BULL MOOSE TUBE

VERIFIED by SCS Global Services
ENVIRONMENTAL PRODUCT DECLARATION
BASED ON LCA

Declaration Owner

Bull Moose Tube

+1.888.227.5430 | www.bullmoosetube.com | techsupport@bullmoose.com

Casa Grande, AZ
1001 North Jefferson Ave.
Casa Grande, AZ 8512

Chicago Heights; IL
555 E 16th St.
Chicago Heights, IL 60411

Elkhart, IN
29851 County Rd. 20 West
Elkhart, IN 46517

Gerald, MO
406 E Industrial Dr./Hwy. 50
Gerald, MO 63037

Masury, OH
1433 Standard Ave. SE
Masury, OH 44438

Sinton, TX
8534 Hwy 89
Sinton, TX 78387

Trenton, GA
195 North Industrial Dr.
Trenton, GA 30752

Product:

Unfabricated Low-Embodied Carbon (LEC) Steel Pipe and Tube

Declared Unit

The declared unit is one metric ton of unfabricated low-embodied carbon (LEC) steel tube and pipe

EPD Number and Period of Validity

SCS-EPD-10294

EPD Valid November 27, 2024 through November 26, 2029

Product Category Rule

PCR for Building-Related Products and Services - Part A: LCA Calculation Rules and Report Requirements, Version 4.0 UL Environment. March 2022.

PCR Guidance for Building-Related Products and Services. Part B: Designated Steel Construction Product EPD Requirements. UL Environment. August 2020.

Program Operator

SCS Global Services
2000 Powell Street, Ste. 600, Emeryville, CA 94608
+1.510.452.8000 | www.SCSglobalServices.com

SCSglobal SERVICES

Declaration owner:	Bull Moose Tube
Address:	See cover for full list of facilities included in EPD
Declaration Number:	SCS-EPD-10294
Declaration Validity Period:	EPD Valid November 27, 2024, through November 26, 2029
Program Operator:	SCS Global Services
Declaration URL Link:	https://www.scsglobalservices.com/certified-green-products-guide
LCA Practitioner:	Tess Garvey, Ph.D., SCS Global Services
LCA Software and LCI database:	OpenLCA 2.20 software and the Ecoinvent v3.10 database
Product's Intended Application:	Steel Pipe and Tube
Product RSL:	n/a
Markets of Applicability:	Global
EPD Type:	Product-Specific
EPD Scope:	Cradle-to-Gate
LCIA Method and Version:	IPCC AR5, TRACI 2.1 and CML-IA
Independent critical review of the LCA and data, according to ISO 14044 and ISO 14071	☐ internal ☒ external
LCA Reviewer:	Lindita Bushi, PhD, Athena Sustainable Materials Institute
Part A Product Category Rule:	PCR for Building-Related Products and Services - Part A: LCA Calculation Rules and Report Requirements, UL v.4.0, March 2022.
Part A PCR Review conducted by:	Lindita Bushi, PhD (Chair); Hugues Imbeault-Tétreault, ing., M.Sc.A.; Jack Geibig
Part B Product Category Rule:	PCR Guidance for Building-Related Products and Services. Part B: Designated Steel Construction Product EPD Requirements. UL Environment. August 2020.
Part B PCR Review conducted by:	Thomas Gloria, PhD; Brandie Sebastian, James Littlefield
Independent verification of the declaration and data, according to ISO 14025 and the PCR	☐ internal ☒ external
EPD Verifier:	Lindita Bushi, PhD, Athena Sustainable Materials Institute
Declaration Contents:	

Disclaimers: *This EPD conforms to ISO 14025, 14040, 14044, and ISO 21930.*

Scope of Results Reported: *The PCR requirements limit the scope of the LCA metrics such that the results exclude environmental and social performance benchmarks and thresholds, and exclude impacts from the depletion of natural resources, land use ecological impacts, ocean impacts related to greenhouse gas emissions, risks from hazardous wastes and impacts linked to hazardous chemical emissions.*

Accuracy of Results: *Due to PCR constraints, this EPD provides estimations of potential impacts that are inherently limited in terms of accuracy.*

Comparability: *The PCR this EPD was based on was not written to support comparative assertions. EPDs based on different PCRs, or different calculation models, may not be comparable. When attempting to compare EPDs or life cycle impacts of products from different companies, the user should be aware of the uncertainty in the final results, due to and not limited to, the practitioner's assumptions, the source of the data used in the study, and the specifics of the product modeled.*

In accordance with ISO 21930:2017, EPDs are comparable only if they comply with the core PCR, use the same sub-category PCR where applicable, include all relevant information modules and are based on equivalent scenarios with respect to the context of construction works.

The owner of the declaration shall be liable for the underlying information and evidence; SCS shall not be liable with respect to manufacturer information, life cycle assessment data, and evidence supplied or made available to SCS.

Cradle-to-Gate GWP 100 for Unfabricated LEC HSS

Table 1 below provides the 100-year GWP for one metric ton of unfabricated LEC steel pipe or tube (A1-A3), produced using steel from the EAF steelmaking route, and prior to downstream transport or tube or pipe fabrication.

Table 1. *100-year Global Warming Potential, based on IPCC AR5, for one metric ton of unfabricated LEC steel pipe or tube produced (A1-A3)*

Cradle-to-Gate Hollow Structural Section (Unfabricated)		
Mill location	**Value**	**Unit**
Casa Grande	1.38	metric ton CO2e per 1 metric ton HSS
Chicago Heights	1.39	metric ton CO2e per 1 metric ton HSS
Gerald	1.49	metric ton CO2e per 1 metric ton HSS
Elkhart	1.16	metric ton CO2e per 1 metric ton HSS
Masury	1.35	metric ton CO2e per 1 metric ton HSS
Sinton	1.06	metric ton CO2e per 1 metric ton HSS
Trenton	1.28	metric ton CO2e per 1 metric ton HSS

1. Bull Moose Tube

Founded in 1962, Bull Moose Tube boasts more than a half-century of proven experience providing customers with superior steel pipe and tube. Our enduring commitment to quality, innovation, and service has made us one of the most respected names in our field and allowed us to grow into one of the largest producers of HSS and mechanical tubing in North America – and the market leader in sprinkler pipe. Our eight manufacturing facilities help ensure consistent product availability with industry-leading geographic reach and our new Sinton, TX facility further expands the company's product offerings in HSS, sprinkler pipe, and pipe pile.

2. Products

2.1 PRODUCT DESCRIPTION

Steel Tubes covered under this declaration represent hollow structural sections (HSS), mechanical tube, pipe piling and sprinkler pipe. These products can have circular, square, or rectangular cross sections, and are widely used in building, bridge and industrial projects. Bull Moose Tube produces HSS in the range of 1" to 14" square (and rectangular and round equivalents), with wall thickness of 0.065" to 0.750". Bull Moose produces mechanical tube in the range of 0.5" to 3" square (and rectangular and round equivalents), with wall thickness of 0.049" to 0.188". Bull Moose Tube produces Sprinkler Pipe from 1" NPS to 10" NPS, wall thickness of Bull Moose sprinkler pipe includes Schedule 10, Schedule 30 and Schedule 40 as well as engineered wall thicknesses. Bull Moose Tube produces Pipe Pile from 5.563" OD to 18" OD round, with wall thickness of 0.188" to 0.750".

2.2 PRODUCT FLOW DIAGRAM

A flow diagram illustrating the production processes and life cycle phases included in the scope of the EPD is provided below.

