From process to product: making free allocation more effective

sandbag
smarter climate policy

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Although the European carbon market has recently been amended, work on its most important reform is only just starting. As per the amended EU ETS Directive, which is in the process of being formally approved by the Council and the Parliament, the allocation rules of free emission permits (so-called "benchmarks") will now have to undergo a review.

Free allocation, a cornerstone of the carbon market

Free allocation is often seen as a protection measure for EU industry (which might otherwise leave the continent) and a matter of revenue distribution, as it reserves a share of the carbon market's trillion euro value for EU-based industrial plants instead of spending it in other ways. However, this system is heavily flawed: it creates obstacles to decarbonisation and innovation, and significantly undermines the carbon market itself.

This is mainly because free allocation is based on the way goods are produced rather than the goods themselves: it is *process-based*. Differentiated benchmarks for the same type of goods disincentivise transition to cleaner processes, as the more polluting processes receive more permits. For example, in the case of steel, the more polluting blast furnace production route typically receives about 25 times more free permits than the cleaner electric arc furnace route.

The European Commission rightly initiated a makeover of the mechanism, by proposing 1) a Carbon Border Adjustment Mechanism (CBAM) in substitution to free allocation for some sectors, and 2) a review of the free allocation benchmarks.

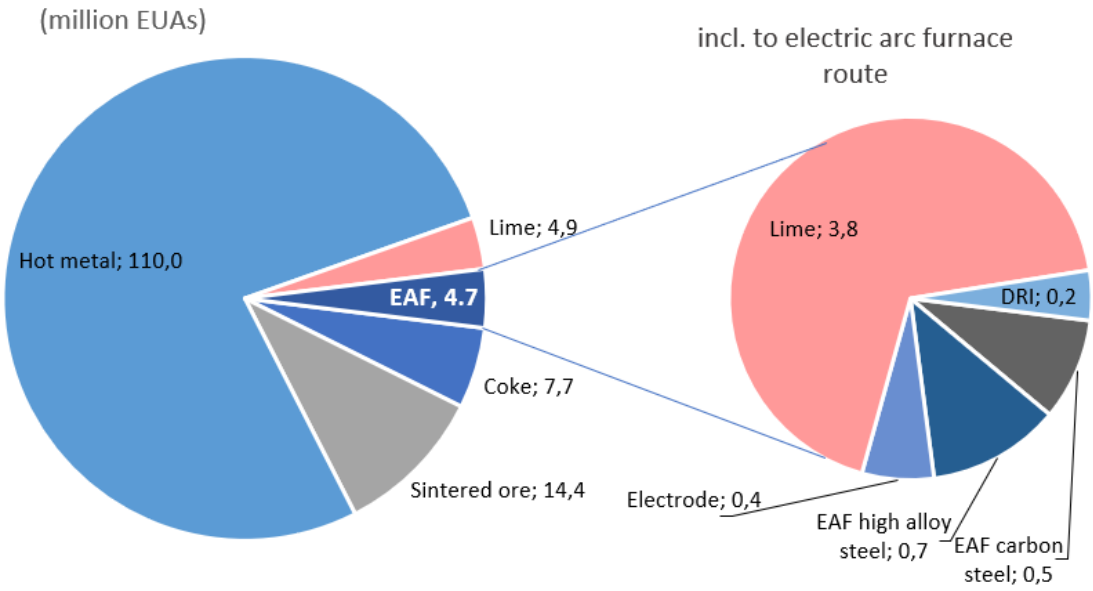
These two initiatives are critical for the EU Emission Trading System (ETS), as they could determine its capacity to speed up decarbonisation, rather than just feed price volatility. Given that the CBAM's implementation is scheduled to be very gradual (it will only replace 48% of the free allowances of the sectors covered by 2030), the review of the benchmarks is relevant even for the sectors falling under the scope of the CBAM.

For incentives to be improved, the benchmark review should ensure that benchmarks are independent of the production process. Accordingly, the amended ETS Directive stipulates that "free allocation for the production of a product should take into account the circular use potential of materials and be **independent of the feedstock or the type of production process**, where the production processes have the same purpose" (Recital 8). Although this is a great concept in theory, implementing it requires a few changes, as we show here for the case of steel.

Product-based benchmarks: the case of steel

In Europe, steel is produced using processes with very different carbon intensities. This is why, although steelmaking using electric arc furnaces (EAF) represented 43.6% of all EU steel production in 2021,[1] the plants involved in this operation only received 3% of the total free allowances for steel while the other 97% went to plants using the blast furnace / basic oxygen furnace (BF-BOF) route.

