CARBON TRUST

The case for low carbon primary aluminium labelling

Methodology statement to define the market category

April 2020

Table of contents

1. Introduction

The widely acknowledged climate emergency poses a significant challenge to many heavy industries, as they must find a way to operate in line with the carbon emission constraints imposed by the aim of the Paris Agreement to keep global warming to well below 2°C. The Science Based Targets Initiative has developed a sectoral decarbonisation approach for the aluminium sector, yet to date, no company from that sector has signed up to it. The aluminium industry's challenge is largely defined by a very energy intensive smelting process, typically leading to a high carbon intensity for primary aluminium. Conscious of the need for improvement, the industry is taking a number of measures to align itself to a future low carbon economy.

These measures include the Aluminium Sustainability Initiative (ASI), which defines a performance standard that, amongst other sustainability criteria, defines a minimum carbon efficiency target for aluminium smelters, to be achieved by 2030 for all existing plants. On the other hand, a significant proportion of smelters make use of renewable energy to produce aluminium that already has a carbon intensity below the 2030 science-based target, which is based on the industry average. Many of the industry's key customers, driven by their own shorter-term carbon targets, which increasingly cover their supply chain, are looking for such carbon reductions in the present.

Of course, aluminium has the advantage of being infinitely recyclable, with the energy input required for recycling being a fraction of that for primary aluminium. As a result, there is already strong demand for recycled aluminium and a generally high recycling rate, as well. Due to growth in demand and the use of aluminium in construction and other long-life products, recycled aluminium alone cannot satisfy total demand. Therefore, it is important to consider the case of primary aluminium, specifically, and identify the most sustainable production options to support its inevitable use.

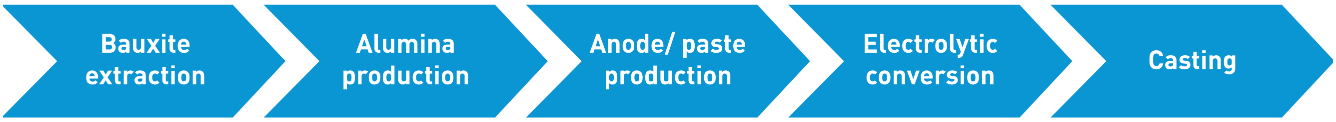
A number of aluminium producers have already launched 'lower carbon primary aluminium' products. These include Rusal's Allow, Hydro's Reduxa 4.0, Rio Tinto's RenewAl and Alcoa's Ecolum. In addition, Harbor Aluminum has launched a green aluminium spot premium at the end of October 2019. All of these products are defined by a threshold carbon intensity. However, there is a lack of consistency on the threshold level or even the scope of the footprint being measured and communicated.

Therefore, this paper presents recommendations for a clear methodology for calculating the carbon footprint of primary aluminium - accounting for the specific source of electricity - as a basis for establishing qualification criteria to carry a lower carbon aluminium 'label' as a demonstration of present performance, rather than future ambition. *Crucially, such a label and the measurement calculations supporting it, would ideally be used by many primary aluminium producers, presenting purchasers with a valued common label of what can be regarded a 'lower carbon primary aluminium'.*

The aim is not to introduce a new standard, but to clarify and constrain choices within existing standards to maximise consistency of measurement, and thus comparability between the results calculated by different companies.

1.1 KEY GHG EMISSION SOURCES FROM PRIMARY ALUMINIUM

The carbon footprint of primary aluminium is determined by emissions during:



By far the most resource intensive aspect is the electricity input into the electrolysis process, requiring typically around 14MWh per tonne of aluminium[1]. Other significant impacts are direct emissions from the anode consumption during electrolysis and thermal energy in alumina production.

At the global level, electricity use accounts for nearly 70% (~11kg CO_2e/kg Al)[2] of primary aluminium's carbon footprint. This reflects reliance on carbon intensive electricity generation by the majority of global primary aluminium production. Thus, it can be seen how the source of electricity has a major impact, and it is therefore imperative that the electricity source and usage is adequately represented.

Over time, as primary aluminium producers work towards alignment with science-based reduction pathways, they will need to move towards both low carbon sources of electricity and efficient manufacturing facilities. As the former has a much more significant impact on final carbon intensity, this should always take precedent for capital investment in carbon reduction measures. As carbon intensity of electricity decreases, so the efficiency of the smelting plant becomes less significant relative to other processes in the value chain, such as bauxite mining and processing or anode production.

1.2 COMPARISON OF LOWER CARBON PRIMARY ALUMINIUM BRANDS AND BENCHMARKS

The below Table 1 provides an overview of four 'lower carbon primary aluminium' brands offered by major aluminium producers, along with their claimed carbon credentials. Although all of them state a threshold figure of $4tCO_2$e per tonne of primary aluminium, they apply different boundaries and calculation methodologies. Rusal's Allow and possibly Rio Tinto's RenewAl thresholds only apply to the smelter and casting activities, whereas the others are cradle-to-gate.

