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REPUBLIC OF TÜRKİYE
MINISTRY OF ENVIRONMENT, URBANIZATION AND CLIMATE CHANGE

Promoting Enhanced EU ETS Alignment in Türkiye's Emerging ETS

This activity is part of the European Union Climate Dialogues Project (EUCDs)

Technical session with focus on EU ETS iron steel sector

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ghg management institute

kataclima CATALYZING ENERGIES

- Day 1: Introducing the EU ETS regulatory framework focus on allocation methods and fall-back benchmarks
- Day 2: Technical session with focus on EU ETS iron steel sector
- Day 3: Technical session with focus on EU ETS cement sector
- Day 4: Technical session with focus on EU ETS aluminium sector
- Day 5: Technical session with focus on EU ETS electricity and fertilizers

- Iron-steel: overview of product benchmarks
- Product benchmarks on BDR
- Blast furnaces: definition and boundaries
- Electric Arc Furnaces: definition and boundaries
- From theory to actual implementation: ETS layout of a steel making plant
- From theory to actual implementation: production data on BDR (activity data, electricity, Prodcom codes, CN codes etc.)
- From theory to actual implementation: emissions at sub-installation level for benchmark update
- From theory to actual implementation: summary and calculation

Iron-steel:
overview of product benchmarks

EUROPEAN COMMISSION
DIRECTORATE-GENERAL
CLIMATE ACTION

Directorate B - European and International Carbon Markets

Guidance Document n°9

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

Sector-specific guidance

Final version issued on 22 April 2024

Metal Production and Processing

Iron and Steel

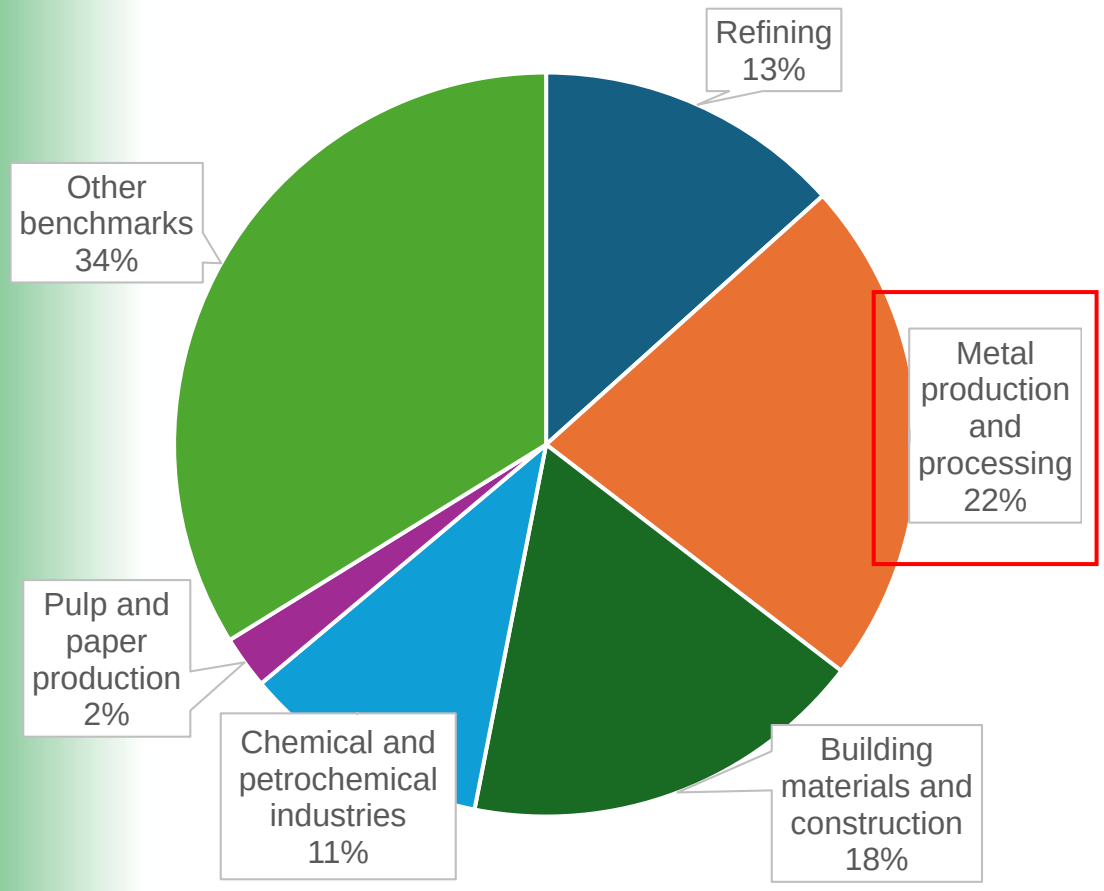
- Coke
- Sintered ore
- Hot metal
- Electric Arc Furnace (EAF) carbon steel
- EAF high alloy steel
- Iron casting

Aluminium Production

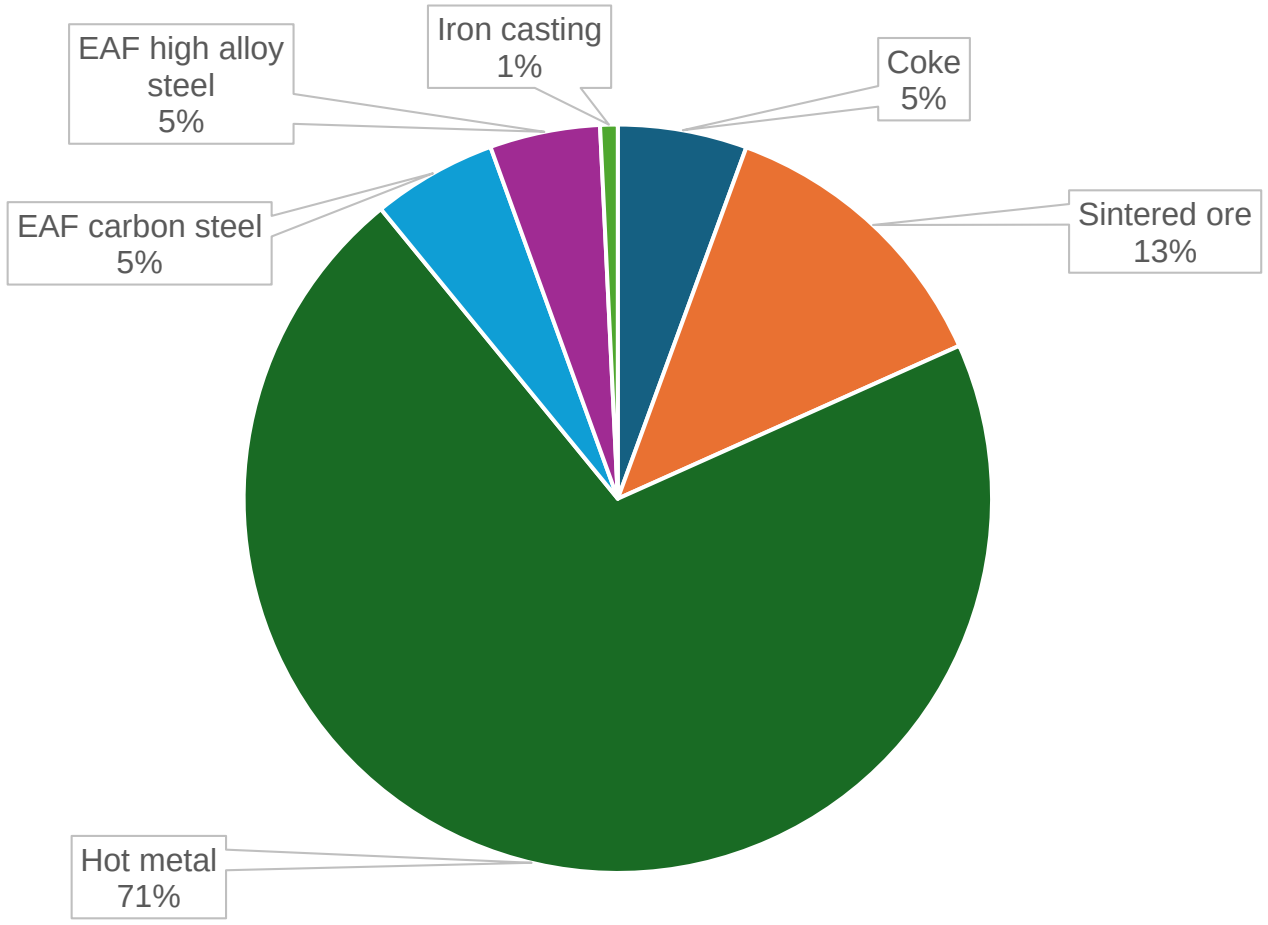
- Pre-bake anode
- Primary aluminium

Iron-steel: overview of product benchmarks

GHG emissions covered by benchmark in 2016/2017 (average)



GHG emissions covered by benchmark in 2016/2017 (average)



Iron-steel:
overview of product benchmarks

2. Coke

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

"Coke-oven coke (obtained from the carbonization of coking coal, at high temperature) or gasworks coke (by-product of gas-works plants) expressed as tonnes of dry coke, determined at the discharge of the coke oven or gas-works plant. Lignite coke is not covered by this benchmark. Coking in refineries is not included but covered by the CWT methodology for refineries."

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

Iron-steel:
overview of product benchmarks

Activities without capacity or production threshold

	Activities	Greenhouse gases
4	Metal ore (including sulphide ore) roasting or sintering, including pelletisation	Carbon dioxide

Product benchmark:

- Agglomerated iron ore

3. Agglomerated iron ore

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

3. Agglomerated iron ore

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

"Agglomerated iron-bearing product containing iron ore fines, fluxes and possibly iron containing recycling materials ***with the chemical and physical properties such as the level of basicity, mechanical strength and permeability required to deliver iron and necessary flux materials into iron ore reduction processes****. Expressed in tonnes of agglomerated ore as leaving the agglomerated iron ore production plant.* ***Agglomerated iron ore returned to the production process is not to be considered as part of the product****."*

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

Iron-steel:
overview of product benchmarks

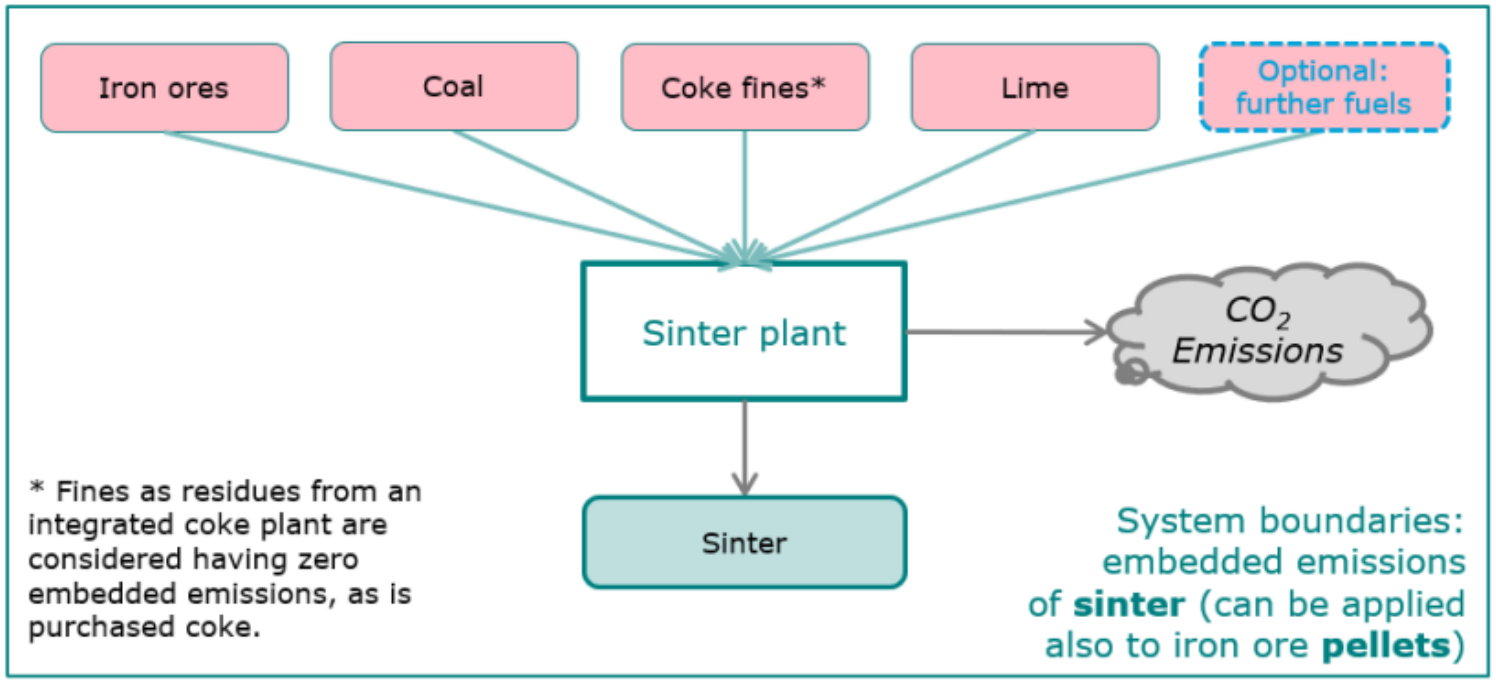
(a) Activities according to Annex I of the EU ETS Directive:

This information is important for the competent authorities because changes compared to previous ETS phases may have taken place.