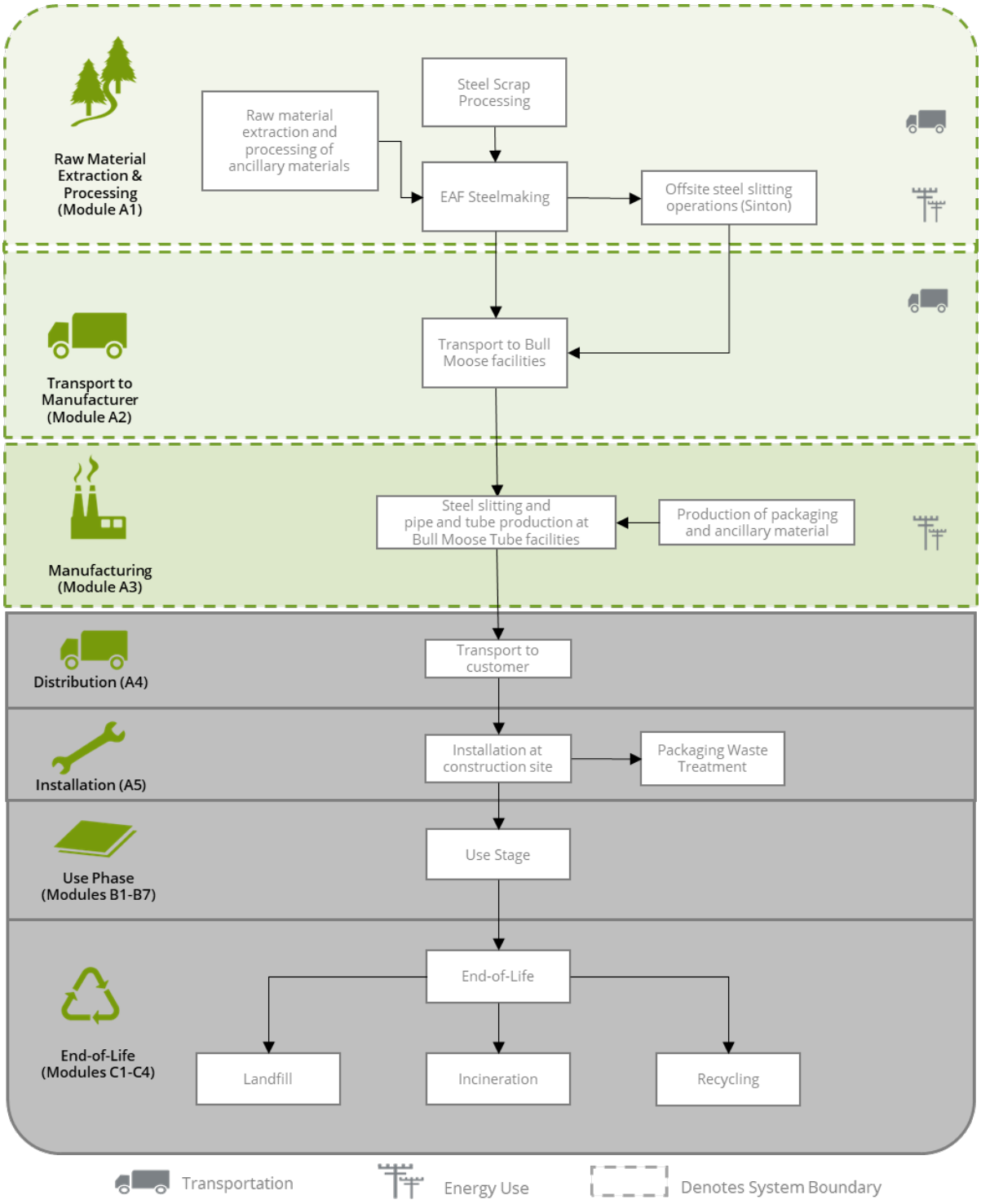

Figure 1. *Flow Diagram for the life cycle of the Bull Moose Tube steel pipe and tube.*

2.3 DECLARATION OF METHODOLOGICAL FRAMEWORK

The scope of the EPD is cradle-to-gate, including raw material extraction and processing, transportation, steel manufacture, and pipe or tube manufacture. The life cycle phases included in the product system boundary are shown below.

Table 1. *Life cycle phases included in the Bull Moose Tube steel pipe and tube product system boundary.*

Product			Construction Process		Use							End-of-life				Benefits and loads beyond the system boundary
A1	A2	A3	A4	A5	B1	B1	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Raw material extraction and processing	Transport to manufacturer	Manufacturing	Transport	Construction - installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction demolition	Transport	Waste processing	Disposal	Reuse, recovery and/or recycling potential
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

X = Module Included | MND = Module Not Declared

Cut-off and allocation procedures are described below and conform to the PCR and ISO standards.

2.4 TECHNICAL DATA

Steel Tubes produced by Bull Moose are defined by the following ASTM Standards:

ASTM A135 Standard Specification for Electric-Resistance-Welded Steel Pipe.
ASTM A252 Standard Specification for Welded and Seamless Steel Pipe Piles
ASTM A500 Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Tubing in Rounds and Shapes.
ASTM A513 Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing.
ASTM A795 Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use.
ASTM A847 Standard Specification for Cold-Formed Welded and Seamless High-Strength, Low-Alloy Structural Tubing with Improved Atmospheric Corrosion Resistance.
ASTM A1085 Standard Specification for Cold-Formed Welded Carbon Steel Hollow Structural Sections (HSS).
ASTM A1110 Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes with 52KSI minimum yield strength and impact requirements.
ASTM A1112 Standard Specification for Cold-Formed Welded High Strength Carbon Steel or High Strength Low-Alloy Hollow Structural Sections (HSS) in Rounds and Shapes.

The CSI codes that products are classified under depend on the final use of the product.

2.5 INTENDED APPLICATION

The intended application of the steel pipe and tube is for use in building, bridge and industrial projects, and serve the primary function of conveying various substances.

2.6 MATERIAL COMPOSITION

The steel pipe and tube modeled in this study are made from low-alloy steel. The steel is manufactured by the electric arc furnace steelmaking technology. In general the low-alloy steel products contain steel with an alloy content lower than 3%, including ≤1.25% Manganese, ≤1.25% Carbon, <1% Silicon, <1% Aluminum, and other alloying elements, each less than 0.1% of the total.

Steel products under normal conditions do not present inhalation, ingestion, or contact health hazards, including but not limited to indoor air emissions, gamma or ionizing radiation emissions, or chemicals released to air or leached to water or soil. These products are used inside the building envelope, or other structures, and do not include materials or substances which have potential route of exposure to humans or flora/fauna in the environment.

2.7 PROPERTIES OF DECLARED PRODUCT AS DELIVERED

The steel products are delivered as unfabricated steel tube or pipe, in sizes meeting customer specifications.

- HSS in the range of 1" to 14" square (and rectangular and round equivalents), with wall thickness of 0.065" to 0.750";
- Mechanical tube in the range of 0.5" to 3" square (and rectangular and round equivalents), with wall thickness of 0.049" to 0.188";
- Sprinkler Pipe from 1" NPS to 10" NPS, with wall thicknesses including Schedule 10, Schedule 30 and Schedule 40 as well as engineered wall thicknesses;
- Pipe Pile from 5.563" to 18" outer diameter round, with wall thickness of 0.188" to 0.750".

2.8 MANUFACTURING

This EPD represents steel tubes produced by Bull Moose Tube at the following sites: Casa Grande, AZ; Chicago Heights; IL; Elkhart, IN; Gerald, MO; Masury, OH; Trenton, GA; and their newest facility in Sinton, TX.

2.9 PACKAGING

Packaging consists of metal banding, lumber and wood for dunnage, plastic film and plastic tarps, depending upon the mill.