Additionally, in October 2019, Harbor Aluminum announced the launch of a green aluminium spot premium, in response to demand from buyers. The qualifying threshold for this is $4.5tCO_2$/t of aluminium from smelter Scope 1 & 2 emissions. This level is estimated by Harbor Aluminium to cover 43% of global primary aluminium supply (exc. China) in 2020. This benchmark is included in the comparison table, alongside the Aluminium Stewardship Initiative's (ASI) Performance standard.

[1] www.world-aluminium.org/statistics
[2] World Aluminium (2017): Life Cycle Inventory Data and Environmental Metrics for the Primary Aluminium Industry – 2015 Data

Table 1: Comparison of lower carbon primary aluminium offerings/indicators

COMPANY	BRAND/ INDICATOR	CARBON FOOTPRINT THRESHOLD	BOUNDARY
Hydro	REDUXA 4.0	4tCO_2e/t Al	Cradle-to-gate (up to and including ingot casting). Scope and methodology not fully disclosed
Rio Tinto	RenewAl	4tCO_2e/t Al	Unclear - appears to be smelter only
Alcoa	ECOLUM	2.5tCO_2e/t at smelter and 4tCO_2e/t Al cradle-to-gate	Separetely defined for both boundaries. Scope and methodology not fully disclosed
Rusal	ALLOW	4tCO_2e/t Al	Scope 1 & 2 emissions of smelter (level 1 of IAI guidelines)
Aluminium Stewardship Initiative	Performance standard	8tCO_2e/t Al (by 2030 for existing smelters)	Scope 1 & 2 emissions of smelter (level 1 of IAI guidelines)
Harbor Aluminum	US MW P1020 green aluminum spot premium	4.5tCO_2e/t Al	Scope 1 & 2 emissions of smelter (level 1 of IAI guidelines)

Ideally each of the above companies, and others, would agree to use a unified and published methodology for GHG calculations (including a single boundary, approaches to secondary data, accounting for electricity etc.), against which each would be independently verified to seek to qualify for a common label.

Currently, all four state they have independent verification, but raise questions to the potential purchaser, which ideally would not exist, and which a common methodology and label would overcome:

Table 2: Questions arising from public statements on lower carbon aluminium approach

COMPANY	BRAND/ INDICATOR	PUBLIC STATEMENT	QUESTONS THAT ARISE FROM READING THE WEBSITE
Hydro	REDUXA 4.0	States that its footprint is verified according to ISO14064	This is a standard that applies to organisation and project footprinting, but not products
Rio Tinto	RenewAl	Below 4 tCO_2e/t Al	Boundaries and methodology are not clear from the information provided on the web site
Alcoa	ECOLUM	Published environmental product declaration (EPD)	This declares a global warming potential of 4.9 tCO_2e/t Al – i.e. it is above the claimed threshold
Rusal	ALLOW	The results are verified independently	Limits the carbon footprint assessment to the direct and indirect emissions at the smelter (gate-to-gate), but does not specify the methodology used
Aluminium Stewardship Initiative	Performance standard	Recognising the ultimate objective established under the UN Framework Convention on Climate Change, the Entity is committed to reducing its Greenhouse Gas (GHG) emissions from a lifecycle perspective to mitigate its impact on the global climate	The standard, published in December 2017, makes no reference to the Paris Agreement and does not indicate how the standard aligns with its aims or the aims of UNFCCC
Harbor Aluminum	US MW P1020 green aluminum spot premium	Calculations of CO_2 emissions according to WRI and/or IAI GHG Protocols	What sources are included in the Scope 1&2 boundary may differ from one facility to another and therefore needs tighter definition for comparability

2. Background

2.1 CARBON FOOTPRINTING PRIMARY ALUMINIUM

There are a number of reports and data sets of the carbon footprint of primary aluminium; published by aluminium producers, industry associations and academia. These studies follow one of several recognised product carbon footprinting or general lifecycle assessment (LCA) standards:

- PAS 2050:2011 Assessment of lifecycle greenhouse gas emissions of goods and services
- GHG Protocol Product Standard
- EN 19694-4:2016 Stationary source emissions. Determination of greenhouse gas (GHG) emissions in energy-intensive industries. Aluminium industry
- ISO 14040:2006 Environmental management. Life cycle assessment. Principles and framework

Some of these standards have been supplemented by additional sector specific guidelines, including the International Aluminium Institute's Aluminium Carbon Footprint Technical Support Document published in February 2018 and the Aluminium Sector GHG Protocol (2006), also developed by IAI.

