ENVIRONMENTAL PRODUCT DECLARATION

PRIMARY ALUMINUM INGOT

INDUSTRY-AVERAGE PRIMARY ALUMINUM INGOT MANUFACTURED IN NORTH AMERICA

The Aluminum Association

The Aluminum Association and the aluminum industry are committed to responsible environmental stewardship. Aluminum is one of the most sustainable materials in use today:

- Strong and lightweight: Aluminum's favorable strength-to-weight ratio means it can be substituted for heavier materials, driving energy efficiency.
- Infinitely recyclable: Aluminum can be recycled over and over again without losing any of its fundamental properties.
- Efficiency improvements: Through voluntary industry efforts, the North American aluminum industry has reduced the carbon footprint of primary aluminum production by 49 percent since 1991.
- Corrosion-resistant: Durable aluminum lasts longer than many competing materials, limiting the need for replacement.
- Highly recycled: Aluminum is one of the most recycled materials on the market today. And production recycled aluminum takes just 7 percent of the energy needed to make primary aluminum.

CERTIFIED
ENVIRONMENTAL PRODUCT DECLARATION
UL.COM/EPD

Environmental Product Declaration

The Aluminum Association

Primary Aluminum Ingot
Aluminum Construction Product

According to ISO 14025 and ISO21930:2017

EPD Program and Program Operator Name, Address, Logo, and Website	UL Environment 333 Pfingsten Road Northbrook, IL 60611 WWW.UL.COM www.spot.ul.com
General Program Instructions and Version Number	Program Operator Rules v2.7 2022
Manufacturer Name and Address	The Aluminum Association 1400 Crystal Drive, Suite 430, Arlington, VA 22202
Declaration Number	4790545973.102.1
Declared Product & Functional Unit or Declared Unit	Primary aluminum ingot, one metric ton of primary aluminum ingot product
Reference PCR and Version Number	ULE PCR Part A – Product Category Rules for Building-Related Products and Services v4 ULE PCR Part B – Aluminum Construction Products v1.0
Description of Product Application/Use	Primary aluminum ingot for fabrication into building products
Product RSL Description (if Appl.)	n/a
Markets of Applicability	North America
Date of Issue	September 27, 2022
Period of Validity	5 Years
EPD Type	Industry-average
Range of Dataset Variability	Industry-average only
EPD Scope	Cradle to gate with end-of-life options (C1-C4 and D)
Year(s) of Reported Primary Data	2015-2019
LCA Software & Version Number	GaBi 10.6.1.35
LCI Database(s) & Version Number	GaBi 2020.1 (CUP 2020.1)
LCIA Methodology & Version Number	IPCC AR5 (GWP), TRACI 2.1 and CML v4.2

The PCR review was conducted by:	UL Environment PCR Review Panel epd@ul.com
This declaration was independently verified in accordance with ISO 14025: 2006. ☐ INTERNAL ☒ EXTERNAL	Cooper McCollum, UL Environment
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	WAP Sustainability
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	James Mellentine, Thrive ESG

LIMITATIONS

Exclusions: EPDs do not indicate that any environmental or social performance benchmarks are met, and there may be impacts that they do not encompass. LCAs do not typically address the site-specific environmental impacts of raw material extraction, nor are they meant to assess human health toxicity. EPDs can complement but cannot replace tools and certifications that are designed to address these impacts and/or set performance thresholds – e.g. Type 1 certifications, health assessments and declarations, environmental impact assessments, etc.

Accuracy of Results: EPDs regularly rely on estimations of impacts; the level of accuracy in estimation of effect differs for any particular product line and reported impact.

Comparability: EPDs from different programs may not be comparable. Full conformance with a PCR allows EPD comparability only when all stages of a life cycle have been considered. However, variations and deviations are possible". Example of variations: Different LCA software and background LCI datasets may lead to differences results for upstream or downstream of the life cycle stages declared.

Product Definition and Information

Description of Organization

The Aluminum Association represents aluminum production and jobs in the United States, ranging from primary production to value added products to recycling, as well as suppliers to the industry. The association is the industry's leading voice, representing companies that make 70% of the aluminum and aluminum products shipped in North America.