2.10 FURTHER INFORMATION

Further information on the product can be found on the manufacturers' website at www.bullmoosetube.com.

3. LCA: Calculation Rules

3.1 DECLARED UNIT

The declared unit used in the study is defined as one (1) metric ton of unfabricated LEC steel pipe and tube, consistent with the PCR.

Table 3. *The modules and unit processes included in the scope for the Bull Moose Tube steel pipe and tube.*

Module	Module Description	Unit Processes Included in Scope
A1	Extraction and processing of raw materials; any reuse of products or materials from previous product systems; processing of secondary materials; generation of electricity from primary energy resources; energy, or other, recovery processes from secondary fuels	Raw material extraction and processing, including but not limited to the recovery or extraction and processing of feedstock materials and including all activities necessary for EAF steelmaking within North America.
A2	Transport (to the manufacturer)	Transportation of raw materials (HRC) to the BMT facilities.
A3	Manufacturing, including ancillary material production	Manufacturing operations within the BMT facilities.
A4	Transport (to the building site)	Module Not Declared
A5	Construction-installation process	Module Not Declared
B1	Product use	Module Not Declared
B2	Product maintenance	Module Not Declared
B3	Product repair	Module Not Declared
B4	Product replacement	Module Not Declared
B5	Product refurbishment	Module Not Declared
B6	Operational energy use by technical building systems	Module Not Declared
B7	Operational water uses by technical building systems	Module Not Declared
C1	Deconstruction, demolition	Module Not Declared
C2	Transport (to waste processing)	Module Not Declared
C3	Waste processing for reuse, recovery and/or recycling	Module Not Declared
C4	Disposal	Module Not Declared
D	Reuse-recovery-recycling potential	Module Not Declared

3.2 UNITS

All data and results are presented using SI units.

3.3 ESTIMATES AND ASSUMPTIONS

- Steel suppliers were modeled based on a subset of steel sourced by each Bull Moose Tube mill, representing the amount of EAF-produced steel purchased in 2023. Only steel purchased by Bull Moose Tube from its EAF steelmaking suppliers is considered as Low Embodied Carbon (LEC), and would be represented by this EPD.
- To the extent possible, EPDs or third party verified impact data representing the steel coil were used to represent steel from the appropriate supplier. Resource indicators from supplier EPDs were included for all waste and resource indicators.
- Data used for the average scrap generation rate is based on 2023 data, which are greater than or equal to the scrap generation rates calculated from the 2021 data collection period. As such this assumption is considered conservative.
- In the absence of supplier-specific impacts (EPDs), ecoinvent datasets were used to represent the electric arc steelmaking and hot rolling, tailored to the appropriate electricity grid.
- Representative inventory data were used to tailor the energy mix for electricity from the regional electricity grid. Supply mixes were modeled based on U.S. EPA eGRID 2021 for AZNM, ERCT, RFCW, SRMW and SRSO in which the BMT operations are located.
- Disposal of manufacturing waste is modeled based on statistics for solid and hazardous waste generation and disposal in the United States, as specified in the PCR. Specifically, where the disposal was done by a third party and the waste disposal method was not explicit, 80% of non-hazardous wastes are disposed in landfill and 20% incinerated. Transportation for end-of-life scenarios was modeled using the EPA WARM model assumption of 20 miles (~32 km), from the point of product use to a landfill, material recovery center, or waste incinerator.

The PCR requires the results for several inventory flows related to construction products to be reported including energy and resource use and waste and outflows. These are aggregated inventory flows, and do not characterize any potential impact; results should be interpreted considering this limitation.

3.4 CUT-OFF RULES

According to the PCR, processes contributing greater than 1% of the total environmental impact indicator for each impact are included in the inventory. No data gaps were allowed which were expected to significantly affect the outcome of the indicator results. No known flows are deliberately excluded from this EPD.

3.5 DATA SOURCES

Primary data were provided by Bull Moose Tube for their manufacturing facilities. The sources of secondary LCI data are the Ecoinvent database and supplier EPDs.

Table 4. *Data sources for the Bull Moose Tube steel pipe and tube.*

Flow	Dataset	Data Source	Publication Date
Suppliers and Coating			
Hot rolled coil	Supplier facility-specific EPD results for Hot rolled sheet and hot rolled coil	EPDs	2023 and 2024
	steel production, electric, low-alloyed | steel, low-alloyed | Cutoff, U - Europe without Switzerland and Austria hot rolling, steel | hot rolling, steel | Cutoff, U - Europe without Austria modified to US electricity grid	Ecoinvent 3.10	2023
Paints	market for acrylic dispersion, with water, in 58% solution state | acrylic dispersion, with water, in 58% solution state | Cutoff, U	Ecoinvent 3.10	2023
Ancillary			
Coolants	market for lubricating oil | lubricating oil | Cutoff, U - RER	Ecoinvent 3.10	2023
Lubricants	market for lubricating oil | lubricating oil | Cutoff, U - RER	Ecoinvent 3.10	2023
Water	market for tap water | tap water | Cutoff, U - RoW	Ecoinvent 3.10	2023
Packaging			
Lumber	EUR-flat pallet production | EUR-flat pallet | Cutoff, U – RoW market for sawnwood, board, softwood, raw, dried (u=20%) | sawnwood, board, softwood, raw, dried (u=20%) | Cutoff, U - RoW	Ecoinvent 3.10	2023
Steel banding	market for steel, low-alloyed | steel, low-alloyed | Cutoff, U - GLO	Ecoinvent 3.10	2023
Plastic sheeting or tarps	packaging film production, low density polyethylene | packaging film, low density polyethylene | Cutoff, U – RoW market for polyethylene, low density, granulate | polyethylene, low density, granulate | Cutoff, U - GLO	Ecoinvent 3.10	2023
Fuels (Across Operations)			
Electricity	market for electricity, medium voltage | electricity, medium voltage | Cutoff, U – US	Ecoinvent 3.10	2023
	Modified for appropriate eGRID subregions	eGRID 2021	2023
Natural gas	market for heat, district or industrial, natural gas | heat, district or industrial, natural gas | Cutoff, U - RoW	Ecoinvent 3.10	2023
Diesel	diesel, burned in building machine | diesel, burned in building machine | Cutoff, U - GLO	Ecoinvent 3.10	2023
Propane	propane, burned in building machine | propane, burned in building machine | Cutoff, U - GLO	Ecoinvent 3.10	2023
Heavy fuel oil	heavy fuel oil, burned in refinery furnace | heavy fuel oil, burned in refinery furnace | Cutoff, U - Europe without Switzerland	Ecoinvent 3.10	2023
Transportation			
Rail	transport, freight train, diesel | transport, freight train | Cutoff, U - US	Ecoinvent 3.10	2023
Road	transport, freight, lorry 16-32 metric ton, EURO4 | transport, freight, lorry 16-32 metric ton, EURO4 | Cutoff, U - RoW	Ecoinvent 3.10	2023
Inland water transport	transport, freight, inland waterways, barge | transport, freight, inland waterways, barge | Cutoff, U - RER	Ecoinvent 3.10	2023
Waste treatment			
Sludge treatment	treatment of sludge from steel rolling, residual material landfill | sludge from steel rolling | Cutoff, U - RER	Ecoinvent 3.10	2023
Landfill general	treatment of inert waste, inert material landfill | inert waste, for final disposal | Cutoff, U – RoW	Ecoinvent 3.10	2023
Incineration, nonhazardous	process-specific burdens, municipal waste incineration | process-specific burdens, municipal waste incineration | Cutoff, U - Europe without Switzerland	Ecoinvent 3.10	2023
Hazardous waste incineration	treatment of hazardous waste, hazardous waste incineration, with energy recovery | hazardous waste, for incineration | Cutoff, U - Europe without Switzerland	Ecoinvent 3.10	2023

3.6 DATA QUALITY

The data quality assessment addressed the following parameters: time-related coverage, geographical coverage, technological coverage, precision, completeness, representativeness, consistency, reproducibility, sources of data, and uncertainty.