These standards have been applied by trade associations (World Aluminium and European Aluminium Association), individual producers and academia, to calculate the carbon footprint of primary aluminium. *Notably, these existing studies typically show variation in terms of scope, boundaries and methodological approaches, making direct comparisons difficult.*

2.2 PRODUCT FOOTPRINT BOUNDARY

A product footprint boundary is generally defined as 'cradle-to-grave' (i.e. full lifecycle, typically for final products) or 'cradle-to-gate' (typically for intermediate products subject to further processing). Some standards also allow for a 'gate-to-gate' boundary, especially where processing is carried out as a service.

The IAI's technical support document defines the boundary for primary aluminium footprinting as 'cradle-to-gate' up to and including ingot casting. It does, however, permit three levels of disclosure[3]:

- **Level 1:** Emissions from aluminium electrolysis, aluminium ingot casting, anode/paste production, as well as emissions from generating electricity and heat consumed in these processes.
- **Level 2:** In addition to Level 1 emissions, direct emissions from bauxite mining and alumina refining, plus emissions associated with electricity & heat consumption and fuel combustion at these two production unit processes.
- **Level 3:** A complete cradle-to-gate carbon footprint of aluminium ingot. This includes all GHG emissions from bauxite mining, alumina production, carbon anode production, aluminium electrolysis and ingot casting processes, raw materials transport, electricity & heat generation, and aluminium dross processing. It also includes the production of ancillary materials and fuels required for primary aluminium production.

[1]Aluminium Carbon Footprint Technical Support Document v1.0 (15th February 2018)

In general, full disclosure of all three levels is recommended for a fair comparison of the impact of products.

Level 1 calculations, along with direct emissions in level 2, must be on the basis of primary data, the guidance, in common with other standards, allows for the use of secondary data in relation to indirect level 2 and all level 3 emissions. The requirement for primary data for elements of level 2 may explain why a significant number of aluminium producers and indices focus on level 1 emissions.

Whilst level 1 activities include the key determinants for the carbon impact of average primary aluminium, it must be conceded that level 2 and 3 activities also make a material contribution to the cradle-to-gate footprint of primary aluminium, particularly where aluminium smelters rely on renewable electricity.

2.3 ACCOUNTING FOR ELECTRICITY IMPACTS

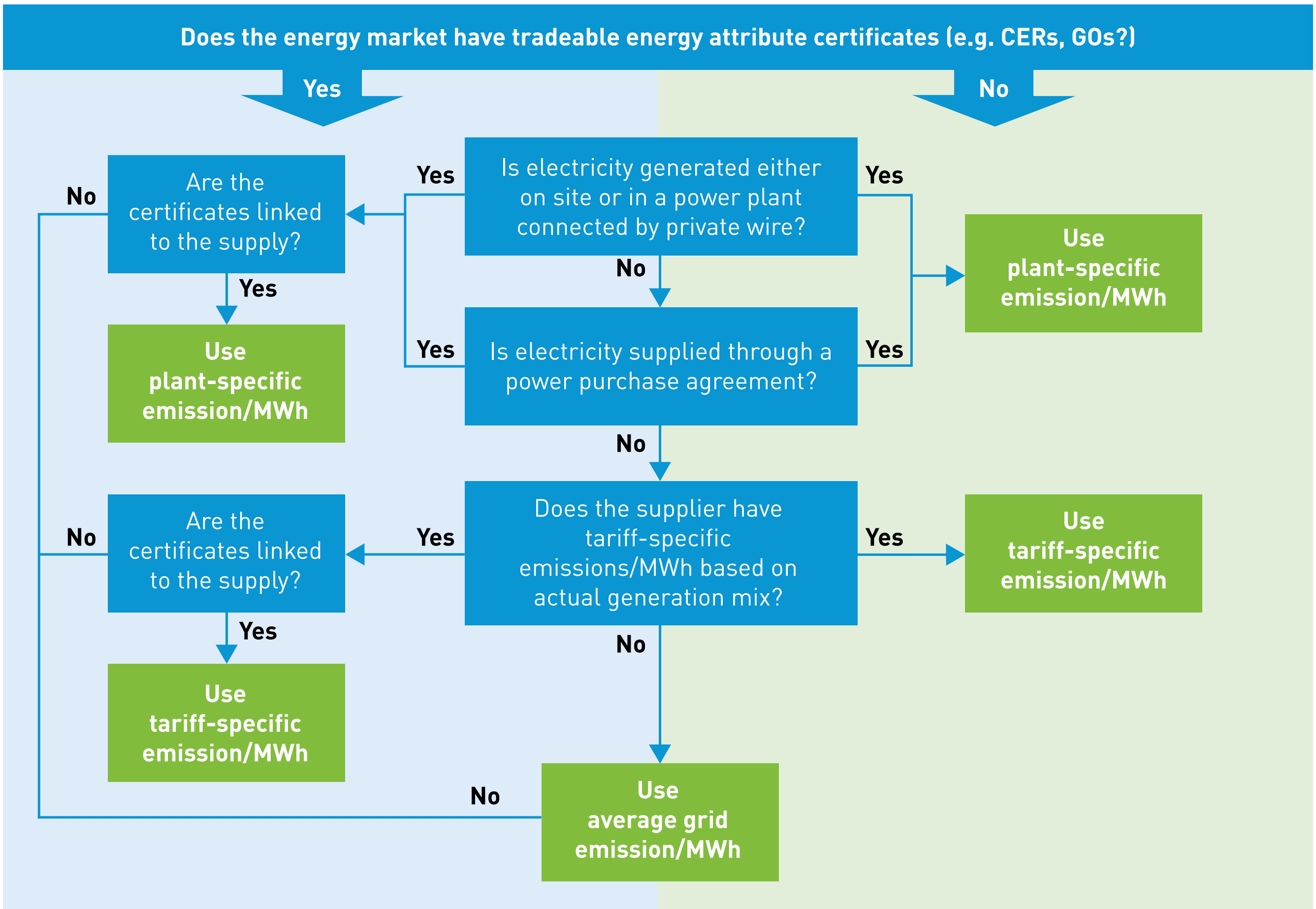
The most common approach to electricity use in (product) carbon footprinting is to consider the emissions associated with electricity generation for the electricity network supplying a particular process. This is quite commonly a national grid network, but may also be dedicated generation not connected to the grid, either on-site or nearby with a private wire connection. In practice, however, such installations often do have a grid connection. The various footprinting standards seek to avoid double counting of renewable energy benefits, where such installations benefit from feed-in tariffs or similar financial incentives linked to their contribution to the calculated carbon intensity of the grid.

