

Product Carbon Footprint & Recycled Content Methodology

Methodology for Product- and Customer-
Level Accounting

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Owner: Corporate Sustainability



Novelis







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Glossary of Relevant Terms

Term	Definition or Description
Allocation	“Partitioning the input or output flows of a process or a product system between the product system under study and one or more other product systems” (ISO 14040:2006, section 3.17)
Alloy	A specific chemical composition of aluminum that affects properties such as strength, conductivity, ductility, corrosion resistance, and appearance. Public standards by national / international bodies exist, e.g., Aluminum Association, for naming standardization. Local naming conventions also exist.
Alloy Family	Family groups aluminum alloys by their main alloying element / characteristic. Industry standards set by the Aluminum Association. Example: 1x; 3x; 5x; 6x etc.
Alloy Group	Groups of various alloys that share key chemical characteristics. Sometimes used in supply chain and operations planning to reduce planning complexity. Example: 5x-High Magnesium alloys are alloys from the 5x alloy family that contain high magnesium content.
Alloys and Hardeners (A&H)	Elements (e.g., Mg, Mn, Fe, etc.) added to aluminum to change the metallurgical properties of the aluminum. Alloying leads to different Aluminum Alloy Families. These make up to 5% mass volume of FRP.
Alumina	Aluminum oxide (Al ₂ O ₃)
Balancing Period	The period for which credit accounts shall not be overdrawn, keeping inputs and outputs in balance, or maintaining a positive balance in credit accounts.
Bauxite	A precursor to aluminum – mined rock with high aluminum content.
Bill of Material (BoM)	Bill of Material documenting the metal input to produce sheet ingots in Novelis cast houses. Plan BoM defines the planned material requirements, while actual BoM is a documentation of actual materials used. Monthly aggregation by alloy, mass, and standardized metal inputs. Actual BoMs are manually generated from local Enterprise Resource Planning or shopfloor-IT systems.
Closed-loop Recycle Scrap (CLR scrap)	Pre-consumer scrap bought from a Novelis customer engaging in a closed-loop recycling agreement. Non-CLR scrap is all other scrap types.
Coated (Process) Scrap	Internal scrap metal that is lacquered / painted or otherwise contaminated with coatings, paint or laminates & foils that require special recycling furnaces for processing.
Cold Coil / Hot Band	Intermediate aluminum product requiring further processing, such as rolling and finishing
Cold Rolling Mill	Metal rolling is a forming process in which metal stock is passed through one or more pairs of rolls to reduce the thickness and to make the thickness uniform. Rolling is classified according to the temperature of the metal rolled. If the temperature of the metal is above its recrystallization temperature, then the process is known as hot rolling. If the temperature of the metal is below its recrystallization temperature, the process is known as cold rolling. Cold rolls take “Hot Band”, the output of Hot Rolling Mills, as input and produce aluminum sheet of different gauges.
Credit Account	A segmented quantity of an input with a particular specified characteristic. Credit accounts have a specified balance, based on the quantity of input available and the amount that has been deducted and applied to products.

Term	Definition or Description
Declared Unit	Quantity of a product for use as a reference unit in the quantification of a partial Product Carbon Footprint (ISO 14067:2018, section 5.3)
Dross	Skimmings from scrap remelting, typically resulting from oxides of alloying elements or attached soot particles (Aluminum Association, 2011)
Evaluation Period	The period for which the performance of the mass balance system is evaluated to ensure accuracy and representativeness.
Flat Rolled Product (FRP)	An aluminum product produced by rolling aluminum between rolls to reduce the thickness and lengthen it.
Hot Rolling Mill	Metal rolling is a forming process in which metal stock is passed through one or more pairs of rolls to reduce the thickness and to make the thickness uniform. Rolling is classified according to the temperature of the metal rolled. If the temperature of the metal is above its recrystallization temperature, then the process is known as hot rolling. If the temperature of the metal is below its recrystallization temperature, the process is known as cold rolling. Hot Mills take “Sheet Ingot” as input and produce either plates or “Hot Band”, aluminum band of a certain gauge for further processing on Cold Mills.
Input	Material or product that enters an organization or part of an organization (ISO 22095:2020; 3.2.1)
Life Cycle Assessment (LCA)	Compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle (ISO 14040:2006, section 3.2)
Life Cycle Impact Assessment (LCIA)	Phase of life cycle assessment aimed at understanding and evaluating the magnitude and significance of the potential environmental impacts for a product system throughout the life cycle of the product (ISO 14040:2006, section 3.4)
Life Cycle Inventory (LCI)	Phase of life cycle assessment involving the compilation and quantification of inputs and outputs for a product throughout its life cycle (ISO 14040:2006, section 3.3)
Low Carbon Prime	Primary remelt aluminum with specified characteristics, defined thoroughly in section 4.3.4.3
Market Scrap	Scrap purchased from a third party, on the market. Can include RSI.
Melt loss	Material loss during the casting process due to burn-off, including dross
Novelis Region	Novelis is organized into four regions: Novelis Asia, Novelis Europe, Novelis North America, Novelis South America Methodology system boundaries are reflective of these regions.
Output	Material or product that leaves an organization or part of an organization (ISO 22095:2020; 3.2.2)
Physical Constraint	Actual production volumes by mass clustered by recycled content (e.g., 90%,95%, 99%) for the specific 12-month certification period
Physical Consumption	Tracking of the physical material that is consumed while making a product. In this context, used to describe the consumption of materials during rolling slab casting as recorded in the actual BoM. The BoM, however, aggregates input materials to certain material classes and does not allow to track a specific charge that is identified with source and other characteristics like chemistry or embedded emissions. The term “physical consumption” describes a site-level, monthly mass-balance for the defined input materials linked to alloys produced.

Term	Definition or Description
Post-Consumer Scrap	Scrap made of material that has reached its intended end user which is no longer being used for its intended purpose. (IAI, 2023)
Pre-Consumer Scrap	Scrap diverted from the waste stream during a manufacturing process that has never reached the end user. (IAI, 2023)
Primary Aluminum / Prime	Unalloyed aluminum produced from alumina, typically by electrolysis, and with an aluminum content of at least 99.7% (IAI, 2023). Referred to interchangeably in this document as Primary Aluminum and Prime.
Product Characteristic	A distinguishing feature of a material or product, can be qualitative or quantitative (ISO 22095:2020; 3.2.6)
Production Characteristic	A distinguishing feature of one or more production processes in a supply chain (ISO 22095:2020; 3.2.7)
Reference Flow	Measure of the inputs to or outputs from processes in each product system required to fulfil the function expressed by the declared unit. (ISO 14067:2018, section 6.3.3)
Recycled Sheet Ingot (RSI)	Aluminum ingot produced entirely or primarily from recycled aluminum scrap.
Scrap	Material, mainly consisting of aluminum resulting from the collection and/or recovery of metal scrap that arises at various production stages or products after use, to be used for remelting to aluminum products to be sold on the market. (IAI 2023)
Scrap – Internal Scrap	Pre-consumer scrap that is melted in the same company where this scrap has been generated. Also known as run-around scrap. (IAI, 2023) Can include coated scrap.
Sheet Ingot (SI)	A slab of aluminum that is rolled into FRP. Usually weigh between 9 and 24 metric tons. A sheet ingot is the first product to enter the rolling process which produces an FRP.
Specified Characteristic	A set of product characteristics and/or production characteristics that the chain of custody is designed to maintain (ISO 22095:2020; 3.2.5)
Technical Constraint	This constraint respects metallurgical boundaries. The constraint represents the minimum prime/max scrap % for casting of an alloy using data from casting level inputs from regional historical data over the past three years
Third Party / External Sheet Ingot	A sheet ingot purchased from a third party rather than cast by Novelis.
Market Segment Groups	Novelis serves four main industries (Market Segment Groups): Aerospace; Automotive; Beverage Packaging & Specialties. Market Segment Groups operate relatively independently from each other within Novelis and Novelis regions.
Market Segments	Within each market segment group, each region has market segments. For North America, this includes beverage packaging, Ford, Non-Ford (General Automotive), Light Gauge, and B&C. For Europe, this includes Beverage Packaging, JLR, Non-JLR (General Automotive), Thick Gauge, and Aero. For NSA, this includes Beverage Packaging and Specialties. For Asia, this includes Beverage Packaging, Specialties, Auto, and Aero.

Key Acronyms

Acronym	Description
AA	Aluminum Association
A&H	Alloys and Hardeners
BoM	Bill of Material
CASH	Continuous Annealing and Solution Heat Treatment
CF	Carbon footprint
CLR	Closed-loop recycling
CoC	Chain of Custody
CY	Calendar Year
ERP	Enterprise Resource Planning (software system)
FRP	Flat Rolled Product
FY	Fiscal Year
GWP	Global Warming Potential
IAI	International Aluminium Institute
LCA	Life Cycle Assessment
LCI	Life Cycle Inventory
LCIA	Life Cycle Impact Assessment
MS	Market Segment
NA	Novelis Asia
NE	Novelis Europe
NNA	Novelis North America
NSA	Novelis South America
PCF	Product Carbon Footprint
RC	Recycled Content
SI	Sheet Ingot

1.0 Project Overview

Novelis is a leading sustainable aluminum solutions provider and a world leader in aluminum rolling and recycling. Driven by our purpose of “shaping a sustainable world together,” we work alongside our customers to provide innovative, low-carbon, and high-recycled-content aluminum solutions to the aerospace, automotive, beverage packaging, and specialty markets. Novelis’ global Product Carbon Footprint & Recycled Content Methodology (the Methodology), is an innovative, standard-based methodology that aims to enable increased value chain collaboration, cultivating the use of lower carbon, lightweight, infinitely recyclable aluminum, driving aluminum circularity, and industry carbon reduction.

The Methodology includes a carbon accounting methodology that defines how a customer-level Carbon Footprint is calculated and reported externally. The Methodology also defines how to report recycled content at the customer level, following the current Novelis recycled content methodology.

The Methodology seeks to increase customer-specific closed-loop recycling and enable commercial strategies that propagate the use of low-carbon input materials like low-carbon primary aluminum and scrap. It does this by providing a holistic and transparent system view of factors that affect the carbon footprint of products. The Methodology will drive commercial decarbonization by incentivizing closed-loop recycling agreements and pricing strategies to boost the upstream purchase of low-carbon materials, while also encouraging customers to transition to alloys with higher recycled content and the use of low-carbon prime.

This document contains the methodology, reference data, and reference sources of the underlying model to calculate the carbon footprint of Novelis’ products. For credibility and confidence in the study results, the Methodology follows the requirements of the WRI/WBCSD GHG Protocol – Scope 1, Scope 2, scope 3, and Product Life Cycle Accounting and Reporting Standards applied indirectly via Novelis Global Environmental Reporting Directive which was built on the following framework and requirements established in the standards below and suggestions of the third -party reviewer. For the mass balance chain of custody portion of the methodology, the Methodology also considers implementation expectations clarified in ISO 22095-2:2026 where relevant to documentation, attribution, and credit-account governance. The methodology contained in this document was reviewed by an independent reviewer, DNV, to ensure the study adheres to the following standards:

- ISO 14040:2006 Environmental management – Life cycle assessment – Principles and framework, International Organization for Standardization, 2006 (ISO 14040, 2006).
- ISO 14044:2006: Environmental management – Life cycle assessment – Requirements and Guidelines, International Organization for Standardization, 2006 (ISO 14044, 2006).
- ISO 14067:2018: Greenhouse gases – carbon footprint of products – requirements and guidelines for quantification, 2018 (ISO 14067:2018)
- ISO 22095:2020: Chain of custody – general terminology and models, 2020 (ISO22095:2020).
- ISO 22095-2:2026: Requirements and guidelines for mass balance, 2026 (ISO22095:2026)

2.0 Methodology Summary

The aim of this methodology is to describe the necessary data and processes to calculate the carbon footprint and recycled content of Novelis flat-rolled aluminum products for customer-level reporting.

Given Novelis's position in the supply chain, further processing of our products is generally necessary; therefore, this methodology focuses on providing a cradle-to-gate footprint for business-to-business reporting. Along with traditional inputs used to calculate the carbon footprint of a product, as outlined in ISO 14067:2018 and WRI/WBCSD GHG Protocol – Scope 1, Scope 2, Scope 3, and Product Life Cycle Accounting and Reporting Standards, the methodology also utilizes a mass balance chain of custody governance model which will be assessed for conformity to ISO 22095:2020 on an annual basis by an independent verification partner with selected implementation details further clarified using ISO 22095-2:2026 where relevant.

The purpose of this two-fold approach is to first establish a carbon footprint baseline, following ISO LCA rules. In a second step, a holistic view of our product carbon footprints following a mass balance chain of custody model, which considers commercial & customer-level impacts, is established. In practice, this results in a more precise reallocation of recycled content material and lower carbon inputs based on mass balance chain of custody. That will provide robust circularity and other carbon footprint insights, not considered in a traditional cradle-to-gate PCF.

In summary, the Methodology has two phases. The first phase follows ISO 14067:2018 and WRI/WBCSD GHG Protocol – Scope 1, Scope 2, Scope 3, and Product Life Cycle Accounting and Reporting Standards to complete the physical baseline carbon footprint for all of Novelis' products. The second phase applies the principles of ISO 22095:2020 to transparently reallocate mass flows within a specified system boundary to report a carbon footprint reflecting decarbonization efforts between Novelis and its customers, including explicit rules for attribution, balancing-period control, and credit-account governance.

Physical Baseline

The first phase, referred to as the physical baseline of the calculation, defines the methodology for calculating the carbon footprint at the alloy level. Once the alloy level physical baseline is calculated, then the carbon footprint is aggregated to the customer level to understand the customer-specific carbon footprint for each alloy. The goal of the physical baseline methodology is to calculate the accurate footprint for each customer applying an LCA-based approach. Baseline in this instance is defined as the customer-specific carbon footprint at the alloy level before any mass balance reallocation has taken place.

LCA is a rigorous study of the inputs and outputs from and to the natural environment of a particular product or solution that provides a scientific basis for impact evaluation throughout the complete life cycle. The raw material acquisition and manufacturing portions of this study are limited to the utilization of regionalized industry average data from existing published studies, combined with operational data. Only the impact category of climate change is selected for the purpose of this methodology.

To develop the physical baseline methodology, Novelis applied relevant ISO standards, ISO 14040:2006, 14044:2006, and 14067:2018, to define the system boundaries, allocation methods, data sources, cut-off criteria, intended audience, life cycle inventory, and other relevant factors in outlining a consistent product carbon footprint calculation process.

Mass Balance Chain of Custody

Once the physical baseline for each product and customer is established, the Methodology relies on a mass balance model as defined by ISO 22095:2020 to calculate the carbon footprint and recycled content reported to customers, Section 4.0. Mass balance in this context is a chain of custody model in which specified inputs are mixed and allocated to specific outputs, i.e., products, using a credit account system. Commercial qualities, e.g., closed-loop recycled content gathered after an agreement between Novelis and a customer, are modeled with a chain of custody model. Quantification and assignment of these commercial impacts to customers is an important outcome of this methodology to support the incentivization of closed-loop recycling and low-carbon input material sourcing. The mass balance chain of custody model applied by the Methodology is described in detail in the mass balance chain of custody section of this document. The methodology is intended to make these allocation rules transparent, consistently applied, and auditable within each regional system boundary.

Geographical System Boundaries

Novelis defines its global system with four regions: Novelis Asia, Novelis Europe, Novelis North America & Novelis South America. The Methodology system boundaries will follow the same four regions, as shown in Appendix A. Each region will be considered a standalone system. This multi-boundary approach requires that each boundary maintains individual balances, so that the aggregated Novelis system also maintains a balance. Attribution, credit-account management, and inventory balancing are therefore governed within each regional boundary, not across regions, except where explicitly defined for physical baseline treatment of inter-regional shipments.

3.0 Physical Baseline

3.1 Goal and Scope

The purpose of the physical baseline is to define the Methodology for determining the physical cradle-to-gate carbon footprint of Novelis flat-rolled aluminum alloys.

The physical baseline of the methodology is based on the principles of ISO 14067:2018 for carbon footprint of products. Carbon footprints for all products within a specified boundary are to be calculated simultaneously to ensure no carbon leakage or double counting. These carbon footprints are then aggregated to the customer level.

LCA is a credible framework to evaluate the environmental footprint, including carbon footprint, of products and identify low-impact/high-benefit practices and support decisions that lead to reduced environmental impacts. In the physical baseline methodology, LCA is applied to assess the carbon footprint only. Other environmental impacts, i.e., energy consumption, acidification, eutrophication, and water, are not assessed in this methodology. The physical baseline report, the first calculation step in the methodology, is an LCA background report.

In line with ISO 14044: 2006, the goal of the methodology should clearly specify the intended application, reasons for being carried out, the intended audience, and whether the results are intended to be disclosed to the public. The scope describes the most important aspects of the methodology, including the declared unit, system boundaries, cut-off criterion, allocation, impact assessment method assumptions, and limitations.

This methodology is based on the attributional LCA approach, which describes the physical reality of an existing supply chain by quantifying the energy and material flows within an existing life cycle.

3.1.1 System Description Overview

The product system addressed in the physical baseline of the Methodology is the production of Novelis aluminum alloys from mining through processing and finishing by Novelis.

The product system refers to the aluminum flat rolled product (FRP) of a specific alloy. The FRP alloys that Novelis produces are intermediate products and inputs for the following Market Segment Groups: automotive, beverage packaging, aerospace, and specialties. A product as defined in this methodology refers to FRP of a specific alloy entering a specific Market Segment Group.

Table 1: Novelis Market Segment Groups

Market Segment Group	Typical Aluminum Application by Downstream Customer
Automotive	Aluminum is used as an input material for various vehicle parts. Examples include car hoods and other body parts made from stamped aluminum.
Beverage packaging – Can	Aluminum is the primary input material in the production of beverage cans, including can body, can ends, and can tabs. This Market Segment was historically called “Can”
Aerospace	Aluminum is used as an input material for airplane components, such as fuselage and wing structure.
Specialties	This is a broad Market Segment category that includes building materials, consumer electronics, industrial products, and various other industries.

3.1.2 Declared Unit and Reference Flow

The physical baseline is a cradle-to-gate methodology that seeks to provide an intermediate product carbon footprint. Further processing is generally required for Novelis products, and this methodology does not consider the use and end-of-life stages of the product lifecycle.

The Methodology uses one metric ton (t) of Aluminum Flat Rolled Product (FRP) for each customer-specific alloy as its declared unit.

Based on this declared unit, one t of FRP is also the reference flow for this methodology.

