XCarb®
Recycled and renewably produced

ArcelorMittal Dofasco

ArcelorMittal



Environmental Product Declaration

XCarb® Recycled and Renewably Produced
Hot Rolled Steel Coil

The development of this environmental product declaration (EPD) for **XCarb® Recycled and Renewably Produced (RRP) hot rolled steel coil** was commissioned by ArcelorMittal Dofasco. This Type III EPD was developed in compliance with CAN/CSA-ISO 14025 and ISO 21930:2017 and has been third-party verified by Hugues Imbeault-Tétreault. This EPD includes life cycle assessment (LCA) results for raw material supply, transportation, manufacturing, and end of life (cradle-to-gate with options). For more information about ArcelorMittal and the XCarb® RRP product offers, please visit: https://dofasco.arcelormittal.com/products/xcarb-recycled-and-renewably-produced

Environmental Product Declaration

CSA Registered Based on ISO 14025 and Other Requirements
For more information visit csaregistries.ca/epd

1434-6790
November 2026-November 2031

Issue date: November 12, 2026

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ArcelorMittal

1. General Information

1.1 EPD Information

EPD program operator	CSA 178 Rexdale Blvd, Toronto, ON, Canada M9W 1R3 www.csastandards.org
General program instructions	CSA-SDP-5.1:26 CSA general program instructions for Type III environmental product declarations (2026)
Manufacturer name and address	ArcelorMittal Dofasco G.P. 1330 Burlington St. E., Hamilton, ON, L8N 3J5 https://dofasco.arcelormittal.com/
Declaration number	#1434-6790
Declaration product & declared unit	1 metric ton of XCarb® RRP hot rolled steel coil
Reference PCR and version number	Smart EPD Part A Product Category Rule for Building and Construction Products and Services,1000, version 1.2 Valid from March 14, 2025, until March 14, 2030. Smart EPD Part B Product Category Rule for Designated Stee Construction Products, 1000-008, version 3. Valid from April 3, 2025, until April 3, 2030.
Markets of applicability	Canada
Date of issue	November 12, 2026
Period of validity	November 12, 2026 to November 11, 2031
EPD type	Product-specific, facility-specific
Dataset variability	Not applicable
EPD scope	Cradle-to-gate with options: Production (A1-A3), End of Life (C1-C4), D
Year(s) of reported primary data	January 2024 - December 2024
LCA software & version number	Sphera LCA for Expert 10.9
LCI database(s) & version number	Sphera LCA for Expert 10.9, Ecoinvent 3.10, US LCI v1.0 LCI of steel scrap from Worldsteel Association (2021)
LCIA methodology & version number	TRACI 2.2, IPCC AR6 & CML 2016
The sub-category PCR review was conducted by:	Dr. Thomas Gloria (chair) Industrial Ecology Consulting (t.gloria@industrial-ecology.com) Robert Wills Wills Marketing Service (robertwills.steel@gmail.com) Joseph Anderson Independent Consultant (jga323@gmail.com)

This declaration was independently verified in accordance with ISO 14025:2006. The Smart EPD PCR Part A for Building and Construction Products and Services," v1.2 (March 2025), in conformance with ISO 21930:2017, serves as the core PCR.	__ Internal x External
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	Farid Safari ArcelorMittal Global R&D 1330 Burlington St. E Hamilton, ON, L8S 3K2
The life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	Hugues Imbeault-Tétreault Groupe AGÉCO 1995, Frank-Carrel Street, suite 219 Quebec (Quebec) G1N 4H9

1.2 Limitations, liability and ownership

- The EPD owner has sole ownership, liability, and responsibility for the EPD.
- No known flows are deliberately excluded from this EPD
- EPDs are only comparable if they conform with ISO 21930, this sub-category PCR, includes all relevant information modules and are based on equivalent scenarios with respect to the construction works context.
- Environmental declarations from different programs (ISO 14025) may not be comparable. Comparison of the environmental performance of products using EPD information shall be based on the product's use and impacts at the building or construction works level, and therefore EPDs may not be used for comparability purposes when not considering the whole building life cycle. EPD comparability is only possible 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 in results upstream or downstream of the life cycle stages declared.
- It is recognized that by following the typical ISO 21930:2017 definitions of module A1, A2 and A3 for a specific production facility, inconsistencies will occur in classifying individual processes as either A1 or A3 based on the scope of the operations that take place at a given facility. Care must be taken not to compare A1, A2 or A3 on an individual basis for a given product from various mill producers, but, instead on the aggregated total of A1, A2 and A3. Separate A1, A2 and A3 values are provided for a better understanding of the processes taking place at a given facility and a greater level of transparency.
- The environmental impact results of products in this document are based on a declared unit and therefore do not provide sufficient information to establish comparisons. The results shall not be used for comparisons without knowledge of how the physical properties of the product impact the precise function at the construction level. The environmental impact results shall be converted to a functional unit basis before any comparison is attempted.
- Construction product environmental impact results provide a sufficient basis for comparison only when considered in the context of the construction works project. In all cases of comparing construction products, the principle that the basis for comparison of the assessment is the construction works level shall be maintained by ensuring that the same functional requirements are met and the criteria in ISO 21930:2017 Section 5.5 "Comparability of EPDs for construction products" are satisfied.
- A manufacturer shall not make claims based on an industry-average EPD which leads the market to believe the industry-average is representative of manufacturer-specific or product-specific results.