More recently, the publication of Scope 2 guidance, allowing a market-based approach for organisational GHG accounting, has led to the adoption of similar principles for product footprinting.

This allows companies to report their electricity impacts based on the fuel mix of their specific tariff. As the electricity is still supplied through the grid, the fuel mix (and specifically the renewable elements) are determined by contractual arrangements between producer and supplier, including the allocation of Renewable Energy Certificates (REC), Guarantees of Origin (GO) or similar instruments that can uniquely represent a certain quantity of renewable electricity generation. In other words these are accounting tools, rather than a physical link between the (renewable) energy generated and the electricity consumed. Furthermore, such instruments are not available in all countries.

The IAI's technical support document broadly follows the GHG Protocol's Scope 2 guidance, except that **the contract for the power supply has to be from a defined generation facility.** Any additional electricity beyond the contracted supply from that facility is to be accounted for on the basis of a residual grid mix. This approach is not entirely clear on the requirements to demonstrate a physical link, although it is explicit that virtual RECs or GOs are not permitted.

For clarity, it is recommended that in countries operating unique renewable electricity certification schemes, any renewable energy purchased must be accompanied by its certificates, which shall be retired. For countries where such a scheme is not available, generation facilities must be connected to the aluminium plant by direct wire and/or a power purchase agreement must be in place.



The IAI's methodology makes no reference to upstream emissions from electricity generation or transmission and distribution losses. Both of these components are fully accounted for in product carbon footprinting and can contribute around 20% of fossil-based power generation. For certain renewables, such as biomass, this will be the main source of the carbon contribution from electricity. For this reason, it is important that the full lifecycle emissions from electricity generation are accounted for. Recognising current practice in the aluminium industry, a brief transition period be defined, where direct electricity emissions, only, are used for the definition of lower carbon aluminium. After this, within a period of no more than three years, a revised threshold based on the full electricity impact is defined.

For supplier specific figures, the supplier will typically only report the direct emissions. These should be calculated in line with national reporting guidelines and externally verified. In the second phase, a common reference database should be established for upstream emissions based on generation technology and fuel, and downstream transmission and distribution losses for electricity transmitted through the grid. Any private wire connections must also take transmission losses into account.

Where the grid emission factor is applied, the primary source should be the latest official annual figure published by the national government or agency responsible for the grid in question. If any parts of the lifecycle emission factor are not available through such a source, the alternatives to be used are the IEA's latest CO_2 emissions factors for direct emissions and T&D losses, and UK GHG conversion factors for upstream 'well-to-tank' (WTT) emissions. Both of these sources are updated annually.

Where residual emission factors are required, these can be obtained from the Association of Issuing Bodies for European countries. Residual factors are not widely available in other countries. Where these are not available, the standard grid EF should be used.