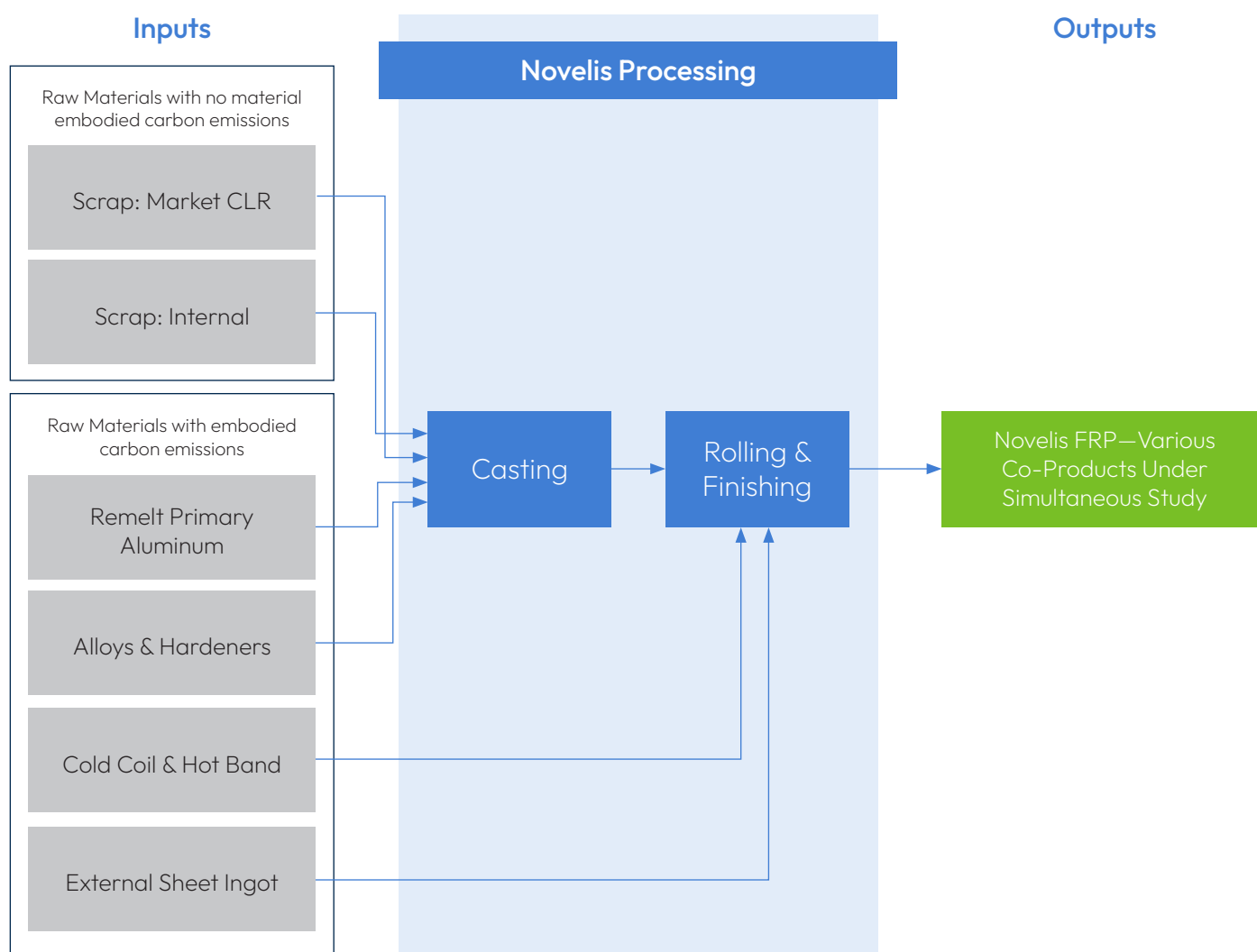
3.1.3 Product System Boundary

The Methodology accounts for the carbon footprint cradle-to-gate related to the production of Novelis alloys. The Novelis system boundary includes Novelis processing (remelt, rolling, and finishing) which intakes refined raw materials, e.g., remelt-prime ingots, rolling slabs, remelt-ready alloying elements, and aluminum scrap (See Figure 1). Aluminum processing from mine (cradle) to smelting reflects upstream activities and is outside the Novelis manufacturing system boundary but is included in the full system boundary of the methodology. Typically, in an LCA, some aspects within the set boundaries are excluded due to statistical insignificance or irrelevancy to the goal and scope. The following activities were included and excluded from the scope and boundaries of this study:

Table 2: Activities Considered in CF Calculation

Included	Excluded
Raw material (metals), mining and processing	Capital goods & maintenance
Combustion of fuels in operations	Research and development
Electricity use in operations	Fuel sourcing and refining
Intercompany and outbound transport paid for by Novelis	Employee commuting & business travel
	Transport from tier 1 suppliers to Novelis sites

Figure 1: System Boundary Emission Sources



3.1.4 Allocation

While calculating a product's carbon footprint, allocation should be avoided if possible. If the life cycles of more than one product are connected, allocation of the process inputs should be avoided by using the system boundary expansion approach. If allocation is unavoidable, allocation between co-products should be applied in a manner that reflects the underlying physical relationships between them. Since Novelis produces multiple alloys from the same processing system, the inputs and outputs of the system are partitioned between its different alloys in a way that reflects the underlying physical relationships between them (described below).

3.1.4.1 Allocation Procedure

The physical baseline methodology calculates the carbon footprint of multiple products simultaneously; therefore, an allocation system is required. This allocation is performed in a manner that reflects the underlying physical relationships between inputs and outputs by using alloy bill of material data to quantify the carbon-intensive input consumption of each respective product by mass.

The allocation process uses the alloy bill of material. The allocation of site-level data using alloy mass ultimately determines how carbon footprint from material inputs is allocated to each product.

The alloy bill of material (BoM) can be thought of as the record of the materials consumed when producing a good. It is a standard concept in production environments and exists for all types of produced products. BoMs reflecting the creation of sheet ingots are used, i.e., the BoM only captures the creation of the ingot, not further downstream operations to create an FRP. The bill of material is generated from site-level operating data and aggregated to the regional level to build the basis of the physical baseline.

The BoM reflects site level material consumption data, e.g., primary aluminum and scrap consumption, as well as production data, i.e., sheet ingot & mass of process scrap production for sheet ingots of each alloy produced in a period.

ERP systems record the actual consumption per production order or production run; thus, linking metal consumption (e.g., remelt primary aluminum A&H and different types of scrap) to the respective alloy for the production run. This data is aggregated for a single month, with the result being a mass of primary aluminum consumed for each alloy at a site level. This site-level primary aluminum content is then aggregated to the system (region) level using allocation by mass. In situations where both internally produced Sheet Ingots and External Sheet Ingots are used, the weighted average footprint by mass of both is used. An illustration of the relevant aspects of this transformation is shown in Figures 2, 3, and 4.

Figure 2: Site-Level BoM – Production ERM Systems Capture Input Consumption (Primary Aluminum, A&H, Scrap)

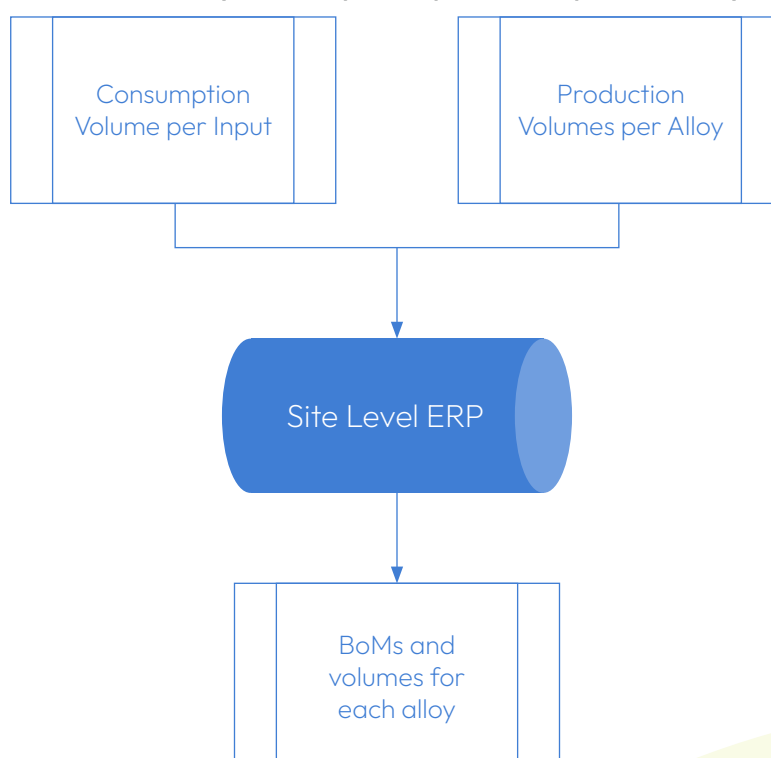


Figure 3: System-Level BoM

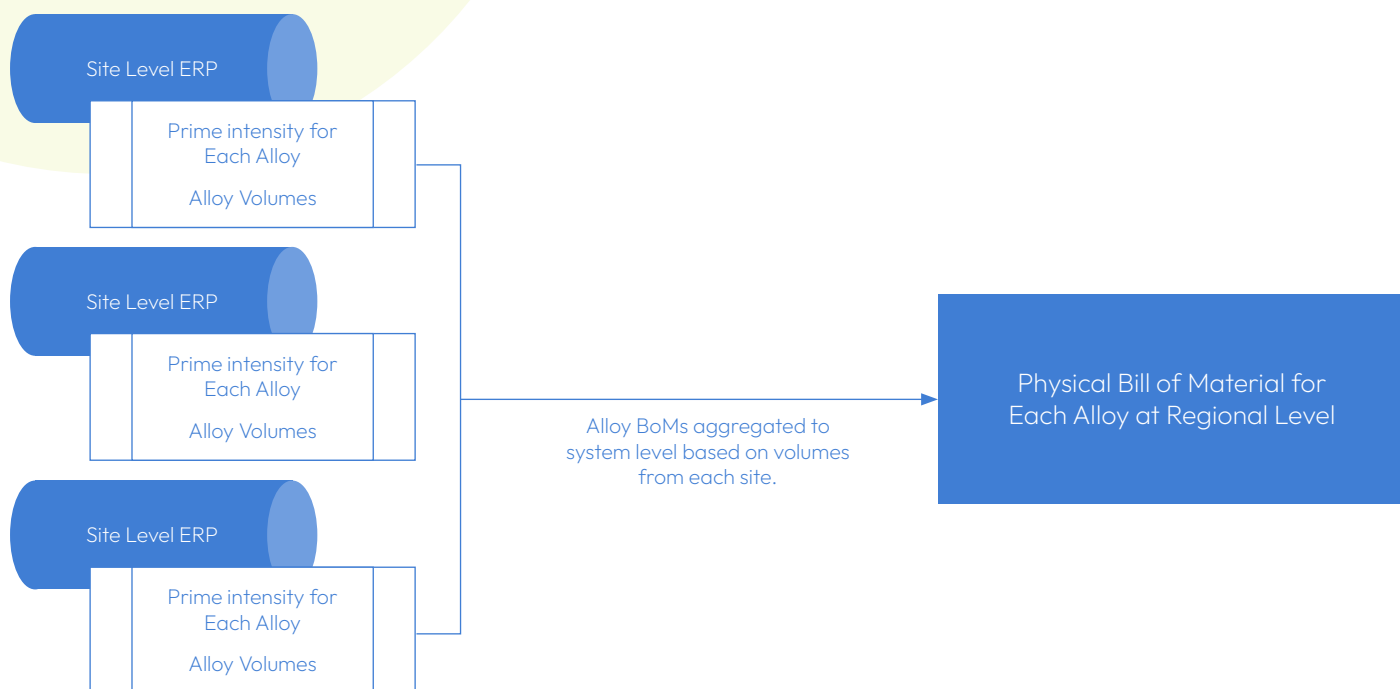


Figure 4: Multi-Output Allocation

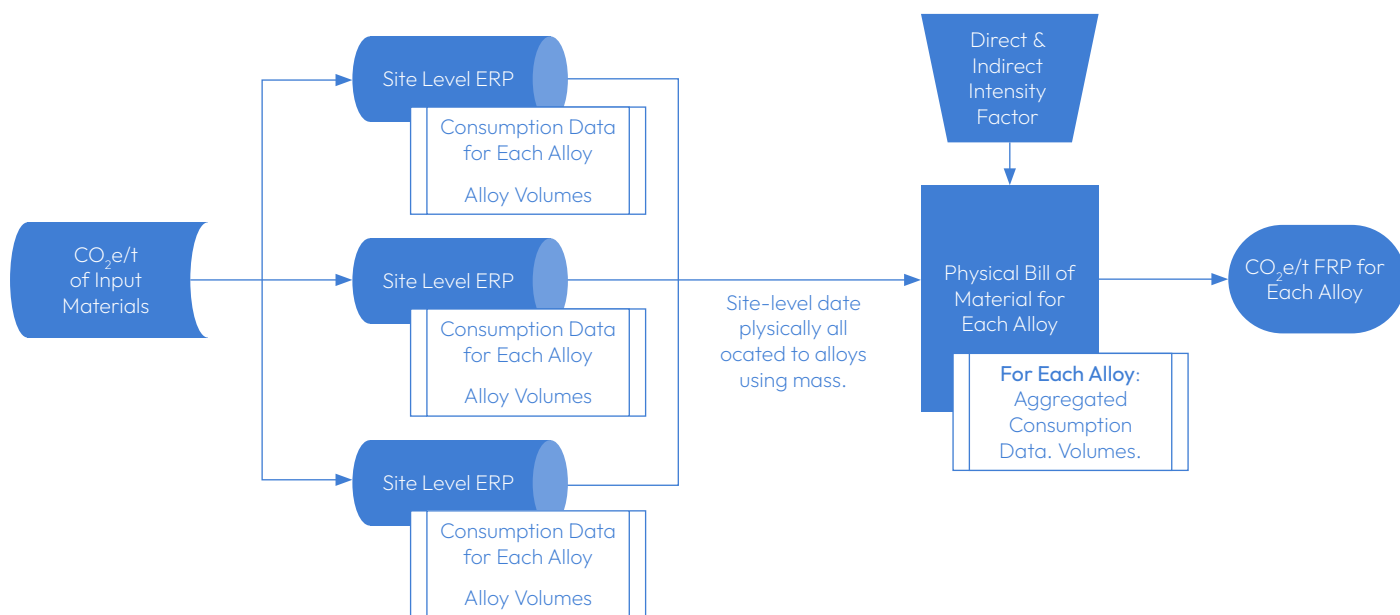


Table 3: Example Calculation: Multi-Output Allocation

Raw Material Inputs For this example, these are the illustrative inputs, mass, and associated carbon intensity for the given reporting period.	Raw Material	Mass (t)	Embodied Carbon tCO ₂ e/t	Embodied Carbon (t)
	Primary aluminum	100	10.5	1050
	External sheet ingot	50	6.5	325
	Alloys and hardeners	10	10.5	105
	Total Scrap	200	0.0	0
	Thereof Novelis Process Scrap	30	0.0	0
	Thereof Market PreConsumer Scrap	70	0.0	0
	Thereof Market PostConsumer Scrap	100	0.0	0
	*Note: All scraps have an embodied carbon intensity of zero applying the cut-off approach. This will be described in section 3.1.4.3.			
		360		1480
Co-products and Waste For this example, these are the hypothetical outputs for the given reporting period.	Output	Mass (t)		
	AA5182 - Can	80		
	AA5754 - Auto	40		
	AA6016 - Auto	180		
	Novelis Process Scrap	30		
	Metal lost in Process	30		
			360t – thereof 300t Sheet Ingot	
Relevant Bill of Material Data This is the relevant BoM data used for the allocation.	AA5182 - Can	Consumed: 30t prime; 20t external SI; 2.7t A&H		
	AA5754 - Auto	Consumed: 10t prime; 10t external SI; 1.3t A&H		
	AA6016 - Auto	Consumed: 60t prime; 20t external SI; 6.0t A&H		
Processing Factor used for illustrative purposes only.	Every ton of FRP produced shares the impact of energy consumption-related emissions with a factor of 0.7 tCO ₂ e/t FRP. Total processing emissions for this system: 210tCO ₂ e			
System Carbon Footprint Calculation	$CO_2e_{multi-product\ system-intensity} = CO_2e_{multi-product\ system} / V_{products}$			
	$CO_2e_{system} = [(100\ t \times 10.5\ tCO_2e/t) + (50\ t \times 6.5\ tCO_2e/t) + (10\ t \times 10.5\ tCO_2e/t) + (200\ t \times 0\ tCO_2e/t)] + (300\ t \times 0.7\ tCO_2e/t)$			
	$CO_2e_{multi-product\ system} = 1,690\ tCO_2e$			
	$CO_2e_{multi-product\ system-intensity} = 1,690/300$			
	$CO_2e_{multi-product\ system-intensity} = 5.6\ tCO_2e/t$			

Allocation to Products Using BoM Consumption Data

$$\text{CO}_2\text{e}_{\text{product}} = \sum (\text{V}_{\text{raw material consumed}} \times \text{CO}_2\text{e}_{\text{raw material/t}}) + \text{V}_{\text{product}} \times \text{CO}_2\text{e}_{\text{processing/t}}$$

$$\text{CO}_2\text{e}_{\text{product-intensity}} = \text{CO}_2\text{e}_{\text{product}} / \text{V}_{\text{product}}$$

$$\text{CO}_2\text{e}_{\text{AA5182-Can}} = [(30\text{t} \times 10.5 \text{ tCO}_2\text{e/t}) + (20 \text{ t} \times 6.5 \text{ tCO}_2\text{e/t}) + (2.7 \text{ t} \times 10.5 \text{ tCO}_2\text{e/t}) + (27.3 \text{ t} \times 0 \text{ tCO}_2\text{e/t})] + (80 \text{ t} \times 0.7 \text{ tCO}_2\text{e/t})$$

$$\text{CO}_2\text{e}_{\text{AA5182-Can}} = 529 \text{ tCO}_2\text{e}$$

$$\text{CO}_2\text{e}_{\text{AA5182-Can-Intensity}} = 529/80$$

$$\text{CO}_2\text{e}_{\text{AA5182-Can-Intensity}} = 6.61 \text{ tCO}_2\text{e/t}$$

The same calculation is performed for AA5754-Auto and AA6016-Auto, and the results are as follows:

$$\text{CO}_2\text{e}_{\text{AA5754-Auto}} = 212 \text{ tCO}_2\text{e}$$

$$\text{CO}_2\text{e}_{\text{AA5754-Auto-Intensity}} = 5.3 \text{ tCO}_2\text{e/t}$$

$$\text{CO}_2\text{e}_{\text{AA6016-Auto}} = 949 \text{ tCO}_2\text{e}$$

$$\text{CO}_2\text{e}_{\text{AA6016-Auto-Intensity}} = 5.27 \text{ tCO}_2\text{e/t}$$

Balance Check

$$\text{CO}_2\text{e}_{\text{System}} = \sum \text{CO}_2\text{e}_{\text{Product}}$$

$$1690 \text{ tCO}_2\text{e} = 1690 \text{ tCO}_2\text{e}$$

The sum of product carbon footprints equals the multi-product system carbon footprint.

