Environmental Product Declaration

according to ISO 21930

LF25AUB-Z3

Lead Free Adjustable Pressure Reducing Valve

Product Family: Regulators

Sustainability Mission Statement

A Safer World is a More Sustainable World

Watts was founded on a simple premise: the water we use every day should be delivered safely and reliably. We influenced the codes that shaped the way the world uses water. Our goal has always been to be good stewards of this critical resource while creating solutions that keep our customers safe where they live, work, and play. Watts believes a safer world is a more sustainable world.

EPD Scope Cradle to Grave

Reference Standards

Core PCR	PCR for Building-Related Products and Services Part A v.3.2
Sub-Category PCR	UL Part B: Kitchen and Bath Fixture Fittings and Accessory Products v.1

Product Specifications

Functional Unit: 1 packaged product

Model Size	Packaged Weight (kg)
0.5" LF25AUB-Z3	1.425
0.75" LF25AUB-Z3	1.546
1.0" LF25AUB-Z3	2.228
1.25" LF25AUB-Z3	4.0389
1.5" LF25AUB-Z3	4.256
2.0" LF25AUB-Z3	6.08

Product Service Life	20 years
Building Service Life	75 years

Manufacturing Specifications

Location	Franklin, NH
Energy Source	100% Offsite Wind Power RECs*

*Model results shows Grid results with REC results shown in Further Information section at end

Greenhouse Gas Emission

Model Size	IPCC AR5 GWP 100 A1-A3 (kg CO_2 eq)
0.5" LF25AUB-Z3	19.2
0.75" LF25AUB-Z3	22.6
1.0" LF25AUB-Z3	41
1.25" LF25AUB-Z3	65.3
1.5" LF25AUB-Z3	68.1
2.0" LF25AUB-Z3	100

Verified by:

SMART EPD

ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH ISO 14025 AND ISO 21930:2017

SmartEPD-2024-023-0169-01

LF25AUB-Z3 - Water Pressure Reducing Valve

Watts Water Technologies, Inc.

SMART EPD CERTIFIED ENVIRONMENTAL PRODUCT DECLARATION

Date of Issue: Sep 30, 2024

Expiration: Sep 30, 2029

Last updated: Sep 30, 2024

General Information

Watts

815 Chestnut St, North Andover, MA 01845

1-978-689-6066

watts.com

Product Name:	LF25AUB-Z3 - Water Pressure Reducing Valve
Functional Unit:	1 unit 1 packaged product
Declaration Number:	SmartEPD-2024-023-0169-01
Date of Issue:	September 30, 2024
Expiration:	September 30, 2029
Last updated:	September 30, 2024
EPD Scope:	Cradle to grave A1 - A3, A4, A5, B1 - B7, C1 - C4
Market(s) of Applicability:	North America, Europe

Reference Standards

Standard(s):	ISO 14025 and ISO 21930:2017
Core PCR:	PCR for Building-Related Products and Services Part A v.3.2 Date of issue: December 12, 2018
Sub-category PCR:	UL Part B: Kitchen and Bath Fixture Fittings and Accessory Products v.1 Date of issue: October 08, 2020 Valid until: October 08, 2025
Sub-category PCR review panel:	Contact Smart EPD for more information.
General Program Instructions:	Smart EPD General Program Instructions v.1.0, November 2022

Verification Information

LCA Author/Creator:	Olivia Tsamparlis | Watts Water | olivia.tsamparlis@wattswater.com Vas Gnanadoss | Watts Water | vasanth.gnanadoss@wattswater.com
EPD Program Operator:	Smart EPD | info@smartepd.com | www.smartepd.com | 585 Grove St., Ste. 145 PMB 966, Herndon, VA 20170, USA

Verification:

Independent critical review of the LCA and data, according to ISO 14044 and ISO 14071 : External

Gaspard Philis | LCA.no | gaspard@lca.no

Independent external verification of EPD, according to ISO 14025 and reference PCR(s) : External

Gaspard Philis | LCA.no | gaspard@lca.no

Limitations, Liability, and Ownership

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 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 results for upstream or downstream of the life cycle stages declared. The EPD owner has sole ownership, liability, and responsibility for the EPD.

Organization Information

Watts Water Technologies, Inc. (Watts) is a global leader of quality water solutions for residential, industrial, municipal, and commercial settings. Our family of brands offers one of the most varied product lines in the world, with world-class, water-related solutions focused on Drainage, HVAC and Hot Water, Plumbing & Flow Control and Water Quality & Rainwater Harvesting.

Further information can be found at: https://www.watts.com/

Product Description

Pressure Reducing Valves are designed to reduce incoming water or steam pressure to a safer constant predetermined downstream level. This 3/4 inch lead free brass water pressure reducing valve is designed to reduce incoming water pressure to protect plumbing systems and reduce water consumption for commercial, industrial, and residential applications. The easy maintenance assembly consists of a replaceable seat module, NPT threaded female union inlet by NPT female outlet and a bypass feature to control thermal expansion pressure.

Further information can be found at: https://www.watts.com/products/plumbing-flow-control-solutions/pressure-reducing-valves/water-pressure-reducing-valves/lf25aub-z3/lf

Product Information

Functional Unit:	1 unit 1 packaged product
Mass:	6.08 kg
Reference Service Life:	20 Years
Product Specificity:	✗ Product Average ✓ Product Specific

Averaging:

Averaging was not conducted for this EPD. When a single value is shown it represents the largest value, or most conservative figure. When a range is shown it represents the smallest and largest extremes of a value for all sizes considered.

Plants

Franklin Manufacturing Plant
583 S Main St, Franklin, NH 03235, USA

Product Specifications

Product SKU(s):	009217, 0009257, 009309, 009392, 009431, 009465
Product Classification Codes:	Masterformat - 15400 UNSPSC - 401416 EC3 - Plumbing -> PlumbingEquipment EC3 - Plumbing -> PlumbingFixtures -> OtherPlumbingFixtures

Material Composition

Material/Component Category	Origin	% Mass
Body_Bronze	US	45-48
Spring Cage_Bronze	US	13-18
Hex Screw_Stainless Steel	CN	2-7
Nut_Brass	CN	3-8
Spring_Stainless Steel	US	2-3
Tailpiece_Brass	CN	3
Rivet_Brass	US	0-2
Disc Holder_Brass	CN	2-2
Plug_Brass	CN	2-6
Plug_Bronze	CN	2-2
Bushing_Acetal	US	0-2
Screw_Stainless Steel	TH	0-2
Paint_Acrylic	US	0-1
Plate_Steel	US	1-1
Strainer_Stainless Steel	US	1
Washer_Steel	US	1
Washer_Steel	US	0-1
Nut_Steel	CN	0-1
Seat Rng_Stainless Steel	US	0-1
Spring Washer_Brass	US	0-1
Oring_EPDM	US	0-1

Packaging Material	Origin	kg Mass
Paper	GLO	0.32

Biogenic Carbon Content	kg C per unit
Biogenic carbon content in product	None
Biogenic carbon content in accompanying packaging	0.18

Hazardous Materials
No regulated hazardous or dangerous substances are included in this product.