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1.3 Description of Organization

ArcelorMittal Dofasco (AMD) is a steel manufacturer based in Hamilton, Ontario, specializing in the production of high-quality flat carbon steel. Founded in 1912, it is a subsidiary of ArcelorMittal Group. The company operates as a major industrial company in Hamilton, shipping millions of tons of steel to North American market including construction, automotive, packaging and energy sectors. AM Dofasco products include Hot-Rolled Coil (HRC), Cold-rolled Coil (CRC), Hot Dip Galvanized (HDG) coil, pre-painted coils, galvalume (zinc & aluminum coated), and tinplate. Steel is made by AM Dofasco via both Electric Arc Furnace (EAF) & Basic Oxygen Furnace (BOF) routes. ArcelorMittal's roadmap to Net-zero includes several steppingstones to achieve carbon-neutrality by 2050: steelmaking transformation, energy transformation, increased use of scrap, clean electricity and offsetting residual emissions.

2. Product information and Methodological Framework

2.1 Product information & Declared Unit

The declared unit is one (1) metric ton of XCarb® RRP hot rolled steel coil made via EAF stream at ArcelorMittal Dofasco.

2.2 Product Specifications

Hot Rolled (HR) steel coils are used in many markets including automotive (parts and tubing), construction (hollow structural sections, joists, pre-engineered buildings and sheet piling), and heavy equipment in oil & gas industry (Oil Country Tubular Good [OCTG] and line pipes). Further product specifications are presented in Table 1. This product is available in different gauges and thicknesses. The minimum values for physical properties are presented in Table 1.

Table 1. XCarb® RRP HR Steel Coil Specifications

Product specification	Description	Units
Standard	ASTM A1011/A1011M-18a	n/a
Product classification codes	UNSPSC code class: 302643, CSI classification: 05 00 00 [Metal]	n/a
System boundary option	Mill product (option 1)	n/a
Form factor	Coil	n/a
Product route representation	EAF	n/a
Steel type	Flat Carbon	n/a
Option	Hot rolled	n/a
Density	7800	kg/m^3
Minimum tensile strength	300	MPa
Minimum yield strength	220	MPa

2.3 Product Material and Component Information

The main material components of the HR steel coil product are presented in Table 2.

Table 2. Material Composition of XCarb® RRP HR Steel Coil

Material	Typical Material Specifications	Weight%
Virgin iron	North America	25.7
Alloying elements	North America	0.8
Steel scrap (total recycled content)	North America	73.5
Steel scrap (post-consumer external)	North America	28.2
External scrap (pre-consumer)	North America	28.3
Internal scrap	North America	17

Products do not contain hazardous substances complying with NA Standard; The Transportation of Dangerous Goods (TDG) Regulations (SOR/2001-286); The Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations (SOR/2021-25), as originally adopted under the Canadian Environmental Protection Act (1999)51F. Also, the products do not release dangerous substances to the environment, including indoor air emissions, gamma or ionizing radiation, or chemicals released to air or leached to water and soil. Therefore, no substances required to be reported as hazardous are associated with the production of this product.

2.4 XCarb®

XCarb® is the new brand name for ArcelorMittal's ongoing global program of steelmaking innovation targeted at carbon-neutral steel by 2050.

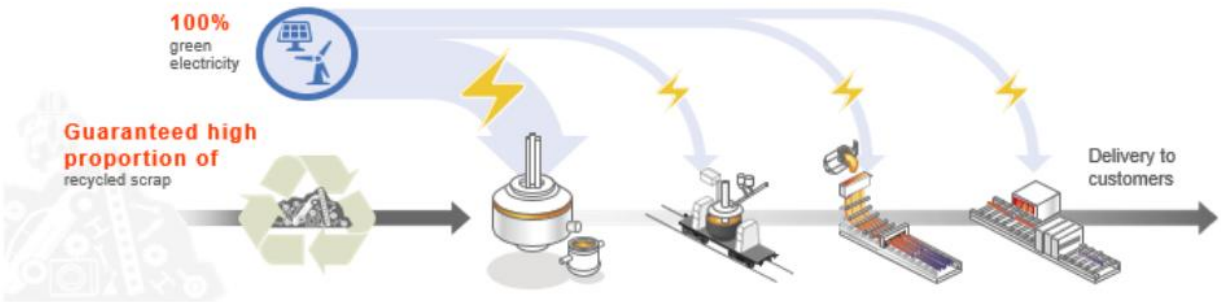


Figure 1. XCarb® RRP Steel Coil Production Process

The XCarb® RRP steel branding applies to products made via the EAF route using minimum 70% scrap steel and 100% renewable electricity. This is ensured by the purchasing of Renewable

Energy Certificates (RECs), a market-based offering that certifies the bearer owns a specific amount (in megawatt-hours) of electricity generated from a renewable energy resource. The electricity used in the steelmaking process is independently verified, with a 'Guarantee of Origin' given that it is from renewable sources. Steels with the XCarb® RRP label are audited and certified by an independent third party. On a bi-annual basis, the auditor verifies that the steel complies with two conditions (70% minimum scrap content and 100% renewable electricity) and grants the use of XCarb® RRP label. By using high scrap content and fully renewable electricity, XCarb® RRP products have a Global Warming Potential (GWP) lower than the industry average.

