, of iron or steel other than stainless "whether or not with their nuts and washers", with slotted or cross-recessed heads (excl. wood screws and self-tapping screws)
	73181568	Hexagonal-socket head screws and bolts, of iron or steel other than stainless "whether or not with their nuts and washers" (excl. wood screws, self-tapping screws and screws and bolts for fixing railway track construction material)
2	73181210	Wood screws of stainless steel (excl. coach screws)
	73181410	Self-tapping screws, of stainless steel (excl. wood screws)
	73181552	Screws and bolts, of stainless steel "whether or not with their nuts and washers", with slotted or cross-recessed heads (excl. wood screws and self-tapping screws)
	73181562	Hexagonal-socket head screws and bolts, of stainless steel "whether or not with their nuts and washers" (excl. wood screws, self-tapping screws and screws and bolts for fixing railway track construction material)

Therefore, the operator must determine two separate average values for annual direct emissions (i.e. for each of the two production processes). This is aligned with the fact that the percentages of scrap are different for the two main product groups, and because the quantities produced are different.

Table 4-12 shows the data that the operator has to monitor (input and output quantities, energy consumption (excluding electricity), consumption of precursors, specific embedded emissions of the precursors obtained from their producers).

Table 4-13 presents the calculation of specific embedded emissions of the two product groups, where the installation's own specific emissions are added to the embedded emissions of the precursors. To calculate the specific embedded emissions, Equation 62 is used. Therefore, the emissions embedded in precursor carbon steel (1,567 t CO_2/t in the example) are multiplied by the specific mass consumption of precursor carbon steel, m_i (1,176 in the example, as calculated in Table 4-12). The same approach is used for precursor high-alloy steel.

Table 4-12: Example installation No.3, main inputs and outputs

Precursors:	SEE direct (t CO_2 / t)			
Carbon Steel (see Example 1)	1,567			
High alloy steel (see Example 2)	1,783			
Products:	Activity level (t product / yr)	consumed quantity (t steel / yr)	scrap produced (t / yr)	m_i (t precursor / t product)
Carbon steel screws and nuts	17 000,00	20 000,00	3 000,00	1,176
High alloy steel screws and nuts	8 200,00	10 000,00	1 800,00	1,220
Energy consumed (average for both products)			Emission factor	
Natural gas (heating, forging,…)	3,5	GJ / t product	56,1	t CO_2 / TJ

Table 4-13: Example installation No.3, Calculation of specific embedded emissions (SEE)

Direct specific emissions	**SEE (t CO_2 / t)**	**m_i (t/t)**	**SEE (t CO_2 / t product)**
Precursor: carbon steel	1,567	1,176	1,843
Direct emissions (natural gas)			0,196
total SEE (carbon steel screws and nuts)			**2,039**
Precursor: High alloy steel	1,783	1,220	2,175
Direct emissions (natural gas)			0,196
total SEE (high alloy steel screws and nuts)			**2,371**

Finally, the specific free allocation levels are calculated like in the previous examples. Note, however, that the SEFA values of the precursors are taken here to be "actual data", i.e. taken from the operators of examples 1 and 2 above (same approach as used for the specific embedded emissions). Only the CBAM benchmark for the installation's own production process needs to be taken from Column A in section 5 of the Annex to the Free Allocation Adjustment Act. The M_i values are taken from the monitoring of embedded emissions. The results are presented in Table 4-14, using the same presentation method as explained in the previous examples.

Table 4-14: Calculation of the specific free allocation of each product of the example installation (screws and nuts from precursors received from installations in examples 1 and 2). "BM_g^* Col.A" means the value from column A in section 5 of the Annex to the Free Allocation Adjustment Act.

Product / precursor	BM_g^* **col. A** **t CO_2 / t**	M_i **t / t**	**SEFA** **t CO_2 / t**	BM_g **Col. B** **t CO_2 / t**	**Remarks**
Production process	0,038				CN 73181290
Precursor: carbon steel	1,242	1,176			SEFA calculated in Example 1 (bars and rods)
Carbon steel screws and nuts			**1,499**	1,364	(C) = carbon steel
Production process	0,038				CN 73181210
Precursor: stainless steel bars & rods	0,919	1,220			SEFA calculated in Example 2 (bars and rods)
Stainless steel screws and nuts			**1,159**	1,154	stainless steel (1)

