ENVIRONMENTAL PRODUCT DECLARATION

COLD-ROLLED OR TIN MILL PRODUCT STEEL COIL

UNITED STATES STEEL CORPORATION

GARY WORKS, ONE NORTH BROADWAY, GARY, INDIANA 46402

United States Steel

United States Steel Corporation (U. S. Steel) is a leading steel producer with operations in the U.S. and Central Europe. With a renewed emphasis on innovation, U. S. Steel serves the automotive, construction, appliance, energy, containers, and packaging industries with high value-added steel products.

In addition to being ISO 14001 certified, U. S. Steel aims to reduce emissions in its operations and is implementing innovative best practice solutions to improve its environmental performance and reduce energy consumption.

ASTM INTERNATIONAL

ENVIRONMENTAL PRODUCT DECLARATION

United States Steel

Cold-Rolled or Tin Mill Product Steel Coil
Carbon Steel Sheets

ASTM INTERNATIONAL

According to ISO 14025 and ISO 21930:2017

EPD PROGRAM AND PROGRAM OPERATOR NAME, ADDRESS, LOGO, AND WEBSITE	ASTM INTERNATIONAL 100 BARR HARBOR DRIVE P.O. BOX C700 WEST CONSHOHOCKEN, PA 19428-2959, USA HTTPS://WWW.ASTM.ORG/ ASTM INTERNATIONAL
GENERAL PROGRAM INSTRUCTIONS AND VERSION NUMBER	ASTM Program Operator Rules. Version: 8.0, Revised 04/29/20
MANUFACTURER NAME AND ADDRESS	United States Steel Corporation, One North Broadway, Gary, IN 46402
DECLARATION NUMBER	EPD 610
DECLARED PRODUCT & FUNCTIONAL UNIT OR DECLARED UNIT	Cold-Rolled or Tin Mill Product Steel Coil, 1 metric ton
REFERENCE PCR AND VERSION NUMBER	Part A: Life Cycle Assessment Calculation Rules and Report Requirements, UL Environment, UL 10010, v3.2, 2018; and Part B: Designated Steel Construction Product EPD Requirements, UL Environment, UL 10010–34, v2.0, 2020
DESCRIPTION OF PRODUCT APPLICATION/USE	Cold-rolled or tin mill product steel coil used in automotive, construction, appliance, energy, containers, and packaging industries
PRODUCT RSL DESCRIPTION (IF APPL.)	N/A
MARKETS OF APPLICABILITY	North America
DATE OF ISSUE	1/19/2024
PERIOD OF VALIDITY	5 years
EPD TYPE	Product-specific
RANGE OF DATASET VARIABILITY	Site-specific, mean
EPD SCOPE	Cradle-to-gate
YEAR(S) OF REPORTED PRIMARY DATA	2021
LCA SOFTWARE & VERSION NUMBER	LCA for Experts v10.7
LCI DATABASE(S) & VERSION NUMBER	LCA for Experts 2023.1
LCIA METHODOLOGY & VERSION NUMBER	TRACI 2.1, IPCC 2013 (AR5)

The PCR review was conducted by:	Dr. Tom Gloria, Chair, Industrial Ecology Associates
This declaration was independently verified in accordance with ISO 14025: 2006, ISO 21930:2017 and PCR. ☐ INTERNAL ☒ EXTERNAL	Tim Brooke, ASTM International
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	Trinity Consultants, Inc.
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	Lindita Bushi, PhD., Athena Sustainable Materials Institute

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: The environmental impact results of steel 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 steel 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. See Section 3 for additional EPD comparability guidelines.

1. Product Definition and Information

Description of Company/Organization

The Gary Works steel mill manufactures steel products via a Blast Furnace (BF) and Basic Oxygen Process (BOP). Raw materials are combined in a blast furnace to produce liquid iron, which is then refined in a basic oxygen process and Ladle Metallurgical Furnace (LMF) or RH Degasser to create steel. The steel is then sent to a caster to cast the steel into 9” thick slabs which are further processed at the hot strip mill to be rolled into hot-rolled coils. In addition to being sold as hot-rolled product, the hot-rolled steel can be further processed into cold-rolled or tin mill products. These additional final products are then transported off-site for distribution.