2.5 EPD Representativeness

2.5.1 Scope of EPD

The scope of this EPD is cradle to gate with options which includes the production (A1-A3) and end of life (C1-C4) stages. Module D is also reported in this study as optional.

Table 3. Life Cycle Stages in the HR Steel Coil EPD
[**x**: included in the scope, MND: module not declared]

Module	Production Stage	Included Within Scope
A1	Raw material supply	**x**
A2	Transport	**x**
A3	Manufacturing	**x**
	Construction Stage	
A4	Transport to site	**MND**
A5	Assembly/Install	**MND**
	Use Stage	
B1	Use	**MND**
B2	Maintenance	**MND**
B3	Repair	**MND**
B4	Replacement	**MND**
B5	Refurbishment	**MND**
B6	Operational energy use	**MND**
B7	Operational water use	**MND**
	End of Life Stage	
C1	Deconstruction	**x**
C2	Transport	**x**
C3	Waste processing	**x**
C4	Disposal	**x**
	Benefits and Loads Beyond the System Boundary	
D	Reuse, recovery, recycling potential	**x**

2.5.2 EPD Data Specificity

The information for data specificity is presented in Table 4. The LCI data for this study is mostly from primary data collected from ArcelorMittal Dofasco and supply chain specific according to ACLCA guideline for calculating and communicating data specificity. For a few inventory flows (e.g., silicon manganese alloy) proxy databases were used. However, the contribution of corresponding flows is less than 5% for GWP of the product. Hence, this LCA study is considered to be more than 95% supply chain specific.

Table 4. Data Specificity

Product specificity	Product specific
Facility specificity	Facility specific
Supply chain specificity	>95%

2.6 Manufacturing Information

2.6.1 Manufacturing Process

XCarb® RRP HR steel coils are produced through the EAF steelmaking route at AMD site located in Hamilton, Ontario, Canada. The process begins with upstream mining of raw materials (mainly iron ore, metallurgical coal and limestone).Iron ore is upgraded into pellets at the palletization plant, a process which is also upstream of the Dofasco site. In Hamilton (onsite), metallurgical coal is converted into coke, which alongside iron ore pellets and limestone, are then fed into the blast furnace. Pig iron, the blast furnace product, is then fed into EAF along with scrap steel.

The minimum steel scrap used for XCarb® RRP steelmaking at AMD through EAF stream is 73.5% of the metallic inputs into the EAF on weight percentage basis, with pig iron and alloys making up the difference. The EAF process uses electricity and oxy-fuel burners to preheat and melt the scrap into liquid steel. Slag is generated in the EAF with the addition of lime which removes impurities and oxygen and/or carbon is added to refine the carbon level in the liquid steel.

Next, the liquid steel is refined in a ladle metallurgy operation with added elements to give a targeted chemical composition based on customer specifications. After the ladle metallurgy facility, the liquid steel is solidified at the caster into steel slabs. The liquid steel from the ladle is then continuously cast through a mold to produce slabs which are subsequently hot rolled into coils (Figure 2). This product is known as Hot Rolled Coil (HRC).

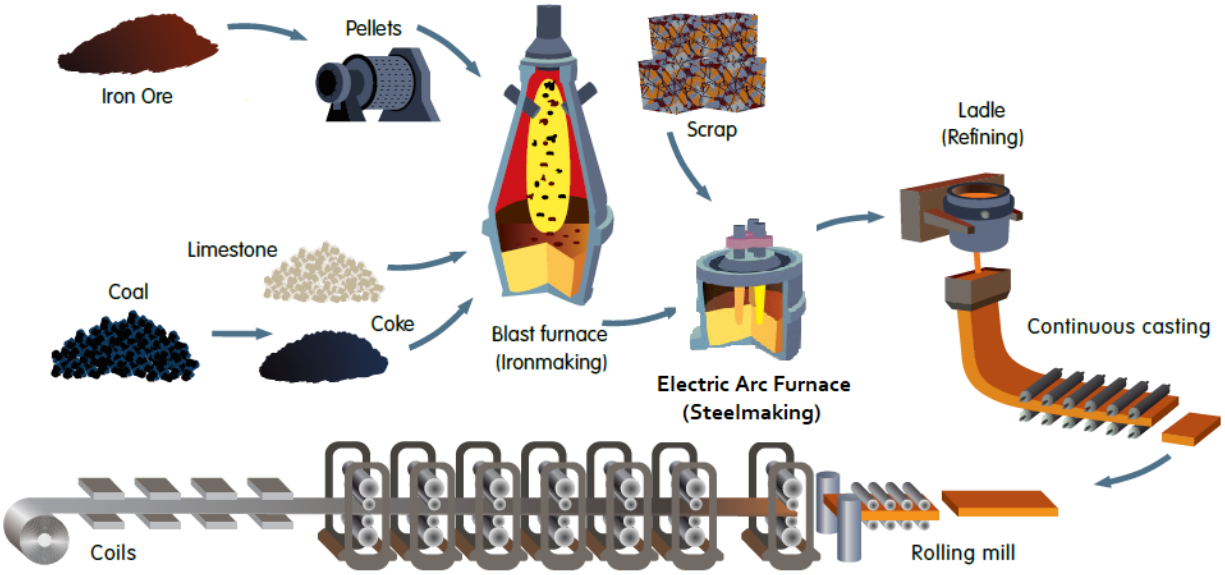


Figure 2. EAF Steelmaking for Steel Coil Production

2.6.2 Process flow diagram

The process flow diagram for production of XCarb® RRP HR steel coil is shown in Figure 3.