Annex A List of definitions

Term	Definition
'Accuracy'	means the closeness of the agreement between the result of a measurement and the true value of the particular quantity or a reference value determined empirically using internationally accepted and traceable calibration materials and standard methods, taking into account both random and systematic factors
'Activity data'	means the amount of fuels or materials consumed or produced by a process relevant for the calculation-based methodology, expressed in terajoules (TJ), mass in tonnes or (for gases) volume in normal cubic metres, as appropriate
'Actual emissions'	means the emissions calculated based on primary data from the production processes of goods and from the production of electricity consumed during those processes as determined in accordance with the methods set out in Annex IV [to the Methodology Act]
'Activity level'	means the quantity of goods to which the same functional unit applies that are produced within the system boundaries of a production process during a reporting period
'Aggregated goods categories'	means aggregated goods categories pursuant to Table 1 of point 2 of Annex I. A group of CBAM goods with their CN codes, used for the purpose of defining system boundaries of production processes.
'Agricultural, aquaculture, fisheries and forestry residues'	means residues that are directly generated by agriculture, aquaculture, fisheries and forestry and that do not include residues from related industries or processing
'Authorised CBAM declarant'	means a person authorised by the competent authority in accordance with Article 17 [of the CBAM Regulation]. The 'authorised CBAM declarant' [which replaces the term 'reporting declarant' from the transitional period] may be importers of CBAM goods, or their indirect customs representatives, who have applied for and been granted the status of authorised CBAM declarant.
'Batch'	means an amount of fuel or material representatively sampled and characterised, and transferred as one shipment or continuously over a specific period of time
'Biomass'	means biomass as defined in Article 2, point (24) of the Renewable Energy Directive (RED II)[27]; it includes bioliquids and biofuels as defined in Article 2, point (32) and (33), biomass fuels as defined in Article 2, point (27) and biogas as defined in Article 2 point (28) of the RED II;

[27] Directive (EU) 2018/2001

Term	Definition
'Biomass fraction'	means the ratio of carbon stemming from biomass to the total carbon content of a fuel or material, expressed as a fraction
'Calculation factors'	means net calorific value, emission factor, preliminary emission factor, oxidation factor, conversion factor, carbon content or biomass fraction
'Calibration'	means the set of operations, which establishes, under specified conditions, the relations between values indicated by a measuring instrument or measuring system, or values represented by a material measure or a reference material and the corresponding values of a quantity realised by a reference standard
'Carbon price'	means the monetary amount paid in a third country, under a carbon emissions reduction scheme, in the form of a tax, levy or fee or in the form of emission allowances under a greenhouse gas emissions trading system, calculated on greenhouse gases covered by such a measure, and released during the production of goods
'CBAM certificate'	means a certificate in electronic format corresponding to one tonne of CO_2e of embedded emissions in goods
'CO_2 emission factor'	means the weighted average of the CO_2 intensity of electricity produced from fossil fuels within a geographic area. The CO_2 emission factor is the result of the division of the CO_2 emission data of the electricity sector by the gross electricity generation based on fossil fuels in the relevant geographic area. It is expressed in tonnes of CO_2 per megawatt-hour
'Combined nomenclature' (CN)	means the classification of goods, designed to meet the needs of: i) the Common customs tariff, setting import duties for products imported into the European Union (EU), as well as the Integrated tariff of the European Communities (Taric), incorporating all EU and trade measures applied to goods imported into and exported out of the EU; ii) the international trade statistics of the EU. The CN provides the means of collecting, exchanging and publishing data on EU international trade statistics. It is also used for the collection and publication of international trade statistics in intra-EU trade.[28]
'Combustion emissions'	means greenhouse gas emissions occurring during the exothermic reaction of a fuel with oxygen
'Competent authority'	means the authority designated by each Member State in accordance with Article 11 [of the CBAM Regulation]

[28] For definition see: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Combined_nomenclature_(CN)

Term	Definition
'Continuous emission measurement' (CEM)	means a set of operations having the objective of determining the value of a quantity by means of periodic measurements, applying either measurements in the stack or extractive procedures with a measuring instrument located close to the stack, whilst excluding measurement methodologies based on the collection of individual samples from the stack
'Control system'	means the operator's risk assessment and entire set of control activities, including the continuous management thereof, that an operator has established, documented, implemented and maintained pursuant to point A.2. of Annex II
'Complex goods'	means goods other than simple goods
'Conservative'	means that a set of assumptions is defined in order to ensure that no under-estimation of reported emissions or over-estimation of production of heat, electricity or goods occurs
'Conversion factor'	means the ratio of carbon emitted as CO_2 to the total carbon contained in the source stream before the emitting process takes place, expressed as a fraction, considering CO emitted to the atmosphere as the molar equivalent amount of CO_2
'Co-product'	means any of two or more products resulting from the same production process
'Customs declarant'	means a declarant as defined in Article 5, point (15) of Regulation (EU) No 952/2013 lodging a customs declaration for release for free circulation of goods in its own name or the person in whose name such a declaration is lodged
'CCUS system'	means a group of economic operators with technically connected installations and transport equipment for CO_2 capture, transport, use in production of goods, or geological storage
'Data flow activities'	mean activities related to the acquisition, processing and handling of data that are needed to draft an emissions report from primary source data
'Data set'	means one type of data, either at installation level or production process level as relevant in the circumstances, as any of the following: (a) the amount of fuels or materials consumed or produced by a production process as relevant for the calculation-based methodology, expressed in terajoules, mass in tonnes, or for gases as volume in normal cubic metres, as appropriate, including for waste gases; (b) a calculation factor;