Table 5. *Data quality assessment for the Bull Moose Tube steel pipe and tube product system.*

Data Quality Parameter	Data Quality Discussion
Time-Related Coverage: Age of data and the minimum length of time over which data is collected	The most recent available data are used, based on other considerations such as data quality and similarity to the actual operations. Typically, these data are less than 10 years old. All of the data used represented an average of at least one year's worth of data collection. Manufacturer-supplied data (primary data) are based on annual production for January 1-December 31, 2020 for all BMT facilities except for Sinton for which the production was representative of January 1-March 31, 2024, while the steel suppliers are representative of 2023 operations. All supplier data (EPDs) are less than 5 years old.
Geographical Coverage: Geographical area from which data for unit processes is collected to satisfy the goal of the study	The data used in the analysis provide the best possible representation available with current data. Actual processes for upstream operations are representative of the actual steel mill or North American region. Surrogate data used in the assessment are representative of European operations. Data are considered sufficiently similar to actual processes.
Technology Coverage: Specific technology or technology mix	For the most part, data are representative of the actual technologies used for processing, transportation, and manufacturing operations.
Precision: Measure of the variability of the data values for each data expressed	Precision of results are not quantified due to a lack of data. Data collected for operations were typically averaged for one or more years and over multiple operations, which is expected to reduce the variability of results.
Completeness: Percentage of flow that is measured or estimated	The LCA model included all known mass and energy flows for production of the unfabricated LEC steel pipe and tube. In some instances, surrogate data used to represent upstream and downstream operations may be missing some data which is propagated in the model. No known processes or activities contributing to more than 1% of the total environmental impact for each indicator are excluded.
Representativeness: Qualitative assessment of the degree to which the data set reflects the true population of interest	Data used in the assessment represent typical or average processes as currently reported from multiple data sources and are therefore generally representative of the range of actual processes and technologies for production of these materials. Considerable deviation may exist among actual processes on a site-specific basis; however, such a determination would require detailed data collection throughout the supply chain back to resource extraction.
Consistency: Qualitative assessment of whether the study methodology is applied uniformly to the various components of the analysis	The consistency of the assessment within modules A2 and A3 is considered to be high. Data sources of similar quality and age are used with a bias towards Ecoinvent v3.10 data where available. Different portions of the product life cycle are equally considered; however, it must be noted that final disposition of the product is based on assumptions of current average practices in Europe and the United States. Some data within modules in A1 are based on primary data and would be difficult to assess for consistency.
Reproducibility: Qualitative assessment of the extent to which information about the methodology and data values would allow an independent practitioner to reproduce the results reported in the study	Based on the description of data and assumptions used, this assessment would be reproducible by other practitioners. All assumptions, models, and data sources are documented.
Sources of the Data: Description of all primary and secondary data sources	Data for each of the BMT manufacturing facilities and EPDs used represent an annual average and are considered of high quality due to the length of time over which these data are collected, as compared to a snapshot that may not accurately reflect fluctuations in production. The Ecoinvent database is used for secondary LCI datasets.
Uncertainty of the Information: Uncertainty related to data, models, and assumptions	Uncertainty related to materials in the unfabricated LEC steel pipe and tube is low. Actual supplier data for upstream operations was not available for all suppliers and the study relied upon the use of existing representative datasets. These datasets contained relatively recent data (<10 years) but lacked geographical representativeness. Uncertainty related to the impact assessment methods used in the study are high. The impact assessment method required by the PCR includes impact potentials, which lack characterization of providing and receiving environments or tipping points.

3.7 PERIOD UNDER REVIEW

The period of review is January 01, 2020 through December 31, 2020 for the six facilities Casa Grande, AZ, Chicago Heights, IL, Elkhart, IN, Gerald, MO, Masury, OH, and Trenton, GA. The materials data (suppliers and quantities), as well as transportation distances and modes for the steel, is taken from January 01 through December 31, 2023.

The facility in Sinton, TX was opened in 2022, and as such the period of review for this facility is January 1 through March 31 of 2024.

3.8 ALLOCATION

Mass allocation was deemed the most accurate and reproducible way of calculating the energy and material requirements for the manufacture of the steel and steel products. Primary data for resource use (e.g., electricity, natural gas, water), waste/co-products, and emissions released, are allocated on a mass-basis as a fraction of total annual production.

Per ISO 21930, 2.8.4.1.2, useable output flows such as steel scrap shall not be considered as co-products but shall be considered waste, and no allocation to secondary material, secondary fuels, or recovered energy shall be permitted. With respect to the steel scrap, the 100-0 recycled content approach is used in which the recycled material bears only the burden of any processing from waste material.

The transportation from primary producer of material components (e.g., steel coil) to the Bull Moose Tube facilities is based on primary data provided by Bull Moose Tube, including modes, distances, and amount of steel transported. Transportation was allocated on the basis of the mass and distance the material was transported.

3.9 COMPARABILITY

The PCR this EPD was based on was not written to support comparative assertions. EPDs based on different PCRs, or different calculation models, may not be comparable. When attempting to compare EPDs or life cycle impacts of products from different companies, the user should be aware of the uncertainty in the final results, due to and not limited to, the practitioner's assumptions, the source of the data used in the study, and the specifics of the product modeled.

4. LCA: Scenarios and Additional Technical Information

Manufacturing

The steel products included in this study are manufactured from hot rolled coil, produced using EAF steelmaking method in North America, and formed into pipe or tube at the Bull Moose Tube facilities. The transport of materials from upstream steelmaking, and other materials production, to Bull Moose Tube mills is based on primary data of the transport distance and mode of transport.

At the Bull Moose Tube facilities, the master coil is received and then slit into smaller, slit coils for each tube mill located in the plant with the exception of the Sinton mill which is slit off-site. The slit coils are loaded into the tube mills and are formed into tubes and welded using electric resistance welding (ERW) and cut to length on the tube mill. During ERW, an electric current is passed between the two edges of the steel to heat them. The tubes are then packaged (bundled) and placed into the warehouse for shipment to customers. Packaging varies by facility and consists of dunnage, metal banding and plastic sheeting. Ancillary materials consist of coolants and lubricating oils.

The Bull Moose Tube mills are located in Casa Grande, AZ, Chicago Heights, IL, Elkhart, IN, Gerald, MO, Masury, OH, Sinton, TX and Trenton, GA. The electricity supply mixes for each facility are modeled using ecoinvent electricity grids and modified for the appropriate eGRID 2022 subregions. Electricity and resource use at the manufacturing facilities are allocated to the steel products based on product mass.

5. LCA: Results

Results of the Life Cycle Assessment are presented in Tables 6-20. It is noted that LCA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

The following environmental impact category indicators are reported using characterization factors based on the U.S. EPA's Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts – TRACI 2.1, and CML-IA.

These six impact categories 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.

TRACI 2.1 Impact Category	Unit
Global Warming Potential **(GWP)***	kg CO_2 eq
Ozone Depletion Potential **(ODP)**	kg CFC 11 eq
Acidification Potential **(AP)**	kg SO_2 eq
Eutrophication Potential **(EP)**	kg N eq
Smog Formation Potential **(SFP)**	kg O_3 eq
Fossil Fuel Depletion Potential **(FFD)**	MJ Surplus, LHV
CMLI-A Impact Category	**Unit**
Abiotic depletion potential **(ADP-fossil fuels)** for fossil resources	MJ, LHV

***** GWP is based on IPCC AR5

The following inventory parameters, specified by the PCR, are also reported.