Based in the Washington, D.C. area, the association is the U.S. industry's leading voice — developing global standards, business intelligence, sustainability research and industry expertise for member companies, policymakers and the general public (AA, 2022).

Product Description

Product Identification

This EPD covers the production of primary aluminum ingot for further processing into aluminum semi-fabrications and products. The results represent an average across all primary aluminum ingot manufactured in North America (United States and Canada) and includes various alloy compositions.

Averages are obtained through aggregating production-weighted data from the participating companies.

Product Specification

Name	Value	Unit
Density	2.66-2.84	$(kg/m^3) \times 10^3$
Melting point (Typical)	475-655	°C
Electrical conductivity (Typical) at 20°C/at 68˚F	Equal Volume:16-36	MS/m (0.58*%IACS)
Thermal conductivity (Typical) at 25˚c/at 77˚F	109-234	W/(m.K)
Average Coefficient of thermal expansion (Typical) 20˚ to 100˚c /68° to 212°F	19.4-24.1	per ˚C
Modulus of elasticity (Typical)	69-74	$MPa * 10^3$
Chemical composition	Varying alloy by alloy, most case Al > 90	% by mass

Application

Primary aluminum ingots are used to create aluminum semi-fabricated products, such as rolled coils, casted components, or extrusions for further aluminum product manufacturing.

Technical Requirements

Aluminum ingots do not need to comply with any particular standard. Chemical composition of most high-purity alloys follow the *International Alloy Designations and Chemical Composition Limits for Wrought Aluminum and Wrought Aluminum Alloys* (AA, 2009).

Properties of Declared Product as Delivered

The output of primary ingot production are aluminum ingots, primarily from bauxite ore, suitable for rolling, extruding, or shape casting. The dimensions of the ingot vary based on the semi-fabrication requirements.

Material Composition

Most primary aluminum ingots contain near 100% of pure aluminum. In some cases, alloy elements are added to make a designated alloy. Material composition varies alloy by alloy but in most cases aluminum is more than 90% by mass.

Base and Ancillary Materials

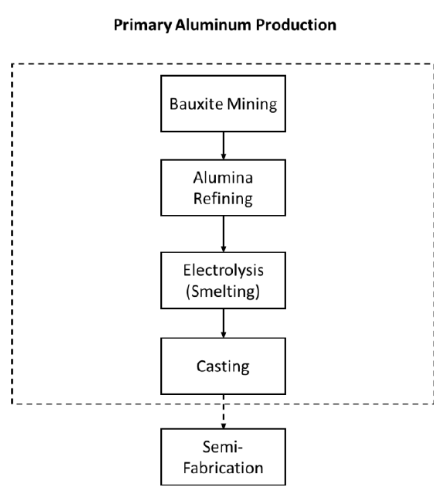
Bauxite ore is the primary raw material source for aluminum production. This ore consists primarily of the minerals gibbsite $Al(OH)_3$, boehmite, and diaspore AlOOH, together with minor fractions of iron oxides, clay minerals, and small amount of TiO_2.

The bauxite ore must first be refined into alumina (aluminum oxide) before it can be electrolyzed into aluminum ingot. According to a recent survey by the International Aluminium Institute (IAI), the production of one metric ton of alumina requires approximately 2.9 metric tons of bauxite (taking into account the purity of bauxite and losses during processing and transportation) (IAI, 2013). Raw materials for alumina production include bauxite, caustic soda, and sodium carbonate.

In addition to the alumina, carbon anodes are used in the electrolysis process to produce primary aluminum ingot. Anodes are made from petroleum coke and coal pitch, and are consumed in the process of separating the alumina into aluminum and oxygen gas. The final composition of the aluminum ingot varies by alloy, but is typically greater than 90% aluminum by mass.

Manufacturing

The manufacturing of primary aluminum ingot includes the component processes of bauxite mining, alumina refining, electrolysis (including anode production and smelting), and primary ingot casting. The intial raw material is bauxite ore and the final product is primary aluminum ingot with intermediate products of alumina (aluminum oxide) and molten aluminum (liquid) metal.