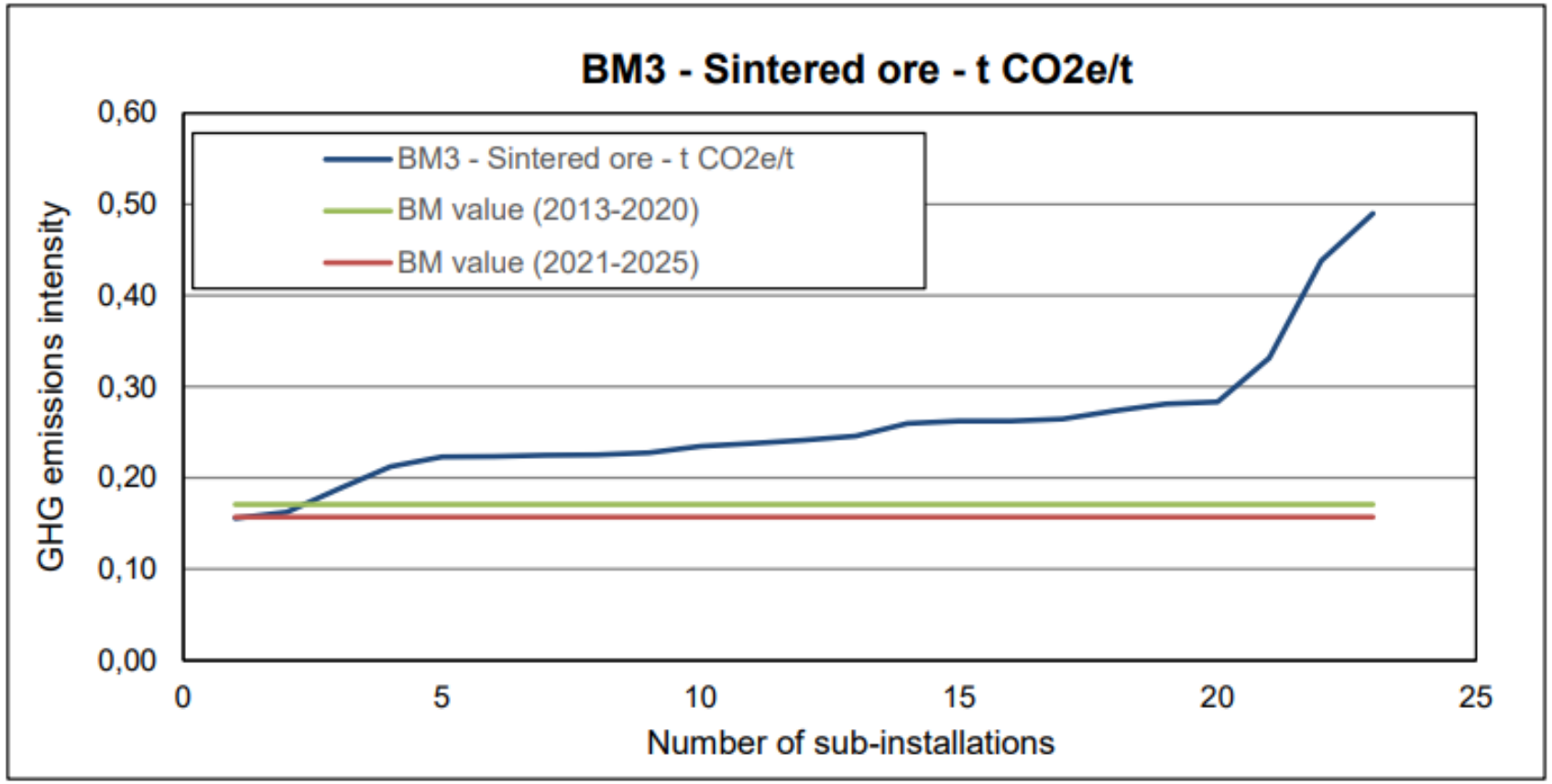
To the extent feasible, please sort the list with regard to the direct emissions, starting with the activity causing the highest direct emissions.

Number	Name of activity (Annex I of the ETS Directive)	Total rated thermal input (MW)
1	Metal ore (including sulphide ore) roasting or sintering, including pelletisation	

Sintered ore production process



Iron-steel:
overview of product benchmarks



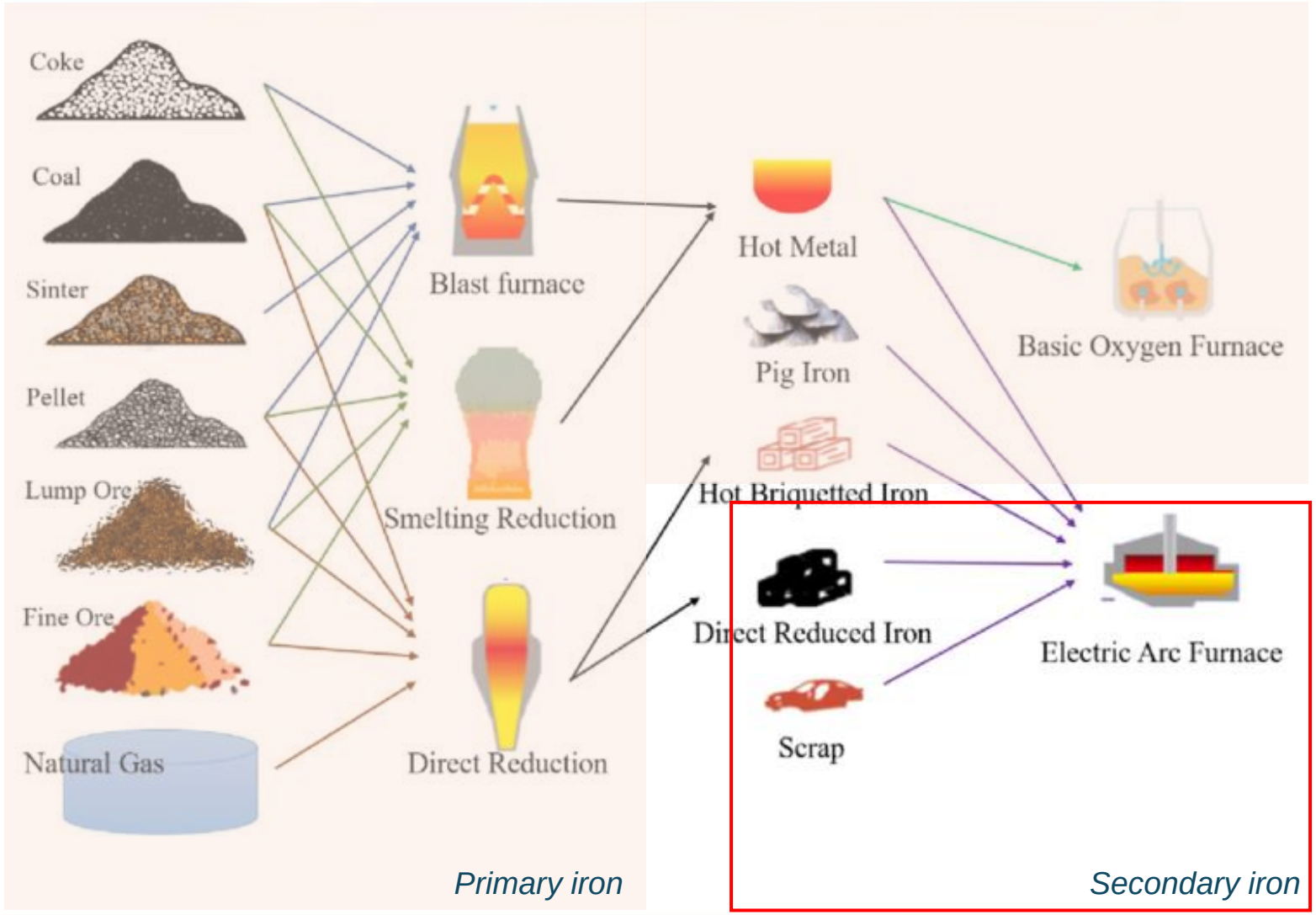
Key parameters for BM3 Sintered ore	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	0,163	t CO_2e/t
Benchmark value for 2021-2025	0,157	t CO_2e/t

Iron-steel:
overview of product benchmarks

Main benchmarks:

- Agglomerated iron ore
- Hot metal
- EAF carbon steel
- EAF high alloy steel
- Iron casting

Starting from iron ore, BOF crude steel is produced via the production of hot metal in a blast furnace and its following conversion to crude steel in a basic oxygen furnace, while EAF steel is produced by the smelting of scrap or direct reduced iron in an electric arc furnace.



Iron-steel:
overview of product benchmarks

Specific activities with capacity threshold expressed as total rated thermal input exceeding 20 MW

Activities
Production or processing of ferrous metals (including ferro-alloys). Processing includes, inter alia, rolling mills, re-heaters, annealing furnaces, smitheries, foundries, coating and pickling

Product benchmark:

- Iron casting

7. Iron casting

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

According to the FAR this product benchmark covers: *"Casted iron expressed as tonnes of liquid iron ready alloyed, skinned, and ready for casting."*

Iron-steel:
overview of product benchmarks

PRODCOM code	Description
24.52.30.00	Tube or pipe fittings of cast steel
24.51.11.10	Malleable iron castings for land vehicles, piston engines and other machinery and mechanical appliances
24.51.11.90	Parts for other utilisation (malleable iron casting)
24.51.12.10	Parts of land vehicles (nodular iron castings)
24.51.12.20	Ductile iron castings for transmission shafts, crankshafts, camshafts, cranks, bearing housings and plain shaft bearings (excluding for bearing housings incorporating ball or roller bearings)
24.51.12.40	Other parts of piston engines and mechanical engineering (nodular iron castings)
24.51.12.50	Ductile iron castings for machinery and mechanical appliances excluding for piston engines
24.51.12.90	Ductile iron castings for locomotives/rolling stock/parts, use other than in land vehicles, bearing housings, plain shaft bearings, piston engines, gearing, pulleys, clutches, machinery
24.51.13.10	Grey iron castings for land vehicles (excluding for locomotives or rolling stock, construction industry vehicles)
24.51.20.00	Tubes, pipes and hollow profiles of cast iron excluding tubes, pipes, hollow profiles made into identifiable parts of articles, such as sections of central heating radiators and machinery parts
24.51.30.30	Tube or pipe fittings, of non-malleable cast iron
24.51.30.50	Tube or pipe fittings of malleable cast iron
24.51.13.20	Grey iron castings for transmission shafts, crankshafts, camshafts, cranks, bearing housings and plain shaft bearings (excluding bearing housings incorporating ball or roller bearings)
24.51.13.40	Other parts of piston engines and mechanical engineering (cast iron: not ductile)
24.51.13.50	Grey iron castings for machinery and mechanical appliances excluding for piston engines
24.51.13.90	Grey iron castings for locomotives/rolling stock/parts, use other than in land vehicles, bearing housings, plain shaft bearings, piston engines, gearing, pulleys, clutches, machinery

- Iron-steel: overview of product benchmarks
- Product benchmarks on BDR
- Blast furnaces: definition and boundaries
- Electric Arc Furnaces: definition and boundaries
- From theory to actual implementation: ETS layout of a steel making plant
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- From theory to actual implementation: summary and calculation

Product benchmarks on BDR

- A
- B
- C
- D
- E
- F
- G
- H
- I
- J
- K

Activities and…

product benchmarks

Further installation data:

(a) Activities according to Annex I of the EU ETS Directive:

This information is important for the competent authorities because changes compared to previous ETS phases may have taken place.

To the extent feasible, please sort the list with regard to the direct emissions, starting with the activity causing the highest direct emissions.

Number	Name of activity (Annex I of the ETS Directive)	Total rated thermal input (MW)
1	Metal ore (including sulphide ore) roasting or sintering, including pelletisation	
2	Production of iron or steel (primary or secondary fusion) including continuous casting, with a capacity exceeding 2,5 tonnes per hour	
3	Production or processing of ferrous metals (including ferro-alloys) where combustion units with a total rated thermal input exceeding 20 MW are operated. Processing includes, inter alia, rolling mills, re-heaters, annealing furnaces, smitheries, foun	

No.	Product type	<average of 10% best?	>80% performer?	Start of operation	CL exposed?	CBAM?
1	Coke				VERO	FALSO
2	Agglomerated iron ore				VERO	VERO
3	Hot metal				VERO	VERO
4	EAF carbon steel				VERO	VERO
5	EAF high alloy steel				VERO	VERO
6	Iron casting, CBAM				VERO	VERO
7	Iron casting, non-CBAM				VERO	FALSO
8					N.A.	N.A.

Sheet "ProductBM" - SUB-INSTALLATION DATA RELATING TO PRODUCT BENCHMARKS

A
B
C
D
E
F
G
H
I
J
K

F. Sheet "ProductBM" - SUB-INSTALLATION DATA RELATING TO PRODUCT BENCHMARKS

The navigation bar above only contains links to the relevant sub-installations listed in section A.III.1.

I Historic Activity levels and disaggregated production details

F. Product BM	Navigation area:	Table of contents	Previous sheet	Next sheet	Summary
	Top of sheet	BM 1: Coke	BM 2: Agglomerated iron ore	BM 3: Hot metal	BM 4: EAF carbon steel
	End of sheet	BM 5: EAF high alloy steel	BM 6: Iron casting, CBAM	BM 7: Iron casting, non-CBAM	

Product benchmarks on BDR

A
B
C
D
E
F
G
H
I
J
K

Activities and…

Fall-back approach (fuel benchmark)

4 Further installation data:

(a) Activities according to Annex I of the EU ETS Directive:

This information is important for the competent authorities because changes compared to previous ETS phases may have taken place.

To the extent feasible, please sort the list with regard to the direct emissions, starting with the activity causing the highest direct emissions.

Number	Name of activity (Annex I of the ETS Directive)	Total rated thermal input (MW)
1	Combustion of fuels in installations with a total rated thermal input exceeding 20 MW (except in installations for the incineration of hazardous or municipal waste)	

No.	Sub-installation type	<average of 10% best?	relevant?	Start of operation	CL exposed?	CBAM?
11	Heat benchmark sub-installation (CL | non-CBAM)		FALSO		VERO	FALSO
12	Heat benchmark sub-installation (non-CL | non-CBAM)		FALSO		FALSO	FALSO
13	Heat benchmark sub-installation (CL | CBAM)		FALSO		VERO	VERO
14	District heating sub-installation		FALSO		FALSO	FALSO
15	Fuel benchmark sub-installation (CL | non-CBAM)		FALSO		VERO	FALSO
16	Fuel benchmark sub-installation (non-CL | non-CBAM)		FALSO		FALSO	FALSO
17	Fuel benchmark sub-installation (CL | CBAM)		VERO		VERO	VERO
18	Process emissions sub-installation (CL | non-CBAM)		FALSO		VERO	FALSO
19	Process emissions sub-installation (non-CL | non-CBAM)		FALSO		FALSO	FALSO
20	Process emissions sub-installation (CL | CBAM)		FALSO		VERO	VERO

Sheet “G_Fall-back" - SUB-INSTALLATION DATA RELATING TO FUEL BENCHMARK (after continuous casting)

A
B
C
D
E
F
G
H
I
J
K

G. Sheet "Fall-back" - SUB-INSTALLATION DATA RELATING TO FALL-BACK SUB-INSTALLATIONS

The navigation bar above only contains links to sub-installations that are selected as "relevant" in section A.III.2.

