SUPERDUPERTUBE

Environmental Product Declaration

In accordance with ISO 14025 and EN 15804:2012+A2:2019
Ateljé Lyktan AB, Fyrvaktaregatan 7, SE-296 35, Sweden

Programme:	The International EPD® System, www.environdec.com
Programme operator:	EPD International AB
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General information

Programme information

Programme:	The International EPD® System
Address:	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
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CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product category rules (PCR): PCR2019-14 Construction products v1.11 and UN CPC code(s) 4653 Together with EN 15804:2012+A2:2019
PCR review was conducted by: *The Technical Committee of the International EPD® System.* *Review chair: Claudia A. Peña, University of Concepción, Chile. Contact via info@environdec.com*
Independent third-party verification of the declaration and data, according to ISO 14025:2006: ☐ EPD process certification ☒ EPD verification
Third party verifier: *Bureau Veritas Certification Sverige AB* *Accredited by: SWEDAC (accreditation number 1236)*
Procedure for follow-up of data during EPD validity involves third party verifier: ☐ Yes ☒ No

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but from different programmes may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804. For further information about comparability, see EN 15804 and ISO 14025.

The LCA approach harmonizes with the Product Environmental Footprint Category Rules for building products, cradle to grave (EPD International, 2021). The Life Cycle Assessment report (Böckin, 2022) is available to EPD-auditor on request and include all the detailed information required according to ISO 14044 (ISO, 2006b).

Company information

Owner of the EPD
Ateljé Lyktan AB

Contact
Rasmus Nilsson

Description
Ateljé Lyktan develops, produces and markets lighting products - with a focus on energy efficiency, sustainability and circularity. We design our products to be used, upgraded and reused in a well-thought-out and flexible way. We make it possible to extend the life of the product by upgrading both hardware and software. The company was founded in 1934. The head office and factory are located in Åhus, located on the shores of the Baltic Sea in the southern Sweden.

Name and location of production site(s)
Ateljé Lyktan AB, Fyrvaktaregatan 7, SE-296 35, Sweden

Product-related or management system-related certifications
Ateljé Lyktan AB is certified according to ISO 9001 and ISO 14001. All products are produced in accordance with the requirements for CE-marking.

Product information

Product name
Superdupertube

Product identification
Superdupertube 1140

Product description
Superdupertube is a lighting luminaire for offices, classrooms and other open spaces.

Including LED light source, colour temperature 3000K or 4000K. Colour rendering CRI min. 90. 90. Lifespan: L100B10 50 000h. The product has a direct (30%) and an indirect light (70%).

Equipped with Philips LED driver Touch and DALI to regulate the light with amplitude modulation creating a flicker-free light. Dimming 1-100%. The luminaire is delivered as standard with pre-programmed Constant Lumen Output (CLO).

The structural components in this luminaire consist of extruded and injection moulded hemp fibre reinforced bio composite. The binder used in the composite is starch-based aliphatic polyester, made from responsibly-grown sugarcane and beetroot.

Luminaire available in various lengths, ranging from a length of 1140 mm to 2270 mm. It comes in both single and system variants, which is used for continuous lines. The version modelled for this report has a length of 1140 mm, a weight of 2,32 kg and a power-rating of 48 W. It has an estimated reference service life (RSL) of 20 years for which the limiting is the biopolymer profile, which according to the supplier lasts at least 20 years in indoor environments with low humidity and a temperature of ca 23 degrees C.

The EPD results will represent the baseline luminaire size and conversion factors for the other available sizes. The conversion factors in the table below are based on the length of the luminaire, which means that an underlying assumption is that environmental impacts scale with the length for all impact categories. This is mostly true[1], except for the energy in the use phase, which is handled by having a separate conversion factor for the B6 module. In practice, new results can be generated by multiplying with the conversion factor, which is simply the ratio of the length compared to the baseline length of 1140 mm (for the energy in the use phase, it is the ratio of the power draw compared to the baseline power of 48W).