Annual free allocation to the steel sector, by process



Source: Sandbag, from European Commission data for 2021-25[2]

The main reason for these different treatments is that EAF steelmaking can use a lot more scrap than BF-BOF steelmaking, which reduces its carbon footprint dramatically. However, in Europe, the EAF and the BF-BOF steelmaking routes do not typically produce the same products: blast furnaces tend to be used to make flat sheets (used to make e.g. automotive vehicles, aircraft, white goods such as dishwashers etc.), whereas EAFs are used to make long products (such as rails, construction beams, window frames etc.). There is indeed a near-perfect match between the amount of crude steel made from blast furnaces (86.1m tonnes in 2021) and the amount of flat steel products made in the EU27 (84.4m tonnes). Flat products are usually made from blast furnaces because their higher quality standards require more pure raw material, which can be attained by directly using iron ore. That quality level could also be achieved by EAFs, e.g. by recycling high quality scrap or blending lower-quality scrap with direct reduced iron (DRI), but DRI is virtually not manufactured in Europe. This is why over 20 million tonnes of collected steel scrap end up unrecycled and being exported by the EU every year, despite large emission reductions that its use would achieve through electrification, i.e. the switch from BF-BOF to EAF, as we showed in a recent report.

[1] for EU27 Member States (Source: Eurofer)

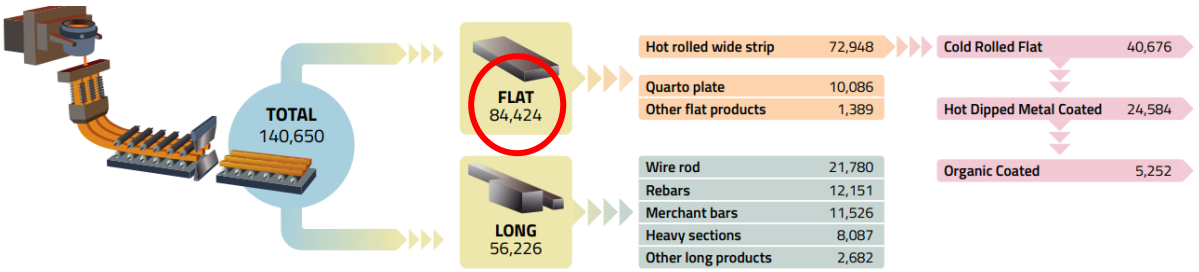
[2] Assumptions: 56.8% of lime production is for steelmaking, in equal proportion per tonne of crude steel for EAF compared to BF-EAF; ArcelorMittal's Hamburg plant receives 0.415 EUA per tonne of DRI produced (based on own assumptions); Electrode direct emissions estimated to be 4 to 7 kg CO2 / t steel. Source: Echterhof, 2021. Review on the Use of Alternative Carbon Sources in EAF Steelmaking. Metals 2021.

By securing more free emission permits for BF-BOF processes than for EAF processes under the EU ETS, the current allocation benchmarks are an obstacle in the way of a large-scale switch to electric steelmaking. However, allocating, without distinction, the same number of free permits to the EAF route as the BF-BOF route is currently receiving would not be satisfactory either: it would lead to a near doubling of (preliminary) free allocation. But there is another solution.

Free allowances are currently given to plants involved in each stage of the process such as lime making, coking, ore sintering, direct reduction etc., regardless of the end product, be it flat or long. Instead, free allocation could happen slightly further down the value chain, where hot steel becomes an actual product, long or flat. **Different benchmarks should then be linked to flat products and long products**. This would incentivise the electrification of flat product production without significantly changing the number of emission allowances allocated.

