



EUROPEAN COMMISSION
DIRECTORATE-GENERAL
CLIMATE ACTION

Directorate B - European and International Carbon Markets

Update of benchmark values for the years 2021 – 2025 of phase 4 of the EU ETS

Benchmark curves and key parameters

Updated final version issued on 12 October 2021

Benchmark	Preliminary free allocation 2021	(Attributed) GHG emissions covered by benchmark in 2016/2017 (average)	Page
Refinery products	74 689 001	114 809 016	8
Coke	7 722 487	10 162 295	9
Sintered ore	14 393 515	23 154 801	10
Hot metal	110 024 564	128 889 587	11
EAF carbon steel	2 050 637	9 804 572	12
EAF high alloy steel	2 185 759	8 681 596	13
Iron casting	930 583	1 380 242	14
Pre-bake anode	612 390	825 070	15
[Primary] Aluminium	6 130 853	6 973 626	16
Grey cement clinker	90 105 535	105 321 006	17
White cement clinker	2 145 323	2 646 157	18
Lime	15 062 292	21 751 588	19
Dolime	1 265 828	1 794 640	20
Sintered dolime	722 297	790 184	21
Float glass	4 066 932	5 129 544	22
Bottles and jars of colourless	2 265 406	3 582 195	23
Bottles and jars of coloured glass	2 519 439	3 771 180	24
Continuous filament glass fibre	283 967	390 741	25
Facing bricks	452 784	681 443	26
Pavers	160 430	207 165	27
Roof tiles	735 846	1 109 511	28
Spray dried powder	1 323 716	1 712 944	29
Mineral wool	1 577 648	3 187 683	30
Plaster	36 673	47 230	31
Dried secondary gypsum	50 229	78 682	32
Plasterboard	253 159	1 131 799	33
Short fibre kraft pulp	416 663	927 669	34
Long fibre kraft pulp	360 057	967 436	35
Sulphite pulp, thermo-mechanical	19 633	249 991	36
Recovered paper pulp	1 065 261	621 837	37
Newsprint	1 309 487	1 017 364	38
Uncoated fine paper	3 151 681	2 485 893	39
Coated fine paper	3 409 004	3 244 348	40
Tissue	1 517 281	2 167 734	41
Testliner and fluting	3 880 504	4 641 400	42
Uncoated carton board	792 054	874 778	43
Coated carton board	1 911 301	1 341 063	44
Carbon black	1 394 408	1 824 820	45
Nitric acid	4 614 965	4 297 166	46
Adipic acid	1 468 379	857 227	47
Ammonia	23 958 607	30 588 525	48
Steam cracking	22 816 634	31 393 609	49
Aromatics	1 139 604	1 896 871	50
Styrene	1 655 811	2 676 322	51
Phenol/ acetone	812 138	1 200 943	52
Ethylenoxid / Ethylenglykol	839 637	1 484 310	53
Vinylchlorid-Monomer (VCM)	758 335	1 639 059	54
S-PVC	216 193	400 288	55
E-PVC	61 707	96 197	56
Hydrogen	5 074 480	7 051 720	57
Synthesis gas	317 371	357 368	58
Soda ash	5 497 992	7 218 816	59
Heat Benchmark	79 883 758	212 553 983	60
Fuel Benchmark	36 183 747	58 812 970	61
Process emissions	18 288 675	19 523 842	62

Introduction

The EU Emissions Trading System (EU ETS) is the EU's key instrument to effectively and efficiently reduce greenhouse gas (GHG) emissions from industry and the power sector. The EU ETS started operating in 2005 and operates in all EU countries plus Iceland, Liechtenstein and Norway. It is a cap-and-trade system that limits emissions from more than 11,000 energy-intensive installations (power stations & industrial plants) and around 500 airlines. A cap is set on the total amount of certain GHGs that can be emitted by installations covered by the system. The cap is reduced over time so that total emissions fall. Within the cap, companies receive or buy emission allowances which they can trade with one another as needed. Since 2005, emissions from stationary sources (power and industry) have declined by around 35% until 2019.

To mitigate the risk of carbon leakage, industrial installations receive a significant part of the allowances needed to cover their emissions for free.

Since the start of phase 3 of the EU ETS (2013-2020), free allocation has been based on benchmarks, which constitute an important element of the allocation formula. Benchmarks are expressed as GHG emission intensity (tonnes of GHG emitted per tonne of product produced) and should represent the performance of the 10% best installations covered by the EU ETS producing the product. The use of benchmarks to determine free allocation has the advantage that all installations receive the same number of free allowance per tonne of product produced. In principle, efficient installations do not need to buy allowances whereas installations emitting above benchmark level need to purchase additional allowances to cover their emissions. This incentivises cost-effective emissions reductions.

In 2011, the Commission adopted a Decision on free allocation rules¹ that also established 54 benchmarks. In addition to 52 product benchmarks (output-based), two benchmarks for heat and fuel consumption (input-based) were introduced as fall-back for products and processes not covered by the product benchmarks. Besides, process emissions accounting for about 1% of the industrial ETS emissions are allocated based on historical emissions, where installations receive 97% free allocation of the historical process emissions.

The 2011 Decision on free allocation rules was based on the 'one product – one benchmark principle' as explained in its recital 5 ('... *No differentiation was made on the basis of geography or on the basis of technologies, raw materials or fuels used, so as not to distort comparative advantages in carbon efficiency across the Union economy, and to enhance harmonisation of the transitional free allocation of emission allowances.*'). It therefore implemented the requirements of Article 10a(1) of Directive 2003/87/EC² ('... *by taking into account of the most efficient techniques, substitutes, alternative production processes, high efficiency co-generation, efficient recovery of waste gases, use of biomass and capture and storage of CO₂ ...*'). Concretely, all sub-installations producing a product covered by the definition of a product benchmark are assigned to that product benchmark, without any differentiation based on technologies applied or fuels/materials used.

For phase 3, the collection of benchmark data was organised by European industry associations on a voluntary basis to determine benchmark curves (data points on GHG intensity per installation), based on a methodology set by the Commission through a guidance paper. On that basis, the Commission determined the benchmark value as the average of the 10% most efficient installations.

43 benchmarks were based on data collected on installations' emissions intensities in 2007/2008, of which 14 covered only single-product installations to facilitate the data collection (no need to assign emissions to different products and processes). For these 43 benchmarks, the use of benchmark curves based on data delivered by the respective European industry associations allowed the determination of the average performance of the 10% most efficient installations.

Furthermore, 7 benchmarks were based on literature information on specific GHG emissions or energy consumption (due to a lack of data or to the lack of data compliant with the ETS benchmarking methodology).

¹ Commission Decision 2011/278/EU of 27 April 2011 determining transitional Union-wide rules for harmonised free allocation of emission allowances pursuant to Article 10a of Directive 2003/87/EU of the European Parliament and of the Council.

² Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC. OJ L 275, 25.10.2003, p. 32.

This concerned some product benchmarks in the pulp/paper and steel sectors as well as the heat and fuel benchmarks which are applied across sectors. For these benchmarks, literature information was used to determine energy consumption and waste gas production which were then converted into emission values by using default emission factors, with the aim to estimate the installations' emissions intensities at a level representing the average performance of the 10% most efficient installations in 2007/2008. For the heat and fuel benchmarks, these estimates have been based on the use of natural gas as reference fuel and a boiler efficiency of 90% for the heat benchmark.

Finally, the values of 4 benchmarks (aromatics, hydrogen, synthesis gas and coated fine paper) were based on other benchmarks to ensure level playing fields for producers of the same or similar products.

As set out in the revised Directive 2003/87/EC, benchmarks will remain a key element to determine transitional free allocation to industry. The benchmarks to be applied for phase 4 (2021-2030) are based on the ones developed for phase 3. Only updates of the benchmark values have been required, but no changes to the benchmark definitions including the system boundaries.

ETS benchmarks are no regulatory limits that installations need to comply with, but rather a tool to distribute free allocation to installations while incentivising emissions reductions.

Status of this document

The benchmark curves and key statistical parameters presented in this document are based on data submitted by Member States and available to the Commission on 27 January 2021. Therefore, this document presents the data used for calculating the average GHG emissions intensity of the 10% most efficient installations and the updated benchmarks as published in Commission Implementing Regulation (EU) 2021/447.³

General methodology

The revised benchmark values were determined on the basis of verified information on the GHG emission intensities provided by operators of the installations and reported in the National Implementation Measures (NIMs) pursuant to Article 11 of Directive 2003/87/EC⁴ for the years 2016 and 2017.

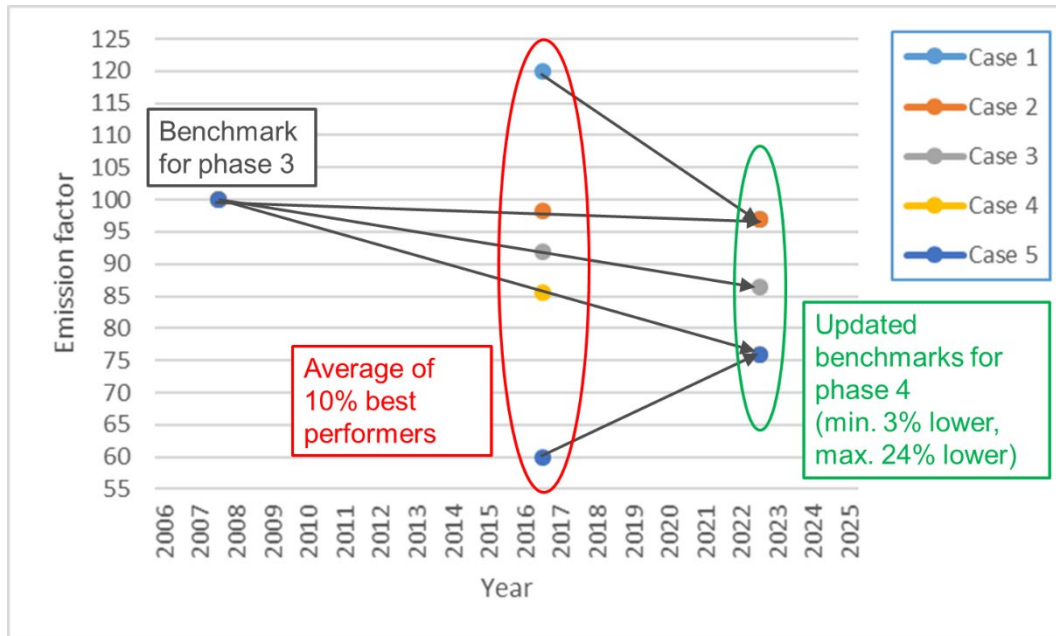
For each benchmark, the average performance in 2016 and 2017 of the 10 % most efficient installations was calculated. On the basis of a comparison of those values with the benchmark values set out in Decision 2011/278/EU which were based on performance data for the years 2007 and 2008, annual reduction rates were determined for each benchmark for the 9-year period from 2007/2008 to 2016/2017. Those annual reduction rates were then used to calculate, by means of extrapolation, the corresponding reductions of the benchmark values for the 15-year period from 2007/2008 to 2022/2023. In accordance with Article 10a(2) of Directive 2003/87/EC, the applied reduction over the 15-year period should not be lower than 3 % and not be higher than 24 %. This leads to five possible cases:

- Case 1. Annual reduction rate below 0.2%. In this case, an annual reduction rate of 0.2% is applied, leading to a 3% reduction of the benchmark value;
- Case 2. Annual reduction rate equal to 0.2%. In this case, an annual reduction rate of 0.2% is applied, leading to a 3% reduction of the benchmark value;
- Case 3. Annual reduction rate above 0.2% and below 1.6%. In this case, the calculated annual reduction rate is applied over 15 years;

³ Commission Implementing Regulation (EU) 2021/447 of 12 March 2021 determining revised benchmark values for free allocation of emission allowances for the period from 2021 to 2025. OJ L 87, 15.3.2021, p. 29.

⁴ Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC. OJ L 275, 25.10.2003, p. 32.

- Case 4. Annual reduction rate equal to 1.6%. In this case, an annual reduction rate of 1.6% is applied, leading to a 24% reduction of the benchmark value;
- Case 5. Annual reduction rate above 1.6%. In this case, an annual reduction rate of 1.6% is applied, leading to a 24% reduction of the benchmark value.



Pursuant to Article 10a(2) of Directive 2003/87/EC, specific provisions apply for the update of the benchmark values for aromatics, hydrogen, syngas and hot metal:

- The benchmark values for aromatics, hydrogen and syngas are adjusted by the same percentage as the refineries benchmark.
- The hot metal benchmark is updated with an annual reduction rate of 0,2%.

Assessment of National Implementation Measures (NIMs)

The list of installations containing information relevant for the free allocation of emission allowances was submitted to the Commission by the Member States by 30 September 2019 in accordance with Article 11(1) of Directive 2003/87/EC.

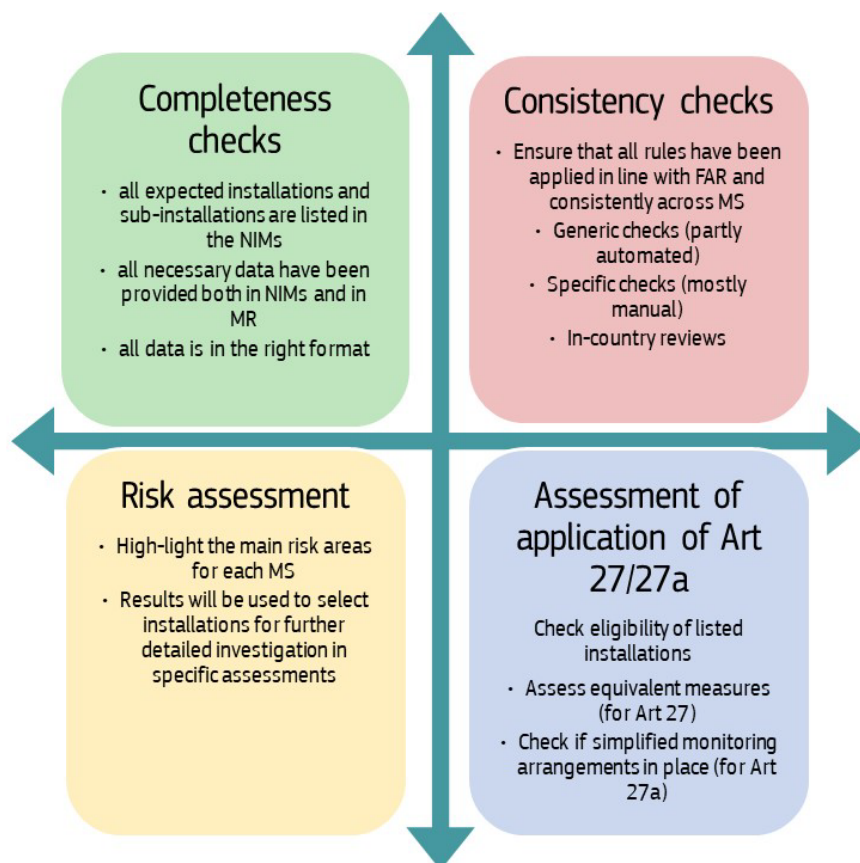
To ensure that the benchmark and free allocation values are based on correct data, the Commission carried out in-depth completeness and consistency checks of the data relevant for the free allocation of emission allowances, also using automated tools. Where appropriate, the Commission asked the concerned competent authorities for clarifications and corrections.

Installations excluded under Article 27 or Article 27a of Directive 2003/87/EC were not considered when determining the revised benchmark values. An evaluation of the exclusions under Article 27 and 27a was done as part of the assessment of the NIMs.

In addition, around 300 installations were selected for more detailed assessments (specific consistency checks). For all these installations, the Baseline Data Reports, Verification Reports and Monitoring Methodology Plans together with any relevant additional information for each installation were requested to the Competent Authority. The Commission analysed those documents and asked additional questions when necessary.

The installations for the specific consistency checks were selected based on a risk assessment which took into consideration the probability of the installation setting benchmark values and the levels of free allocation received. Also the methodology followed by Member States for analysing the NIMs data and the questions identified by the Commission were taken into consideration in the risk assessment.

As a result of this procedure, the Commission obtained an accurate, consistent and comparable set of data on the GHG emission intensities of all stationary installations covered by Directive 2003/87/EC. That high-quality dataset was used to determine the revised benchmark values for the period from 2021 to 2025 for each of the 54 benchmarks.



Specific issues

In general, data from all sub-installations falling under the definition of a specific benchmark, as set out in Annex I to Delegated Regulation (EU) 2019/331⁵ (i.e. Free Allocation Regulation (FAR)), were used to determine the average performance of the 10 % most efficient installations in the years 2016 and 2017, as established in Article 10a(2) of Directive 2003/87/EC and recital (11) of Directive (EU) 2018/410⁶. Nevertheless, in some cases the GHG emission intensities of the concerned sub-installations were not considered when determining the revised benchmark values. This is relevant in the case of:

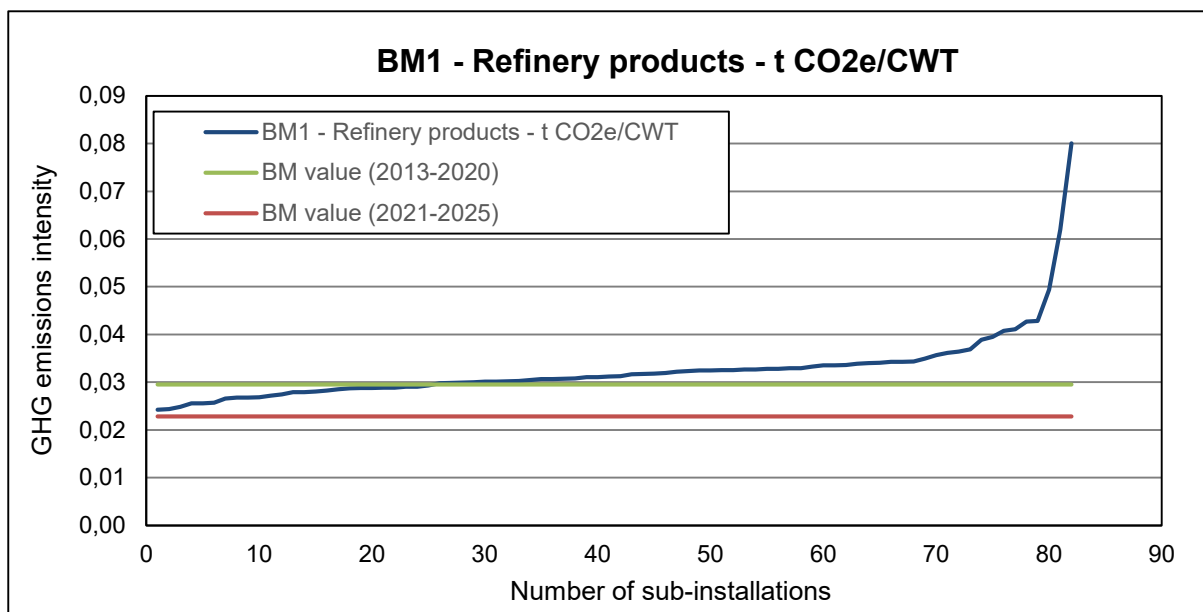
- Sub-installations importing intermediate products whose production is covered by the system boundaries of the relevant product benchmark and where it was not feasible to determine the greenhouse emissions associated with the production of those intermediate products based on the submitted data. This concerns the benchmark value updates for refinery products, hot metal, sintered dolime, ammonia, hydrogen and soda ash.
- Sub-installations exporting intermediate products whose production is covered by the system boundaries of the relevant product benchmark and where it was not feasible to determine the greenhouse emissions associated with the subsequent processes based on the submitted data. This concerns the benchmark value update for refinery products and hot metal;

The FAR was used to ensure the consistent treatment of emissions related to imports, exports and in-house production of measurable heat, of carbon-containing waste gases and of transferred CO₂. For that purpose, the relevant emission factors were determined by using the heat and fuel benchmark values which in turn had been updated by applying the determined annual reduction rates. For heat imports with unknown or not clearly defined emission factors and for heat exports, a value of 53,3 t CO₂ equivalents/TJ was used. That value was obtained by applying an annual reduction rate of 1,6 % to the heat benchmark value for the 9-year period from 2007/2008 to 2016/2017. For waste gas exports, a value of 37,4 t CO₂ equivalents/TJ was subtracted from the actual emission factor of the waste gas. That value corresponds to the emission factor of natural gas (56,1 t CO₂ equivalents/TJ) multiplied by a factor of 0,667 that accounts for the difference in efficiencies between the use of the waste gas and the use of the reference fuel natural gas. For waste gas imports, a value of 48,0 t CO₂ equivalents/TJ was used. That value was obtained by applying an annual reduction rate of 1,6 % to the fuel benchmark value for the 9-year period from 2007/2008 to 2016/2017.

The methodology for attributing emissions to different sub-installations that is established in the FAR can lead to negative GHG emission intensities in cases in which heat produced using a fuel with a low emission factor is exported to other sub-installations or installations. In such cases, the GHG emission intensity of the concerned sub-installation were set to zero for the purpose of determining the revised benchmark values.

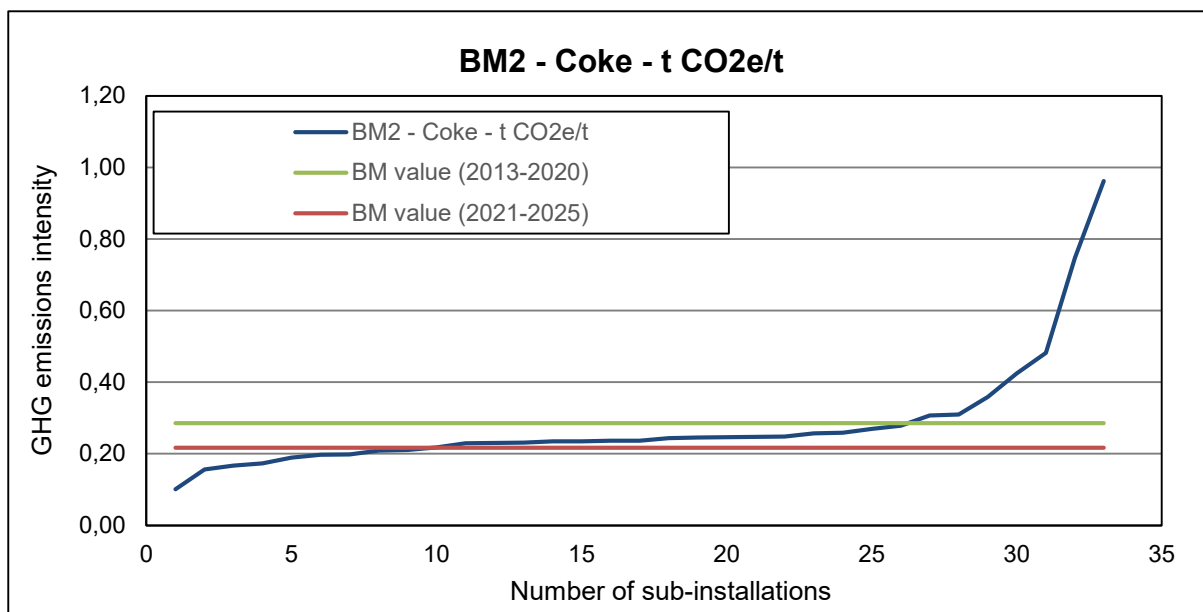
⁵ Commission Delegated Regulation (EU) 2019/331 of 19 December 2019 determining transitional Union-wide rules for harmonised free allocation of emission allowances pursuant to Article 10a of Directive 2003/87/EC of the European Parliament and of the Council. OJ L 59, 27.2.2019. p. 8.

⁶ Directive (EU) 2018/410 of the European Parliament and of the Council of 14 March 2018 amending Directive 2003/87/EC to enhance cost-effective emission reductions and low-carbon investments, and Decision (EU) 2015/1814 (OJ L 76, 19.3.2018, p. 3).