I Historic Activity levels and disaggregated production details

G. Fall-back	Navigation area:	Table of contents	Previous sheet	Next sheet	Summary
	Top of sheet				
	End of sheet			Fuel benchmark sub-installation (CL I CBAM)	

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- From theory to actual implementation: summary and calculation

Blast furnaces: definition and boundaries

Activities with production thresholds

Activities	Relevant capacity	Relevant capacity threshold to be exceeded
Production of iron or steel (primary or secondary fusion) including continuous casting	Capacity	2,5 tonnes per hour

Product benchmark:

- ➢ Hot metal — *Primary iron*
- ➢ EAF carbon steel
- ➢ EAF high alloy steel — *Secondary iron*

Clause 4 of Annex I stipulates:

"*If a unit serves an activity for which the threshold is not expressed as total rated thermal input,* ***the threshold of this activity shall take precedence for the decision about the inclusion in the EU ETS."***

Blast furnaces: definition and boundaries

4. Hot metal

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

"Iron produced from iron ores for primary steelmaking including

- ***a) liquid iron saturated with carbon for further processing, considered as product of blast furnaces, and expressed in tonnes of liquid iron at the exit point of the blast furnace****, excluding liquid iron produced from sponge iron under b),*
- ***b) sponge iron at the exit point of a direct reduced iron reactor and expressed in tonnes of sponge iron at the exit point of the direct reduced iron reactor****. Similar products such as ferroalloys are not covered by this product benchmark.* ***Residual material and by-products are not to be considered as part of the product****."*

only one DRI producing plant in the EU

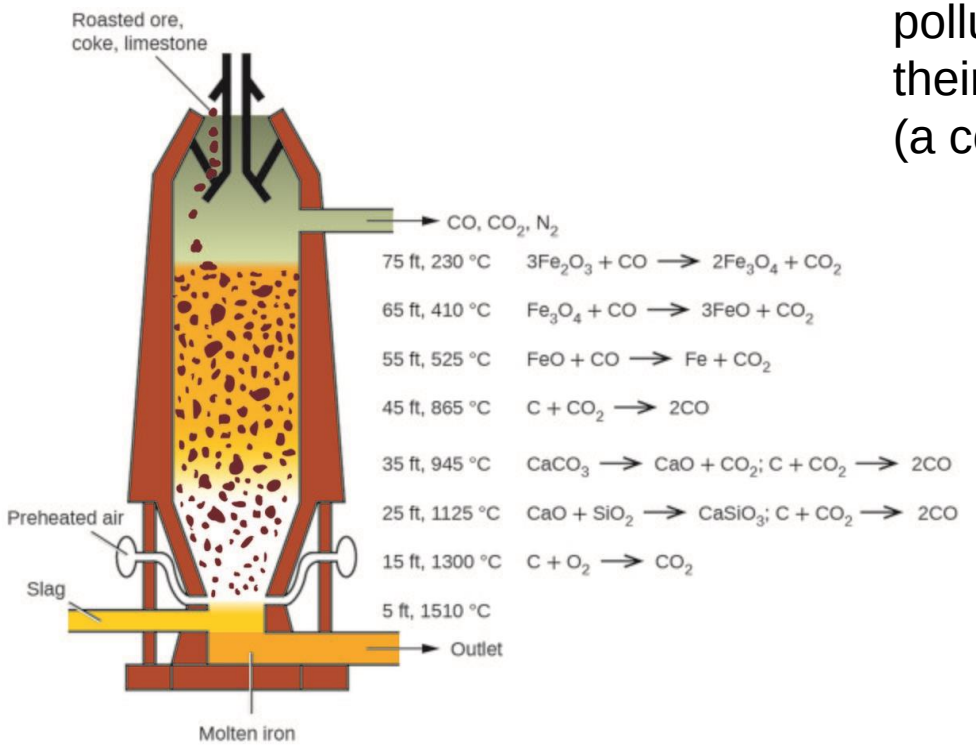
The liquid iron is considered to be the product of blast furnaces and sponge iron the product of direct reduced iron reactors. Within the given system boundaries, the benchmark also indirectly covers steel produced by the blast furnace route. Similar products such as ferroalloys are not covered by this product benchmark.

Blast furnaces:
definition and boundaries

Hot metal: Liquid iron at the exit point of the blast furnace or sponge iron at the exit point of a direct reduced iron reactor (for the calculation of HAL)

The hot metal benchmark is updated with an annual reduction rate of 0,2%.

Liquid iron



Higher carbon and other pollutant emissions due to their intensive use of coke (a coal-derived fuel).

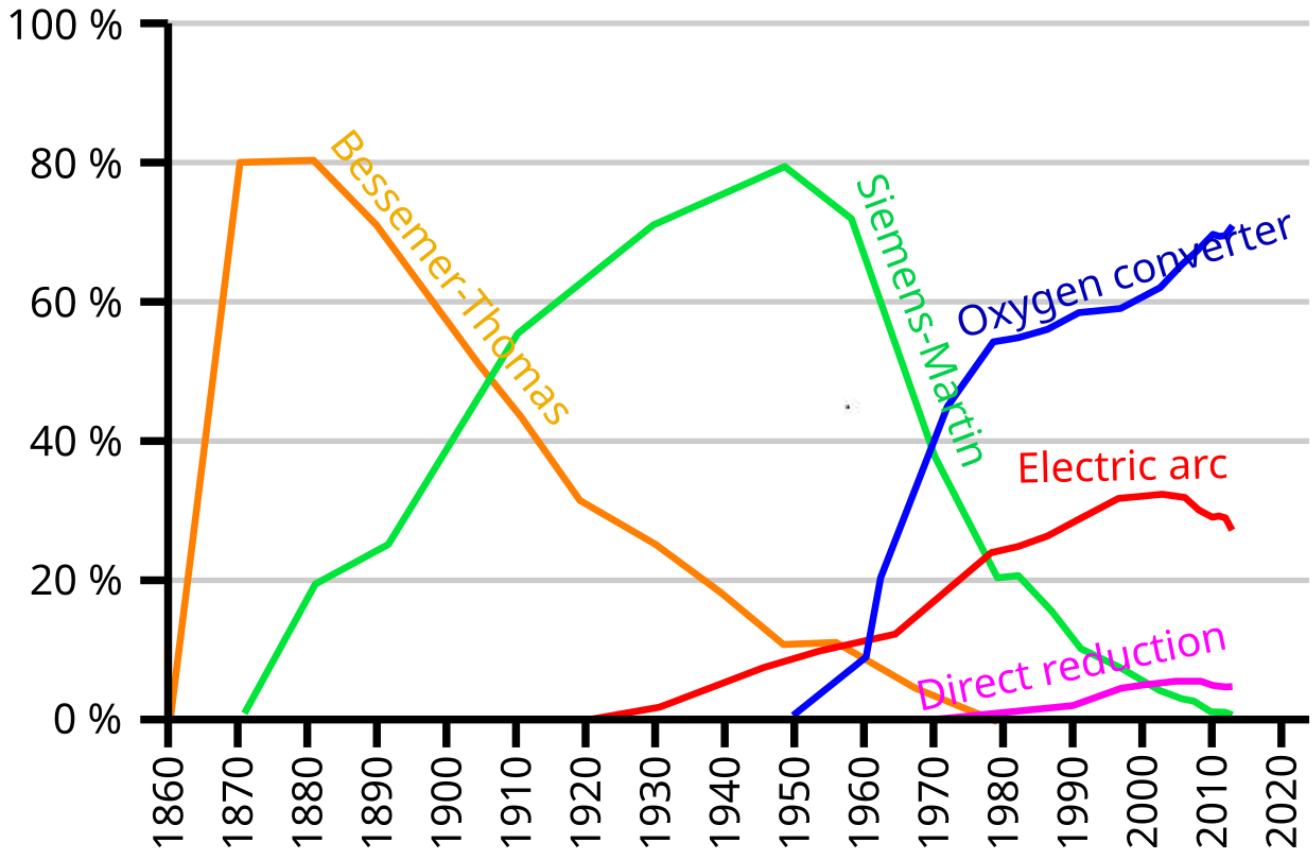
Map of EU steel production sites

*Hot metal is most **commonly produced in blast furnaces** that are fed with sinter, coke and additives. To make best possible use of the heat of roughly 1600 °C, **hot metal is delivered as fast as possible to the basic oxygen furnace, where its conversion to crude steel takes place**. Oxygen is blown through molten hot metal in the BOF in order to drive out the carbon content. Scrap is added to the BOF to be able to control the reaction and keep the temperature within limits.*

Blast furnaces:
definition and boundaries

Hot metal: Liquid iron at the exit point of the blast furnace or sponge iron at the exit point of a direct reduced iron reactor (for the calculation of HAL)

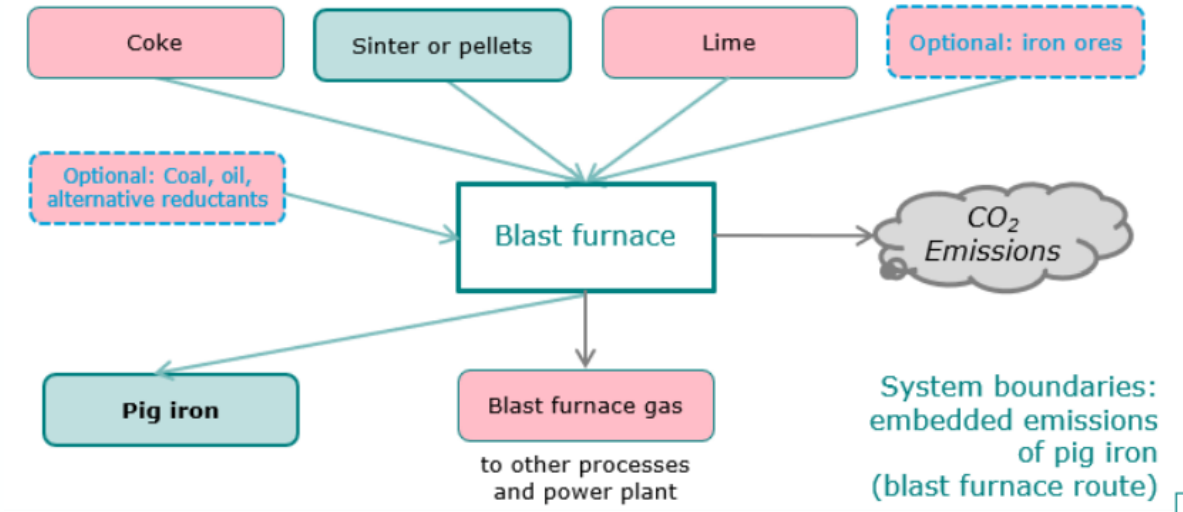
Iron produced from iron ores for primary steelmaking



Alternatively to the blast furnace process iron ore can also be converted into metallic iron in a direct reduction process. The product yielded is often referred to as "direct reduced iron (DRI)" or "sponge iron". Direct reduced iron is used instead of scrap as input for electric arc furnaces.

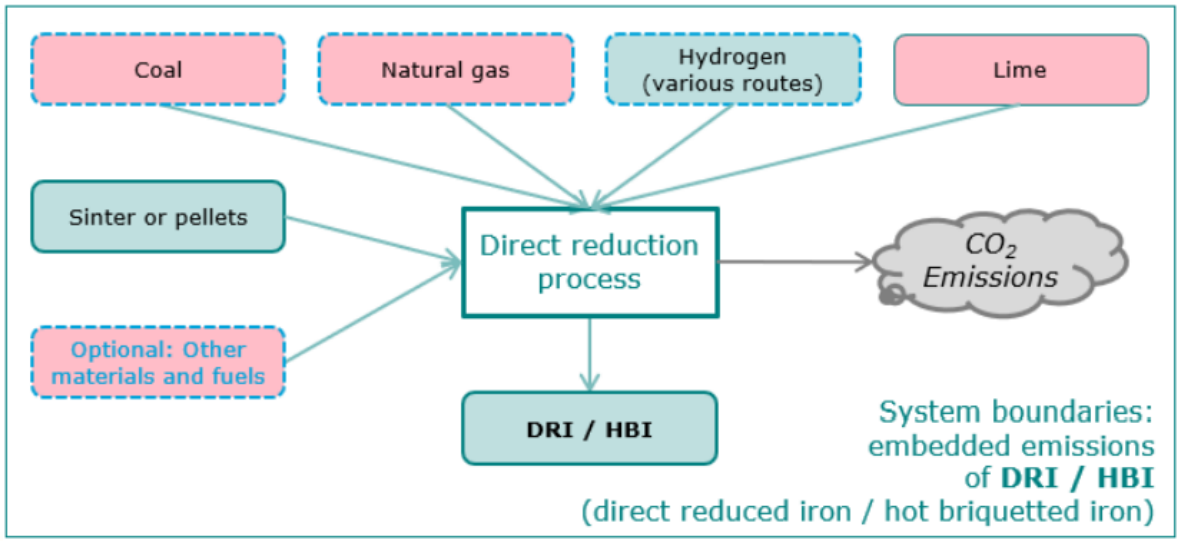
Blast furnaces: definition and boundaries

Pig iron – Blast furnace production route



System boundaries: embedded emissions of pig iron (blast furnace route)