EU steel production by production route and product category

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	% shares 2021
Basic Oxygen Furnace and other	90,570	89,934	92,981	91,616	91,678	94,354	92,202	87,270	74,498	86,087	56.4%
Electric	68,433	64,384	64,084	63,513	62,620	66,515	67,864	62,974	57,719	66,548	43.6%
Total Crude Steel	**159,003**	**154,318**	**157,065**	**155,129**	**154,298**	**160,869**	**160,066**	**150,244**	**132,217**	**152,634**	**100%**

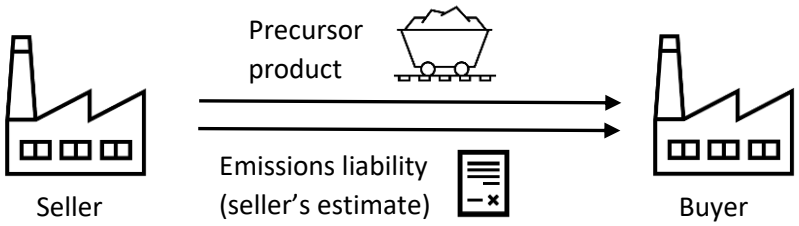


Source: Eurofer

Moving free allocation down the value chain requires some changes, however. If the free allowances are only given at the final production point of finished products, the plants producing intermediate products ("precursors") cannot be forced to buy allowances for their own emissions without being at an unfair disadvantage compared to their foreign competitors.

Transfer of emissions liability from precursor to product

Our proposed solution is that, if free emission allowances are to be given further down the value chain, the liability of emissions should also travel down that chain. To this end, an ETS-covered plant selling precursors to another ETS-covered plant should transfer an emission liability to the acquiring entity, based on their own estimates.



At the end of each period (as illustrated on the figure in page 6):

- the seller
  - reports both their total emissions and the liabilities transferred to clients,
  - only receives **free allowances covering goods not sold to ETS-covered clients**
  - only surrenders allowances covering the difference:

$$Allowances\ surrendered(precursor\ plant) = Verified\ emissions(precursor\ plant) - \sum Transferred\ liabilities(precursors\ sold)$$

- the buyer
  - reports both their total emissions and the liabilities received from suppliers,
  - receives **free allowances covering the goods produced minus the precursors imported from outside the EU ETS**
  - surrenders allowances covering the sum:

$$Allowances\ surrendered(steel\ plant) = Verified\ emissions(steel\ plant) + \sum Received\ liabilities(precursors\ acquired)$$

Some precursors may themselves be made using other precursors. This is the case for sintered ore, which is often made from lime. Allowances surrendered must then take into account both the precursors acquired (such as lime) and sold (sinter itself):

$$Allowances\ surrendered(sinter\ plant) = Verified\ emissions(sinter\ plant) - \sum Transferred\ liabilities(sinter\ sold) + \sum Received\ liabilities(lime\ acquired)$$

With this system, precursor manufacturers transfer a liability based on estimates of the emissions embedded in the products they have sold. Although this creates additional work and responsibility, it does not have to be verified independently and can be done using the sellers' own methodology, based on information on their own process.

At the end of each reporting period, emissions from the precursor plant are verified under the ETS process and compared with the sum of emission liabilities transferred to clients over the same period.

Two situations may then happen:

Case 1 "Deficit": Carbon Liability Transferred < Verified Emissions

Consequence: The precursor plant must surrender free allowances or pay for the carbon emissions representing the difference.

Case 2 "Excess": Carbon Liability Transferred > Verified Emissions

Consequence: The precursor plant will be able to declare less emissions the following year, by subtracting the excess reported in the current year.

The proposed change would be minimal at the scale of the EUETS, as it would affect very few of the 11,000 plants covered by the scheme (see table below):

Precursor	Number of plant in EUETS	2021 emissions (tCO2)
Coke	15	553,784
Sinter	9	2,236,714
Lime*	202	27,096,439

*Source: Sandbag Dashboard based on EUTL data; * covers "Production of lime, or calcination of dolomite/magnesite", only part of which is used for steelmaking*

What should the value of the benchmark be?

Instead of there being benchmarks for processes such as hot metal, electric furnaces or precursors, we are proposing one benchmark for flat steel and one for long steel products. The benchmark of each product should therefore be *extended* to cover ETS-covered precursors, as illustrated in the below table for flat steel products which would involve the 'lime', 'coke', 'sintered ore' and 'hot metal' benchmarks.