Variable Definitions

$$\text{CO}_2\text{e}_{\text{multi-product system}} = \text{absolute carbon emissions of system}$$

$$\text{CO}_2\text{e}_{\text{multi-product System-intensity}} = \text{carbon intensity per t FRP before allocation}$$

$$\text{CO}_2\text{e}_{\text{product}} = \text{absolute carbon emissions of a product}$$

$$\text{CO}_2\text{e}_{\text{product-intensity}} = \text{carbon intensity per t FRP of a specific product}$$

$$\text{V}_{\text{product}} = \text{Volume of good, saleable product} = \text{FRP sold}$$

$$\text{V}_{\text{raw material}} = \text{Volume of raw material input into production}$$

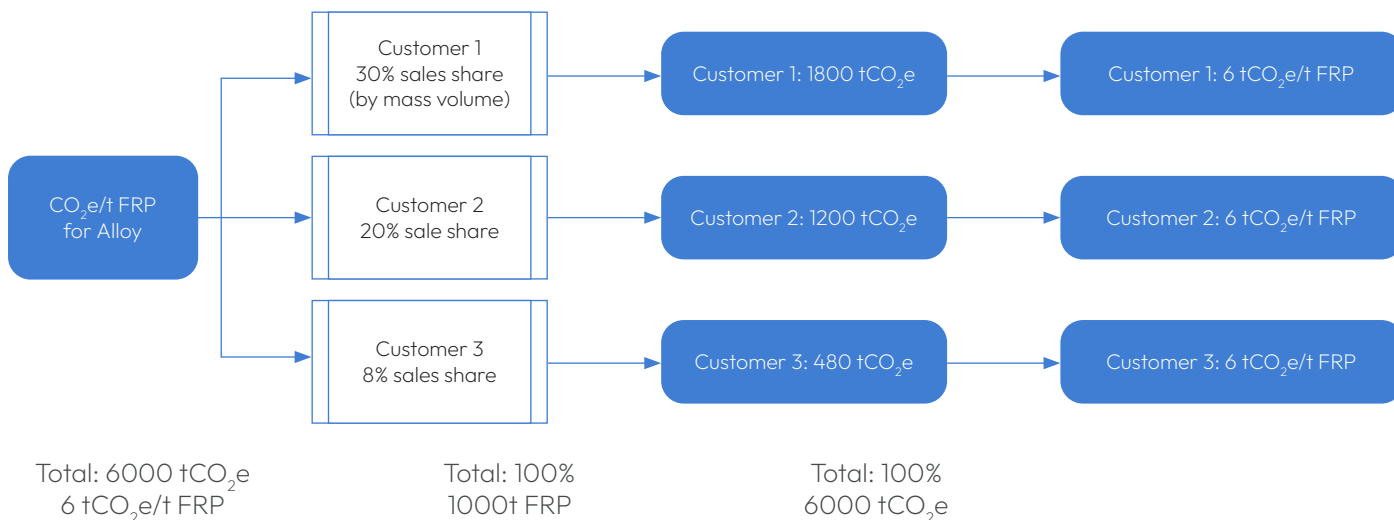
$$\text{CO}_2\text{e}_{\text{raw material}} = \text{Carbon intensity for respective raw material}$$

Each variable is considered for a given reporting period.

3.1.4.2 Customer-Level Allocation

To provide customer-level reporting, the methodology includes a final allocation to aggregate results at the customer level. PCFs leaving Novelis's gate ($\text{tCO}_2\text{e} / \text{t FRP}$) are multiplied by mass shipped to customers, reflective of a mass-allocation approach. The result is a carbon footprint for each customer for the reporting period.

Figure 5: Customer Allocation



3.1.4.3 End-of-Life Allocation

The Methodology only considers cradle-to-gate emissions and therefore excludes use and end-of-life phase emissions. The physical layer of the methodology follows the Cut-off approach. Cut-off approach, also known as 100:0 or recycled content approach (Allacker, et al, 2017), defines that the burdens of processing and recycling of any waste material sent to recycling are attributed to the subsequent, scrap-consuming product system and considered to be outside of the system boundary (i.e., they are "cut off"). Accordingly, any scrap inputs into the manufacturing stage are considered free of any upstream virgin material carbon emissions.

3.1.5 Data Quality

The data used for this methodology should provide a meaningful input into the PCF calculation, and therefore shall be complete, precise, consistent, representative, and reproducible given reasonable constraints on time and budget.

- **Completeness:** Given the goals of this methodology, completeness of data is required to ensure that no understatements take place. Completeness will be verified annually by both internal and external review, confirming that no gaps over 1% exist in coverage.
- **Precision:** Primary data is the most precise, followed by secondary and modeled data. Primary data from our operations is used, while secondary data is used for bauxite to aluminum.
- **Representative:** Data should be representative of the geographical region and period relevant as defined by reporting requirements. Geographies considered are Novelis' North America, South America, Europe, and Asia regions, described in Appendix A.
- **Consistency and reproducibility:** Consistency and reproducibility are of utmost importance as this methodology will be applied to produce reports for multiple customers per reporting period. Consistency and reproducibility are imbedded in this methodology and are seen as a key parameter of this methodology.

3.1.6 Cut-off Criteria

Cut-off criteria and assumptions for inclusion of inputs and outputs in this assessment were established utilizing the environmental significance criteria. If a flow is less than 1% of the cumulative mass and/or CO₂e of all the inputs and outputs, it may be excluded. All relevant activities as illustrated in Table 2 and Figure 1 have been reviewed utilizing a combination of primary and secondary data. While most inventory data are sourced from primary resources, representative proxies are used to close gaps in the absence of primary data.

3.1.7 Intended Audience

The intended audience are Novelis' beverage packaging, automotive, aerospace, and specialties customers. The results will be made available to these business-level customers as part of contractual agreements or upon request. For credibility and confidence in the study results, this methodology pursues a review by an independent reviewer to ensure the study follows the requirement of ISO 14044:2006 and ISO 14067:2018. Novelis will use the information from the application of this methodology in an aggregated manner for public communications, to develop marketing materials, and to provide data to stakeholders.

3.1.8 Impact Assessment Method

The physical baseline follows ISO 14067:2018; therefore, Global Warming Potential is the only impact addressed in this methodology.

Global Warming Potential is characterized by a unit of measure to which the resource and emission flows have been normalized. To aggregate the substances into the impact categories, substances are multiplied by an emission factor to convert into an equivalent substance, CO₂, and then added together to create a total for each impact category, global warming potential. Carbon emissions are reported as units of carbon dioxide equivalent, or CO₂e. CO₂e emissions are therefore inclusive of carbon dioxide (CO₂), nitrous oxide (N₂O), and methane (CH₄). The other GHGs of sulfur hexafluoride (SF₆), perfluorocarbons (PFCs) and nitrogen trifluoride (NF₃) are not emitted by Novelis' facilities.

Carbon dioxide equivalent emissions utilize Global Warming Potentials defined by the Intergovernmental Panel on Climate Change's (IPCC) Fifth Assessment Report: AR5 – 100 years.

3.1.9 Limitations

A fundamental application of the results of a carbon footprint or life cycle assessment, after proper interpretation, is its use as an analytical tool to provide design guidance which acknowledges the complicated system and provides clarity and quantitative information for quantifying the carbon footprint and recycled content of Novelis' products. The methodology will support Novelis in customer reporting, marketing materials and other external communications.

As there are limitations to using any one model or tool as the only way to evaluate environmental performance, there are limitations to using carbon footprint and LCA as well. The limitations of the carbon footprint or LCA include its inherent relative and potential nature of results. In addition, as with any other modeling exercise, depending on data acquisition, models, data availability and quality, allocations, assumptions, and the limited development of some of the characterization models could further contribute to the uncertainty in results. Despite these recognized limitations, life cycle assessments and carbon footprints provide important directional insights for proper claims and potential further improvements in the environmental sustainability of products.

Specifically, the following limitations are identified:

1. Only carbon footprint is included in the LCA model results. Emission factor data mostly comes from secondary sources with industry average LCIA results. The software and LCA calculation methods used vary among the literature sources. Many environmental indicators may not be comparable as they could vary depending on the impact assessment method used. These LCIA results shall not be converted from one indicator to another without having full access to the complete LCI table. Carbon footprint results, or Global Warming Potential in kg CO₂e, on the other hand, uses some version of the IPCC GWP method. CO₂e emissions are characterized with a factor 1 for all versions of the IPCC methods and CO₂ is the GHG emission that typically dominates aluminum and steel impacts. As such, the specific version of the IPCC Assessment Report used is less relevant in these cases.

2. To aim to achieve conformance with ISO 14067:2018, all five separate GWP metrics (fossil, biogenic emissions, biogenic removals, land use change, and aircraft) need to be documented. However, this methodology uses carbon footprint results obtained from published studies of industry averages, which the impact calculation methods and indicator provided are not consistent and don't include all the GWP metrics. Biogenic emissions, land use, and biogenic removals are excluded.
3. There are exclusions to this carbon footprint methodology. These include emissions from fuel extraction and transport of raw materials from suppliers to Novelis. Furthermore, this is a partial carbon footprint, cradle-to-gate ending with the production of Novelis FRP.
4. Carbon intensity values for alloys and hardeners from secondary sources are not applied under this methodology. Alloys & Hardeners are considered with the same carbon intensity as remelt primary aluminum ingots. This may result in imprecise results for alloys with high content of certain alloying elements. In line with the GHG Protocol Standard, Novelis has adopted the approach of treating alloy elements the same as prime materials based on a materiality assessment referenced from The Aluminum Association Semi-Fab LCA. The assessment provides the following rationale for this treatment: "Substituting alloy elements with primary aluminum does not end up with under-counting of the potential environmental impact since on a per unit mass basis, the footprint of primary aluminum is often higher than most of the alloy elements. The substitution is a conservative approach."

It should be highlighted that a carbon footprint cannot provide the sole basis for comparative assertions of overall environmental superiority or equivalence as ISO 14044:2006 requires a comprehensive set of LCIA indicators to support such claims.

3.2 Life Cycle Inventory

LCI data contains the details of the resources flowing into a process and the emissions flowing from a process to air, soil and water.

3.2.1 Raw Materials

Embodied carbon emissions from raw material inputs significantly influence the total emissions of each declared unit. Therefore, completeness and representativeness for this activity is especially important. However, given these are indirect emissions that take place at our suppliers' sites, secondary data, such as that from industry associations, and modeling are necessary.

Of these raw materials, embodied emissions come from three sources entering Novelis operations:

1. Remelt Primary Aluminum,
2. Alloys and Hardeners and
3. External Sheet Ingot as well as other intermediary products like Cold- or Hot Milled Band.

While aluminum scrap is also a raw material input, it is considered free of burden when it enters Novelis's operational boundary as Novelis applies the "Cut-Off" or "Recycled Content" approach. More information on the handling of scrap in this methodology is included in section 3.1.4.3.

3.2.1.1 Remelt Primary Aluminum

Remelt Primary Aluminum is virgin aluminum used for remelting in Novelis' casting operations. This material is the main source of carbon footprint and has a complex upstream-supply chain. IAI describes four distinct production phases for remelt primary aluminum prior to a processor like Novelis in their 2019 life cycle inventory report: bauxite mining, alumina production, electrolysis, and casting into primary aluminum ingots.

Bauxite mining is the process of extracting bauxite from aluminum ores in the earth. Carbon emissions due to bauxite mining are the result of typical mining operations, such as heavy machinery operation, transport, and occasional blasting operations.

Alumina production is the process of refining bauxite into alumina. It involves the washing of bauxite and chemical extraction of alumina. Carbon emissions due to alumina production result primarily from fuel and electricity use in this stage.

Electrolysis is the process of reducing alumina in electrolytic smelters to aluminum and CO₂ through chemical reaction with carbon anodes. Carbon emissions due to alumina smelting are primarily due to electricity use but also include direct emissions from the reduction process. Molten aluminum is collected from the electrolysis smelters and cast into primary ingots. Novelis processes this aluminum through casting, rolling and finishing.

From FY25 forward, Novelis will request supplier specific carbon intensity data (covering Scope 1, 2 and 3 emissions / cradle-to-gate) from Prime suppliers for the quantities purchased. Any supplier specific data received will be subject to a data quality review by Global Sustainability and Global Procurement in accordance with Novelis' Primary Aluminium Carbon Intensity Data Quality Policy (available in Appendix I). Data requests will be made annually. For any purchased Prime and Sheet Ingot without supplier specific data, Novelis combines publicly available information for the process steps, covering bauxite mining, electrolysis, as well as the smelting and casting of primary ingots. Therefore, when defining the calculation for the carbon footprint of Novelis products, primary and secondary data is used to establish the carbon emissions from bauxite mining, alumina production, and electrolysis of primary ingots.

The secondary data sources are:

1. **International Aluminum Institute (IAI):** For the process steps bauxite mining to alumina, the carbon footprint is based on IAI Life Cycle Inventory data. Novelis uses the LCI's global averages for its calculations. The data is updated annually each July and publicly available.
2. **CRU Group:** For alumina smelting to aluminum prime casting, smelter-specific data (energy mix, emissions) provided by CRU (www.crugroup.com) is used. The data is updated annually each calendar year and only available under a commercial license.

The carbon footprint of primary aluminum is calculated for each smelter Novelis sources, CRU database, combined with the bauxite to alumina carbon footprint from IAI. The supplier mix is considered at the regional level, and the calculation is shown in Table 4.

Table 4: Primary Aluminum Carbon Emissions

Values	Description	Reference
$CO_2e_{\text{prime}} = CO_2e_{\text{bauxite}} + CO_2e_{\text{alumina}} + CO_2e_{\text{anode}} + CO_2e_{\text{smelting}} + CO_2e_{\text{casting}} \quad (\text{Eq. a})$		
CO_2e_{unit} unit = bauxite, alumina, anode, casting	IAI global average	Source 1
CO_2e_{smelting}	CRU emission factor	Equation a
$CO_2e_{\text{smelting}} = \text{CRU emission factor based on smelter source mapping} \quad (\text{Eq. b.})$		
Source	Publisher	Document
1	International Aluminum Institute (IAI)	GHG Emissions Data for the Aluminium Sector (2022)

An example of the carbon footprint calculation is shown in Table 5. In this example, primary aluminum is processed in a Norwegian smelter powered by hydropower. The CO₂e footprint from bauxite to alumina refining would be 3.78 tCO₂e/t primary aluminum using IAI factors, plus 2.32 tCO₂e/t from operations taking place for smelting per CRU smelter-specific data, hence leading to 6.10 tCO₂e/t of primary aluminum used.

Table 5: Primary Aluminum CO₂e Calculation Illustrative Example

2024t CO ₂ /t	Electricity – Indirect	Perfluorocarb on (PFC) – Direct	Process (CO ₂) – Direct	Ancillary Materials – Indirect	Thermal Energy – Direct/Indirect	Transport – Indirect	Total	Smelter Specific	Total Prime
Mining	0.02				0.05		0.07		
Refining	0.2			0.4	1.5	0.3	2.4		
Anode Production	0.0		0.1	0.8	0.1		1.0		
Electrolysis				0.1		0.2	0.3		
Casting				0.0		0.0	0.0		
Total Raw Material	0.23	0.0	0.1	1.3	1.65	0.5	3.78		
Scope 1 + 2 Smelter								2.32	
Total raw material plus Smelter 1 and 2									6.10
Source:	International Aluminium Institute: Greenhouse Gas Emissions Intensity – Primary Aluminium, 2024 factors.							CRU	

The carbon intensity of primary aluminum is calculated using the regional supplier mix. The calculation in Table 5 illustrates this aggregation, which produces a regional emission factor for primary aluminum entering the system.

Table 6: Primary Aluminum Carbon Emissions Aggregated to System Level

Values	Description	Reference
$CO_{2e\ prime-region} = (\sum CO_{2e\ prime} \times \text{Associated Mass}) / \text{Total Prime Mass (Eq. c)}$		
$CO_{2e\ prime} \times \text{Associated Mass}$	Embodied emissions based on source and source mass over given period.	Equation a
Total Prime Mass	Total remelt primary aluminum entering the system over given period.	Equation b

3.2.1.2 Alloys & Hardeners

FRP products consist of various aluminum alloys, some of which contain up to 5% of alloying and hardening elements.

Alloying elements and hardeners are metals and other chemical elements used during the casting process to ensure that the chemical composition of an alloy is met. Novelis treats all alloys & hardeners as virgin material, even in cases where secondary, i.e., recycled, materials are used.

The materials have different upstream processes, generally involving Mining, Beneficiation & Refining processes and in some cases blending with aluminum to produce “remelt-ready” products.

Supplier information on the carbon footprint and other LCI relevant data of the consumed materials is generally not available. Secondary databases like Sphera GaBi or Ecoinvent do not cover all the elements Novelis uses, nor the different grades & production routes. Alloys & Hardeners are therefore considered to have the same carbon intensity as remelt primary ingots, which is a conservative approach (See Section 3.1.9 for more information).

3.2.1.3 External Sheet Ingots

Novelis sources external sheet ingots where it does not have the capacities or capabilities to produce the sheet ingots internally.

External Sheet ingots are treated the same way as remelt primary ingots, follow the same upstream production process and carbon footprint. The process differs only to the extent that during smelting, rolling slabs are cast rather than remelt ingots.

Data for external sheet ingot mass and embodied carbon is collected in the same manner as primary aluminum.

3.2.1.4 Scrap

Aluminum scrap is an input into most Novelis products. Scrap falls into the following categories, which can overlap and are defined in the glossary: pre-consumer scrap, post-consumer scrap, closed-loop scrap, internal scrap, and market scrap. Scrap in all forms is a valuable input in terms of environmental benefit; according to The International Aluminum Institute's factsheet on aluminum recycling, recycling aluminum scrap requires up to 95% less energy than production from ore (IAI, 2020).