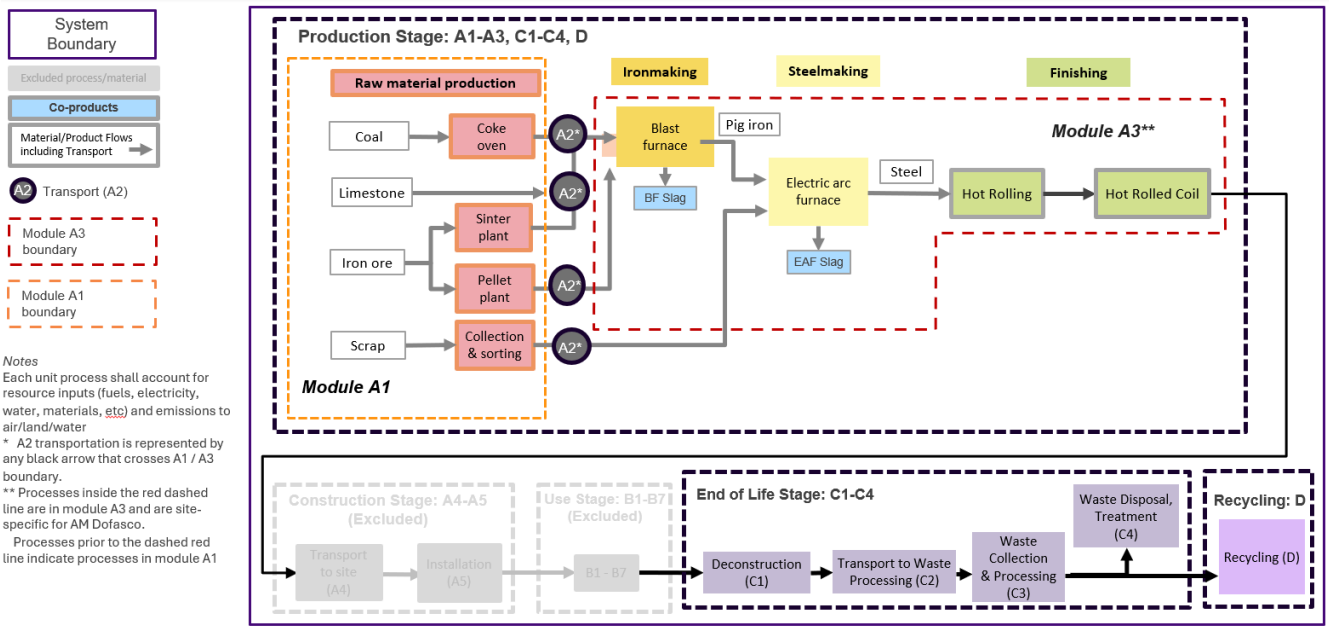


Figure 3. Process Flow Diagram for XCarb® RRP Hot Rolled Steel Coil Production

2.7 Software, Data Source and Data Quality

2.7.1 Software and Database

Modeling was completed using the Sphera LCA for expert software v10.9. LCI data sources were used to create results for each inventory flow relative to the declared unit of one metric ton of HRC. A summary of the LCI data sources used is provided in Table 5. Foreground data are all provided by AMD and is supply chain specific to this process for modules A1, A2 & A3 including the LCI information for raw materials, the transportation information and the on-site steelmaking processes.

2.7.2 Data Sources

Foreground data for this study are primary and obtained from AM Dofasco for a full year of operations between January 2024 and December 2024. Secondary/background Databases & datasets used for LCA calculations are presented in Table 5.

Table 5. Key Process Data Source Used for Development of LCA Model for XCarb® RRP HR Steel Coil

Input / Unit Process	Origin of Material or Process	LCI Data Source Reference
Coal	Canada	Sphera 10.9 – CA, technology mix, consumption mix, to consumer, 70% carbon content
Iron ore	Global	Sphera 10.9 – US, iron ore mix, Iron ore 65%
Limestone	Canada	Sphera 10.9 – RNA; Limestone at Mine
Coke	North America	Sphera 10.9 – US, Metallurgical coke, coke oven process, from hard coal, production mix, at plant
Ferroalloys	Global	Sphera 10.9 – Other Alloys (FeMn/FeSi/FeNi-33%/33%/33%)
Iron pellets	Canada	Sphera 10.9 – GLO; Pellets, Iron, at plant
Steel scrap processing	Canada	Sphera 10.9 – GLO, Steel scrap (from EoL stage)
Grid electricity – Consumption mix	Ontario, Canada	Sphera 10.9 Electricity grid, consumption mix, modified according to StatCan 2024 data for Ontario grid)
Grid electricity – Renewable Energy Certificate (RECs)	Canada	Sphera 10.9, electricity grid (modified according to REC)
Fuels – Diesel	North America	Sphera 10.9 – US, Consumption mix, at filling station
Fuels – Natural gas	Canada	Sphera 10.9 – CA, Natural gas mix, technology mix, consumption mix, to consumer, medium pressure level
Transportation – Truck	North America	USLCI v1.0 – RNA, combination truck, diesel powered
Transportation – Rail	North America	USLCI v1.0 – RNA, Transport, train, diesel powered
Transportation – Ship	Global	Sphera 10.9 – GLO, Bulk commodity carrier, average, sea