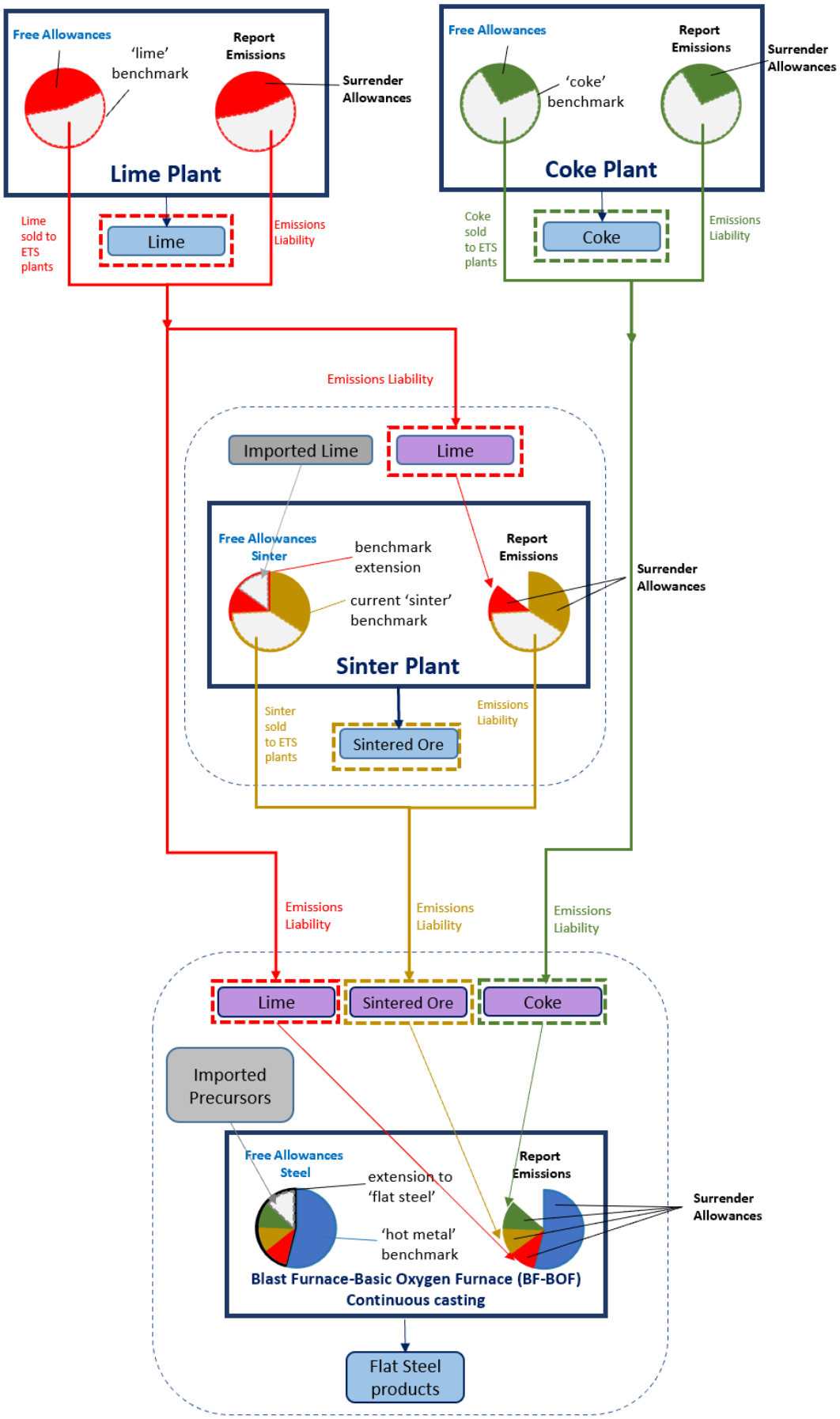
Benchmark	Current value (EUA/t)	Extension (EUA/t)	New value (EUA/t)
Coke	0.217	-	**0.217**
Lime	0.725	-	**0.725**
Sintered Ore	0.157	0.022	**0.178**
New: Flat steel	1.288 ('hot metal')	0.495	**1.783**

Similarly, long products in Europe are typically produced using steel scrap fed into electric arc furnaces (EAF), so a long steel benchmark should add the current benchmarks for 'EAF carbon steel', a value based on generic benchmarks used to calculate free allocation for the manufacturing of electrodes and the casting. According to our own estimate, this should be around **0.072 EUA per tonne of long steel** for direct emissions only.

By granting free allowances in amounts matching the flat steel benchmark rather than the individual process benchmarks, our proposal would equally reward the production of flat steel products through BF-BOF and EAF routes, regardless of the precursors used including steel scrap, direct reduced iron (DRI) or more "innovative" ones such as hydrogen. This would incentivise the switch from more polluting to less polluting processes everywhere the change makes economic sense, without giving an advantage to the former.