For the physical baseline, all scrap is treated the same. Applying the cut-off method described in section 3.1.4.3, all scrap has an embodied carbon footprint of zero.

3.2.2 Casting and Rolling

Novelis processes raw materials through two distinct operational processes: casting and rolling.

Aluminum casting is the process of melting down aluminum with up to 5% of alloying and hardening elements and casting this material into an aluminum ingot. Carbon emissions due to aluminum casting result from electricity use and fuel combustion.

Aluminum rolling and finishing is the process of rolling aluminum ingots in hot rolling mills, cold rolling mills, CASH lines, and other finishing processes to produce flat rolled aluminum. Carbon emissions are due to rolling and finishing result from electricity use and fuel combustion.

For simplicity, the carbon emissions due to casting and rolling are modeled using internal Novelis data. They are calculated following the same methodology outlined in section 2.5.1 of Novelis's Environmental Reporting Directive, which defines the calculation of Novelis' global carbon emissions: [Introduction \(novelis.com\)](#)

Processing emissions from casting and rolling are aggregated to the regional level and divided by mass of FRP produced to generate a t carbon / t FRP emission factor as shown in Table 7. This modeled intensity is applied to every declared unit.

Table 7: Operational Energy Consumption Emission Factor

$$CO_2e_{\text{processing}} = (\sum \text{Casting \& Rolling Energy Emissions}_{\text{region}}) / (\text{Regional Mass})$$

$$CO_2e_{\text{processing}} = \text{emission factor for energy consumption}$$

$$\sum \text{Casting \& Rolling Energy Emissions}_{\text{region}} = \text{Absolute operational carbon emissions for a given region for the reporting period}$$

$$\text{Regional Mass} = \text{Mass of FRP produced during the reporting period}$$

3.2.2.1 Primary Aluminum Consumption and Impact on PCF Calculation

Raw materials, specifically primary aluminum, account for approximately 80% of the embodied carbon for FRP produced by Novelis. Therefore, primary aluminum consumption per alloy has the highest contribution to a product's carbon footprint. The example in Table 8 illustrates this by demonstrating the calculation of the carbon footprint of one ton of FRP of alloy AA6111. In this example, the emission factor for Novelis operational emissions is 0.7 tCO₂e per t FRP, the modeled emission factor for primary aluminum in this system is 6.2 tCO₂e per t primary aluminum, and 0.5 t of primary aluminum and 0.5 t of scrap was consumed to produce 1 t of FRP AA6111.

Table 8: Primary Aluminum CO₂e Consumption Impact on PCF

$$\text{CO}_2\text{e}_{1\text{t AA6111}} = V \times \text{CO}_2\text{e}_{\text{processing}} + V_{\text{prime-consumed}} \times \text{CO}_2\text{e}_{\text{prime}} + V_{\text{scrap}} \times \text{CO}_2\text{e}_{\text{scrap}}$$

V = Volume (mass) of FRP Produced

$V_{\text{prime-consumed}}$ = Volume (mass) of prime consumed in production

V_{scrap} = Volume (mass) of scrap consumed in production

$\text{CO}_2\text{e}_{\text{processing}}$ = Carbon emission factor for operational emissions

$\text{CO}_2\text{e}_{\text{prime}}$ = Carbon emission factor for prime

$\text{CO}_2\text{e}_{\text{scrap}}$ = Carbon emission factor for scrap

$$\text{CO}_2\text{e}_{1\text{t AA6111}} = 1 \text{ t} \times 0.7 \text{ tCO}_2\text{e/t} + 0.5 \text{ t} \times 6.2 \text{ tCO}_2\text{e/t} + 0.5 \text{ t} \times 0 \text{ tCO}_2\text{e/t}$$

$$\text{CO}_2\text{e}_{1\text{t AA6111}} = 3.8 \text{ tCO}_2\text{e}$$

The example in Table 8 illustrates the impact of primary aluminum consumption on the carbon footprint of a respective product. For a system, the following parameters apply to all produced alloys:

- Carbon Intensity of consumed primary aluminum
- Direct carbon footprint relevant emissions of system, distributed to produced tons of FRP (Scope 1)
- Indirect carbon footprint from power consumption, distributed to produced tons of FRP (Scope 2)

The variability of carbon footprint per ton of FRP for the different alloys produced in the system therefore depends only on the primary aluminum consumption. The two extreme cases are FRP produced with no primary aluminum input – carbon footprint then consists only of Scope 1 & 2 – or FRP produced solely from primary aluminum. Most products' alloys are in the range of 5-40% primary aluminum share on input.

3.2.2.2 External Sheet Ingot and PCF Calculation

Consumption of external sheet ingots is recorded and aggregated to system level. External Sheet Ingot carbon intensity is modeled in the same manner as primary aluminum carbon intensity and scrap, using secondary data from IAI and CRU for the prime % and assuming 0 burden for the scrap %.

3.2.2.3 Alloys and Hardeners and PCF Calculation

Alloys and hardeners are given the same carbon intensity as primary aluminum for the respective region. For calculation purposes, they are treated as prime with the prime emission factors for each region applied to alloys and hardeners. They are allocated using consumption data (BoM).

3.2.3 Time Period for Data Collection Aggregation and Reporting

The reporting period will follow Novelis' fiscal year, which begins April 1st and ends March 31st. Data collection is aligned to the reporting and supports ongoing reviews during the reporting period. Data includes the categories described in Table 8.

In addition to the Novelis fiscal year (April 1–March 31), Novelis may compile customer disclosures for alternative contiguous 12-month windows (e.g., calendar year) where commercially required. Data collection frequency remains unvaried; all calculations are performed ex-post using the same inputs and process.

Each customer receives one externally reported disclosure per region per 12-month reporting window.

Finalization and publishing of results will be completed no later than the end of the first quarter following the fiscal year with results available to customers by request throughout the following year.

To avoid overlap and any risk of double counting, the methodology uses Balancing Periods chosen to be completely contained in both reporting periods (if applicable). All inputs and credit movements (CLR, Market Scrap, LCP) are aggregated, reviewed, and locked at the close of each balancing period. FY and CY reporting windows are then assembled ex-post by summing the relevant, already-locked Ledgers; no re-allocation occurs at the annual reporting stage.

Table 9: Data Collection Frequency and Descriptions

Type	Minimum Collection Frequency	Descriptions
Sales Information	Monthly	FRP sales volume (mass) by customer, product & alloy
Bill of Material – Internal Sheet Ingots	Monthly	Detail on internal Sheet Ingot production
External Sheet Ingots Sourced	Monthly	Detail on mass and source of external sheet ingots sourced
Production Volumes (Mass) System	Quarterly	Total Production of system to establish processing emission factors
Processing Emissions	Quarterly	Total Novelis processing emissions of system
Carbon Intensity Primary aluminum and external Sheet Ingot	Quarterly	Modeled carbon intensities for primary aluminum and external sheet ingot
Auxiliary mapping data	Quarterly	Includes alloy mappings, customer mappings, products to Market Segment Group mapping

3.3 Physical Baseline & Mass Balance Chain of Custody

As discussed in section 2.0 of this document, the Methodology relies on both the Physical Baseline methodology and the Mass Balance Chain of Custody methodology to develop customer and product level results. This section outlines additional information necessary to serve as context as this methodology transitions from the Physical Baseline to the Mass Balance Chain of Custody.

3.3.1 Handling of Scrap in Physical Baseline and Mass Balance Chain of Custody

As described in section 3.2.1.4, for the physical baseline, all scrap is treated the same.

For the Mass Balance Chain of Custody, a segmentation of closed-loop and market scrap takes place. This segmentation and its reasoning are explained in section 4. Therefore, whereas in the physical baseline “scrap” generally refers to all scrap types, in the Mass Balance Chain of Custody, scrap is referred to as “CLR scrap” which refers to closed-loop recycle scrap, and “Market scrap” which refers to all other scrap types. The cut-off method described in section 3.1.4.3 is applied to both scrap segments, maintaining zero embodied carbon emissions for all scrap types.

3.3.2 Handling of Primary Aluminum in Physical Baseline and Mass Balance Chain of Custody

As with scrap, segmentation also occurs for primary aluminum in the mass balance chain of custody. While all primary aluminum intensities are included in the calculation of regional carbon intensities for the physical baseline, for the mass balance chain of custody primary aluminum is segmented into “low carbon prime” and “non-low carbon prime”. The basis for this segmentation is described in section 4, but the result is two distinct raw material groups with distinct carbon intensity averages. As this is a segmentation of existing data and not the addition of new raw materials, the aggregate results of the physical baseline and mass balance chain of custody are equivalent.

3.3.3 Handling of Inter-Regional Transfers

Primary carbon intensity from the primary purchasing region will transfer scope 3.1 with the inter-regional shipment (SI/FRP) to the receiving region. The shipping region will provide their physical baseline carbon intensity at the alloy level. The receiving region will apply this scope 3.1 carbon intensity to the prime content of the inter-regional shipment. Scope 1 and Scope 2 intensity for the shipping region will be applied to the total shipped mass. In summary, Scope 1, 2, and 3.1 emissions proportionate to the quantity shipped between regions will transfer from the shipping region to the receiving region. BoM adjustments are limited to primary material (t).

For methodological chain of custody purposes, each region remains a standalone system boundary and inter-regional transfers do not move credit account balances between regions. Prime and scrap attributes are locked by the delivering region and shall not be reallocated by the receiving region. The alloy-level recycled content and prime/scrap mix therefore remain embedded in the transferred material and carry through into the receiving region's final output.



4.0 Controlled Mass Balance Chain of Custody

The purpose of the mass balance chain of custody section is to provide a methodology to reallocate specific inputs based on a mass balance model as defined by ISO 22095:2020. Novelis' mass balance model, however, is constrained beyond what is required by ISO 22095:2020. The controlled mass balance model is used to calculate the carbon footprint and recycled content reported to Novelis customers. Novelis implements constraints to achieve a greater level of physical presence compared to baseline mass balance, progressing towards controlled blending as detailed in section 4.2.4.

Controlled mass balance is a chain of custody model in which specified inputs are allocated to specific outputs, i.e., customer-specific products, using a credit account system. Impacts of commercial mechanisms, e.g., closed-loop recycling agreements between Novelis and a customer, are currently untraceable in a physical baseline and are modeled with a mass balance CoC model. Quantification of the environmental benefit of these commercial mechanisms and their assignment to customers is the outcome of this methodology. Appropriate allocation of these environmental benefits to customers supports the incentivization of closed-loop recycling and low-carbon input material sourcing.

The mass balance chain of custody methodology uses the results of the physical baseline as its starting point, details steps on reallocation of inputs, and provides guidance on reporting of results. The two main sections of the Methodology – physical baseline and mass balance chain of custody – shall be viewed together as one unified methodology.

4.1 Goal and Scope

The physical baseline follows LCA methodology to develop a cradle-to-gate carbon footprint baseline for Novelis products and customers. This is a useful starting point to ensure data collection and impact calculations follow a strict and robust framework. However, the physical baseline fails to capture commercial considerations that have direct and measurable impacts on the environmental sustainability of Novelis products. The controlled mass balance chain of custody section provides a framework that captures commercial impacts while adhering to the management systems set out by ISO 22095:2020. Closed-loop recycling agreements and low carbon prime inputs are particularly relevant in the development of the controlled mass balance chain of custody section of the Methodology.

Closed-loop recycling agreements are defined as a commercial contract between Novelis and a downstream customer, to ensure that the scrap material generated downstream of Novelis is returned to Novelis as clean scrap and not downcycled or sold to the market. However, this scrap may not go back into a product the CLR customer purchases from Novelis. This may be due to operational challenges such as scrap processing limitations at the site it was returned to, or due to location-based logistical efficiency challenges. Therefore, with only the results of the physical baseline, the customer may not receive the full environmental benefit of the CLR agreement.

A controlled mass balance chain of custody model that includes reallocation of CLR and market scrap allows customers who engage in closed-loop recycling to receive most or all environmental benefit from these agreements. This may propagate future CLR and market scrap agreements, eliminating cases of downcycling, increasing preconsumer closed-loop recycling, and lowering the use of primary aluminum inputs.

Commercial agreements to source more low carbon prime aluminum as inputs for Novelis products are another opportunity to demonstrate the value of the mass balance methodology. Customers may be willing to pay for low carbon prime inputs to lower the carbon footprint of material they buy from Novelis. An identity preserved chain of custody model that trace low carbon prime from smelter to product would be difficult to set up with existing material flow data availability. It would also create more restricted supply chain flows that could lead to operational and logistical inefficiency with both economic and environmental drawbacks, for instance, transportation burdens.

A controlled mass balance chain of custody enables Novelis to use reallocation mechanisms to share the additional cost of sourcing low carbon prime with customers who are willing to pay through a well-governed chain of custody model.

4.2 Controlled Mass Balance Chain of Custody Key Concepts

4.2.1 Chain of Custody

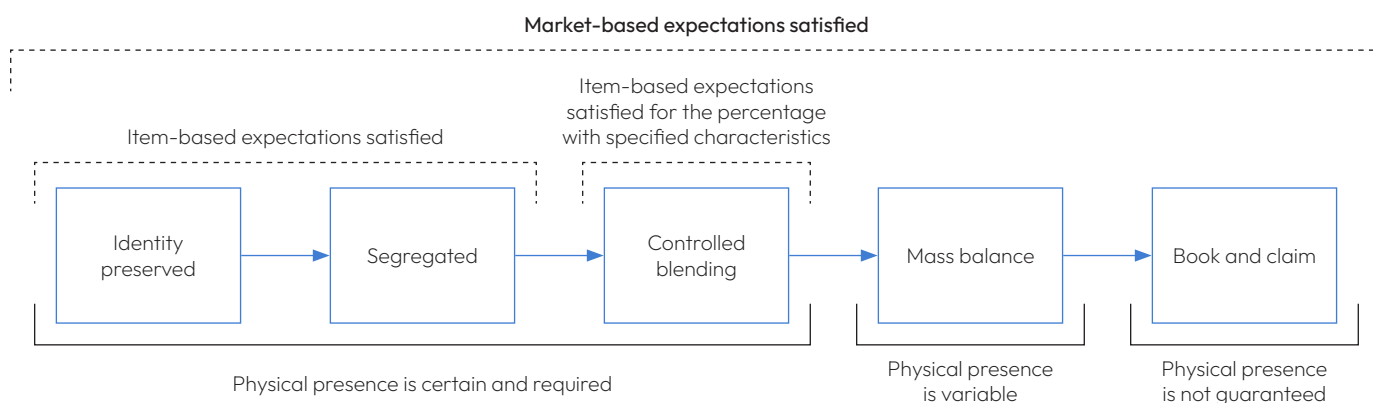
A chain of custody is the process by which inputs and outputs and associated information are transferred, monitored, and controlled as they move through a supply chain. A chain of custody system describes the measures, and their documentation, taken to implement a chain of custody. A chain of custody model is a specific approach taken to preserve a set of specified characteristics in a particular chain of custody system. The implementation of some chain of custody models implies a level of physical presence of specified characteristics, whereas some chain of custody models define a management system that reduces the need for material tracking while still supporting claims being made.

ISO 22095:2020 defines five chain of custody models:

1. identity preserved model
2. segregated model
3. controlled blending model
4. mass balance model
5. book and claim model

The relative presence of specified characteristics, which may be claimed to be in a product based on system inputs, is shown in figure 7.

Figure 6: Chain Of Custody Models and The Certainty of Physical Presence of Specified Characteristics



(Source: ISO 22095:2020/Amd.1:2026; 5.1; Figure 1)

4.2.2 Controlled Mass Balance Model

The Methodology uses a controlled mass balance chain of custody model that pulls on characteristics of controlled blending. A mass balance model is defined in ISO 22095-2:2026 as a “chain of custody model in which materials or products with a set of specified characteristics (3.28) are mixed or co-processed according to defined criteria with materials or products without that set of characteristics.” A mass balance model quantifies inputs that lead to specified characteristics of outputs and allows for a distribution of these characteristics to the outputs, based on the proportion defined by the input quantities.

A controlled blending model is defined in ISO 22095:2020 as “a chain of custody model in which material or products with a set of specified characteristics are mixed according to a certain criteria with materials or products without that set of characteristics resulting in a known proportion of the specified characteristics in the final output.

Since the Methodology does not yet meet all controlled blending requirements, it uses a controlled mass balance model. Novelis has implemented a series of model enhancements to ensure a higher degree of physical presence above what is required by mass balance, as defined in ISO 22095:2020. These enhancements include: (1) physical constraints and (2) technical constraints (Section 4.2.4). Furthermore, a logistics and production system designed to ensure some presence of certain specified characteristics could result in greater system inefficiency, as described in Section 4.1—potentially increasing our carbon footprint by increasing material movement and transportation-related emissions.

A mass balance model is implemented using one of two methods, rolling average percentage method or credit method. The Methodology applies the credit method.

4.2.2.1 Specified Characteristics Relevant to the Methodology

There are three specified characteristics that are relevant to the controlled mass balance chain of custody model implementation. These are described in Table 10 in relation to the inputs considered for credit accounts.

Table 10: Specified Relevant Characteristics

Input Material	Specified Characteristics
Low Carbon Prime	Embodied (from mining to smelting) carbon intensity of 7 tCO₂e / t Al or lower for Novelis Europe and North Asia, North America and South America, or sourced from a smelter more than 50% renewable energy sources.
Closed-loop recycle scrap	- Preconsumer scrap returned from Novelis customers via closed-loop recycle agreements - No embodied carbon footprint 100% recycled content
Market scrap	- All scrap that is not internally produced or CLR scrap - No embodied carbon footprint 100% recycled content

4.2.3 Credit Method

The credit method is used to ensure the quantity of inputs with a specified characteristic and the resulting outputs with claims of that specified characteristic balance for a given period. This works by creating and maintaining a credit account to track the quantity of each type of input used as an output declaration. These credits are then applied to outputs based on specified rules defined in section 4.3.4. The credit account must not be overdrawn for a given balancing period.

Each credit account uses a conversion factor, either when material enters the credit account or when material is drawn from the credit account, to convert input mass into their equivalent output mass. This conversion factor is developed either through a conversion of units or a physical-relationship calculation. An example of this is if an input is measured in cubic meters, while the output is measured in tons, a conversion must take place either as credits enter the credit account or are deducted from the credit account. This conversion, which applies to the conversion factor, converts units of either the input or the output so that any change in credit account balance is appropriately calculated.

For the controlled mass balance chain of custody, the conversion factor will be 1:1 since there are no unit conversions required and any other physical losses or changes are already accounted for in the physical baseline calculation and associated data preparation steps. Credit recognition and deduction shall follow the applicable balancing-period rules so that credits are assigned only against quantified and documented inputs within the relevant period.