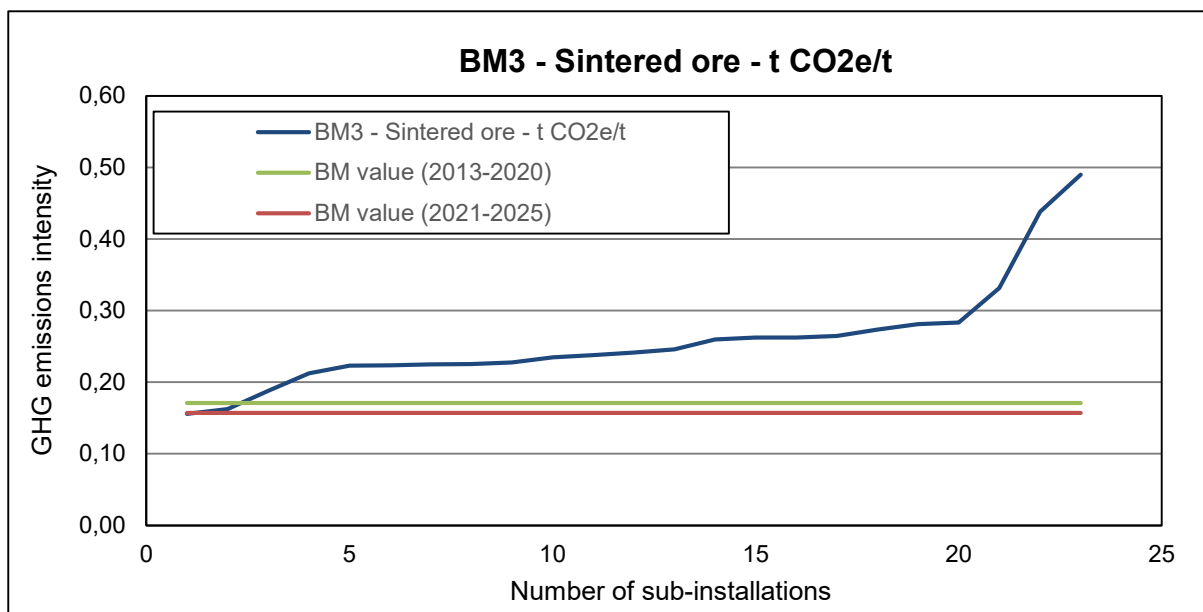


Key parameters for BM1 Refinery products	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	0,0255	t CO ₂ e/CWT
Benchmark value for 2021-2025	0,0228	t CO ₂ e/CWT
Benchmark value for phase 3, 2013 – 2020 (as a reference)	0,0295	t CO ₂ e/CWT
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017	-1,51%	
Update rate in %/year applied to the phase 3 benchmark	-1,51%	
Update rate in % applied to the phase 3 benchmark	-22,7%	
Median GHG emissions intensity of all installations in 2016/2017	0,0312	t CO ₂ e/CWT
Average GHG emissions intensity of all installations in 2016/2017	0,0326	t CO ₂ e/CWT
Weighted average ⁷ GHG emissions intensity of all installations in 2016/2017	0,0308	t CO ₂ e/CWT
Number of (sub-)installations using the benchmark for free allocation	90	
Number of (sub-)installations taken into account for the benchmark value update	82	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)	114 809 016	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021	74 689 001	EUA

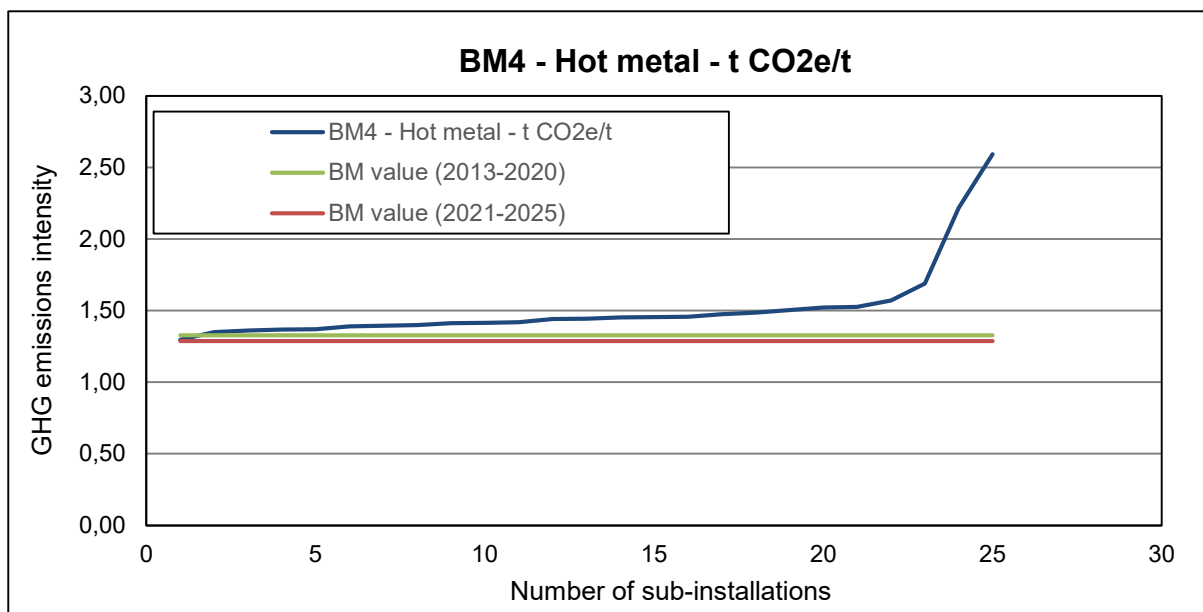
⁷ The weighted average is calculated for each benchmark by dividing the sum of the attributed emissions in 2016 and 2017 by the sum of activity levels in 2016 and 2017



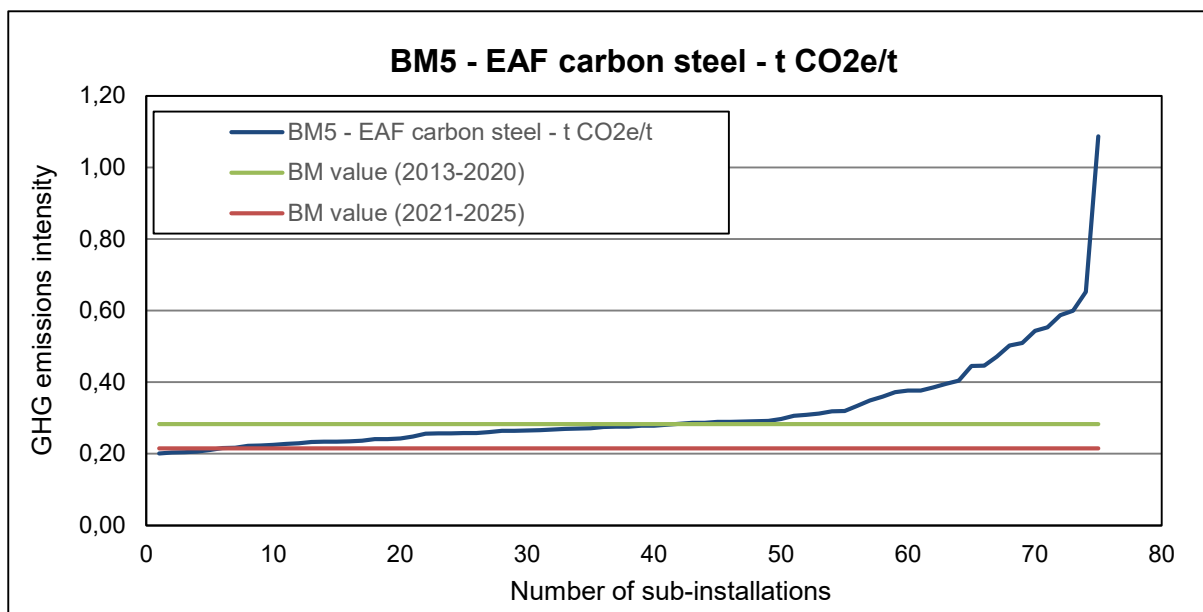
Key parameters for BM2 Coke		Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017		0,144	t CO₂e/t
Benchmark value for 2021-2025		0,217	t CO₂e/t
Benchmark value for phase 3, 2013 – 2020 (as a reference)		0,286	t CO ₂ e/t
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017		-5,52%	
Update rate in %/year applied to the phase 3 benchmark		-1,60%	
Update rate in % applied to the phase 3 benchmark		-24,0%	
Median GHG emissions intensity of all installations in 2016/2017		0,237	t CO ₂ e/t
Average GHG emissions intensity of all installations in 2016/2017		0,283	t CO ₂ e/t
Weighted average GHG emissions intensity of all installations in 2016/2017		0,282	t CO ₂ e/t
Number of (sub-)installations using the benchmark for free allocation		33	
Number of (sub-)installations taken into account for the benchmark value update		33	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)		10 162 295	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021		7 722 487	EUA



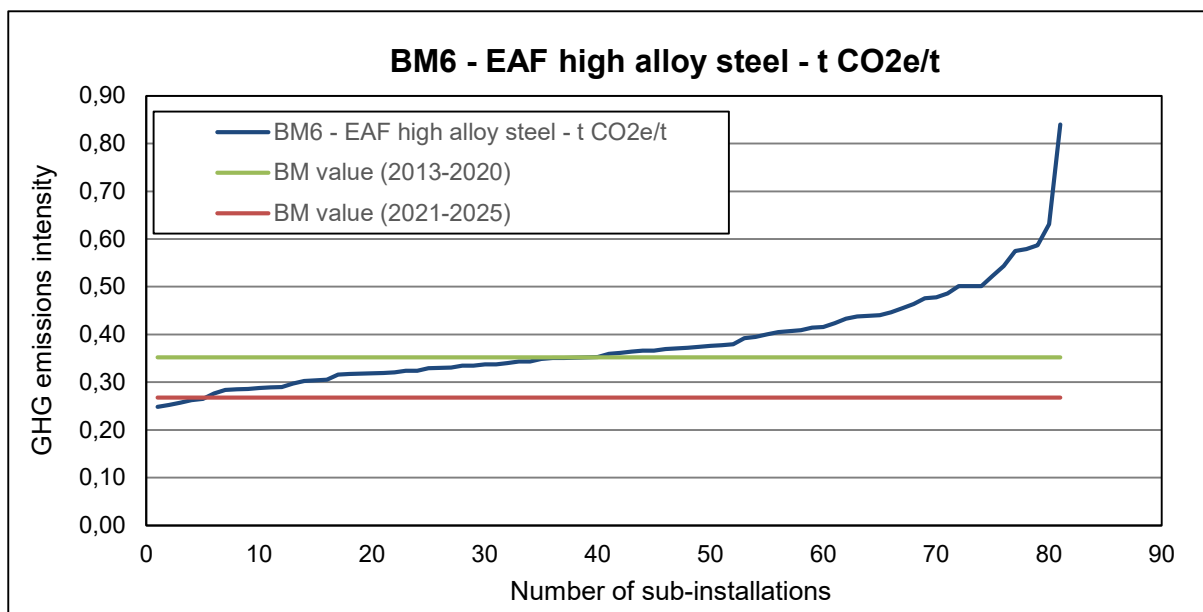
Key parameters for BM3 Sintered ore	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	0,163	t CO ₂ e/t
Benchmark value for 2021-2025	0,157	t CO ₂ e/t
Benchmark value for phase 3, 2013 – 2020 (as a reference)	0,171	t CO ₂ e/t
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017	-0,53%	
Update rate in %/year applied to the phase 3 benchmark	-0,53%	
Update rate in % applied to the phase 3 benchmark	-7,9%	
Median GHG emissions intensity of all installations in 2016/2017	0,242	t CO ₂ e/t
Average GHG emissions intensity of all installations in 2016/2017	0,259	t CO ₂ e/t
Weighted average GHG emissions intensity of all installations in 2016/2017	0,248	t CO ₂ e/t
Number of (sub-)installations using the benchmark for free allocation	24	
Number of (sub-)installations taken into account for the benchmark value update	23	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)	23 154 801	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021	14 393 515	EUA



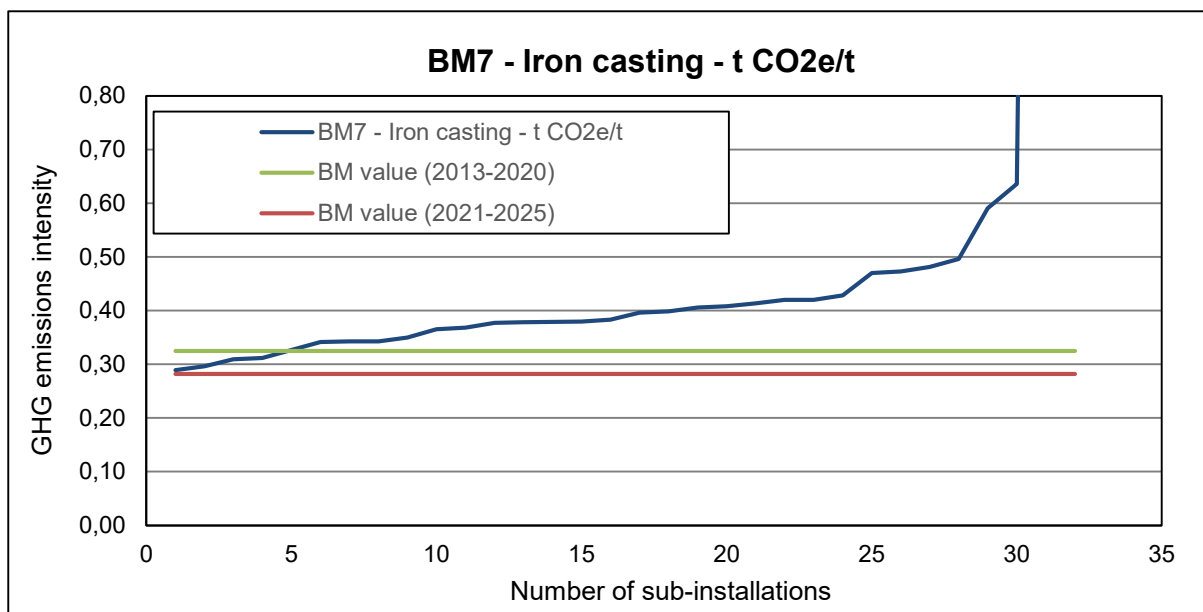
Key parameters for BM4 Hot metal	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	1,331	t CO₂e/t
Benchmark value for 2021-2025	1,288	t CO₂e/t
Benchmark value for phase 3, 2013 – 2020 (as a reference)	1,328	t CO ₂ e/t
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017	0,02%	
Update rate in %/year applied to the phase 3 benchmark	-0,20%	
Update rate in % applied to the phase 3 benchmark	-3,0%	
Median GHG emissions intensity of all installations in 2016/2017	1,443	t CO ₂ e/t
Average GHG emissions intensity of all installations in 2016/2017	1,520	t CO ₂ e/t
Weighted average GHG emissions intensity of all installations in 2016/2017	1,495	t CO ₂ e/t
Number of (sub-)installations using the benchmark for free allocation	28	
Number of (sub-)installations taken into account for the benchmark value update	25	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)	128 889 587	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021	110 024 564	EUA



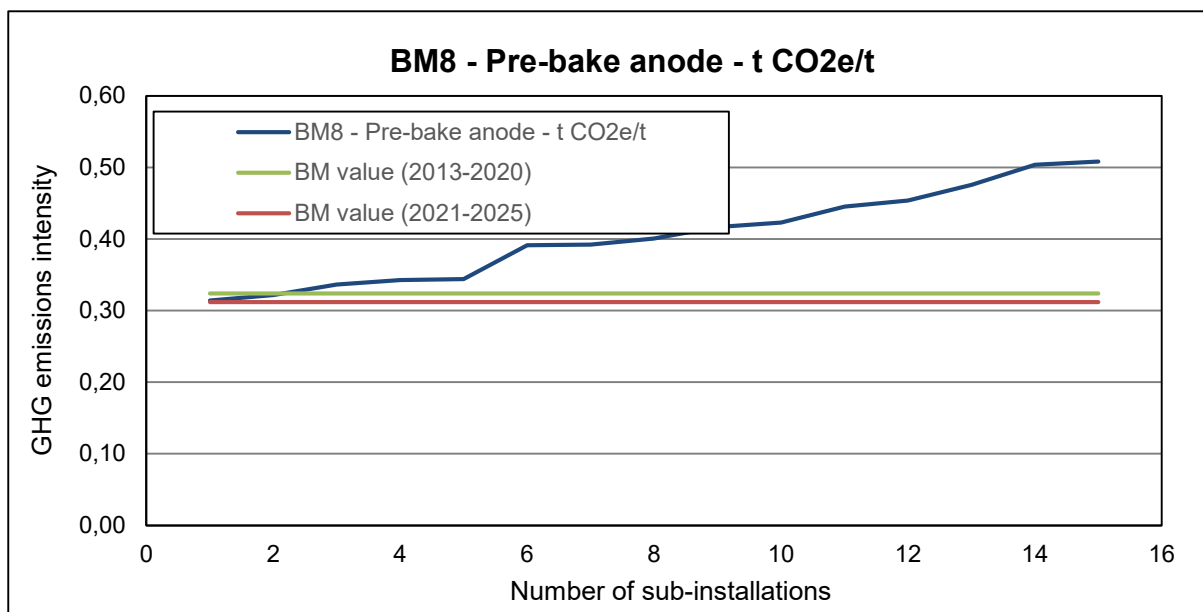
Key parameters for BM5 EAF carbon steel	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	0,209	t CO₂e/t
Benchmark value for 2021-2025	0,215	t CO₂e/t
Benchmark value for phase 3, 2013 – 2020 (as a reference)	0,283	t CO ₂ e/t
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017	-2,89%	
Update rate in %/year applied to the phase 3 benchmark	-1,60%	
Update rate in % applied to the phase 3 benchmark	-24,0%	
Median GHG emissions intensity of all installations in 2016/2017	0,276	t CO ₂ e/t
Average GHG emissions intensity of all installations in 2016/2017	0,320	t CO ₂ e/t
Weighted average GHG emissions intensity of all installations in 2016/2017	0,255	t CO ₂ e/t
Number of (sub-)installations using the benchmark for free allocation	76	
Number of (sub-)installations taken into account for the benchmark value update	75	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)	9 804 572	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021	2 050 637	EUA



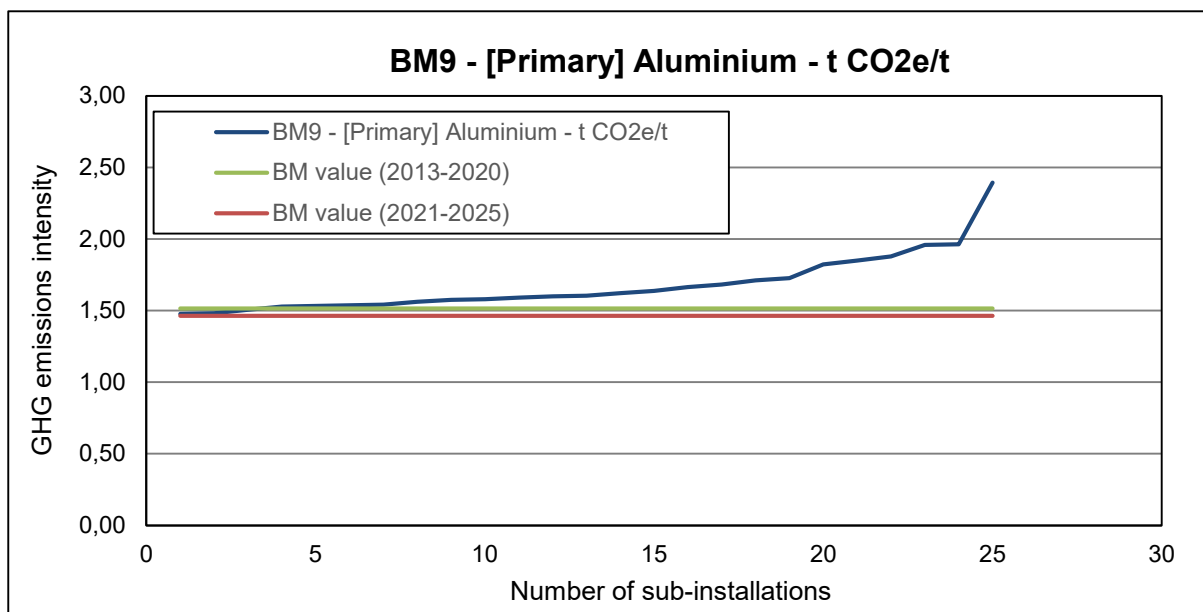
Key parameters for BM6 EAF high alloy steel	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	0,266	t CO ₂ e/t
Benchmark value for 2021-2025	0,268	t CO ₂ e/t
Benchmark value for phase 3, 2013 – 2020 (as a reference)	0,352	t CO ₂ e/t
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017	-2,70%	
Update rate in %/year applied to the phase 3 benchmark	-1,60%	
Update rate in % applied to the phase 3 benchmark	-24,0%	
Median GHG emissions intensity of all installations in 2016/2017	0,360	t CO ₂ e/t
Average GHG emissions intensity of all installations in 2016/2017	0,382	t CO ₂ e/t
Weighted average GHG emissions intensity of all installations in 2016/2017	0,323	t CO ₂ e/t
Number of (sub-)installations using the benchmark for free allocation	82	
Number of (sub-)installations taken into account for the benchmark value update	81	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)	8 681 596	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021	2 185 759	EUA



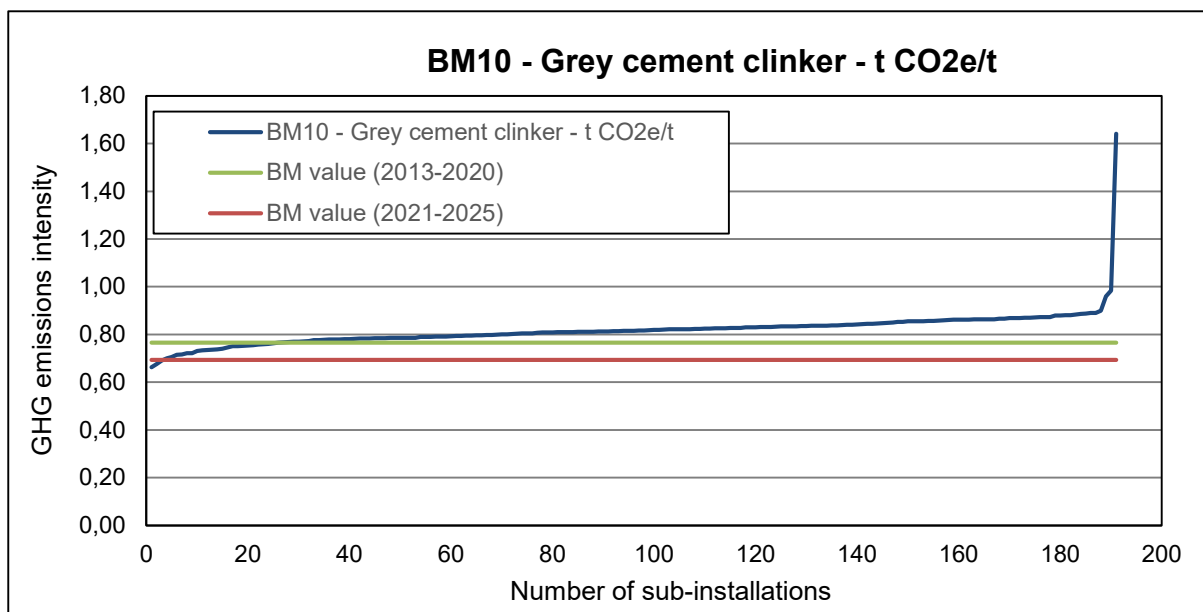
Key parameters for BM7 Iron casting	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	0,299	t CO ₂ e/t
Benchmark value for 2021-2025	0,282	t CO ₂ e/t
Benchmark value for phase 3, 2013 – 2020 (as a reference)	0,325	t CO ₂ e/t
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017	-0,89%	
Update rate in %/year applied to the phase 3 benchmark	-0,89%	
Update rate in % applied to the phase 3 benchmark	-13,4%	
Median GHG emissions intensity of all installations in 2016/2017	0,390	t CO ₂ e/t
Average GHG emissions intensity of all installations in 2016/2017	0,785	t CO ₂ e/t
Weighted average GHG emissions intensity of all installations in 2016/2017	0,370	t CO ₂ e/t
Number of (sub-)installations using the benchmark for free allocation	32	
Number of (sub-)installations taken into account for the benchmark value update	32	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)	1 380 242	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021	930 583	EUA