Resources	Unit	Waste and Outflows	Unit
RPR_E: Renewable primary resources used as energy carrier (fuel)	MJ, LHV	**HWD:** Hazardous waste disposed	kg
RPR_M: Renewable primary resources with energy content used as material	MJ, LHV	**NHWD:** Non-hazardous waste disposed	kg
$NRPR_E$: Non-renewable primary resources used as an energy carrier (fuel)	MJ, LHV	**HLRW:** High-level radioactive waste, conditioned, to final repository	kg
$NRPR_M$: Non-renewable primary resources with energy content used as material	MJ, LHV	**ILLRW:** Intermediate- and low-level radioactive waste, conditioned, to final repository	kg
SM: Secondary materials	kg	**CRU:** Components for re-use	kg
RSF: Renewable secondary fuels	MJ, LHV	**MR:** Materials for recycling	kg
NRSF: Non-renewable secondary fuels	MJ, LHV	**MER:** Materials for energy recovery	kg
RE: Recovered energy	MJ, LHV	**EE:** Recovered energy exported from the product system	MJ, LHV
FW: Use of net freshwater resources	m^3	-	-

Table 6. *Resource use and wastes results for the declared unit of unfabricated LEC steel pipe and tube product, produced at **Casa Grande**. All values are rounded to three significant digits. Results representing energy flows are calculated using lower heating (i.e., net calorific) values.*

Parameter	Material extraction (A1)	Upstream transport (A2)	Production (A3)	Total
Resources				
RPRE (MJ)	760	56.2	1,230	2,100
	37%	3%	60%	100%
RPRM (MJ)	0.0	0.0	1,480	1,480
	0%	0%	100%	100%
NRPRE (MJ)	13,500	2,070	1,020	16,600
	82%	13%	5%	100%
NRPRM (MJ)	282	0.0	0.0	282
	100%	0%	0%	100%
SM (kg)	971	0.0	0.0	971
	100%	0%	0%	100%
RSF (MJ)	0.0	0.0	0.0	0.0
NRSF (MJ)	0.0	0.0	0.0	0.0
RE (MJ)	0.0	0.0	0.0	0.0
FW (m^3)	11.4	0.392	0.377	12.2
	94%	3.2%	3.1%	100%
Wastes				
HWD (kg)	4.09	0.0	0.0	4.09
	100%	0%	0%	100%
NHWD (kg)	1.92	0.0	0.808	2.73
	69%	0%	31%	100%
HLRW (kg)	$2.57x10^{-5}$	0.0	0.0	$2.57x10^{-5}$
	100%	0%	0%	100%
ILLRW (kg)	$2.23x10^{-4}$	0.0	0.0	$2.23x10^{-4}$
	100%	0%	0%	100%
CRU (kg)	0.0	0.0	0.0	0.0
MR (kg)	78.5	0.0	65.9	144
	54%	0%	46%	100%
MER (kg)	0.0	0.0	0.0	0.0
EE (MJ)	0.0	0.0	0.0	0.0

Table 7. *Resource use and wastes results for the declared unit of unfabricated LEC steel pipe and tube product, produced at **Chicago Heights**. All values are rounded to three significant digits. Results representing energy flows are calculated using lower heating (i.e., net calorific) values.*

Parameter	Material extraction (A1)	Upstream transport (A2)	Production (A3)	Total
Resources				
RPRE (MJ)	666	11.3	20.3	698
	95%	2%	3%	100%
RPRM (MJ)	0.0	0.0	29.8	29.8
	0%	0%	100%	100%
NRPRE (MJ)	17,200	856	860	19,000
	91%	4.5%	4.5%	100%
NRPRM (MJ)	0.0	0.0	0.0	0.0
	n/a	n/a	n/a	n/a
SM (kg)	1,100	0.0	0.0	1,100
	100%	0%	0%	100%
RSF (MJ)	0.0	0.0	0.0	0.0
NRSF (MJ)	0.0	0.0	0.0	0.0
RE (MJ)	0.0	0.0	0.0	0.0
FW (m^3)	17.1	0.117	0.309	17.6
	98%	0.67%	1.8%	100%
Wastes				
HWD (kg)	6.28	0.0	0.0267	6.30
	100%	0%	0%	100%
NHWD (kg)	1.88	0.0	1.84	3.72
	51%	0%	49%	100%
HLRW (kg)	0.0	0.0	0.0	0.0
	n/a	n/a	n/a	n/a
ILLRW (kg)	0.0	0.0	0.0	0.0
	n/a	n/a	n/a	n/a
CRU (kg)	0.0	0.0	0.0	0.0
MR (kg)	124	0.0	58.6	182
	68%	0%	32%	100%
MER (kg)	0.0	0.0	0.0	0.0
EE (MJ)	0.0	0.0	0.0	0.0

Table 8. *Resource use and wastes results for the declared unit of unfabricated LEC steel pipe and tube product, produced at* ***Elkhart****. All values are rounded to three significant digits. Results representing energy flows are calculated using lower heating (i.e., net calorific) values.*

Parameter	Material extraction (A1)	Upstream transport (A2)	Production (A3)	Total
Resources				
RPRE (MJ)	940	5.56	161	1,110
	85%	0.5%	15%	100%
RPRM (MJ)	0.0	0.0	52.9	52.9
	0%	0%	100%	100%
NRPRE (MJ)	13,700	409	640	14,800
	93%	2.80%	4.30%	100%
NRPRM (MJ)	86.6	0.0	3.81	90.4
	96%	0%	4%	100%
SM (kg)	918	0.0	0.0	918
	100%	0%	0%	100%
RSF (MJ)	0.0	0.0	0.0	0.0
NRSF (MJ)	0.0	0.0	0.0	0.0
RE (MJ)	0.0	0.0	0.0	0.0
FW (m^3)	16.0	$5.67x10^{-2}$	0.275	16.4
	98%	0.35%	1.7%	100%
Wastes				
HWD (kg)	1.29	0.0	0.0	1.29
	100%	0%	0%	100%
NHWD (kg)	0.871	0.0	0.449	1.32
	66%	0%	34%	100%
HLRW (kg)	$1.58x10^{-6}$	0.0	0.0	$1.58x10^{-6}$
	100%	0%	0%	100%
ILLRW (kg)	0.00132	0.0	0.0	0.00132
	100%	0%	0%	100%
CRU (kg)	0.0	0.0	0.0	0.0
MR (kg)	123	0.0	106	229
	54%	0%	46%	100%
MER (kg)	0.0	0.0	0.0	0.0
EE (MJ)	0.0	0.0	0.0	0.0

Table 9. *Resource use and wastes results for the declared unit of unfabricated LEC steel pipe and tube product, produced at* ***Gerald****. All values are rounded to three significant digits. Results representing energy flows are calculated using lower heating (i.e., net calorific) values.*