Table 11 shows how the credit account balances are calculated using the method.

Table 11: Credit Account Balance Formula

$$C_b = C_{bp} + (M_{in} \times cf) - M_o$$

C_b = Credit balance

C_{bp} = Credit balance by the end of the previous period

M_{in} = Volume of material into the credit account

M_o = Volume of material deducted from the credit account

cf = Conversion factor

Source: ISO 22095:2020, Annex C.1 Mass Balance Implementation

4.2.4 Physical and Technical Constraints

To ensure a higher degree of physical presence compared to baseline mass balance, Novelis has implemented two constraints to ensure a higher degree of physical presence than baseline mass balance, moving towards controlled blending.

4.2.4.1 Constraint #1: Technical Constraint

Technical constraints ensure that each product is not allocated more than our system has historically demonstrated for that alloy/site. This is represented by the Maximum Demonstrated Scrap / Minimum Demonstrated Prime.

The Methodology shall use internally set maximum scrap and minimum primary aluminum limits that will limit the amount of CLR and market scrap that each alloy can absorb. This internal control ensures that the outcomes of this methodology accurately reflect the technical constraints measured in our operational environment and maintains the incentivization of good scrap handling practices and alloy innovation.

Theoretically, most alloys have a maximum scrap absorption potential of 95% or higher. However, achieving this theoretical maximum in practice is often impractical due to supply constraints, scrap sorting & segregation limitations, and logistical challenges. Therefore, Novelis sets a technical constraint utilizing demonstrated scrap absorption limits, calculated at casting, for each product for each Novelis region.

To set these limits, all historical monthly average primary aluminum consumption is calculated for each alloy at each site within a respective region. The lowest demonstrated primary aluminum consumption monthly average for each alloy becomes the limit for CLR and market scrap reallocation and shall be expressed as a percentage of inputs.

Maximum demonstrated scrap absorption is calculated by subtracting the minimum primary aluminum requirement from one. When CLR or market scrap is allocated to a customer, the total fraction of scrap in each of the products purchased by that customer shall not exceed the maximum scrap absorption.

Maximum demonstrated scrap and minimum demonstrated prime are complimentary, meaning they should sum to 1. An alloy's prime % is calculated by dividing gross prime, alloys, and hardeners by total inputs.

4.2.4.2 Constraint #2: Physical Constraint

Each region shall implement the physical constraint process to guide forward-looking sales commitments and ensure they are coordinated with production performance. This procedure is required only when establishing active, forward-looking commitments on highly circular alloys in large quantities. Conversely, this constraint is not required if the mass volumes committed are significantly lower than production. For highly circular alloys like AA3104, the minimum prime (technical constraint) criterion may result in minimum constraint for alloys that have near-zero minimum prime limits. Therefore, to further constrain Novelis's mass balance approach, an additional physical constraint is added to guarantee that the committed RC% mass volumes not only match the operational constraint at the alloy level but also have been produced in quantities that are compatible with the sales commitments.

Once all scrap has been reallocated and RC% has been calculated for each Alloy and Customer, physical constraints are formulated by calculating actual mass volumes by recycled content bucket (e.g., 90%, 95%, and 99%).

Calculating Actual Volumes: RC% is calculated, utilizing Novelis' product-level recycled content calculation, this is based on total system inputs (incl. external SI and coils,) and FRP outputs. Timing and level of RC% calculation established and documented through regional quarterly governance process.

Calculating Recycled Content Buckets: The resulting volumes are bucketed based on the RC% results. The buckets are as follows:

1. 90% Bucket: 90%-95% RC
2. 95% Bucket: 95%-99% RC
3. 99% Bucket: 99%-100% RC

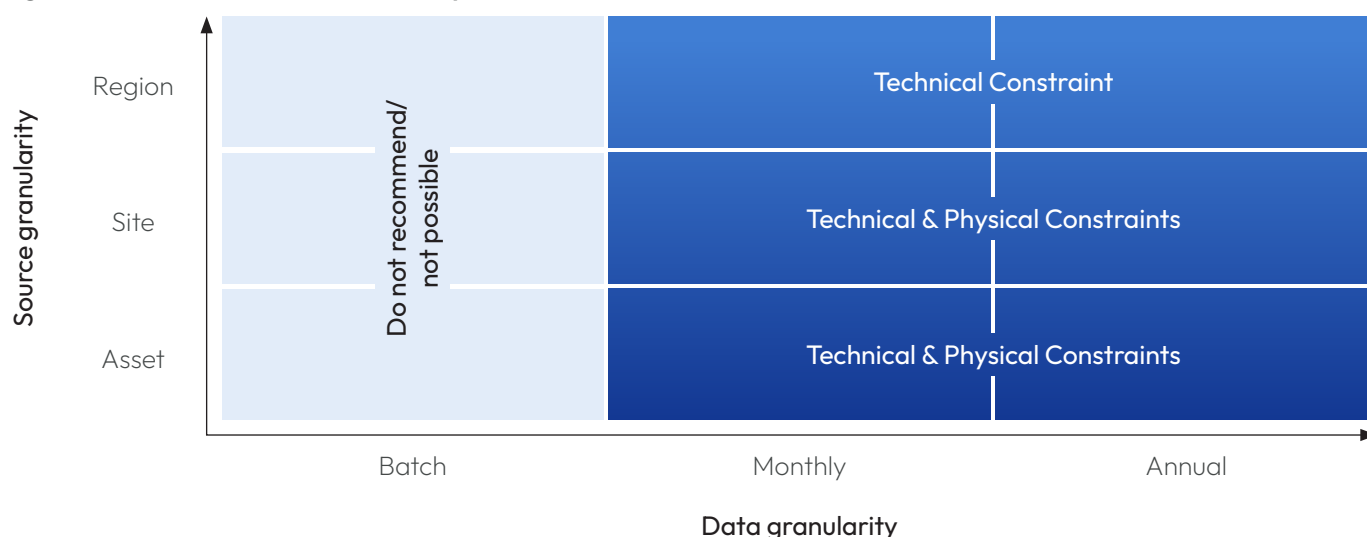
For the certification period, all mass volumes sold must not exceed the mass volumes identified in the RC buckets. A buffer will be applied to each bucket for each certification period to guarantee that the sold mass is not equal or greater than the produced mass. (1) To estimate the forward-looking committable volumes, Novelis' methodology excludes coated scrap & RAR adjustment. (2) to calculate RC% certification for customer disclosures, Novelis methodology includes all adjustments. The delta between (2) and (1) is our internal buffer, to mitigate the risk of overcommitting high recycled content volumes. Management of the buffers will be managed through the regional quarterly governance review process. Example Below:

Table 12: Physical Constraint

Bucket (Excludes Coated Scrap & RAR Adjustment in RC Formula)	Volume Available (Mass)	Customer Shipments	Sold RC% Claim:
90%	100	Customer A: 50 Customer B: 50	Customer A: 90% Customer B: 90%
95%	80	Customer A: 50 Customer B: 30	Customer A: 95% Customer B: 95%
99%	50	Customer A: 20 Customer B: 30	Customer A: 99% Customer B: 99%

Figure 7 provides a visualization of how physical and technical constraints can be calculated based on regional data availability. Using a data-driven approach, each region leverages its data to best reflect operational constraints, thereby promoting effective scrap handling, creating demand for lower-carbon products, and driving alloy innovation.

Figure 7: Novelis Constraint Matrix-Physical vs. Technical



4.3 Controlled Mass Balance Chain of Custody Framework and Requirements

4.3.1 Geographical Coverage

The mass balance model's geographic coverage will reflect Novelis's regions: Novelis Asia, Novelis Europe, Novelis North America & Novelis South America. Each of these regions, shown in Appendix A, will operate as a stand-alone mass balance system.

4.3.2 Timeframe Requirements

There are three timeframe requirements defined by the Methodology mass balance model: the balancing period, the evaluation period, and the reporting period. The maximum acceptable timeframe covered by these periods is shown in Table 13.

Table 13: Timeframe Requirements

Period	Description	Timeframe Covered
Balancing Period	The period for which credit accounts shall not be overdrawn, keeping inputs and outputs in balance, or maintaining a positive balance in credit accounts. More information on the Balancing Period in section 4.4.6.	Last 12 months (CY balancing set and FY balancing set) or Quarter
Evaluation Period	The period for which the performance of the mass balance system is evaluated to ensure accuracy and representativeness. This may include audits, reviews of monitoring systems, or review of management systems. More information on the evaluation period and processes it entails in section 4.4.3.	One year
Reporting Period	The period for which the Methodology cover results. More information on how and when results are reported in section 4.4.9.	One year

While the Balancing Period, Evaluation Period, and Reporting Period are each one year, the Methodology may operate multiple annual Reporting Groups (e.g., FY and CY) per region. These groups may overlap in months; however, balancing credit accounts is governed at the regional Balancing Period level and prevents double allocation across groups by ensuring that any input, credit recognition, deduction, and closing balance is recorded only once within the applicable balancing-period ledger.

The Methodology uses only historical data and applies only ex-post mechanisms for the mass balance chain of custody. All reporting and reviews involve historical data. Credit recognition, deduction, and reporting shall therefore be based only on quantified and documented inputs available for the applicable balancing period.

4.3.3 Data Requirements

Most data requirements for the mass balance chain of custody are covered in the physical baseline section of the Methodology. Therefore, the mass balance chain of custody section of this methodology cannot operate on a standalone basis without the physical baseline. The data sources used to develop physical baseline results are the starting point for the mass balance chain of custody model.

There are three additional segmentations of data required for the mass balance mechanism to take place. These are: segmenting closed-loop recycle scrap return mass volumes by customer, segmenting of market scrap, and segmenting low-carbon prime mass volumes from total primary aluminum mass volumes. CLR scrap returns by customer data are necessary to build CLR credit accounts and for assigning CLR scrap credits. Market scrap is necessary to build a market scrap credit account and for assigning credits. Low-carbon prime mass volumes are necessary to calculate regional low carbon prime intensity factor, to build a low-carbon prime credit account, and ultimately as an input into the final carbon footprint calculation once all credits have been allocated. These data and their application will be described in greater detail in section 4.3.4.

4.3.4 Credit Accounts

The mass balance model for each region shall maintain credit accounts for three separate input materials: closed-loop recycle scrap, market scrap, and low carbon prime. The management of these credit accounts will reflect the regional coverage, with each region having separate mass balances and therefore credit accounts. To maintain circularity within alloy groups, regional CLR scrap and market scrap credit accounts will be separated by alloys. Separate credit accounts for low carbon prime will also be maintained for each Market Segment Group.

The mechanisms to deduct and allocate credit from these accounts should follow: 1. CLR scrap credits deducted and allocated; 2. Market scrap credits deducted and allocated; 3. LCP credits deducted and allocated. This sequence defines the attribution hierarchy applied and shall be applied consistently within each region and balancing period. Recycled content shall be calculated before and after CLR and market scrap credit allocation, and the carbon footprint shall be calculated after LCP credit allocation.

No carbon footprint or recycled content calculations take place until the allocation of all credits has taken place. The post-allocation calculation methodology of CF and RC is covered in section 4.3.5. Any constraints, prioritization rules, or exceptions affecting allocation shall be documented in the applicable subsection and applied consistently.

Table 14: Low Carbon Prime Novelis Credit Accounts

Region	Credit Accounts
Novelis Europe	Auto – Low Carbon Prime
	Beverage Packaging – Low Carbon Prime
	Specialties – Low Carbon Prime
	Aerospace – Low Carbon Prime
Novelis North America	Auto – Low Carbon Prime
	Beverage Packaging – Low Carbon Prime
	Specialties – Low Carbon Prime
Novelis Asia	Auto – Low Carbon Prime
	Beverage Packaging – Low Carbon Prime
	Specialties – Low Carbon Prime
Novelis South America	Beverage Packaging – Low Carbon Prime
	Specialties – Low Carbon Prime

4.3.4.1 Closed-Loop Recycle Scrap

Closed-loop recycle scrap (CLR) is pre-consumer scrap that is returned by Novelis customers to be reprocessed, combined with primary material, and converted into FRP. As the Methodology follows the cut-off approach, this scrap is considered free of any upstream burdens when it enters Novelis' operational boundaries. This means that it has no embodied carbon and is considered as recycled content.

4.3.4.1.1 CLR Scrap Data

CLR scrap data shall be collected and segmented at least quarterly by each region and must include volume by mass segmented by source customer.

4.3.4.1.2 CLR Scrap Conversion Factor

In the case of CLR scrap and FRP, the units of measurement are the same for both inputs and outputs, tons. Any physical relationship changes are already accounted for. Therefore, the conversion factor for CLR Scrap is 1.

4.3.4.1.3 CLR Credit Account

The credit balance in credit accounts for CLR scrap is calculated using the formula in Table 15 & 16.

Table 15: Credit Account Formula Applied for CLR

$$C_{b-vs} = C_{bp} + (M_{in} \times cf) - M_o$$

C_{b-vs} = Credit balance for a particular value stream

C_{bp} = Credit balance by the end of the previous period

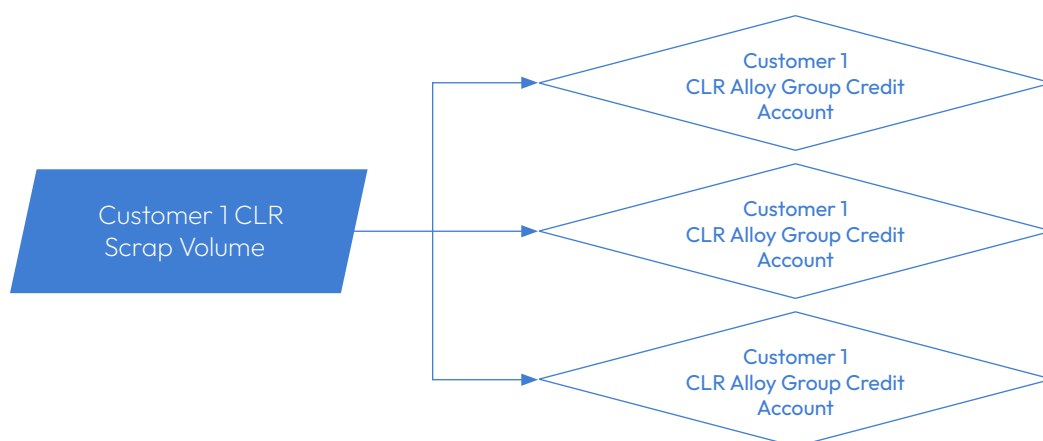
M_{in} = Volume of CLR scrap into the credit account

M_o = Volume of CLR scrap deducted from the credit account

cf = Conversion factor

For each Market Segment Group credit account, M_{in} , or the volume by mass of CLR scrap that enters a credit account, is determined by the customer returning the scrap. The process of forming the CLR credit accounts is illustrated in Figure 8.

Figure 8: CLR Scrap Entering Alloy Group Credit Accounts



4.3.4.1.4 Market Segment CLR Credit Account Transfers

Credits may be transferred between Market Segment Groups, but not between regions. A transfer between Market Segment Group credit accounts requires Regional President and Global Market Segment President approval.

4.3.4.1.5 CLR Scrap Credit Allocation

Since the physical baseline is the starting point for the mass balance chain of custody method, an additional, intermediate transformation must take place to correct the baseline before assignment of credits, removing all the CLR scrap input since it has now been placed in credit accounts.

1. CLR scrap is removed from all physical baseline BoMs, applying a pro-rata shipment share.
2. An equivalent mass volume of prime is added to the baseline BoMs, replacing the CLR scrap that was removed.

This is a virtual, intermediate step to maintain a balance of inputs once CLR scrap is assigned from credit accounts. This process relies on the fact that scrap content and primary aluminum content should be complimentary inputs, with their combined mass remaining unchanged. No calculation of carbon footprint takes place at this stage.

Once this transformation has taken place, credits can be assigned. When CLR credits are assigned, the equivalent mass of primary aluminum is subtracted. If all CLR credits have been assigned, all the virtual primary aluminum that was added during the intermediate transformation will have been removed, returning the system to balance.

CLR Credits are assigned based on the following rules hierarchy:

1. Customers who engage in CLR agreements shall receive credits proportional to the amount of CLR scrap supplied to Novelis in a 1:1 ratio, displacing primary aluminum.
2. CLR scrap credit assignment shall be limited by alloy demonstrated minimum primary aluminum requirement.
3. Any remaining CLR credit is distributed pro rata by shipment share to remaining customers in the respective Market Segment Group.

Once CLR credits are assigned, no calculation of carbon footprint takes place until low carbon prime inputs have been credited following the procedure in section 4.3.4.2.

4.3.4.1.6 CLR Scrap High Circularity Alloy Cap

Some alloys are already more circular in nature than others due to higher-than-average end-of-life recycling, for instance: alloys used in beverage can production. These products will have a cap of 25% on the credit from CLR scrap, reflective of an average downstream recovery. This measure will prevent incentivizing pre-consumer scrap recycling over end-of-life scrap and will also help incentivize customers to switch to these more circular materials due to the indirect RC% and CO₂e benefit they will receive. All other regions will determine if recovery caps are needed on a per-product/Market Segment basis, reflective of market conditions to encourage our customers to maximize scrap returns.

4.3.4.2 Market Scrap

Markets scrap is a raw material used by Novelis to produce aluminum FRP. In the context of the Methodology, market scrap includes all scrap that is not internally produced or CLR scrap. As the Methodology follows the cut-off approach, this scrap is considered free of any upstream burdens when it enters Novelis' operational boundaries. This means that it has no embodied carbon and is considered as recycled content.

4.3.4.2.1 Market Scrap Data

Market scrap data shall be collected and segmented at least quarterly by each region and must include volume by mass segmented by alloy.

4.3.4.2.2 Market Scrap Conversion Factor

In the case of market scrap and FRP, the units of measurement are the same for both inputs and outputs, tons. Any physical relationship changes are already accounted for. Therefore, the conversion factor for market scrap is 1.

4.3.4.2.3 Market Scrap Credit Account

The credit balance in credit accounts for market scrap is calculated using the formula in Table 16.

Table 16: Market Scrap Credit Account Formula

$$C_{b-VS} = C_{bp} + (M_{in} \times cf) - M_o$$

C_{b-MS} = Credit balance for a particular alloy

C_{bp} = Credit balance by the end of the previous period

M_{in} = Volume of market scrap into the credit account

M_o = Volume of market scrap deducted from the credit account

cf = Conversion factor

A credit account will be maintained for each alloy within a region. For each credit account, Min, or the mass of market scrap that enters a credit account, is determined by the alloy of the scrap.