Nearly all primary aluminum ingot in North America is made from imported bauxite. The ore for this declaration is modeled as being imported from Jamaica, Guinea, and Brazil, which sum to 99.4% of the bauxite imports to North America in 2010 (USGS, 2011). Additionally, some alumina is imported directly by the North American aluminum industry. This is modeled based upon data directly collected and aggregated by the International Aluminium Institute.

There are two generic types of electrolysis technologies for aluminum: Prebake and Söderberg. The two technologies differ in the type of anodes they consume. As a consequence of advanced design and better computer control of the Prebake technology, the efficiency and emission levels have been significantly improved. In North America, the Söderberg technology has been phased out. All facilities are now using prebake technology.

Molten metal from electrolysis is siphoned from the pots and sent to a resident cast house for further alloying, heat treatment, fluxing, and filtering as necessary for the final product. The metal is then cast into ingots in a variety of methods: open molds (typically for remelt ingot), through direct chill molds for various fabrication shapes, electromagnetic molds for some sheet ingots, and through continuous casters for aluminum coils.

Packaging

Product delivery packaging includes wood, steel, paper board, and sometimes plastic wraps. Packaging is included in the scope of this EPD.

Transportation

Supply chain material transporation is included in the varies stages of raw material production processes. In addition, a transportation distance of 100 km (62 miles) by truck has been added for the transportation of waste to end-of-life.

Product Installation

Product installation is not under the scope of this EPD.

Use

For the purpose of this declaration, primary aluminum ingots are considered to be used for the manufacturing of aluminum building products, such as extrusions and sheets. No additional special conditions of use are relevant for this product under the scope of this EPD.

Reference Service Life and Estimated Building Service Life

Service lifes for primary aluminum products vary based on their application. This EPD does not cover the product use phase and therefore makes no specific claim as to a typical reference service life.

Recycling and Disposal

Aluminum is a highly recyclable material. During manufacturing, most process and new scrap are fed back into the production process. At the end of life, aluminum scrap is collected and sold to both secondary smelting and semi-fabrication companies. The recycling rate for aluminum scrap is assumed to be 95%. Recycling over 95% is typical for aluminum products in high volume automotive and construction market sectors (IAI 2013).

Table 1 Recycling and disposal

Name	Unit
Deconstruction	--
Transportation to the disposal site	100 km by truck
Waste processing	--
Disposal to landfill	5%
Recycling rate of the product	95%
Removals of biogenic carbon	N/A

Life Cycle Assessment Background Information

Declared Unit

The declared unit is the production of one metric ton of primary aluminum ingot. The results can be converted to one kilogram by dividing by 1,000.

System Boundary

Per the PCR, this cradle-to-gate with options analysis provides information on the Product Stage of the aluminum product life cycle, including modules A1–A3, C1-C4 and D:

- A1 The provision of resources, additives and energy
- A2 Transport of resources and additives to the production site
- A3 Production process on site, including energy, production of additives, disposal of production residues, consideration of related emissions and recycling of production scrap (“closed loop”)
- C1 Deconstruction
- C2 Transport to the disposal site
- C3 Waste processing
- C4 Disposal at the end of the life cycle, i.e., during building deconstruction
- D Net benefits resulting from reuse, recycling and energy recovery that take place beyond the system boundary.

Table 2 below represents the system boundary and scope.

Table 2 System boundary modules included and excluded from the study

	PRODUCT STAGE			CONSTRUCT-ION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY
	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
	Raw material supply	Transport	Manufacturing	Transport from gate to site	Assembly/Install	Use	Maintenance	Repair	Replacement	Refurbishment	Building Operational Energy Use During Product Use	Building Operational Water Use During Product Use	Deconstruction	Transport	Waste processing	Disposal	Reuse, Recovery, Recycling Potential
EPD Type	X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	X	X	X	X	X

* X = module included, MND = module not declared

It should be noted here that, C1 and C3 are to be reported as zero as they are assumed to fall below the cut-off criteria defined by ISO 21930. C2 is assumed as 100 km by truck. Materials for recycling (95%) for aluminum is reported in C4 module.