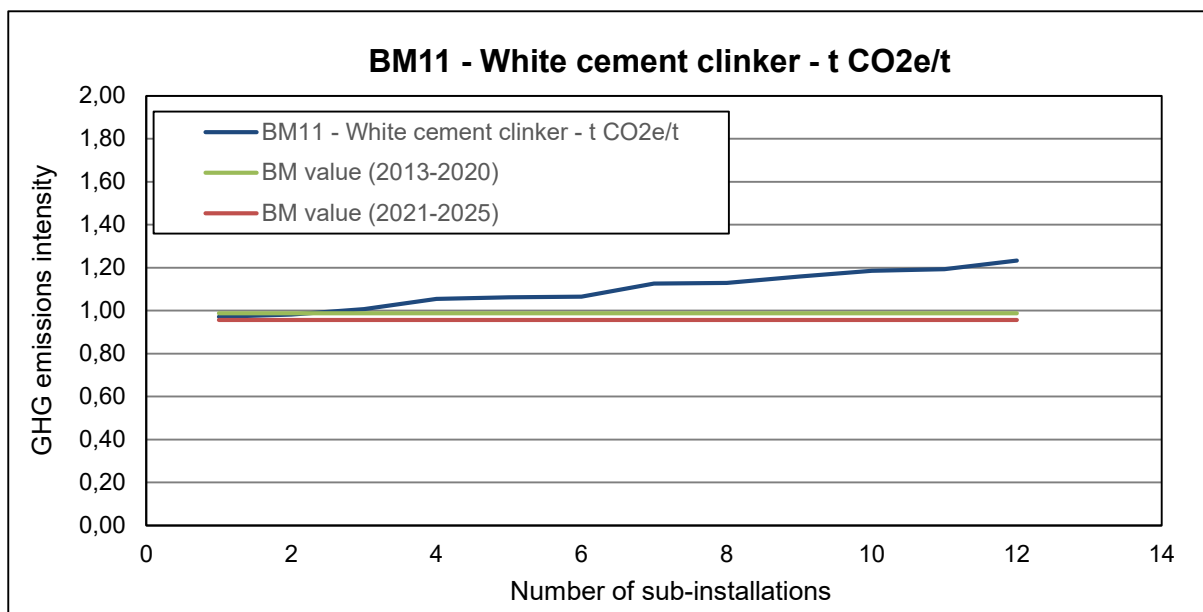
Key parameters for BM8 Pre-bake anode	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	0,317	t CO₂e/t
Benchmark value for 2021-2025	0,312	t CO₂e/t
Benchmark value for phase 3, 2013 – 2020 (as a reference)	0,324	t CO ₂ e/t
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017	-0,26%	
Update rate in %/year applied to the phase 3 benchmark	-0,26%	
Update rate in % applied to the phase 3 benchmark	-3,8%	
Median GHG emissions intensity of all installations in 2016/2017	0,401	t CO ₂ e/t
Average GHG emissions intensity of all installations in 2016/2017	0,405	t CO ₂ e/t
Weighted average GHG emissions intensity of all installations in 2016/2017	0,408	t CO ₂ e/t
Number of (sub-)installations using the benchmark for free allocation	15	
Number of (sub-)installations taken into account for the benchmark value update	15	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)	825 070	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021	612 390	EUA



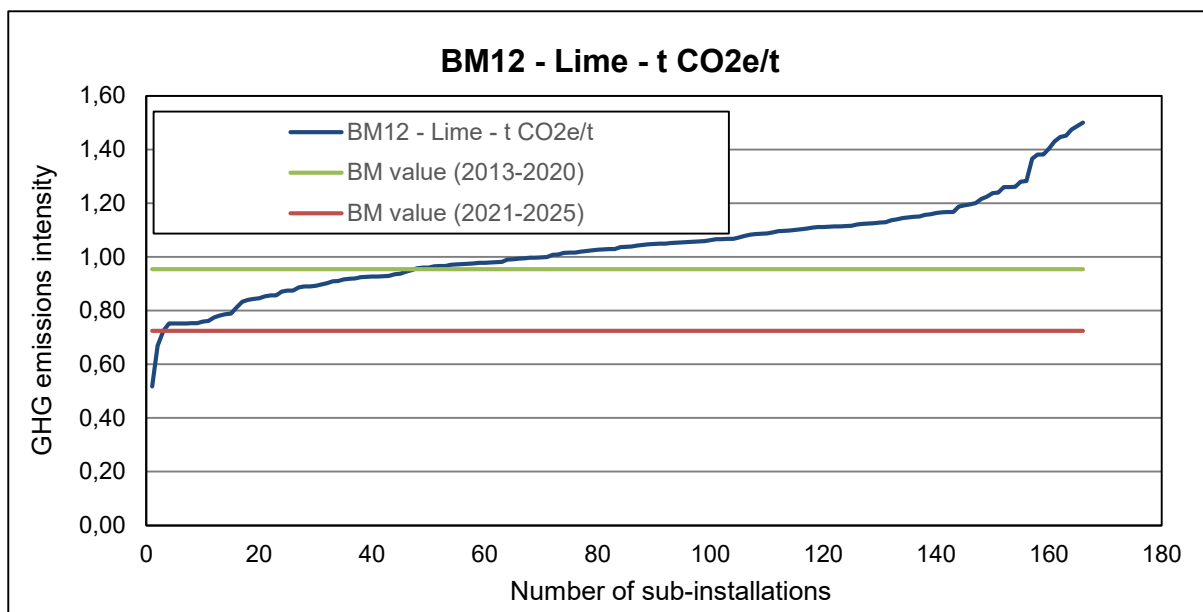
Key parameters for BM9 [Primary] Aluminium	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	1,484	t CO ₂ e/t
Benchmark value for 2021-2025	1,464	t CO ₂ e/t
Benchmark value for phase 3, 2013 – 2020 (as a reference)	1,514	t CO ₂ e/t
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017	-0,22%	
Update rate in %/year applied to the phase 3 benchmark	-0,22%	
Update rate in % applied to the phase 3 benchmark	-3,3%	
Median GHG emissions intensity of all installations in 2016/2017	1,604	t CO ₂ e/t
Average GHG emissions intensity of all installations in 2016/2017	1,681	t CO ₂ e/t
Weighted average GHG emissions intensity of all installations in 2016/2017	1,641	t CO ₂ e/t
Number of (sub-)installations using the benchmark for free allocation	25	
Number of (sub-)installations taken into account for the benchmark value update	25	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)	6 973 626	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021	6 130 853	EUA



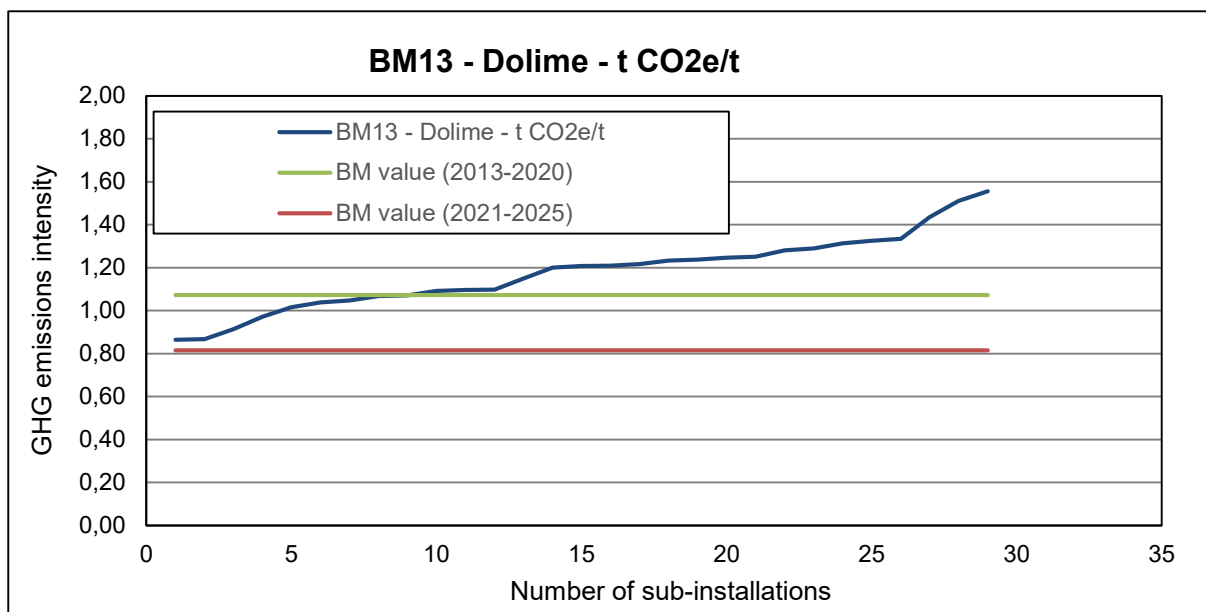
Key parameters for BM10 Grey cement clinker		Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017		0,722	t CO ₂ e/t
Benchmark value for 2021-2025		0,693	t CO ₂ e/t
Benchmark value for phase 3, 2013 – 2020 (as a reference)		0,766	t CO ₂ e/t
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017		-0,63%	
Update rate in %/year applied to the phase 3 benchmark		-0,63%	
Update rate in % applied to the phase 3 benchmark		-9,5%	
Median GHG emissions intensity of all installations in 2016/2017		0,816	t CO ₂ e/t
Average GHG emissions intensity of all installations in 2016/2017		0,818	t CO ₂ e/t
Weighted average GHG emissions intensity of all installations in 2016/2017		0,810	t CO ₂ e/t
Number of (sub-)installations using the benchmark for free allocation		191	
Number of (sub-)installations taken into account for the benchmark value update		191	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)		105 321 006	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021		90 105 535	EUA



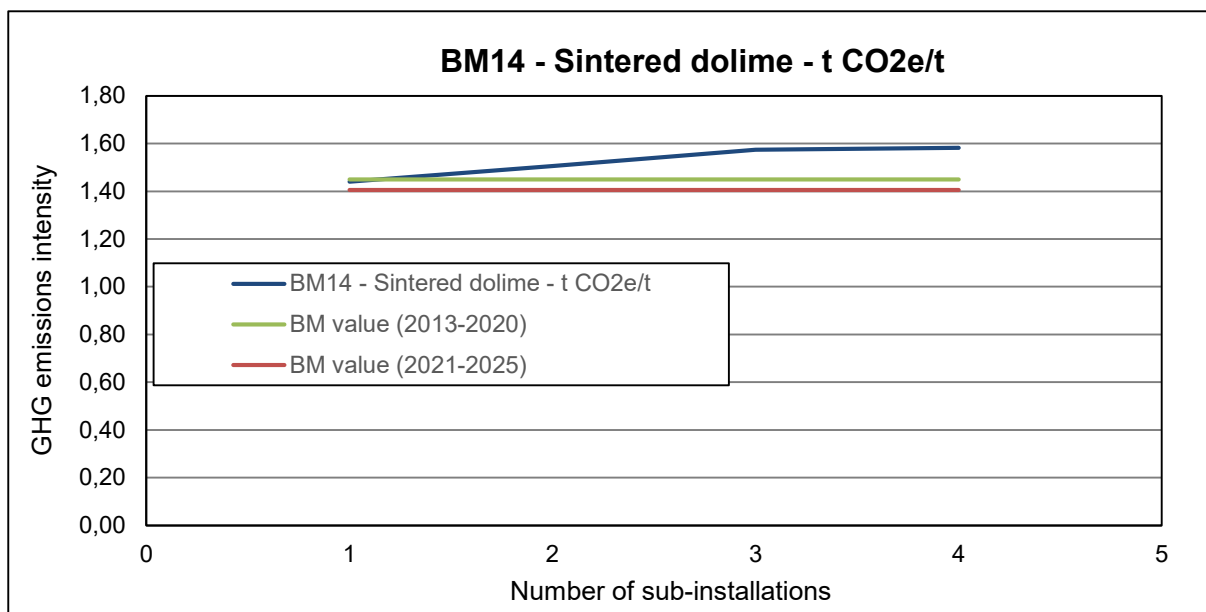
Key parameters for BM11 White cement clinker	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	0,973	t CO ₂ e/t
Benchmark value for 2021-2025	0,957	t CO ₂ e/t
Benchmark value for phase 3, 2013 – 2020 (as a reference)	0,987	t CO ₂ e/t
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017	-0,16%	
Update rate in %/year applied to the phase 3 benchmark	-0,20%	
Update rate in % applied to the phase 3 benchmark	-3,0%	
Median GHG emissions intensity of all installations in 2016/2017	1,095	t CO ₂ e/t
Average GHG emissions intensity of all installations in 2016/2017	1,097	t CO ₂ e/t
Weighted average GHG emissions intensity of all installations in 2016/2017	1,114	t CO ₂ e/t
Number of (sub-)installations using the benchmark for free allocation	12	
Number of (sub-)installations taken into account for the benchmark value update	12	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)	2 646 157	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021	2 145 323	EUA



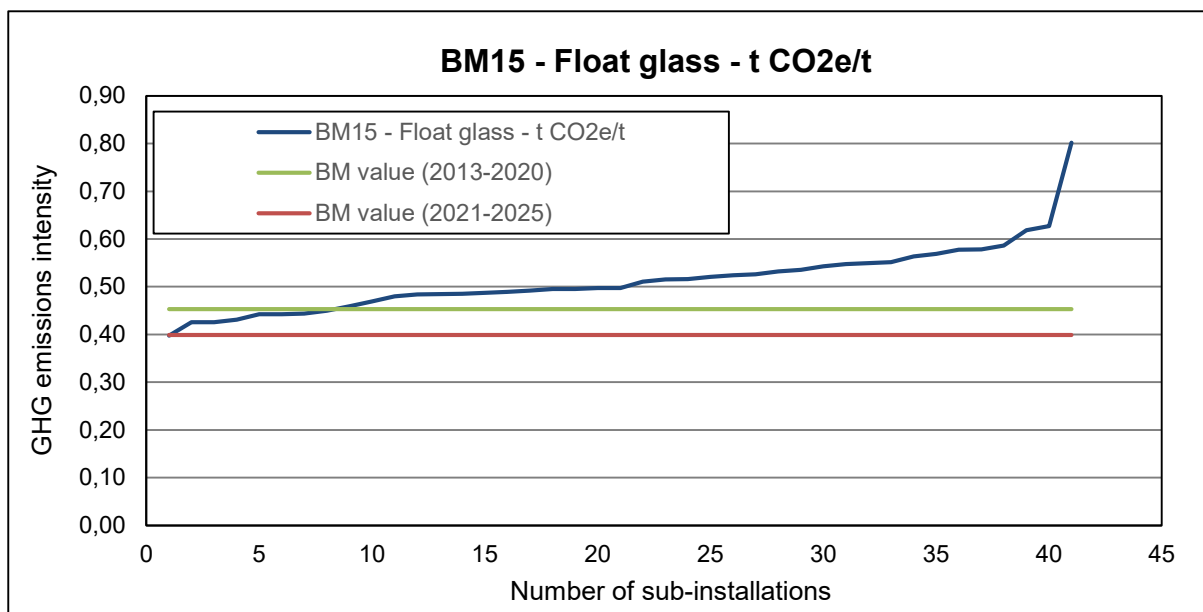
Key parameters for BM12 Lime	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	0,746	t CO ₂ e/t
Benchmark value for 2021-2025	0,725	t CO ₂ e/t
Benchmark value for phase 3, 2013 – 2020 (as a reference)	0,954	t CO ₂ e/t
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017	-2,42%	
Update rate in %/year applied to the phase 3 benchmark	-1,60%	
Update rate in % applied to the phase 3 benchmark	-24,0%	
Median GHG emissions intensity of all installations in 2016/2017	1,033	t CO ₂ e/t
Average GHG emissions intensity of all installations in 2016/2017	1,034	t CO ₂ e/t
Weighted average GHG emissions intensity of all installations in 2016/2017	1,059	t CO ₂ e/t
Number of (sub-)installations using the benchmark for free allocation	171	
Number of (sub-)installations taken into account for the benchmark value update	166	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)	21 751 588	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021	15 062 292	EUA



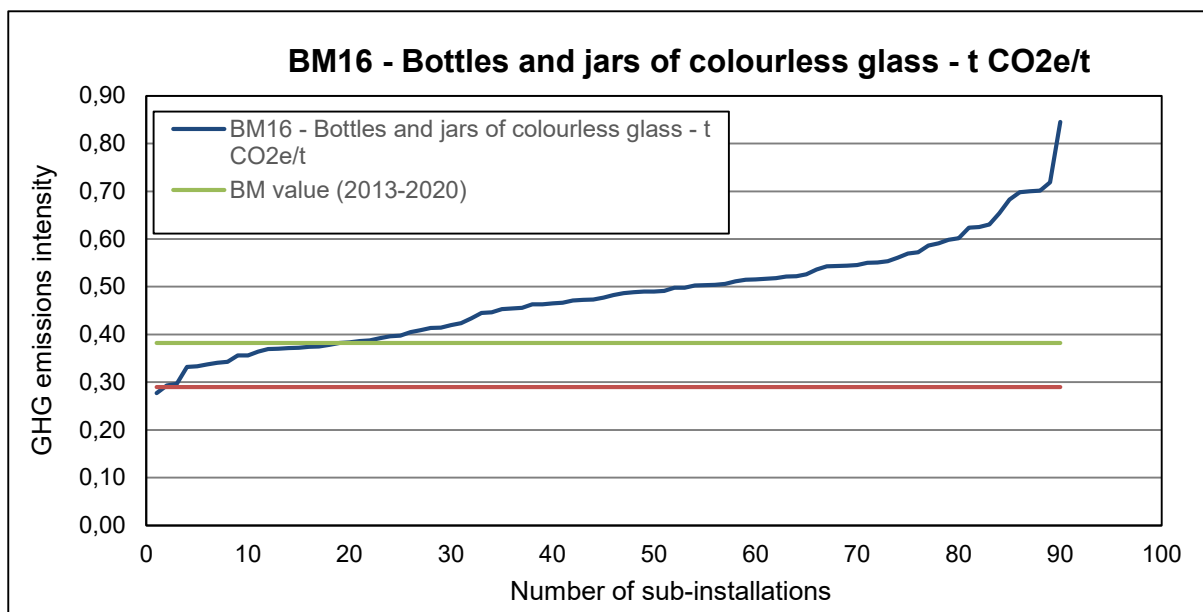
Key parameters for BM13 Dolime	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	0,881	t CO ₂ e/t
Benchmark value for 2021-2025	0,815	t CO ₂ e/t
Benchmark value for phase 3, 2013 – 2020 (as a reference)	1,072	t CO ₂ e/t
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017	-1,98%	
Update rate in %/year applied to the phase 3 benchmark	-1,60%	
Update rate in % applied to the phase 3 benchmark	-24,0%	
Median GHG emissions intensity of all installations in 2016/2017	1,208	t CO ₂ e/t
Average GHG emissions intensity of all installations in 2016/2017	1,177	t CO ₂ e/t
Weighted average GHG emissions intensity of all installations in 2016/2017	1,214	t CO ₂ e/t
Number of (sub-)installations using the benchmark for free allocation	36	
Number of (sub-)installations taken into account for the benchmark value update	29	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)	1 794 640	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021	1 265 828	EUA



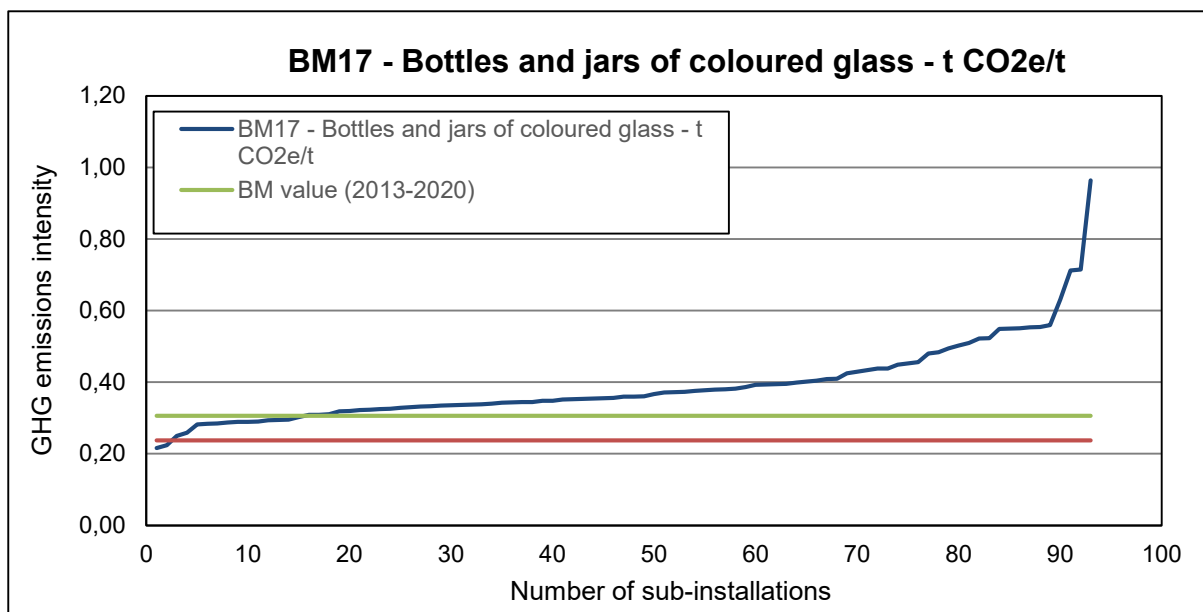
Key parameters for BM14 Sintered dolime	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	1,441	t CO₂e/t
Benchmark value for 2021-2025	1,406	t CO₂e/t
Benchmark value for phase 3, 2013 – 2020 (as a reference)	1,449	t CO ₂ e/t
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017	-0,06%	
Update rate in %/year applied to the phase 3 benchmark	-0,20%	
Update rate in % applied to the phase 3 benchmark	-3,0%	
Median GHG emissions intensity of all installations in 2016/2017	1,539	t CO ₂ e/t
Average GHG emissions intensity of all installations in 2016/2017	1,525	t CO ₂ e/t
Weighted average GHG emissions intensity of all installations in 2016/2017	1,535	t CO ₂ e/t
Number of (sub-)installations using the benchmark for free allocation	6	
Number of (sub-)installations taken into account for the benchmark value update	4	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)	790 184	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021	722 297	EUA