2.7.3 Data Quality

This LCA study is developed based on primary data collection and by using the inventory data available from supply chain & manufacturing site departments. Due to the extensive checks of

the primary data collected from the AMD EAF stream, the overall quality of the data is considered to be very good and is representative of the systems described in terms of reliability, completeness as well as technological, temporal and geographical coverage. The primary data source for upstream raw material supply (A1) is collected from the supply chain department and the Sphera LCA for expert database which is representative to the geographical region is used for modelling. For module A2, the transportation LCI data is collected from the energy & environment and supply chain departments including the type of transportation, tonnage of material transported and the distance of transportation which indicates a very good quality and high representativeness. The data was also compared to product-specific published data and to other similar sites within the ArcelorMittal group. For module A3, all the foreground data was collected from AMD for the 12 consecutive months of 2024. The following is the data quality assessment for LCI collection for life cycle stages of this study.

Temporal: Data was collected in 2025 for the entire 2024 calendar year for the manufacturing (ironmaking and EAF steelmaking processes). All secondary data come from the Sphera database and are representative of the years 2021 to 2024.

Geographical: All primary data for the AMD EAF stream are site specific. Background data, where possible, were selected for the North American region. Where country-specific or region-specific data were unavailable, proxy data or global average were used (e.g., for alloy materials). Geographical representativeness is high.

Technological: All primary and secondary data were modeled to be specific to the technologies or technology mixes under study. Where technology-specific data were unavailable, proxy data were used—in particular, for silico manganese production. Therefore, technological representativeness is considered to be high.

For secondary data used for upstream inputs in the modeling, the most up to date and most geographically representative Sphera datasets were selected in the modeling. For module C, the most up to date and most geographically representative Sphera datasets were predominantly used. The only exception was for module C3 where a scrap processing Ecoinvent dataset was used which was last updated in 2023.

2.8 LCA Discussion

2.8.1 Allocation Procedure

The allocation method used is based on physical partitioning according to the method developed by World Steel Association and EUROFER which takes account of the manner in

which changes in inputs and outputs affect the production of co-products and material flows that carry specific inherent physical properties. For HR steel coil production, according to Smart EPD Part B for designated steel products, only EAF Slag is considered as co-product and is assigned with burden. Cut-off approach is used for all other co-products including steel scrap from AMD operations are not assigned with a share of the steelmaking impacts. Both internal and home scrap were modeled in a way receiving no burden as they stay within the facility's bounds and impacts associated with their production and processing were captured in the site-wide inventory. External steel scrap is considered as secondary material and is assigned no upstream burden from its production. For end of life, this study assumes 85% of the HR steel coil is recycled and 15% will go to landfill for disposal.

2.8.2 Cut-Off Procedure

This study complies with the rules defined by worldsteel's procedure of data inventory.

1. All energetic inputs to the process stages were recorded, including heating fuels, electricity, steam and compressed air.
2. The sum of the excluded material flows must not exceed 5% of mass, energy or environmental relevance. However, in reality at least 99.9% of material inputs to each process stage were included, which is in line with the ISO 21930 requirement (<1%).

3. Technical Information and Scenario

3.1 End of Life (Modules C1-C4)

Assumptions and relevant information for the end-of-life scenario in this EPD are presented in Table 6.

Table 6. End of Life Data Sources and Relevant Scenario Information

Name		Value	Per Declared Unit Unit
Description of scenario			
Module C1: Demolition			
Module C1: Name of LCI dataset used for modeling		Sphera 10.9. Excavator, 100 kW	
Module C2: Transport distance		100	km
Module C2: Transport mode/fuel		Diesel/Truck	-
Module C2: Name of LCI dataset(s) used for modeling		Sphera 10.9, GLO. Euro VI cargo, 34-40 t gross weight/27 t payload capacity	
Recovery (specified by type)	**Reuse**	NA	kg
	Recycling	850	kg
	Module C4: Landfill	150	kg

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Module C4: Name of LCI dataset used for modeling	Sphera 10.9, US/Inert matter on Landfill, Production mix (region specific sites), at landfill site	
Module C3: Waste Processing (sorting/shredding) (based on recycling mass)	13.3	MJ
Module C3: Name of LCI dataset(s) used for modeling	Ecoinvent 3.10, Steel separation and sorting, cutt-off by classification	
Removals of biogenic carbon (excluding packaging)	0	kg CO_2
Further assumptions for scenario development (e.g., frequency and time period of use, number of occupants)		

3.2 Reuse, Recovery, and/or Recycling (Module D)

Assumptions and relevant information for module D in this EPD are presented in Table 7.