Time coverage: Aluminum Association primary data represent production within calendar year 2016. Refer to the 2022 Semi-fab LCA report for more information on temporal coverage (AA, 2022). Background data for upstream and downstream processes (i.e., raw materials, energy resources, transportation, and ancillary materials) were obtained from the GaBi 10 (CUP 2020.1) databases.

Technology coverage: Data were collected for primary aluminum ingots produced by various AA members throughout North America.

Geographical coverage: Aluminum Association members manufacture primary aluminum ingots in various locations in Canada and the United States. As such, the geographical coverage for this study is based on North American system boundaries for all processes and products. Whenever Canadian or U.S. background data were not readily available, European data or global data were used as proxies.

Interpreting the Results in Module D

The values in Module D include a recognition of the benefits or impacts related to aluminum recycling which occur at the end of the product's service life. The rate of aluminum recycling and related processes will evolve over time. The results included in Module D attempt to capture future benefits, or impacts, but are based on a methodology that uses current industry-average data reflecting current processes.

A net scrap approach was taken to capture the benefits and impacts related to aluminum recycling reported in Module D. The following datasets in Table 3 were used to calculate the associated net recycling credit.

Table 3 Background datasets used for Module D

Background datasets (Sphera, 2021)	**Reference year**
RNA: Secondary aluminum ingot (95% recycled content) AA	2016
RNA: Primary aluminum ingot AA	2016

Estimates and Assumptions

The LCA required only limited use of estimates and assumptions. Averages and best-estimates were used to fill in minor data gaps, such as the source of ancilary materials. Other estimates and assumptions are discussed in detail in the LCA background report.

Cut-off Criteria

Input: All material flows that enter the system and are over 1% of the product mass or contribute more than 1% to the primary energy consumption are included.

Output: All material flows that exit the system and whose environmental impact makes up more than 1% of the total impact in an impact category considered are included.

Data Sources

In order to model the life cycle for the production of the primary aluminum ingot, the GaBi 10 software system developed by Sphera was used. All relevant background data necessary for the production of primary aluminum ingot were taken from the GaBi 2020 databases or were made available by the Aluminum Association through industry survey results. Companies participating in the project, either with AA or IAI, are provided in the Participating Companies section.

Primary aluminum used in North America is sourced domestically and from other geographic regions, for which carbon intensity information is shared in the below Table 4:

Table 4 Data sources, origin and carbon intensity for primary aluminum

Dataset	**Geographic origin**	**Electricity sources** (IAI, 2017)	**Carbon intensity** (kg CO_2 eq/kWh)
RNA: Primary aluminum ingot	Domestic (North America)	Hydro (80%), lignite (17%), natural gas (3%), nuclear and fuel oil: <1%	0.214
RLA: Aluminum ingot mix IAI 2015	Argentina	Hydro (64%), natural gas (35%), coal <1%	0.393
RME: Aluminum ingot mix IAI 2015	Bahrain	Natural gas (100%)	0.45
RLA: Aluminum ingot mix IAI 2015	Brazil	Hydro (64%), natural gas (35%), coal <1%	0.393
RU: Aluminum ingot mix IAI 2015	Russia	Hydro (98%), coal (2%)	0.0421
RME: Aluminum ingot mix IAI 2015	United Arab Emirates	Natural gas (100%)	0.45
RLA: Aluminum ingot mix IAI 2015	Venezuela	Hydro (64%), natural gas (35%), coal <1%	0.393
GLO: Aluminum ingot mix IAI 2015	Rest of the World	Hydro (25%), coal (64%), natural gas (10%), nuclear (1%), oil <1%	0.778

Data Quality

The data is considered of high quality. Inventory data quality is judged by its precision (measured, calculated or estimated), completeness (e.g., unreported emissions), consistency (degree of uniformity of the methodology applied on a study serving as a data source) and representativeness (geographical, temporal, and technological). To cover these requirements and to ensure reliable results, first-hand industry data in combination with consistent background life cycle inventories from the GaBi 2020 database were used.