2.4 ACCOUNTING FOR OTHER EMISSION SOURCES

Quantification of all other GHG impacts within the cradle-to-gate scope should follow the guidance document prepared by IAI – which allows for a significant use of secondary data from standardised sources to remove barriers of cost or complexity from the process, whilst maintaining a high degree of comparability between cradle-to-gate footprints.

3. 'Lower carbon primary aluminium' labelling

Aluminium has the advantage of being infinitely recyclable without degradation of its physical properties. Moreover, recycling of aluminium does not require electrolysis or any of the upstream processes, resulting in an average carbon footprint of approximately 1.1tCO_2e per tonne of aluminium and much lower production costs. As a result of these facts, the recovery rate for aluminium is already very high in most countries. Due to this lower cost, secondary aluminium will always be in high demand, and hence it is the availability of recyclate that is the main limiting factor in its use.

Since global demand for aluminium continues to grow and a significant proportion of this goes into long-life products, such as construction materials (thereby removing its availability as recyclate for a long period of time), it is clear that recyclate alone cannot satisfy demand for aluminium. **Primary aluminium production will, therefore, continue to play an important role.** With aluminium production estimated to account for approximately one per cent of global GHG emissions, the sector will have to demonstrate its contribution towards climate change mitigation by reducing the carbon footprint of its primary processes.

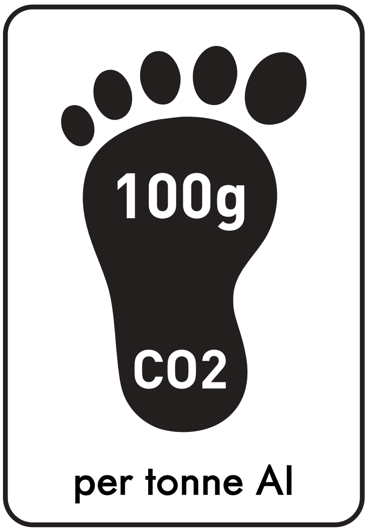
In addition, the industry's clients are also increasingly looking at the impacts of their value chain and demanding demonstrable reductions across the board. As a result, the need for market clarity demands an independent labelling scheme that demonstrates 'lower carbon primary aluminium' production. This section considers alternative options for such a labelling scheme, to meet the needs of the industry and its customers.

It is important for any labelling scheme to have credibility through rigour and consistency to ensure comparability of results. This in turn will promote acceptability amongst a majority of producers and, most importantly, key customers. In this section, actual and illustrative examples of Carbon Trust labels are shown, to demonstrate the types of labelling which could be used.

3.1 CARBON FOOTPRINT DISCLOSURE

The first option for 'lower carbon' labelling would simply be disclosure of the carbon footprint of the aluminium. Provided that these results were derived using a common methodology and guidelines, and have been independently verified, then these would be valid for comparison.

Figure 2: Example of label declaring the product carbon footprint



The 'label' containing the footprint does not make a direct statement on the product's relative carbon efficiency. Instead, this is established by comparison with other individual product labels or average data published by World Aluminium or others. In practice, it would be quite likely that companies whose aluminium has an above average carbon footprint would not apply the label and might not divulge the information, unless it is demanded by a majority of customers as part of any transaction.

Divulging a specific footprint would be beneficial for customer companies wanting to calculate the footprint of their own products. On the other hand, such specific information may prove a distraction, if aluminium suppliers are compared on the basis of very small differences that may lie within the range of uncertainty.

There are, of course, a number of alternative options for disclosing the actual carbon footprint, including Environmental Product Declarations (EPDs). Use of such alternatives would require explicit reference to the guidelines established for the lower carbon aluminium definition, as it might otherwise undermine the objective of consistency and comparability.

3.2 LOWER CARBON LABEL

At the other extreme of publishing the specific carbon footprint would be a label based on a single threshold value which defines what is and isn't classified as 'lower carbon primary aluminium'. Whilst this is conceptually a simple approach, discussions on the definition of the threshold are almost inevitable. Two potential approaches to defining this might be:

Figure 3: Example of a label denoting a lower carbon product

1. **Relative performance** against the range of GHG impacts of all aluminium production: in this case any aluminium that falls into the quartile (for example) of low carbon intensity is eligible for the label (i.e. the threshold value must be reviewed periodically)

2. **Absolute value** (likely based on a definition of typical production efficiencies, delivered with renewable energy: due to the predominance of the carbon intensity of the electricity source) - it is relatively straightforward to define a threshold that covers all sources of renewable or low carbon electricity

The binary nature of this approach could involve extensive debate on the exact threshold, particularly if there is no clear gap in the distribution of carbon intensity for different producers. Ideally, a threshold can be placed in a clear gap between renewables powered production and fossil powered production.