4.3.4.2.4 Market Scrap Credit Allocation

Market Scrap Credits are assigned based on the following rules hierarchy:

1. Customers who engage in high recycled content agreements that involve a charged premium, such as purchasing a high-RC% grade product, shall receive credits proportional to the amount necessary to meet the terms of these agreements, displacing primary aluminum.
2. Customers who engage in high recycled content agreements that are based on a specific routing to ensure traceability shall receive credits reflective of the routing arrangement.
 - 2.1. Market scrap credit assignment shall be limited by alloy demonstrated minimum primary aluminum requirement and physical constraint if applicable.
3. Any remaining market scrap credit is distributed pro rata by shipment share to remaining customers in the respective Market Segment Group. A 5% buffer volume, calculated prior to any reallocations, of market scrap shall be maintained in the credit account. Remaining buffer volumes will be distributed pro rata by shipment share to remaining customers in the respective Market Segment Group.

Once CLR and market scrap credits are assigned, no calculation of carbon footprint takes place until low-carbon prime inputs have been credited following the procedure in section 4.3.4.2.

4.3.4.2.5 High Recycled Content Agreements Involving Premiums

A prerequisite for assigning market scrap credits based on a charged premium (rule 1 above) is the condition that the premium must be allocated to fund projects that have environmental additionality. To draw a direct link between scrap premiums and scrap availability, the fund created by these premiums should be appropriated to projects that increase the uptake of usable aluminum scrap other otherwise provide some clear and measurable environmental benefit.

4.3.4.3 Low Carbon Prime

Low Carbon Prime is remelt primary aluminum that was produced in a smelter that uses a decarbonized process, such as renewable energy to power operations. There is currently no industry defined carbon intensity threshold for what denotes low carbon prime aluminum. External sheet ingot is not considered low carbon prime but could be externally produced from such and therefore have a lower CO₂e intensity.

4.3.4.3.1 Low Carbon Prime Segmentation

Novelis does not currently receive certificates or documentation verifying the purchase of low carbon prime for all primary smelters. Due to the lack of a consistent and standardized industry approach on the reporting of primary aluminum carbon footprint data to customers, Novelis identifies low carbon prime smelters and uses IAI and CRU data to establish the carbon intensity per ton from these smelters. This follows the same data collection process described in section 3.2.1.1. This data, combined with the volume by mass sourced from these smelters, allows Novelis to segment a mass volume of remelt primary aluminum with an embodied carbon intensity that is lower than the regional average. The low carbon prime segmentation in alignment with this methodology shall be completed by regional strategy & sustainability that leads in collaboration with procurement annually or this process shall be automated and reviewed annually. Low carbon prime shall be defined as meeting at least one of the following conditions:

1. Primary aluminum from a smelter with a carbon intensity below a specified threshold, defined for each region in Table 15.
2. Primary aluminum from a smelter that consumes most of its electricity from a renewable source.

Table 17: LCP Carbon Intensity Thresholds by Novelis Region

Region	LCP Intensity*
Novelis Asia	<7 tCO ₂ e/t
Novelis Europe	<7 tCO ₂ e/t
Novelis South America	<7 tCO ₂ e/t
Novelis North America	<7 tCO ₂ e/t

*These thresholds are based on IAI industry average data: Bauxite to alumina is 3.77 tCO₂e/t globally. Hydro-based smelting ranges from 3-4 tCO₂e/t globally. Together, that information informed us of our 7ton CO₂e/ton LCP benchmark.

4.3.4.3.2 LCP Credit Account

The credit balance in credit accounts for LCP is calculated using the formula described in Table 18, which is an adaptation of the credit balance formula described in ISO 22095:2020.

Table 18: LCP Credit Account Formula

$$C_b = C_{bp} + (M_{in} \times cf) - M_o$$

C_b = Credit balance for a particular region

C_{bp} = Credit balance by the end of the previous period

M_{in} = Volume of LCP into the credit account

M_o = Volume of LCP deducted from the credit account

cf = Conversion factor

The mass of low carbon prime in each respective Market Segment Group's credit account is determined by where low carbon prime physically enters Novelis's system. Low-carbon prime that enters a site producing FRP for only one Market Segment Group will be apportioned to that Market Segment Group's regional credit account. For sites that serve multiple Market Segment Groups, the input into each Market Segment Group's credit account will be determined by the mass proportion of each Market Segment served.

4.3.4.3.3 Market Segment LCP Credit Account Transfers

Credits may be transferred between Market Segments and Market Segment Groups, but not between regions. A transfer between Market Segment Group credit accounts requires Regional President and Global Market Segment President approval.

4.3.4.3.4 Regional LCP Volume by Mass and Intensity

To quantify the regional volume to be used as M_{in} in the equation in Table 16, the following steps must be taken:

1. All mass of remelt primary aluminum meeting the low carbon prime criteria shall be segmented from the remelt primary aluminum data.
2. A new carbon intensity for this low carbon prime mass shall be calculated, using weighted average by mass.

This mass of LCP should be used as M_{in} in the equation in Table 18. The newly calculated primary aluminum intensity is the specified characteristic for this volume by mass.

4.3.4.3.5 LCP and Non-LCP Intensity Calculations

1. The LCP CO₂e intensity is calculated by dividing total LCP embedded CO₂e by total LCP mass..
2. The non-LCP CO₂e intensity is calculated by dividing total non-LCP embedded CO₂e by total non-LCP mass..

Table 19: LCP and Non-LCP Calculation Example

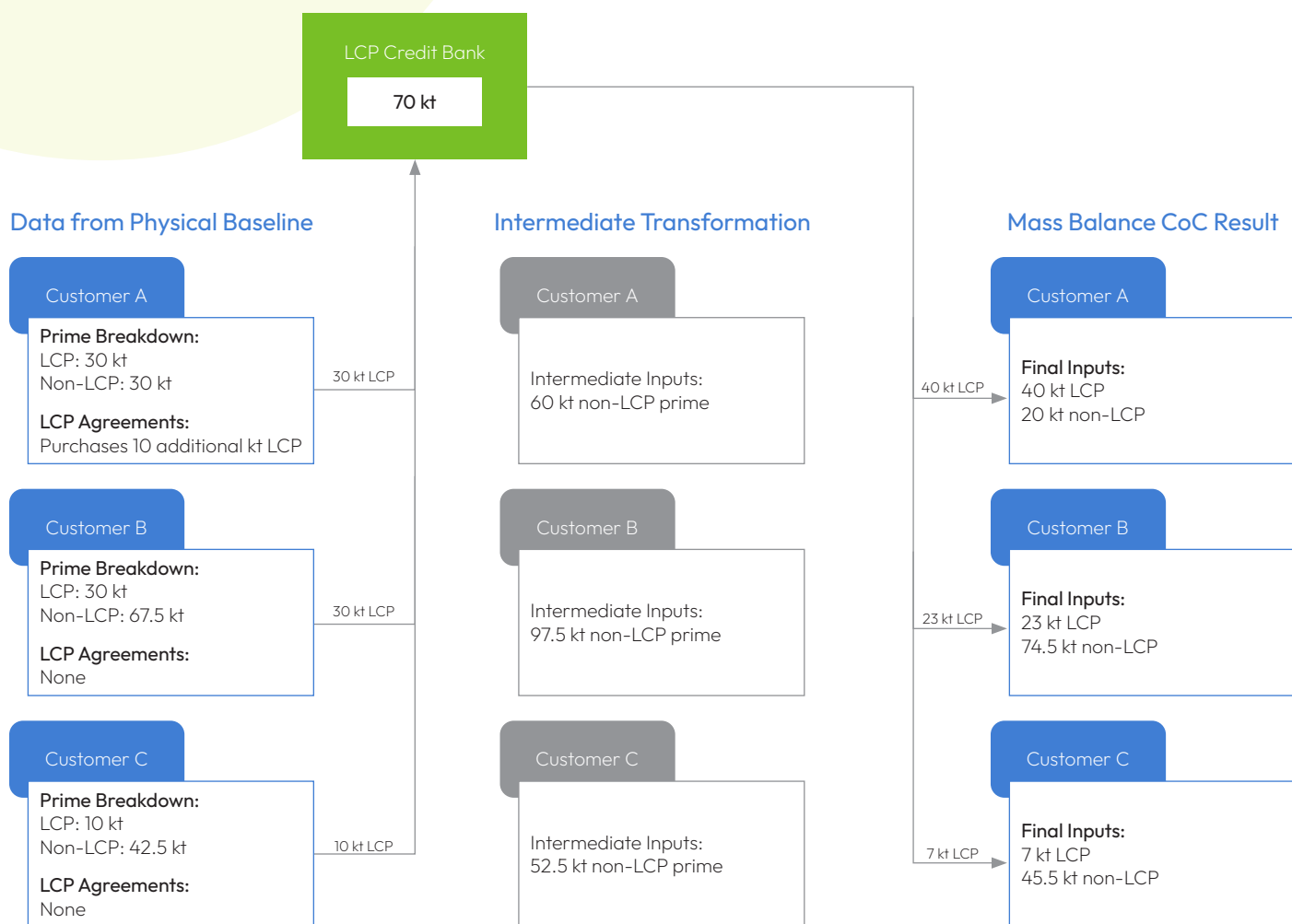
Example Background Information	There are 100 tons of primary aluminum in each region. The carbon intensity of this input is 7.35 tCO₂e / t Al. Of this primary aluminum, 20 tons are LCP, of which 5 tons have a carbon intensity of 4 tCO₂e / t Al and 15 tons have a carbon intensity of 5 tCO₂e / t Al. 80 tons are Non-LCP, all of which have a carbon intensity of 8 tCO₂e / t Al.
Calculating the Regional LCP Intensity Factor	$(5 \text{ tAl} \times 4 \text{ tCO}_2\text{e/tAl} + 15 \text{ tAl} \times 5 \text{ tCO}_2\text{e/tAl}) / 20 \text{ tAl} = 4.75 \text{ tCO}_2\text{e/t Al}$ 4.75 is used as the regional carbon intensity factor for Low Carbon Prime.
Calculating the Regional Non-LCP Intensity Factor	$(80 \text{ tAl} \times 8 \text{ tCO}_2\text{e/tAl}) / 80 \text{ tAl} = 8 \text{ tCO}_2\text{e/tAl}$ 8 is used as the regional carbon intensity factor for Non-Low Carbon Prime.

4.3.4.3.5.1 LCP Credit Allocation

As LCP is deducted from the credit account and assigned to products, non-LCP is replaced with LCP, utilizing the new LCP CO₂e intensity. LCP Credits are assigned based on the following rules hierarchy:

1. Customers who have entered into existing LCP agreements with Novelis, ensuring a pass through of funds to purchase LCP.
2. Customers who pay a premium will be allocated a specified quantity of low carbon prime based on the premium amount paid (See section 4.3.4.4.3.1 Appropriation of Premium Funds for Additional Details).
3. Remaining credits will be allocated to customers proportional to their physical baseline share.

Figure 9: LCP Credit Bank And Allocation of LCP Credits



Credit Allocation Rule Hierarchy

1. Customers who have entered into LCP agreements with Novelis.
2. Customers who pay a premium will be allocated a specified quantity of low carbon prime based on the premium amount paid.
3. Remaining Credits will be allocated to customer's proportional to their physical baseline share.

4.3.4.3.5.2 Premium Relation to Low Carbon Prime Credit

There are two mechanisms for allocating low carbon prime credits:

1. A pass-through cost or premium charged to the customer wishing to have more low carbon prime in their product. The value of this premium or pass-through cost shall be determined using the corresponding cost to procure more low-carbon prime.
2. A charged premium, such as purchasing a specific Premium product with high recycled content and low carbon prime, shall receive credits proportional to the amount necessary to meet the terms of these agreements, displacing primary aluminum.
 - a. An internal LCP price premium will be set on an annual basis.

4.3.4.3.5.3 Appropriation of Premium Funds

A fundamental consideration of LCP credit allocation is environmental additionality. To ensure that the LCP credit allocation scheme results in propagation and purchase of additional low carbon prime, any premiums charged to the customer with intent of passing through LCP benefit shall be used to purchase additional LCP from Novelis suppliers. The process for governing premium funds and their appropriation will be set in collaboration with commercial and finance teams on an annual basis.

4.3.5 Calculation of Results

4.3.5.1 Customer-level Carbon Footprint

Calculation methodology for carbon footprint follows the same approach to the physical baseline albeit with reallocated inputs since CLR scrap and LCP have been redistributed via the credit method. Table 21 shows the formula to calculate a customer's carbon footprint.

Table 20: Customer Carbon Footprint Formula

$$CO_2e_{Customer} = \sum(V_{consumed-inputi} \times CO_2e_{inputi}) + V_{purchased} \times CO_2e_{processing}$$

$CO_2e_{Customer}$ = absolute carbon emissions for a given customer

$V_{Purchased}$ = Volume of FRP sold

$V_{consumed-inputi}$ = Volume of each input

CO_2e_{inputi} = Carbon intensity of each input

$CO_2e_{processing}$ = regional emission factor for energy emissions per ton FRP produced

Using the resulting customer inputs from the examples used in sections 4.3.4.1 and 4.3.3.2, an example calculating the customer carbon footprints is shown in Table 21.

Table 21: Example, Customer Carbon Footprint Calculation

This example builds on the results from examples in Figures 8 and 9. Other relevant information for this example:

LCP regional carbon intensity factor (illustrative): **4.75 tCO₂e / t Al**

Non-LCP regional carbon intensity factor (illustrative): **8.75 tCO₂e / t Al**

Regional energy carbon emission factor (illustrative): **0.7 tCO₂e / t FRP**

Customer A

Purchased:

100 kt FRP

Final Inputs:

20 kt CLR scrap

20 kt non-CLR scrap

40 kt LCP

20 kt non-LCP

$$\text{CO}_2\text{e}_{\text{Customer}} = \sum (V_{\text{consumed-input}} \times \text{CO}_2\text{e}_{\text{input}}) + V_{\text{purchased}} \times \text{CO}_2\text{e}_{\text{energy}}$$

$$\begin{aligned}\text{CO}_2\text{e}_{\text{Customer A}} &= 40 \text{ kt LCP} \times 4.75 \text{ ktCO}_2\text{e/kt LCP} \\ &+ 20 \text{ kt nonLCP} \times 8.75 \text{ ktCO}_2\text{e/kt nonLCP} \\ &+ 100 \text{ kt FRP} \times 0.7 \text{ ktCO}_2\text{e/kt FRP}\end{aligned}$$

$$\text{CO}_2\text{e}_{\text{Customer A}} = 1065 \text{ ktCO}_2\text{e}$$

Customer B

Purchased:

100 kt FRP

Final Inputs:

2.5 kt CLR scrap

10 kt non-CLR scrap

18 kt LCP

69.5 kt non-LCP

$$\text{CO}_2\text{e}_{\text{Customer}} = \sum (V_{\text{consumed-input}} \times \text{CO}_2\text{e}_{\text{input}}) + V_{\text{purchased}} \times \text{CO}_2\text{e}_{\text{energy}}$$

$$\begin{aligned}\text{CO}_2\text{e}_{\text{Customer B}} &= 18 \text{ kt LCP} \times 4.75 \text{ ktCO}_2\text{e/kt LCP} \\ &+ 69.5 \text{ kt nonLCP} \times 8.75 \text{ ktCO}_2\text{e/kt nonLCP} \\ &+ 100 \text{ kt FRP} \times 0.7 \text{ ktCO}_2\text{e/kt FRP}\end{aligned}$$

$$\text{CO}_2\text{e}_{\text{Customer B}} = 1394 \text{ ktCO}_2\text{e}$$

Customer C

Purchased:

100 kt FRP

Final Inputs:

27.5 kt CLR scrap

10 kt non-CLR scrap

12 kt LCP

50.5 kt non-LCP

$$\text{CO}_2\text{e}_{\text{Customer}} = \sum (V_{\text{consumed-input}} \times \text{CO}_2\text{e}_{\text{input}}) + V_{\text{purchased}} \times \text{CO}_2\text{e}_{\text{energy}}$$

$$\begin{aligned}\text{CO}_2\text{e}_{\text{Customer C}} &= 12 \text{ kt LCP} \times 4.75 \text{ ktCO}_2\text{e/kt LCP} \\ &+ 50.5 \text{ kt nonLCP} \times 8.75 \text{ ktCO}_2\text{e/kt nonLCP} \\ &+ 100 \text{ kt FRP} \times 0.7 \text{ ktCO}_2\text{e/kt FRP}\end{aligned}$$

$$\text{CO}_2\text{e}_{\text{Customer C}} = 1199 \text{ ktCO}_2\text{e}$$

4.3.5.2 Recycled Content Calculation

The recycled content of products is another metric that can be calculated using the allocated inventory data of products. This calculation follows Novelis' existing recycled content calculation methodology, applied at the product level (see Appendix B).

Recycled content is a mass balance formula. It's a measure of raw materials brought into the system vs. mass that leaves the system. The recycled content of FRP is calculated using the formula in table 22. This calculation can be applied to the existing input and output flows determined by the physical baseline and the mass balance chain of custody, along with a small correction to incorporate RAR melt loss as an additional output flow.

Table 22: FRP RC Calculation Formula

$$RC\%_{\text{Alloy}} = \frac{\text{Alloy 3P Ship-Net Primary Alloy} + \text{adjustment}}{\text{Alloy 3P Ship}}$$

$RC\%_{\text{Alloy}}$ = Recycled content of alloy

Alloy 3P Ship = Third party shipments:FRP Sales of alloy

Net Primary_{Alloy FRP} = The mass of remelt prime and alloys & hardeners consumed, after melt loss

adjustment = Coated scrap and runaround melt loss, calculated by:
(regional coated scrap + regional runaround melt loss)

Coated Scrap

Coated scrap is internal scrap metal that is lacquered, painted or otherwise contaminated with coatings, paint or laminates & foils that require special recycling furnaces for processing. Examples are coated and painted coils. For environmental permitting and safety concerns, these coatings must be removed prior to consumption within our remelts. Since coated scrap requires additional processing to absorb (remelt/recycle), it is considered pre-consumer scrap per ISO 14021.

The necessary data to quantify the coated scrap impact at a product level is not currently available and is therefore modeled at a regional level. Coated scrap volume by mass is proportionally allocated to the appropriate alloys.

Runaround Melt Loss Adjustment

Runaround (RAR) melt loss must be accounted for to accurately assess RC%. This is material loss from internal scrap that takes place during the casting process. The necessary data to quantify runaround melt loss at a product level is not currently available and is therefore modeled at a regional level.