Table 7. Reuse, Recover, and/or Recycling Potentials (D), Relevant Scenario Information

Name	Per Declared Unit	
	Value	Unit
Description of scenario	Partial Recycling	
Recycled content of product	73.5	%
Net energy benefit from energy recovery from waste treatment declared as exported energy in C3 (R>0.6)	Not Applicable	MJ
End of Life Recovery Rate	85%	
Data Source for LCI of scrap (if used)	2021 World Steel Scrap database	
Net energy benefit from thermal energy due to treatment of waste declared as exported energy in C4 (R<0.6)	0	MJ
Net energy benefit from material flow declared in C3 for energy recovery	0	MJ
Process and conversion efficiencies		

4. Environmental Information from LCA

4.1 Life Cycle Impact Assessment Results

LCIA results for 1 metric ton of XCarb® RRP HR steel coil are presented in Table 9-11. The Ontario electricity grid (consumption mix) dataset was used for modeling the electricity consumption in the model except for the EAF steelmaking process unit where the electricity mix of Renewable Energy Certificate (RECs) was used. Information regarding the use of RECs is shown

in Table 8. The use of renewable energy through EACs resulted in a 2.2% reduction in the A1-A3 total GWP impacts of steel production. The RECs allocated to AMD have not been and will not be sold or transferred after a claim has been made. All energy attributes shall be retired and taken out of circulation by the manufacturer after being applied to an EPD.

Table 8: Renewable Electricity Technical Scenario

Electricity source	**Offsite**
Renewable energy type	Hydro
Percentage of manufacturer's product-related electricity covered	56%
Grid type used to model remaining electricity	Consumption, grid mix
Electricity accounting methodology	Market-based
Commitment pledged for entire validity of EPDs*	Yes

Notes
*ArcelorMittal Dofasco is committed to purchase RECs each year to cover the electricity used for production of future demands (if any) for XCarb® RRP steel coils during the validity of this EPD.

Table 9 presents the environmental impacts for 1 metric ton of XCarb® RRP HR steel coil. LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

Table 9. Environmental impacts for 1 metric ton of XCarb® RRP hot rolled steel coil

Module	Method	Unit	A1	A2	A3	C1	C2	C3	C4	D*	A1-A3
GWP-Total	IPCC AR6 GWP100	kg CO_2 eq	3.61 E+02	7.34 E+00	6.87 E+02	2.45 E+00	7.04 E+00	3.77 E-01	1.29 E+01	-2.13 E+02	1.06 E+03
GWP-Fossil	IPCC AR6 GWP100	kg CO_2 eq	3.61 E+02	7.31 E+00	6.87 E+02	2.44 E+00	7.03 E+00	3.77 E-01	1.30 E+01	-2.13 E+02	1.06 E+03
GWP-Biogenic	IPCC AR6 GWP100	kg CO_2 eq	5.84 E-01	2.66 E-02	3.22 E-01	8.45 E-03	6.30 E-02	1.02 E-02	1.06 E-02	-1.88 E-01	9.33 E-01
GWP-Luluc	IPCC AR6 GWP100	kg CO_2 eq	4.52 E-01	8.08 E-03	4.44 E-01	4.22 E-03	2.89 E-01	2.04 E-03	1.16 E-03	-1.83 E-01	9.04 E-01
AP	TRACI 2.2	kg SO_2 eq	1.63 E+00	6.92 E-02	6.29 E-01	1.00 E+0	6.52 E-03	3.43 E-04	7.87 E-02	-4.70 E-01	2.33 E+00
EP	TRACI 2.2	kg N eq	6.70 E-02	4.60 E-03	2.06 E-02	1.03 E-04	8.45 E-04	3.84 E-05	3.48 E-03	-1.86 E-02	9.22 E-02
ODP	TRACI 2.2	kg CFC 11 eq	8.34 E-10	2.93 E-13	8.29 E-14	2.91 E-14	3.16 E-13	3.38 E-14	6.83 E-13	-1.69 E-10	8.34 E-10
POCP	TRACI 2.2	kg O_3 eq	2.57 E+01	2.10 E+00	1.22 E+01	4.58 E-02	1.33 E-01	8.94 E-03	1.47 E+00	-8.08 E+00	4.00 E+01

Notes
*Interpreting the Results in Module D: The values in Module D include a recognition of the benefits or impacts related to steel recovery and recycling which occur beyond the end of the product's service life. The rate of steel recycling and related production 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 estimates reflecting current processes. Comparisons cannot be

made between product-specific or industry average EPDs at the design stage of a project, before a building or construction works has been specified.

The reported impact assessment values in this EPD may not be a precise representation of potential environmental burdens. Moreover, comparisons may be made between product-specific or industry average EPDs at the time of product purchase only when product or construction works performance and specifications have been established and serve as a functional unit for comparison. Environmental impact results shall be converted to a functional unit basis before any comparison is attempted. Any comparison of EPDs shall be subject to the requirements of ISO 21930 or EN 15804. EPDs are not comparative assertions and are either not comparable or have limited comparability when they have different system boundaries, are based on different product category rules or are missing relevant environmental impacts. Such comparisons can be inaccurate and could lead to erroneous selection of materials or products that are higher-impact, at least in some impact categories.

Abbreviations: GWP = Global Warming Potential, 100 years, ODP = Ozone Depletion Potential, AP = Acidification Potential, EP = Eutrophication Potential, POCP = Photochemical oxidant creation potential

Resource use indicators are presented in Table 10.