3.3 CARBON INTENSITY BANDING

A compromise solution between the above two extremes, which is already widely applied to energy-using consumer goods is the use of banding labels, which give each product an A – G (or similar) rating depending on their carbon footprint. Each band would cover a footprint range of equal width (e.g. 6t – 9t CO_2e/t Al) to cover the full range of carbon footprints and allowing further improvement at the low end. The example shown here is an illustrative one rather than an actual label.

Figure 4: Example carbon footprint banding label

3.4 PRODUCT DEFINITION

The eligibility assessment for the label is conducted at single plant level. This means that it is not possible to average the per tonne emissions of several plants to obtain an overall carbon performance just below the threshold, when some of the plans don't meet the criteria on their own.

3.5 CARBON FOOTPRINT IMPROVEMENTS OVER TIME

Both the lower carbon label and banding label would need to consider overall carbon efficiency improvements over time, particularly as a result of expected decarbonisation of electricity networks as part of national commitments under the Paris Agreement. This would, of course, not be an issue in the case of footprint disclosure.

If the lower carbon label were pegged at a certain percentile performance, the threshold could be reviewed at a fixed interval. In this case, the validity period of individual labels would have to be aligned to avoid or minimise the overlap of labels applying different standards.

In the case of the banding, it would be possible to introduce further, more stringent bands as the lowest carbon footprint moves lower. The introduction of A+, A++ and further bands may not be elegant, but is tried and tested in consumer goods. Depending on the width of each band, there should be no need to introduce more than one or two additional bands, at best.

4. Market impact of labelling scheme

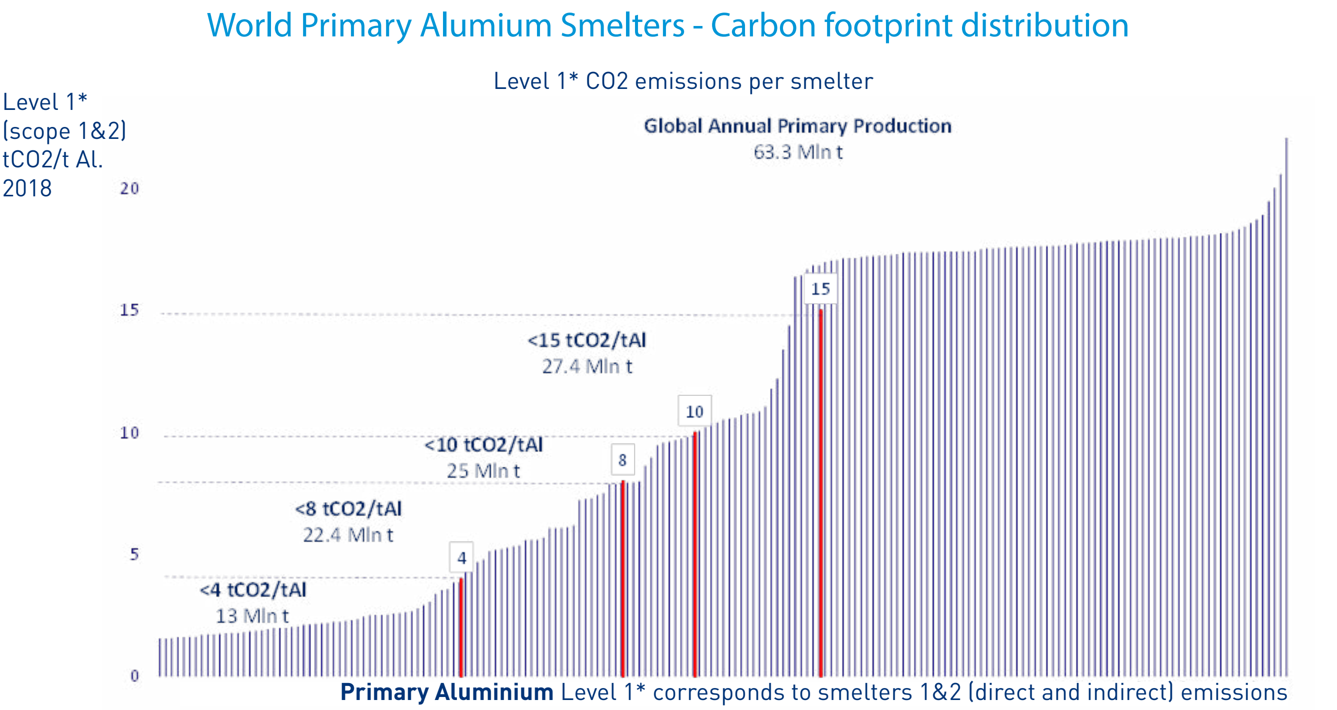
In developing a 'lower carbon primary aluminium' labelling scheme, recognised and supported by the industry and its customers, consideration has to be given to the potential implications for the aluminium market and how it helps to further the reduction in overall carbon intensity of primary aluminium. It is clear that major customers of the aluminium industry in packaging, automotive and other sectors are looking at their supply chain to drive down their Scope 3 carbon footprints. What is less clear is the extent to which they are prepared to pay a premium for the lower carbon product.