Length (mm)	Power (W)	Conversion factor for all modules except B6	Conversion factor for B6 module	Comment
1140	48	1	1	Baseline
1420	62	1,25	1,29	
1700	76	1,50	1,58	
2270	89	2,00	1,85	

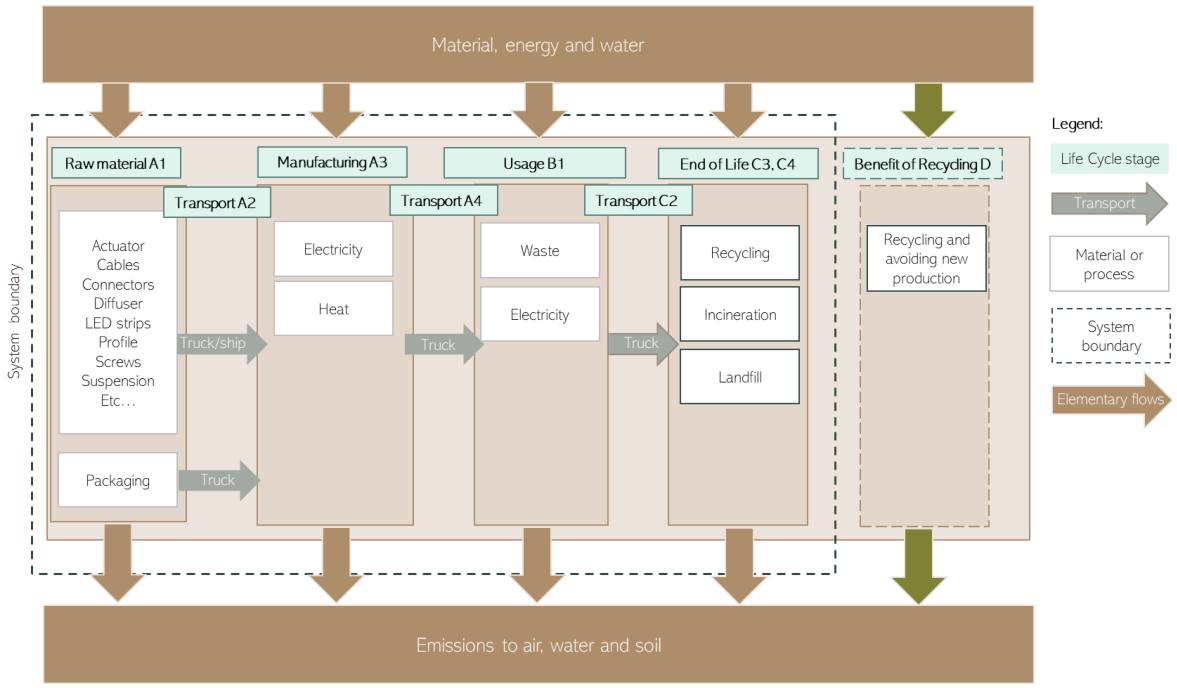
[1] Most components scale linearly with the length, except the transformers, which do not change regardless of the size. Hence, using the conversion factors will give a slight overestimation of the results in some impact categories.

LCA information

Declared Unit	**One (1) Superdupertube (which represent a family of articles with small variations, represented by version with length of 1140 mm, a weight of 2,32 kg and a power-rating of 48 W).**
Function	Office light during the lifetime of one luminaire.
Lifetime	Reference Service Life: 20 years.
Product group classification	UN CPC 4653
Goal and Scope	Understanding the product's environmental impact during the life cycle, for internal product development to reduce the impact but also to our stakeholders when selecting luminaires.
Audience	Primarily purchasers of luminaires but also lighting installers, lighting designers, architects and constructors.
Manufacturing Site	Ateljé Lyktan, Åhus, Sweden.
Geographical Area	Europe. Use and disposal is represented by Sweden (the product's main market).
Compliant with	This EPD follows the "Book-keeping" LCA approach which is defined as attributional LCA in the ISO 14040 standard. In accordance with ISO 14025, ISO 14040 – ISO 140 44 and EN 15804:2012+A2:2019 This EPD follows the Product Category Rules PCR2019-14 Construction products v1.11 valid until 2024-12-20
Cut-Off Rules	The following procedure is followed for the exclusion of inputs and output: - Data for elementary flows to and from the product system contributing to a minimum of 99% of the declared environmental impacts shall be included A screening and expert judgement showed that the following aspects contribute less than 1% and could be cut-off: - Various supplier packaging - Energy and material use in installation - Energy for deconstruction
Background data	The data quality is considered good. All site-specific data for raw materials, auxiliary materials as well as energy and emissions in the manufacturing process is from 2021 and have been represented with Ecoinvent datasets. All other relevant environmental aspects have been represented by generic Ecoinvent data. Ecoinvent is the world's biggest LCI (Life cycle inventory) data library and the latest and most updated version was used. Ecoinvent contains data for the specific geographical regions relevant for this study. The background data from Ecoinvent 3.8 are from 2016-2021.
Foreground data - primary	Weight of articles and composition of raw materials. Suppliers' location for transport and some specific data on energy and material use Packaging, rest materials, electricity, heat and waste.
Electricity data	Electricity consumption in the A3 module is Goo-certified hydro power and B6 electricity is represented by data for national production mix in Ecoinvent 3.8 regionalized for Sweden.
Allocations	Polluter Pays / Allocation by Classification One allocation rules is applied: the energy and fuel necessary for the manufacture is allocated in kWh by production of the declared unit
Impact Assessment methods	Potential environmental impacts are calculated with Environmental Footprint 3.0 method as implemented in SimaPro 9.2 Resource use values are calculated from Cumulative Energy Demand V1.11.
Based on LCA Report	Miljögiraff LCA Report 964A Superdupertube - (Daniel Böckin, Miljögiraff AB)
Software	SimaPro 9.3