Term	Definition
	(c) net quantity of measurable heat, and the relevant parameters required for determining this quantity, in particular: i) mass flow of heat transfer medium; and ii) enthalpy of transmitted and returned heat transfer medium, as specified by composition, temperature, pressure and saturation; (d) quantities of non-measurable heat, specified by the relevant quantities of fuels used for producing the heat, and the net calorific value (NCV) of the fuel mix; (e) quantities of electricity; (f) quantities of CO_2 transferred between installations; (g) quantities of precursors received from outside the production process, and their relevant parameters, such as country of origin, used production route, specific direct and indirect emissions;
'Default value'	means a value, which is calculated or drawn from secondary data, which represents the embedded emissions in goods
'Direct emissions'	means emissions from the production processes of goods including emissions from the production of heating and cooling that is consumed during the production processes, irrespective of the location of the production of the heating or cooling
'Embedded emissions'	means direct emissions released during the production of goods and indirect emissions from the production of electricity that is consumed during the production processes, calculated in accordance with the methods set out in Annex IV and further specified in the implementing acts adopted pursuant to Article 7(7)
'Emissions'	mean the release of greenhouse gases into the atmosphere from the production of goods
'Emission factor'	means the average emission rate of a greenhouse gas relative to the activity data of a source stream assuming complete oxidation for combustion and complete conversion for all other chemical reactions
'Emission factor' for electricity	means the default value, expressed in CO_2e, representing the emission intensity of electricity consumed in production of goods.
'Emission source'	means a separately identifiable part of an installation or a process within an installation, from which relevant greenhouse gases are emitted
EU ETS	means the system for greenhouse gas emissions allowance trading within the Union in respect of activities listed in Annex I to Directive 2003/87/EC other than aviation activities

Term	Definition
'EU ETS allowance'	means an allowance as defined in Article 3, point (a), of Directive 2003/87/EC in respect of activities listed in Annex I to that Directive other than aviation activities
'Fossil carbon'	means inorganic and organic carbon that is not biomass
'Fossil fraction'	means the ratio of fossil carbon to the total carbon content of a fuel or material, expressed as a fraction
'Fugitive emissions'	means irregular or unintended emissions from sources that are not localised, or too diverse or too small to be monitored individually
'Functional unit'	means the reference unit used for the calculation of embedded emissions in goods
'Goods'	means goods listed in Annex I [to the CBAM the CBAM Regulation]
'Greenhouse gases'	mean greenhouse gases as specified in Annex I [to the CBAM the CBAM Regulation] in relation to each of the goods listed in that Annex
'Heat meter'	means a thermal energy meter or any other device to measure and record the amount of thermal energy produced based upon flow volumes and temperatures
'Importer'	means either the person lodging a customs declaration for release for free circulation of goods or a bill of discharge in accordance with Article 175(5) of Delegated Regulation (EU) 2015/2446 in its own name and on its own behalf or, where the customs declaration is lodged by an indirect customs representative in accordance with Article 18 of Regulation (EU) No 952/2013, the person on whose behalf such a declaration is lodged
'Importation'	means release for free circulation as provided for in Article 201 of Regulation (EU) No 952/2013
'Indirect customs Representative'	A customs representative appointed by an importer established in a Member State. If the importer appoints an indirect customs representative and they agree, they can act as an authorised CBAM declarant and submit the application for an authorisation on behalf of the importer. The indirect customs representative is liable for all operations made for the importers it represents
'Indirect emissions'	means emissions from the production of electricity which is consumed during the production processes of goods, irrespective of the location of the production of the consumed electricity
'Inherent CO_2'	means CO_2 which is part of a source stream.
'Installation'	means a stationary technical unit where a production process is carried out