Parameter	Material extraction (A1)	Upstream transport (A2)	Production (A3)	Total
Resources				
RPRE (MJ)	440	29.3	255	724
	61%	4%	35%	100%
RPRM (MJ)	0.0	0.0	282	282
	0%	0%	100%	100%
NRPRE (MJ)	12,700	1,770	1,240	15,700
	81%	11%	8%	100%
NRPRM (MJ)	624	0.0	0.0	624
	100%	0%	0%	100%
SM (kg)	804	0.0	0.0	804
	100%	0%	0%	100%
RSF (MJ)	0.0	0.0	0.0	0.0
NRSF (MJ)	0.0	0.0	0.0	0.0
RE (MJ)	0.0	0.0	0.0	0.0
FW (m^3)	4.06	0.266	0.427	4.75
	85%	5.6%	9%	100%
Wastes				
HWD (kg)	6.88	0.0	0.0	6.88
	100%	0%	0%	100%
NHWD (kg)	3.63	0.0	0.0	3.63
	100%	0%	0%	100%
HLRW (kg)	$5.74x10^{-5}$	0.0	0.0	$5.74x10^{-5}$
	100%	0%	0%	100%
ILLRW (kg)	$9.76x10^{-4}$	0.0	0.0	$9.76x10^{-4}$
	100%	0%	0%	100%
CRU (kg)	0.0	0.0	0.0	0.0
MR (kg)	19.8	0.0	65.9	85.7
	23%	0%	77%	100%
MER (kg)	0.0	0.0	0.0	0.0
EE (MJ)	0.0	0.0	0.0	0.0

Table 10. *Resource use and wastes results for the declared unit of unfabricated LEC steel pipe and tube product, produced at* ***Masury****. All values are rounded to three significant digits. Results representing energy flows are calculated using lower heating (i.e., net calorific) values.*

Parameter	Material extraction (A1)	Upstream transport (A2)	Production (A3)	Total
Resources				
RPRE (MJ)	530	13.3	139	683
	78%	2%	20%	100%
RPRM (MJ)	0.0	0.0	65.6	65.6
	0%	0%	100%	100%
NRPRE (MJ)	12,800	1,000	859	14,600
	87%	7%	6%	100%
NRPRM (MJ)	336	0.0	5.35	341
	98%	0%	2%	100%
SM (kg)	931	0.0	0.0	931
	100%	0%	0%	100%
RSF (MJ)	0.0	0.0	0.0	0.0
NRSF (MJ)	0.0	0.0	0.0	0.0
RE (MJ)	0.0	0.0	0.0	0.0
FW (m^3)	11.4	0.137	0.307	11.9
	96%	1.2%	2.6%	100%
Wastes				
HWD (kg)	1.63	0.00	0.00	1.63
	100%	0%	0%	100%
NHWD (kg)	1.97	0.00	0.00	1.97
	100%	0%	0%	100%
HLRW (kg)	0.00	0.00	0.00	0.00
	n/a	n/a	n/a	n/a
ILLRW (kg)	0.00	0.00	0.00	0.00
	n/a	n/a	n/a	n/a
CRU (kg)	0.0	0.0	0.0	0.0
MR (kg)	94.2	0.0	63.6	158
	60%	0%	40%	100%
MER (kg)	0.0	0.0	0.0	0.0
EE (MJ)	0.0	0.0	0.0	0.0

Table 11. *Resource use and wastes results for the declared unit of unfabricated LEC steel pipe and tube product, produced at* ***Sinton****. All values are rounded to three significant digits. Results representing energy flows are calculated using lower heating (i.e., net calorific) values.*

Parameter	Material extraction (A1)	Upstream transport (A2)	Production (A3)	Total
Resources				
RPRE (MJ)	1,200	0.433	114	1,310
	91%	0.033%	8.7%	100%
RPRM (MJ)	0.0	0.0	0.0	0.0
	n/a	n/a	n/a	n/a
NRPRE (MJ)	13,500	23.4	823	14,400
	94%	0.16%	5.7%	100%
NRPRM (MJ)	0.0	0.0	0.0	0.0
	n/a	n/a	n/a	n/a
SM (kg)	1,150	0.0	0.0	1,150
	100%	0%	0%	100%
RSF (MJ)	0.0	0.0	0.0	0.0
NRSF (MJ)	0.0	0.0	0.0	0.0
RE (MJ)	0.0	0.0	0.0	0.0
FW (m^3)	18.0	$3.67x10^{-3}$	0.165	18.2
	99%	0.02%	0.91%	100%
Wastes				
HWD (kg)	n/a	n/a	0.0	0.0
	n/a	n/a	n/a	n/a
NHWD (kg)	n/a	n/a	0.0	0.0
	n/a	n/a	n/a	n/a
HLRW (kg)	n/a	n/a	n/a	n/a
	n/a	n/a	n/a	n/a
ILLRW (kg)	n/a	n/a	n/a	n/a
	n/a	n/a	n/a	n/a
CRU (kg)	0.0	0.0	0.0	0.0
MR (kg)	133	n/a	120	253
	53%	0%	47%	100%
MER (kg)	0.0	0.0	0.0	0.0
EE (MJ)	0.0	0.0	0.0	0.0

Table 12. *Resource use and wastes results for the declared unit of unfabricated LEC steel pipe and tube product, produced at **Trenton, GA**. All values are rounded to three significant digits. Results representing energy flows are calculated using lower heating (i.e., net calorific) values.*

Parameter	Material extraction (A1)	Upstream transport (A2)	Production (A3)	Total
Resources				
RPRE (MJ)	817	10.8	178	1,010
	81%	1.1%	18%	100%
RPRM (MJ)	0.00	0.0	40.6	40.6
	0%	0%	100%	100%
NRPRE (MJ)	16,800	817	875	18,500
	91%	4%	5%	100%
NRPRM (MJ)	518	0.0	0.0	518
	100%	0%	0%	100%
SM (kg)	829	0.0	0.0	829
	100%	0%	0%	100%
RSF (MJ)	0.0	0.0	0.0	0.0
NRSF (MJ)	0.0	0.0	0.0	0.0
RE (MJ)	0.0	0.0	0.0	0.0
FW (m^3)	4.46	0.112	0.402	4.97
	90%	2.3%	8.1%	100%
Wastes				
HWD (kg)	11.2	0.0	0.00	11.2
	100%	0%	0%	100%
NHWD (kg)	34.8	0.0	0.00	34.8
	100%	0%	0%	100%
HLRW (kg)	0.0	0.0	0.0	0.0
	n/a	n/a	n/a	n/a
ILLRW (kg)	0.635	0.0	0.0	0.635
	100%	0%	0%	100%
CRU (kg)	0.0	0.0	0.0	0.0
MR (kg)	71.1	0.0	106	177
	54%	0%	46%	100%
MER (kg)	0.0	0.0	0.0	0.0
EE (MJ)	0.0	0.0	0.0	0.0

Table 13. *LCIA results for the declared unit of unfabricated LEC steel pipe and tube product, produced at* ***Casa Grande****. All values are rounded to three significant digits. Results representing energy flows are calculated using lower heating (i.e., net calorific) values.*

Impact Category	Material extraction (A1)	Upstream transport (A2)	Production (A3)	Total
IPCC AR5				
GWP100 (AR5) (kg CO2-eq)	1,150	168	57.8	1,380
	84%	12%	4.2%	100%
TRACI				
Climate change (kg CO2 eq)	1,150	165	57.1	1,370
	84%	12%	4.2%	100%
Acidification (kg SO2 eq)	4.00	1.45	0.163	5.61
	71%	26%	2.9%	100%
Eutrophication (kg N eq)	3.06	0.270	0.290	3.62
	85%	7.5%	8%	100%
Ozone depletion (kg CFC-11 eq)	$1.39x10^{-5}$	$2.13x10^{-6}$	$7.16x10^{-7}$	$1.67x10^{-5}$
	83%	13%	4.3%	100%
Smog formation (kg O3 eq)	60.9	44.0	3.53	108
	56%	41%	3.3%	100%
Fossil fuel depletion (MJ surplus)	1,040	271	86.7	1,400
	74%	19%	6.2%	100%
CML IA				
Abiotic depletion of resources, fossil (MJ, LHV)	12,200	2,020	750	15,000
	82%	13%	5%	100%