System diagram

This study includes a cradle-to-grave perspective. That means that all processes needed for raw material extraction, manufacturing, transport, usage and end-of-life are included in the study. All modules (A1-D) are declared, although some modules (B1-B5, B7. C1, C4) do not have any environmental aspects. Furthermore, modules A5 and C1 are not shown in the system diagram (see all declared modules below and further descriptions of the life cycle under the content and life cycle information below).



Modules declared, geographical scope, share of specific data (in GWP-GHG indicator) and data variation

Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules declared	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Geo-graphy	GLO	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE
Type of data used	G/S	G/S	G/S	G	G	-	-	-	-	-	G	-	-	G	G	-	G
Share of specific data, %	8	100	83	0	0	-	-	-	-	-	0	-	-	0	0	-	0

Modules declared: (X = included; ND = not declared), geographical scope, share of specific data (in GWP-GHG indicator) EPD modules included (G = generic data, S = Specific data).

Content and life cycle information

The following table shows the material content of the Superduper tube and the percentage of recycled and renewable material in the product.

Product materials	**Weight, kg**	**Post-consumer material, weight-%**	**Renewable material, weight-%**
Electronics	0,59	0	0
Polycarbonate (PC)	0,32	0	0
Polyethylene terephthalate (PET)	0,01	0	0
Biopolymer (Polylactic acid, PLA)	1,33	0	100
Steel	0,08	0	0
TOTAL	2,32	0	57
Packaging materials	**Weight, kg**	**Post-consumer material, weight-%**	**Renewable material, weight-%**
Cardboard packaging	0,48	80	100
EU pallet	0,04	0	99
Dangerous substances from the candidate list of SVHC for Authorisation	**EC No.**	**CAS No.**	**Weight-% per functional or declared unit**
(No dangerous substances exceeding 0,1 wt%)			

The majority of the product weight comes from the PLA components. They include a profile, a louvre, a suspension and an end cap. The biopolymer was codeveloped by the supplier and ateljé Lyktan. Electricity used for its production was modelled with a Swedish electricity mix (not a residual mix, due to lack of data).

Electronics represent a significant share of the product, and these include LED strips, a transformer, a terminal block and various cables.

Manufacturing takes place in Åhus, Sweden and includes assembling, drilling and cutting. The energy consumption for manufacturing was estimated by dividing the company's entire monthly energy consumption by the average number of products produced monthly. The source of this energy is hydropower (4,1 g CO2-eq/kWh), certified with a Guarantee of Origin.

Packaging is shown in the table above and includes a cardboard box and pallets for transport.

It is assumed that there are no environmental aspects during **installation** of the product, except the waste management of packaging after installation.

For the **use phase**, the luminaire is assumed to be installed in Sweden (ateljé Lyktan's main market) in an office environment. The lifetime energy consumption of 2,4 MWh was calculated by multiplying the reference service life (RSL=20 years) with the number of use hours per year (2500 hours in an office environment, according to EN15193) and the power draw of the Superduper tube (48W). The energy source was average electricity on the Swedish grid (48,7 g CO2-eq/kWh).