Our proposed method would also keep the protection against carbon leakage intact, thanks to the subtraction from the free allocation of precursors acquired from overseas plants. It would not change the overall number of free allowances given to steel plants.

Free allocation for production of flat steel on BF-BOF route

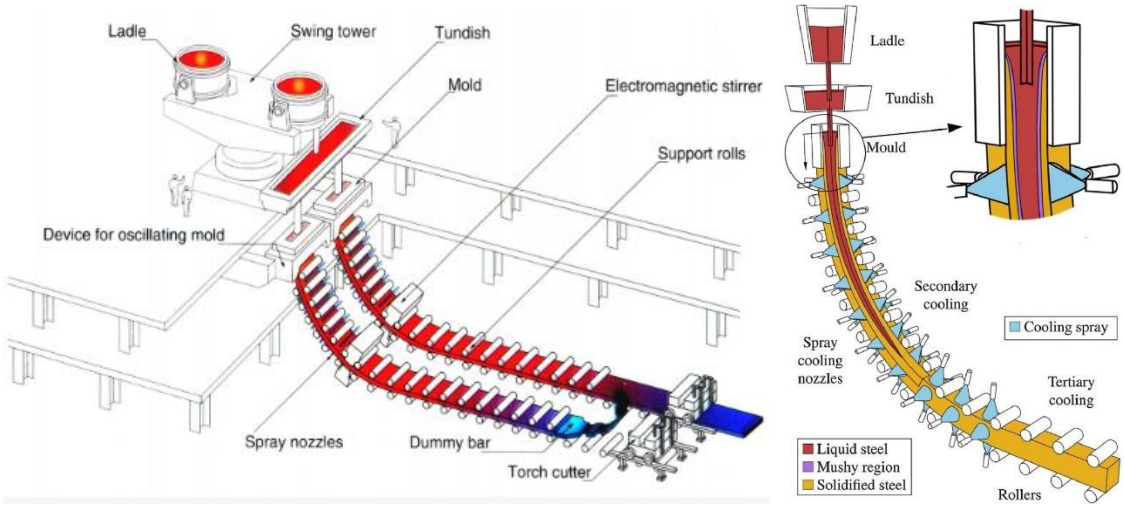


Who should receive free allowances?

A key question is about which facility along the value chain is the most appropriate for receiving free allowances. The selected point should be low enough in the chain to ensure most EU ETS emissions occur upstream but high enough to ensure free allocation is only done once.

Our proposal is that free allowances for steel should be given to **casting facilities**, as the casting stage is where steel products can be determined as flat or long, in semi-finished steel forms such as slabs, blooms, and billets. Most steel producers in the EU have on-site casting facilities, such as continuous casting plants or ingot casting plants. However, in some cases, the casting process is outsourced to specialized casting plants.

Casting only takes place once in the steel value chain. However, if it ever happened that a steel product underwent two casting processes before commercialisation, only the first one should be a valid recipient of free allowances.



Casting diagram for flat and long steel[3]

Hydrogen as a precursor

Although hydrogen is seen as a potential precursor in steelmaking via electric arc furnaces using direct reduced iron (DRI), its production is covered by its own free allocation benchmark called 'hydrogen'. In the current system, free allowances in hydrogen DRI steelmaking would be given using the 'hydrogen' and the 'EAF carbon steel' benchmarks. However, in many sectors, hydrogen is in direct competition with other processes, so giving free allowances directly to hydrogen production would distort the optimal cost/quality balance between HDRI and other inputs such as steel scrap or imported DRI. Covering all flat steel production under the 'flat steel' benchmark would secure revenues towards the extra costs incurred to produce "green" hydrogen and eliminate the distortion.

[3] Source: Guthrie and Isac, 2022, Continuous Casting Practices for Steel: Past, Present and Future

Free allocation to HDRI steelmaking

Current allocation method (EUA/t of steel)			New method (EUA/t)
Hydrogen	EAF other processes	**Total current**	**Flat steel benchmark**
0.171*	0.072	**0.224**	**1.783**