Table 14. *LCIA results for the declared unit of unfabricated LEC steel pipe and tube product, produced at* ***Chicago Heights****. All values are rounded to three significant digits. Results representing energy flows are calculated using lower heating (i.e., net calorific) values.*

Impact Category	Material extraction (A1)	Upstream transport (A2)	Production (A3)	Total
IPCC AR5				
GWP100 (AR5) (kg CO2-eq)	1,280	61.2	50.8	1,390
	92%	4.4%	3.6%	100%
TRACI				
Climate change (kg CO2 eq)	1,280	60.2	50.2	1,390
	92%	4.3%	3.6%	100%
Acidification (kg SO2 eq)	5.26	0.229	0.144	5.63
	93%	4.1%	2.6%	100%
Eutrophication (kg N eq)	6.48	$6.70x10^{-2}$	0.174	6.73
	96%	1%	2.6%	100%
Ozone depletion (kg CFC-11 eq)	$3.84x10^{-5}$	$9.85x10^{-7}$	$8.50x10^{-7}$	$4.02x10^{-5}$
	95%	2.4%	2.1%	100%
Smog formation (kg O3 eq)	63.3	5.84	1.53	70.6
	90%	8.3%	2.2%	100%
Fossil fuel depletion (MJ surplus)	1,020	120	56.9	1,200
	85%	10%	4.8%	100%
CML IA				
Abiotic depletion of resources, fossil (MJ, LHV)	13,200	844	576	14,600
	90%	5.8%	3.9%	100%

Table 15. *LCIA results for the declared unit of unfabricated LEC steel pipe and tube product, produced at* ***Elkhart****. All values are rounded to three significant digits. Results representing energy flows are calculated using lower heating (i.e., net calorific) values.*

Impact Category	Material extraction (A1)	Upstream transport (A2)	Production (A3)	Total
IPCC AR5				
GWP100 (AR5) (kg CO2-eq)	1,100	29.4	36.1	1,160
	94%	2.5%	3.1%	100%
TRACI				
Climate change (kg CO2 eq)	1,090	28.9	35.6	1,150
	94%	2.5%	3.1%	100%
Acidification (kg SO2 eq)	3.67	0.114	0.123	3.91
	94%	2.9%	3.1%	100%
Eutrophication (kg N eq)	4.30	$3.26x10^{-2}$	0.135	4.47
	96%	0.73%	3%	100%
Ozone depletion (kg CFC-11 eq)	$3.17x10^{-5}$	$4.70x10^{-7}$	$6.87x10^{-7}$	$3.29x10^{-5}$
	96%	1.4%	2.1%	100%
Smog formation (kg O3 eq)	51.6	2.95	1.51	56.1
	92%	5.3%	2.7%	100%
Fossil fuel depletion (MJ surplus)	1,050	57.1	50.0	1,160
	91%	4.9%	4.3%	100%
CML IA				
Abiotic depletion of resources, fossil (MJ, LHV)	11,400	404	467	12,300
	93%	3.3%	3.8%	100%

Table 16. *LCIA results for the declared unit of unfabricated LEC steel pipe and tube product, produced at* ***Gerald****. All values are rounded to three significant digits. Results representing energy flows are calculated using lower heating (i.e., net calorific) values.*

Impact Category	Material extraction (A1)	Upstream transport (A2)	Production (A3)	Total
IPCC AR5				
GWP100 (AR5) (kg CO2-eq)	1,270	130	95.7	1,490
	85%	8.7%	6.4%	100%
TRACI				
Climate change (kg CO2 eq)	1,270	128	94.8	1,490
	85%	8.6%	6.4%	100%
Acidification (kg SO2 eq)	4.53	0.624	0.286	5.43
	83%	11%	5.3%	100%
Eutrophication (kg N eq)	1.20	0.152	0.474	1.83
	66%	8.3%	26%	100%
Ozone depletion (kg CFC-11 eq)	$6.05x10^{-6}$	$2.11x10^{-6}$	$1.61x10^{-6}$	$9.78x10^{-6}$
	62%	22%	16%	100%
Smog formation (kg O3 eq)	76.7	17.3	4.96	98.9
	78%	17%	5%	100%
Fossil fuel depletion (MJ surplus)	966	244	75.7	1,290
	75%	19%	5.9%	100%
CML IA				
Abiotic depletion of resources, fossil (MJ, LHV)	13,400	1,730	1,050	16,200
	83%	11%	6.5%	100%

Table 17. *LCIA results for the declared unit of unfabricated LEC steel pipe and tube product, produced at **Masury**. All values are rounded to three significant digits. Results representing energy flows are calculated using lower heating (i.e., net calorific) values.*

Impact Category	Material extraction (A1)	Upstream transport (A2)	Production (A3)	Total
IPCC AR5				
GWP100 (AR5) (kg CO2-eq)	1,220	71.7	53.3	1,350
	91%	5.3%	4%	100%
TRACI				
Climate change (kg CO2 eq)	1,210	70.5	52.6	1,340
	91%	5.3%	3.9%	100%
Acidification (kg SO2 eq)	4.85	0.269	0.159	5.27
	92%	5.1%	3%	100%
Eutrophication (kg N eq)	4.38	$7.85x10^{-2}$	0.200	4.66
	94%	1.7%	4.3%	100%
Ozone depletion (kg CFC-11 eq)	$6.70x10^{-5}$	$1.15x10^{-6}$	$8.46x10^{-7}$	$6.90x10^{-5}$
	97%	1.7%	1.2%	100%
Smog formation (kg O3 eq)	64.5	6.84	2.56	73.9
	87%	9.3%	3.5%	100%
Fossil fuel depletion (MJ surplus)	861	140	57.4	1,060
	81%	13%	5.4%	100%
CML IA				
Abiotic depletion of resources, fossil (MJ, LHV)	12,200	989	593	13,800
	89%	7.2%	4.3%	100%

Table 18. *LCIA results for the declared unit of unfabricated LEC steel pipe and tube product, produced at **Sinton**. All values are rounded to three significant digits. Results representing energy flows are calculated using lower heating (i.e., net calorific) values.*

Impact Category	Material extraction (A1)	Upstream transport (A2)	Production (A3)	Total
IPCC AR5				
GWP100 (AR5) (kg CO2-eq)	1,000	1.75	52.6	1,060
	95%	0.17%	5%	100%
TRACI				
Climate change (kg CO2 eq)	990	1.73	52.0	1,040
	95%	0.17%	5%	100%
Acidification (kg SO2 eq)	2.78	$1.01x10^{-2}$	0.109	2.90
	96%	0.35%	3.7%	100%
Eutrophication (kg N eq)	3.80	$2.29x10^{-3}$	0.299	4.10
	93%	0.056%	7.3%	100%
Ozone depletion (kg CFC-11 eq)	$1.34x10^{-5}$	$2.58x10^{-8}$	$5.87x10^{-7}$	$1.40x10^{-5}$
	96%	0.18%	4.2%	100%
Smog formation (kg O3 eq)	43.1	0.288	1.21	44.6
	97%	0.65%	2.7%	100%
Fossil fuel depletion (MJ surplus)	1,170	3.18	76.9	1,250
	94%	0.25%	6.1%	100%
CML IA				
Abiotic depletion of resources, fossil (MJ, LHV)	10,800	23.0	675	11,500
	94%	0.2%	5.9%	100%

Table 19. *LCIA results for the declared unit of unfabricated LEC steel pipe and tube product, produced at* ***Trenton, GA****. All values are rounded to three significant digits. Results representing energy flows are calculated using lower heating (i.e., net calorific) values.*