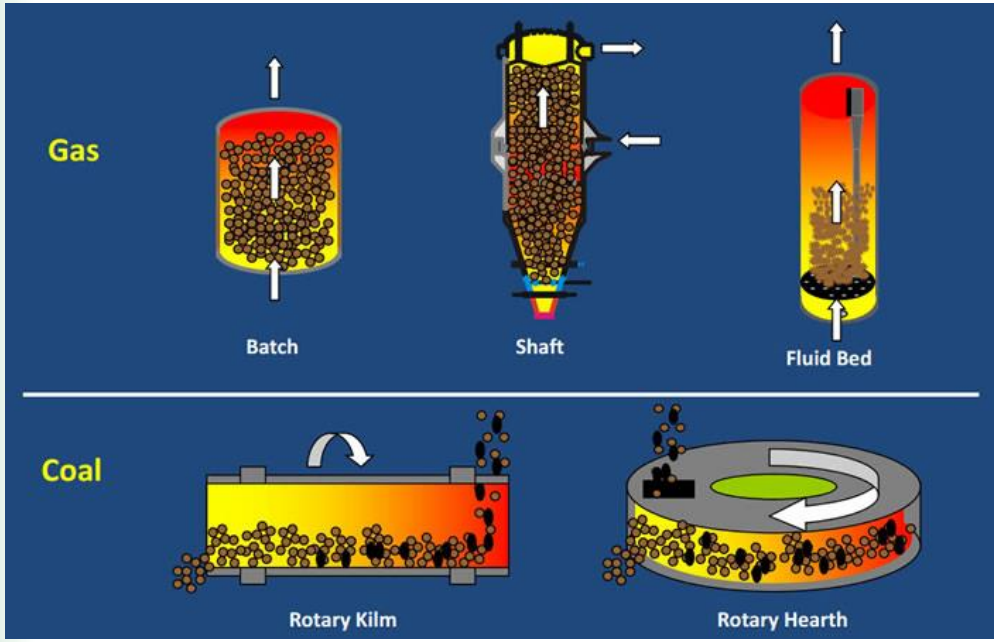
DRI production process

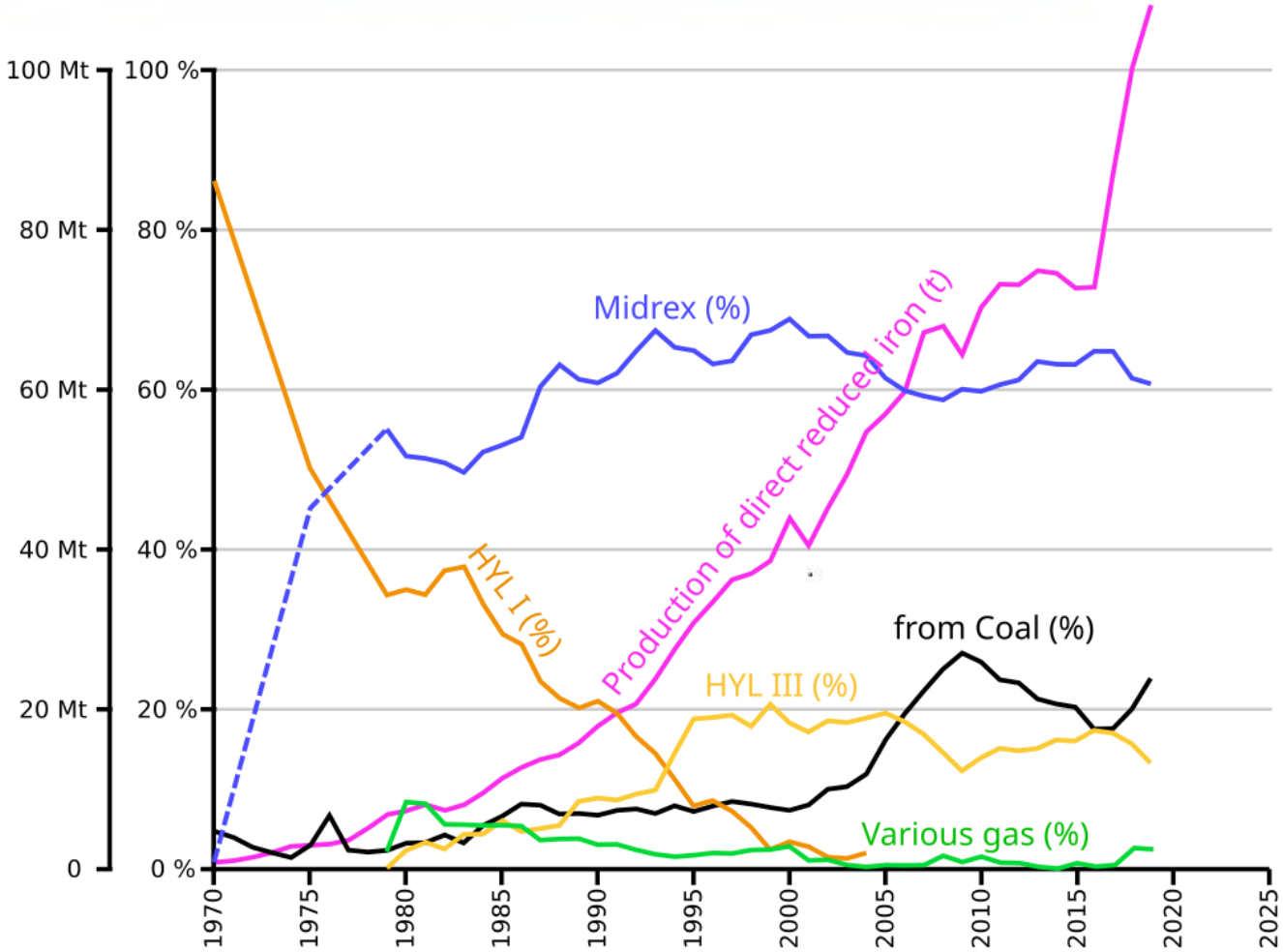


System boundaries: embedded emissions of **DRI / HBI** (direct reduced iron / hot briquetted iron)

Blast furnaces:
definition and boundaries

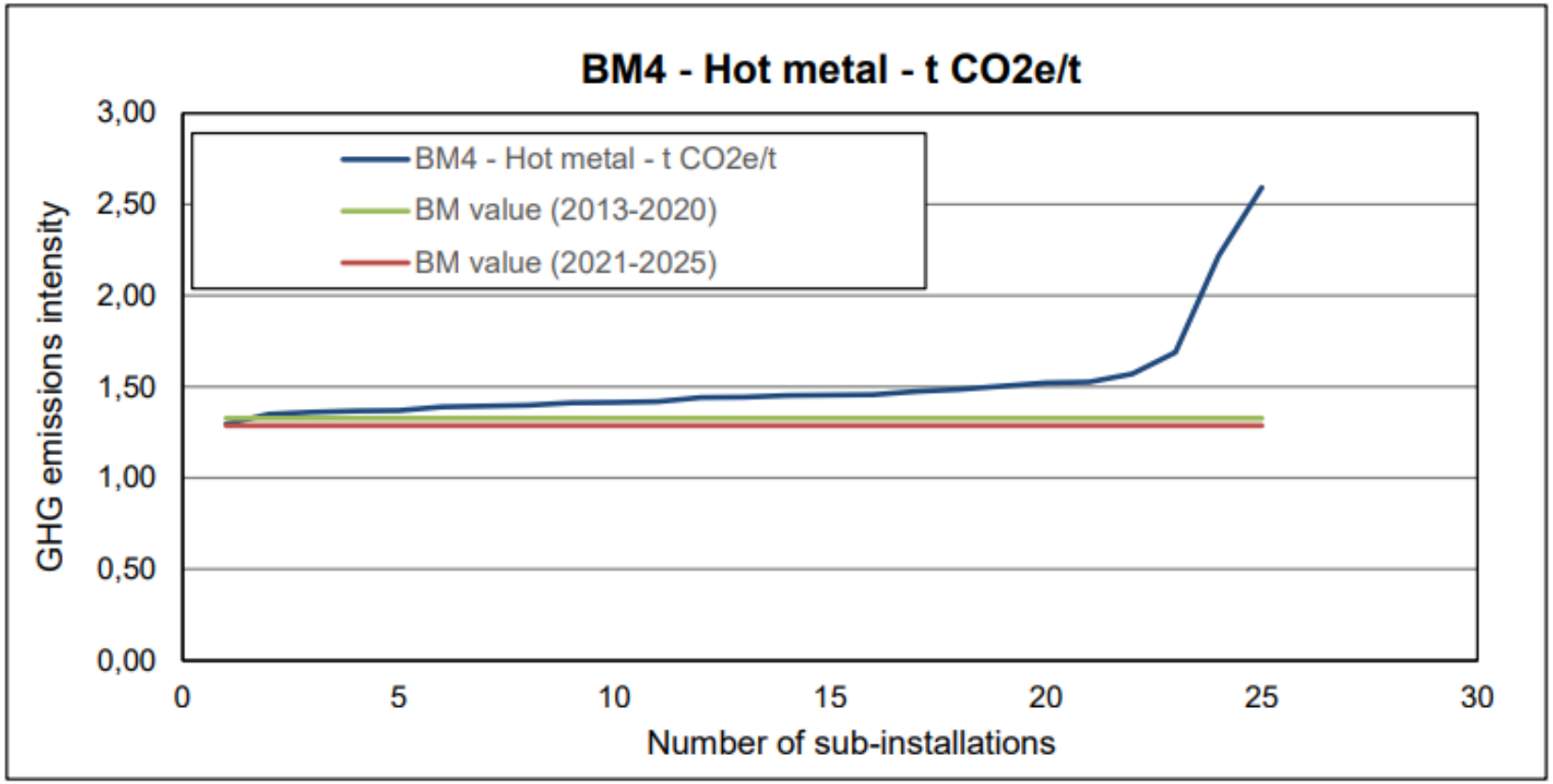
Sponge iron





Midrex: gas-based shaft furnace processes

Blast furnaces:
definition and boundaries



Key parameters for BM4 Hot metal	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	1,331	t CO_2e/t
Benchmark value for 2021-2025	1,288	t CO_2e/t

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Electric Arc Furnaces: definition and boundaries

Activities with production thresholds

Activities	Relevant capacity	Relevant capacity threshold to be exceeded
Production of iron or steel (primary or secondary fusion) including continuous casting	Capacity	2,5 tonnes per hour

Product benchmark:

- Hot metal — *Primary iron*
- EAF carbon steel — *Secondary iron*
- EAF high alloy steel — *Secondary iron*

Clause 4 of Annex I stipulates:

"*If a unit serves an activity for which the threshold is not expressed as total rated thermal input,* ***the threshold of this activity shall take precedence for the decision about the inclusion in the EU ETS."***

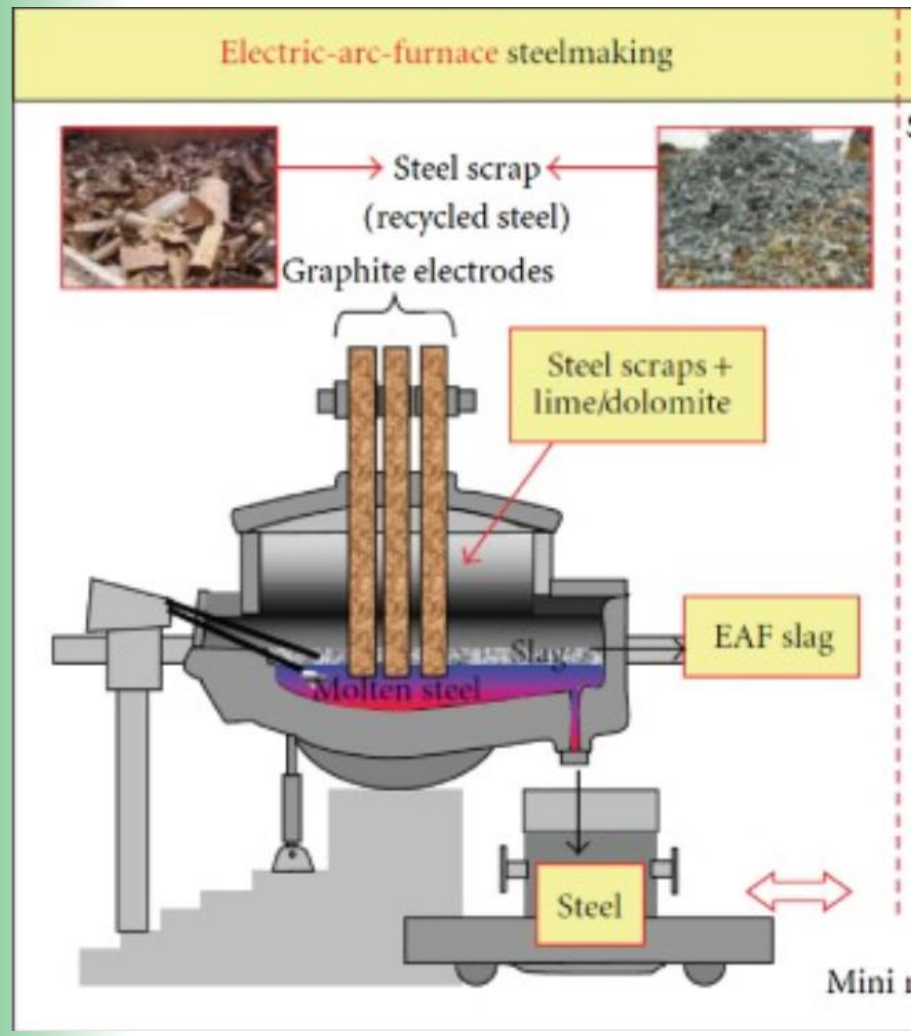
Electric Arc Furnaces: definition and boundaries

5. EAF carbon steel

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

"Steel containing ***less than 8 % metallic alloying elements and tramp elements to such levels limiting the use to those applications where no high surface quality and processability is required*** *and if none of the criteria for the content of the metal alloying elements and the steel quality for high alloy steel are met.* ***Expressed in tonnes of crude secondary steel ex-caster****.* ***Steel produced from sponge iron already covered under the hot metal benchmark is not covered by this benchmark****."*

Electric Arc Furnaces: definition and boundaries

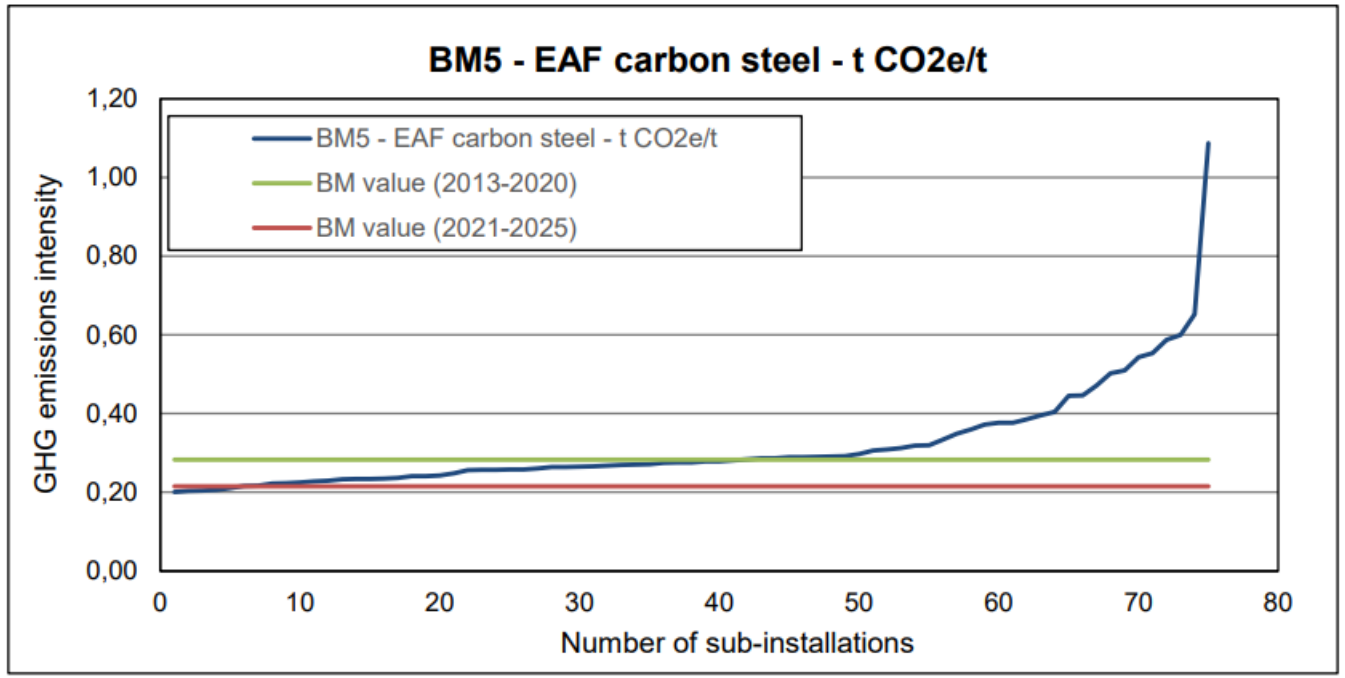


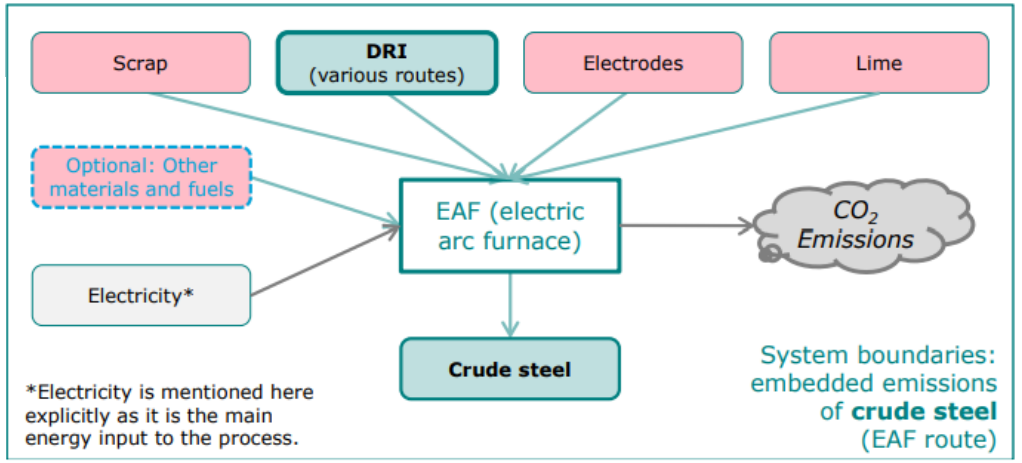
PRODCOM code	Description
24.10.21.10	Flat semi-finished products (of non-alloy steel)
24.10.21.21	Ingots, other primary forms and long semi-finished products for seamless tubes (of non-alloy steel)
24.10.21.22	Other ingots, primary forms and long semi-finished products including blanks (of non-alloy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