EPD Data Specificity

Primary Data Year:	2022
Manufacturing Specificity:	✗ Industry Average ✗ Manufacturer Average ✓ Facility Specific

Software and LCI Data Sources

LCA Software:	SimaPro v. 9.5
LCI Foreground Database(s):	Ecoinvent v. 3.9.1 | RoW | Cut-Off by Classification
LCI Background Database(s):	Ecoinvent v. 3.9.1 | RoW | Cut-Off by Classification

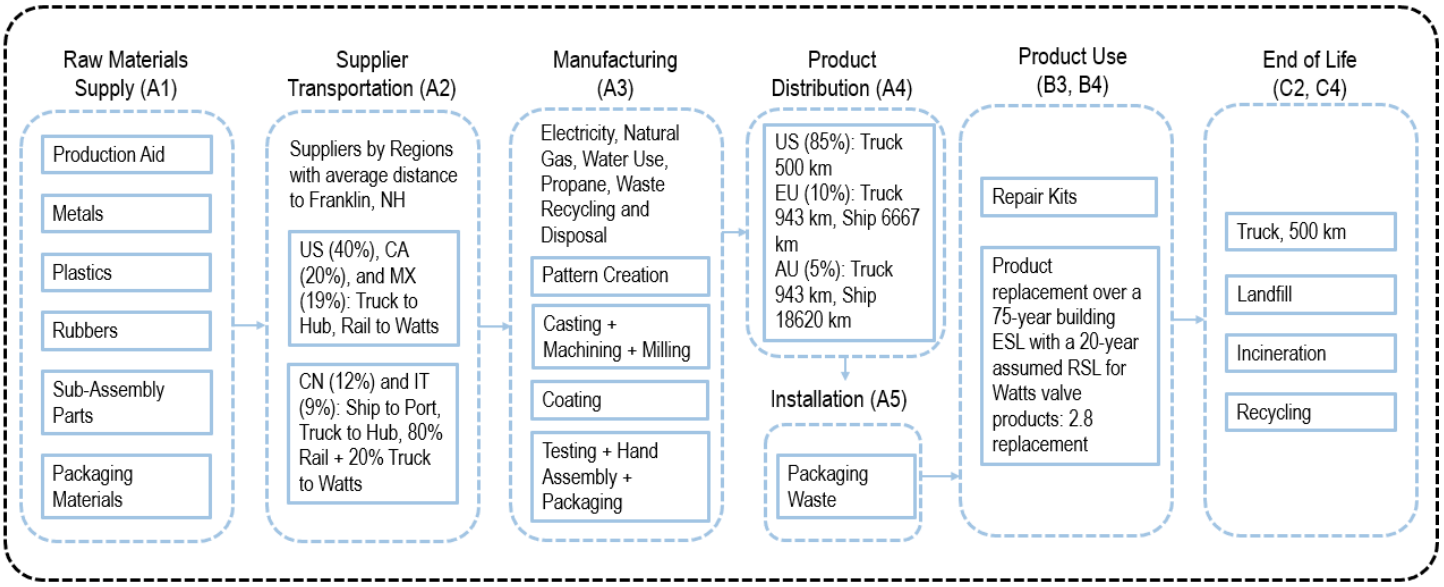
Renewable Electricity

Renewable electricity is used:	Yes
Electricity Source:	Offsite
Renewable type:	Wind
Percent of EPD Owner's product-related electricity covered:	100 %
Commitment pledged for entire EPD validity period:	Yes

System Boundary

Production	A1	Raw material supply	✓
	A2	Transport	✓
	A3	Manufacturing	✓
Construction	A4	Transport to site	✓
	A5	Assembly / Install	✓
Use	B1	Use	✓
	B2	Maintenance	✓
	B3	Repair	✓
	B4	Replacement	✓
	B5	Refurbishment	✓
	B6	Operational Energy Use	✓
	B7	Operational Water Use	✓
End of Life	C1	Deconstruction	✓
	C2	Transport	✓
	C3	Waste Processing	✓
	C4	Disposal	✓
Benefits & Loads Beyond System Boundary	D	Recycling, Reuse Recovery Potential	ND

Product Flow Diagram



Life Cycle Module Descriptions

The system boundary for this study is cradle-to-grave with modules A1-C4, covering supplied raw materials (A1), transport from suppliers to Watts (A2), production of manufactured products (A3), transport from Watts to customers (A4), product's installation (A5), product repair (B3), replacement (B4), transport to end-of-life facilities (C2), and disposal of the product (C4).

Each module includes provision of all relevant materials, products, and energy. Potential impacts and aspects related to wastage (i.e. production, transport and waste processing and end-of-life stage of lost waste products and materials) are considered in the module in which the wastage occurs.

No impacts from the product's use (B1, B2, B5-B7) or from demolition (C1) or waste processing (C3) are included. Waste processing is not included because the product is sent directly to disposal (C4). The installation module A5 contains only the packaging waste, other impacts in this module are declared as having zero impact as the process is manual using hand tools that don't consume energy. The use stage modules B1, B2, B5 to B7 are declared as having zero impacts as there are no direct energy or water use during consume use, nor is any direct emissions from the valve products once they are installed. The other use stage modules account for B3, materials needed for repair (i.e., repair kits description) and B4, replacing the valve to match building service life.

LCA Discussion

Allocation Procedure

While conducting an LCA, if the life cycles of more than one product are connected, allocation of the process inputs should be avoided by using the system boundary expansion approach. In accordance with the ISO 14040 series and PCR, mass should be used as the primary basis for co-product allocation. The allocations of relevance for calculation (appropriation of impacts across various products) shall be indicated, at least:

- Allocation in the use of recycled and/or secondary raw materials.
- Allocation of energy, ancillary and operating materials used for individual products in a factory.

No multi-output allocation was necessary in the foreground of the study. Allocation of secondary data taken from ecoinvent v3.9.1 cut-off by classification has allocation applied to it.

Given that raw materials are key contributors to environmental performance, mass-based allocation of plant overhead utility consumption, resource use and waste generation was applied for Franklin facility, where all products in this study are manufactured. Operational manufacturing energy and water inputs and waste stream are allocated to total pound of product output per product category based on earned hours, then to 1 pound of product. No allocation is required for products at end-of-life: product scrap and packaging waste at the job site is assumed to be inert in landfills, so no landfill gas is produced from product waste.

Cut-off Procedure

For the processes within the system boundary all energy and material flows have been included in the model. PCR allows for any mass flow to be omitted if it is less than 1%, with cumulative flows not exceeding 5%. In situations where gathering accurate weight data for smaller components acquired from suppliers, such as o-rings or tiny metal inserts, presents a challenge, the total weight of materials listed in the Bill of Materials (BOM) might not precisely align with the product's total weight as recorded in the system. To accommodate this discrepancy, a 5% cut-off criterion (note 1) has been implemented in the A1, Raw Material Calculation process. This approach helps ensure more accurate and realistic accounting of materials, despite the challenges in obtaining exact weights of smaller parts.

For other life cycle modules, this study includes 100% of the material flows; no known flows are excluded. Results from manufacturing are limited to the primary data obtained from product throughput and annual reports. The amount spent on production aides was minimal, so they were considered negligible and not included. All upstream and downstream activities are included using a combination of primary and secondary data. While the majority of inventory data are sourced from primary resources, representative proxies are used to close gaps in the absence of primary data.

This study uses the cut-off approach method for recycling. According to this approach, the first life of a material bears the environmental burdens of its production (e.g., raw material extraction and processing) and the second life (e.g., scrap input) bears the burdens of refurbishment (e.g., collection and refining of scrap). The burdens from waste treatment are taken by the life after which they occur.

Note 1: In the study, we have accounted for 100% of the materials by mass as detailed in the product's bill of materials, which includes not only the core components but also production aids and packaging. However, when aggregating the actual weights for each specific part, there may be a slight variance of up to +/- 5% between the sum of the weights of all components and the total product weight recorded in Watt's internal system. It is important to note that the internal system's figures are based on approximate product specifications and serve as a reference. Therefore, any perceived discrepancies or a 5% cut-off are due to these approximations and do not reflect omissions in our materials accounting.