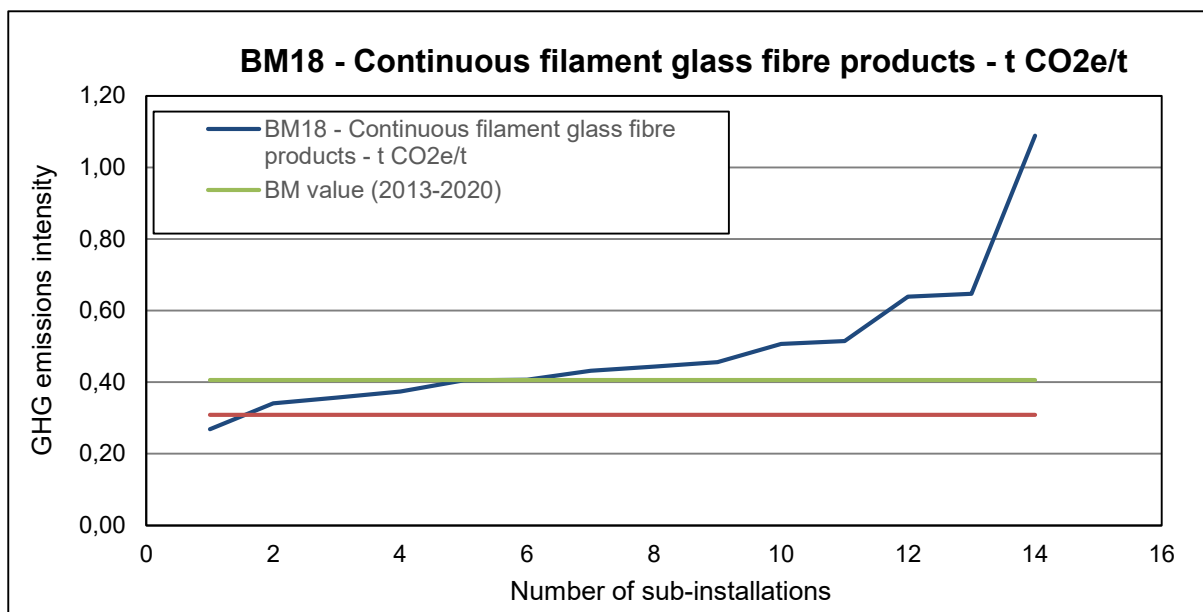
Key parameters for BM15 Float glass	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	0,421	t CO₂e/t
Benchmark value for 2021-2025	0,399	t CO₂e/t
Benchmark value for phase 3, 2013 – 2020 (as a reference)	0,453	t CO ₂ e/t
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017	-0,80%	
Update rate in %/year applied to the phase 3 benchmark	-0,80%	
Update rate in % applied to the phase 3 benchmark	-11,9%	
Median GHG emissions intensity of all installations in 2016/2017	0,497	t CO ₂ e/t
Average GHG emissions intensity of all installations in 2016/2017	0,514	t CO ₂ e/t
Weighted average GHG emissions intensity of all installations in 2016/2017	0,510	t CO ₂ e/t
Number of (sub-)installations using the benchmark for free allocation	42	
Number of (sub-)installations taken into account for the benchmark value update	41	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)	5 129 544	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021	4 066 932	EUA



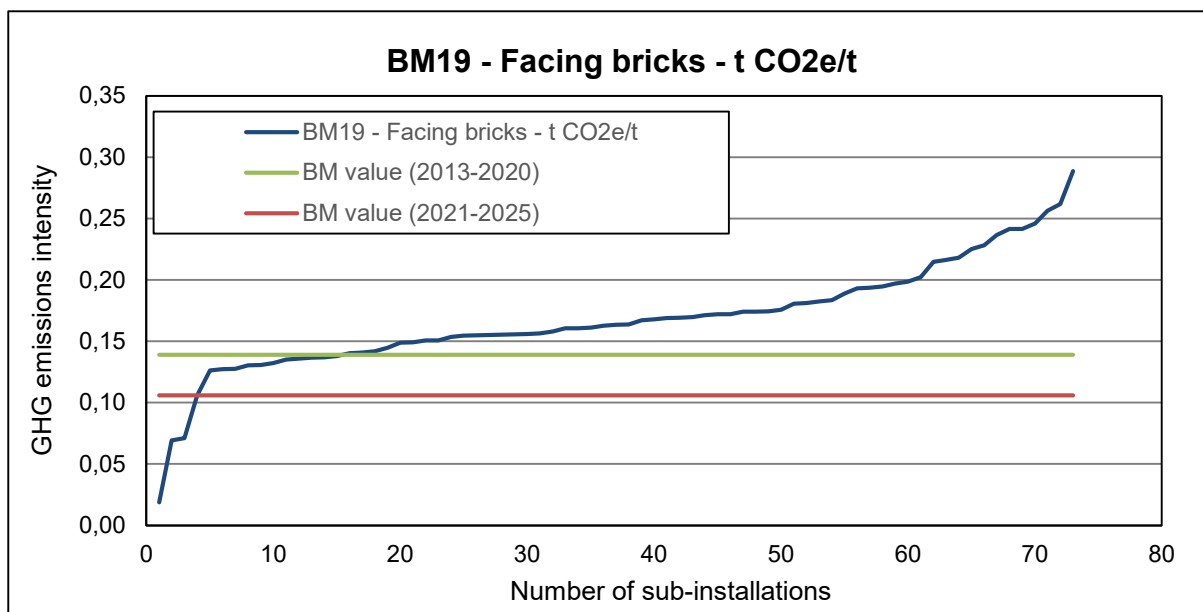
Key parameters for BM16 Bottles and jars of colourless glass	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	0,323	t CO ₂ e/t
Benchmark value for 2021-2025	0,290	t CO ₂ e/t
Benchmark value for phase 3, 2013 – 2020 (as a reference)	0,382	t CO ₂ e/t
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017	-1,71%	
Update rate in %/year applied to the phase 3 benchmark	-1,60%	
Update rate in % applied to the phase 3 benchmark	-24,0%	
Median GHG emissions intensity of all installations in 2016/2017	0,480	t CO ₂ e/t
Average GHG emissions intensity of all installations in 2016/2017	0,481	t CO ₂ e/t
Weighted average GHG emissions intensity of all installations in 2016/2017	0,459	t CO ₂ e/t
Number of (sub-)installations using the benchmark for free allocation	92	
Number of (sub-)installations taken into account for the benchmark value update	90	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)	3 582 195	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021	2 265 406	EUA



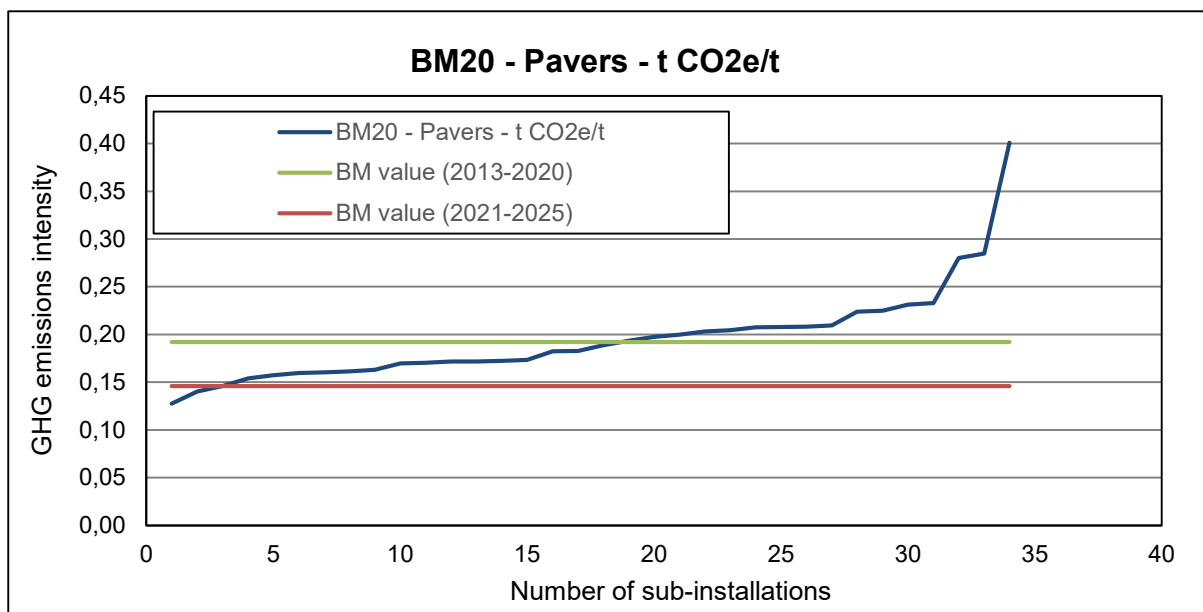
Key parameters for BM17 Bottles and jars of coloured glass	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	0,265	t CO ₂ e/t
Benchmark value for 2021-2025	0,237	t CO ₂ e/t
Benchmark value for phase 3, 2013 – 2020 (as a reference)	0,306	t CO ₂ e/t
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017	-1,50%	
Update rate in %/year applied to the phase 3 benchmark	-1,50%	
Update rate in % applied to the phase 3 benchmark	-22,5%	
Median GHG emissions intensity of all installations in 2016/2017	0,360	t CO ₂ e/t
Average GHG emissions intensity of all installations in 2016/2017	0,391	t CO ₂ e/t
Weighted average GHG emissions intensity of all installations in 2016/2017	0,353	t CO ₂ e/t
Number of (sub-)installations using the benchmark for free allocation	95	
Number of (sub-)installations taken into account for the benchmark value update	93	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)	3 771 180	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021	2 519 439	EUA



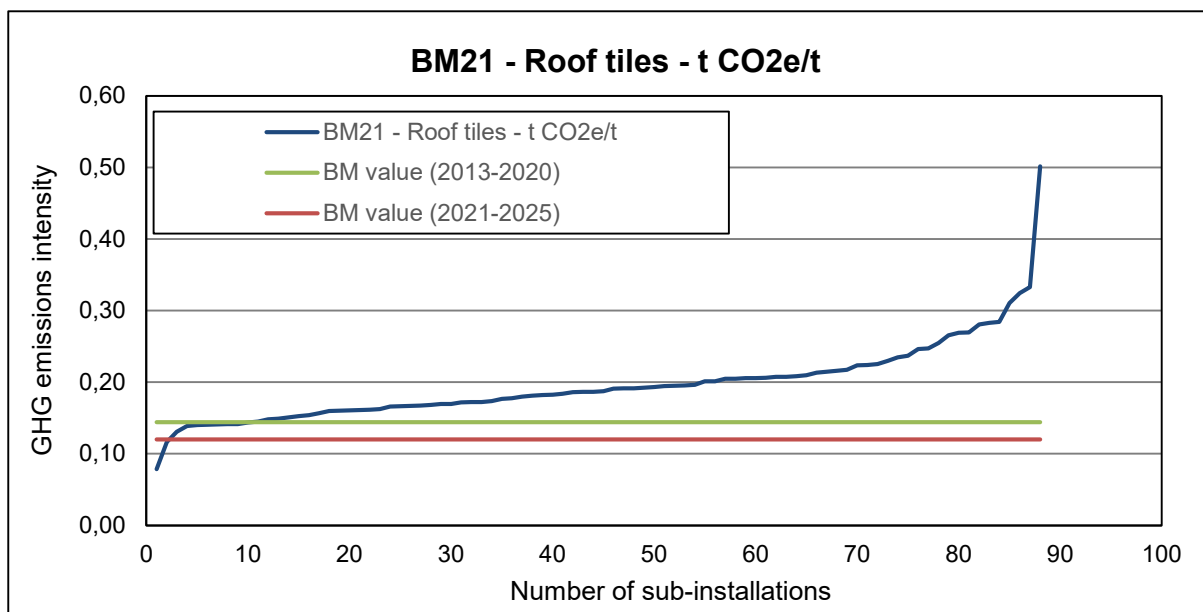
Key parameters for BM18 Continuous filament glass fibre products	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	0,290	t CO ₂ e/t
Benchmark value for 2021-2025	0,309	t CO ₂ e/t
Benchmark value for phase 3, 2013 – 2020 (as a reference)	0,406	t CO ₂ e/t
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017	-3,19%	
Update rate in %/year applied to the phase 3 benchmark	-1,60%	
Update rate in % applied to the phase 3 benchmark	-24,0%	
Median GHG emissions intensity of all installations in 2016/2017	0,438	t CO ₂ e/t
Average GHG emissions intensity of all installations in 2016/2017	0,492	t CO ₂ e/t
Weighted average GHG emissions intensity of all installations in 2016/2017	0,415	t CO ₂ e/t
Number of (sub-)installations using the benchmark for free allocation	14	
Number of (sub-)installations taken into account for the benchmark value update	14	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)	390 741	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021	283 967	EUA



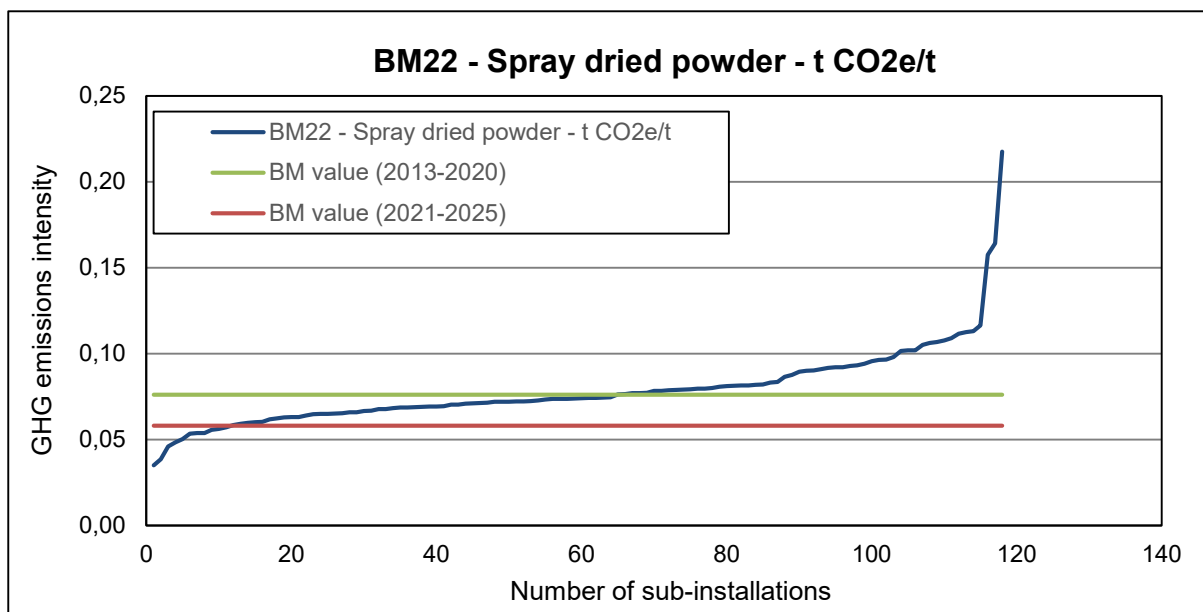
Key parameters for BM19 Facing bricks		Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017		0,094	t CO₂e/t
Benchmark value for 2021-2025		0,106	t CO₂e/t
Benchmark value for phase 3, 2013 – 2020 (as a reference)		0,139	t CO ₂ e/t
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017		-3,61%	
Update rate in %/year applied to the phase 3 benchmark		-1,60%	
Update rate in % applied to the phase 3 benchmark		-24,0%	
Median GHG emissions intensity of all installations in 2016/2017		0,163	t CO ₂ e/t
Average GHG emissions intensity of all installations in 2016/2017		0,168	t CO ₂ e/t
Weighted average GHG emissions intensity of all installations in 2016/2017		0,160	t CO ₂ e/t
Number of (sub-)installations using the benchmark for free allocation		73	
Number of (sub-)installations taken into account for the benchmark value update		73	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)		681 443	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021		452 784	EUA



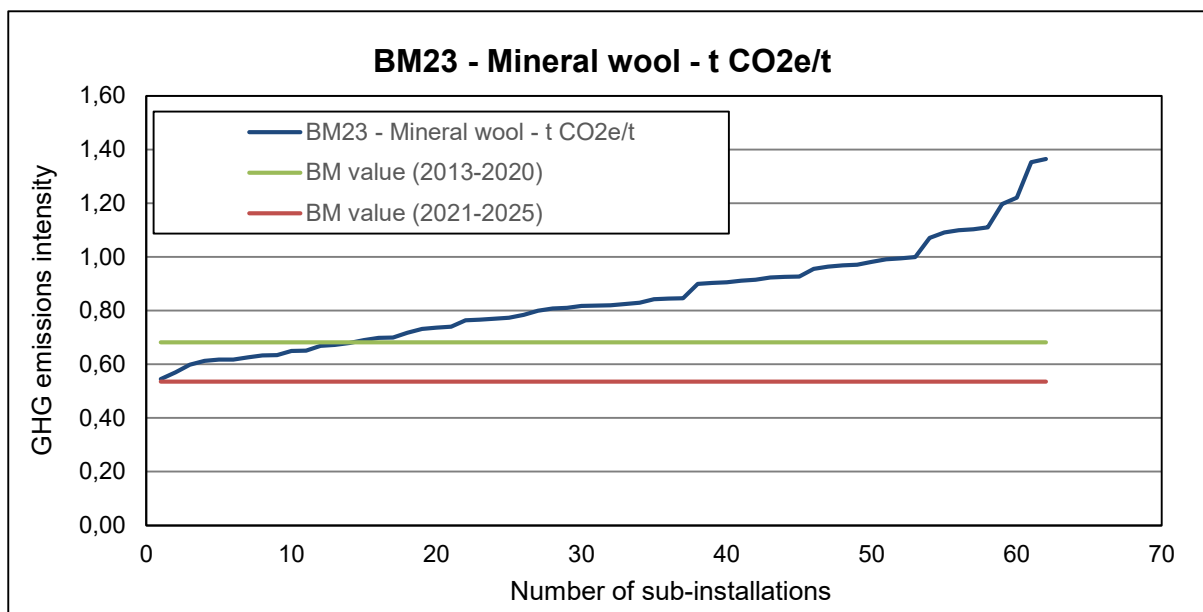
Key parameters for BM20 Pavers		Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017		0,140	t CO₂e/t
Benchmark value for 2021-2025		0,146	t CO₂e/t
Benchmark value for phase 3, 2013 – 2020 (as a reference)		0,192	t CO ₂ e/t
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017		-3,02%	
Update rate in %/year applied to the phase 3 benchmark		-1,60%	
Update rate in % applied to the phase 3 benchmark		-24,0%	
Median GHG emissions intensity of all installations in 2016/2017		0,186	t CO ₂ e/t
Average GHG emissions intensity of all installations in 2016/2017		0,196	t CO ₂ e/t
Weighted average GHG emissions intensity of all installations in 2016/2017		0,183	t CO ₂ e/t
Number of (sub-)installations using the benchmark for free allocation		35	
Number of (sub-)installations taken into account for the benchmark value update		34	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)		207 165	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021		160 430	EUA



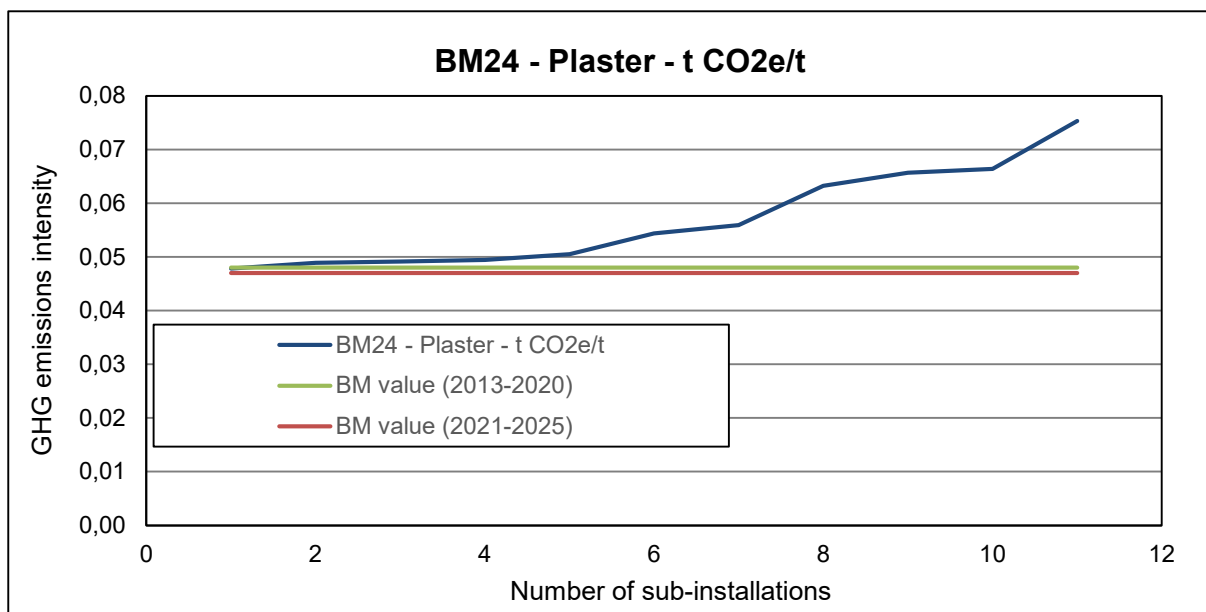
Key parameters for BM21 Roof tiles	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	0,130	t CO ₂ e/t
Benchmark value for 2021-2025	0,120	t CO ₂ e/t
Benchmark value for phase 3, 2013 – 2020 (as a reference)	0,144	t CO ₂ e/t
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017	-1,11%	
Update rate in %/year applied to the phase 3 benchmark	-1,11%	
Update rate in % applied to the phase 3 benchmark	-16,7%	
Median GHG emissions intensity of all installations in 2016/2017	0,187	t CO ₂ e/t
Average GHG emissions intensity of all installations in 2016/2017	0,197	t CO ₂ e/t
Weighted average GHG emissions intensity of all installations in 2016/2017	0,184	t CO ₂ e/t
Number of (sub-)installations using the benchmark for free allocation	89	
Number of (sub-)installations taken into account for the benchmark value update	88	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)	1 109 511	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021	735 846	EUA



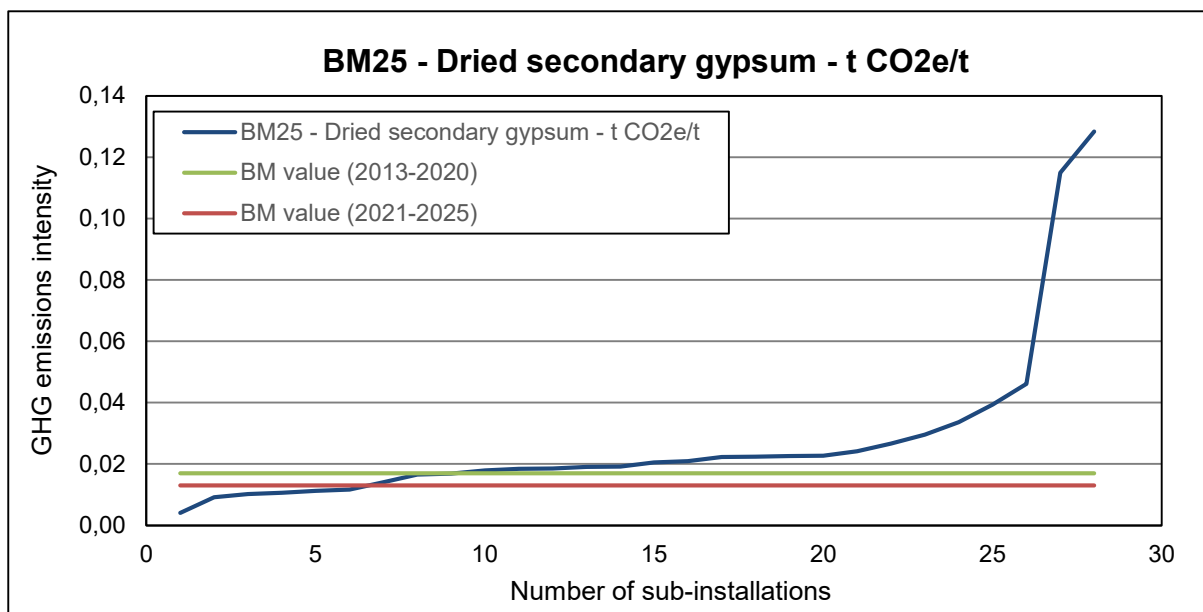
Key parameters for BM22 Spray dried powder	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	0,050	t CO ₂ e/t
Benchmark value for 2021-2025	0,058	t CO ₂ e/t
Benchmark value for phase 3, 2013 – 2020 (as a reference)	0,076	t CO ₂ e/t
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017	-3,74%	
Update rate in %/year applied to the phase 3 benchmark	-1,60%	
Update rate in % applied to the phase 3 benchmark	-24,0%	
Median GHG emissions intensity of all installations in 2016/2017	0,074	t CO ₂ e/t
Average GHG emissions intensity of all installations in 2016/2017	0,079	t CO ₂ e/t
Weighted average GHG emissions intensity of all installations in 2016/2017	0,074	t CO ₂ e/t
Number of (sub-)installations using the benchmark for free allocation	122	
Number of (sub-)installations taken into account for the benchmark value update	118	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)	1 712 944	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021	1 323 716	EUA