"All processes directly or indirectly linked to the process units
- electric arc furnace
- secondary metallurgy
- casting and cutting
- post-combustion unit
- dedusting unit
- vessels heating stands
- casting ingots preheating stands
- scrap drying and
- scrap preheating

are included.
Processes downstream of casting are not included.

Electric Arc Furnaces: definition and boundaries





Key parameters for BM5 EAF carbon steel	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	0,209	t CO_2e/t
Benchmark value for 2021-2025	0,215	t CO_2e/t

6. EAF high alloy steel

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

"**Steel containing 8 % or more metallic alloying elements or where high surface quality and processability is required.** Expressed in tonnes of crude secondary steel ex-caster. **Steel produced from sponge iron already covered under the hot metal benchmark is not covered by this benchmark.**"

EAF high alloy steel

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

EAF steel should be regarded as high-quality steel if at least one of the following criteria is met:

1. hydrogen content max 0,0003%
2. sulphur content max 0,003%
3. phosphorus content max 0,01%
4. micro cleanliness:
   a) K3 (Oxide) < 40; K4 < 50 according to DIN 50602 (or any equivalent international standard)
   b) sulfide: Athin 2,0; Aheavy 1,5 according to ISO 4967
   c) oxide: Bthin 1,5; Bheavy 0,5 according to ISO 4967
   d) ASTME 45: procedure B, C, D max. 2
   e) SEP 1920: ultrasonic examination: core examination - KSR max. 2 mm
5. macro cleanliness: blue shortness: max. 2,5 mm / dm^2

The alloy content criterion or the five criteria listed above must be applied to steel casts separately. Only amounts matching at least one of these criteria should be regarded as "high alloy steel" and aggregated on an annual basis for all years of the relevant baseline period

EAF high alloy steel

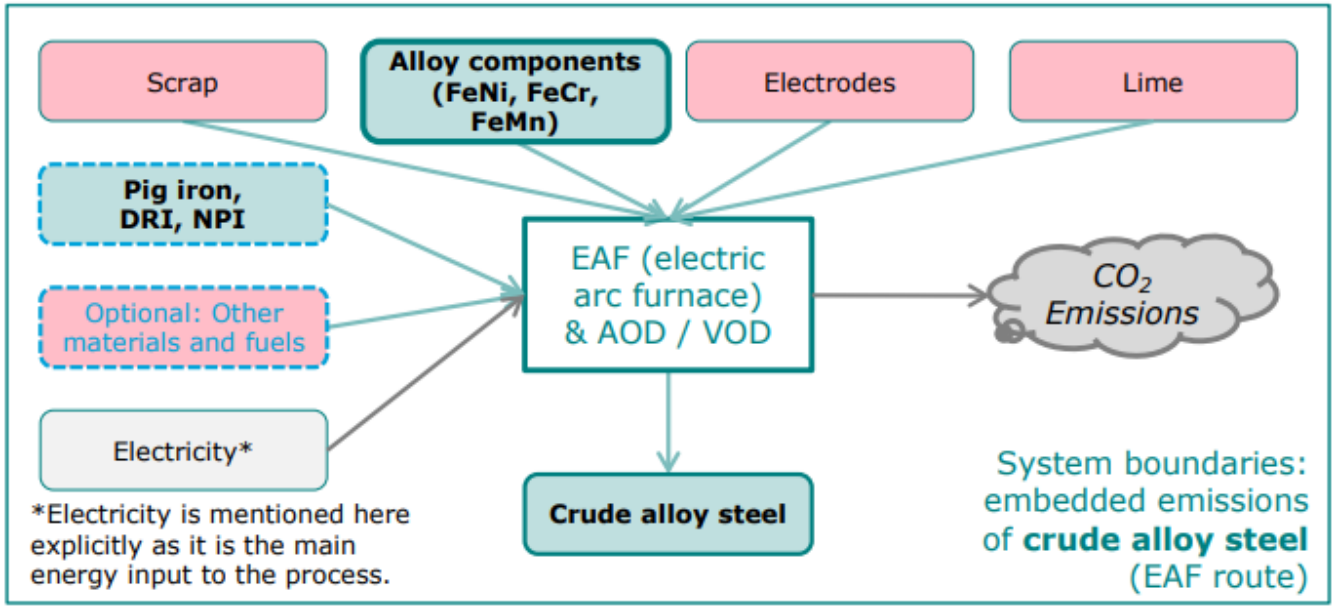
Alternatively, steel could be regarded as of high surface quality and processability **if for more than 10% of the production output one of the following technological non-destructive tests is required:**

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

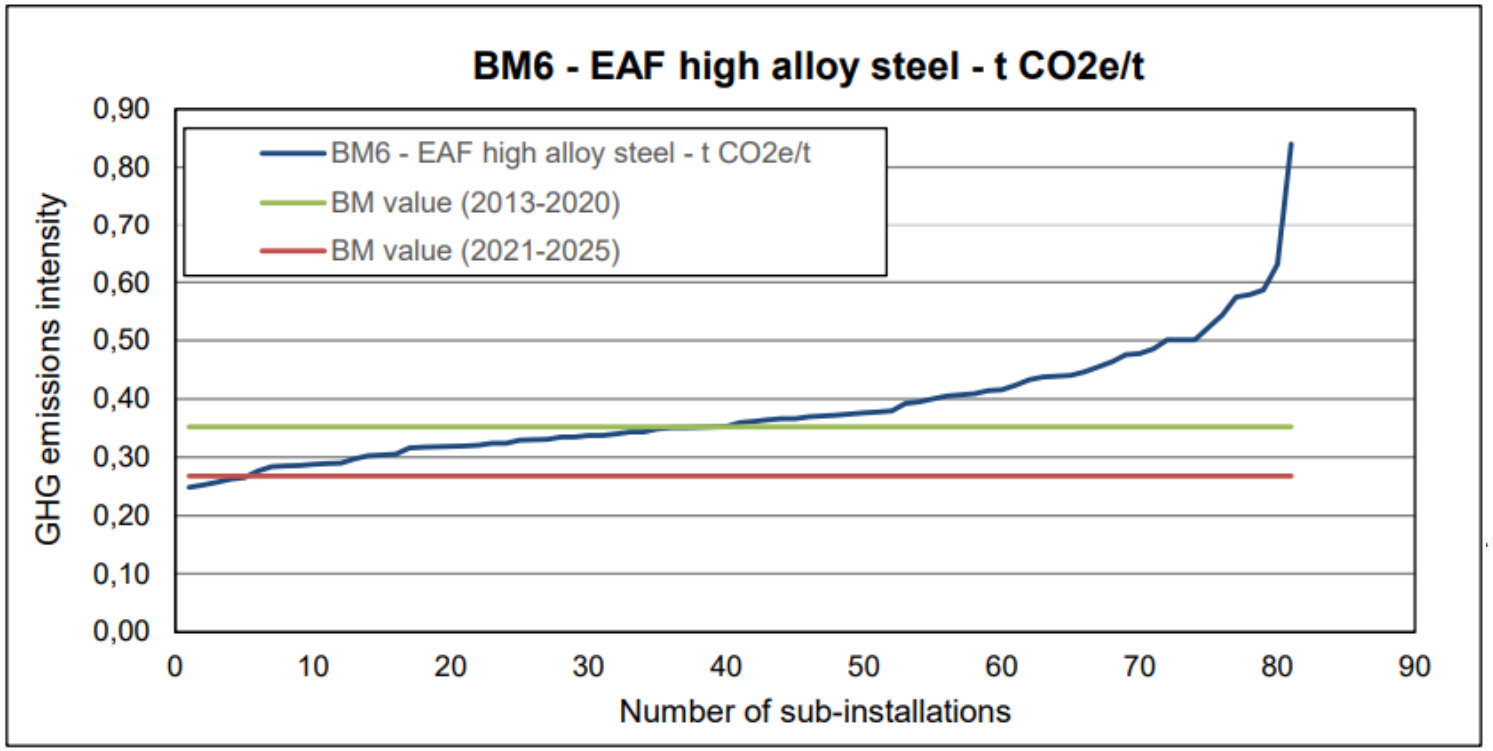
To the extent that none of the criteria for the content of the metal alloying elements and the steel quality are met, the EAF carbon steel benchmark (see section 5) should be applied.

Electric Arc Furnaces: definition and boundaries

EAF high alloy steel



Electric Arc Furnaces: definition and boundaries



Key parameters for BM6 EAF high alloy steel	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	0,266	t CO_2e/t
Benchmark value for 2021-2025	0,268	t CO_2e/t

partici.fi/74728546

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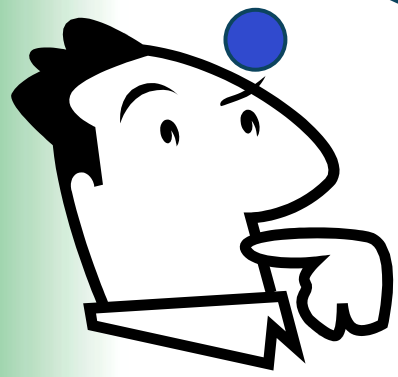
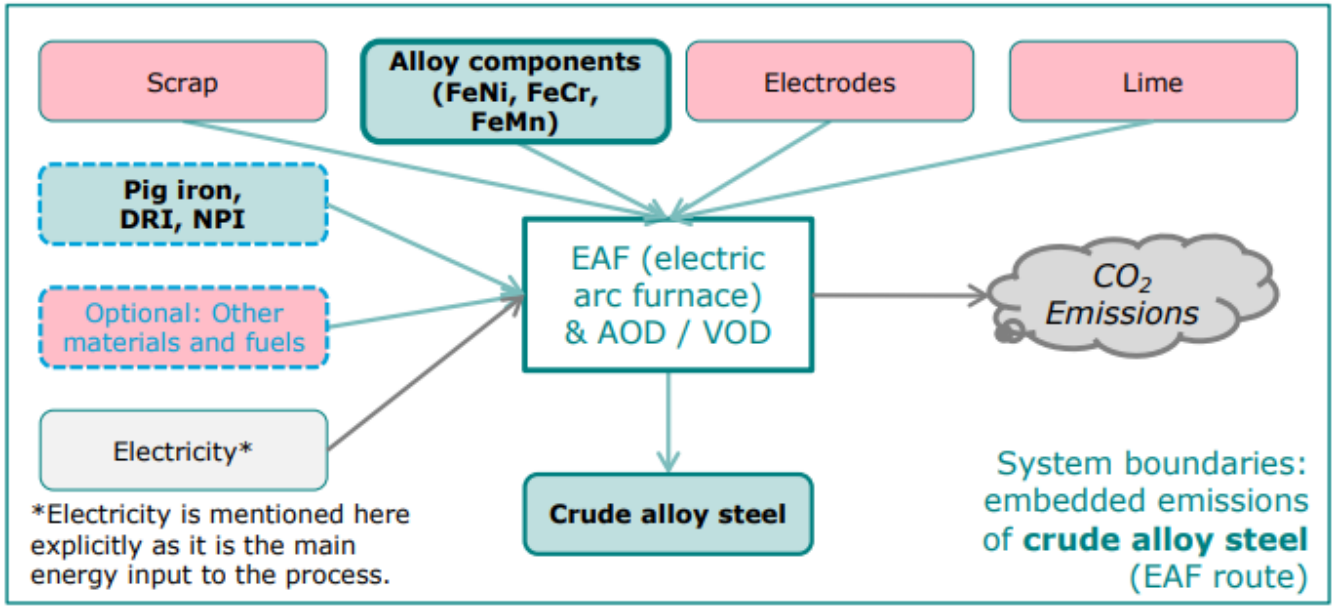
- From theory to actual implementation: summary and calculation