Data Quality Discussion

Life cycle inventory data used in this study are evaluated based on three categories: precision and completeness, consistency and reproducibility, and representativeness.

Precision and completeness: Foreground data are sourced from primary information provided by the client and has been reviewed internally to ensure precision and completeness. In order to balance out seasonal variations, operations data over a 12-month period is used to represent production activities. In addition, key model input such as mass balance, energy balance and emission inventory are reviewed by TrueNorth Collective team.
Ecoinvent v3.9.1 cut-off by classification is used as the main database for background data. This version is published in 2023. Ecoinvent is widely used in research and industry to support life cycle assessment practices. Each version of this database goes through thorough review process and documentation of precision and completeness is available by the provider.

Consistency and reproducibility: To ensure consistency, primary data were collected at the same level of granularity. All input and output information, modelling assumptions and dataset choices are provided in this report for the purpose of reproducibility.

Representativeness: Refer to the sections above for details about representativeness.

Results

Environmental Impact Assessment Results

IPCC AR5 GWP 100, TRACI 2.1

per 1 unit.

LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

0.5 LF25AUB-Z3

Impact Category	Method	Unit	A1A2A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
GWP-total	IPCC AR5 GWP 100	kg CO2 eq	19.2	0.221	0.102	ND	ND	0.344	54.7	ND	ND	ND	ND	0.0366	ND	0.0268
GWP-total	TRACI 2.1	kg CO2 eq	18.8	0.218	0.0849	ND	ND	0.313	53.7	ND	ND	ND	ND	0.0361	ND	0.0263
ODP	TRACI 2.1	kg CFC 11 eq	0.000017	3.65e-9	1.74e-10	ND	ND	1.07e-8	0.0000477	ND	ND	ND	ND	6.05e-10	ND	4.44e-10
AP	TRACI 2.1	kg SO2 eq	0.27	0.00119	0.0000626	ND	ND	0.000894	0.76	ND	ND	ND	ND	0.000196	ND	0.000188
EP-fw	TRACI 2.1	kg N eq	0.208	0.000225	0.000461	ND	ND	0.00149	0.583	ND	ND	ND	ND	0.0000373	ND	0.0000623
POCP	TRACI 2.1	kg O3 eq	1.51	0.0332	0.00144	ND	ND	0.0126	4.36	ND	ND	ND	ND	0.00549	ND	0.00296

Abbreviations:

GWP = Global Warming Potential, 100 years (may also be denoted as GWP-total, GWP-fossil (fossil fuels), GWP-biogenic (biogenic sources), GWP-luluc (land use and land use change)), ODP = Ozone Depletion Potential, AP = Acidification Potential, EP = Eutrophication Potential, SFP = Smog Formation Potential, POCP = Photochemical oxidant creation potential, ADP-Fossil = Abiotic depletion potential for fossil resources, ADP-Minerals&Metals = Abiotic depletion potential for non-fossil resources, WDP = Water deprivation potential, PM = Particular Matter Emissions, IRP = Ionizing radiation, human health, ETP-fw = Eco-toxicity (freshwater), HTP-c = Human toxicity (cancer), HTP-nc = Human toxicity (non-cancer), SQP = Soil quality index.

per 1 unit.

0.75 LF25AUB-Z3

Impact Category	Method	Unit	A1A2A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
GWP-total	IPCC AR5 GWP 100	kg CO2 eq	22.6	0.24	0.103	ND	ND	0.929	64.6	ND	ND	ND	ND	0.0402	ND	0.0295
GWP-total	TRACI 2.1	kg CO2 eq	22.3	0.236	0.0858	ND	ND	0.888	63.6	ND	ND	ND	ND	0.0397	ND	0.0289
ODP	TRACI 2.1	kg CFC 11 eq	0.000017	3.96e-9	1.76e-10	ND	ND	0.0000167	0.0000477	ND	ND	ND	ND	6.65e-10	ND	4.89e-10
AP	TRACI 2.1	kg SO2 eq	0.678	0.00129	0.0000633	ND	ND	0.0013	1.9	ND	ND	ND	ND	0.000216	ND	0.000207
EP-fw	TRACI 2.1	kg N eq	0.516	0.000244	0.000465	ND	ND	0.00171	1.45	ND	ND	ND	ND	0.000041	ND	0.0000685
POCP	TRACI 2.1	kg O3 eq	2.91	0.036	0.00145	ND	ND	0.0159	8.29	ND	ND	ND	ND	0.00604	ND	0.00326

Abbreviations:

GWP = Global Warming Potential, 100 years (may also be denoted as GWP-total, GWP-fossil (fossil fuels), GWP-biogenic (biogenic sources), GWP-luluc (land use and land use change)), ODP = Ozone Depletion Potential, AP = Acidification Potential, EP = Eutrophication Potential, SFP = Smog Formation Potential, POCP = Photochemical oxidant creation potential, ADP-Fossil = Abiotic depletion potential for fossil resources, ADP-Minerals&Metals = Abiotic depletion potential for non-fossil resources, WDP = Water deprivation potential, PM = Particular Matter Emissions, IRP = Ionizing radiation, human health, ETP-fw = Eco-toxicity (freshwater), HTP-c = Human toxicity (cancer), HTP-nc = Human toxicity (non-cancer), SQP = Soil quality index.

per 1 unit.

1 LF25AUB-Z3

Impact Category	Method	Unit	A1A2A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
GWP-total	IPCC AR5 GWP 100	kg CO2 eq	41	0.345	0.0811	ND	ND	0.648	116	ND	ND	ND	ND	0.063	ND	0.0462
GWP-total	TRACI 2.1	kg CO2 eq	40.3	0.341	0.0676	ND	ND	0.61	114	ND	ND	ND	ND	0.0621	ND	0.0453
ODP	TRACI 2.1	kg CFC 11 eq	0.0000211	5.71e-9	1.38e-10	ND	ND	1.47e-8	0.000059	ND	ND	ND	ND	1.04e-9	ND	7.65e-10
AP	TRACI 2.1	kg SO2 eq	0.998	0.00185	0.0000499	ND	ND	0.00211	2.8	ND	ND	ND	ND	0.000338	ND	0.000324
EP-fw	TRACI 2.1	kg N eq	0.765	0.000352	0.000367	ND	ND	0.00209	2.14	ND	ND	ND	ND	0.0000643	ND	0.000107
POCP	TRACI 2.1	kg O3 eq	4.6	0.0518	0.00115	ND	ND	0.0282	13.1	ND	ND	ND	ND	0.00946	ND	0.0051

Abbreviations:

GWP = Global Warming Potential, 100 years (may also be denoted as GWP-total, GWP-fossil (fossil fuels), GWP-biogenic (biogenic sources), GWP-luluc (land use and land use change)), ODP = Ozone Depletion Potential, AP = Acidification Potential, EP = Eutrophication Potential, SFP = Smog Formation Potential, POCP = Photochemical oxidant creation potential, ADP-Fossil = Abiotic depletion potential for fossil resources, ADP-Minerals&Metals = Abiotic depletion potential for non-fossil resources, WDP = Water deprivation potential, PM = Particular Matter Emissions, IRP = Ionizing radiation, human health, ETP-fw = Eco-toxicity (freshwater), HTP-c = Human toxicity (cancer), HTP-nc = Human toxicity (non-cancer), SQP = Soil quality index.

per 1 unit.