This environmental product declaration (EPD) represents cold-rolled or tin mill product steel coil produced via blast furnace (BF) from U. S. Steel’s Gary Works, finished anywhere in the U. S. Steel network.

Product Description

The cold-rolled or tin mill product steel coil is produced to a variety of standards. Cold-rolled or tin mill product steel coil standards include ASTM A424 (Type 3 only), ASTM A1008, ASTM A1088, ASTM A980, ASME SA-1008, JFS A2001, JIS G3135, JIS G3141, SAE J403, SAE J1392, SAE J2340, SAE J2745, ASTM A599, ASTM A624, ASTM A625, ASTM A626, ASTM A650, ASTM A657, and EN10268. In addition, Gary Works supplies steel to various customer specific standards.

The ASTM Program Operator for Product Category Rules (PCR) and Environmental Product Declarations (EPDs), General Program Instructions, Version: 8.0, Revised 04/29/20, requires the identification of the UNSPSC code and the appropriate Construction Specification Institute (CSI) / Construction Specifications Canadian (CSC) classification for the declared products. Steel product produced by the integrated mills is categorized as follows:

- CSI MasterFormat Code: 05 00 00 Metals
- UNSPSC Code: 302640 Carbon Steel Sheets

Application

U. S. Steel serves the automotive, construction, appliance, energy, containers, and packaging industries with high value-added steel products.

Declaration of Methodological Framework

The scope of the EPD is cradle-to-gate, including raw material extraction and processing, upstream transportation, and product manufacture (Modules A1, A2, and A3). This EPD follows the attributional LCA approach (ISO 21930, 7.1.1).

Technical Requirements, Properties of Declared Product as Delivered, and Material Composition

Steel is an alloy of iron and carbon containing less than 2% carbon and varying amounts of manganese, silicon, and other alloys. These alloying elements improve the chemical and physical properties of steel, such as strength, ductility, durability, and corrosion resistance. There are more than 3,500 different grades of steel with many different physical, chemical, and environmental properties. Technical data for the studied product can be found in the table below.

Table 1. Technical data for steel product

NAME	VALUE	UNIT
Melting Point	1510	°C
Density	7850	kg/m^3
Iron Content	> 86	%
Aluminum Content	≤ 2	%
Chromium content	≤ 2	%
Copper content	≤ 1	%
Manganese content	≤ 3	%
Molybdenum content	≤ 1	%
Nickel content	≤ 2	%
Silicon Content	≤ 3.5	%

Manufacturing

Metallurgical coke used in the iron-making process at the integrated mills is produced in a byproduct coke plant comprised of a series of coke ovens grouped into batteries. Coal is received via barge, truck, and rail and stored on-site until it is used. Destructive distillation ("coking") of coal occurs in coke ovens without contact with air. Individual coke ovens operate intermittently, with run times of each oven coordinated to ensure a consistent flow of collectible gas across the battery. The coke oven gas is directed into an offtake system and collecting main, and then further processed in a byproducts plant to condense and separate oils and desulfurize the gas. Coke manufacturing includes preparing, charging, and heating the coal; removing and cooling the coke product; and cooling, cleaning, and recycling the oven gas. Several types of coal may be blended to produce the desired properties and to control the expansion of the coal mixture in the oven. After coking is completed, the coke is removed from the oven; doors on both sides of the chamber are opened and a ram is inserted into the chamber. The coke is pushed out of the oven, through the coke guide and into a quench car. After the coke is pushed from the oven, the doors are cleaned and repositioned. The quench car carrying the hot coke moves along the battery tracks to a quench tower where it is sprayed with water to cool the coke and prevent it from igniting. The coke is then drained, cooled, and sized before being stored or sent to the blast furnace. U. S. Steel's Clairton Coke Plant provides coke to the Gary Works facility via rail to be used in the blast furnace process.