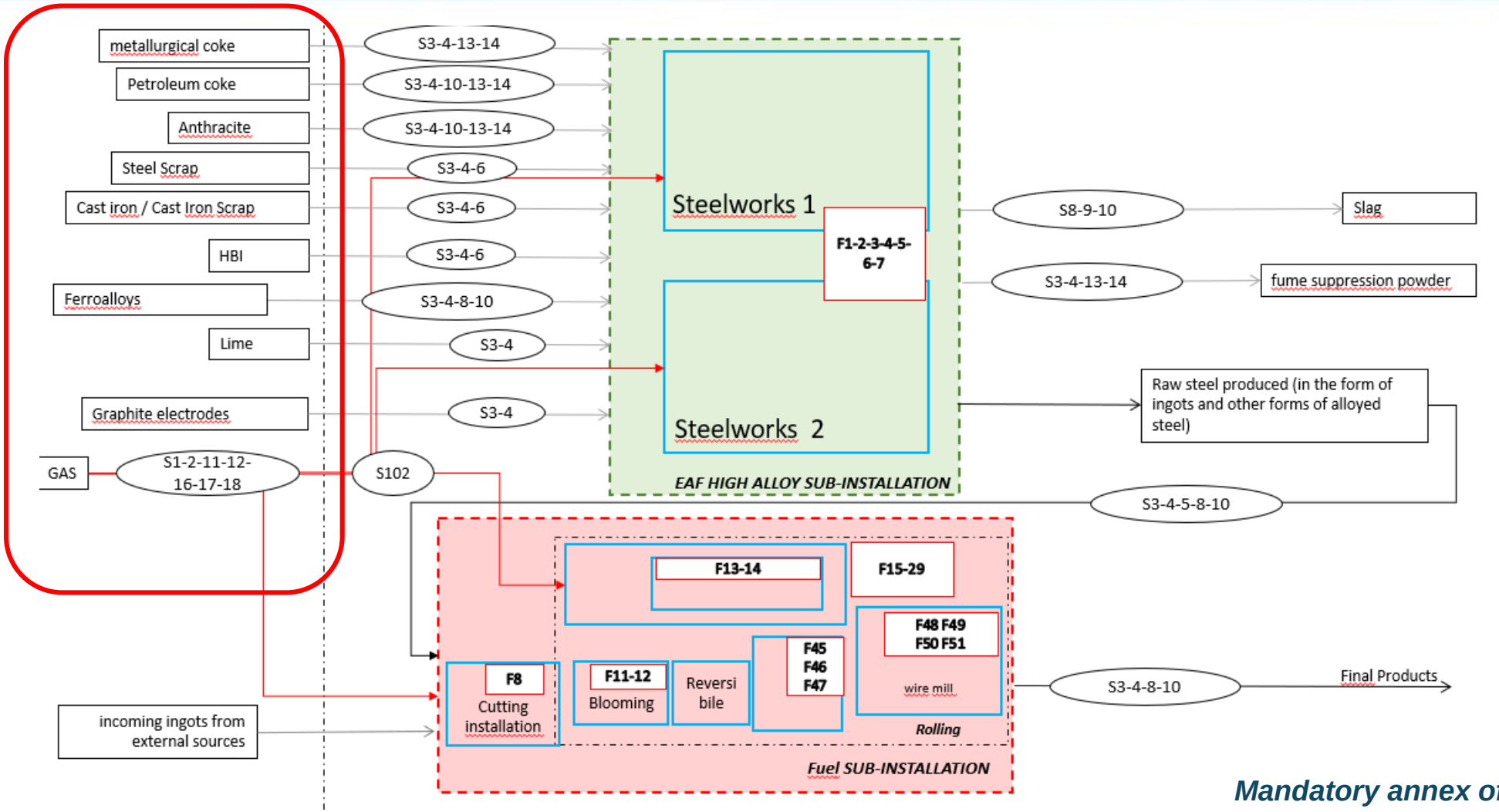
ETS layout of a steel making plant

On a real EAF iron steel plant?





ETS layout of a steel making plant



Mandatory annex of a MMP

Emissions from a steel making plant

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Source Streams (excluding PFC emissions)

#	Method	Source stream name	Activity Data	AD Unit	NCV	NCV Unit	EF	EF Unit	C-Content	C-Content Unit
Ex.1	Combustion	Heavy fuel oil	252.000,00	t	45,00	GJ/t	73,00	tCO2/TJ		
Ex.2	Process Emissions	Clay	121.000,00	t			0,09	tCO2/t		
Ex.3	Mass balance	Steel	-1.808.226,00	t			0,00		0,3878	tC/t
1	Combustion	Natural Gas	171.660,94	1000Nm3	37,47	Gj/1000nm3	56,23	tCO2/TJ	0	
2	Mass balance	Anthracite	34.103,38	t	0,00		0,00		0,799084125	tC/t
3	Mass balance	Metallurgical Coke	21.573,89	t	0,00		0,00		0,851569821	tC/t
4	Mass balance	Petroleum Coke	5.999,70	t	0,00		0,00		0,982716386	tC/t
5	Mass balance	Graphite electrodes	7.027,76	t	0,00		0,00		0,995676158	tC/t
6	Mass balance	Lime	182.703,71	t	0,00		0,00		0,007108992	tC/t
7	Mass balance	Steel scrap	3.178.214,03	t	0,00		0,00		0,0018	tC/t
8	Mass balance	Cast Iron / Cast Iron Scrap	279.742,32	t	0,00		0,00		0,0409	tC/t
9	Mass balance	HIB	47.992,08	t	0,00		0,00		0,02	tC/t
10	Mass balance	Raw steel production	-3.039.769,72	t	0,00		0,00		0,003065514	tC/t
11	Mass balance	Fume suppression Powder	-71.586,28	t	0,00		0,00		0,01	tC/t
12	Mass balance	Slag	-479.432,66	t	0,00		0,00		0,003	tC/t
13	Mass balance	Ferroalloys	16.199,79	t	0,00		0,00		0,073137045	tC/t
14	Mass balance	Ferroalloys	3.139,10	t	0,00		0,00		0,080838107	tC/t
15	Mass balance	Ferroalloys	13.991,80	t	0,00		0,00		0,068990811	tC/t
16	Mass balance	Ferroalloys	27.851,28	t	0,00		0,00		0,020316153	tC/t
17	Mass balance	Ferroalloys	491,19	t	0,00		0,00		0,99	tC/t
18	Mass balance	Ferroalloys	6.333,76	t	0,00		0,00		0,0008	tC/t
19	Mass balance	Ferroalloys	6.787,18	t	0,00		0,00		0,0009	tC/t
20	Mass balance	Ferroalloys	2.004,33	t	0,00		0,00		0,00889	tC/t

Emissions from a steel making plant

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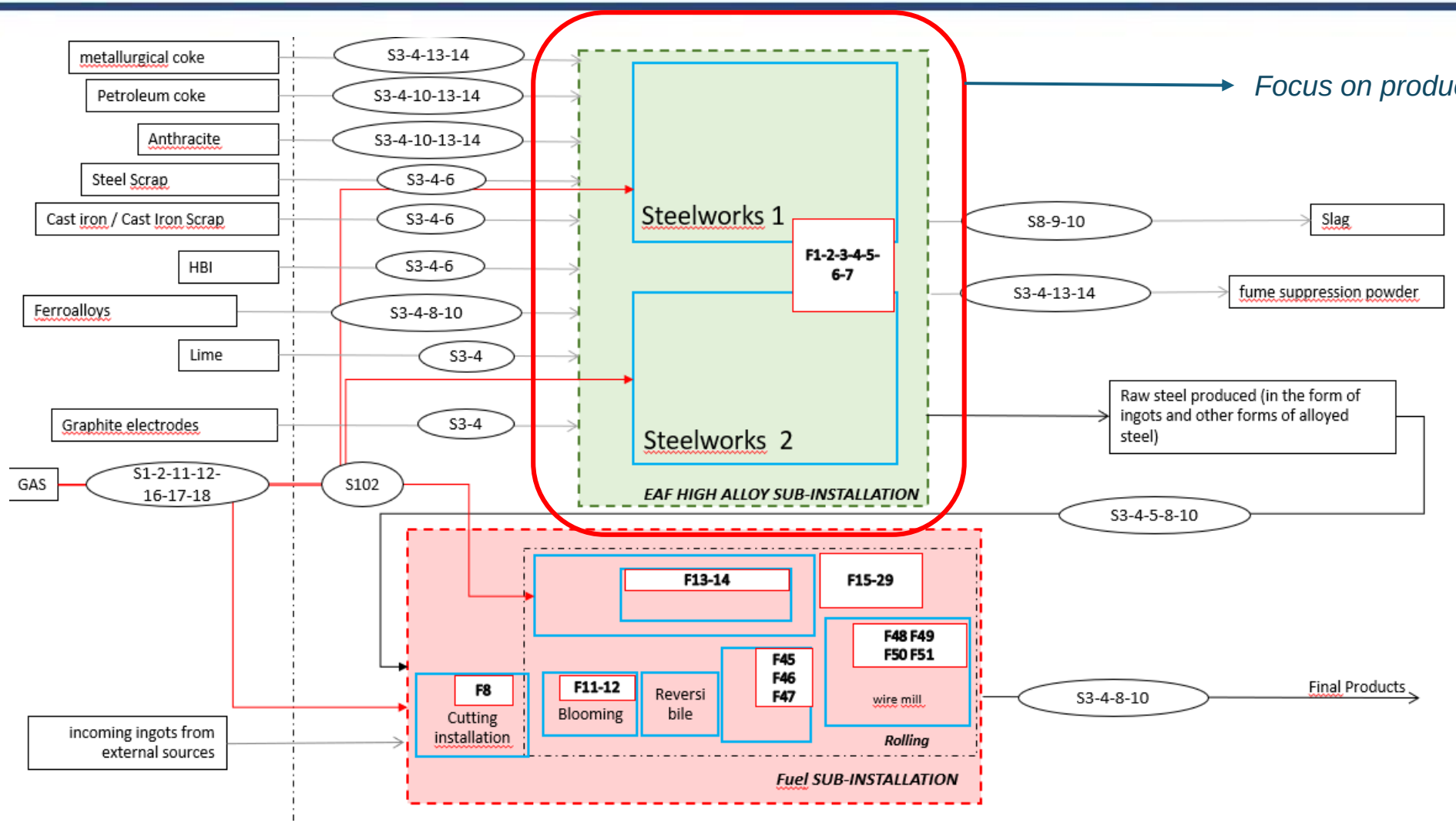
Source Streams (excluding PFC emissions)

#	Method	Source stream name	CO2e fossil (t)	CO2e bio (t)	CO2e non-sust. bio (t)	Energy content (fossil), TJ	Energy content (bio), TJ
Ex.1	Combustion	Heavy fuel oil	827.820,0	0,0	0,0	11.340,00	0,00
Ex.2	Process Emissions	Clay	10.640,7	0,0	0,0	0,00	0,00
Ex.3	Mass balance	Steel	-2.569.306,9	0,0	0,0	0,00	0,00
1	Combustion	Natural Gas	361.743,2	0,0	0,0	6.432,74	0,00
2	Mass balance	Anthracite	99.849,4	0,0	0,0	0,00	0,00
3	Mass balance	Metallurgical Coke	67.313,8	0,0	0,0	0,00	0,00
4	Mass balance	Petroleum Coke	21.603,0	0,0	0,0	0,00	0,00
5	Mass balance	Graphite electrodes	25.638,4	0,0	0,0	0,00	0,00
6	Mass balance	Lime	4.758,9	0,0	0,0	0,00	0,00
7	Mass balance	Steel scrap	20.961,0	0,0	0,0	0,00	0,00
8	Mass balance	Cast Iron / Cast Iron Scrap	41.921,5	0,0	0,0	0,00	0,00
9	Mass balance	HIB	3.516,9	0,0	0,0	0,00	0,00
10	Mass balance	Raw steel production	-34.142,8	0,0	0,0	0,00	0,00
11	Mass balance	Fume suppression Powder	-2.622,9	0,0	0,0	0,00	0,00
12	Mass balance	Slag	-5.269,9	0,0	0,0	0,00	0,00
13	Mass balance	Ferroalloys	4.341,1	0,0	0,0	0,00	0,00
14	Mass balance	Ferroalloys	929,8	0,0	0,0	0,00	0,00
15	Mass balance	Ferroalloys	3.536,9	0,0	0,0	0,00	0,00
16	Mass balance	Ferroalloys	2.073,2	0,0	0,0	0,00	0,00
17	Mass balance	Ferroalloys	1.781,7	0,0	0,0	0,00	0,00
18	Mass balance	Ferroalloys	18,6	0,0	0,0	0,00	0,00
19	Mass balance	Ferroalloys	22,4	0,0	0,0	0,00	0,00
20	Mass balance	Ferroalloys	65,3	0,0	0,0	0,00	0,00

ETS layout of a steel making plant



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Production data on BDR

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F. Sheet "ProductBM" - SUB-INSTALLATION DATA RELATING TO PRODUCT BENCHMARKS

The navigation bar above only contains links to the relevant sub-installations listed in section A.III.1.

I Historic Activity levels and disaggregated production details

1 Sub-installation with product benchmark: EAF high alloy steel

The name of the product benchmark sub-installation is displayed automatically based in the inputs in sheet "A_InstallationData".

This sheet serves the following two purposes:

- *data needed to determine the amount of free allocation of product benchmark sub-installations;*
- *data needed to determine improvement rates of product benchmark values.*

(a) Historic activity levels

Under this point the "main activity levels" should be reported, i.e. the data which is directly applicable for the calculation of the allocation.

Usually this is the production data of the product, e.g. tonnes of grey cement clinker or tonnes of glass bottles, as defined by Annex I of the FAR.

However, if a message appears under point (b), the appropriate calculation tool has to be used, and its results are automatically copied into this table under (iii).

Based on the start of normal operation entered in A.III., it will be automatically determined if this sub-installation has been operating for less than one year in the baseline period. If this is the case, the historic activity level will be determined based on the first calendar year after the start of normal operation, pursuant to the third sub-paragraph of Article 15(7).

Annual activity levels:	Unit	2019	2020	2021	2022	2023
i. EAF high alloy steel	tonnes	2.617.277	2.588.871	3.176.753	2.823.564	3.039.770
ii. From sheet "H_SpecialBM":	tonnes					
iii. Values used for calculation:	tonnes	2.617.277	2.588.871	3.176.753	2.823.564	3.039.770

(b) Special reporting requirements:

Some product benchmarks require special information to be reported (e.g. CWT values). If relevant, an automatically generated message will appear here.

(c) Electricity consumption

Please enter here the electricity consumed within the system boundaries of this sub-installation. For product benchmarks listed in section 2 of Annex I of the FAR, entries here are mandatory and have to correspond to the related system boundaries indicated in that section.