1.25 LF25AUB-Z3

Impact Category	Method	Unit	A1A2A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
GWP-total	IPCC AR5 GWP 100	kg CO2 eq	65.3	0.626	0.121	ND	ND	0.527	185	ND	ND	ND	ND	0.116	ND	0.0851
GWP-total	TRACI 2.1	kg CO2 eq	64.2	0.618	0.101	ND	ND	0.493	182	ND	ND	ND	ND	0.115	ND	0.0836
ODP	TRACI 2.1	kg CFC 11 eq	0.00000107	1.04e-8	2.07e-10	ND	ND	1.03e-8	0.00000304	ND	ND	ND	ND	1.92e-9	ND	1.41e-9
AP	TRACI 2.1	kg SO2 eq	1.54	0.00336	0.0000744	ND	ND	0.00175	4.31	ND	ND	ND	ND	0.000623	ND	0.000598
EP-fw	TRACI 2.1	kg N eq	1.18	0.000639	0.000547	ND	ND	0.00198	3.3	ND	ND	ND	ND	0.000119	ND	0.000198
POCP	TRACI 2.1	kg O3 eq	7.12	0.094	0.00171	ND	ND	0.0234	20.3	ND	ND	ND	ND	0.0174	ND	0.0094

Abbreviations:

GWP = Global Warming Potential, 100 years (may also be denoted as GWP-total, GWP-fossil (fossil fuels), GWP-biogenic (biogenic sources), GWP-luluc (land use and land use change)), ODP = Ozone Depletion Potential, AP = Acidification Potential, EP = Eutrophication Potential, SFP = Smog Formation Potential, POCP = Photochemical oxidant creation potential, ADP-Fossil = Abiotic depletion potential for fossil resources, ADP-Minerals&Metals = Abiotic depletion potential for non-fossil resources, WDP = Water deprivation potential, PM = Particular Matter Emissions, IRP = Ionizing radiation, human health, ETP-fw = Eco-toxicity (freshwater), HTP-c = Human toxicity (cancer), HTP-nc = Human toxicity (non-cancer), SQP = Soil quality index.

per 1 unit.

1.5 LF25AUB-Z3

Impact Category	Method	Unit	A1A2A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
GWP-total	IPCC AR5 GWP 100	kg CO2 eq	68.1	0.66	0.121	ND	ND	0.766	193	ND	ND	ND	ND	0.123	ND	0.0901
GWP-total	TRACI 2.1	kg CO2 eq	67	0.651	0.101	ND	ND	0.726	190	ND	ND	ND	ND	0.121	ND	0.0884
ODP	TRACI 2.1	kg CFC 11 eq	0.00000112	1.09e-8	2.06e-10	ND	ND	1.57e-8	0.00000319	ND	ND	ND	ND	2.03e-9	ND	1.49e-9
AP	TRACI 2.1	kg SO2 eq	1.6	0.00354	0.0000743	ND	ND	0.00273	4.5	ND	ND	ND	ND	0.000659	ND	0.000632
EP-fw	TRACI 2.1	kg N eq	1.23	0.000673	0.000546	ND	ND	0.00253	3.44	ND	ND	ND	ND	0.000125	ND	0.000209
POCP	TRACI 2.1	kg O3 eq	7.43	0.0991	0.00171	ND	ND	0.0359	21.2	ND	ND	ND	ND	0.0185	ND	0.00995

Abbreviations:

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per 1 unit.

2 LF25AUB-Z3

Impact Category	Method	Unit	A1A2A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
GWP-total	IPCC AR5 GWP 100	kg CO2 eq	100	0.942	0.133	ND	ND	1.05	285	ND	ND	ND	ND	0.179	ND	0.131
GWP-total	TRACI 2.1	kg CO2 eq	98.8	0.93	0.111	ND	ND	1.01	280	ND	ND	ND	ND	0.176	ND	0.129
ODP	TRACI 2.1	kg CFC 11 eq	0.00000166	1.56e-8	2.26e-10	ND	ND	2.07e-8	0.0000047	ND	ND	ND	ND	2.95e-9	ND	2.17e-9
AP	TRACI 2.1	kg SO2 eq	2.34	0.00506	0.0000816	ND	ND	0.00404	6.58	ND	ND	ND	ND	0.000958	ND	0.000919
EP-fw	TRACI 2.1	kg N eq	1.79	0.000962	0.0006	ND	ND	0.00332	5.03	ND	ND	ND	ND	0.000182	ND	0.000304
POCP	TRACI 2.1	kg O3 eq	10.9	0.142	0.00187	ND	ND	0.0521	31	ND	ND	ND	ND	0.0268	ND	0.0145

Abbreviations:

GWP = Global Warming Potential, 100 years (may also be denoted as GWP-total, GWP-fossil (fossil fuels), GWP-biogenic (biogenic sources), GWP-luluc (land use and land use change)), ODP = Ozone Depletion Potential, AP = Acidification Potential, EP = Eutrophication Potential, SFP = Smog Formation Potential, POCP = Photochemical oxidant creation potential, ADP-Fossil = Abiotic depletion potential for fossil resources, ADP-Minerals&Metals = Abiotic depletion potential for non-fossil resources, WDP = Water deprivation potential, PM = Particular Matter Emissions, IRP = Ionizing radiation, human health, ETP-fw = Eco-toxicity (freshwater), HTP-c = Human toxicity (cancer), HTP-nc = Human toxicity (non-cancer), SQP = Soil quality index.

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 or EN 15804. EPDs are not comparative assertions and are either not comparable or have limited comparability when they have different system boundaries. 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.

Resource Use Indicators

per 1 unit.

0.5 LF25AUB-Z3

Indicator	Unit	A1A2A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
PERE	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PERM	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PERT	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PENRE	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PENRM	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PENRT	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RPRE	MJ	40.4	0.0395	0.00282	ND	ND	1.41	113	ND	ND	ND	ND	0.00653	ND	0.023
RPRM	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RPRT	MJ	40.4	0.0395	0.00282	ND	ND	1.41	113	ND	ND	ND	ND	0.00653	ND	0.023
NRPRE	MJ	310	3.32	0.143	ND	ND	3.76	881	ND	ND	ND	ND	0.55	ND	0.446
NRPRM	MJ	1.73	ND	ND	ND	ND	ND	4.84	ND	ND	ND	ND	ND	ND	ND
NRPRT	MJ	312	3.32	0.143	ND	ND	3.76	886	ND	ND	ND	ND	0.55	ND	0.446
ADP-fossil	MJ	27.3	0.438	0.0182	ND	ND	0.421	78	ND	ND	ND	ND	0.0726	ND	0.0453
SM	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RSF	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NRSF	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FW	m3	0.000436	ND	ND	ND	ND	ND	0.00122	ND	ND	ND	ND	ND	ND	ND

Abbreviations:

RPRE or PERE = Renewable primary resources used as energy carrier (fuel), RPRM or PERM = Renewable primary resources with energy content used as material, RPRT or PERT = Total use of renewable primary resources with energy content, NRPRE or PENRE = Non-renewable primary resources used as an energy carrier (fuel), NRPRM or PENRM = Non-renewable primary resources with energy content used as material, NRPRT or PENRT = Total non-renewable primary resources with energy content, SM: Secondary materials, RSF = Renewable secondary fuels, NRSF = Non-renewable secondary fuels, RE = Recovered energy, ADPF = Abiotic depletion potential, FW = Use of net freshwater resources, VOCs = Volatile Organic Compounds.

per 1 unit.