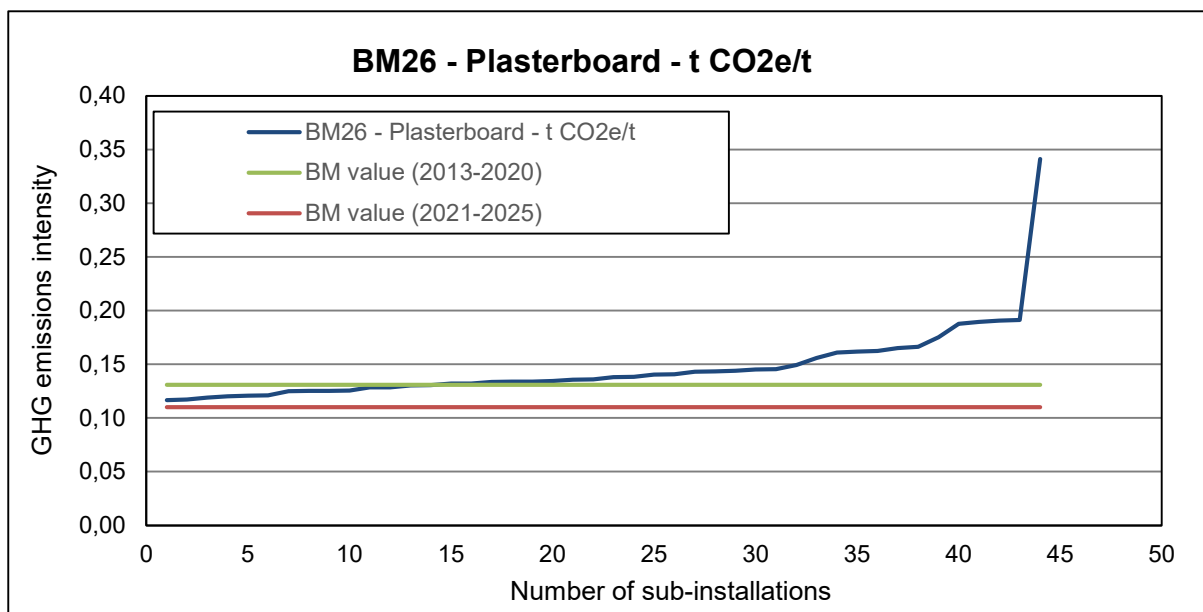
Key parameters for BM23 Mineral wool	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	0,595	t CO ₂ e/t
Benchmark value for 2021-2025	0,536	t CO ₂ e/t
Benchmark value for phase 3, 2013 – 2020 (as a reference)	0,682	t CO ₂ e/t
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017	-1,42%	
Update rate in %/year applied to the phase 3 benchmark	-1,42%	
Update rate in % applied to the phase 3 benchmark	-21,4%	
Median GHG emissions intensity of all installations in 2016/2017	0,819	t CO ₂ e/t
Average GHG emissions intensity of all installations in 2016/2017	0,846	t CO ₂ e/t
Weighted average GHG emissions intensity of all installations in 2016/2017	0,779	t CO ₂ e/t
Number of (sub-)installations using the benchmark for free allocation	62	
Number of (sub-)installations taken into account for the benchmark value update	62	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)	3 187 6832	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021	1 577 648	EUA



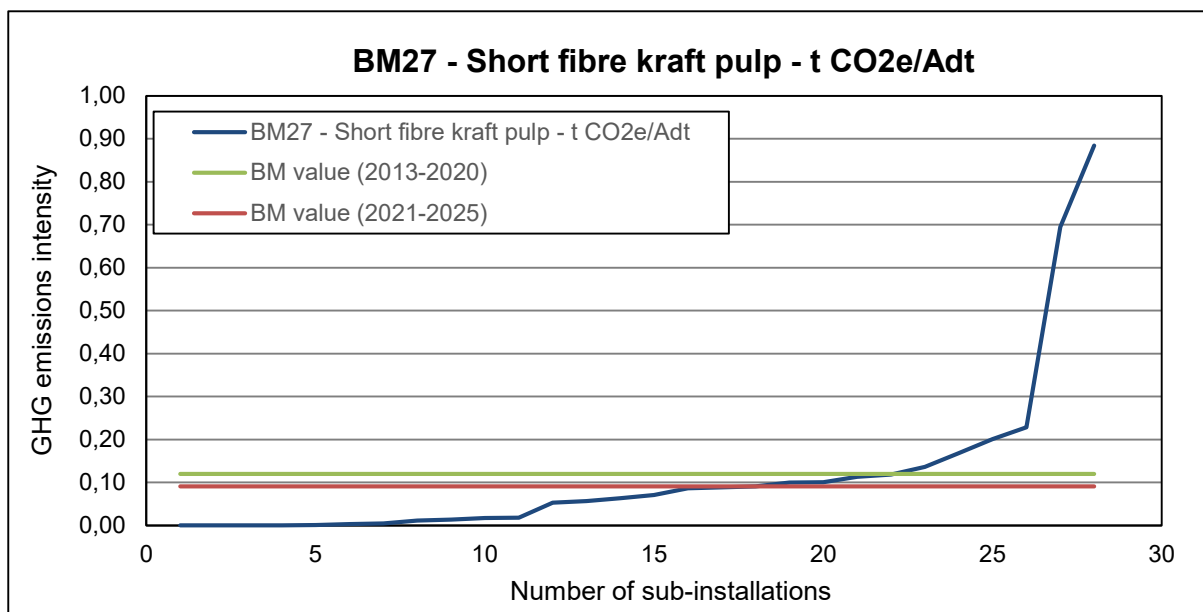
Key parameters for BM24 Plaster	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	0,048	t CO₂e/t
Benchmark value for 2021-2025	0,047	t CO₂e/t
Benchmark value for phase 3, 2013 – 2020 (as a reference)	0,048	t CO ₂ e/t
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017	-0,02%	
Update rate in %/year applied to the phase 3 benchmark	-0,20%	
Update rate in % applied to the phase 3 benchmark	-3,0%	
Median GHG emissions intensity of all installations in 2016/2017	0,054	t CO ₂ e/t
Average GHG emissions intensity of all installations in 2016/2017	0,057	t CO ₂ e/t
Weighted average GHG emissions intensity of all installations in 2016/2017	0,060	t CO ₂ e/t
Number of (sub-)installations using the benchmark for free allocation	11	
Number of (sub-)installations taken into account for the benchmark value update	11	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)	47 230	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021	36 673	EUA



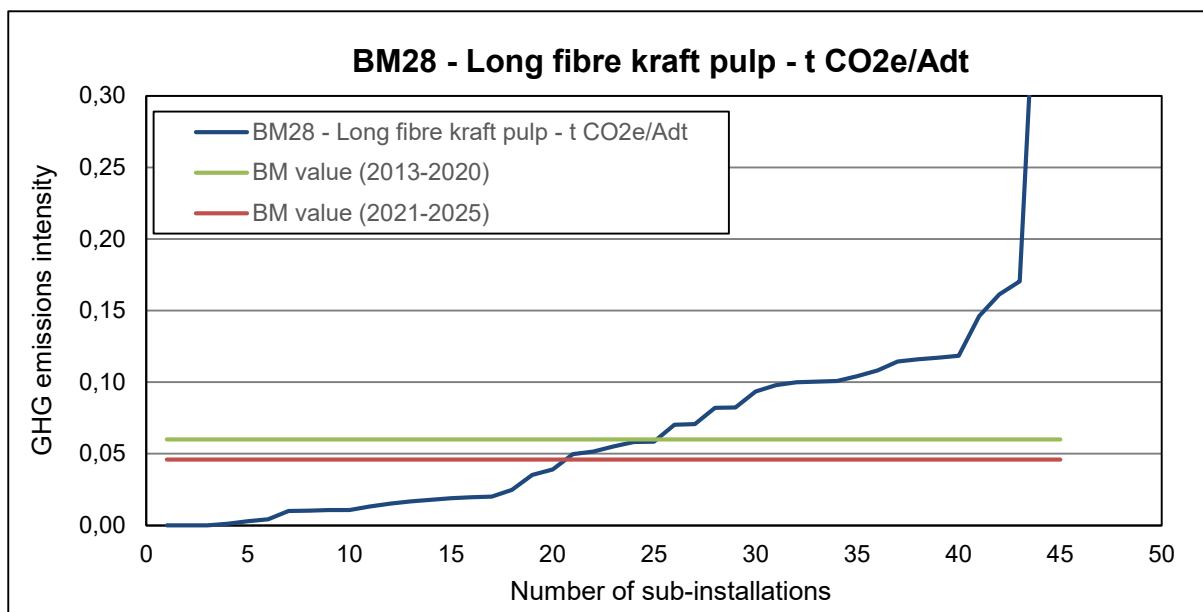
Key parameters for BM25 Dried secondary gypsum	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	0,008	t CO ₂ e/t
Benchmark value for 2021-2025	0,013	t CO ₂ e/t
Benchmark value for phase 3, 2013 – 2020 (as a reference)	0,017	t CO ₂ e/t
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017	-6,12%	
Update rate in %/year applied to the phase 3 benchmark	-1,60%	
Update rate in % applied to the phase 3 benchmark	-24,0%	
Median GHG emissions intensity of all installations in 2016/2017	0,020	t CO ₂ e/t
Average GHG emissions intensity of all installations in 2016/2017	0,028	t CO ₂ e/t
Weighted average GHG emissions intensity of all installations in 2016/2017	0,021	t CO ₂ e/t
Number of (sub-)installations using the benchmark for free allocation	29	
Number of (sub-)installations taken into account for the benchmark value update	28	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)	78 682	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021	50 229	EUA



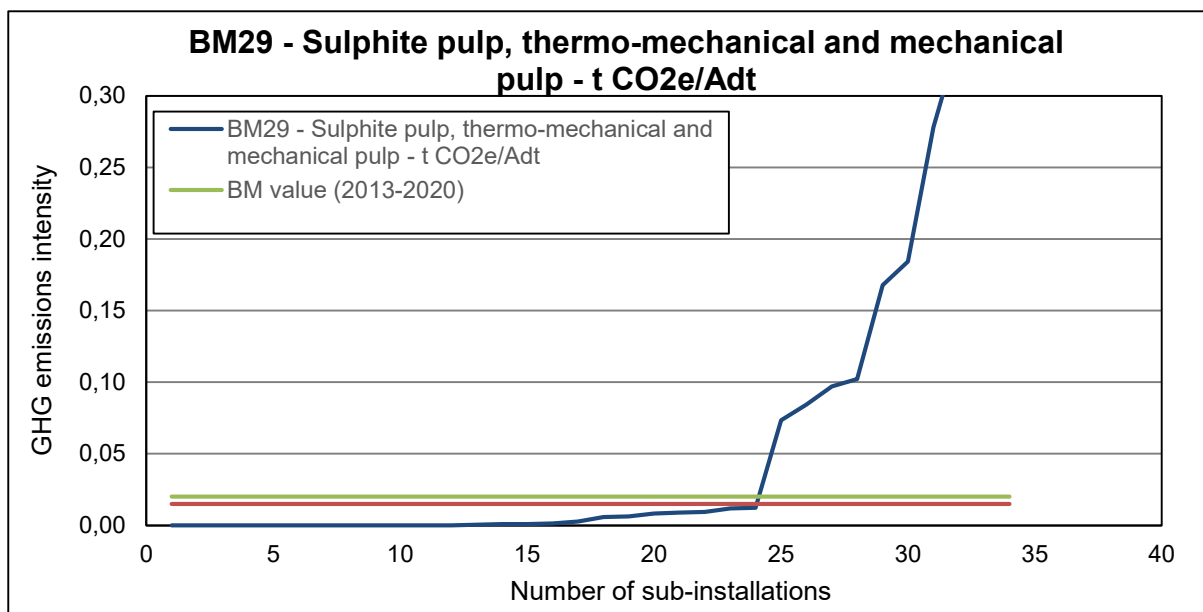
Key parameters for BM26 Plasterboard		Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017		0,119	t CO₂e/t
Benchmark value for 2021-2025		0,110	t CO₂e/t
Benchmark value for phase 3, 2013 – 2020 (as a reference)		0,131	t CO ₂ e/t
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017		-1,06%	
Update rate in %/year applied to the phase 3 benchmark		-1,06%	
Update rate in % applied to the phase 3 benchmark		-15,9%	
Median GHG emissions intensity of all installations in 2016/2017		0,137	t CO ₂ e/t
Average GHG emissions intensity of all installations in 2016/2017		0,147	t CO ₂ e/t
Weighted average GHG emissions intensity of all installations in 2016/2017		0,142	t CO ₂ e/t
Number of (sub-)installations using the benchmark for free allocation		44	
Number of (sub-)installations taken into account for the benchmark value update		44	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)		1 131 799	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021		253 159	EUA



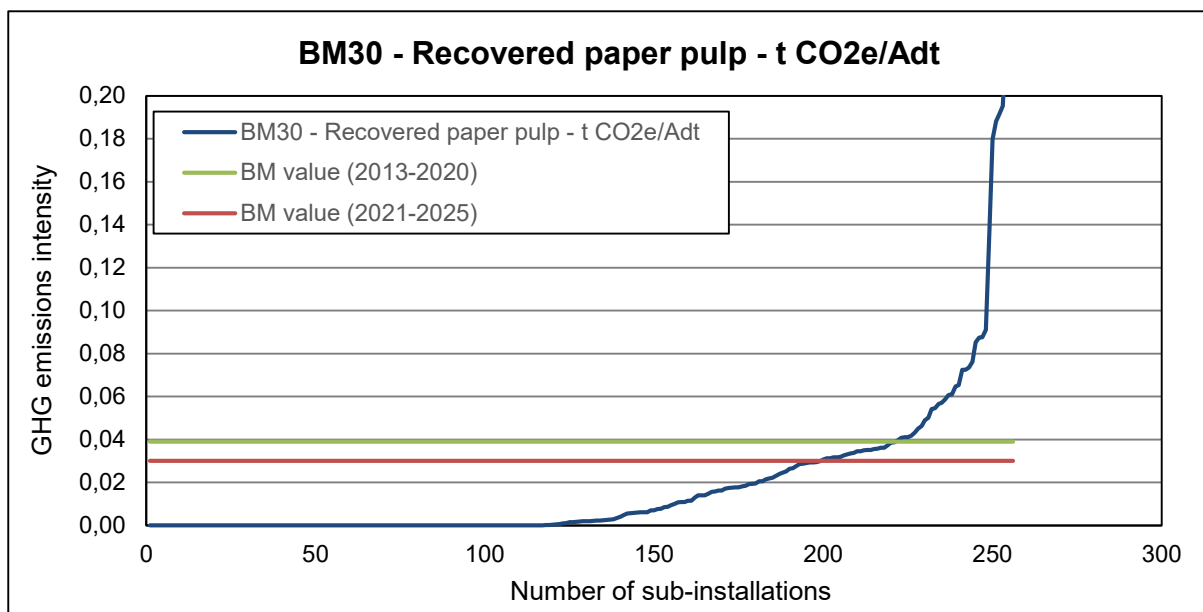
Key parameters for BM27 Short fibre kraft pulp	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	0,000	t CO ₂ e/Adt
Benchmark value for 2021-2025	0,091	t CO ₂ e/Adt
Benchmark value for phase 3, 2013 – 2020 (as a reference)	0,120	t CO ₂ e/Adt
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017	-11,11%	
Update rate in %/year applied to the phase 3 benchmark	-1,60%	
Update rate in % applied to the phase 3 benchmark	-24,0%	
Median GHG emissions intensity of all installations in 2016/2017	0,067	t CO ₂ e/Adt
Average GHG emissions intensity of all installations in 2016/2017	0,119	t CO ₂ e/Adt
Weighted average GHG emissions intensity of all installations in 2016/2017	0,111	t CO ₂ e/Adt
Number of (sub-)installations using the benchmark for free allocation	29	
Number of (sub-)installations taken into account for the benchmark value update	28	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)	927 669	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021	416 663	EUA



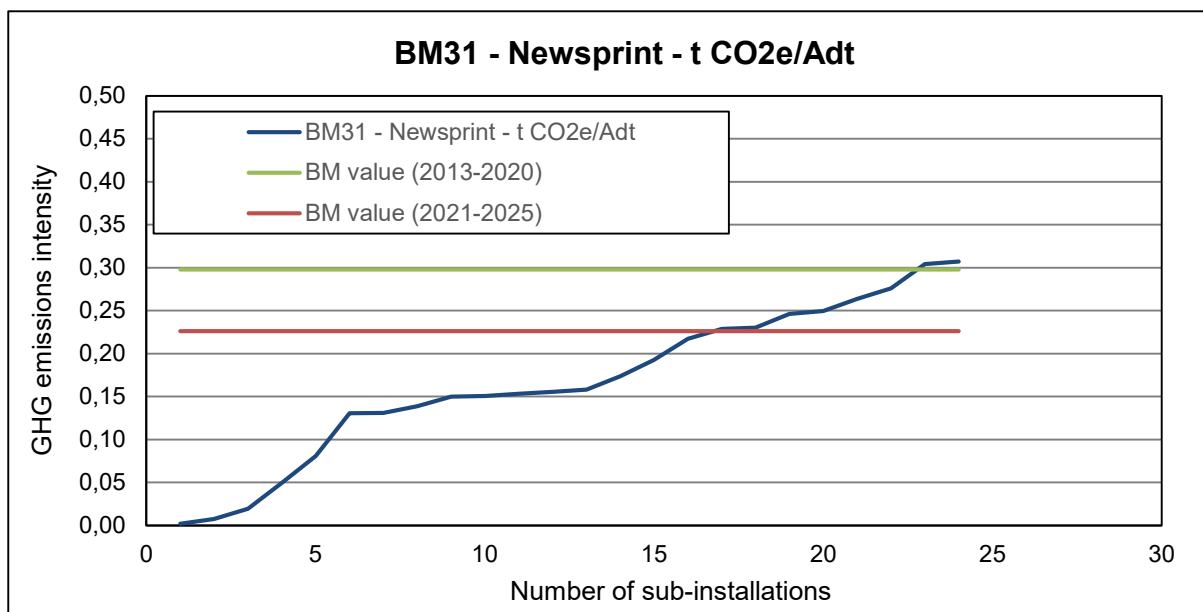
Key parameters for BM28 Long fibre kraft pulp	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	0,001	t CO ₂ e/Adt
Benchmark value for 2021-2025	0,046	t CO ₂ e/Adt
Benchmark value for phase 3, 2013 – 2020 (as a reference)	0,060	t CO ₂ e/Adt
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017	-11,00%	
Update rate in %/year applied to the phase 3 benchmark	-1,60%	
Update rate in % applied to the phase 3 benchmark	-24,0%	
Median GHG emissions intensity of all installations in 2016/2017	0,055	t CO ₂ e/Adt
Average GHG emissions intensity of all installations in 2016/2017	0,415	t CO ₂ e/Adt
Weighted average GHG emissions intensity of all installations in 2016/2017	0,072	t CO ₂ e/Adt
Number of (sub-)installations using the benchmark for free allocation	45	
Number of (sub-)installations taken into account for the benchmark value update	45	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)	967 436	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021	360 057	EUA



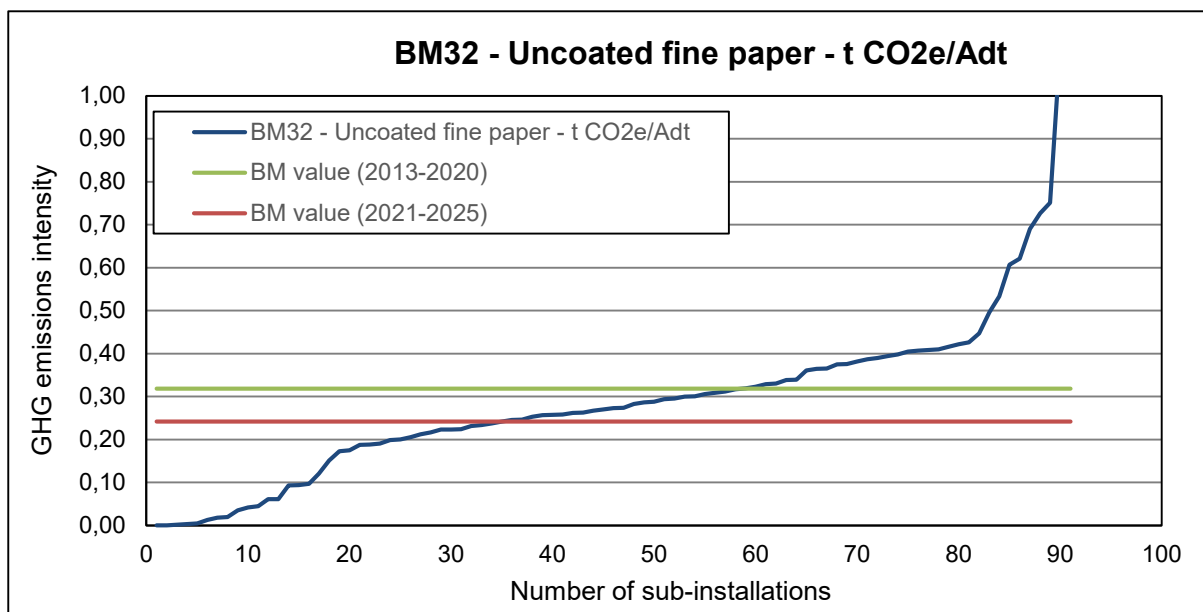
Key parameters for BM29 Sulphite pulp, thermo-mechanical and mechanical pulp	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	0,000	t CO₂e/Adt
Benchmark value for 2021-2025	0,015	t CO₂e/Adt
Benchmark value for phase 3, 2013 – 2020 (as a reference)	0,020	t CO ₂ e/Adt
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017	-11,11%	
Update rate in %/year applied to the phase 3 benchmark	-1,60%	
Update rate in % applied to the phase 3 benchmark	-24,0%	
Median GHG emissions intensity of all installations in 2016/2017	0,004	t CO ₂ e/Adt
Average GHG emissions intensity of all installations in 2016/2017	0,075	t CO ₂ e/Adt
Weighted average GHG emissions intensity of all installations in 2016/2017	0,042	t CO ₂ e/Adt
Number of (sub-)installations using the benchmark for free allocation	31	
Number of (sub-)installations taken into account for the benchmark value update	34	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)	249 991	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021	19 633	EUA



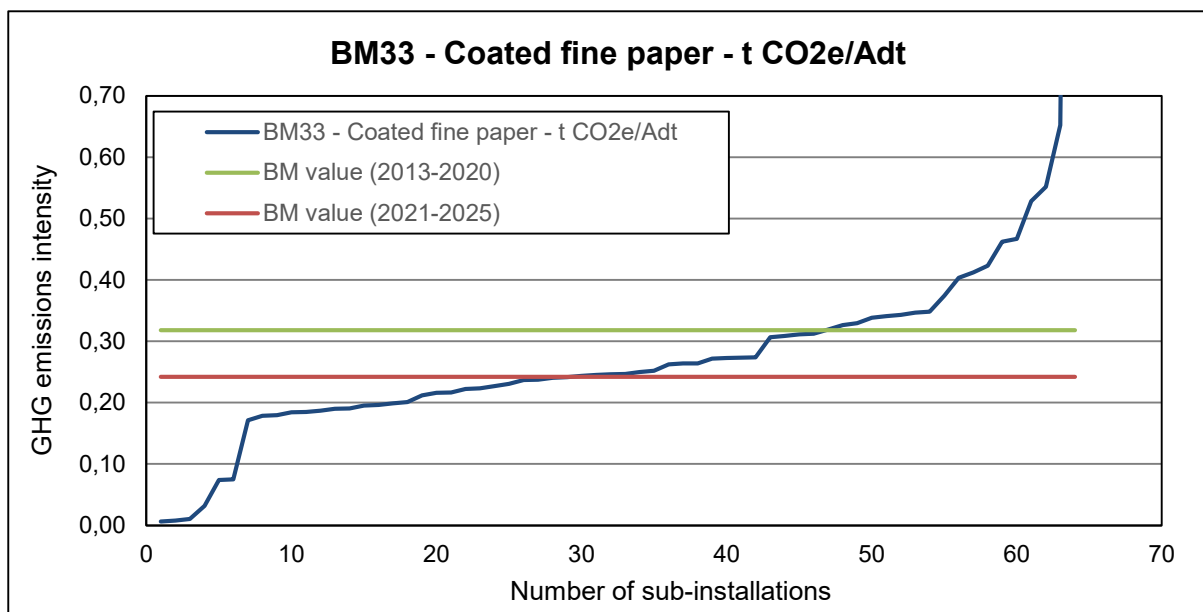
Key parameters for BM30 Recovered paper pulp	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	0,000	t CO ₂ e/Adt
Benchmark value for 2021-2025	0,030	t CO ₂ e/Adt
Benchmark value for phase 3, 2013 – 2020 (as a reference)	0,039	t CO ₂ e/Adt
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017	-11,11%	
Update rate in %/year applied to the phase 3 benchmark	-1,60%	
Update rate in % applied to the phase 3 benchmark	-24,0%	
Median GHG emissions intensity of all installations in 2016/2017	0,002	t CO ₂ e/Adt
Average GHG emissions intensity of all installations in 2016/2017	0,020	t CO ₂ e/Adt
Weighted average GHG emissions intensity of all installations in 2016/2017	0,017	t CO ₂ e/Adt
Number of (sub-)installations using the benchmark for free allocation	253	
Number of (sub-)installations taken into account for the benchmark value update	256	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)	621 837	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021	1 065 261	EUA