Parameter	Unit	2019	2020	2021	2022	2023
Relevant electricity consumption	MWh / year	1.758.109	1.727.399	2.004.889	1.830.673	1.575.157

Production data on BDR

BDR

(f) Individual production levels of products included in this product benchmark sub-installation

	PRODCOM 2010	Name of product or group of products	Unit	2019	2020	2021	2022	2023	CN codes
1	24.10.23.10	EAF high Alloy steel	t	2.617.277	2.588.871	3.176.753	2.823.564	3.039.770	7224 90 14

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CPA 24.10.23: Other alloy steel in ingots or other primary forms and semi-finished products of other alloy steel

24.10.23.10	Flat semi-finished products (of alloy steel other than of stainless steel)	7224 90 14	kg	S	

CN code

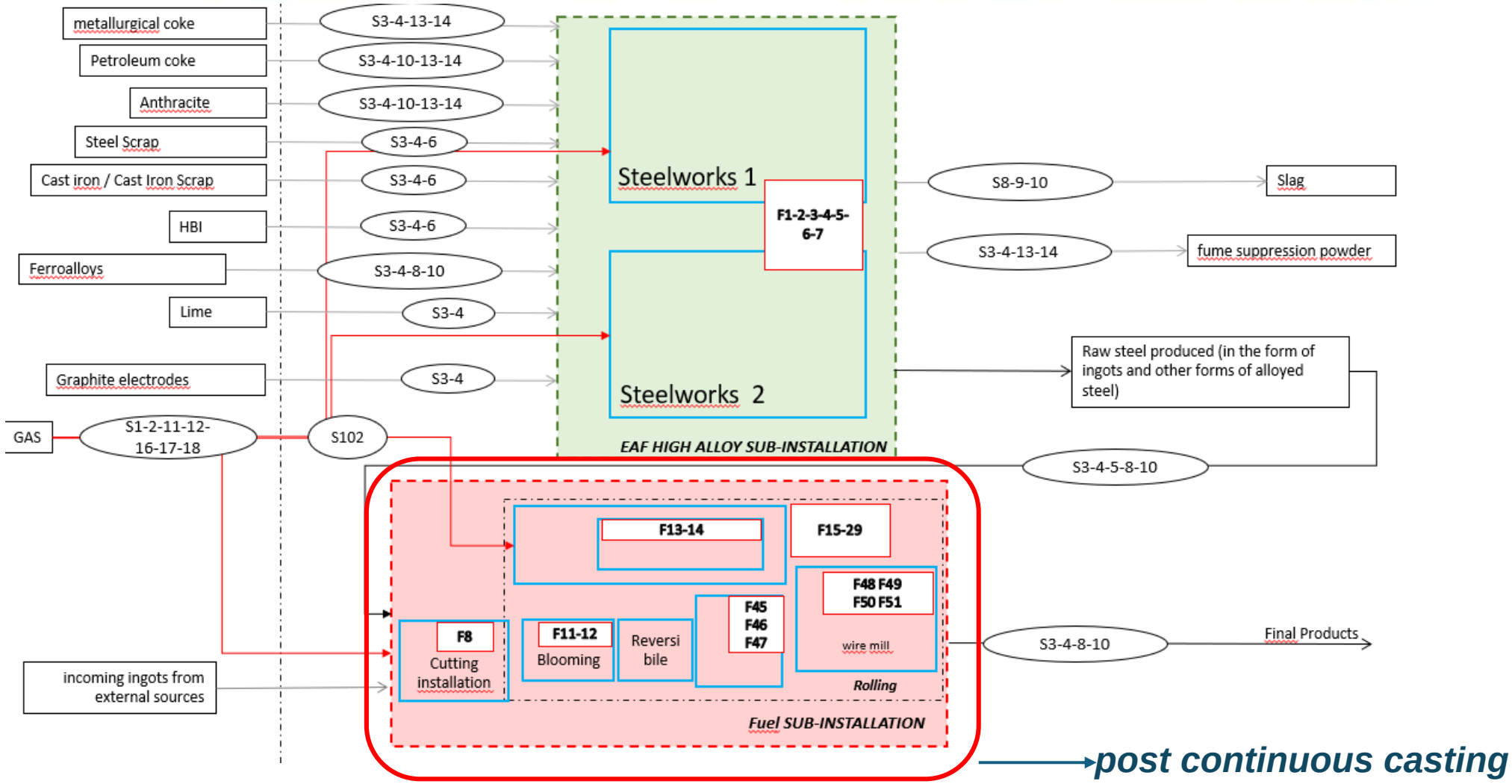
COMMISSION REGULATION (EU) No 860/2010

of 10 September 2010

establishing for 2010 the 'Prodcom list' of industrial products provided for by Council Regulation (EEC) No 3924/91

(Text with EEA relevance)

Production data on BDR



Production data on BDR

This plant has an iron casting process that it is not covered by the product benchmark “iron casting”.

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(a) Historic activity levels

The following data is taken automatically from sheet "E_EnergyFlows" section E.1.c. Thus, data input is mandatory there.

Main activity level:	Unit	2019	2020	2021	2022	2023
Fuel benchmark sub-installation (CL | CBAM)	TJ	4.254,47	3.984,02	5.489,87	5.135,30	5.360,36

Production details

(b) Identification of relevant products or services associated with this sub-installation

Please list here to which production processes or services this sub-installation relates. This may include the following items:

- *Production of goods not covered by product benchmarks within the installation (please provide types of product);*
- *production of mechanical energy, heating or cooling (all uses excluding production of electricity).*

	Use type	Product name or service type	PRODCOM 2010	CN codes
1	Production of goods	Ribbed or otherwise worked rods, of non-alloy steel.	24106110	7213 10 00
2	Production of goods	Hot-rolled bars (excluding drilled bars for perforation) of non-alloy steel (excl. free-cutting steel).	24106250	7214 10 00

Production levels:

	Product name or service type	Unit	2019	2020	2021	2022	2023
1	Ribbed or otherwise worked rods, of non-alloy	t	195.412,37	144.071,24	624.128,24	251.604,92	277.281,72
2	Hot-rolled bars (excluding drilled bars for	t	629.453,42	626.253,53	807.623,97	767.519,84	818.802,81

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Emissions at sub-installation level for benchmark update

Emissions from each product sub installation…..

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Directly attributable emissions (DirEm*)	Unit	2019	2020	2021	2022	2023
EAF high alloy steel	t CO2e/year	300.471	299.332	325.136	302.596	338.400

(h) Energy input to this sub-installation and relevant emission factor

As required by Annex IV, section 2.4(a) of the FAR, please provide the total energy input from fuels, materials and from electricity for heat production to the sub-installation and a corresponding weighted emission factor, taking into account the related energy content of each fuel which is included in the figure given under point (g), applying the same system boundaries as for point (g).

The term "fuel" should be understood as any source stream in accordance with the M&R Regulation that is combustible and for which a net calorific value can be determined. The weighted emission factor corresponds to the accumulated emissions from the fuels divided by the total energy content.

The weighted emission factor should furthermore include emissions from corresponding flue gas cleaning, if applicable.

Data provided here are only used for consistency checking and have no direct impact on either the attributable emissions or the allocation.

		Unit	2019	2020	2021	2022	2023
i.	Energy input	TJ / year	954,98	886,06	1.140,30	954,80	1.079,91
ii.	Weighted emission factor	t CO2 / TJ	55,54	55,55	55,77	55,99	56,23

+

Emissions from mass balance

Emissions at sub-installation level for benchmark update

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(k) Measurable heat import to and export from this sub-installation

Data provided here will impact the attributable emissions in accordance with sections 10.1.2 and 10.1.3 of Annex VII of the FAR.

This includes the total amount of heat either produced in, imported from or exported to (sub-)installations covered by the EU ETS or from installations or entities not covered by the EU ETS. The specific emission factors (EF) associated with the heat should take into account the provisions in FAR Annex VII sections 8 and 10, in particular sections 10.1.2 and 10.1.3 thereof.

Emissions related to measurable heat produced onsite from units serving more than one sub-installation should also be entered here under "imports" instead of directly attributing the emissions via the fuel's emission factor under point (g) above. The same applies to any heat "imported" from other sub-installations.

Where the heat is exclusively produced for one sub-installation and corresponding emissions therefore entered under (g) above, corresponding amounts should not be reported here as imports to avoid double counting.

For attributing emissions from cogeneration (CHP) to production of heat, the "CHP tool" in section D.III. of this template has to be used.

	Total heat imported	Unit	2019	2020	2021	2022	2023
i.	Net heat imported	TJ / year	0,00	0,00	0,00	0,00	0,00
ii.	Specific EF (imported heat)	t CO2 / TJ					
	Special heat import	**Unit**	**2019**	**2020**	**2021**	**2022**	**2023**
iii.	Net heat imported from pulp sub-installations	TJ / year	0,00	0,00	0,00	0,00	0,00
iv.	Net heat imported from nitric acid sub-installation	TJ / year	0,00	0,00	0,00	0,00	0,00
	Total heat exported	**Unit**	**2019**	**2020**	**2021**	**2022**	**2023**
v.	Net heat exported	TJ / year	0,00	0,00	0,00	0,00	0,00
vi.	Specific EF (exported heat)	t CO2 / TJ					

Emissions at sub-installation level for benchmark update

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Attribution of emissions to sub-installations (section D.II)

Data is taken automatically from corresponding entries in sheets F and G in the light blue boxes under each sub-installation.

The attributable emissions are determined as follows:

= *The direct emissions are monitored in line with the MP approved under the MRR, i.e. taking into account the emissions from calculation based methodologies (using source streams), measurement based methodologies (CEMS) as well as no-tier approaches ("fall-backs").*

+/- *Emissions associated with further internal source streams*

+/- *Amount of GHG imported and exported as feedstock*

\+ *Emissions associated with imported heat in accordance with sections II.1.2 and II.1.3 of Annex VII of the FAR*

\- *Emissions associated with exported heat in accordance with sections II.1.2 and II.1.3 of Annex VII of the FAR*

\+ *Emissions associated with imported waste gases in accordance with section II.1.5 of Annex VII of the FAR*

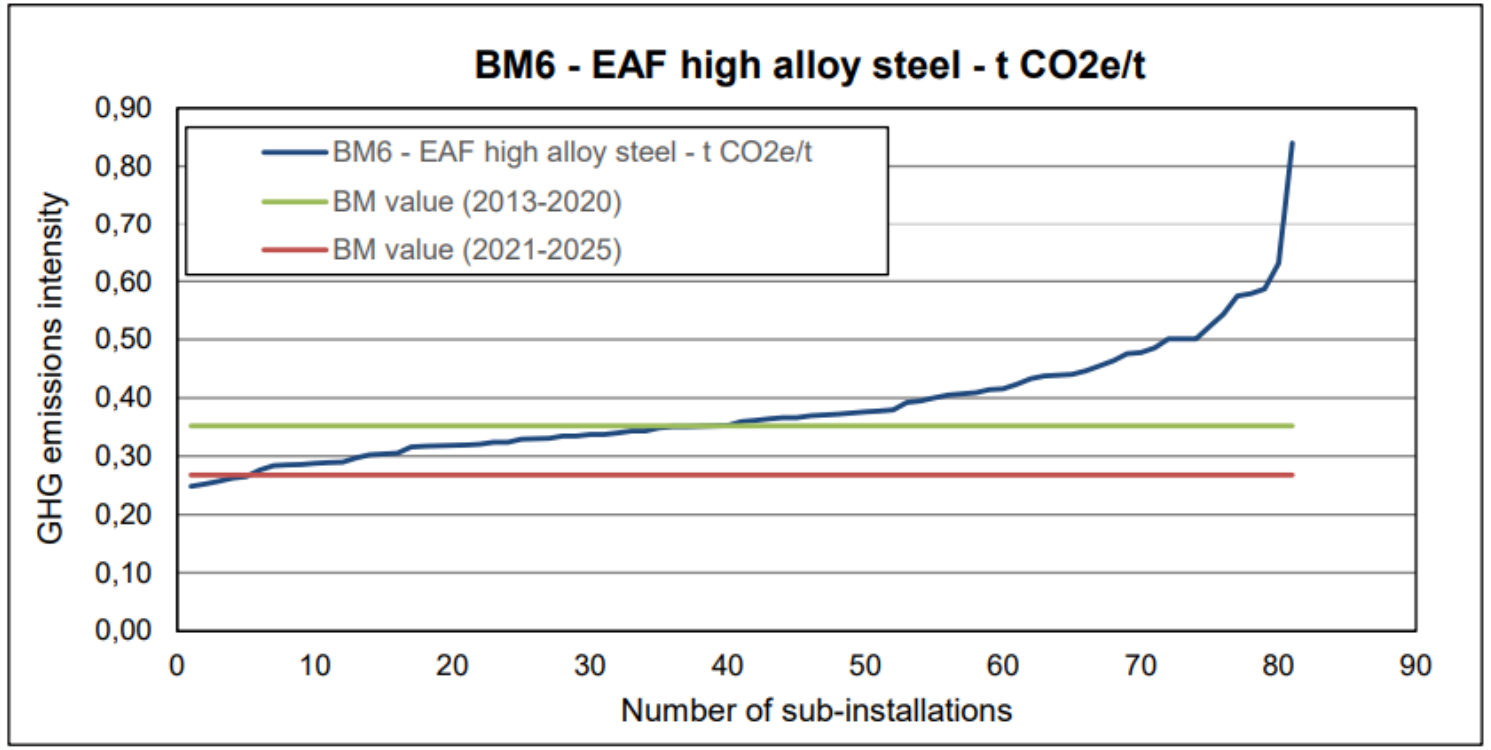
\- *Emissions associated with exported waste gases in accordance with section II.1.5 of Annex VII of the FAR by deducting the energy content multiplied with the emission factor of natural gas and the default correction factor of 0.667*

\- *Emissions associated with electricity produced other than via measurable heat.*

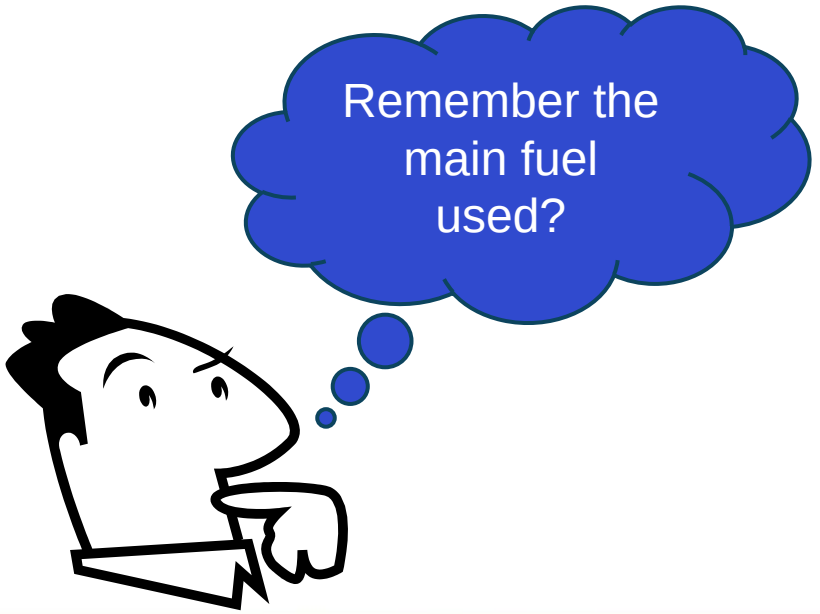
The "Total direct emissions" and the value "other emissions" are displayed for control purposes. It includes emissions related to electricity production, flaring other than safety flaring, and other emissions which do not lead to free allocation. In some cases the sum of attributed emissions might not add up to the installation's total emissions, e.g. where import or export of heat or waste gases are relevant.