The correction factor for RAR melt loss is calculated by taking the regional mass of primary aluminum material loss due to RAR melt loss and dividing it by total FRP sales for the region. Each region shall set a factor to be used for RAR melt adjustment on all alloys, and this factor shall be reviewed annually and communicated transparently with recycled content results.

The example in Table 23 shows how the RC% of one alloy is calculated.

Inclusion of CMI (Can Manufacturers Institute) Recycled Content Formula

The preferred CMI formula for BP Industry will be employed for BP customers to ensure consistency in that MS. This requires pre- and post-scrap reporting. (**Additional info on CMI Guidance can be found here:** [Beverage-Can-Recycled-Content-Guidance.pdf](#)).

Physical Baseline and Mass Balance Chain of Custody RC%

Recycled content should be calculated for each alloy and customer twice. Once after the physical baseline methodology has been followed, and once after the allocation of all credits in the mass balance chain of custody. This will produce a baseline RC% and a final RC% once consideration of the mass balance chain of custody has been included. The aggregate results, the combined RC% for all alloys in a region will be equivalent before and after the mass balance chain of custody allocation.

Table 23: Example, Product-Level Recycled Content Calculation

In this example, 100 kt of a specific alloy is sold in each reporting period. The recycled content of this alloy is calculated to be 77.6%.

Example Data	Total Mass Sold in Period	100 kt
	Inputs (from physical baseline data or after mass balance chain of custody credit allocation)	Remelt primary aluminum: 20 kt A&H: 3 kt Scrap: 80 kt
	Runaround	2 kt
	Regional Coated Scrap Factor (Illustrative)	0.1 kt
	Regional Runaround Melt Loss Factor (Illustrative)	0.2 kt
Calculation	$RC\%_{\text{Alloy FRP}} = \text{Alloy 3P Ship-Net Primary}_{\text{FRP}} + \text{adjustment}/\text{Alloy 3P Ship}$	
	$\text{Alloy 3P Ship} = 100 \text{ kt}$	
	$\text{Net Primary}_{\text{FRP}} = 0.98 \times (20 \text{ kt} + 3 \text{ kt})$	
	$\text{adjustment} = (0.2 \times 2 \text{ kt}) + (0.1 \times 2 \text{ kt})$	
	$RC\%_{\text{Alloy FRP}} = (100 \text{ kt} - 23 \text{ kt} + 0.4 \text{ kt} + 0.2 \text{ kt})/(100 \text{ kt})$	
	$RC\%_{\text{Alloy FRP}} = 77.6\%$	
Variable Descriptions	Alloy 3P Ship = Volume of FRP of specific alloy sold in period	
	Net Primary _{FRP} = Mass of remelt prime and alloys & hardeners consumed,after melt loss (melt loss calculated using regional melt loss factor)	
	adjustment = Coated scrap and runaround melt loss,calculated by:(regional coated scrap + regional runaround melt loss)	

4.3.5.3 Calculation of Region Average results

Average carbon footprint and recycled content values can be calculated for the region based on FRP shipped. If a customer receives a specific allocation, those volumes are removed before the regional average is calculated. The related prime inputs are also removed.

The regional average therefore represents only the remaining regional volume that has not been assigned to a customer-specific allocation. This prevents the same volume or input from being counted twice.

4.4 Governance

4.4.1 Top Management Accountability & Key Governance Functions

Top management accountability for the Methodology resides with the Novelis Executive Committee (ExCom), reflecting the strategic value of this methodology and the importance of related external disclosures. ExCom provides oversight of the Methodology as part of its broader accountability for sustainability, financial performance, risk management, and external reporting. Table 24 summarizes the key management responsibilities.

ExCom delegates responsibility for governance execution, oversight, prioritization, and issue resolution to the regional Steering Committee(s) operating within the governance structure outlined in **Figure 10**. The Steering Committee(s) provide the regional decision forum for customer commitments, resource prioritization, cross-functional alignment, and escalation of risks or non-conformities that may affect implementation.

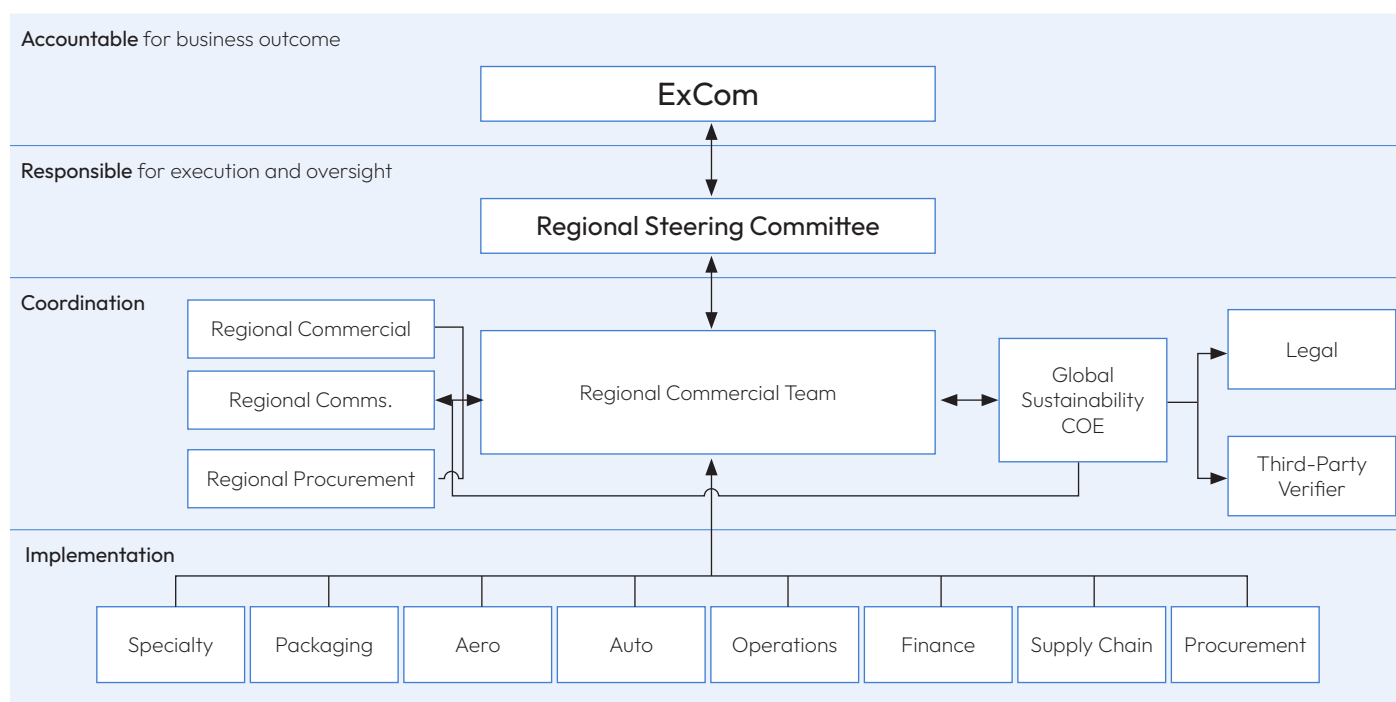
Within this structure, Regional Commercial teams are responsible for identifying customer needs, managing customer-facing commitments, and coordinating with relevant regional stakeholders to confirm that commitments can be supported. The Global Sustainability Center of Excellence (COE) maintains the methodology, defines common rules and minimum control expectations, supports consistent regional implementation, and coordinates assurance activities. Detailed roles, responsibilities, and decision authority across the governance structure are described in **Table 25**.

This governance model is intended to ensure that responsibility, authority, and control are clearly assigned across the chain of custody system while maintaining consistency between regional execution and global methodology requirements.

Table 24: Responsibilities of Top Management

Novelis ExCom Responsibilities	Description
Strategic Oversight	Provide governance oversight of the Methodology as part of Novelis' sustainability and commercial strategy, ensuring alignment with corporate objectives and external commitments
Governance and Oversight	Ensure that outputs and related disclosures are credible, consistent, and able to withstand external scrutiny, including customer, regulatory, and assurance review
Delegation of Authority	Delegate responsibility for methodology ownership, implementation, and control to the Sustainability COE and regional governance structures, with clearly defined roles and decision rights
Resource Allocation	Ensure appropriate resources (personnel, systems, and funding) are available to implement and maintain the Methodology across all regions
Risk Oversight	Oversee risks associated with sustainability claims, data integrity, and customer commitments, ensuring appropriate governance structures are in place to manage these risks
Performance Review	Review overall performance through established governance channels, including audit outcomes, non-conformities, and key risks requiring escalation

Figure 10: Governance Structure



4.4.2 Competence

Implementation and maintenance of the mass balance chain of custody model is performed through defined functional roles across global and regional governance structures. Individuals assigned to these roles shall be appropriately qualified, trained, and accountable for executing responsibilities in accordance with this methodology.

At the global level, the Sustainability Center of Excellence (COE) is responsible for defining competence requirements, maintaining training materials, and ensuring consistent interpretation and application of the methodology. At the regional level, Sustainability points of contact (POCs) and other functional role owners are responsible for coordinating execution, maintaining required documentation, and ensuring that data inputs, calculations, and disclosures are complete, consistent, and auditable.

This structure aims to ensure that competence is established and maintained across all roles supporting the Methodology, aligned with the requirements for responsibility, authority, and control defined for the chain of custody system. Roles and responsibilities are described in Table 25.

Table 25: Roles and Responsibilities for Governance

Governance Layer	Functional Role	Responsible Party	Core Responsibilities	Decision Authority
Global	Methodology Owner (COE)	Global Sustainability COE	- Own and maintain methodology and documentation - Define rules for mass balance, credit allocation, and constraints - Maintain templates, tools, and training	Final authority on methodology, attribution rules, and claim structure
	Assurance & Standards Oversight	Global Sustainability COE	- Coordinate external assurance and ISO alignment - Maintain audit framework and documentation requirements - Define minimum control expectations across regions	Authority over assurance framework
Regional	Governance / Decision Authority	Regional Steering Committee(s)	- Approve or reject regional customer commitments and disclosures in accordance with global guidance - Resolve cross-functional conflicts - Review performance and over-commitment risk	Final authority on regional commitments, prioritization, and escalation
	Implementation Owner	Corporate Sustainability Project Leads	- Ensure implementation of methodology in region - Coordinate data collection, validation, and documentation - Interpret COE guidance for regional application - Support customer disclosures and internal alignment	Accountable for regional conformance
	Demand Owner / Customer Centricity	Regional Commercial	- Field customer requests and define requirements - Evaluate commercial viability of commitments - Communicate outputs to customers - Provide market feedback into governance process	Authority to pursue opportunities within governance-defined constraints

Governance Layer	Functional Role	Responsible Party	Core Responsibilities	Decision Authority
	Data Owner / Supply Inputs	Procurement	- Ensure availability and tracking of scrap, CLR, and LCP inputs - Provide data for credit account formation - Surface risks to supply vs commitments	Accountable for supply data integrity
	Data Owner / Production Reality	Operations	- Provide BoM and production data - Execute within technical and physical constraints - Flag risks to meeting committed RC% / CO₂e targets	Accountable for physical feasibility
	Data Owner – Financial / Reporting Inputs	Finance	- Provide financial and volume datasets - Ensure consistency and traceability of reported figures - Support audit and validation processes	Accountable for financial data integrity
Controls	Compliance & Risk Review	Legal	- Review customer disclosures and contracts, as needed - Ensure regulatory and contractual compliance	Approval authority on legal / compliance aspects when triggered
Independent	External Assurance	Third-party verifier	- Verify conformity to methodology and ISO standards - Validate data, controls, and reported results	Independent assurance authority

4.4.3 Evaluation of Performance and Management of Non-Conformities

The mass balance chain of custody model shall be evaluated on an ongoing basis for performance issues and non-conformities. A thorough evaluation will take place annually, as outlined by the evaluation period, and will involve a review with top management. Any performance issues or non-conformities that affect the results shall be communicated immediately to relevant stakeholders and corrected immediately. A breakdown of these evaluations based on timeframe is shown in Table 26.

Table 26: Frequency of Reviews

Quarterly	- Reviews of calculation and credit allocation systems by employees directly involved in the implementation of the Methodology. - Identification and escalation of any issues that could lead to non-conformity.
Quarterly	- Review and assessment of data sources and flows, identification of any gaps. - Escalation and communication of any non-conformities to affected stakeholders.
Annually	- Internal audit of conformance for each region, results reviewed with top management. - Internal audit focuses on: accuracy of Input data, consistency and accuracy of data-elaboration processes, accuracy of output data, input vs output checks, validation of relevant data points - Third party onsite audit and verification that results conform to this methodology. - Non-conformities to be communicated to affected stakeholders and corrections targeted within one quarter.

4.4.4 Documentation

Table 27: Governance of Mass Balance Chain of Custody Documentation

Documentation	Description	Responsible for Upkeep	Review Period
CLR Customer Mass Volumes	This includes a data table aggregating CLR mass by customer as well as documentation to be used as evidence these volumes were sourced by Novelis, e.g., purchase orders, contracts, agreements. Documentation should also support the basis for attribution of CLR credits to the relevant customer and any approved transfers between Market Segment Groups.	Global Sustainability COE	Quarterly
Market Scrap Mass Volumes	This includes a data table aggregating market scrap mass by alloy as well as documentation to be used as evidence these volumes were sourced by Novelis, e.g., purchase orders, contracts, agreements. Documentation should also support any premium-based allocation, routing-based allocation, applicable buffers, and any exceptions used in credit assignment.	Global Sustainability COE	Quarterly
LCP Mass Volume and Intensity	This includes a data table aggregating LCP mass, source, and associated carbon intensity, as well as documentation to be used as evidence these volumes were sourced by Novelis, e.g., purchase orders, contracts, agreements. Documentation should also support the basis for LCP segmentation, the applicable specified characteristic, and the regional weighted-average intensity used in the credit account.	Global Sustainability COE	Quarterly
Scrap Absorption by Alloy	Table summarizing max scrap absorption for each alloy in each region includes the basis, source period, and approval of the demonstrated minimum prime or maximum scrap constraint used.	Global Sustainability COE	Annually, Q1 of Fiscal Year

4.4.5 Chain of Custody Assurance

The mass balance chain of custody process shall receive annual or quarterly third-party assurance. This assurance will include, but not be limited to:

- Confirmation that the handling of inputs and credit accounts conforms with the processes described in this document and with methodologies outlined in ISO 22095:2020.
- Confirmation that input and output characteristics and mass volumes are accurate, as appropriate to this methodology, through confirmation of purchases, sales or other forms of documentation.
- Ensure that each transaction relevant to this methodology is clearly identifiable.
- Ensure that results of this methodology are reported in a manner that is transparent and consistent with this methodology.

Additionally, the mass balance chain of custody process shall receive annual or quarterly third-party assurance of the following:

- Primary mass volumes, including appropriate segmentation of LCP and credit account formation.
- Closed-loop scrap mass and their respective credit account formation.

The results of this assurance engagement shall be reviewed by the Sustainability Center of Excellence (COE) and the relevant regional governance structure, and necessary actions shall be implemented to address any identified gaps or non-conformities.

4.4.6 Inventory Balancing

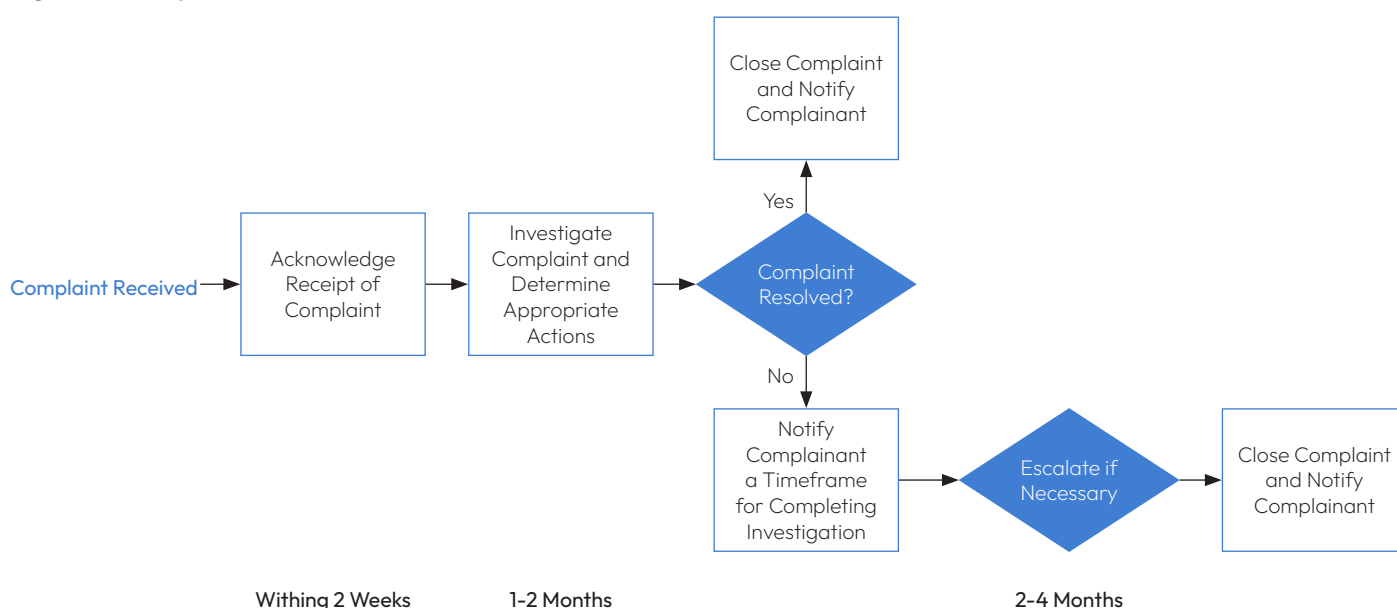
Inventory balancing shall take place at least annually. This process requires the quantification of relevant inputs and outputs of this mass balance chain of custody model and comparison against the aggregated results. A buffer of 5% shall be maintained for every credit account, meaning 5% of all credits shall not be distributed for each period, and remaining buffer volumes will be distributed pro rata by shipment share to remaining customers in the respective Market Segment Group. The results of this inventory balancing will be reviewed with the relevant regional governance structure, with escalation to the Sustainability Center of Excellence (COE) where required and any imbalance over 1% will result in the halting of external reporting until the reason for imbalance is identified and corrected.