The question for differentiated primary aluminium is closely linked to the approach for recycled aluminium. In the case of recycled aluminium, which is supply constrained, generating demand by crediting the lower carbon impact of the recycled material to the user does not, ultimately, drive real carbon reductions in the market. The question for primary aluminium should therefore be whether the supply of 'lower carbon primary aluminium' is constrained. Although aluminium plants are capital intensive and immobile, it is, at least theoretically, possible to connect renewable electricity supply to plants, meaning that the same constraints faced by the recycled market do not apply.

Supply of 'lower carbon primary aluminium' is not constrained, and increase in demand caused by successful deployment of a 'lower carbon primary aluminium' label could lead to increased supply to meet this demand; and hence a reduction in global emissions.

Figure 5, below, shows a gradual increase of the carbon intensity of aluminium plants' Scope 1 & 2 emissions, with a plateau of around 17 tCO_2e/t Al, which covers over half the total production volume. The threshold value of 4tCO_2e/t Al recommended for the lower carbon aluminium label covers approximately 20% of global aluminium production in 2018. This provides a good balance of competition within the lower aluminium market, whilst being ambitious in the global context of aluminium production. It also coincides with the boundary for aluminium produced using renewable electricity.

Figure 5: Carbon Footprint Distribution of world aluminium smelters (Source: CRU)



5.1 FOOTPRINTING REQUIREMENTS

This section details the specific requirements that should be adopted for comparability as part of a 'lower carbon primary aluminium' labelling scheme.

Boundary

The boundary for the assessment should be **cradle-to-gate - all stages up to and including primary aluminium ingot casting,** in accordance with IAI's Aluminium Carbon Footprint Technical Support Document levels 1, 2 and 3.

Primary data

Primary data is required for all level 1 activities, as well as direct level 2 emissions, outlined in IAI's Aluminium Carbon Footprint Technical Support Document. This covers the anode/paste production, electrolysis and ingot casting. Calculations of direct emissions from these processes and collection of activity data must follow the tier 3 method defined in Appendix A of the aluminium sector GHG Protocol.

In addition to level 1 and 2 activities, **any level 3 activities that are under the direct control** of the aluminium producer making the declaration **must also use primary activity data** as the basis for the emission calculations.

