



ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH EN 15804+A2 & ISO 14025

EPD HUB, HUB-5939

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Cascade

Whitecroft Lighting Limited



This EPD is intended for business-to-business and/or business-to-consumer communication. Life Cycle Assessment study has been performed in accordance with the requirements of EN 15804, EPD Hub PCR version 1.2 (24 Mar 2025) and JRC characterization factors EF 3.1. The manufacturer has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programs may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804 and if they are not compared in a building context.

MANUFACTURER AND SITE

Manufacturer	Whitecroft Lighting Limited
Address	Burlington Street, OL7 0AX, Ashton-Under-Lyne, GB
Contact details	email@whitecroftright.com
Website	https://www.whitecroftright.com/
Place of production	Whitecroft Lighting, Ashton-under-Lyne, United Kingdom
Place(s) of raw material origin	United Kingdom
Place(s) of installation and use	United Kingdom
Period for data	Calendar year 2025

EPD STANDARDS, SCOPE AND VERIFICATION

Program operator	EPD Hub, hub@epdhub.com
Reference standard	EN 15804:2012+A2:2019/AC:2021 and ISO 14025
PCR	EPD Hub Core PCR version 1.2, 24 Mar 2025
Sector	Electrical product
Category of EPD	Third party verified EPD
Parent EPD number	-
Scope of the EPD	Cradle to gate with options, A4-A5, B4, B6, and modules C1-C4, D
EPD author	Sandhra Mili Lal, Whitecroft Lighting
EPD verification	Independent verification of this EPD and data, according to ISO 14025: <input type="checkbox"/> Internal verification <input checked="" type="checkbox"/> External verification
EPD verifier	Magaly Gonzalez Vazquez as an authorized verifier for EPD Hub

PRODUCT SPECIFICATION

Product name	Cascade
Product number / reference	CAPH24K8XT
GTIN (Global Trade Item Number)	-
NOBB (Norwegian Building Product Database)	-
A1-A3 Specific data (%)	22

PRODUCT CLASSIFICATION

Declared operating voltage, Volt	240
Light source color temperature, Kelvin	4000
Protection index for water and dust (IP)	IP44/20
Impact resistance index (IK)	-
Luminous flux, Lumen	3306
Electrical power, Watt	25.4
Luminous efficiency, Lm/W	130.2
Additional characteristics	-

PRODUCT DESCRIPTION

Cascade is a recessed modular luminaire designed for integration into ceiling systems in indoor building applications. It is a ceiling-mounted lighting solution within the category of recessed luminaires. The luminaire incorporates a central linear optical system designed to provide controlled light distribution and support visual comfort in indoor environments requiring general lighting with controlled glare. The product is manufactured with a modular construction and includes a replaceable light engine cartridge, allowing for maintenance and component replacement during its service life.

Cascade is intended for use in indoor environments such as offices, educational facilities, healthcare settings, and other similar applications where recessed ceiling luminaires are installed. Detailed technical data, including performance characteristics and reference service life, are provided in the technical documentation and published product information, with performance values determined in accordance with applicable product standards.

For further information, please visit: <https://www.whitecroftright.com>

ABOUT THE MANUFACTURER

Founded in 1945, and headquartered in Ashton-under-Lyne, Greater Manchester, Whitecroft Lighting is one of the UK's largest public and private sector lighting providers, working with education, healthcare, industrial and workspace projects. Whitecroft Lighting undertakes all R&D, product design and manufacturing in its HQ and neighbouring 10,000sqm manufacturing facility. The company continuously strives to offer its customers the best service in the industry, with extensive sales, specification, design, product development, and after-sales support teams working closely with clients nationally.

In recent years, Whitecroft Lighting has been at the forefront of sustainability and circularity in UK commercial lighting, leading the market in the development of products that minimise the use of material and promote reusability through replaceable modular hardware.

ENVIRONMENTAL DATA SUMMARY

Declared unit	1 unit
Declared unit mass, kg	3.445
Mass of packaging, kg	0.426
Functional unit	Provide lighting that delivers an outgoing artificial luminous flux of 1,000 lumens during a reference lifetime of 35,000 hours
Reference service life (years)	20
Assigned lifetime (hours)	50000
GWP-total, A1-A3 (kg CO ₂ e)	27.3
GWP-fossil, A1-A3 (kg CO ₂ e)	27.4
Secondary material, inputs (%)	26
Secondary material, outputs (%)	57.4
Total energy use, A1-A3 (kWh)	126
Net freshwater use, A1-A3 (m ³)	2.01E-01

LIFE CYCLE ASSESSMENT

SYSTEM BOUNDARY

This EPD covers the life-cycle modules listed in the following table.