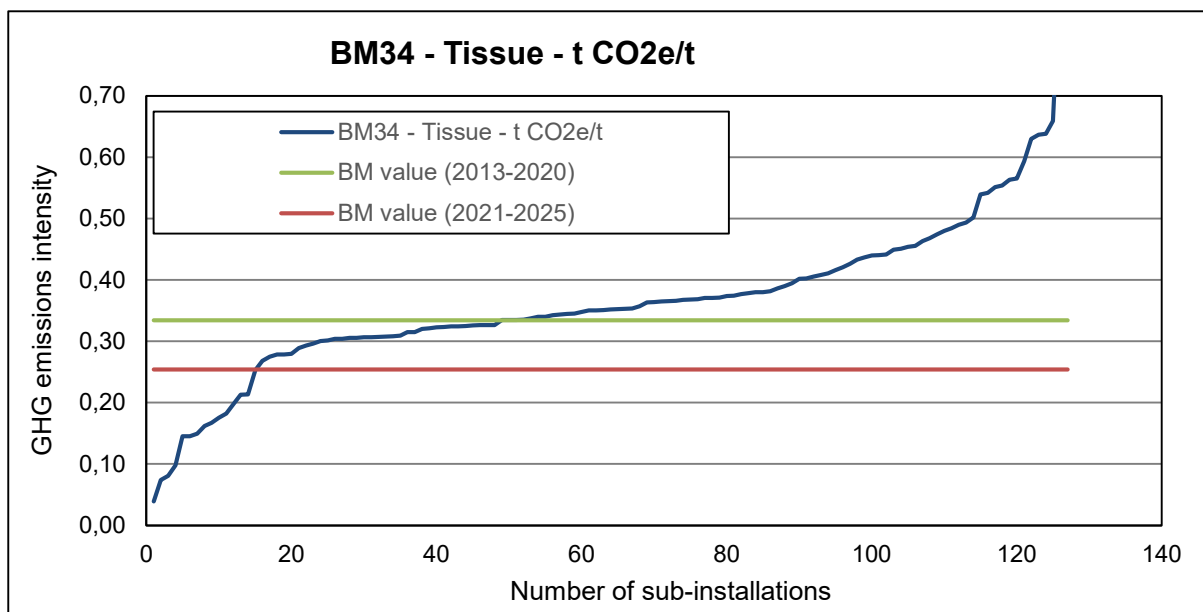
Key parameters for BM31 Newsprint	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	0,007	t CO ₂ e/Adt
Benchmark value for 2021-2025	0,226	t CO ₂ e/Adt
Benchmark value for phase 3, 2013 – 2020 (as a reference)	0,298	t CO ₂ e/Adt
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017	-10,85%	
Update rate in %/year applied to the phase 3 benchmark	-1,60%	
Update rate in % applied to the phase 3 benchmark	-24,0%	
Median GHG emissions intensity of all installations in 2016/2017	0,157	t CO ₂ e/Adt
Average GHG emissions intensity of all installations in 2016/2017	0,167	t CO ₂ e/Adt
Weighted average GHG emissions intensity of all installations in 2016/2017	0,161	t CO ₂ e/Adt
Number of (sub-)installations using the benchmark for free allocation	23	
Number of (sub-)installations taken into account for the benchmark value update	24	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)	1 017 364	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021	1 309 487	EUA



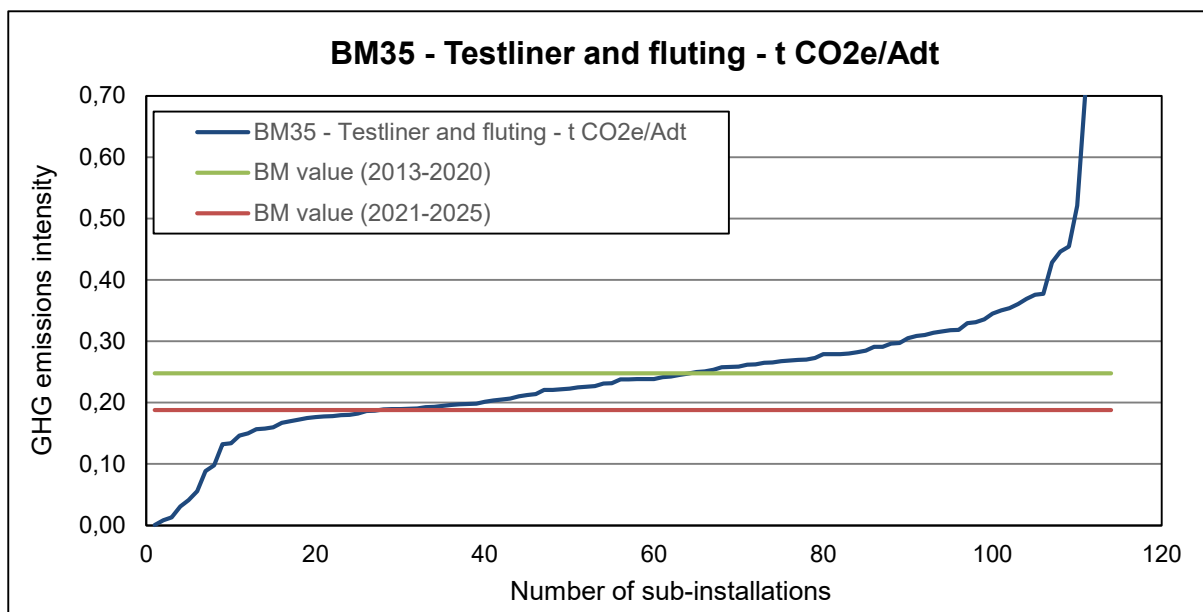
Key parameters for BM32 Uncoated fine paper	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	0,011	t CO ₂ e/Adt
Benchmark value for 2021-2025	0,242	t CO ₂ e/Adt
Benchmark value for phase 3, 2013 – 2020 (as a reference)	0,318	t CO ₂ e/Adt
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017	-10,73%	
Update rate in %/year applied to the phase 3 benchmark	-1,60%	
Update rate in % applied to the phase 3 benchmark	-24,0%	
Median GHG emissions intensity of all installations in 2016/2017	0,273	t CO ₂ e/Adt
Average GHG emissions intensity of all installations in 2016/2017	0,914	t CO ₂ e/Adt
Weighted average GHG emissions intensity of all installations in 2016/2017	0,179	t CO ₂ e/Adt
Number of (sub-)installations using the benchmark for free allocation	87	
Number of (sub-)installations taken into account for the benchmark value update	91	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)	2 485 893	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021	3 151 681	EUA



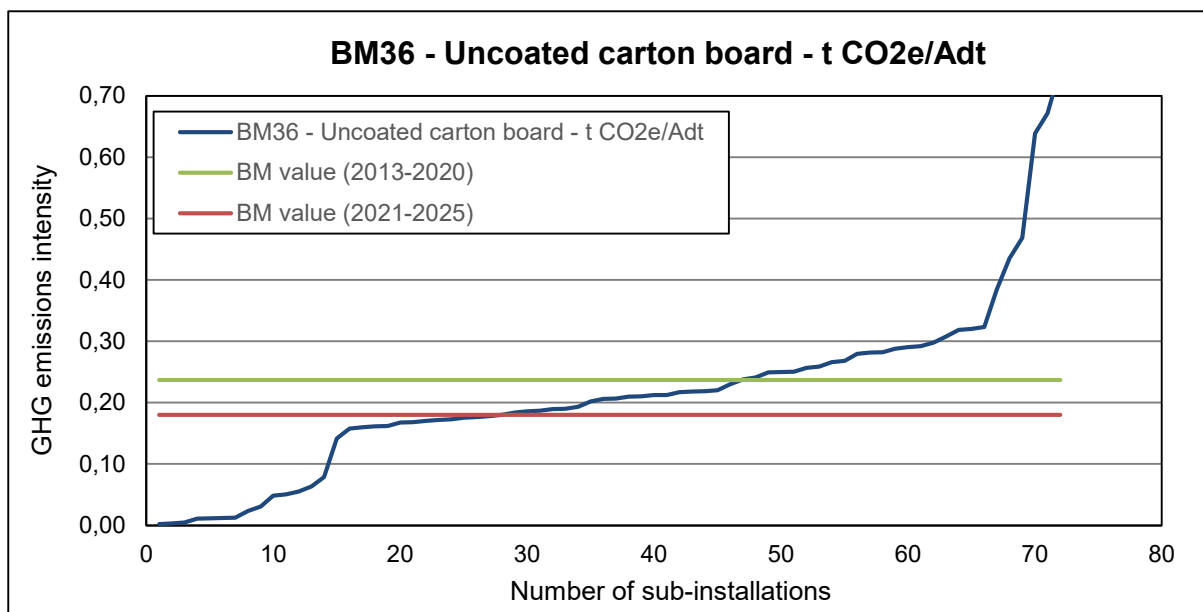
Key parameters for BM33 Coated fine paper	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	0,043	t CO ₂ e/Adt
Benchmark value for 2021-2025	0,242	t CO ₂ e/Adt
Benchmark value for phase 3, 2013 – 2020 (as a reference)	0,318	t CO ₂ e/Adt
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017	-9,61%	
Update rate in %/year applied to the phase 3 benchmark	-1,60%	
Update rate in % applied to the phase 3 benchmark	-24,0%	
Median GHG emissions intensity of all installations in 2016/2017	0,246	t CO ₂ e/Adt
Average GHG emissions intensity of all installations in 2016/2017	0,302	t CO ₂ e/Adt
Weighted average GHG emissions intensity of all installations in 2016/2017	0,219	t CO ₂ e/Adt
Number of (sub-)installations using the benchmark for free allocation	63	
Number of (sub-)installations taken into account for the benchmark value update	64	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)	3 244 348	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021	3 409 004	EUA



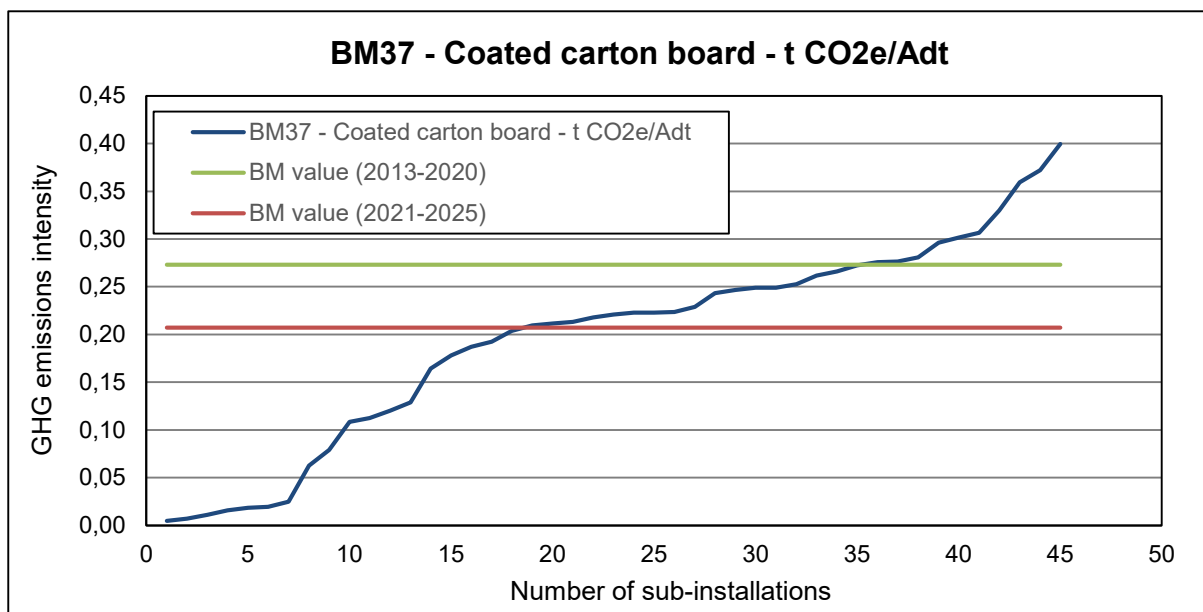
Key parameters for BM34 Tissue		Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017		0,139	t CO₂e/t
Benchmark value for 2021-2025		0,254	t CO₂e/t
Benchmark value for phase 3, 2013 – 2020 (as a reference)		0,334	t CO ₂ e/t
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017		-6,49%	
Update rate in %/year applied to the phase 3 benchmark		-1,60%	
Update rate in % applied to the phase 3 benchmark		-24,0%	
Median GHG emissions intensity of all installations in 2016/2017		0,352	t CO ₂ e/t
Average GHG emissions intensity of all installations in 2016/2017		0,369	t CO ₂ e/t
Weighted average GHG emissions intensity of all installations in 2016/2017		0,352	t CO ₂ e/t
Number of (sub-)installations using the benchmark for free allocation		128	
Number of (sub-)installations taken into account for the benchmark value update		127	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)		2 167 734	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021		1 517 281	EUA



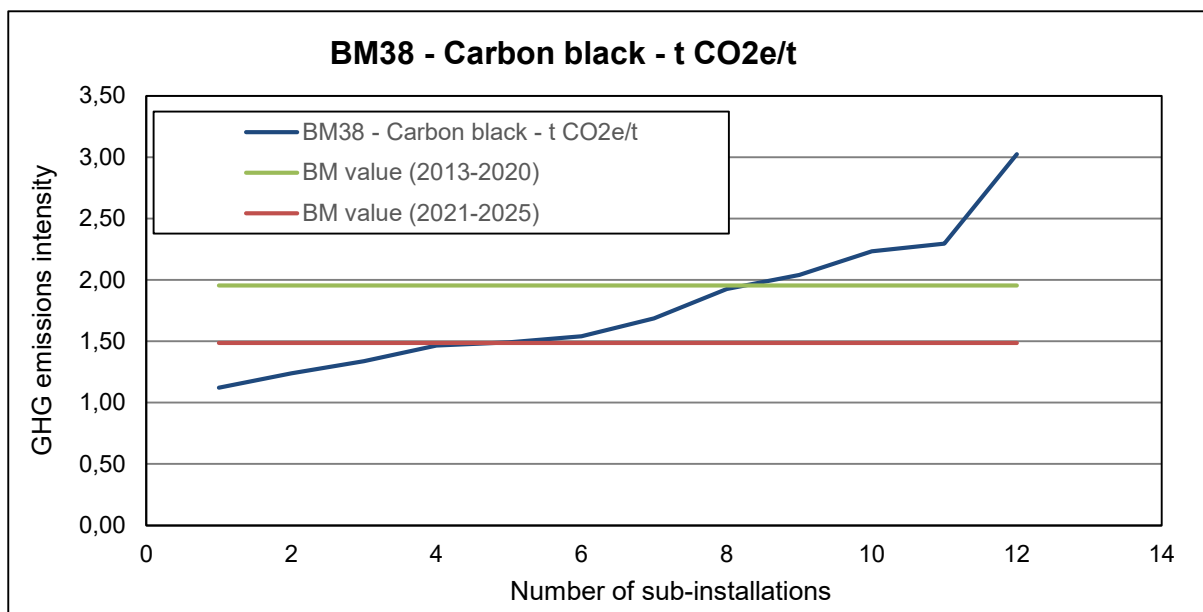
Key parameters for BM35 Testliner and fluting	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	0,071	t CO ₂ e/Adt
Benchmark value for 2021-2025	0,188	t CO ₂ e/Adt
Benchmark value for phase 3, 2013 – 2020 (as a reference)	0,248	t CO ₂ e/Adt
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017	-7,94%	
Update rate in %/year applied to the phase 3 benchmark	-1,60%	
Update rate in % applied to the phase 3 benchmark	-24,0%	
Median GHG emissions intensity of all installations in 2016/2017	0,238	t CO ₂ e/Adt
Average GHG emissions intensity of all installations in 2016/2017	0,258	t CO ₂ e/Adt
Weighted average GHG emissions intensity of all installations in 2016/2017	0,223	t CO ₂ e/Adt
Number of (sub-)installations using the benchmark for free allocation	118	
Number of (sub-)installations taken into account for the benchmark value update	114	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)	4 641 400	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021	3 880 504	EUA



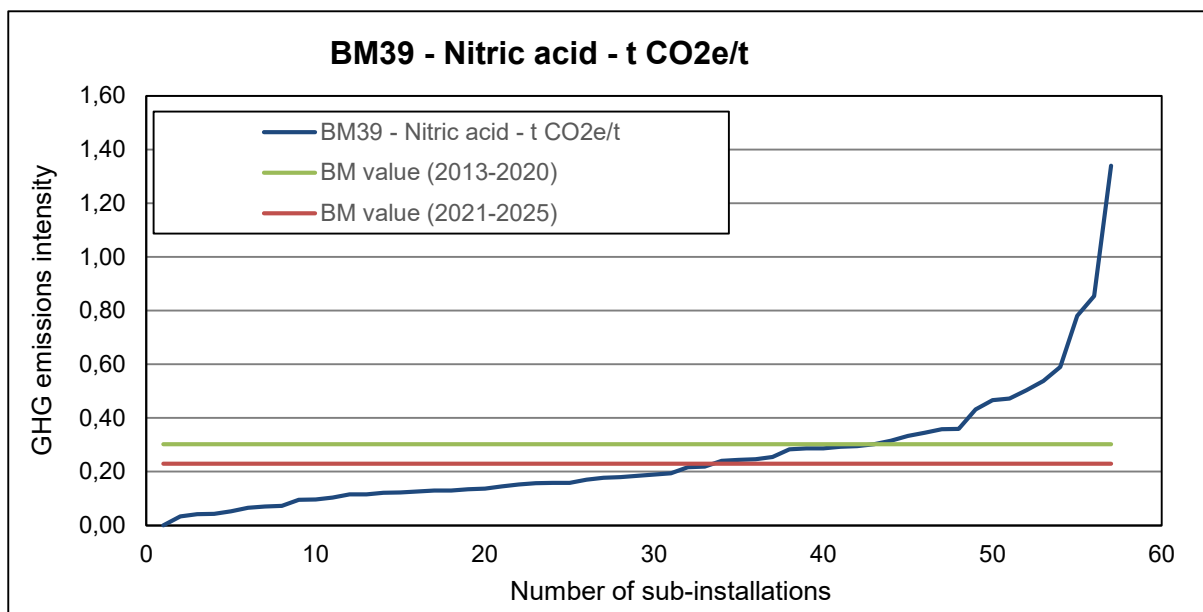
Key parameters for BM36 Uncoated carton board	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	0,009	t CO ₂ e/Adt
Benchmark value for 2021-2025	0,180	t CO ₂ e/Adt
Benchmark value for phase 3, 2013 – 2020 (as a reference)	0,237	t CO ₂ e/Adt
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017	-10,71%	
Update rate in %/year applied to the phase 3 benchmark	-1,60%	
Update rate in % applied to the phase 3 benchmark	-24,0%	
Median GHG emissions intensity of all installations in 2016/2017	0,206	t CO ₂ e/Adt
Average GHG emissions intensity of all installations in 2016/2017	0,213	t CO ₂ e/Adt
Weighted average GHG emissions intensity of all installations in 2016/2017	0,186	t CO ₂ e/Adt
Number of (sub-)installations using the benchmark for free allocation	71	
Number of (sub-)installations taken into account for the benchmark value update	72	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)	874 778	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021	792 054	EUA



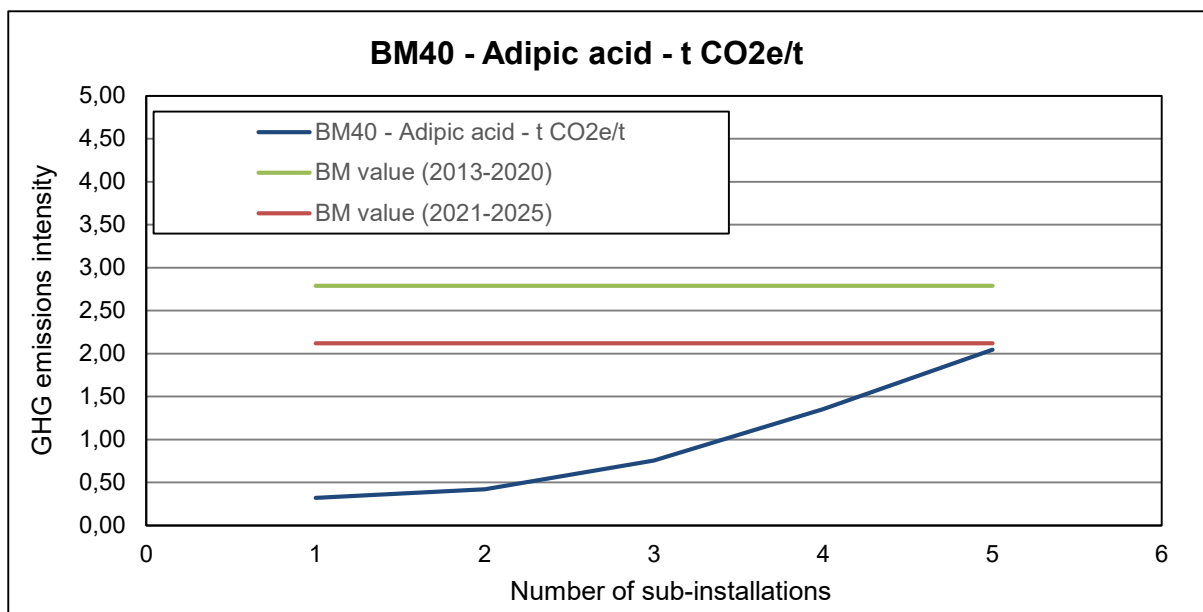
Key parameters for BM37 Coated carton board	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	0,011	t CO ₂ e/Adt
Benchmark value for 2021-2025	0,207	t CO ₂ e/Adt
Benchmark value for phase 3, 2013 – 2020 (as a reference)	0,273	t CO ₂ e/Adt
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017	-10,68%	
Update rate in %/year applied to the phase 3 benchmark	-1,60%	
Update rate in % applied to the phase 3 benchmark	-24,0%	
Median GHG emissions intensity of all installations in 2016/2017	0,221	t CO ₂ e/Adt
Average GHG emissions intensity of all installations in 2016/2017	0,197	t CO ₂ e/Adt
Weighted average GHG emissions intensity of all installations in 2016/2017	0,143	t CO ₂ e/Adt
Number of (sub-)installations using the benchmark for free allocation	46	
Number of (sub-)installations taken into account for the benchmark value update	45	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)	1 341 063	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021	1 911 301	EUA