The sintering process converts fine-sized raw materials, including iron ore fines, mill scale, coke fines, and various ironmaking and steelmaking co-products into an agglomerated product, sinter, of suitable size for charging into a blast furnace. These raw materials are mostly generated on-site and transferred to the sinter plant via in-plant transport. Small amounts of recycled iron ore fines are received via truck. The raw materials are placed on a continuous, travelling grate called the sinter strand. A burner hood at the beginning of the sinter strand ignites the mixture, after which the combustion is self-supporting, and it provides sufficient heat to cause surface melting and agglomeration of the mix. On the underside of the sinter strand is a series of windboxes that draw combusted air down through the material bed into a common duct, leading to a gas cleaning device. The fused sinter is discharged at the end of the sinter strand, where it is crushed and screened. The undersized sinter is recycled to the mixing mill and back to the strand. The cooled sinter is crushed and screened for a final time, and the product is sent to be charged to the blast furnaces. U. S. Steel's Gary Sinter Plant provides sinter as a secondary iron unit to the Gary Works blast furnaces.

The integrated mills use a blast furnace to produce new virgin iron from an iron source (in the form of pellets or sinter), limestone, and metallugical coke. The blast furnace consists of a steel cylinder that is lined with refractories that can withstand the high temperatures reached within (~1400°F – 2100°F). Iron ore pellets and limestone are received via lake freighter, truck, and/or rail and are brought to a stockyard until needed. As discussed above, coke is produced at the Clairton Plant of Mon Valley Works where it is used but is also sent to the Gary facility via rail to be used in their blast furnace process. The blast furnace is loaded with the iron ore pellets and sinter, coke, and limestone via skip cars which travel to the top of the furnace while heated air is supplied from the bottom through tuyeres. The coke, in the presence of this heated air reacts and is the reducing agent, pulling oxygen from the iron pellets and sinter as well as providing energy to melt the iron and other materials in the furnace.The limestone reacts with impurities from the iron material and coke which creates slag as a coproduct. Both the liquid iron and slag are periodically removed from the furnace by the casting process, where a taphole is drilled through the furnace and both materials are removed. As liquids, the slag floats on top of the liquid iron, which allows for separation in the iron trough. The slag is directed to slag pits where it is either air cooled or granulated. The carbon-saturated liquid iron, often called hot metal, is directed into refractory lined torpedo ladle cars and transferred to the BOP shop via in-plant rail transport.

From the blast furnace, the molten hot metal is sent directly to the basic oxygen furnace (BOF) or basic oxygen process (BOP) shop to convert the molten iron into steel. This furnace, like the blast furnace, is lined with refractories to help the steel shell withstand the high temperatures that occur during the steelmaking process. The hot metal is first desulfurized by injecting a mix of magnesium and lime into the hot metal. The magnesium and lime react with the sulfur, forming a slag that floats on the hot metal which is skimmed off. This desulfurized hot metal and steel scrap are charged into a BOF. Steel scrap is received via barge, rail, and truck, and is inspected and sorted into various piles in the on-site scrapyard. Lime and dolomitic lime are also added into the BOF as fluxing agents. Pure oxygen is injected into the BOF and the chemical reactions between the oxygen and various elements in the mixture generate heat to melt the scrap and make steel. Some of the compounds that form react with the lime and dolomitic lime to generate a slag. Once the oxygen blow is complete, the product is liquid steel. It is removed from the BOF by tilting the furnace and pouring the liquid steel into a ladle. Some slag may join the steel in the ladle, but most of the slag remains in the BOF, where at the end of the process the furnace is turned over and the slag is dumped into slag pots, which are periodically removed for processing. While tapping the steel from the BOF into the ladle, alloying materials and fluxes are added. These include but are not limited to aluminum, manganese, silicon, chromium, or molybdenum for alloys and lime or calcium aluminate for fluxes, and are added based on the specific grade being produced.