Product stage			Assembly stage			Use stage							End of life stage				Beyond the system boundaries
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D	
X	X	X	X	X	ND	ND	ND	X	ND	X	ND	X	X	X	X	X	
Raw materials	Transport	Manufacturing	Transport	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstr./demo.	Transport	Waste processing	Disposal	Reuse, Recovery, Recycling	

Not declared = ND.

CUT-OFF CRITERIA

The study does not exclude any modules or processes which are stated mandatory in the reference standard and the applied PCR. The study does not exclude any hazardous materials or substances. There is no neglected unit process more than 1% of total mass or energy flows. The module-specific total neglected input and output flows also do not exceed 5% of energy usage or mass.

The production of capital equipment, construction activities, and infrastructure, maintenance and operation of capital equipment, personnel-related activities, energy and water use related to company management and sales activities are excluded.

VALIDATION OF DATA

Data collection for production, transport, and packaging was conducted using time and site-specific information, as defined in the general information section on page 1 and 2. Upstream process calculations rely on generic data as defined in the Bibliography section. Manufacturer-provided specific and generic data were used for the product's manufacturing stage. The analysis was performed in One Click LCA EPD Generator, with the 'Cut-Off, EN 15804+A2' allocation method, and characterization factors according to EN 15804:2012+A2:2019/AC:2021 and JRC EF 3.1.

ALLOCATION, ESTIMATES AND ASSUMPTIONS

All allocations are done as per the reference standards and the applied PCR. In this study, allocation has been done in the following ways:

Data type	Allocation
Raw materials	No allocation
Packaging materials	No allocation
Ancillary materials	Allocated by mass
Manufacturing energy and waste	Allocated by mass

PRODUCT & MANUFACTURING SITES GROUPING

Type of grouping	No grouping
Grouping method	Not applicable
Variation in GWP-fossil for A1-A3, %	-

This EPD is product and factory specific.

PRODUCT RAW MATERIAL MAIN COMPOSITION

Raw material category	Amount, mass- %	Material origin
Metals	69.81132	United Kingdom
Minerals	0	-
Fossil materials	23.3672	United Kingdom, Germany
Bio-based materials	0	-
Electronic parts	6.82148	United Kingdom

BIOGENIC CARBON CONTENT

Product's biogenic carbon content at the factory gate

Biogenic carbon content in product, kg C	0
Biogenic carbon content in packaging, kg C	0.17427

SUBSTANCES, REACH - VERY HIGH CONCERN

The product does not contain any REACH SVHC substances in amounts greater than 0,1 % (1000 ppm).

LCA SOFTWARE AND BIBLIOGRAPHY

This EPD has been created using One Click LCA Luminaire EPD Generator v2.2.8. The LCA and EPD have been prepared according to the reference standards, EN 50693, and ISO 14040/14044. Ecoinvent v3.10.1/3.11/3.12 and One Click LCA databases were used as sources of environmental data. Allocation used in Ecoinvent 3.10.1/3.11/3.12 environmental data sources follow the methodology 'allocation, cut-off, EN 15804+A2'.

Scenario for packaging waste treatment are based on EUROSTAT statistics, taking Europe as scenario geography.

PRODUCT LIFE CYCLE

MANUFACTURING (A1-A3)

The environmental impacts considered for the product stage cover the manufacturing of raw materials used in the production. The material losses occurring during the manufacturing processes are treated as per the waste handling practices in the factory, while scenario assumptions are made in the absence of exact data. The study also considers the fuels used by machines as well as losses during electricity transmission. The use of green energy in manufacturing is demonstrated through our Renewable Energy Certificate provided by SSE, and its use is ensured throughout the validity period of this EPD.

The product is made of metals, plastics, and electronic components. All components are transported to the production facility, where the main manufacturing processes are associated with assembly of different parts and components. The finished product is packaged with paper and cardboard as packaging material before being sent to customers. Transport (A2) between raw material supply and production site is considered between 2000km to 300000km. A renewable mix of wind and hydro was used to model A3 Energy with a GO.

Co-product allocation is neglected as revenue of co-product is very low. Hence, the waste undergoes a conservative waste treatment as per the default end-of-life values of EN 50693.