The LCI data sets from the GaBi database are widely distributed and used with the GaBi 10 Software. The datasets have been used in LCA models worldwide in industrial and scientific applications in internal as well as in many critically reviewed and published studies. In the process of providing these datasets, they are cross-checked with other databases and values from industry and science.

Period under Review

Primary data for bauxite mining, alumina refining, and primary aluminum production was collected by the International Aluminum Institute (IAI) and provided to the Aluminum Association (AA). Primary data collected from the participating companies and from their operational activities is representative for the year of 2016. Additional data necessary to model raw material production, energy generation, etc. were adopted from the GaBi 2020 database with typical reference years between 2016 and 2021.

Allocation

Internal recycling of by-products (e.g., salt cake, dross) is included within the system boundary. Note that co-product allocation may also be used in background data from the GaBi database (e.g., caustic acid).

The "net scrap" substitution approach is used to address recycled content, post-industrial scrap, and post-consumer scrap. Under this approach, the end-of-life scrap collected for recycling is first reduced by the scrap inputs into production. Only the remaining *net scrap* is then modeled as being sent to material recycling in order to avoid double-counting the benefits of using recycled content. If more scrap is recovered at product end-of-life than is required in the manufacturing stage, the product system receives a credit equal to the burden of primary material production minus the burden of recycling scrap into secondary material based on the mass of secondary material produced. If less scrap is recovered at product end-of-life than is required in the manufacturing stage, this net credit becomes a net burden.

Comparability (Optional)

A comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to ISO 21930 and the building context, respectively the product-specific characteristics of performance are taken into account.

Life Cycle Assessment Results

The results from the Aluminum Association primary aluminum ingots are given below. While interpreting the Module D results one should consider that, the values in Module D include a recognition of the benefits or impacts related to aluminum recycling which occur at the end of the product's service life. The rate of aluminum recycling and related processes will evolve over time. The results included in Module D attempt to capture future benefits, or impacts, but are based on a methodology that uses current industry-average data reflecting current processes.

GWP excludes biogenic carbon as there are no relevant biogenic carbon removals or emissions in the life cycle. There is no calcination, carbonation and combustion of waste from non-renewable sources.

Life Cycle Impact Assessment Results

Table 5. North American Impact Assessment Results

TRACI v2.1	UNIT	A1-A3	C1	C2	C3	C4	D
IPCC AR5 GWP	[kg CO_2-Eq.]	8.51E+03	-	9.90E+00	-	2.17E+00	-7.55E+03
ODP	[kg CFC11-Eq.]	-1.99E-13	-	1.05E-15	-	7.02E-15	5.70E-13
AP	[kg SO_2-Eq.]	3.86E+01	-	2.85E-02	-	9.49E-03	-3.58E+01
EP	[kg $(PO_4)^{3-}$-Eq.]	8.78E-01	-	3.36E-03	-	5.35E-04	-7.93E-01
SFP	[kg O_3-Eq.]	3.26E+02	-	6.40E-01	-	1.67E-01	-2.94E+02
ADP_{fossil}*	[MJ]	6.56E+03	-	1.86E+01	-	4.25E+00	-5.08E+03

** Resource depletion metric based on EI99 [MJ surplus energy]*

Table 6. EU Impact Assessment Results

CML v4.2	Unit	A1-A3	C1	C2	C3	C4	D
GWP	[kg CO_2-Eq.]	8.49E+03	-	9.88E+00	-	2.16E+00	-7.54E+03
ODP	[kg CFC11-Eq.]	3.13E-12	-	1.05E-15	-	7.02E-15	-2.57E-12
AP	[kg SO_2-Eq.]	4.14E+01	-	2.12E-02	-	8.75E-03	-3.85E+01
EP	[kg $(PO_4)^{3-}$-Eq.]	2.53E+00	-	6.49E-03	-	1.17E-03	-2.31E+00
POCP	[kg Ethane-Eq.]	2.08E+00	-	-7.13E-03	-	7.64E-05	-1.91E+00
ADP_{fossil}	[MJ]	8.12E+04	-	1.39E+02	-	3.27E+01	-6.87E+04
$ADP_{elements}$	[kg Sb-Eq.]	4.03E-06	-	1.60E-09	-	1.80E-09	-3.08E-06