After the liquid steel is in the ladle, it is sent to either an LMF or RH Degasser, depending on the final product. Both facilities allow for heating the steel, making bulk and fine alloy additions, and improving the steel homogeneity. Once the steel is at the desired chemistry and temperature, the ladle of molten steel is sent to the slab caster.

The casting machine receives ladles containing liquid steel from the BOP shop. The molten steel pours out of the bottom of the ladle through a refractory tube into a holding bath (tundish), which acts as a buffer between the batch process of steelmaking and continuous casting. Steel is poured from the tundish through another refractory tube into the water-cooled copper mold, which is where solidification starts. The mold’s dimensions determine the width and thickness of the slab being cast. Once the molten steel encounters the water-cooled mold, the surface solidifies while the inside is still molten. Exiting the mold, the steel strand is supported by sets of rolls. Cooling water is applied to the surface of the slabs to further solidify the steel as well as keep the rolls cool. Solidification is completed before the strand exits the caster. At the exit of the caster, the strand is cut into individual lengths of steel called slabs, which are either sent directly to the hot mill or to a slab yard.

The Hot Mill unit receives cut slabs of steel from the caster. The slabs are fed into a natural gas-fired furnace which raises the temperature of the slab. The slab is first processed through the roughing mill, where it is reduced to an intermediate thickness called a transfer bar, then the finishing mill where it is rolled to the final ordered thickness. Each rolling step, while making the steel thinner, also makes it longer. After rolling, the steel is inspected and cooled to the designated temperature for coiling the steel in the down coiler. The coils are transported to a storage warehouse, and the final product is hot rolled steel coil.

Hot rolled material that requires further processing is sent through the pickle line. The pickling section immerses the steel strip in a hydrochloric acid solution to remove scale (iron oxide) from the surface of the hot rolled steel. After pickling, oil is applied to the steel to protect it. Some steel products are sold in this state as hot rolled pickled and oiled (HRPO) steel or they can be further processed either on site at the specific facility or another finishing facility. Pickling operations are supported by a natural gas-fired steam boiler. Pickling can be performed at Gary Works or other facilities within U. S. Steel's network or by outside processors.

HRPO steel can be further processed in the cold mill, where the steel is made thinner and longer by passing the strip through a series of rolling stands at ambient temperature. Strip thickness and profile are controlled in the process. The resulting product is cold rolled full hard (CRFH) steel, which is used as a precursor to downstream operations, whether those operations are located at the same facility or another U. S. Steel facility.

CRFH steel needs to be further processed to be usable by end customers. One process is annealing, where CRFH coils are heated and cooled. In Batch (or Box) Annealing, coils of steel are heated and cooled over a matter of days under either a pure hydrogen or a blended hydrogen/nitrogen atmosphere to recover their mechanical properties and prevent the surface of the steel from oxidizing. Alternatively, the CRFH steel may also be annealed in a Continuous Annealing Line, where coils are unwound and quickly heated and cooled to enhance their properties. After annealing, coils are processed in a Skin Pass or Temper Mill to help impart a surface as well as provide some stiffness to the steel. In the case of batch annealing, this is performed in a standalone unit, while with continuous annealing it can be either in-line or on a standalone unit. For tin mill products, an alternative to temper rolling is double cold reduction, where additional cold reduction occurs. The final product is cold rolled fully processed steel for sheet products or blackplate for tin products. After annealing and temper rolling, the blackplate steel can undergo electroplating. Coatings of either tin or chromium can be applied in an electrotinning line (ETL) or tin-free steel (TFS) line, respectively.

Intermediate-processed steel can also be transported from one of the integrated mills to other off-site finishing facilities. There are seven finishing facilities in U. S. Steel that accept and process steel from the integrated mills. The Midwest Plant and Great Lakes Works facilities have capabilities to pickle, cold roll, anneal, temper roll, and galvanize steel. Additionally, the Midwest Plant can also produce tin mill products. PRO-TEC Coating Company has capabilities to continuously anneal or galvanize steel. The processes at these stand-alone sites are similar to those described above at the integrated mills.