A market-based approach is used in modelling the electricity mix utilized in the factory. This product is made of steel, extruded plastic and electronic components. Those materials are manufactured by various suppliers around the world. The main manufacturing process involved are hot working and injection moulding. Separate prefabricated components are transported to Whitecroft Lighting's production facility in Ashton-under-Lyne, where they are processed using CNC manufacturing and undergo manual and robotic assembly.

Whitecroft Lighting facility uses 100% renewable electric energy that consist of: 44% onshore wind energy production, 26% conventional hydro, 23% offshore wind and 7% pumped storage. Heat production is provided with natural gas.

Finished product leaves the facility packaged in cardboard. Product contains both QR code leading to all necessary product information and physical copy of product leaflet.

TRANSPORT AND INSTALLATION (A4-A5)

Transportation distances from manufacturing sites to customer locations are based on sales volume-based weighted averages. In the absence of exact data, conservative assumptions are made (A4). Packaging waste generated during installation is modelled using EUROSTAT waste treatment data. Paper and cardboard packaging end of life is modelled as 83% recycling, 8% incineration, and 9% landfill. A transport distance of 50 km between the installation site and waste treatment facilities is assumed. No material losses occur during installation, and energy consumption is considered negligible.

The average distance of transportation from production plant to building site is assumed as 330km (Distance from Ashton-Under Lyne, UK, to London, UK.) The transportation method is assumed to be lorry. Vehicle capacity utilisation volume factor is assumed to be 100% which means full load. In reality, this value may vary, but as the role of transportation emissions in the total result is small, the variety in load is assumed to be negligible.

Empty returns are not considered as it is assumed that the return trip is used to serve the needs of other clients.

Transportation does not cause losses as products are packaged properly. Also, the volume capacity utilisation factor is assumed to be 100% for the nested packaged products.

Environmental impacts from installation into the building include waste packaging materials (A5) and release of biogenic carbon dioxide from wood pallets and cardboard. The impacts of energy consumption and the used ancillary materials during installation are considered negligible.

PRODUCT USE AND MAINTENANCE (B1-B7)

The product consumes electricity during use phase and the scenario in this study is based on the European electricity grid mix (B6). The reference service life time is 20 years with 2500h of use per year, so 50000 hours in total. B6 Operation Consumption is calculated in kWh, as follow: $\text{time in use in hours} \times \text{in use power consumption (W)} / 1000$. The result per Declared unit as well as Functional Unit are also presented in this EPD. Impacts due to electricity production include direct emissions to air, transformation, and transmission losses.

Lifetime of the product is assumed to be 20 years, in line with industry trends observed by Whitecroft. At

this point in time, LED output >90% of initial output (L90@50K Hours).