Life Cycle Inventory Results

Table 7. Resource Use

Parameter	Unit	A1-A3	C1	C2	C3	C4	D
RPR_E	[MJ]	5.29E+04	-	5.82E+00	-	2.71E+00	-4.96E+04
RPR_M	[MJ]	-	-	-	-	-	-
RPR_T	[MJ]	5.29E+04	-	5.82E+00	-	2.71E+00	-4.96E+04
$NRPR_E$	[MJ]	8.27E+04	-	1.40E+02	-	3.35E+01	-6.98E+04
$NRPR_M$	[MJ]	-	-	-	-	-	-
$NRPR_T$		8.27E+04	-	1.40E+02	-	3.35E+01	-6.98E+04
SM	[kg]	-	-	-	-	-	-
RSF	[MJ]	-	-	-	-	-	-
NRSF	[MJ]	-	-	-	-	-	-
RE	[MJ]	-	-	-	-	-	-
FW	[m^3]	1.75E+02	-	2.62E-02	-	4.75E-03	-1.65E+02

Table 8. Output Flows and Waste Categories

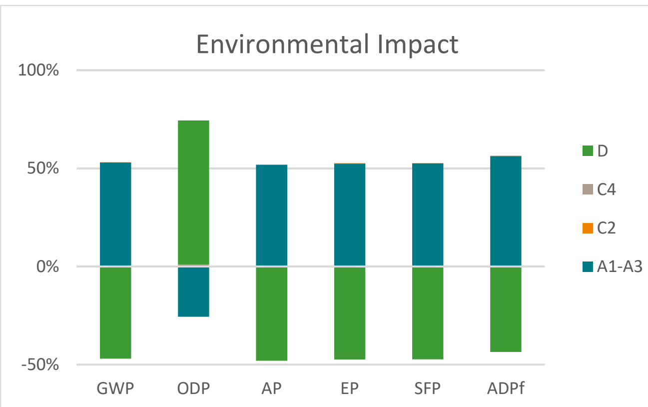
Parameter	Unit	A1-A3	C1	C2	C3	C4	D
HWD	[kg]	4.87E-05	-	2.40E-06	-	2.24E-07	-4.25E-05
NHWD	[kg]	2.40E+03	-	-	-	5.00E+01	-2.25E+03
HLRW	[kg]	7.77E-04	-	3.05E-07	-	3.30E-07	-5.98E-04
ILLRW	[kg]	2.00E-02	-	8.16E-06	-	8.70E-06	-1.51E-02
CRU	[kg]	-	-	-	-	-	-
MFR	[kg]	5.48E+00	-	-	9.50E+02	-	-5.17E+00
MER	[kg]	1.39E+01	-	-	-	-	-1.31E+01
EE	[MJ]	-	-	-	-	-	-

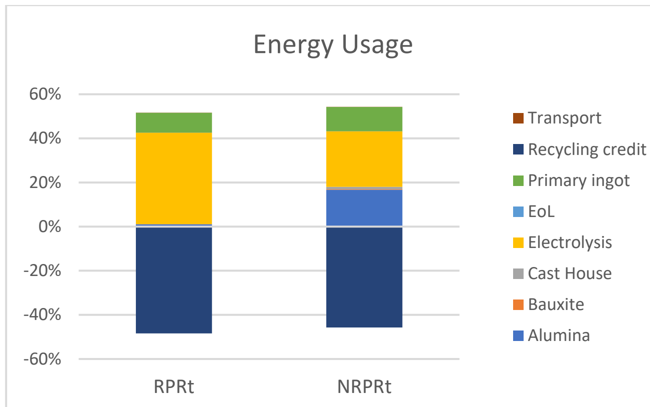
LCA Interpretation

The results represent the cradle-to-gate with end of life impacts of the production of one metric ton of primary aluminum ingot. A key result is that the environmental impacts of primary aluminum ingot production (A1-A3) are largely driven by the electricity consumption during the electrolysis of alumina and the recycling processes at end of life.