	Unit	2019	2020	2021	2022	2023
Total direct emissions of the	**t CO2e/year**	**536.845**	**520.747**	**631.667**	**590.223**	**639.747**
Sub-installation level data:	**Unit**	**2019**	**2020**	**2021**	**2022**	**2023**
EAF high alloy steel	t CO2e/year	300.471	299.332	325.136	302.596	338.400

Emissions at sub-installation level for benchmark update



In the example given, the GHG emission intensity was of about 0,35 (t CO_2 / t), as average for the years 2016 – 2017.



Key parameters for BM6 EAF high alloy steel	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	0,266	t CO_2e/t
Benchmark value for 2021-2025	0,268	t CO_2e/t

Emissions at sub-installation level for benchmark update

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Data required for the determination of the benchmark improvement rate pursuant to Article 10a(2) of the EU ETS Directive

Fall-Back sub-installation: **Fuel benchmark sub-installation (CL | CBAM)**

(c) Directly attributable emissions (DirEm*) to this sub-installation

Detailed instructions for data entries here can be found under point 4.c above.

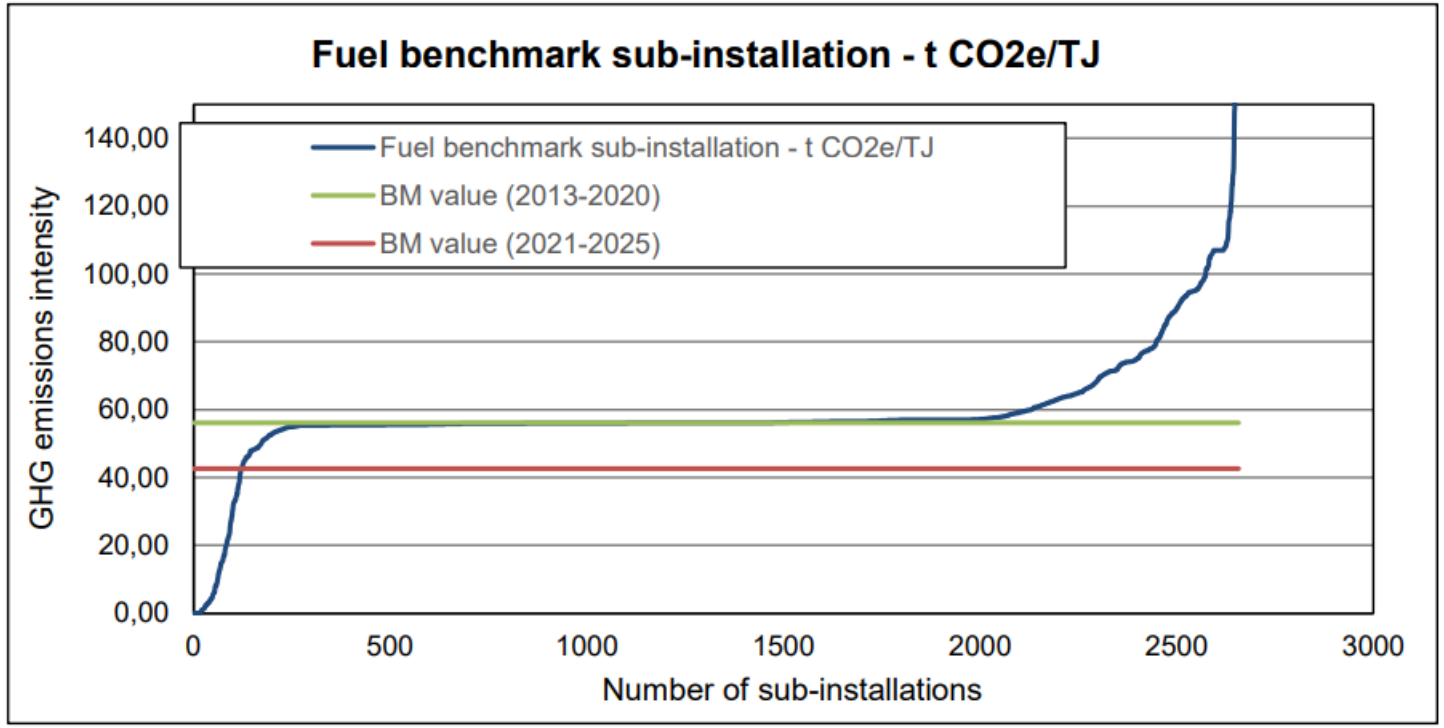
Total direct emissions	Unit	2019	2020	2021	2022	2023
Fuel benchmark sub-installation (CL | CBAM)	t CO2e/year	236.305	221.326	306.173	287.104	301.340

(d) Energy input to this sub-installation and relevant emission factor

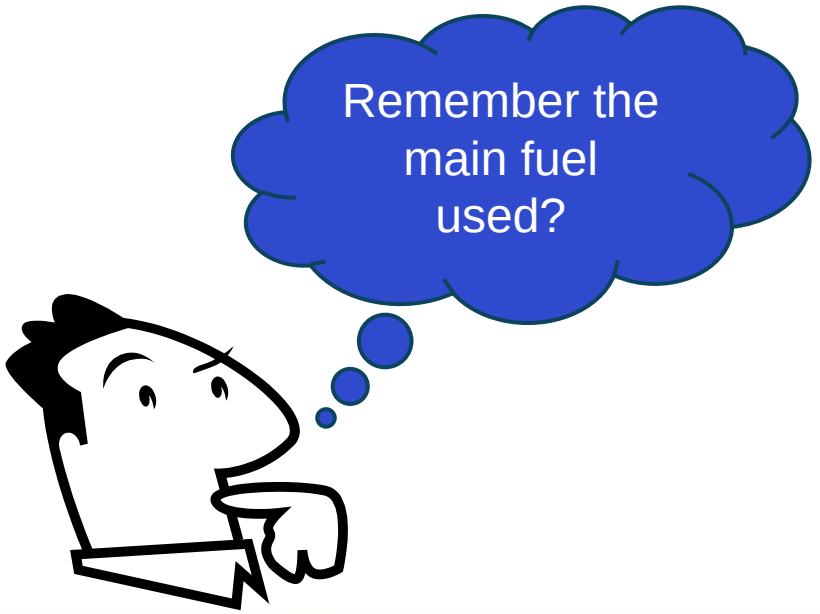
Detailed instructions for data entries here can be found under point 4.d above.

		Unit	2019	2020	2021	2022	2023
i.	Energy input entered under (a)	TJ / year	4.254,47	3.984,02	5.489,87	5.135,30	5.360,36
ii.	Weighted emission factor (=c./d.)	t CO2 / TJ	55,54	55,55	55,77	55,91	56,22
iii.	Fuel input from waste gases	TJ / year	0,00	0,00	0,00	0,00	0,00
iv.	Specific EF (waste gas)	t CO2 / TJ	0,00	0,00	0,00	0,00	0,00
v.	Electricity input for heat production	TJ / year	0,00	0,00	0,00	0,00	0,00
vi.	Weighted emission factor	t CO2 / TJ					
(e)	**Net heat exported**	TJ / year	0,00	0,00	0,00	0,00	0,00
	Specific EF (heat export)	t CO2 / TJ					

Emissions at sub-installation level for benchmark update



In the example given, the GHG emission intensity was about 56 (t CO_2 / TJ) in average for the years 2016 – 2017.



- Iron-steel: overview of product benchmarks
- Product benchmarks on BDR
- Blast furnaces: definition and boundaries
- Electric Arc Furnaces: definition and boundaries
- From theory to actual implementation: ETS layout of a steel making plant
- From theory to actual implementation: production data on BDR (activity data, electricity, Prodcom codes, CN codes etc.)
- From theory to actual implementation: emissions at sub-installation level for benchmark update
- From theory to actual implementation: summary and calculation

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II Baseline period and eligibility

1 Eligibility for free allocation (section A.II.1):

The operator of this installation confirms that an application for free allocation under Article 10a of the EU ETS Directive is hereby filed.
The operator of this installation confirms that this report may be used by the competent authority and the European Commission.

2 Conditionalities (sections A.II.2 to A.III.4)

(a) Result of conditionalities 1 and 2 (20% reduction of free allocation)

Conditionality Art. 22a (EnEff)	FALSO		
Conditionality Art. 22b(1) (80th Percentile)	FALSO	**Result: 20% conditionality applies:**	**FALSO**

(b) Conditionality 1: Outstanding recommendations for energy efficiency improvement measures

Recommendations for energy efficiency measures for this installation relevant?	FALSO
Are there any outstanding recommendations from 2019-2022 which have not yet been implemented?	

Not related to industrial process?	Pay-back period >3 years?	Investment costs >5% turnover or >25% profit?	Investment costs >50% equivalent allocation?	Conditions not yet occurred?

Any recommendations remaining after point c)?	
If measures remain after point d), have you applied equivalent measures for ALL of them?	

(c) Conditionality 2: >80th Percentile performers

Was the GHG intensity of any of the product BM sub-installations above the 80th percentile?	FALSO
If (a) is relevant, are you submitting a climate-neutrality plan (CNP) as part of this application?	
CA confirms completeness of the CNP?	

(d) Conditionality Art. 22b(2) (district heating)

3 Baseline years (Section A.II.5)

	2019	2020	2021	2022	2023
Year to be taken into account:	VERO	VERO	VERO	VERO	VERO

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	Unit	2019	2020	2021	2022	2023
Total direct emissions of the	**t CO2e/year**	**536.845**	**520.747**	**631.667**	**590.223**	**639.747**
Sub-installation level data:	**Unit**	**2019**	**2020**	**2021**	**2022**	**2023**
EAF high alloy steel	t CO2e/year	300.471	299.332	325.136	302.596	338.400
	t CO2e/year					
	t CO2e/year					
	t CO2e/year					
	t CO2e/year					
	t CO2e/year					
	t CO2e/year					
	t CO2e/year					
	t CO2e/year					
	t CO2e/year					
Heat benchmark sub-installation (CL | non-CBAM)	t CO2e/year					
Heat benchmark sub-installation (non-CL | non-	t CO2e/year					
Heat benchmark sub-installation (CL | CBAM)	t CO2e/year					
District heating sub-installation	t CO2e/year					
Fuel benchmark sub-installation (CL | non-CBAM)	t CO2e/year					
Fuel benchmark sub-installation (non-CL | non-	t CO2e/year					
Fuel benchmark sub-installation (CL | CBAM)	t CO2e/year	236.305	221.326	306.173	287.104	301.340
Process emissions sub-installation (CL |	**t CO2e/year**					
Process emissions sub-installation (non-CL	**t CO2e/year**					
Process emissions sub-installation (CL |	**t CO2e/year**					
Control: Other emissions	t CO2e/year	69	90	358	523	7

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1 Sub-installation with product benchmark 1: **EAF high alloy steel**

		CL-exposed		Started	No. of BM	15(7).3?	BM value (min/max/actual)	
EAF high alloy steel		VERO		00/01/1900	6	FALSC	0,1760	EUA/tonnes
	non-ETS heat	CBAM	WGflare	HVC-Corr	VCM-F		0,3309	EUA/tonnes
Special factors:	0	VERO	0	0	1,0000			EUA/tonnes

	Unit	2019	2020	2021	2022	2023	
HAL (Historic activity level) reported	tonnes	2.617.277	2.588.871	3.176.753	2.823.564	3.039.770	Median
Values used for HAL calculation:	tonnes	2.617.277	2.588.871	3.176.753	2.823.564	3.039.770	2.823.564
Relevant electricity consumption	MWh / year	1.758.109	1.727.399	2.004.889	1.830.673	1.575.157	

HAL total	Prelim Alloc Year 1 (min)	Prelim Alloc Year 1 (max)	Prelim Alloc Year 1 (actual)
2.823.564 tonnes / year	**496.947** EUA / year	**934.261** EUA / year	EUA / year

	Unit	2019	2020	2021	2022	2023
Total attributed emissions	**t CO2e/year**	**300.471**	**299.332**	**325.136**	**302.596**	**338.400**
Total energy input	TJ / year	954,98	886,06	1.140,30	954,80	1.079,91
Weighted emission factor	t CO2 / TJ	55,54	55,55	55,77	55,99	56,23
Direct emissions	t CO2 / year	300.471	299.332	325.136	302.596	338.400

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17 Fall-Back sub-installation 7:

		Fuel benchmark sub-installation (CL | CBAM)			relevant	
	CL-exposed	Started	15(7).3?	No. of BM	BM value (min/max/actual)	
Fuel benchmark sub-installation (CL | CBAM	VERO	00/01/1900	FALSO	7	28,05	EUA/TJ
	CBAM				52,73	EUA/TJ
	VERO					EUA/TJ

	Unit	2019	2020	2021	2022	2023	
HAL (Historic activity level) reported	TJ	4.254	3.984	5.490	5.135	5.360	Median
Values used for HAL calculation:	TJ	4.254	3.984	5.490	5.135	5.360	5.135

HAL total		Prelim Alloc Year 1 (min)		Prelim Alloc Year 1 (max)		Prelim Alloc Year 1 (actual)	
5.135	TJ / year	**144.045**	EUA / year	**270.805**	EUA / year		EUA / year

	Unit	2019	2020	2021	2022	2023
Total attributed emissions	**t CO2e/year**	**236.304,67**	**221.325,54**	**306.173,24**	**287.103,65**	**301.340,00**
Total energy input	TJ / year	4.254,47	3.984,02	5.489,87	5.135,30	5.360,36
Weighted emission factor	t CO2 / TJ	55,54	55,55	55,77	55,91	56,22
Fuel input from waste gases	TJ / year	0,00	0,00	0,00	0,00	0,00
Weighted emission factor	t CO2 / TJ	0,00	0,00	0,00	0,00	0,00
Electricity input for heat production	TJ / year	0,00	0,00	0,00	0,00	0,00
Weighted emission factor	t CO2 / TJ					
Direct emissions	t CO2 / year	236.304,67	221.325,54	306.173,24	287.103,65	301.340,00

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	Sub-installation	2026	2027	2028	2029	2030
1	EAF high alloy steel	484.523	472.100	447.252	385.134	255.928
2						
3						
4						
5						
6						
7						
8						
9						
10						
11	Heat benchmark sub-installation (CL | non-CBAM)					
12	Heat benchmark sub-installation (non-CL | non-CBAM)					
13	Heat benchmark sub-installation (CL | CBAM)					
14	District heating sub-installation					
15	Fuel benchmark sub-installation (CL | non-CBAM)					
16	Fuel benchmark sub-installation (non-CL | non-CBAM)					
17	Fuel benchmark sub-installation (CL | CBAM)	140.444	136.843	129.641	111.635	74.183
18	Process emissions sub-installation (CL | non-CBAM)					
19	Process emissions sub-installation (non-CL | non-CBAM)					
20	Process emissions sub-installation (CL | CBAM)					
	Total preliminary free allocation	**624.967**	**608.943**	**576.893**	**496.769**	**330.111**

Grazie per l'attenzione
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