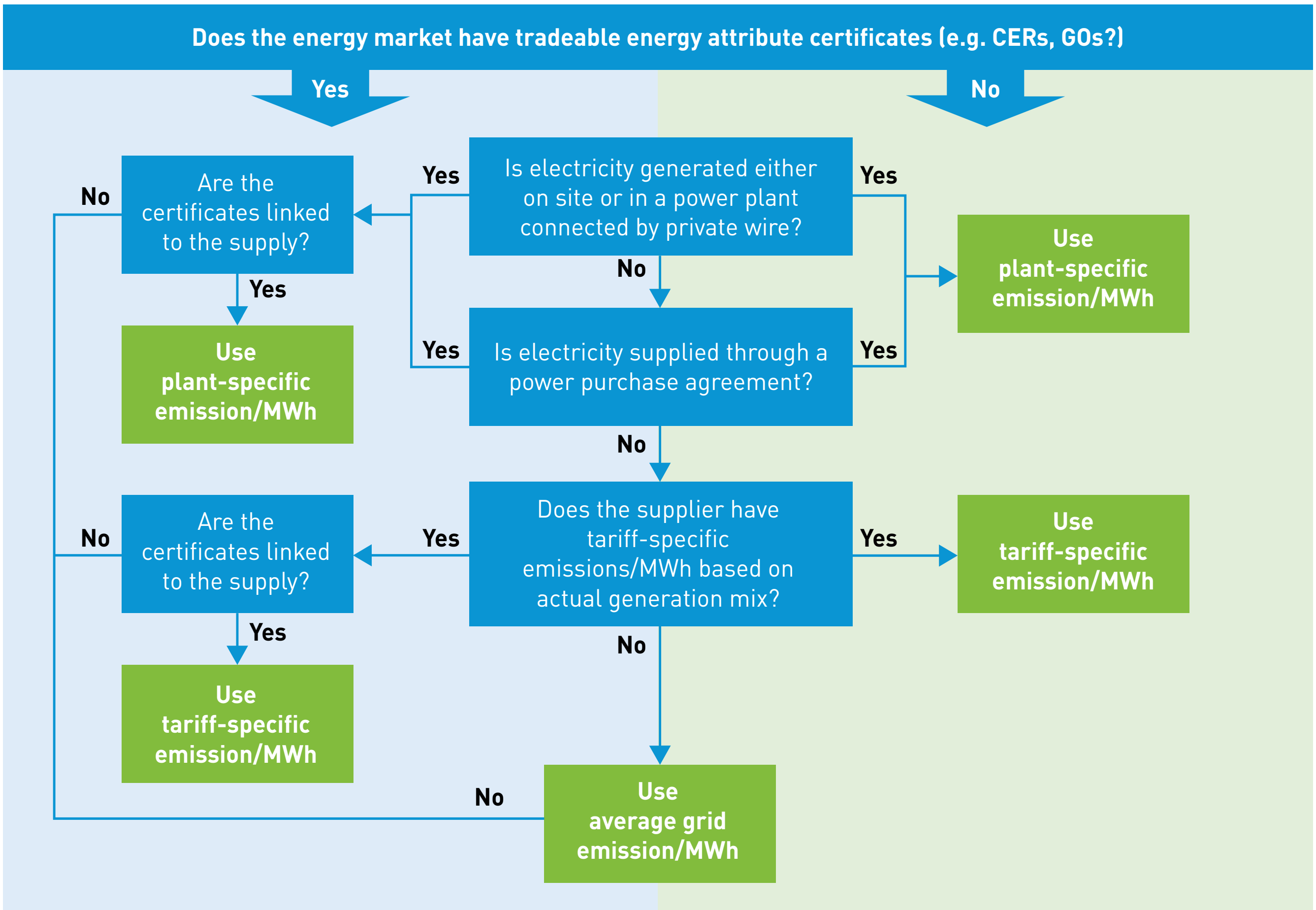
Secondary data

Primary data is required for all level 1 activities, as well as direct level 2 emissions, outlined in IAI's Aluminium Carbon Footprint Technical Support Document. This covers the anode/paste production, electrolysis and ingot casting. Calculations of direct emissions from these processes and collection of activity data must follow the tier 3 method defined in Appendix A of the aluminium sector GHG Protocol.

Electricity emission factor

The appropriate emissions factor to apply to the electricity consumption in the smelter process is determined in accordance with the decision tree presented below.

The electricity emission factor must include the **full lifecycle impact** of electricity generation, including transmission and distribution losses for consistency with the life-cycle approach of product carbon footprinting.



5.2 'LOWER CARBON PRIMARY ALUMINIUM' DEFINITION

The ASI's Performance Standard (PS) and Harbor Aluminum already provide reference points for sustainable aluminium products, at least partly based on carbon intensity. The carbon requirements of the ASI's PS represent a commitment to meet a threshold performance by 2030 for existing smelters. Presently, around half of the global aluminium smelters meet this threshold. The Harbor green aluminium spot premium sets a threshold that is broadly in line with expectations for aluminium production relying on hydro-power generated electricity. On the other hand, the current 'green' aluminium brands marketed by various aluminium producers tend to coalesce around a 4 tCO_2e threshold. Despite the uncertainties around the methodologies applied, they are broadly aligned with IAI's Level 1 footprint.

The initial focus on level 1 emissions, only, as the basis of a 'lower carbon primary aluminium' is designed to reflect current industry practice and remove barriers to the adoption of this label. The ultimate ambition, however, should be a quantification of the cradle-to-gate impacts, including the full impacts from electricity generation to be applied within a short period, say from the start of 2023.

In summary, the recommendations of this paper are as follows:

- A 'lower carbon primary aluminium' label should be defined by a current threshold of 4tCO_2e per tonne of aluminium for the process emissions from aluminium electrolysis, anode production and aluminium casting.
- The carbon footprint measurement of primary aluminium must follow the IAI methodology with a uniform approach to electricity impact accounting as set out in this report.
- The footprinting scope should expand from IAI's Level 1 to full cradle-to-gate, including the full lifecycle impact of electricity after a short introduction period for the scheme, say by early 2023.
- The aluminium sector as a whole needs to achieve emission reductions over time consistent with the decarbonisation pathways defined by science-based targets aligned to the Paris Agreement goals. This implies a regular review of the threshold level for the 'lower carbon primary aluminium' label.

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ABOUT THE CARBON TRUST

The Carbon Trust is an independent company with a mission to accelerate the move to a sustainable, low carbon economy. The Carbon Trust:

- advises businesses, governments and the public sector on opportunities in a sustainable, low carbon world;
- measures and certifies the environmental footprint of organisations, products and services;
- helps develop and deploy low carbon technologies and solutions, from energy efficiency to renewable power.

The company has approximately 180 staff with over 30 nationalities, based in the UK, China, Brazil, Mexico, South Africa and the USA. The Carbon Trust's experts come from a diverse range of professional backgrounds, including engineering, policy, academia, and business management.

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