Impact Category	Material extraction (A1)	Upstream transport (A2)	Production (A3)	Total
IPCC AR5				
GWP100 (AR5) (kg CO2-eq)	1,170	58.4	50.9	1,280
	91%	4.6%	4%	100%
TRACI				
Climate change (kg CO2 eq)	1,170	57.4	50.2	1,280
	92%	4.5%	3.9%	100%
Acidification (kg SO2 eq)	4.64	0.219	0.121	4.98
	93%	4.4%	2.4%	100%
Eutrophication (kg N eq)	0.305	$6.40x10^{-2}$	0.172	0.541
	56%	12%	32%	100%
Ozone depletion (kg CFC-11 eq)	$3.26x10^{-6}$	$9.40x10^{-7}$	$7.77x10^{-7}$	$4.98x10^{-6}$
	66%	19%	16%	100%
Smog formation (kg O3 eq)	77.3	5.57	3.13	86.0
	90%	6.5%	3.6%	100%
Fossil fuel depletion (MJ surplus)	1,260	114	76.3	1,450
	87%	7.9%	5.3%	100%
CML IA				
Abiotic depletion of resources, fossil (MJ, LHV)	13,800	806	654	15,300
	90%	5.3%	4.3%	100%

The PCR requires the calculation of carbon emissions and removals. Biogenic carbon removals are included in the packaging, while emissions are not included in the A1-A3 modules as no biogenic materials are used in the product and packaging end of life is outside the scope.

Table 20. *Biogenic carbon results for the declared unit of unfabricated steel pipe and tube.*

Parameter	Module		
	A1	A2	A3
Biogenic Carbon Removal from Product	0.0	0.0	0.0
Biogenic Carbon Emission from Product	0.0	0.0	0.0
Biogenic Carbon Removal from Packaging	0.0	0.0	Casa Grande: 182 kg CO2/mt Chicago Heights: 0.00 kg CO2/mt Elkhart: 6.51 kg CO2/mt Gerald: 34.7 kg CO2/mt Masury: 8.07 kg CO2/mt Sinton: 0.00 kg CO2/mt Trenton: 5.00 kg CO2/mt
Biogenic Carbon Emission from Packaging	0.0	0.0	0.0
Biogenic Carbon Emission from Combustion of Waste from Renewable Sources Used in Production	0.0	0.0	Neg.

6. LCA: Interpretation

The contributions to total impact indicator results are dominated by the steelmaking phase (A1), followed by either the tube mill (A3) or transportation of slit steel to the pipe mill (A2), depending upon the indicator. For the steel products, generally speaking, the contribution to impacts from steelmaking (A1) was the most significant across impact indicators, contributing 55-99% of impacts.

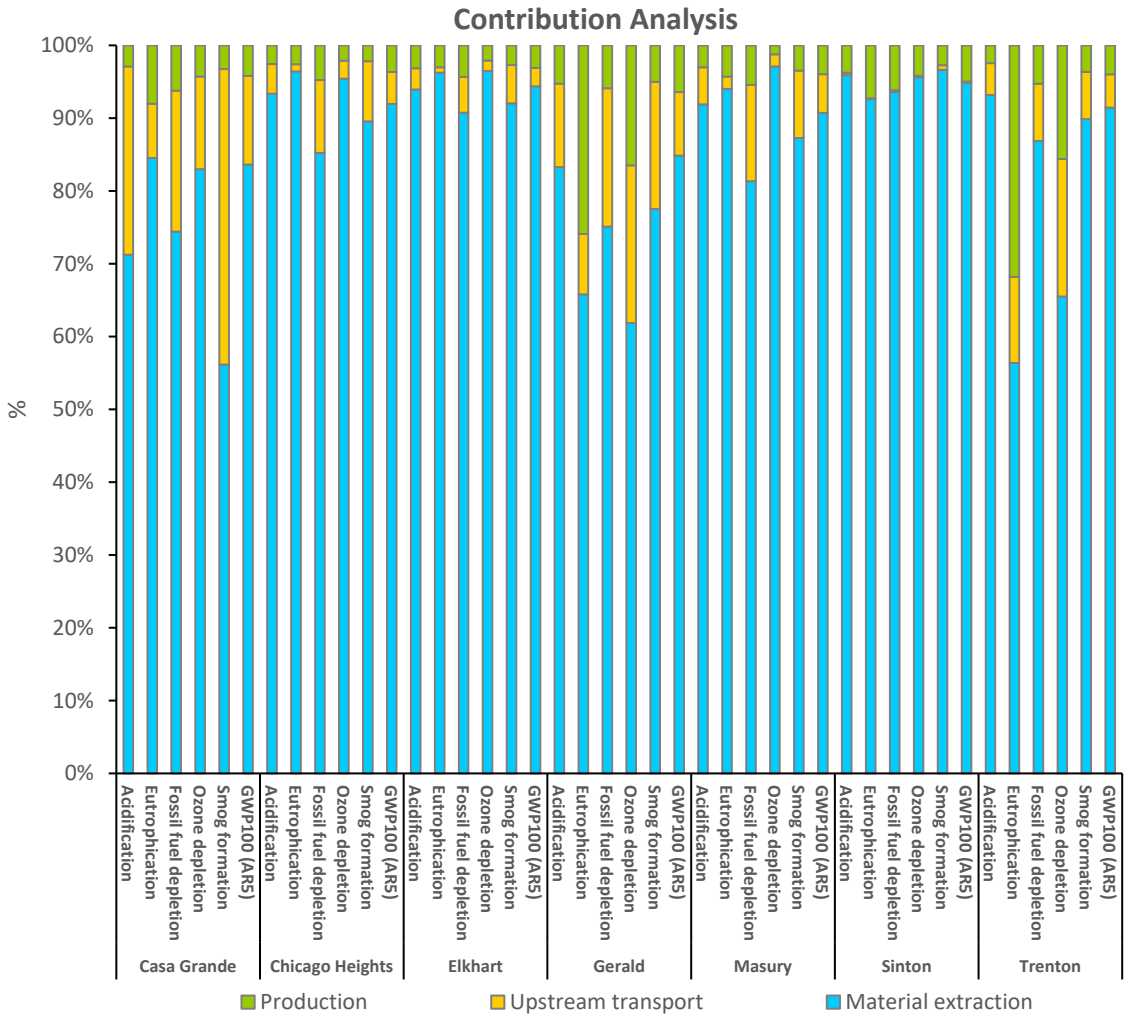

Figure 2. *Contribution analysis for LEC steel pipe and tube, produced by BMT (TRACI 2.1).*

Limitations

To the extent possible, EPDs representing the hot rolled coil were used to represent the appropriate supplier. In the absence of primary data, Ecoinvent datasets were used to represent the appropriate steelmaking technology and hot rolling.

7. Additional Environmental Information

All of the Bull Moose Tube manufacturing facilities are ISO 9001-2015 certified.

8. References

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For more information, contact:

Bull Moose Tube

+1.888.227.5430 | www.bullmoosetube.com | techsupport@bullmoose.com

Casa Grande, AZ
1001 North Jefferson Ave.
Casa Grande, AZ 8512

Chicago Heights; IL
555 E 16th St.
Chicago Heights, IL 60411

Elkhart, IN
29851 County Rd. 20 West
Elkhart, IN 46517

Gerald, MO
406 E Industrial Dr./Hwy. 50
Gerald, MO 63037

Masury, OH
1433 Standard Ave. SE
Masury, OH 44438

Sinton, TX
8534 Hwy 89
Sinton, TX 78387

Trenton, GA
195 North Industrial Dr.
Trenton, GA 30752

SCS Global Services

2000 Powell Street, Ste. 600, Emeryville, CA 94608 USA

Main +1.510.452.8000 | fax +1.510.452.8001