Term	Definition
'Legal metrological control'	means the control exercised by a public authority or regulator of the measurement tasks intended for the field of application of a measuring instrument, for reasons of public interest, public health, public safety, public order, protection of the environment, the levying of taxes and duties, the protection of consumers and fair trading
'Measurable heat'	means a net heat flow transported through identifiable pipelines or ducts using a heat transfer medium, such as, in particular, steam, hot air, water, oil, liquid metals and salts, for which a heat meter is or could be installed
'Measurement point'	means the emission source for which continuous emission measurement systems (CEMS) are used for emission measurement, or the cross-section of a pipeline system for which the CO_2 flow is determined using continuous measurement systems
'Measurement system'	means a complete set of measuring instruments and other equipment used to determine variables for the monitoring and calculation of emissions
'Minimum requirements'	means monitoring methods using the minimum efforts allowed for determining data in order to result in emission data acceptable for the purpose of the CBAM Regulation.
'Mixed fuel'	means a fuel which contains both biomass and fossil carbon
'Mixed material'	means a material which contains both biomass and fossil carbon
'Multifunctional process'	means a process that delivers multiple outputs or whose outputs feed into several production processes
'Net calorific value' (NCV)	means the specific amount of energy released as heat when a fuel or material undergoes complete combustion with oxygen under standard conditions, less the heat of vaporisation of any water formed
'Non-CBAM good'	means any good produced in the installation that is not included in Annex I to the CBAM Regulation
'Non-measurable heat'	means all heat other than measurable heat
'Operator'	means any person who operates or controls an installation in a third country, including a parent company that controls an installation in a third country
'Oxidation factor'	means the ratio of carbon oxidised to CO_2 as a consequence of combustion to the total carbon contained in the fuel, expressed as a fraction, considering carbon monoxide (CO) emitted to the atmosphere as the molar equivalent amount of carbon dioxide (CO_2)
'Power purchase agreement'	means a contract under which a person agrees to purchase electricity directly from an electricity producer

Term	Definition
'Precursor'	means any input material into a production process included in the list of goods set out in Annex I to the CBAM Regulation;
'Preliminary emission factor'	means the assumed total emission factor of a fuel or material based on the carbon content of its biomass fraction and its fossil fraction before multiplying it by the fossil fraction to produce the emission factor
'Production process'	means the chemical and physical processes carried out to produce goods in an installation
'Production route' [29]	means a specific technology used in a production process to produce goods
'Process emissions'	means greenhouse gas emissions other than combustion emissions occurring as a result of intentional and unintentional reactions between substances or their transformation, for a primary purpose other than the generation of heat, including from the following processes: (a) the chemical, electrolytic or pyrometallurgical reduction of metal compounds in ores, concentrates and secondary materials; (b) the removal of impurities from metals and metal compounds; (c) the decomposition of carbonates, including those used for flue gas cleaning; (d) chemical syntheses of products and intermediate products where the carbon bearing material participates in the reaction; (e) the use of carbon containing additives or raw materials; (f) the chemical or electrolytic reduction of metalloid oxides or non-metal oxides such as silicon oxides and phosphates.
'Proxy data'	means annual values which are empirically substantiated or derived from accepted sources and which an operator uses to substitute a data set[30] for the purpose of ensuring complete reporting
'Rebate'	means any amount that reduces the amount due or paid by a person liable for the payment of a carbon price, before its payment or after, in a monetary form or in any other form.
'Recommended improvements'	means monitoring methods which are proven means to ensure that data are more accurate or less prone to mistakes than by mere application of minimum requirements
'Related emissions'	means: – the direct emissions caused by the source stream or emission source concerned; – emissions attributed to a quantity of measurable heat; – the indirect emissions related to the quantity of electricity concerned; – embedded emissions of a material produced or of a precursor consumed.

[29] Note that different production routes can fall within the same production process.

[30] Refers to the activity data or the calculation factors.

Term	Definition
'Reporting period'	means the period corresponding to the calendar year during which the good was produced and used by the authorised CBAM declarant as reference for the determination of embedded emissions
'Residue'	means a substance that is not the end product that a production process directly seeks to produce; it is not a primary aim of the production process and the process has not been deliberately modified to produce it
'Simple goods'	means goods produced in a production process requiring exclusively input materials (precursors) and fuels having zero embedded emissions
'Source stream'	means either of the following: (a) a specific fuel type, raw material or product giving rise to emissions of relevant greenhouse gases at one or more emission sources as a result of its consumption or production; (b) a specific fuel type, raw material or product containing carbon and included in the calculation of greenhouse gas emissions using a mass-balance method
'Specific embedded emissions'	means the embedded emissions of one tonne of goods, expressed as tonnes of CO_2e emissions per tonne of goods
'Standard conditions'	means temperature of 273,15 K and pressure conditions of 101 325 Pa defining normal cubic metres (Nm^3)
'System boundary'	means the group of chemical or physical processes included in the calculation of embedded emissions of goods under the same aggregated goods category. The system boundaries shall cover direct emissions, indirect emissions for goods not listed in Annex II to the CBAM Regulation, and the embedded emissions of any precursor.
'Third country'	means a country or territory outside the customs territory of the [European] Union
'Tonne of $CO_2(e)$'	means one metric tonne of carbon dioxide ('CO_2'), or an amount of any other greenhouse gas listed in Annex I [to the CBAM Regulation] with an equivalent global warming potential ['CO_2e']
'Transmission system operator'	means an operator as defined in Article 2, point (35) of Directive (EU) 2019/944 of the European Parliament and of the Council ([31]).