**based on 50% scrap use, source: V. Vogl, M. Ahman, L. Nilsson*

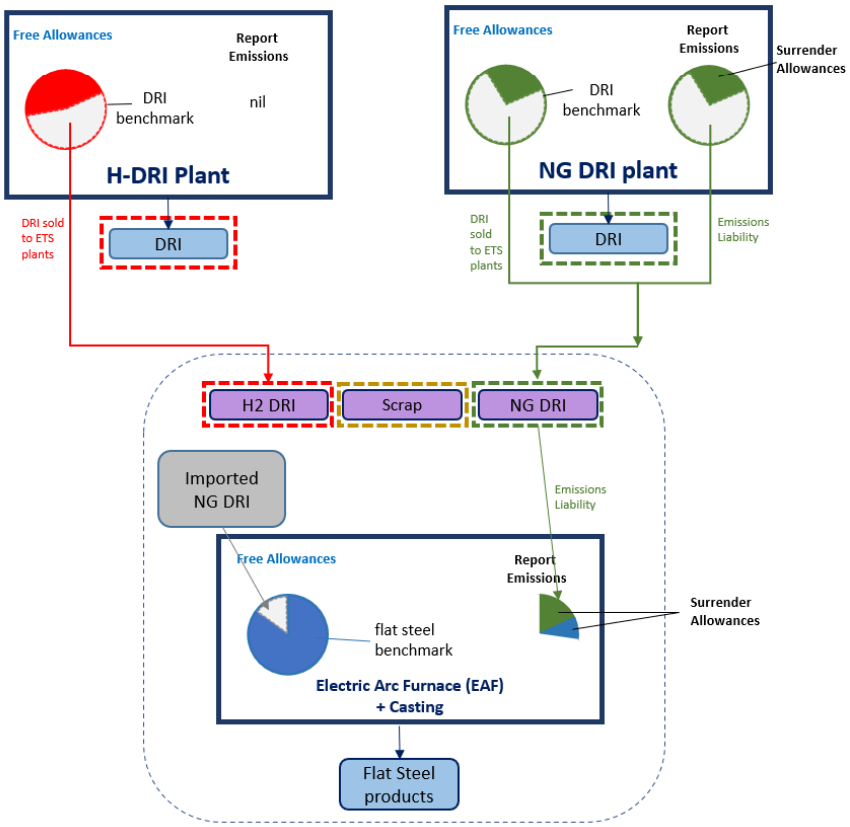
For electrolytic hydrogen that has no direct emissions under the EU ETS, the process would be simpler than for carbonated precursors. At the end of each period (as illustrated in the picture below):

- the electrolyser
  - reports no emissions
  - only receives **free allowances covering hydrogen not sold to ETS-covered steel plants**
  - surrenders no allowances

- the steel plant
  - reports both its total emissions and the liabilities received from precursor suppliers
  - receives **free allowances covering the goods produced minus the precursors imported from outside the EU ETS**
  - surrenders allowances covering the sum:

$$Allowances\ surrendered(steel\ plant) = Verified\ emissions(steel\ plant) + \sum Received\ liabilities(precursors\ acquired)$$

Free allocation for production of flat steel through EAF route



How the ETS Directive amendment complicates things

For the proposed changes to be possible as part of the upcoming benchmark reform. they need to comply with the newly voted amendment to the ETS Directive. This requires a couple of points to be clarified.

The product benchmark 'hot metal'

Our proposal to introduce a 'flat steel' benchmark might be seen as contradicting the third sub-paragraph of Art 10a(2) of the Directive. which stipulates:

"(e) For the period from 2026 to 2030 the annual reduction rate of **the product benchmark hot metal** shall not be affected by the change of benchmark definitions and system boundaries applicable pursuant to the fifth subparagraph of article 10a(1)".

As well as recital 8b:

"it is necessary to **exclude from the calculation of the hot metal benchmark** for the period 2026-2030 installations that were operational during the reference period 2021-2022 and that would otherwise be included in that calculation due to the review of its definition".

The two wordings suggest that a benchmark should continue to be specific to the hot metal process, as that benchmark was named explicitly. Although this might be an obstacle for renaming the benchmark to 'flat steel', the two texts only restrict the selection of installations used to calculate the benchmark (the 10% most efficient), which our proposal does not affect.

Primary vs. secondary production

Another obstacle to our proposal could be the newly introduced Recital 8, which stipulates that "the revised benchmarks for 2026 to 2030 should continue **distinguishing between primary and secondary production of steel and aluminium"**, which our proposed method does not.

Two caveats to the above wording may still make our proposal possible. Firstly, it is only a recital, with no actual article implementing it. Secondly, the application of our proposal would not negatively impact any existing plant owners, as it would leave them free to e.g. transition from blast furnaces to electric furnaces for the production of flat steel (and reduce their carbon costs), or not.