Packaging

Packaging at the Gary Works facility falls below the cut-off criteria and therefore it is not included in the LCA for this EPD.

2. Life Cycle Assessment Background Information

Functional or Declared Unit

The declared unit is one (1) metric ton of cold-rolled or tin mill product steel coil.

System Boundary

Per the PCR, this cradle-to-gate analysis provides information on the Product Stage of the steel product life cycle, including modules A1, A2, and A3. Product delivery, installation and use, and product disposal (modules A4 – A5, B1 – B7, C1 – C4, and D) have not been included.

PRODUCT STAGE			CONSTRUCT-ION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY
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
A1	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

Estimates and Assumptions

The underlying study was conducted in accordance with the PCR. While this EPD has been developed by industry experts to best represent the product system, real life environmental impacts of fabricated steel products may extend beyond those defined in this document.

All raw materials and energy inputs have been modeled using Life Cycle Inventory (LCI) data that best represents actual production. As available, site-specific information for raw materials, raw material transportation, energy use, resource use, and emissions was used to represent an annual average. In cases where raw material LCI data was not available, proxy materials were chosen that have readily available LCI.

Cut-off Criteria

Per the PCR, processes or flows contributing less than 1% of the total environmental impact indicator for each impact or mass input to the system may be excluded from the LCA for this EPD. Processes or flows contributing greater than 1% of the total environmental impact indicator for each impact are included in the inventory.

The mass input of any excluded flow is less than 1% of the total mass input streams into the system and the cumulative mass input of all of the omitted streams is less than 5% of the total mass input streams. Therefore, no data gaps were allowed which were expected to significantly affect the outcome of the indicator results.

Data Sources

The LCA model was created using the LCA for Experts (formerly GaBi) Software system for life cycle engineering, version 10.7, developed by Sphera. Background life cycle inventory data for raw materials and processes were obtained from the Managed LCA Content (formerly known as GaBi databases), including the 2023 Professional Database and the Extension Database XVII: Full US 2023. Primary manufacturing data and fabrication data were provided by U. S. Steel.

Data Quality

A variety of tests and checks were performed by the LCA practitioner throughout the project to ensure high quality of the completed LCA. Checks included an extensive review of project-specific LCA models as well as the background data used.

Primary data represents production in the United States at three integrated mills. Production data has been collected by U. S. Steel directly from the production sites and are average values for the year 2021 (12 consecutive months of averaged data as required for manufacturer specific data sets). The data has been measured and verified internally. The data is assumed to be the most relevant according to current conditions and production practices. U. S. Steel uses the most recent 2021 data from EPA's eGRID Power Profiler to represent the electricity grid mix at Gary Works. Proxy datasets were used as needed for raw material inputs to address lack of data for a specific material or for a specific geographical region. These proxy datasets were chosen for their technological representativeness of the actual materials.

Period under Review

Primary data collected represent production during the 2021 calendar year. This analysis is intended to represent production in 2021.

Allocation

Per ISO 21930 and the PCR, this is an attributional LCA and as such, no allocation using system expansion was performed. Allocation of background data (energy and materials) taken from the Managed LCA Content (formerly known as GaBi databases) is documented online at https://sphera.com/life-cycle-assessment-lca-database/.

Gary Works' Blast Furnaces produce iron and slag. The iron is sent to the Basic Oxygen Furnace which produces steel and slag. All slag is sold as-is. All steel continues onto the rolling mill to be rolled into steel product. The slag and steel product are considered co-products of the product system resulting from a joint co-production process. Therefore, this study allocated the environmental burden upstream of the BOP between the blast furnace slag and virgin iron and upstream of the rolling mill between the BOP slag and steel. The World Steel Association has developed a methodology to allocate life cycle impact for slag from the steel-making process that applies to the integrated mill process; this methodology was used to partition impacts between the iron/steel and slag products. Report available at: https://worldsteel.org/wp-content/uploads/A-methodology-to-determine-the-LCI-of-steel-industry-coproducts.pdf. Per the World Steel Association methodology, the blast furnace and BOP processes are thermodynamic systems requiring energy to drive the production processes; therefore, the energy associated with the mass flows and chemical reactions of the co-products should be the basis for the partitioning of the flows between the co-products.