These impacts are largely offset by the recycling credit used at end of life represented by module D. The recycling process occuring at end of life has some small effect on ozone depletion potential.

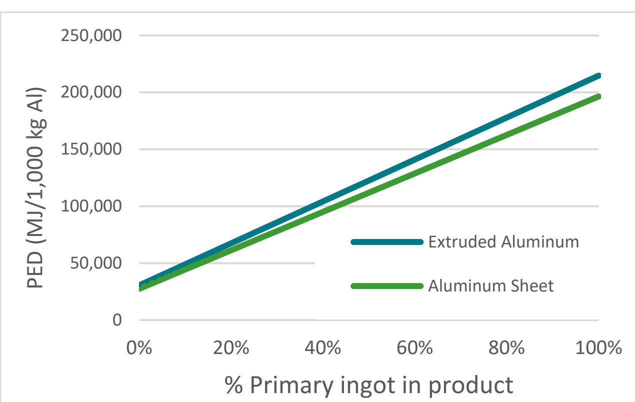
There is still a strong push in the aluminum industry to maximize aluminum recycling rates and close material loops.

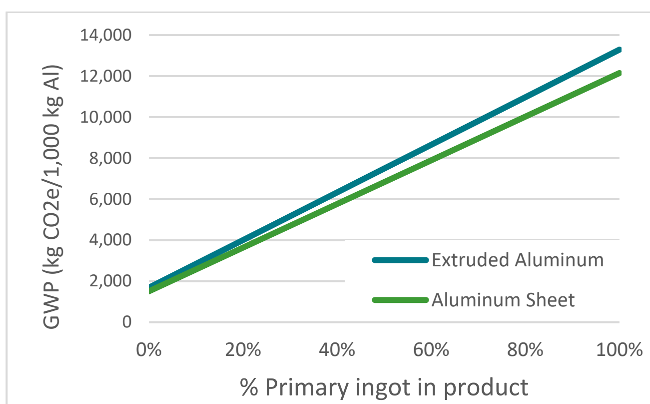




Sensitivity Analysis

A sensitivity analysis has been conducted to examine the impact of increasing primary aluminum content in semi-finished products. Given the significant influence of primary aluminum on the cradle-to-gate footprint, one way to address it is to reduce the use of primary aluminum and increase the use of recycled metal. As shown below, a one percent increase in primary aluminum content in the products will increase the cradle-to-gate primary energy demand and global warming potential by as much as 1856 MJ and 117 kg CO2e, respectively, for 1,000 kg semi-finished products. This is equal to say that a one percentage point increase in recycled aluminum content will reduce the energy demand and carbon footprint by the same amount.



