A Product-Level GHG Accounting Approach to Decrease Emissions in the Aluminum Supply Chain

Product-Level Data Enables Purchasers to Push for Emissions Reductions

Corporations and governments are signaling their intentions to purchase key commodities produced with lower emissions. To achieve this, emissions data at the product level — where purchasing decisions are made — is key. Further, it is critical to ensure that product-level emissions reporting is comparable based on primary data and to provide sufficient information for purchasing decisions to drive measurable emissions reductions.

Focus Decarbonization on Ore-Based Production

Global demand for aluminum is projected to grow massively by 2050 given its extensive use in construction, transport, power transmission, and packaging. It also plays a prominent role in clean technologies like solar panels and electric cars. However, its production is emissions intensive. The sector is currently responsible for 2 percent of global greenhouse gas (GHG) emissions and demand for aluminum is projected to grow up to 80 percent by 2050. Emissions from the sector could grow at the same scale if action is not taken to decarbonize.

Aluminum is produced from either ***ore-based (primary)*** or ***scrap-based (secondary)*** inputs. Ore-based aluminum production requires a substantial amount of energy and uses fossil fuels and fossil-powered electricity, contributing most of the sector's emissions. Production from scrap-based inputs requires significantly less energy and therefore releases less emissions since the material has been refined and smelted during its original production.

	Ore-based aluminum	Scrap-based aluminum
Energy intensity	**~166 GJ/t Al ingot**	**~9 GJ/t Al ingot**
Share of total aluminum emissions	**97%**	**3%**
Share of current production	**67%**	**33%**
Share of production by 2050	**46%**	**54%**

Source: International Aluminum Institute, The Aluminum Association

Currently, around one-third of global aluminum is produced using scrap. Because of its lower energy demand and emissions intensity, increasing the share of scrap-based production is a fast and effective way to reduce the sector's emissions in the near term. However, the supply of scrap is constrained by the lifetime of aluminum-containing products, especially those in construction and automotive sectors — models suggest that only 54 percent of global demand for aluminum will be met with scrap in 2050. As a result, achieving the sector's decarbonization goal will inevitably require a focus on reducing emissions in ore-based production. This can be done through transitioning to clean electricity and deploying zero-emissions technologies.

Electricity Decarbonization

Aluminum producers are seeking opportunities to reduce their electricity impacts by switching to renewable energy. Since the accessibility of renewable energy can be constrained by an operation's location, aluminum producers have started investing in market-based mechanisms (e.g., power purchase agreements) for electricity decarbonization. However, these efforts cannot be captured by current location-based accounting methods.

Market Signals for Demand for Decarbonization and Improved GHG Accounting

Low-carbon aluminum has started to gather momentum by leading producers, investors, policymakers, and purchasers since it was highlighted in COP26 discussions, sending strong market signals for decarbonizing the ore-based aluminum production. Companies are piloting zero-carbon ore-based aluminum technologies (e.g., inert anode) and plan to scale them up to commercial demonstration. Banks have agreed to develop a framework that measures aluminum producers' emissions performance separately for ore-based and scrap-based inputs. End-users are forming coalitions to harness the purchasing power of companies to spur investments in zero-carbon technologies. All stakeholders believe that there is a need for a consistent measure of low-carbon aluminum.

Aluminum Producers Can Capitalize on this Momentum to Differentiate their Products

To reap the benefits of the new market demand for low-carbon aluminum, aluminum producers should provide the emissions intensity of their ore-based and scrap-based supply chain segments (in addition to the overall emissions and scrap content) to differentiate their products in the market. This would demonstrate decarbonization efforts in ore-based production (e.g., inert anode, renewable-powered electrolysis) as products move downstream. The ore-based versus scrap-based data would provide investors and end-users with transparent and credible metrics to independently understand the alignment of an individual supplier's progress on each sectoral decarbonization pathway identified by IAI. These pathways include:

- **Decarbonizing electricity** – shifting to renewable sources (on-site or contractual) would reduce the emissions intensity of the ore-based segment, where 60 percent of emissions come from electricity use.
- **Deploying zero-emissions technology to reduce direct emissions** – this would enable the direct valuing of the emissions reductions in the ore-based segment, which are the hardest to abate.
- I**ncreasing scrap utilization** – the goal is to maximize scrap collection and processing efficiency, which is reflected in the recycled content reporting and scrap-based segment emissions.

RMI's Aluminum Emissions Reporting Guidance Supports Aluminum Product-level Reporting

RMI's Aluminum Sector Emissions Reporting Guidance provides the tools and methodologies to support aluminum supply chains actors in reporting product-level emissions based on the ore-based and scrap-based production processes. Using RMI's guidance, aluminum producers can demonstrate their decarbonization efforts and directly convey these efforts to investors and supply chain stakeholders to ensure climate alignment and clearly demonstrate emissions reductions and purchasers can actively contribute to the decarbonization of this critical sector.

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