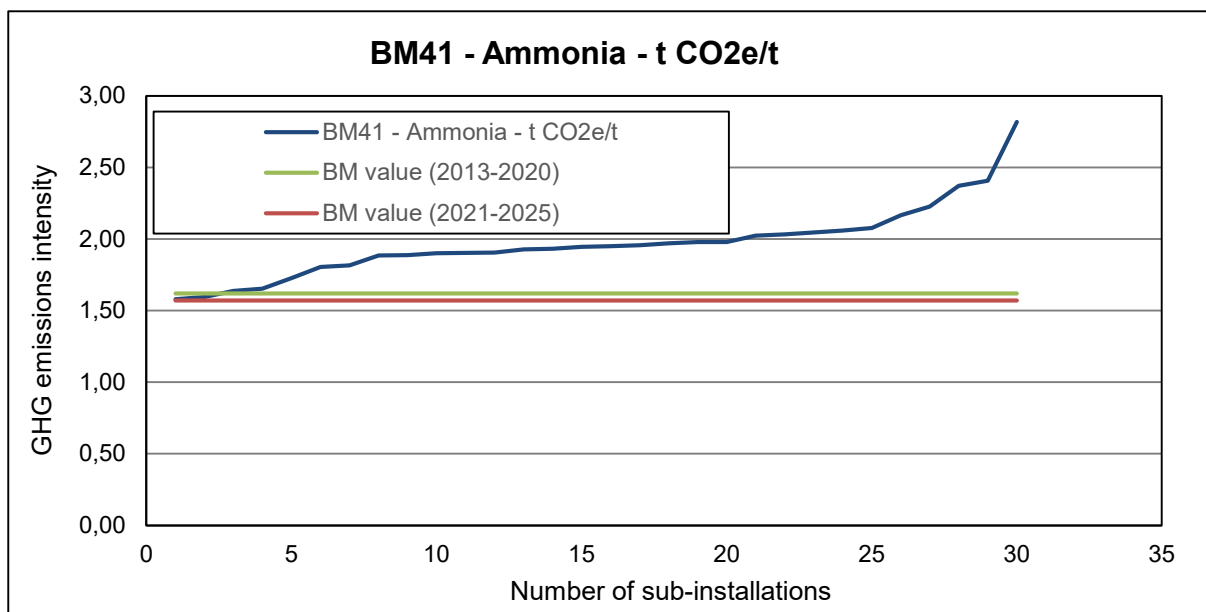
Key parameters for BM38 Carbon black		Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017		1,141	t CO₂e/t
Benchmark value for 2021-2025		1,485	t CO₂e/t
Benchmark value for phase 3, 2013 – 2020 (as a reference)		1,954	t CO ₂ e/t
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017		-4,62%	
Update rate in %/year applied to the phase 3 benchmark		-1,60%	
Update rate in % applied to the phase 3 benchmark		-24,0%	
Median GHG emissions intensity of all installations in 2016/2017		1,615	t CO ₂ e/t
Average GHG emissions intensity of all installations in 2016/2017		1,783	t CO ₂ e/t
Weighted average GHG emissions intensity of all installations in 2016/2017		1,824	t CO ₂ e/t
Number of (sub-)installations using the benchmark for free allocation		12	
Number of (sub-)installations taken into account for the benchmark value update		12	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)		1 824 820	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021		1 394 408	EUA



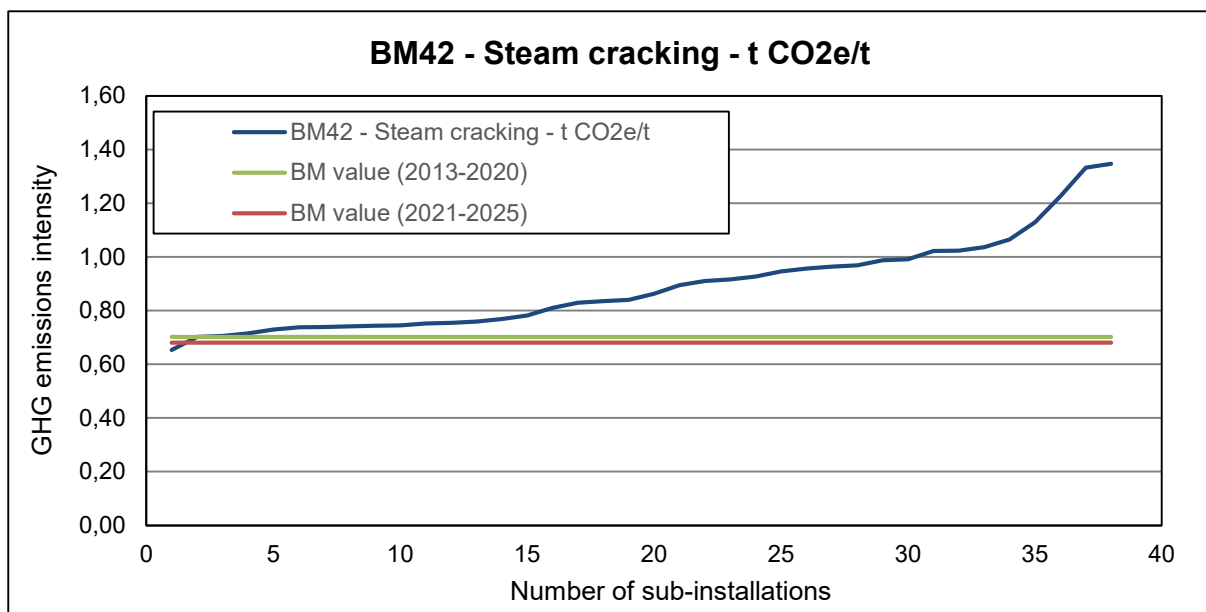
Key parameters for BM39 Nitric acid	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	0,038	t CO ₂ e/t
Benchmark value for 2021-2025	0,230	t CO ₂ e/t
Benchmark value for phase 3, 2013 – 2020 (as a reference)	0,302	t CO ₂ e/t
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017	-9,71%	
Update rate in %/year applied to the phase 3 benchmark	-1,60%	
Update rate in % applied to the phase 3 benchmark	-24,0%	
Median GHG emissions intensity of all installations in 2016/2017	0,184	t CO ₂ e/t
Average GHG emissions intensity of all installations in 2016/2017	0,255	t CO ₂ e/t
Weighted average GHG emissions intensity of all installations in 2016/2017	0,205	t CO ₂ e/t
Number of (sub-)installations using the benchmark for free allocation	57	
Number of (sub-)installations taken into account for the benchmark value update	57	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)	4 297 166	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021	4 614 965	EUA



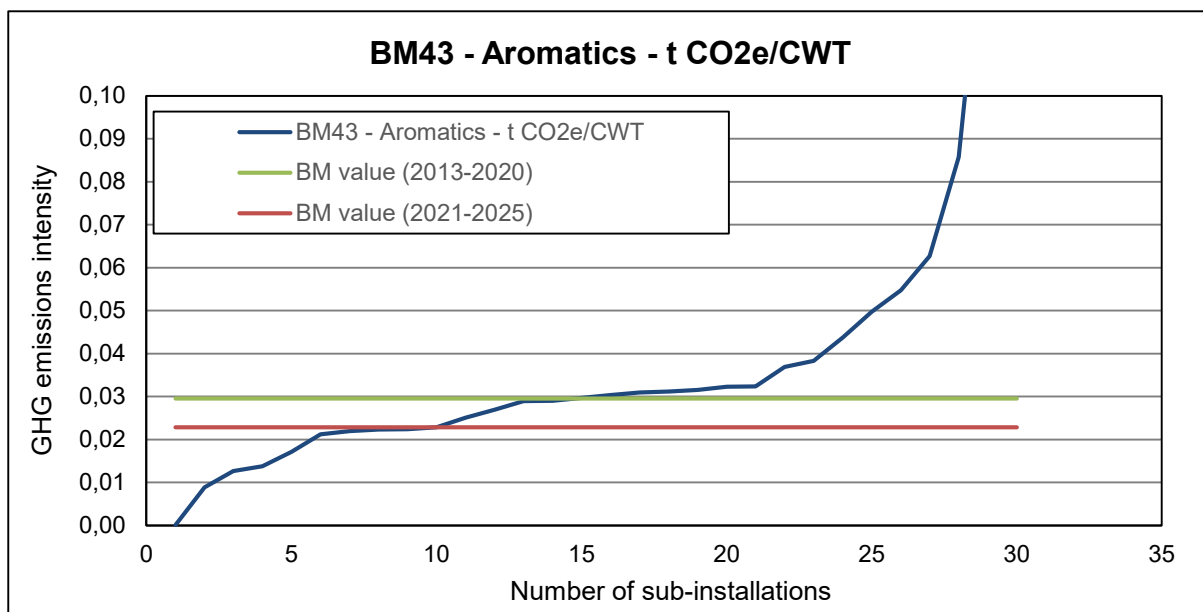
Key parameters for BM40 Adipic acid	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	0,32	t CO ₂ e/t
Benchmark value for 2021-2025	2,12	t CO ₂ e/t
Benchmark value for phase 3, 2013 – 2020 (as a reference)	2,79	t CO ₂ e/t
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017	-9,84%	
Update rate in %/year applied to the phase 3 benchmark	-1,60%	
Update rate in % applied to the phase 3 benchmark	-24,0%	
Median GHG emissions intensity of all installations in 2016/2017	0,76	t CO ₂ e/t
Average GHG emissions intensity of all installations in 2016/2017	0,98	t CO ₂ e/t
Weighted average GHG emissions intensity of all installations in 2016/2017	1,14	t CO ₂ e/t
Number of (sub-)installations using the benchmark for free allocation	5	
Number of (sub-)installations taken into account for the benchmark value update	5	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)	857 227	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021	1 468 379	EUA



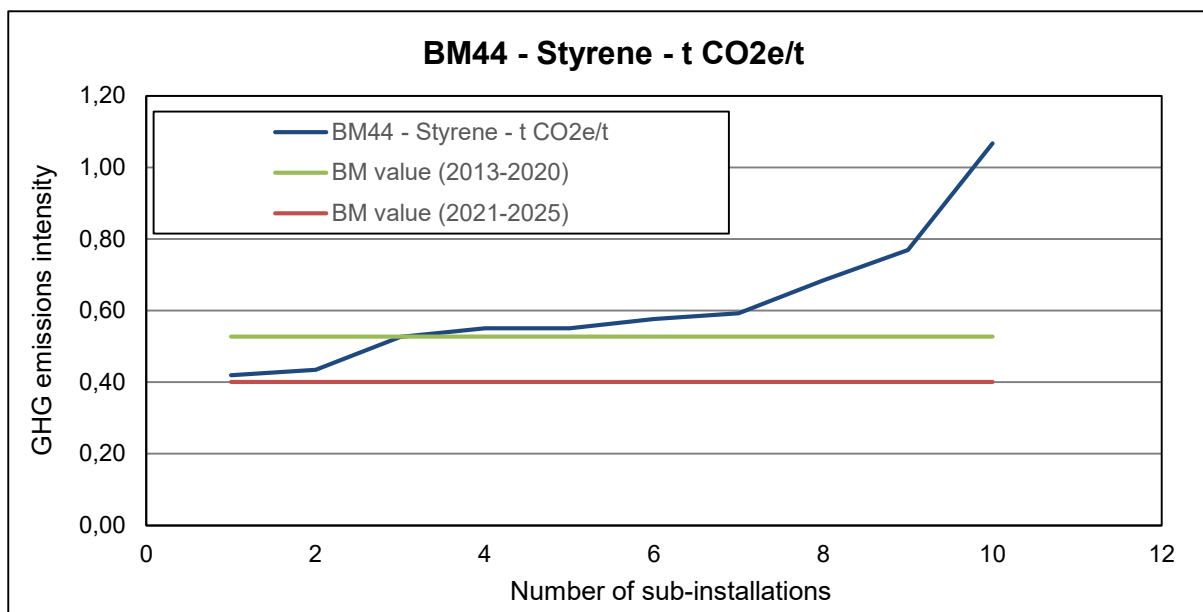
Key parameters for BM41 Ammonia	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	1,604	t CO ₂ e/t
Benchmark value for 2021-2025	1,570	t CO ₂ e/t
Benchmark value for phase 3, 2013 – 2020 (as a reference)	1,619	t CO ₂ e/t
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017	-0,11%	
Update rate in %/year applied to the phase 3 benchmark	-0,20%	
Update rate in % applied to the phase 3 benchmark	-3,0%	
Median GHG emissions intensity of all installations in 2016/2017	1,948	t CO ₂ e/t
Average GHG emissions intensity of all installations in 2016/2017	1,972	t CO ₂ e/t
Weighted average GHG emissions intensity of all installations in 2016/2017	1,947	t CO ₂ e/t
Number of (sub-)installations using the benchmark for free allocation	35	
Number of (sub-)installations taken into account for the benchmark value update	30	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)	30 588 525	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021	23 958 607	EUA



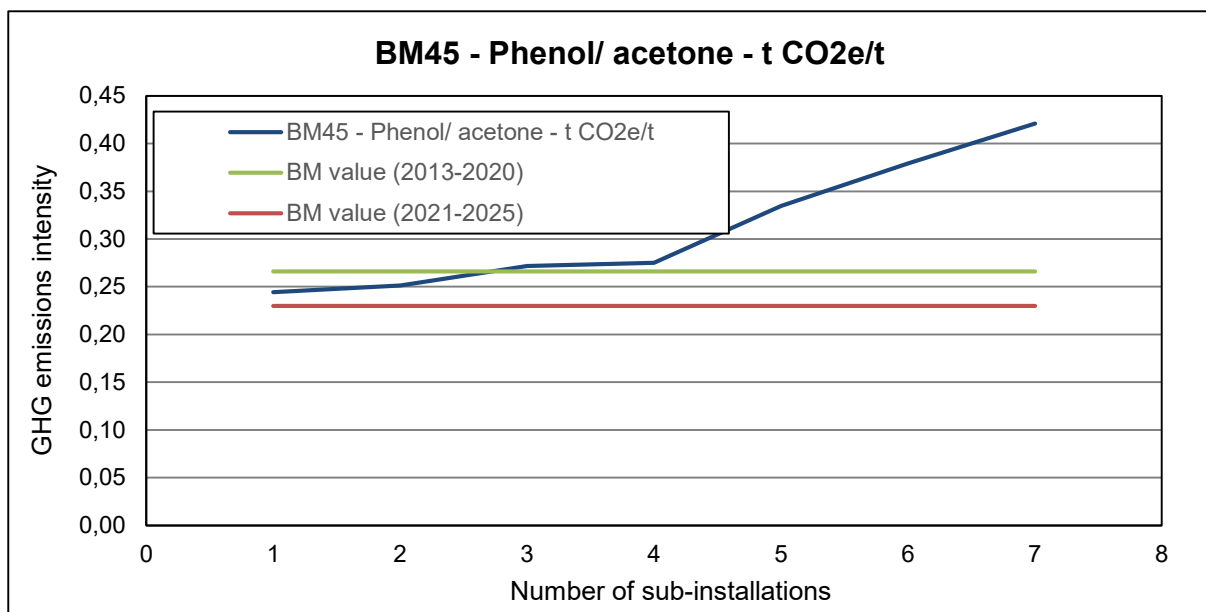
Key parameters for BM42 Steam cracking		Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017		0,693	t CO₂e/t
Benchmark value for 2021-2025		0,681	t CO₂e/t
Benchmark value for phase 3, 2013 – 2020 (as a reference)		0,702	t CO ₂ e/t
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017		-0,15%	
Update rate in %/year applied to the phase 3 benchmark		-0,20%	
Update rate in % applied to the phase 3 benchmark		-3,0%	
Median GHG emissions intensity of all installations in 2016/2017		0,851	t CO ₂ e/t
Average GHG emissions intensity of all installations in 2016/2017		0,891	t CO ₂ e/t
Weighted average GHG emissions intensity of all installations in 2016/2017		0,849	t CO ₂ e/t
Number of (sub-)installations using the benchmark for free allocation		39	
Number of (sub-)installations taken into account for the benchmark value update		38	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)		31 393 609	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021		22 816 634	EUA



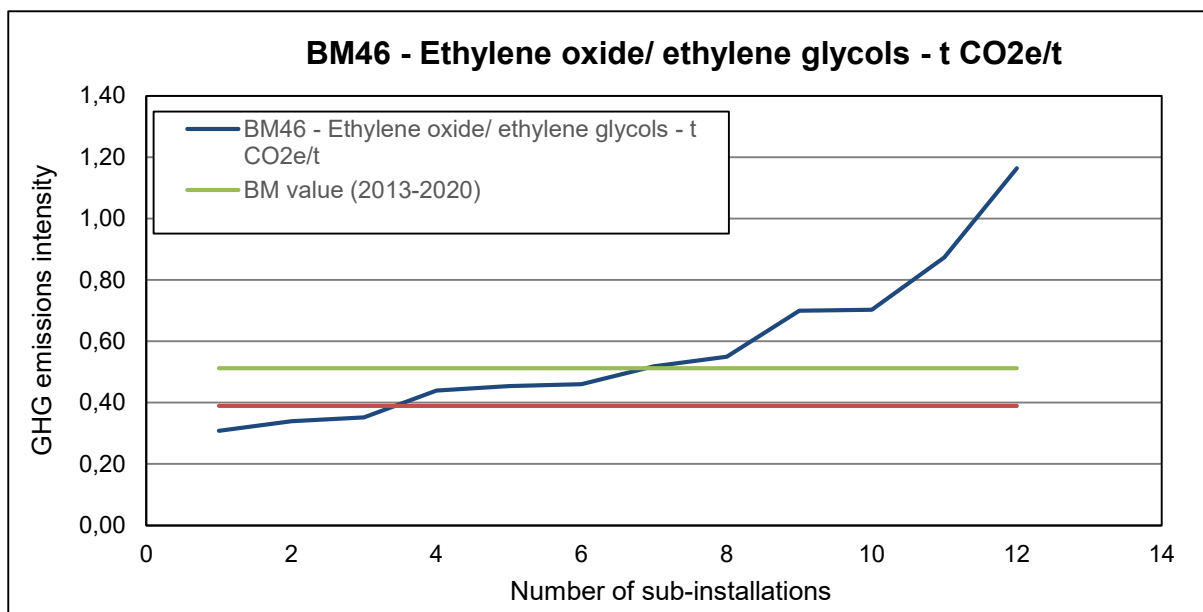
Key parameters for BM43 Aromatics		Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017		0,0072	t CO₂e/CWT
Benchmark value for 2021-2025		0,0228	t CO₂e/CWT
Benchmark value for phase 3, 2013 – 2020 (as a reference)		0,0295	t CO ₂ e/CWT
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017		-8,40%	
Update rate in %/year applied to the phase 3 benchmark		-1,51%	
Update rate in % applied to the phase 3 benchmark		-22,7%	
Median GHG emissions intensity of all installations in 2016/2017		0,0300	t CO ₂ e/CWT
Average GHG emissions intensity of all installations in 2016/2017		0,0389	t CO ₂ e/CWT
Weighted average GHG emissions intensity of all installations in 2016/2017		0,0292	t CO ₂ e/CWT
Number of (sub-)installations using the benchmark for free allocation		29	
Number of (sub-)installations taken into account for the benchmark value update		30	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)		1 896 871	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021		1 139 604	EUA



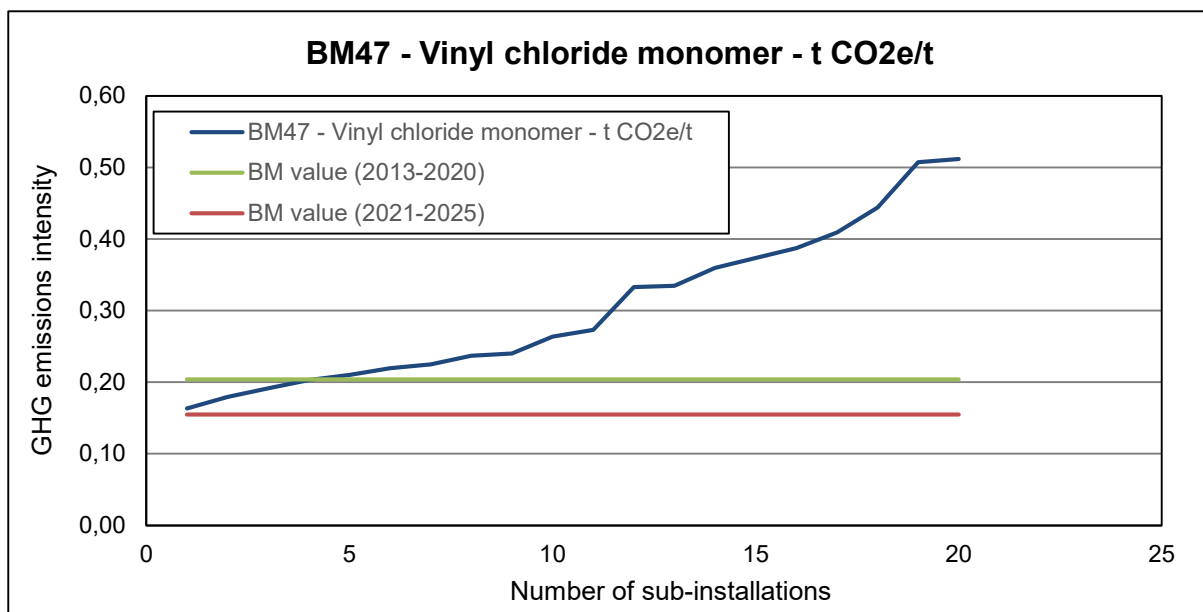
Key parameters for BM44 Styrene		Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017		0,419	t CO₂e/t
Benchmark value for 2021-2025		0,401	t CO₂e/t
Benchmark value for phase 3, 2013 – 2020 (as a reference)		0,527	t CO ₂ e/t
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017		-2,27%	
Update rate in %/year applied to the phase 3 benchmark		-1,60%	
Update rate in % applied to the phase 3 benchmark		-24,0%	
Median GHG emissions intensity of all installations in 2016/2017		0,564	t CO ₂ e/t
Average GHG emissions intensity of all installations in 2016/2017		0,617	t CO ₂ e/t
Weighted average GHG emissions intensity of all installations in 2016/2017		0,558	t CO ₂ e/t
Number of (sub-)installations using the benchmark for free allocation		11	
Number of (sub-)installations taken into account for the benchmark value update		10	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)		2 676 322	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021		1 655 811	EUA



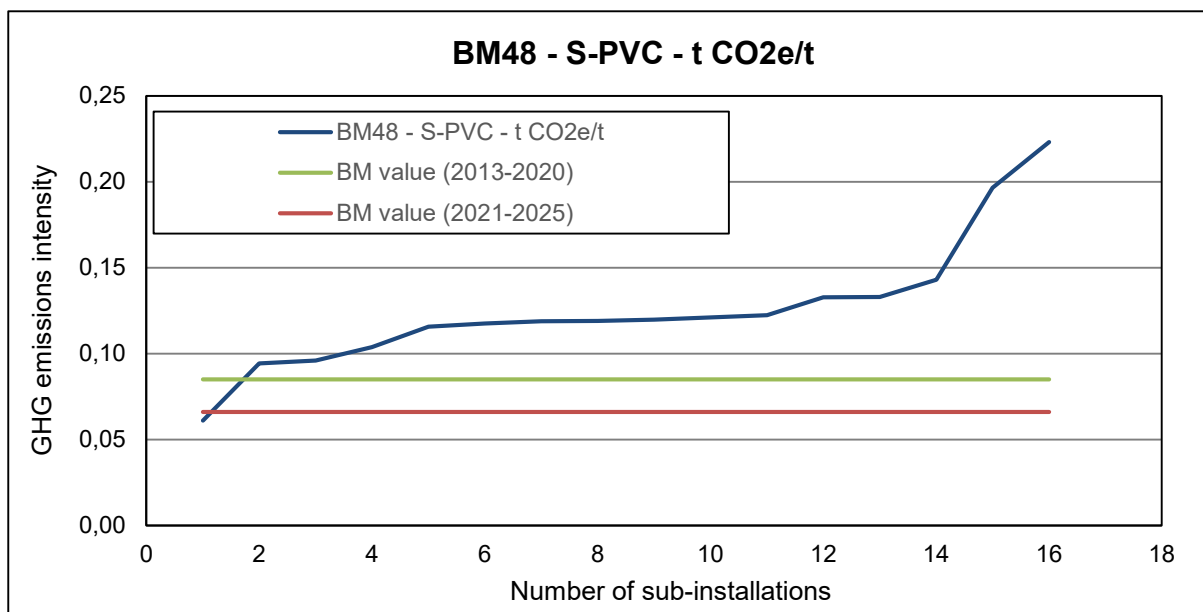
Key parameters for BM45 Phenol/ acetone	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	0,244	t CO ₂ e/t
Benchmark value for 2021-2025	0,230	t CO ₂ e/t
Benchmark value for phase 3, 2013 – 2020 (as a reference)	0,266	t CO ₂ e/t
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017	-0,90%	
Update rate in %/year applied to the phase 3 benchmark	-0,90%	
Update rate in % applied to the phase 3 benchmark	-13,5%	
Median GHG emissions intensity of all installations in 2016/2017	0,275	t CO ₂ e/t
Average GHG emissions intensity of all installations in 2016/2017	0,311	t CO ₂ e/t
Weighted average GHG emissions intensity of all installations in 2016/2017	0,319	t CO ₂ e/t
Number of (sub-)installations using the benchmark for free allocation	7	
Number of (sub-)installations taken into account for the benchmark value update	7	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)	1 200 943	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021	812 138	EUA