Inventory balancing shall confirm that credit account openings, inputs, deductions, transfers, buffers, and closings reconcile to the documented ledger for the applicable balancing period. While formal inventory balancing takes place either quarterly or annually via a last-12-month approach for either CY balancing set or FY balancing set, maintenance of inventory balance is intrinsic to the mechanisms for building the credit accounts and allocating credits, and as such, will be reviewed on an ongoing basis. No reallocation shall occur after the balancing-period ledger has been reviewed and locked, except to correct an identified error through documented governance procedures.

4.4.7 Complaints Procedure

The Methodology includes a formal complaints response procedure to handle customer or other external stakeholder complaints. This procedure is described in Figure 11.

Figure 11: Complaints Procedure



4.4.8 Outsourcing

Novelis does not contract any entities for outsourcing that are relevant to this chain of custody model.

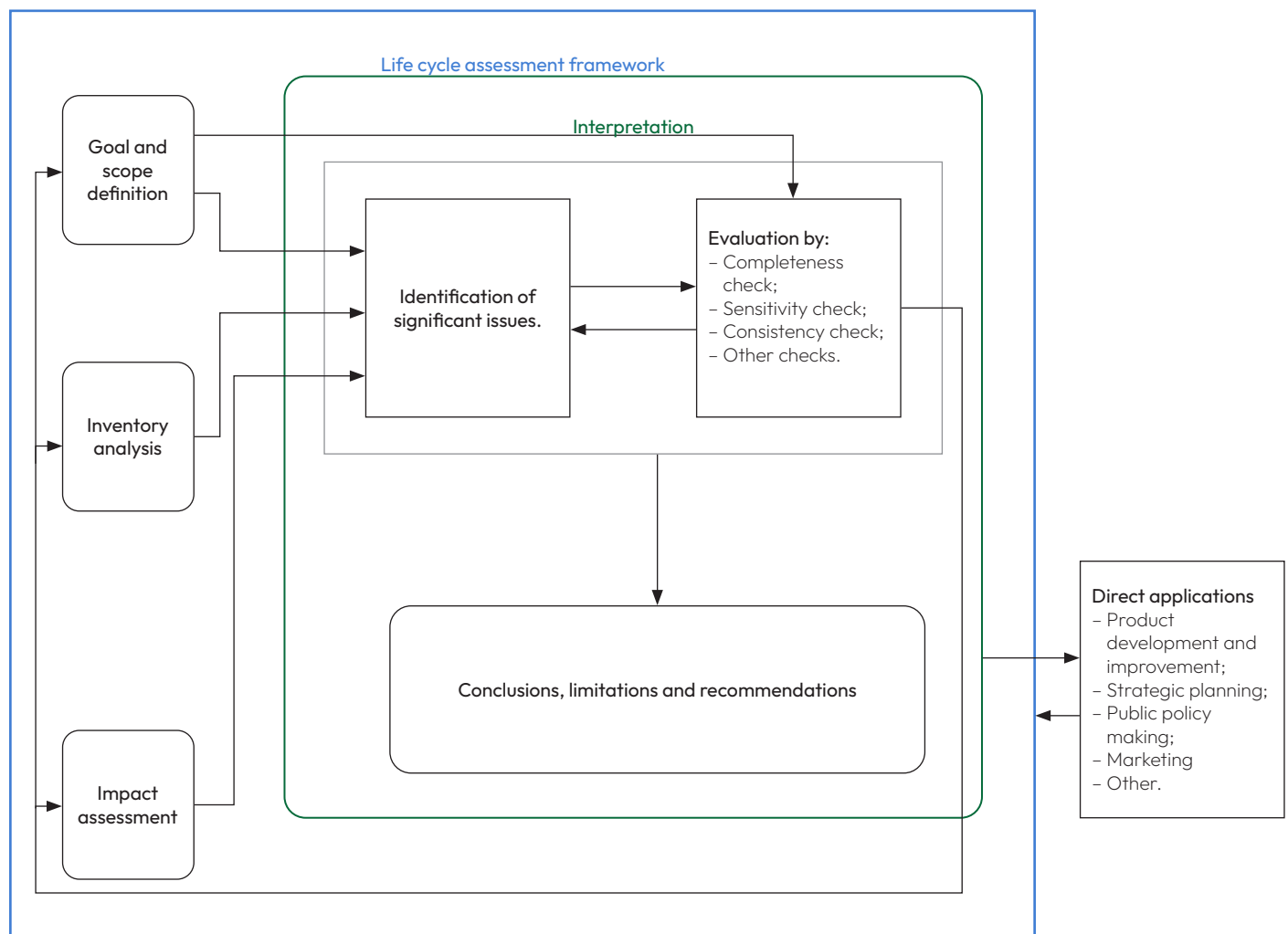
4.4.9 Communication

Results will be communicated annually. Results shall include relevant references to standards applied, a brief description of the methodology and approach, the customer and product-specific mass balance chain-of-custody result. Each customer receives one disclosure version per region; duplicate versions for overlapping groups are not issued.

Result reports shall be produced through coordination between the Sustainability Center of Excellence (COE) and regional functional roles, including Sustainability POCs. Result communication will be standardized in a template two-pager form. The two-pager will communicate results as described above and have an attached assurance statement from a third party. This assurance statement monitors the application of this methodology as illustrated in figure 12, adapted from ISO, below.

Any externally published version of this document or related customer-facing disclosure shall include the applicable legal disclaimer confirming that the document is provided for informational purposes only and is not intended to create reliance, warranties, guarantees, certifications, assurances, or liability for Novelis.

Figure 12: LCA Model of Assessment to be Assured

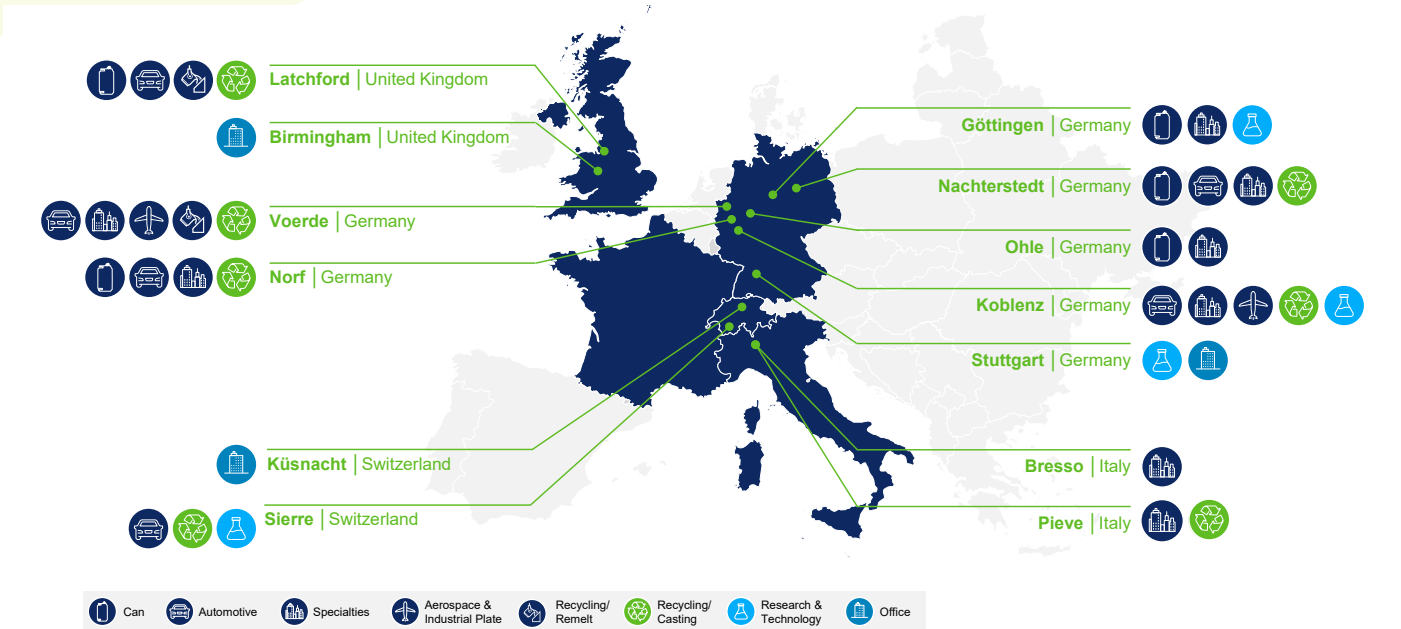


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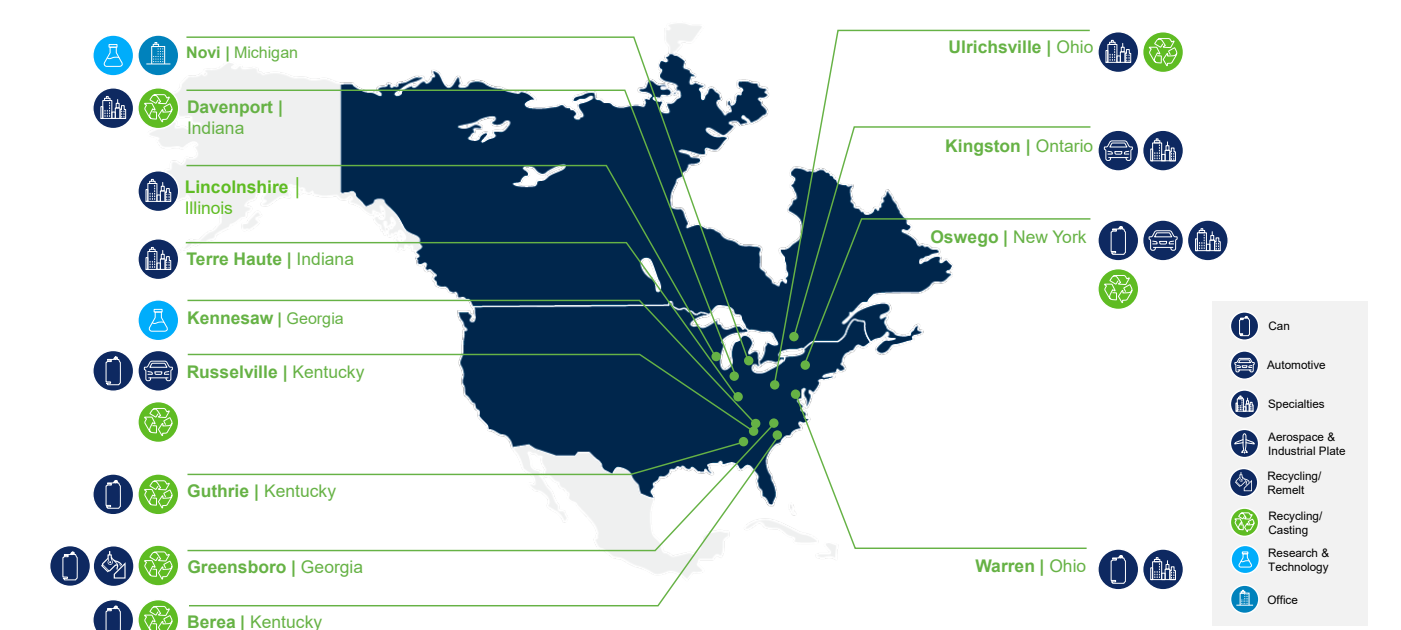
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Appendix A – Novelis Regions

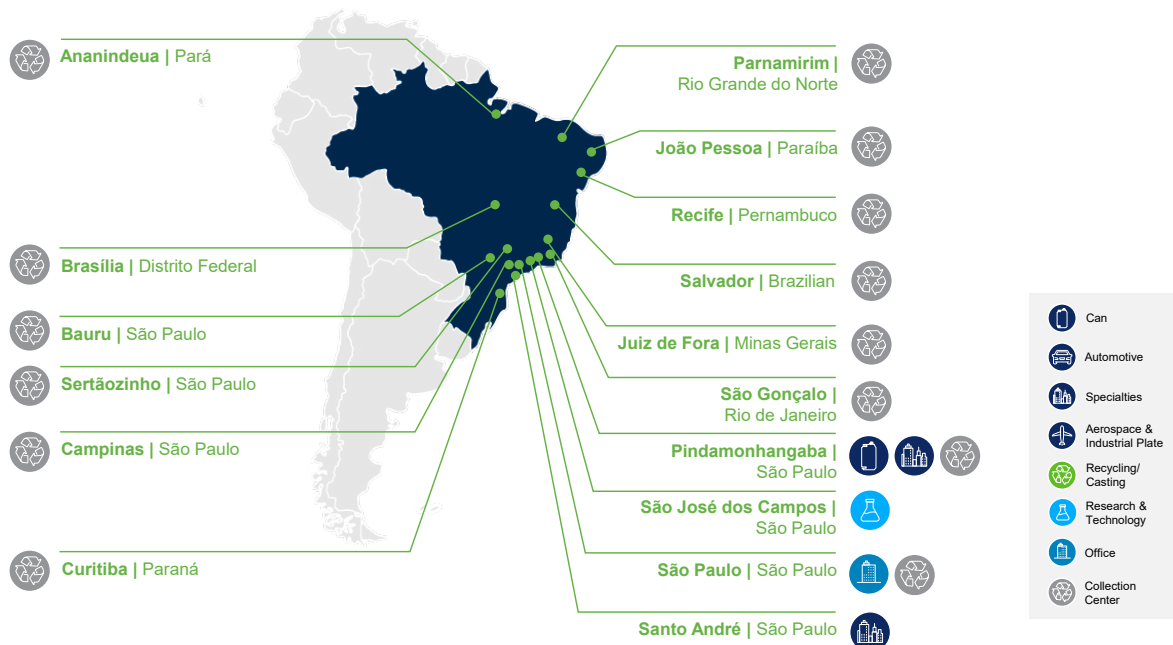
Novelis Europe



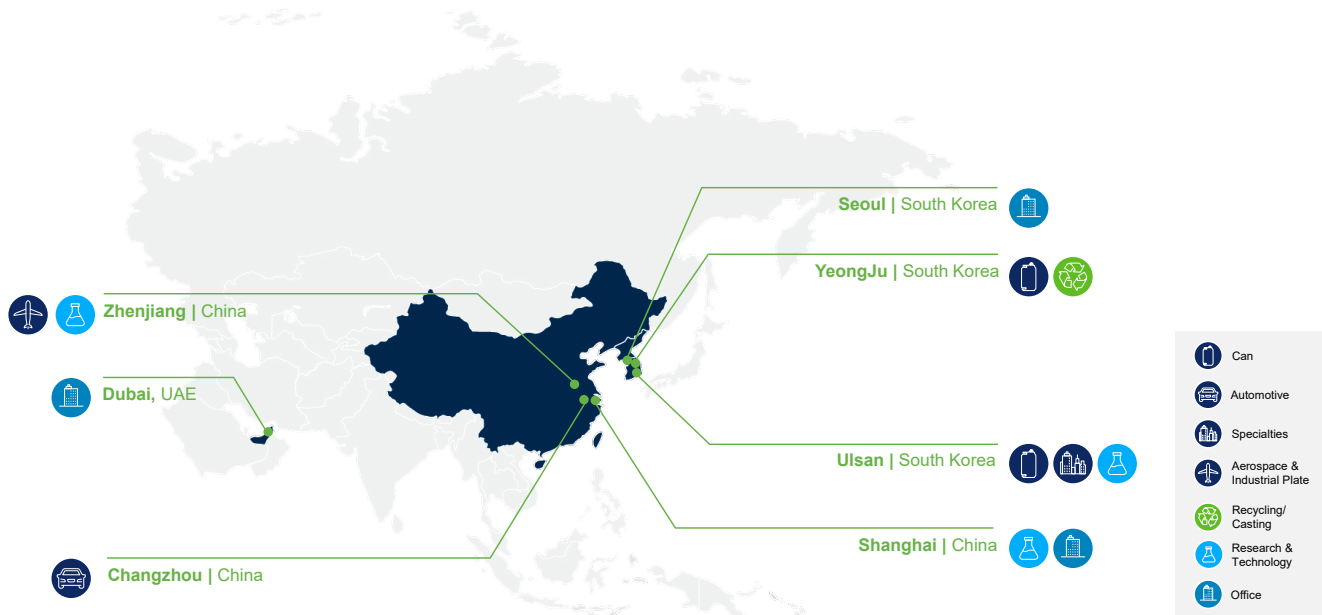
Novelis North America



Novelis South America



Novelis Asia



Appendix B – Novelis Recycled Content Methodology

Metrics Matter

Calculating the Recycled Content of Rolled Aluminum

Executive Summary

Increasing the percentage of recycled material used to manufacture rolled aluminum products is the most impactful step Novelis and our fellow downstream producers can take to reduce the carbon footprint of our products – not only in the immediate timeframe, but over the longer-term horizon as well.

The challenge for the aluminum industry today is that protocols for determining recycled content in general leave a considerable amount of room for interpretation for what counts as recycled content for aluminum products. We recognized this and embarked on a concerted effort to drive alignment within multiple industry groups. As these various working groups contemplate this topic, it's important we raise our voice.

As the leader in aluminum recycling and the company with the highest amount of recycled aluminum in our products, Novelis calculates the effective recycled content of a given coil shipped to a customer by subtracting the percentage of primary in the coil we roll from a baseline of 1.00 and then adjusting for handling painted or coated scrap and metal loss from "run-around" scrap generated in our rolling operations. We believe this calculation, **Effective Recycled Content = (1.00 minus prime content) + adjustment**, should be the industry standard.

We use this approach for our internal reporting and have subjected this international standards-based methodology to review and approval by a respected third party, [TrueNorth Collective, a sustainability consulting group with metals manufacturing and environmental reporting expertise](#). The high level of transparency and objectivity embedded in this approach allows us to share our estimated recycled content metrics externally with confidence.

We encourage our fellow producers and supply chain partners to adopt this methodology to measure and report recycled content.

The standards-based methods we use to calculate and communicate the benefits of aluminum recycling are

critical metrics we all need to employ in support of our goal of driving down carbon emissions.

Only when we all come together to collaboratively assess, report and promote the tremendous benefits of aluminum recycling will our collective claims of carbon reduction be recognized and appreciated.

As the largest purchaser and recycler of aluminum in the world, Novelis is contributing its expertise to develop recycled content standards for aluminum.

This approach offers a roadmap for the creation of a single, universally accepted methodology for measuring the recycled content in aluminum products.

Product Recycled Content Formula

Net Primary: sheet ingot, coil, prime, alloys and hardeners (after melt loss)
Adjustment: coated scrap, runaround melt loss

RC% =

Customer Shipments - Net Primary + Adjustment

Customer Shipments

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Link to full white paper can be found at novelis.com/sustainability/recycling/recycled-content-calculator/