0.75 LF25AUB-Z3

Indicator	Unit	A1A2A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
PERE	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PERM	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PERT	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PENRE	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PENRM	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PENRT	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RPRE	MJ	59.2	0.0428	0.00285	ND	ND	1.57	166	ND	ND	ND	ND	0.00719	ND	0.0253
RPRM	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RPRT	MJ	59.2	0.0428	0.00285	ND	ND	1.57	166	ND	ND	ND	ND	0.00719	ND	0.0253
NRPRE	MJ	355	3.6	0.145	ND	ND	3.38	1010	ND	ND	ND	ND	0.605	ND	0.49
NRPRM	MJ	1.9	ND	ND	ND	ND	ND	5.32	ND	ND	ND	ND	ND	ND	ND
NRPRT	MJ	357	3.6	0.145	ND	ND	3.38	1010	ND	ND	ND	ND	0.605	ND	0.49
ADP-fossil	MJ	30.7	0.475	0.0184	ND	ND	0.312	87.8	ND	ND	ND	ND	0.0798	ND	0.0498
SM	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RSF	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NRSF	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FW	m3	0.00048	ND	ND	ND	ND	ND	0.00134	ND	ND	ND	ND	ND	ND	ND

Abbreviations:

RPRE or PERE = Renewable primary resources used as energy carrier (fuel), RPRM or PERM = Renewable primary resources with energy content used as material, RPRT or PERT = Total use of renewable primary resources with energy content, NRPRE or PENRE = Non-renewable primary resources used as an energy carrier (fuel), NRPRM or PENRM = Non-renewable primary resources with energy content used as material, NRPRT or PENRT = Total non-renewable primary resources with energy content, SM: Secondary materials, RSF = Renewable secondary fuels, NRSF = Non-renewable secondary fuels, RE = Recovered energy, ADPF = Abiotic depletion potential, FW = Use of net freshwater resources, VOCs = Volatile Organic Compounds.

per 1 unit.

1.0 LF25AUB-Z3

Indicator	Unit	A1A2A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
PERE	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PERM	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PERT	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PENRE	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PENRM	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PENRT	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RPRE	MJ	94.9	0.0617	0.00225	ND	ND	1.74	266	ND	ND	ND	ND	0.0113	ND	0.0396
RPRM	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RPRT	MJ	94.9	0.0617	0.00225	ND	ND	1.74	266	ND	ND	ND	ND	0.0113	ND	0.0396
NRPRE	MJ	643	5.2	0.114	ND	ND	12	1820	ND	ND	ND	ND	0.948	ND	0.768
NRPRM	MJ	2.98	ND	ND	ND	ND	ND	8.33	ND	ND	ND	ND	ND	ND	ND
NRPRT	MJ	646	5.2	0.114	ND	ND	12	1830	ND	ND	ND	ND	0.948	ND	0.768
ADP-fossil	MJ	54.9	0.685	0.0145	ND	ND	1.42	156	ND	ND	ND	ND	0.125	ND	0.078
SM	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RSF	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NRSF	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FW	m3	0.000752	ND	ND	ND	ND	ND	0.00211	ND	ND	ND	ND	ND	ND	ND

Abbreviations:

RPRE or PERE = Renewable primary resources used as energy carrier (fuel), RPRM or PERM = Renewable primary resources with energy content used as material, RPRT or PERT = Total use of renewable primary resources with energy content, NRPRE or PENRE = Non-renewable primary resources used as an energy carrier (fuel), NRPRM or PENRM = Non-renewable primary resources with energy content used as material, NRPRT or PENRT = Total non-renewable primary resources with energy content, SM: Secondary materials, RSF = Renewable secondary fuels, NRSF = Non-renewable secondary fuels, RE = Recovered energy, ADPF = Abiotic depletion potential, FW = Use of net freshwater resources, VOCs = Volatile Organic Compounds.

per 1 unit.

1.25 LF25AUB-Z3

Indicator	Unit	A1A2A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
PERE	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PERM	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PERT	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PENRE	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PENRM	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PENRT	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RPRE	MJ	153	0.112	0.00336	ND	ND	1.88	429	ND	ND	ND	ND	0.0208	ND	0.073
RPRM	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RPRT	MJ	153	0.112	0.00336	ND	ND	1.88	429	ND	ND	ND	ND	0.0208	ND	0.073
NRPRE	MJ	1050	9.42	0.171	ND	ND	6.06	2980	ND	ND	ND	ND	1.75	ND	1.42
NRPRM	MJ	5.49	ND	ND	ND	ND	ND	15.4	ND	ND	ND	ND	ND	ND	ND
NRPRT	MJ	1060	9.42	0.171	ND	ND	6.06	3000	ND	ND	ND	ND	1.75	ND	1.42
ADP-fossil	MJ	90.5	1.24	0.0216	ND	ND	0.586	258	ND	ND	ND	ND	0.231	ND	0.144
SM	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RSF	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NRSF	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FW	m3	0.00139	ND	ND	ND	ND	ND	0.00388	ND	ND	ND	ND	ND	ND	ND

Abbreviations:

RPRE or PERE = Renewable primary resources used as energy carrier (fuel), RPRM or PERM = Renewable primary resources with energy content used as material, RPRT or PERT = Total use of renewable primary resources with energy content, NRPRE or PENRE = Non-renewable primary resources used as an energy carrier (fuel), NRPRM or PENRM = Non-renewable primary resources with energy content used as material, NRPRT or PENRT = Total non-renewable primary resources with energy content, SM: Secondary materials, RSF = Renewable secondary fuels, NRSF = Non-renewable secondary fuels, RE = Recovered energy, ADPF = Abiotic depletion potential, FW = Use of net freshwater resources, VOCs = Volatile Organic Compounds.

per 1 unit.

1.5 LF25AUB-Z3

Indicator	Unit	A1A2A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
PERE	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PERM	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PERT	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PENRE	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PENRM	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PENRT	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RPRE	MJ	160	0.118	0.00335	ND	ND	2.17	448	ND	ND	ND	ND	0.022	ND	0.0773
RPRM	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RPRT	MJ	160	0.118	0.00335	ND	ND	2.17	448	ND	ND	ND	ND	0.022	ND	0.0773
NRPRE	MJ	1100	9.93	0.17	ND	ND	12.1	3130	ND	ND	ND	ND	1.85	ND	1.5
NRPRM	MJ	5.81	ND	ND	ND	ND	ND	16.3	ND	ND	ND	ND	ND	ND	ND
NRPRT	MJ	1110	9.93	0.17	ND	ND	12.1	3140	ND	ND	ND	ND	1.85	ND	1.5
ADP-fossil	MJ	95.5	1.31	0.0216	ND	ND	1.3	272	ND	ND	ND	ND	0.244	ND	0.152
SM	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RSF	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NRSF	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FW	m3	0.00147	ND	ND	ND	ND	ND	0.00411	ND	ND	ND	ND	ND	ND	ND

Abbreviations:

RPRE or PERE = Renewable primary resources used as energy carrier (fuel), RPRM or PERM = Renewable primary resources with energy content used as material, RPRT or PERT = Total use of renewable primary resources with energy content, NRPRE or PENRE = Non-renewable primary resources used as an energy carrier (fuel), NRPRM or PENRM = Non-renewable primary resources with energy content used as material, NRPRT or PENRT = Total non-renewable primary resources with energy content, SM: Secondary materials, RSF = Renewable secondary fuels, NRSF = Non-renewable secondary fuels, RE = Recovered energy, ADPF = Abiotic depletion potential, FW = Use of net freshwater resources, VOCs = Volatile Organic Compounds.

per 1 unit.