Table 10. Resources used for production of 1 metric ton of XCarb® RRP HR steel coil

Indicator	Unit	A1	A2	A3	C1	C2	C3	C4	D*	A1-A3
RPR_E	MJ	5.66 E+02	2.98 E+00	2.58 E+03	3.47 E-01	3.76 E+00	7.10 E+00	2.93 E+01	-6.35 E+02	3.15 E+03
RPR_M	MJ	6.73 E-08	4.33 E-11	3.67 E-09	3.64 E-12	3.95 E-11	8.57 E-10	5.32 E-10	-1.43 E-08	7.10 E-08
$NRPR_E$	MJ	1.07 E+04	9.42 E+01	1.25 E+02	8.34 E+00	9.04 E+01	2.70 E+01	1.68 E+02	-2.20 E+03	1.09 E+04
$NRPR_M$	MJ	1.65 E-03	4.32 E-07	4.27 E-07	4.81 E-08	5.21 E-07	2.06 E-08	1.04 E-06	-3.33 E-04	1.65 E-03
SM	kg			5.65 E+02						5.65 E+02
RSF	MJ							3.20 E-02		
NRSF	MJ							6.52 E-02		
RE	MJ									
ADP_{fossil}	MJ	7.87 E+02	1.38 E+01	1.88 E+02	1.18 E+00	1.28 E+01	8.22 E-01	2.15 E+01	-2.00 E+02	9.89 E+02
FW	m^3	1.68 E-03	2.40 E-06	4.78 E-04	2.32 E-07	2.52 E-06	6.85 E-06	5.33 E-05	-4.38 E-04	2.16 E-03

Notes

*Interpreting the Results in Module D: The values in Module D include a recognition of the benefits or impacts related to steel recovery and recycling which occur beyond the end of the product's service life. The rate of steel recycling and related production 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 estimates reflecting current processes.
Not all abbreviated indicators listed below may be present in the results above. The inclusion of indicators varies based on PCR requirements.

Abbreviations: RPR_E = Renewable primary resources used as energy carrier, RPR_M = Renewable primary resources with energy content used as material, $NRPR_E$ = Non-renewable primary resources used as an energy carrier (fuel), $NRPR_M$ = Non-renewable primary resources with energy content used as material, SM = Secondary materials, RSF = Renewable secondary fuels, NRSF = Non-

renewable secondary fuels, RE = Recovered energy, ADP-Fossil = Abiotic depletion potential for fossil resources, FW = Use of net freshwater resources

The waste and output flows for 1 metric ton of XCarb® RRP HR steel coil is presented in Table 11.

Table 11. Waste and output flows for 1 metric ton of XCarb® RRP hot rolled steel coil

Indicator	Unit	A1	A2	A3	C1	C2	C3	C4	D*	A1-A3
HWD	kg			1.74 E-05						1.74 E-05
NHWD	kg			9.01 E-05				1.50 E+02		9.01 E-05
HLRW	kg	9.79 E-05	3.18 E-07	1.37 E-06	3.40 E-08	3.69 E-07	9.23 E-06	1.79 E-06	-2.01 E-05	9.96 E-05
ILLRW	kg	1.48 E-03	5.90 E-06	2.61 E-05	6.20 E-07	6.72 E-06	1.54 E-04	3.39 E-05	-3.05 E-04	1.51 E-03
CRU	kg									
MR	kg						8.50 E+02			
MER	kg									
EE	kg									

Notes
*Interpreting the Results in Module D: The values in Module D include a recognition of the benefits or impacts related to steel recovery and recycling which occur beyond the end of the product's service life. The rate of steel recycling and related production 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 estimates reflecting current processes.
Not all abbreviated indicators listed below may be present in the results above. The inclusion of indicators varies based on PCR requirements.

Abbreviations:
HWD = Hazardous waste disposed, NHWD = Non-hazardous waste disposed, HLRW = High-level radioactive waste, ILLRW = Intermediate- and low-level radioactive waste, CRU =Components for re-use, MR = Materials for recycling, MER = Materials for energy recovery, EE = Recovered energy exported from the product system.

4.2 LCIA Results Interpretation

Figure 4 presents the distribution of GWP-total impact within life cycle stages of XCarb® RRP HR steel coil. As shown, the production of HR steel coils at AMD site contributes to 64% of the total impact, followed by upstream raw material supply with 33%, and end of life with less than 2% and transportation of raw materials to AMD facility with 1%. Moreover, in module A3, the blast furnace is responsible for majority of the GWP impact at production stage, where coal is burnt for making pig iron for EAF process. Recycling the HR steel coil after the end of life has a negative value for GWP which can be counted as a credit in the LCA for the HR steel coil production. However, according to the reference PCR, module D is excluded in the total GWP impacts and the data is provided as optional here.