3. Life Cycle Assessment Results

LCA results are relative expressions and do not predict actual impacts, the exceeding of thresholds, safety margins or risks.

Life Cycle Impact Assessment Results

Table 2. LCIA results, per 1 metric ton of cold-rolled or tin mill product steel coil

PARAMETER	UNIT	A1	A2	A3	Total
GWP 100 (excl. biogenic carbon)	kg CO_2 eq.	3.26E+02	3.64E+01	2.16E+03	2.52E+03
ODP	kg CFC 11 eq.	9.01E-09	7.13E-13	2.61E-09	1.16E-08
AP	kg SO_2 eq.	1.32E+00	5.74E-01	2.41E+00	4.30E+00
EP	kg N eq.	5.75E-02	2.27E-02	5.40E+00	5.48E+00
SFP	kg O_3 eq.	1.80E+01	1.13E+01	4.32E+01	7.24E+01
ADP_{FOSSIL}	MJ, LHV	4.64E+02	6.10E+01	2.26E+03	2.78E+03

Comparability: Comparisons cannot be made between product-specific or industry average EPDs at the design stage of a project, before a building has been specified. Comparisons may be made between product-specific or industry average EPDs at the time of product purchase when product 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. 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 comparison can be inaccurate, and could lead to erroneous selection of materials or products which are higher-impact, at least in some impact categories.

These six impact categories (GWP, ODP, AP, EP, SFP, and ADP fossil) are globally deemed mature enough to be included in Type III environmental declarations. Other categories are being developed and defined and LCA should continue making advances in their development. However, the EPD users shall not use additional measures for comparative purposes.

Life Cycle Inventory Results

Table 3. Resource use results, per 1 metric ton of cold-rolled or tin mill product steel coil

Parameter	Unit	A1	A2	A3	Total
RPR_E	MJ LHV	4.81E+02	3.47E+01	8.47E+02	1.36E+03
RPR_M	MJ LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
$NRPR_E$	MJ LHV	5.60E+03	5.59E+02	1.95E+04	2.56E+04
$NRPR_M$	MJ LHV	1.32E+04	0.00E+00	0.00E+00	1.32E+04
SM	kg	3.06E+02	0.00E+00	0.00E+00	3.06E+02
RSF	MJ LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RE	MJ LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m^3	1.04E+00	7.07E-02	3.12E+01	3.23E+01