2.0 LF25AUB-Z3

Indicator	Unit	A1A2A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
PERE	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PERM	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PERT	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PENRE	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PENRM	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PENRT	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RPRE	MJ	233	0.168	0.00368	ND	ND	2.76	652	ND	ND	ND	ND	0.0319	ND	0.112
RPRM	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RPRT	MJ	233	0.168	0.00368	ND	ND	2.76	652	ND	ND	ND	ND	0.0319	ND	0.112
NRPRE	MJ	1630	14.2	0.187	ND	ND	17.2	4620	ND	ND	ND	ND	2.69	ND	2.18
NRPRM	MJ	8.44	ND	ND	ND	ND	ND	23.6	ND	ND	ND	ND	ND	ND	ND
NRPRT	MJ	1640	14.2	0.187	ND	ND	17.2	4640	ND	ND	ND	ND	2.69	ND	2.18
ADP-fossil	MJ	141	1.87	0.0237	ND	ND	1.78	402	ND	ND	ND	ND	0.354	ND	0.221
SM	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RSF	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NRSF	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FW	m3	0.00213	ND	ND	ND	ND	ND	0.00597	ND	ND	ND	ND	ND	ND	ND

Abbreviations:

RPRE or PERE = Renewable primary resources used as energy carrier (fuel), RPRM or PERM = Renewable primary resources with energy content used as material, RPRT or PERT = Total use of renewable primary resources with energy content, NRPRE or PENRE = Non-renewable primary resources used as an energy carrier (fuel), NRPRM or PENRM = Non-renewable primary resources with energy content used as material, NRPRT or PENRT = Total non-renewable primary resources with energy content, SM: Secondary materials, RSF = Renewable secondary fuels, NRSF = Non-renewable secondary fuels, RE = Recovered energy, ADPF = Abiotic depletion potential, FW = Use of net freshwater resources, VOCs = Volatile Organic Compounds.

Waste and Output Flow Indicators

per 1 unit.

0.5 LF25AUB-Z3

Indicator	Unit	A1A2A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
HWD	kg	0.39	ND	ND	ND	ND	ND	1.09	ND	ND	ND	ND	ND	ND	ND
NHWD	kg	0.0372	ND	ND	ND	ND	ND	0.104	ND	ND	ND	ND	ND	ND	ND
RWD	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
HLRW	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ILLRW	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CRU	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MFR	kg	0.349	ND	ND	ND	ND	ND	0.978	ND	ND	ND	ND	ND	ND	ND
MER	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MNER	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
EEE	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
EET	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Abbreviations:

HWD = Hazardous waste disposed, NHWD = Non-hazardous waste disposed, RWD = Radioactive waste disposed, HLRW = High-level radioactive waste, ILLRW = Intermediate- and low-level radioactive waste, CRU = Components for re-use, MFR or MR = Materials for recycling, MER = Materials for energy recovery, MNER = Materials for incineration, no energy recovery, EE or EEE = Recovered energy exported from the product system, EET = Exported thermal energy.

per 1 unit.

0.75 LF25AUB-Z3

Indicator	Unit	A1A2A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
HWD	kg	0.429	ND	ND	ND	ND	ND	1.2	ND	ND	ND	ND	ND	ND	ND
NHWD	kg	0.0409	ND	ND	ND	ND	ND	0.115	ND	ND	ND	ND	ND	ND	ND
RWD	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
HLRW	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ILLRW	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CRU	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MFR	kg	0.492	ND	ND	ND	ND	ND	1.38	ND	ND	ND	ND	ND	ND	ND
MER	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MNER	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
EEE	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
EET	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Abbreviations:

HWD = Hazardous waste disposed, NHWD = Non-hazardous waste disposed, RWD = Radioactive waste disposed, HLRW = High-level radioactive waste, ILLRW = Intermediate- and low-level radioactive waste, CRU = Components for re-use, MFR or MR = Materials for recycling, MER = Materials for energy recovery, MNER = Materials for incineration, no energy recovery, EE or EEE = Recovered energy exported from the product system, EET = Exported thermal energy.

per 1 unit.

1.0 LF25AUB-Z3

Indicator	Unit	A1A2A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
HWD	kg	0.672	ND	ND	ND	ND	ND	1.88	ND	ND	ND	ND	ND	ND	ND
NHWD	kg	0.0641	ND	ND	ND	ND	ND	0.179	ND	ND	ND	ND	ND	ND	ND
RWD	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
HLRW	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ILLRW	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CRU	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MFR	kg	1.04	ND	ND	ND	ND	ND	2.92	ND	ND	ND	ND	ND	ND	ND
MER	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MNER	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
EEE	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
EET	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Abbreviations:

HWD = Hazardous waste disposed, NHWD = Non-hazardous waste disposed, RWD = Radioactive waste disposed, HLRW = High-level radioactive waste, ILLRW = Intermediate- and low-level radioactive waste, CRU = Components for re-use, MFR or MR = Materials for recycling, MER = Materials for energy recovery, MNER = Materials for incineration, no energy recovery, EE or EEE = Recovered energy exported from the product system, EET = Exported thermal energy.

per 1 unit.

1.25 LF25AUB-Z3

Indicator	Unit	A1A2A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
HWD	kg	1.24	ND	ND	ND	ND	ND	3.47	ND	ND	ND	ND	ND	ND	ND
NHWD	kg	0.118	ND	ND	ND	ND	ND	0.331	ND	ND	ND	ND	ND	ND	ND
RWD	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
HLRW	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ILLRW	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CRU	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MFR	kg	0.688	ND	ND	ND	ND	ND	1.93	ND	ND	ND	ND	ND	ND	ND
MER	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MNER	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
EEE	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
EET	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Abbreviations:

HWD = Hazardous waste disposed, NHWD = Non-hazardous waste disposed, RWD = Radioactive waste disposed, HLRW = High-level radioactive waste, ILLRW = Intermediate- and low-level radioactive waste, CRU = Components for re-use, MFR or MR = Materials for recycling, MER = Materials for energy recovery, MNER = Materials for incineration, no energy recovery, EE or EEE = Recovered energy exported from the product system, EET = Exported thermal energy.

per 1 unit.

1.5 LF25AUB-Z3

Indicator	Unit	A1A2A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
HWD	kg	1.31	ND	ND	ND	ND	ND	3.67	ND	ND	ND	ND	ND	ND	ND
NHWD	kg	0.125	ND	ND	ND	ND	ND	0.35	ND	ND	ND	ND	ND	ND	ND
RWD	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
HLRW	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ILLRW	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CRU	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MFR	kg	0.612	ND	ND	ND	ND	ND	1.71	ND	ND	ND	ND	ND	ND	ND
MER	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MNER	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
EEE	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
EET	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Abbreviations:

HWD = Hazardous waste disposed, NHWD = Non-hazardous waste disposed, RWD = Radioactive waste disposed, HLRW = High-level radioactive waste, ILLRW = Intermediate- and low-level radioactive waste, CRU = Components for re-use, MFR or MR = Materials for recycling, MER = Materials for energy recovery, MNER = Materials for incineration, no energy recovery, EE or EEE = Recovered energy exported from the product system, EET = Exported thermal energy.

per 1 unit.