End of life is based on a generic scenario of Dutch waste management as an approximation for Swedish waste management, where ateljé Lyktan's main market is located. The exception is the electronics, which are assumed to be separated and the copper and steel recycled while the rest is incinerated.

Environmental information

Potential environmental impact – mandatory indicators according to EN 15804

Results per declared unit																			
Indicator	**Unit**	**A1**	**A2**	**A3**	**Tot.A 1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-fossil	kg CO_2 eq.	29,94	0,50	2,08	32,53	0,13	0,01	0	0	0	0	0	110,22	0	0	0,07	0,83	0	-2,91
GWP-biogenic	kg CO_2 eq.	-7,30E-01	4,34E-04	-5,19E-02	-7,82E-01	1,10E-04	9,38E-02	0	0	0	0	0	3,83E+00	0	0	2,06E-05	6,89E-01	0	-2,64E-01
GWP-luluc	kg CO_2 eq.	4,08E-02	2,01E-04	3,39E-03	4,44E-02	5,09E-05	1,79E-06	0	0	0	0	0	7,79E+00	0	0	7,88E-06	8,77E-05	0	-1,44E-02
GWP-total	kg CO_2 eq.	29,28	0,50	2,04	31,83	0,13	0,11	0	0	0	0	0	122,19	0	0	0,07	1,52	0	-3,19
ODP	kg CFC 11 eq.	1,47E-06	1,17E-07	1,47E-07	1,73E-06	2,95E-08	2,79E-09	0	0	0	0	0	5,35E-06	0	0	1,56E-08	9,31E-09	0	-1,15E-06
AP	mol H^+ eq.	2,14E-01	1,43E-03	1,57E-02	2,31E-01	3,61E-04	9,62E-05	0	0	0	0	0	7,68E-01	0	0	4,54E-04	1,89E-03	0	-1,59E-02
EP-freshwater	kg PO_4^{3-} eq.	5,38E-02	1,01E-04	2,24E-03	5,61E-02	2,56E-05	1,66E-06	0	0	0	0	0	1,99E-01	0	0	3,95E-06	1,35E-04	0	-1,25E-03
EP-freshwater	kg P eq	1,75E-02	3,30E-05	7,30E-04	1,83E-02	8,33E-06	5,42E-07	0	0	0	0	0	6,47E-02	0	0	1,29E-06	4,41E-05	0	-4,08E-04
EP-marine	kg N eq.	3,68E-02	2,90E-04	2,96E-03	4,00E-02	7,34E-05	4,36E-05	0	0	0	0	0	1,73E-01	0	0	1,82E-04	3,74E-04	0	-2,97E-03
EP-terrestrial	mol N eq.	3,57E-01	3,16E-03	2,58E-02	3,86E-01	8,00E-04	4,35E-04	0	0	0	0	0	1,64E+00	0	0	2,00E-03	7,95E-03	0	-2,98E-02
POCP	kg NMVOC eq.	9,97E-02	1,22E-03	6,73E-03	1,08E-01	3,07E-04	1,45E-04	0	0	0	0	0	3,87E-01	0	0	7,05E-04	5,15E-04	0	-8,45E-03
ADP-minerals&metals*	kg Sb eq.	2,14E-03	1,78E-06	2,95E-06	2,15E-03	4,51E-07	1,42E-08	0	0	0	0	0	7,60E-03	0	0	6,26E-08	6,68E-07	0	-1,37E-04
ADP-fossil*	MJ	414,32	7,63	21,70	443,65	1,93	0,18	0	0	0	0	0	15055,95	0	0	0,98	0,90	0	-66,19
WDP	m^3	10,26	0,02	0,29	10,58	0,01	0,00	0	0	0	0	0	190,56	0	0	0,00	0,06	0	-6,44
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption.																		

** Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.*

Potential environmental impact – additional mandatory and voluntary indicators

Results per functional or declared unit																		
Indicator	**Unit**	**A1**	**A2**	**A3**	**Tot. A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-GHG[2] (IPCC)	kg CO_2 eq.	29,31	0,50	2,08	31,89	0,13	0,02	0	0	0	0	0	117,48	0	0	0,07	0,87	0	-2,83
Particulate matter	disease inc.	1,74E-06	4,05E-08	1,67E-07	1,9E-06	1,02E-08	1,89E-09	0	0	0	0	0	9,18E-06	0	0	1,01E-08	1,12E-08	0	-2,55E-07
Ionising radiation	kBq U-235 eq	5,42	0,04	0,09	5,6	0,01	0,00	0	0	0	0	0	1076,55	0	0	0,00	0,01	0	-0,47
Ecotoxicity, freshwater	CTUe	1175,37	5,99	47,61	1228,96	1,51	0,16	0	0	0	0	0	7091,31	0	0	0,55	9,57	0	-62,08
Human toxicity, cancer	CTUh	3,10E-08	1,93E-10	8,96E-10	3,21E-08	4,87E-11	1,46E-11	0	0	0	0	0	2,46E-07	0	0	9,82E-12	2,25E-10	0	-1,62E-08
Human toxicity, non-cancer	CTUh	1,12E-06	6,05E-09	2,08E-08	1,15E-06	1,53E-09	1,90E-10	0	0	0	0	0	5,61E-06	0	0	3,71E-10	5,73E-09	0	-8,32E-08
Land use	Pt	103,12	5,32	32,62	141,06	1,34	0,03	0	0	0	0	0	3514,25	0	0	0,17	0,48	0	-29,13

[2] The indicator includes all greenhouse gases included in GWP-total but excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. This indicator is thus equal to the GWP indicator originally defined in EN 15804:2012+A1:2013.

Use of resources

Results per functional or declared unit																			
Indicator	**Unit**	**A1**	**A2**	**A3**	**Tot. A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	37,40	0,11	32,60	70,11	0,03	0	0	0	0	0	0	6243,30	0	0	0	0,12	0	-31,96
PERM	MJ	25,27	0	9,80	35,07	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PERT	MJ	62,67	0,11	42,40	105,18	0,03	0	0	0	0	0	0	6243,30	0	0	0	0,12	0	-31,96
PENRE	MJ	421,60	8,10	23,08	452,77	2,05	0,19	0	0	0	0	0	15113,26	0	0	0	0,96	0	-74,93
PENRM	MJ.	19,27	0	0	19,27	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PENRT	MJ	440,87	8,10	23,08	472,05	2,05	0,19	0	0	0	0	0	15113,26	0	0	0	0,96	0	-74,93
SM	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FW	m^3	0,45	0	0,02	0,47	0	0	0	0	0	0	0	3,96	0	0	0	0	0	0
Acronyms	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water																		

Waste production[3]

Results per functional or declared unit																			
Indicator	**Unit**	**A1**	**A2**	**A3**	**Tot. A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Hazardous waste disposed	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Non-hazardous waste disposed	kg	0	0	0	0	0	0,002	0	0	0	0	0	0	0	0	0	0	0	0
Radioactive waste disposed	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

[3] The reported waste production are flows leaving the system boundary. Since waste treatment processes are part of the system boundary, the indicators are here reported as zero, according to Environdec's "guidance on the resource use and waste indicators" (https://environdec.com/resources/indicators)

Output flows

Results per functional or declared unit																			
Indicator	**Unit**	**A1**	**A2**	**A3**	**Tot. A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Components for re-use	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Material for recycling	kg	0	0	0,16	0,16	0	0,46	0	0	0	0	0	0	0	0	0	0	0,48	0
Materials for energy recovery	kg	0	0	0,07	0,07	0	0,06	0	0	0	0	0	0	0	0	0	0	0	0
Exported energy, electricity	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exported energy, thermal	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Information on biogenic carbon content

Results per functional or declared unit		
BIOGENIC CARBON CONTENT	**Unit**	**QUANTITY**
Biogenic carbon content in product	kg C	0,6
Biogenic carbon content in packaging	kg C	0,3

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO2.

Additional information

From a life cycle perspective, the environmental impact of the Superdupertube can mainly be attributed to electricity consumption in the use phase. The environmental impact of this electricity is dominated by fossil resource use. Despite using average electricity from the Swedish grid (which has a low climate impact compared to e.g. European average electricity), the **use phase stood for 78%** of total climate impacts (IPCC).

The production of raw materials represents approximately 20% of total climate impacts (IPCC). Most of these come from the production of the LED strips (15%~) and some from the PLA profile (2%~).

The model of the product system is sensitive to the source of energy in production of the electricity. If European electricity is used instead, the Environmental Footprint Single score (EF) would be 90% higher.

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