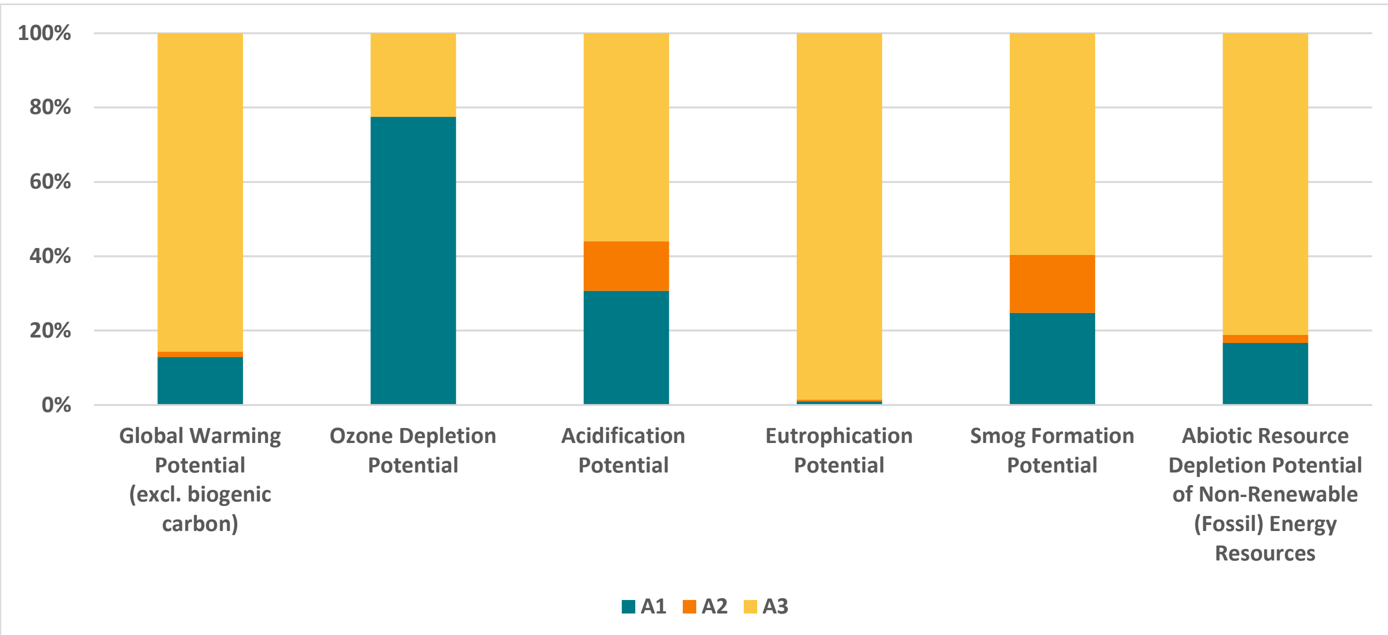
Table 4. Output flows and waste categories results, per 1 metric ton of cold-rolled or tin mill product steel coil

Parameter	Unit	A1	A2	A3	Total
HWD	kg	0.00E+00	0.00E+00	2.89E+00	2.89E+00
NHWD	kg	0.00E+00	0.00E+00	2.35E+02	2.35E+02
HLRW	kg	1.74E-04	1.40E-05	5.16E-04	7.04E-04
ILLRW	kg	1.59E-03	1.30E-04	4.81E-03	6.52E-03
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MR	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00

4. LCA Interpretation

The impact assessment results indicate that Module A3, i.e. manufacturing, is the key contributor to global warming potential, acidification potential, eutrophication potential, smog formation potential, and abiotic resource depletion potential of fossil energy resources. Module A1, i.e. upstream processing and manufacturing of raw materials, is the most significant contributor to ozone depletion potential. Module A2, i.e. transportation of raw materials to the manufacturer, is not the most significant contributors to any environmental impact category. The below figure presents the relative contribution of the A1, A2, and A3 modules to the total.

Figure 1. Cold-Rolled or Tin Mill Product Steel Coil Dominance Analysis



5. Additional Environmental Information

Health and Safety

U. S. Steel has a longstanding commitment to the health and safety of every person who works in its facilities. U. S. Steel's goal is to maintain a sustainable, zero-harm culture that's supported by leadership and owned by an engaged and highly skilled workforce. U. S. Steel empowers its employees with the capabilities and resources needed to assess, reduce, and eliminate workplace risks and hazards and appreciate their dedication to safety.

U. S. Steel received ISO 45001 certification at Gary Works in 2023. ISO 45001 specifies occupational health and safety standards to help reduce accidents in the workplace and provides tools to continuously improve safety performance.

Environmental Activities and Certifications

Additional environmental activities and certifications are discussed in the following subsections. More information on U. S. Steel's certifications and environmental initiatives can be found at https://www.ussteel.com/sustainability/certifications.

ISO 14001:2015 Environmental Management System: Many of U. S. Steel's major production facilities, including Gary Works, Mon Valley Works, Great Lakes Works, Granite City Works, USS Košice, and Big River Steel have Environmental Management Systems that are certified to ISO 14001 — the framework for the measurement and improvement of environmental impacts. U. S. Steel is committed to reducing emissions in their operations, and is implementing innovative best practice solutions to improve their environmental performance and reduce energy consumption.