2.0 LF25AUB-Z3

Indicator	Unit	A1A2A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
HWD	kg	1.91	ND	ND	ND	ND	ND	5.34	ND	ND	ND	ND	ND	ND	ND
NHWD	kg	0.182	ND	ND	ND	ND	ND	0.508	ND	ND	ND	ND	ND	ND	ND
RWD	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
HLRW	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ILLRW	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CRU	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MFR	kg	0.63	ND	ND	ND	ND	ND	1.76	ND	ND	ND	ND	ND	ND	ND
MER	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MNER	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
EEE	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
EET	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Abbreviations:

HWD = Hazardous waste disposed, NHWD = Non-hazardous waste disposed, RWD = Radioactive waste disposed, HLRW = High-level radioactive waste, ILLRW = Intermediate- and low-level radioactive waste, CRU = Components for re-use, MFR or MR = Materials for recycling, MER = Materials for energy recovery, MNER = Materials for incineration, no energy recovery, EE or EEE = Recovered energy exported from the product system, EET = Exported thermal energy.

Carbon Emissions and Removals

per 1 unit.

0.5 LF25AUB-Z3

Indicator	Unit	A1A2A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
BCRP	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BCEP	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BCRK	kg CO2	-0.45	ND	ND	ND	ND	-0.174	-1.26	ND	ND	ND	ND	ND	ND	ND
BCEK	kg CO2	ND	ND	0.507	ND	ND	0.0435	1.42	ND	ND	ND	ND	ND	ND	ND
BCEW	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CCE	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CCR	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CWNR	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Abbreviations:

BCRP = Biogenic Carbon Removal from Product, BCEP = Biogenic Carbon Emission from Product, BCRK = Biogenic Carbon Removal from Packaging, BCEK = Biogenic Carbon Emission from Packaging, BCEW = Biogenic Carbon Emission from Combustion of Waste from Renewable Sources Used in Production Processes, CCE = Calcination Carbon Emissions, CCR = Carbonation Carbon Removals, CWNR = Carbon Emissions from Combustion of Waste from Non-Renewable Sources used in Production Processes, GWP-luc = Carbon Emissions from Land-use Change.

per 1 unit.

0.75 LF25AUB-Z3

Indicator	Unit	A1A2A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
BCRP	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BCEP	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BCRK	kg CO2	-0.455	ND	ND	ND	ND	-0.174	-1.27	ND	ND	ND	ND	ND	ND	ND
BCEK	kg CO2	ND	ND	0.513	ND	ND	0.0435	1.44	ND	ND	ND	ND	ND	ND	ND
BCEW	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CCE	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CCR	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CWNR	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Abbreviations:

BCRP = Biogenic Carbon Removal from Product, BCEP = Biogenic Carbon Emission from Product, BCRK = Biogenic Carbon Removal from Packaging, BCEK = Biogenic Carbon Emission from Packaging, BCEW = Biogenic Carbon Emission from Combustion of Waste from Renewable Sources Used in Production Processes, CCE = Calcination Carbon Emissions, CCR = Carbonation Carbon Removals, CWNR = Carbon Emissions from Combustion of Waste from Non-Renewable Sources used in Production Processes, GWP-luc = Carbon Emissions from Land-use Change.

per 1 unit.

1.0 LF25AUB-Z3

Indicator	Unit	A1A2A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
BCRP	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BCEP	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BCRK	kg CO2	-0.359	ND	ND	ND	ND	-0.174	-1	ND	ND	ND	ND	ND	ND	ND
BCEK	kg CO2	ND	ND	0.404	ND	ND	0.0435	1.13	ND	ND	ND	ND	ND	ND	ND
BCEW	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CCE	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CCR	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CWNR	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Abbreviations:

BCRP = Biogenic Carbon Removal from Product, BCEP = Biogenic Carbon Emission from Product, BCRK = Biogenic Carbon Removal from Packaging, BCEK = Biogenic Carbon Emission from Packaging, BCEW = Biogenic Carbon Emission from Combustion of Waste from Renewable Sources Used in Production Processes, CCE = Calcination Carbon Emissions, CCR = Carbonation Carbon Removals, CWNR = Carbon Emissions from Combustion of Waste from Non-Renewable Sources used in Production Processes, GWP-luc = Carbon Emissions from Land-use Change.

per 1 unit.

1.25 LF25AUB-Z3

Indicator	Unit	A1A2A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
BCRP	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BCEP	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BCRK	kg CO2	-0.536	ND	ND	ND	ND	-0.174	-1.5	ND	ND	ND	ND	ND	ND	ND
BCEK	kg CO2	ND	ND	0.603	ND	ND	0.0435	1.69	ND	ND	ND	ND	ND	ND	ND
BCEW	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CCE	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CCR	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CWNR	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Abbreviations:

BCRP = Biogenic Carbon Removal from Product, BCEP = Biogenic Carbon Emission from Product, BCRK = Biogenic Carbon Removal from Packaging, BCEK = Biogenic Carbon Emission from Packaging, BCEW = Biogenic Carbon Emission from Combustion of Waste from Renewable Sources Used in Production Processes, CCE = Calcination Carbon Emissions, CCR = Carbonation Carbon Removals, CWNR = Carbon Emissions from Combustion of Waste from Non-Renewable Sources used in Production Processes, GWP-luc = Carbon Emissions from Land-use Change.

per 1 unit.

1.5 LF25AUB-Z3

Indicator	Unit	A1A2A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
BCRP	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BCEP	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BCRK	kg CO2	-0.535	ND	ND	ND	ND	-0.174	-1.5	ND	ND	ND	ND	ND	ND	ND
BCEK	kg CO2	ND	ND	0.602	ND	ND	0.0435	1.69	ND	ND	ND	ND	ND	ND	ND
BCEW	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CCE	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CCR	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CWNR	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Abbreviations:

BCRP = Biogenic Carbon Removal from Product, BCEP = Biogenic Carbon Emission from Product, BCRK = Biogenic Carbon Removal from Packaging, BCEK = Biogenic Carbon Emission from Packaging, BCEW = Biogenic Carbon Emission from Combustion of Waste from Renewable Sources Used in Production Processes, CCE = Calcination Carbon Emissions, CCR = Carbonation Carbon Removals, CWNR = Carbon Emissions from Combustion of Waste from Non-Renewable Sources used in Production Processes, GWP-luc = Carbon Emissions from Land-use Change.

per 1 unit.

2.0 LF25AUB-Z3

Indicator	Unit	A1A2A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
BCRP	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BCEP	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BCRK	kg CO2	-0.587	ND	ND	ND	ND	-0.174	-1.64	ND	ND	ND	ND	ND	ND	ND
BCEK	kg CO2	ND	ND	0.661	ND	ND	0.0435	1.85	ND	ND	ND	ND	ND	ND	ND
BCEW	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CCE	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CCR	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CWNR	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Abbreviations:

BCRP = Biogenic Carbon Removal from Product, BCEP = Biogenic Carbon Emission from Product, BCRK = Biogenic Carbon Removal from Packaging, BCEK = Biogenic Carbon Emission from Packaging, BCEW = Biogenic Carbon Emission from Combustion of Waste from Renewable Sources Used in Production Processes, CCE = Calcination Carbon Emissions, CCR = Carbonation Carbon Removals, CWNR = Carbon Emissions from Combustion of Waste from Non-Renewable Sources used in Production Processes, GWP-luc = Carbon Emissions from Land-use Change.