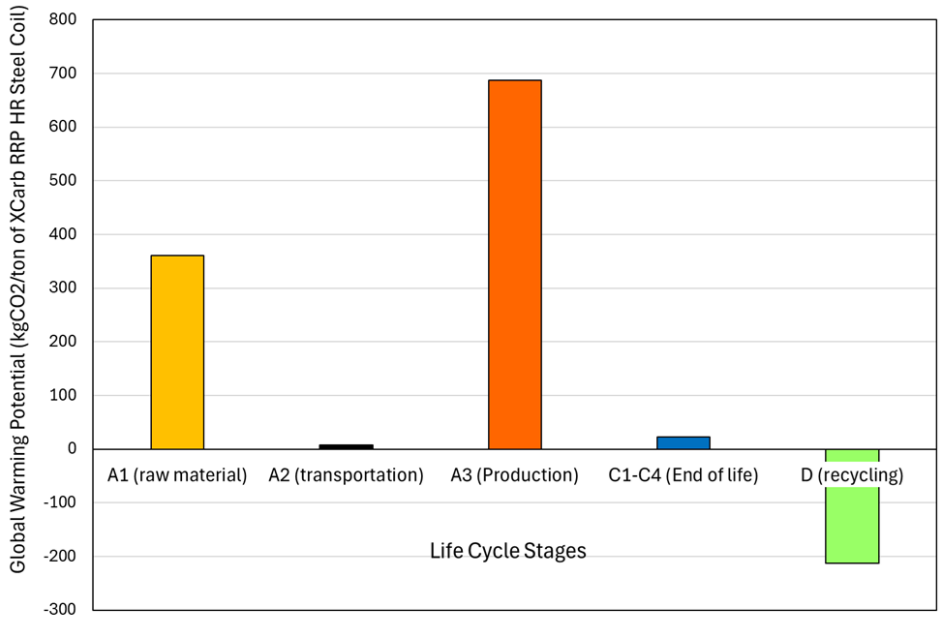


Figure 4. Contribution of life cycle stages to GWP for 1 metric ton of XCarb® RRP HR steel coil.*

*Note: A collection of manufacturer-average and/or facility-specific EPDs is insufficient for setting benchmarks and thresholds unless production volumes are taken into account. Benchmarking and threshold setting efforts shall also consider that some manufacturer-average data and facility-specific data may be represented in Industry-average EPDs and may result in double counting of the same data.

4.3 Additional Environmental Information

Data presented in Table 12 shows the baseline LCIA results without the purchased RECs included, which only slightly increased all impact categories assessed. Deviation of the results in module A3 reflects the difference in grid mix of Ontario vs the 100% renewable electricity used for the EAF steelmaking process at AMD. The baseline LCIA results of XCarb® RRP HR steel coil in this study reflect a dedicated use of RECs during the study's production year. The renewable energy associated with these RECs was confirmed by the supplier as retired from the system and is therefore included in the baseline results, in accordance with Smart EPD PCR Part A requirements.

Table 12. Environmental impacts for 1 metric ton of XCarb® RRP HR steel coil (RECs not applied)

Module	Method	Unit	A1	A2	A3	C1	C2	C3	C4	D	A1-A3
GWP-Total	IPCC AR6 GWP100	kg CO_2 eq	3.61 E+02	7.34 E+00	7.16 E+02	2.45 E+00	7.04 E+00	3.77 E-01	1.29 E+01	-2.24 E+02	1.08 E+03
GWP-Fossil	IPCC AR6 GWP100	kg CO_2 eq	3.61 E+02	7.31 E+00	7.14 E+02	2.44 E+00	7.03 E+00	3.77 E-01	1.30 E+01	-2.24 E+02	1.08 E+03

GWP-Biogenic	IPCC AR6 GWP100	kg CO_2 eq	5.84 E-01	2.66 E-02	1.94 E+00	8.45 E-03	6.30 E-02	1.02 E-02	1.06 E-02	-5.29 E-01	2.55 E+00
GWP-Luluc	IPCC AR6 GWP100	kg CO_2 eq	4.52 E-01	8.08 E-03	7.75 E-01	4.22 E-03	2.89 E-01	2.04 E-03	1.16 E-03	-2.49 E-01	1.23 E+00
AP	TRACI 2.2	kg SO_2 eq	1.63 E+00	6.92 E-02	6.67 E-01	1.00 E+0	6.52 E-03	3.43 E-04	7.87 E-02	-4.78 E-01	2.37 E+00
EP	TRACI 2.2	kg N eq	6.70 E-02	4.60 E-03	2.57 E-02	1.03 E-04	8.45 E-04	3.84 E-05	3.48 E-03	-1.97 E-02	9.73 E-02
ODP	TRACI 2.2	kg CFC 11 eq	8.34 E-10	2.93 E-13	3.42 E-10	2.91 E-14	3.16 E-13	3.38 E-14	6.83 E-13	-2.38 E-10	1.18 E-09
POCP	TRACI 2.2	kg O_3 eq	2.57 E+01	2.10 E+00	1.30 E+01	4.58 E-02	1.33 E-01	8.94 E-03	1.47 E+00	-8.24 E+00	4.08 E+01

5. Glossary

ADP: Abiotic Depletion Potential
AM: ArcelorMittal
AMD: ArcelorMittal Dofasco
AP: Acidification Potential
ASTM: American Society for Testing and Materials
BF: Blast Furnace
BOF: Blast Oxygen Furnace
CRC: Cold Roll Coil
CSA: Canadian Standard Association
CSI: Construction Specifications Institute
EAF: Electric Arc Furnace
EP: Eutrophication Potential
EPD: Environmental Product Declaration
GHG: Greenhouse Gases
GWP: Global Warming Potential
HDG: Hot Dip Galvanized Coil
HR: Hot Rolled
HRC: Hot Roll Coil
IPCC: Intergovernmental Panel on Climate Change
ISO: International Standard Association
LCA: Life Cycle Assessment
LCI: Life Cycle Inventory
LCIA: Life Cycle Impact Assessment
ODP: Ozone Depletion Potential
PCR: Product Category Rule
POCP: Photochemical Ozone Creation Potential
REC: Renewable Energy Certificate

RRP: Recycled and Renewably Produced
UNSPSC: United Nations Standard products and Services Code
Worldsteel: The worldsteel Association of Steel Producers.

6. REFERENCES

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