[31] Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on common rules for the internal market for electricity and amending Directive 2012/27/EU (OJ L 158, 14.6.2019, p. 125).

Term	Definition
'Uncertainty'	means a parameter, associated with the result of the determination of a quantity, that characterises the dispersion of the values that could reasonably be attributed to the particular quantity, including the effects of systematic as well as of random factors, expressed in percent, and describes a confidence interval around the mean value comprising 95% of inferred values taking into account any asymmetry of the distribution of values
'Waste'	means any substance or object which the holder discards or intends or is required to discard, excluding substances that have been intentionally modified or contaminated in order to meet this definition
'Waste gas'	means a gas containing incompletely oxidised carbon in a gaseous state under standard conditions which is a result of any of the processes listed under 'process emissions'

Annex B List of abbreviations

Abbreviation	Full term
AD	Activity Data
AEM	Anode Effect Minutes
AEO	Anode Effect Overvoltage
AL	Activity Level
AOD	Argon Oxygen Decarburisation.
BAT	Best Available Techniques
BF	Biomass Fraction
BFG	Blast Furnace Gas
BM	Benchmark
BOF	Basic Oxygen Furnace
BOFG	Basic Oxygen Furnace Gas
BREFs	Best Available Techniques Reference documents
CA	Competent Authority
CBAM	Carbon Border Adjustment Mechanism, the
CCR	Clinker to Cement Ratio
CCS	Carbon Capture and Storage
CCU(S)	Carbon Capture and Utilisation (and Storage)
CEMS	Continuous Emission Measurement Systems
CF	Conversion Factor
CFP	Carbon footprint of products
CHP	Combined Heat and Power
CKD	Cement Kiln Dust
CN	Combined nomenclature
COG	Coke Oven Gas
DRI	Direct Reduced Iron
EAF	Electric Arc Furnace
EEA	European Economic Area (EU-27, Iceland, Norway, Liechtenstein)
EF	Emission Factor
EFTA	European Free Trade Area
EORI	Economic Operator Registration and Identification
ETS	Emissions Trading System
EU ETS	EU Emissions Trading System
EUA	EU Allowances (used in the EU ETS)
EUR	Euro (currency)

Abbreviation	Full term
FAR	Free Allocation Rules (Regulation 2019/331)[32]
FIFO	First-In-First-Out principle
GHG	Greenhouse Gas
GWP	Global Warming Potential
HBI	Hot Briquetted Iron
HS	Harmonised System (for international trade)
IEA	International Energy Agency
ISO	International Organization for Standardization
LULUCF	Land-use, land change and forestry (criteria)
MP	Monitoring Plan
MRR	Monitoring and Reporting Regulation (Regulation 2018/2066)[33]
MRV	Monitoring, Reporting and Verification
MS	Member State(s)
MWh	Megawatt-hour
NCV	Net Calorific Value
NPI	Nickel pig iron
OF	Oxidation Factor
PCI	Pulverised Coal Injection
PEMS	Predictive Emission Monitoring System
PFC	Perfluoro-carbon
PoS	Proofs of Sustainability
RED II	Renewable Energy Directive, re-cast
SEE	Specific embedded emissions
SEFA	Specific embedded free allocation
TARIC	Integrated Tariff of the European Union database
TJ	Terajoules
TSO	Transmission System Operator
UCC	Union Custom Code
UN/LOCODE	United Nations Code for Trade and Transport Location

[32] Free Allocation Rules (Commission Delegated Regulation (EU) 2019/331 of 19 December 2018 determining transitional Union-wide rules for harmonised free allocation of emission allowances pursuant to Article 10a of Directive 2003/87/EC of the European Parliament and of the Council)

[33] Monitoring and Reporting Regulation (Commission Implementing Regulation (EU) 2018/2066 of 19 December 2018 on the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council and amending Commission Regulation (EU) No 601/2012