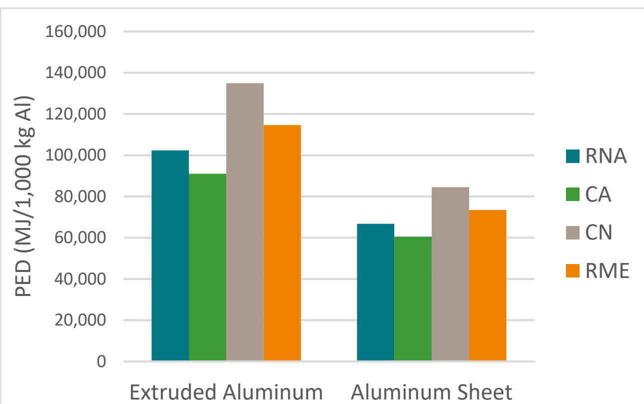


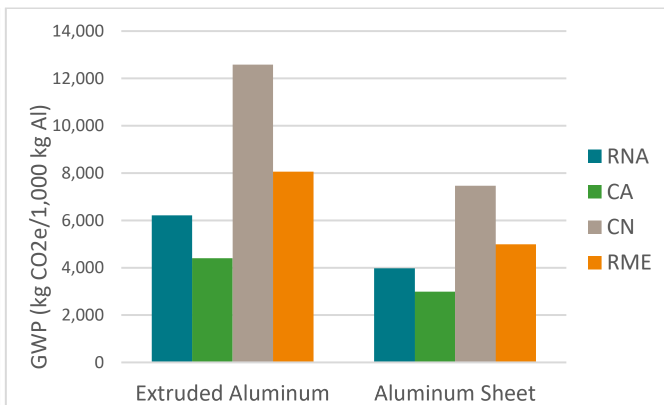
Scenario Analysis

To see the effect of primary aluminum sourcing, a scenario analysis was conducted to alternate the sourcing from different regions or countries other than the baseline case of the North American consumption mix. The metal compositions – shares of primary and recycled metal in the products, are kept unchanged for the scenario analysis. Both figures below show the effects of primary aluminum sourcing on cradle-to-gate primary energy demand and global warming potential, respectively. The regions and countries included in the scenario analysis are:

- RNA represents the weighted average of primary aluminum consumption mix in North America, which is the baseline case;
- CA represents Canada where primary aluminum is exclusively smelted with hydropower electricity;
- CN represents China where primary aluminum is mainly smelted with coal-fired electricity;
- RME represents the Middle East where primary aluminum is mainly smelted with natural gas fired electricity.

Clearly, the scale of difference is dependent both on impact category (e.g., PED or GWP) and on how much primary aluminum content is in the products. The more primary aluminum is in the product, the more striking the difference between hydropower smelted aluminum and coal-power smelted aluminum. The difference is more prominent for GWP than it is for PED. The cradle-to-gate carbon footprint of aluminum sheet made of Chinese primary aluminum would be 3.2 times higher than it is made of Canadian primary aluminum under the same share of primary and recycled content as the baseline case.





For additional sensitivity and scenario analysis information for the above products, please refer to the report (Aluminum Association, 2022).

Additional Environmental Information

Environment and Health During Manufacturing

Air: Hazardous air emission releases comply with regulatory thresholds.

Water/soil: Pollutants in wastewater discharge comply with regulatory thresholds.

Noise: Due to adequate acoustical absorption and mitigation devices, measurements of sound levels have shown that all values inside and outside the production plant comply with regulatory thresholds.

Environment and Health During Use

The environmental and health effects during use are dependent on the ultimate use of the primary aluminum ingot and are outside the scope of this EPD. The following general statements are relevant for all aluminum products:

- Aluminum products are often made from both primary and recycled ingots
- There is no relevant chemical composition difference between primary and secondary ingots if both are governed by the same alloy designation and chemical composition limit standards
- The service life of the final product depends on its application, but is typically long due to aluminum's excellent durability and corrosion resistance
- For that same reason, maintenance needs during use are usually low.

Extraordinary Effects

Fire: Aluminum products comply with ASTM E 136-11.

Water: There is no evidence to suggest water runoff or exposure under normal and intended operation will violate general water quality standards.

Mechanical destruction: Not relevant for aluminum.

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Participating Companies

No.	Company	Note
1	Alcoa Corporation	Primary aluminum
2	Arconic Corporation	Recycling, sheet, extrusion
3	Century Aluminum	Primary aluminum
4	Commonwealth Rolled Products	Formally Aleris International, recycling, sheet
5	Constellium	Recycling, sheet, extrusion
6	Howmet	Formally part of Arconic, recycling, sheet, extrusion
7	Hydro Extrusions North America	Recycling, extrusion
8	Hydro Metals North America	Recycling, extrusion billet
9	Jupiter Aluminum	Recycling, sheet
10	JW Aluminum	Recycling, sheet, foil
11	Kaiser Aluminum	Recycling, sheet, extrusion
12	Keymark	Recycling, extrusion
13	Novelis Inc.	Recycling, sheet, foil
14	Real Alloys	Recycling, RSI
15	Rio Tinto	Primary aluminum
16	Reynolds	Foil
17	Scepter Inc.	Recycling, RSI
18	Skana	Recycling, sheet
19	Smelter Service Corporation	Recycling, RSI
20	United Aluminum	Recycling, sheet