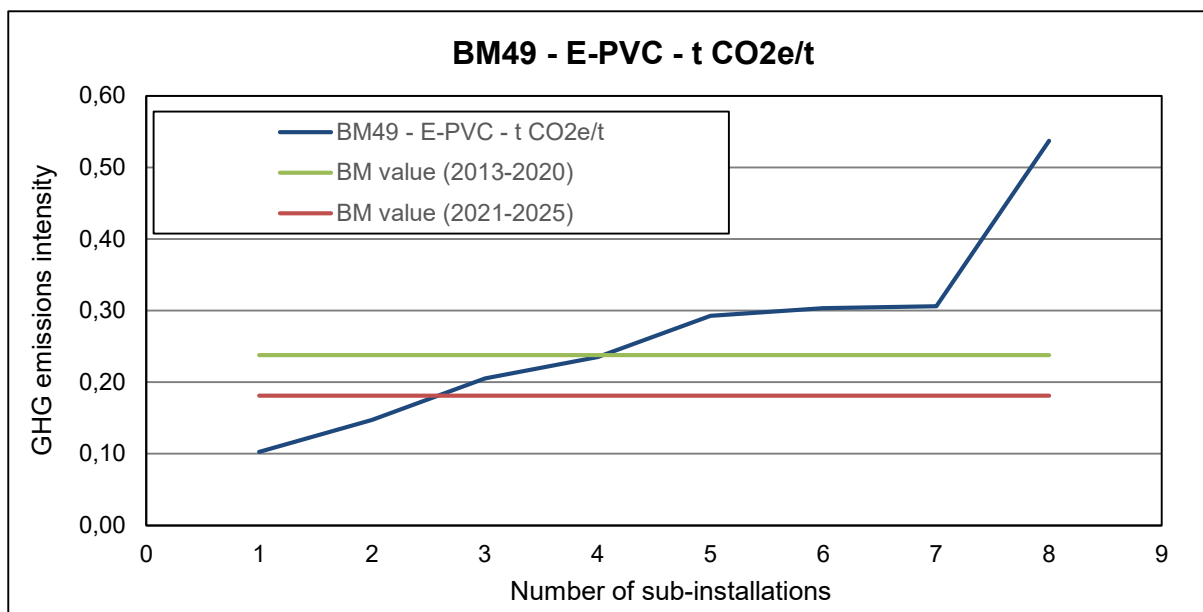
Key parameters for BM46 Ethylene oxide/ ethylene glycols	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	0,314	t CO ₂ e/t
Benchmark value for 2021-2025	0,389	t CO ₂ e/t
Benchmark value for phase 3, 2013 – 2020 (as a reference)	0,512	t CO ₂ e/t
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017	-4,30%	
Update rate in %/year applied to the phase 3 benchmark	-1,60%	
Update rate in % applied to the phase 3 benchmark	-24,0%	
Median GHG emissions intensity of all installations in 2016/2017	0,489	t CO ₂ e/t
Average GHG emissions intensity of all installations in 2016/2017	0,572	t CO ₂ e/t
Weighted average GHG emissions intensity of all installations in 2016/2017	0,510	t CO ₂ e/t
Number of (sub-)installations using the benchmark for free allocation	12	
Number of (sub-)installations taken into account for the benchmark value update	12	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)	1 484 310	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021	839 637	EUA



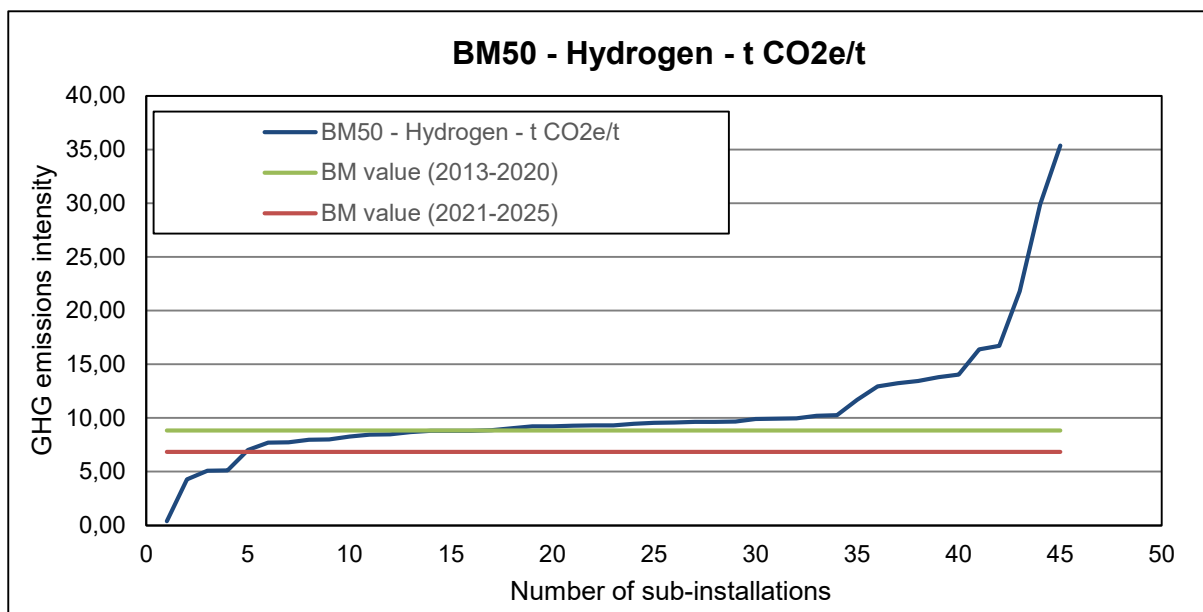
Key parameters for BM47 Vinyl chloride monomer	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	0,171	t CO ₂ e/t
Benchmark value for 2021-2025	0,155	t CO ₂ e/t
Benchmark value for phase 3, 2013 – 2020 (as a reference)	0,204	t CO ₂ e/t
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017	-1,78%	
Update rate in %/year applied to the phase 3 benchmark	-1,60%	
Update rate in % applied to the phase 3 benchmark	-24,0%	
Median GHG emissions intensity of all installations in 2016/2017	0,268	t CO ₂ e/t
Average GHG emissions intensity of all installations in 2016/2017	0,303	t CO ₂ e/t
Weighted average GHG emissions intensity of all installations in 2016/2017	0,277	t CO ₂ e/t
Number of (sub-)installations using the benchmark for free allocation	20	
Number of (sub-)installations taken into account for the benchmark value update	20	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)	1 639 059	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021	758 335	EUA



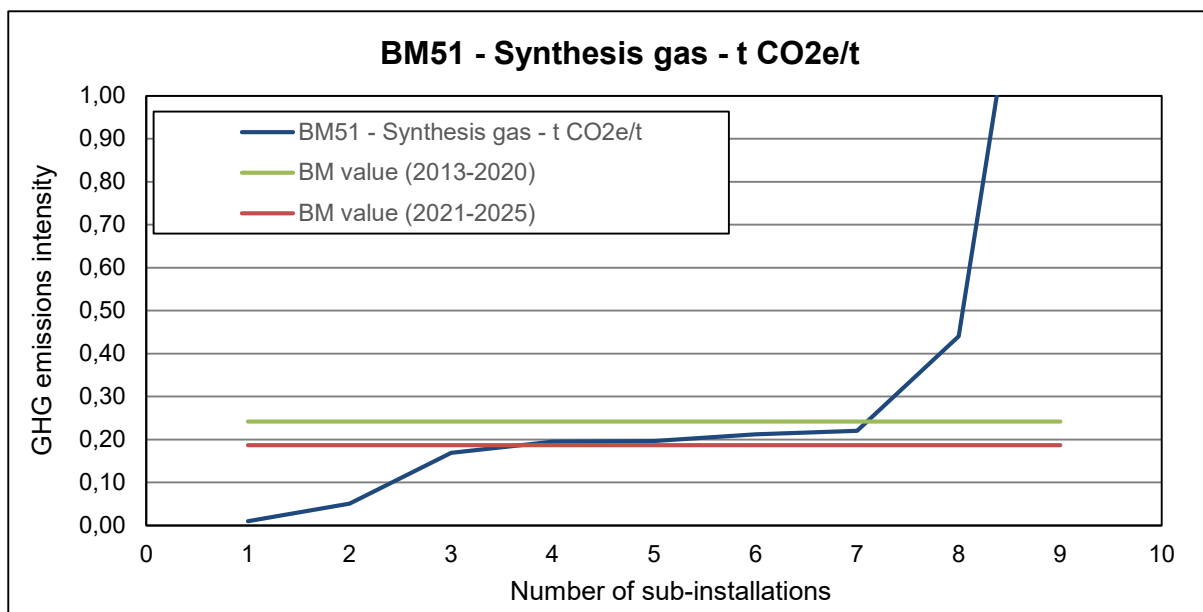
Key parameters for BM48 S-PVC		Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017		0,073	t CO₂e/t
Benchmark value for 2021-2025		0,066	t CO₂e/t
Benchmark value for phase 3, 2013 – 2020 (as a reference)		0,085	t CO ₂ e/t
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017		-1,51%	
Update rate in %/year applied to the phase 3 benchmark		-1,51%	
Update rate in % applied to the phase 3 benchmark		-22,7%	
Median GHG emissions intensity of all installations in 2016/2017		0,119	t CO ₂ e/t
Average GHG emissions intensity of all installations in 2016/2017		0,126	t CO ₂ e/t
Weighted average GHG emissions intensity of all installations in 2016/2017		0,120	t CO ₂ e/t
Number of (sub-)installations using the benchmark for free allocation		16	
Number of (sub-)installations taken into account for the benchmark value update		16	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)		400 288	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021		216 193	EUA



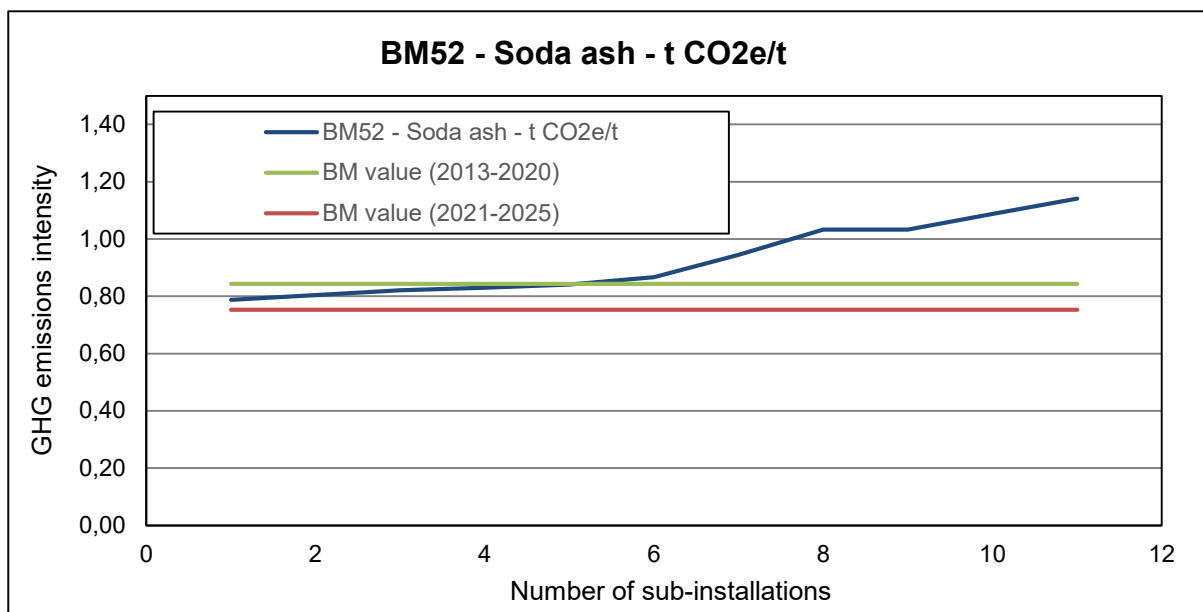
Key parameters for BM49 E-PVC		Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017		0,103	t CO₂e/t
Benchmark value for 2021-2025		0,181	t CO₂e/t
Benchmark value for phase 3, 2013 – 2020 (as a reference)		0,238	t CO ₂ e/t
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017		-6,32%	
Update rate in %/year applied to the phase 3 benchmark		-1,60%	
Update rate in % applied to the phase 3 benchmark		-24,0%	
Median GHG emissions intensity of all installations in 2016/2017		0,264	t CO ₂ e/t
Average GHG emissions intensity of all installations in 2016/2017		0,266	t CO ₂ e/t
Weighted average GHG emissions intensity of all installations in 2016/2017		0,230	t CO ₂ e/t
Number of (sub-)installations using the benchmark for free allocation		8	
Number of (sub-)installations taken into account for the benchmark value update		8	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)		96 197	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021		61 707	EUA



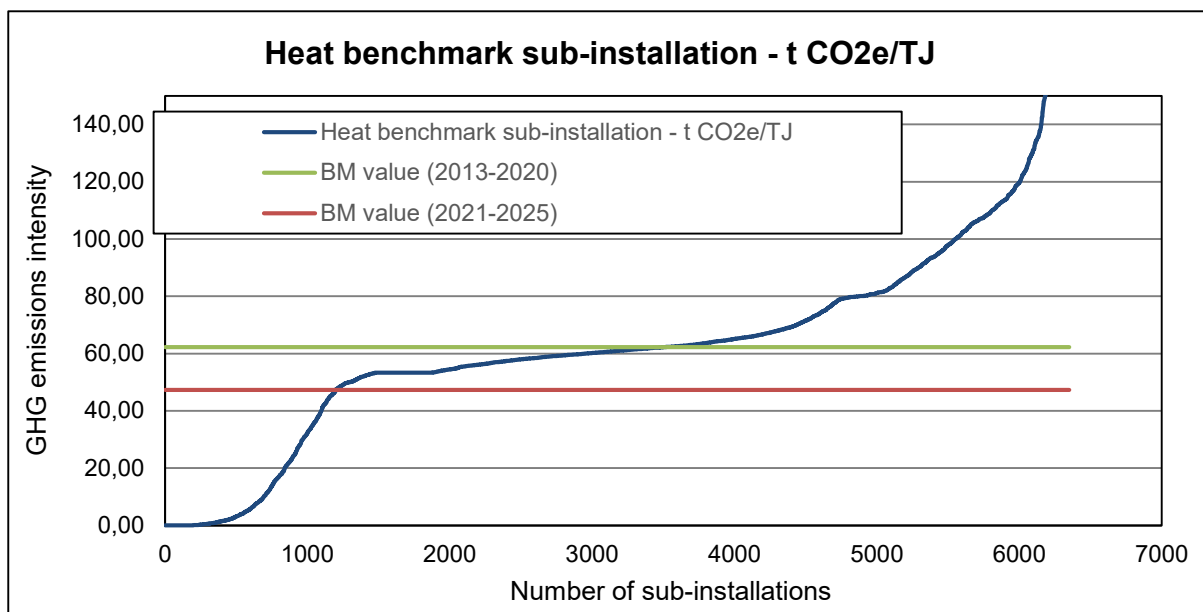
Key parameters for BM50 Hydrogen	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	4,09	t CO ₂ e/t
Benchmark value for 2021-2025	6,84	t CO ₂ e/t
Benchmark value for phase 3, 2013 – 2020 (as a reference)	8,85	t CO ₂ e/t
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017	-5,98%	
Update rate in %/year applied to the phase 3 benchmark	-1,51%	
Update rate in % applied to the phase 3 benchmark	-22,7%	
Median GHG emissions intensity of all installations in 2016/2017	9,32	t CO ₂ e/t
Average GHG emissions intensity of all installations in 2016/2017	10,78	t CO ₂ e/t
Weighted average GHG emissions intensity of all installations in 2016/2017	8,88	t CO ₂ e/t
Number of (sub-)installations using the benchmark for free allocation	49	
Number of (sub-)installations taken into account for the benchmark value update	45	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)	7 051 720	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021	5 074 480	EUA



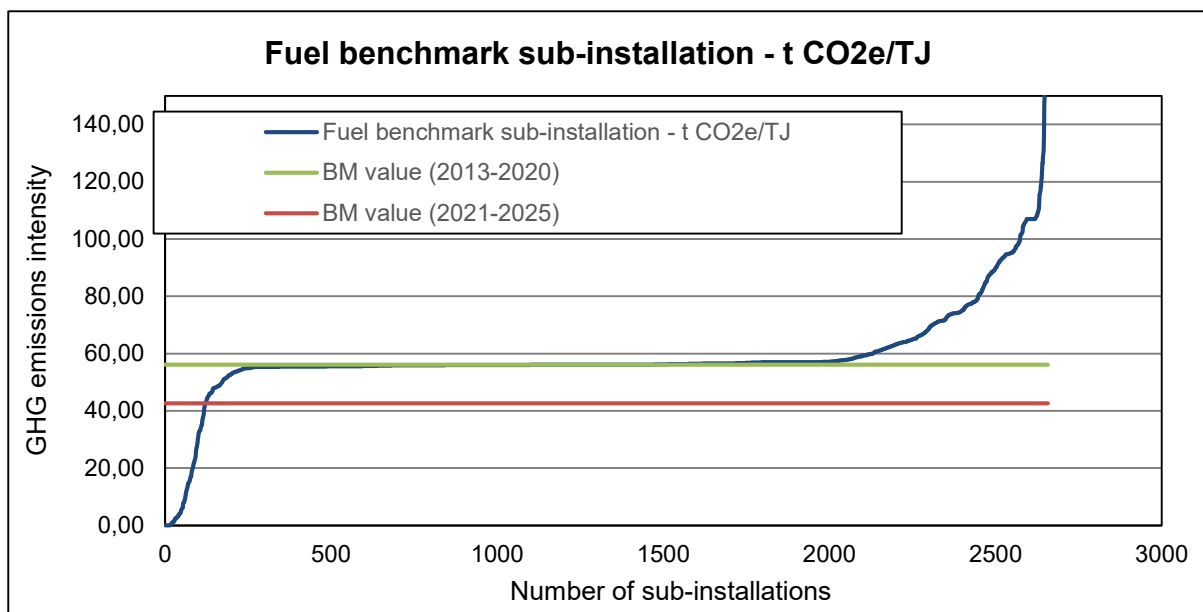
Key parameters for BM51 Synthesis gas	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	0,009	t CO ₂ e/t
Benchmark value for 2021-2025	0,187	t CO ₂ e/t
Benchmark value for phase 3, 2013 – 2020 (as a reference)	0,242	t CO ₂ e/t
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017	-10,68%	
Update rate in %/year applied to the phase 3 benchmark	-1,51%	
Update rate in % applied to the phase 3 benchmark	-22,7%	
Median GHG emissions intensity of all installations in 2016/2017	0,197	t CO ₂ e/t
Average GHG emissions intensity of all installations in 2016/2017	0,381	t CO ₂ e/t
Weighted average GHG emissions intensity of all installations in 2016/2017	0,155	t CO ₂ e/t
Number of (sub-)installations using the benchmark for free allocation	10	
Number of (sub-)installations taken into account for the benchmark value update	9	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)	357 368	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021	317 371	EUA



Key parameters for BM52 Soda ash	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	0,789	t CO₂e/t
Benchmark value for 2021-2025	0,753	t CO₂e/t
Benchmark value for phase 3, 2013 – 2020 (as a reference)	0,843	t CO ₂ e/t
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017	-0,71%	
Update rate in %/year applied to the phase 3 benchmark	-0,71%	
Update rate in % applied to the phase 3 benchmark	-10,7%	
Median GHG emissions intensity of all installations in 2016/2017	0,866	t CO ₂ e/t
Average GHG emissions intensity of all installations in 2016/2017	0,926	t CO ₂ e/t
Weighted average GHG emissions intensity of all installations in 2016/2017	0,945	t CO ₂ e/t
Number of (sub-)installations using the benchmark for free allocation	12	
Number of (sub-)installations taken into account for the benchmark value update	11	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)	7 218 816	t CO ₂ e
Preliminary free allocation covered by benchmark in 2021	5 497 992	EUA



Key parameters for Heat benchmark sub-installation	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	1,6	t CO ₂ e/TJ
Benchmark value for 2021-2025	47,3	t CO ₂ e/TJ
Benchmark value for phase 3, 2013 – 2020 (as a reference)	62,3	t CO ₂ e/TJ
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017	-10,83%	
Update rate in %/year applied to the phase 3 benchmark	-1,60%	
Update rate in % applied to the phase 3 benchmark	-24,0%	
Median GHG emissions intensity of all installations in 2016/2017	60,9	t CO ₂ e/TJ
Average GHG emissions intensity of all installations in 2016/2017	83,7	t CO ₂ e/TJ
Weighted average GHG emissions intensity of all installations in 2016/2017	76,8	t CO ₂ e/TJ
Number of (sub-)installations using the benchmark for free allocation	6 619	
Number of (sub-)installations taken into account for the benchmark value update	6 350	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)	212 553 983	t CO ₂ e
CL sub-installation	74 186 492	
non-CL sub-installation	60 818 938	
District heating sub-installation	77 548 553	
Preliminary free allocation covered by benchmark in 2021	79 883 758	EUA
CL sub-installation	59 340 064	
non-CL sub-installation	4 319 936	
District heating sub-installation	16 223 758	



Key parameters for Fuel benchmark sub-installation	Value	Unit
Average GHG emissions intensity of the 10% most efficient installations in 2016/2017	34,3	t CO ₂ e/TJ
Benchmark value for 2021-2025	42,6	t CO ₂ e/TJ
Benchmark value for phase 3, 2013 – 2020 (as a reference)	56,1	t CO ₂ e/TJ
Calculated update rate in %/year for the period from 2007/2008 to 2016/2017	-4,31%	
Update rate in %/year applied to the phase 3 benchmark	-1,60%	
Update rate in % applied to the phase 3 benchmark	-24,0%	
Median GHG emissions intensity of all installations in 2016/2017	56,1	t CO ₂ e/TJ
Average GHG emissions intensity of all installations in 2016/2017	60,0	t CO ₂ e/TJ
Weighted average GHG emissions intensity of all installations in 2016/2017	57,9	t CO ₂ e/TJ
Number of (sub-)installations using the benchmark for free allocation	2 789	
Number of (sub-)installations taken into account for the benchmark value update	2 657	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017)	58 812 970	t CO ₂ e
CL sub-installation	46 709 968	
non-CL sub-installation	12 103 002	
Preliminary free allocation covered by benchmark in 2021	36 183 747	EUA
CL sub-installation	33 503 034	
non-CL sub-installation	2 680 713	

Key parameters for Process Emissions sub-installation	Value	Unit
Number of (sub-)installations using the benchmark for free allocation	995	
(Attributed) GHG emissions covered by benchmark (average of 2016/2017) CL sub-installation non-CL sub-installation	19 523 842 19 401 227 122 615	t CO _{2e}
Preliminary free allocation covered by benchmark in 2021 CL sub-installation non-CL sub-installation	18 288 675 18 249 124 39 551	EUA

Glossary

Adt.....Air dried tonne

CWT.....CO₂ weighted tonne

EUA.....European Union Allowance