Scenarios

Transport to the building/construction site (A4)

A4 Module

Fuel Type:	Diesel
Liters of Fuel:	27.6 l/100km
Vehicle Type:	16-32 metric ton, EURO3 Truck
Transport Distance:	2700 km
Capacity Utilization:	37 %
Packaging Mass:	0.32 kg
Weight of products transported:	6.08 kg
Capacity utilization volume factor:	<1
Assumptions for scenario development:	Products are shipped out from Watts facility in Franklin, NH, on pallets to customers directly. 85% of customers are based in US, 10% in Europe, mostly France and 5% in Australia. The study uses a conservative assumption that packaged products are shipped via a 16-32 metric ton, EURO3 truck using diesel fuel for US, EU, and AU and a freight container ship using heavy fuel oil for EU and AU. Above information represents North American transport as this covers 85% of transportation. The total transportation impacts of the A4 phase were calculated based on a weighted average of: •Franklin, NH to US Customer: 2700 km by truck (85%) •Franklin, NH to EU Customer: 943 km by truck and 6667 km by ship (10%) •Franklin, NH to AU Customer: 943 km by truck and 18520 km by ship (5%)
Truck Distance (weighted average for US, EU and AU customer):	2436.45 km
Freight Container Ship Distance (weighted average for EU and AU customer):	1592.7 km

Installation in to the building/construction site (A5)

A5 Module

Mass of Packaging Waste Specified by Type:	0.32 kg
Biogenic Carbon Contained in Packaging:	0.18 kg
Assumptions for scenario development:	The installation process is manual using hand tools that don't consume energy. Therefore, only product packaging waste is included in this module. It is assumed all packaging wastes are transported to a waste treatment facility with an average of 100 km by truck. Other impacts in this module are declared as having zero impact. The paper and paperboard packaging EOL assumptions are based on the EPA recommendation of: -Recycled Percentage: 68.21% -Incineration Percentage: 6.23% -Landfill Percentage: 25.55%

Reference Service Life

B1 Module

RSL:	20 Years

Repair (B3)

B3 Module

Repair Cycle:	1 Cycles/RSL
Ancillary Materials Specified by Type:	0.198 kg
Waste Materials From Repair:	0.198 kg
Repair Process Information:	Repair processes are done manually. Parts are replaced with identical parts from a standard repair kit specific to the product.
Further assumptions for scenario development:	Total weight of repair kits is 0.198 kg which includes the o-rings, gaskets, springs, seats, plugs, strainers and discs.

Replacement (B4)

B4 Module

Reference Service Life:	20 Years
Replacement Cycle:	2.8 (ESL/RSL)-1
Further assumptions for scenario development:	Product replacement over a 75-year building ESL with a 20-year assumed RSL for Watts valve products, is calculated as a total of 3.8 [75 / 20 = 3.75, rounded-up to the nearest tenth] of valves needed over the building's lifetime. Total replacement is calculated as 2.8 [75 / 20 – 1 = 2.75, rounded-up to the nearest tenth] of valves. B4 includes these life cycle stages (A1-A5, C2 and C4).

End of Life

C1 - C4 Modules

Collection Process

Collected Separately:	5.76 kg

Recovery

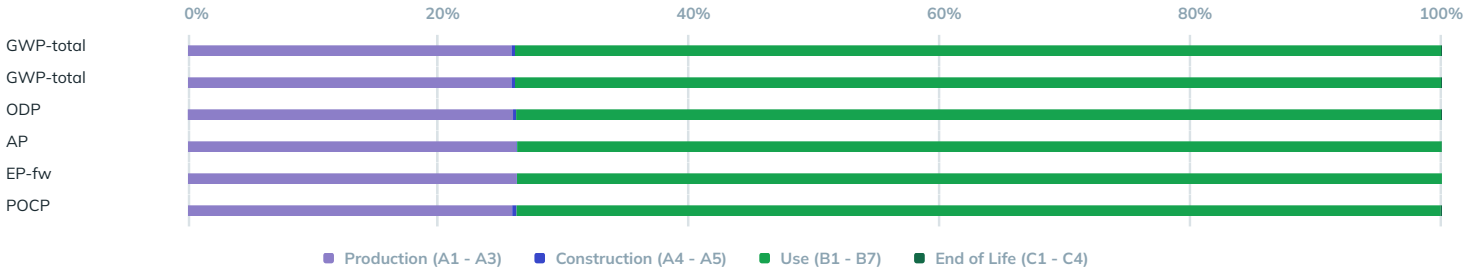
Landfill:	5.76 kg

Assumptions for scenario development:

A 16-32 metric ton, EURO3 truck is used for EOL transportation with an average distance of 100 km by truck (C2).
Due to mixed materials product is assumed to be landfilled at 100% rate (C4).

Interpretation

The analysis of Watts valve products provides useful insights regarding the cradle-to-grave environmental impacts. The LCA results also identify where substantial impacts are occurring to allow further process and materials improvements to be implemented by Watts. The cradle-to-grave impacts for all products are dominated by the B4 replacement phase as ~2.8 declared units are needed to reach the 75 year building lifespan per the PCR requirement. This stage typically accounts for ~70% of the impacts throughout the products' lifecycle. After this the second largest contributor is the A1 Raw Materials Extraction and Processing stage. This stage accounts for ~10-20% of the lifecycle impacts. The A3 Manufacturing stage accounts for 5-10% of the impacts, with the other stages accounting for <1%.



Environmental Activities and Certifications

Certification
ISO 9001
ISO 14001

Further Information

Impact Assessment with REC

LCIA Method	Impact Category	Unit	0.5 A1A2A3	0.75 A1A2A3	1.0 A1A2A3	1.25 A1A2A3	1.5 A1A2A3	2.0 A1A2A3
IPCC AR5 GWP 100	GWP-total	kg CO2 eq	17.07	20.35	37.36	58.63	61.09	90.23
TRACI 2.1	GWP-total	kg CO2 eq	16.90	20.15	37.06	58.28	60.73	89.70
TRACI 2.1	ODP	kg CFC 11 eq	0.00001692	0.00001694	0.0000209	0.000000768	0.00000080	0.000001189
TRACI 2.1	AP	kg SO2 eq	0.30	0.76	1.11	1.71	1.79	2.61
TRACI 2.1	EP-fw	kg N eq	0.09	0.23	0.35	0.53	0.56	0.81
TRACI 2.1	POCP	kg O3 eq	0.01	0.03	0.04	0.07	0.07	0.10

Cradle to Gate Impact Assessment Percent Reduction with REC

The percent reduction of cradle-to-gate impacts with Renewable Energy Credits (RECs) is calculated as:

IPCC AR5 GWP 100, GWP-total = 8.77-10.89% reduction
TRACI 2.1, GWP-total = 8.79-10.93% reduction
TRACI 2.1, ODP = 0.04-2.48% reduction
TRACI 2.1, AP = 0.18-0.41% reduction
TRACI 2.1, EP-fw = 0.18-0.41% reduction
TRACI 2.1, POCP = 0.53-1.15% reduction

Functional Unit for Each Size

0.5 LF25AUB-Z3: 1 packaged product with a mass of 1.425 kg
0.75 LF25AUB-Z3: 1 packaged product with a mass of 1.546 kg
1.0 LF25AUB-Z3: 1 packaged product with a mass of 2.228 kg
1.25 LF25AUB-Z3: 1 packaged product with a mass of 4.0389 kg
1.5 LF25AUB-Z3: 1 packaged product with a mass of 4.256 kg
2.0 LF25AUB-Z3: 1 packaged product with a mass of 6.08 kg

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Product Specification: https://www.watts.com/dfsmedia/0533dbba17714b1ab581ab07a4cbb521/20277-source/es-911-pdf
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