Air: U. S. Steel is committed to environmental progress and strives for 100% compliance with all federal, state, and local agencies' rules, regulations, and permit conditions, even as the regulations become more stringent.

Using 2018 as baseline year, U. S. Steel has set a goal to reduce corporate NOx emissions intensity by 10% by 2030. U. S. Steel has taken steps toward achieving this NOx goal, including:

- Continuing to implement its Best for All® strategy;
- Shutting down Clairton Coke Batteries facilities 1-3 in early 2023;
- Following its enhanced maintenance and fuel use strategy; and
- Establishing tracking metrics.

U. S. Steel has a greenhouse gas target of 20% reduction in greenhouse gas intensity by 2030 from a 2018 baseline, as well as a 2050 net-zero goal. Both targets are based on Scope 1 and Scope 2 emissions.

Water: U. S. Steel facilities use an abundance of water for cooling and process purposes. U. S. Steel is committed to reducing its water consumption and have implemented conservation practices to further this effort. Many of its processes use water-recycling systems that return water for reuse in operations, drastically reducing the amount of water brought into plants. In addition, the integrated mills maintains a Water Stewardship Plan with the goal to minimize water consumption, water discharges, and to reduce the environmental impact of the facility on local water resources.

Waste: Recycling helps reduce reliance on landfills and improves sustainability through raw material and resource management. Every year, U. S. Steel recycles substantial quantities of scrap metal and other steelmaking coproducts and byproducts.

Steel has always been eminently recyclable, so U. S. Steel has a long history of recycling. In 2021, U. S. Steel recycled over 5.2 million metric tons of purchased and produced steel scrap. Because of steel's physical properties, products can be recycled at the end of their useful life without loss of quality, contributing to steel's high recycling rate and affordability.

In 2021, U. S. Steel recycled 235,299 metric tons of steel slag. Slag is a highly sustainable product that is used in place of natural aggregates, such as limestone and gravel, in numerous construction and product applications. Steel slag can be used in cement manufacturing and asphalt mixes and is also recycled in applications such as landfill daily cover and internal haul roads, phosphorus removal in wastewater treatment, ground water remediation, reactive barrier walls, and agricultural applications, including as a liming agent and micronutrient in fertilizer. Use of steel slag in place of mined and quarried rock and mineral aggregates saves these natural resources and reduces the impact to the environment.

U. S. Steel also works with outside organization to repurpose our used equipment. Examples include transforming used conveyor belts into rubber mats and used tires from our mining mobile equipment into feeding and water troughs for livestock. At USSK, construction waste like concrete, debris, and ceramics from reconstruction and modernization projects is reused by third parties, a recycling effort that has continuously minimized the use of landfills.

U. S. Steel recycles several other materials from the byproduct, steelmaking, and steel finishing operations. In 2021, 8,808 metric tons of process materials from the cokemaking byproducts plant were collected and returned directly to coke ovens. Carbon, iron, and steel bearing residuals, such as coal and coke fines, taconite pellet fines, blast furnace and steel furnace air pollution control dusts and sludges are used to produce sinter and briquettes, which are then used as feedstocks for ironmaking and steelmaking, respectively. This included the production of approximately 4.8 million metric tons of sinter, which was used in the blast furnaces, along with 142,151 metric tons of briquettes that was used in the blast furnaces and Basic Oxygen Process (BOP) furnaces.

An additional 114,715 metric tons of mill scale not used internally to make sinter or briquettes was sold to cement manufacturers, which use the mill scale for its iron content, a critical ingredient in cement.

Hydrochloric acid, which is used in steel pickling operations to remove heavy iron oxide rust from the surface of steel coils to prepare the coils for surface coating, results in an iron oxide rich material called spent pickle liquor. The spent pickle liquor is recycled by being sent to a recycling plant to regenerate the hydrochloric acid and return it to plants for reuse in pickling, or it is sold for beneficial use as a wastewater treatment chemical.

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7. Contact Information

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