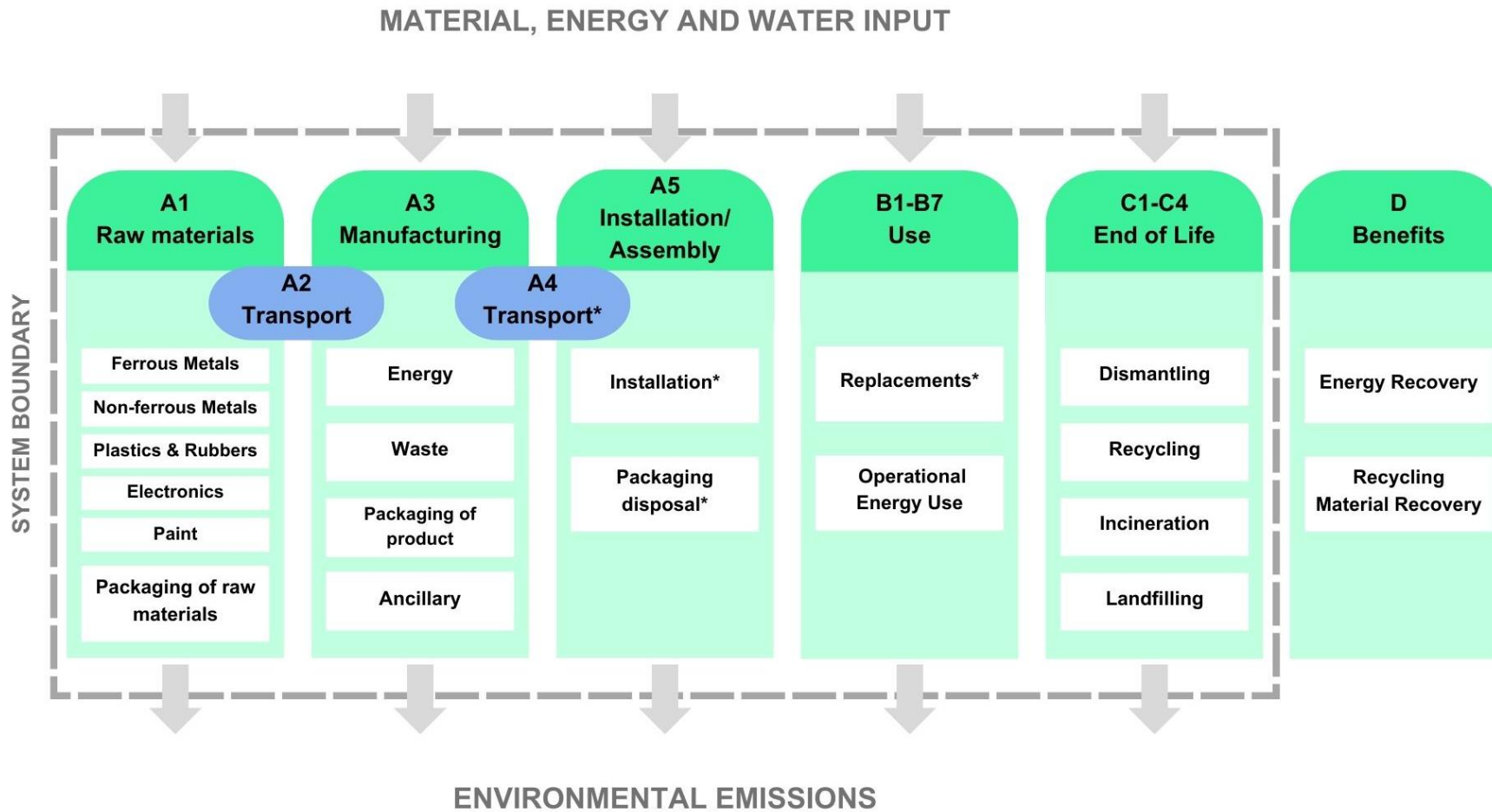
Driver replacement has been included, in line with guidance provided by driver manufacturer. During the use phase (B6), the luminaire consumes power from electricity available on the low voltage level in United Kingdom (datapoint from Ecoinvent 3.10.1, based on statistics from 2024).

Occupancy and application estimations, relevant for product energy use, were made in line with Whitecroft Lighting recommendations.

PRODUCT END OF LIFE (C1-C4, D)

Consumption of energy and natural resources in demolition process is assumed to be negligible. It is assumed that the waste is collected separately and transported to the waste treatment centre. The transport distance is 150 km while the transportation method is assumed to be lorry (C2). According to EN 50693:2019, the sequence of treatment operations occurring to the product shall include de-pollution, fractions separation and preparation (dismantling, crushing, shredding, sorting), recycling, other material recovery, energy recovery and disposal. In this study, the default values from table G.4 of EN 50693 is used for treating materials in different waste treatment methods. Due to the material and energy recovery potential of parts in the lighting system, the end-of-life product is converted into recycled raw materials, while the energy recovered from incineration displaces electricity and heat production (D). The benefits and loads of incineration and recycling from both the materials in Module C as well as packaging treatments from module A5 are included in Module D. Overall, the scenarios included for Module C-D are currently in use and are representative for one of the most likely scenarios.

LIFE CYCLE FLOW DIAGRAM



*If module declared as per scope of the EPD

ENVIRONMENTAL IMPACT DATA, RESULTS PER DECLARED UNIT

The estimated impact results are only relative statements which do not indicate the end points of the impact categories, exceeding threshold values, safety margins or risks.

CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, EF 3.1

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP – total ¹⁾	kg CO ₂ e	2.13E+01	9.37E-02	5.88E+00	2.73E+01	1.38E-01	5.97E-01	ND	ND	ND	6.49E-01	ND	2.84E+02	ND	0.00E+00	8.79E-05	8.97E-01	6.80E-01	2.28E+00
GWP – fossil	kg CO ₂ e	2.10E+01	9.37E-02	6.34E+00	2.74E+01	1.37E-01	1.10E-02	ND	ND	ND	6.47E-01	ND	2.83E+02	ND	0.00E+00	8.79E-05	8.97E-01	6.81E-01	2.29E+00
GWP – biogenic	kg CO ₂ e	2.06E-01	2.12E-05	-4.92E-01	-2.86E-01	3.11E-05	5.86E-01	ND	ND	ND	0.00E+00	ND	6.34E-01	ND	0.00E+00	1.92E-08	-2.24E-04	-1.03E-03	-1.31E-02
GWP – LULUC	kg CO ₂ e	1.00E-01	4.19E-05	3.30E-02	1.33E-01	6.15E-05	6.84E-06	ND	ND	ND	2.13E-03	ND	8.68E-01	ND	0.00E+00	3.89E-08	8.23E-05	1.61E-05	2.03E-03
Ozone depletion pot.	kg CFC ₁₁ e	5.20E-07	1.38E-09	2.67E-07	7.89E-07	2.03E-09	7.56E-11	ND	ND	ND	8.90E-09	ND	5.21E-06	ND	0.00E+00	1.23E-12	9.31E-10	3.70E-10	1.27E-08
Acidification potential	mol H ⁺ e	1.61E-01	3.19E-04	1.13E-02	1.72E-01	4.69E-04	4.92E-05	ND	ND	ND	2.43E-02	ND	1.66E+00	ND	0.00E+00	2.93E-07	8.02E-04	1.73E-04	9.57E-03
EP-freshwater ²⁾	kg Pe	1.49E-02	7.29E-06	6.17E-04	1.56E-02	1.07E-05	2.54E-06	ND	ND	ND	1.89E-03	ND	2.63E-01	ND	0.00E+00	6.84E-09	3.47E-05	5.72E-06	9.09E-04
EP-marine	kg Ne	2.27E-02	1.05E-04	3.67E-03	2.65E-02	1.54E-04	6.98E-05	ND	ND	ND	1.57E-03	ND	2.61E-01	ND	0.00E+00	9.49E-08	2.43E-04	4.52E-04	2.44E-03
EP-terrestrial	mol Ne	2.39E-01	1.14E-03	3.55E-02	2.76E-01	1.68E-03	1.41E-04	ND	ND	ND	2.00E-02	ND	2.34E+00	ND	0.00E+00	1.03E-06	2.44E-03	8.00E-04	2.09E-02
POCP (“smog”) ³⁾	kg NMVOCe	8.41E-02	4.71E-04	1.37E-02	9.83E-02	6.91E-04	5.76E-05	ND	ND	ND	6.02E-03	ND	7.69E-01	ND	0.00E+00	4.08E-07	6.77E-04	2.27E-04	7.38E-03
ADP-minerals & metals ⁴⁾	kg Sbe	1.89E-03	2.61E-07	1.38E-05	1.90E-03	3.84E-07	8.54E-08	ND	ND	ND	2.91E-04	ND	3.82E-03	ND	0.00E+00	2.89E-10	3.29E-06	6.01E-08	-1.73E-07
ADP-fossil resources	MJ	2.90E+02	1.36E+00	1.25E+02	4.17E+02	2.00E+00	8.10E-02	ND	ND	ND	8.79E+00	ND	6.58E+03	ND	0.00E+00	1.23E-03	8.81E-01	2.72E-01	2.44E+01
Water use ⁵⁾	m ³ e depr.	7.29E+00	6.72E-03	9.31E-01	8.23E+00	9.86E-03	4.84E-03	ND	ND	ND	3.27E-01	ND	1.79E+02	ND	0.00E+00	5.72E-06	6.67E-02	3.18E-02	1.22E+00

1) GWP = Global Warming Potential. 2) EP = Eutrophication potential. Required characterisation method and data are in kg P-eq. Multiply by 3,07 to get PO4e. 3) POCP = Photochemical ozone formation. 4) ADP = Abiotic depletion potential. 5) EN 15804+A2 disclaimer for Abiotic depletion and Water use and optional indicators except Particulate matter and Ionizing radiation, human health. The results of these environmental impact indicators shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

ADDITIONAL (OPTIONAL) ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, EF 3.1

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Particulate matter	Incidence	1.41E-06	9.38E-09	7.86E-08	1.49E-06	1.38E-08	5.03E-10	ND	ND	ND	7.34E-08	ND	5.93E-06	ND	0.00E+00	6.97E-12	9.34E-09	2.22E-09	2.35E-07
Ionizing radiation ⁶⁾	kBq U235e	1.66E+00	1.18E-03	2.20E+00	3.86E+00	1.74E-03	8.40E-04	ND	ND	ND	5.70E-02	ND	1.82E+02	ND	0.00E+00	9.98E-07	3.42E-03	3.36E-04	9.87E-02
Ecotoxicity (freshwater)	CTUe	4.00E+02	1.92E-01	4.71E+01	4.47E+02	2.82E-01	1.77E+00	ND	ND	ND	3.19E+01	ND	1.00E+03	ND	0.00E+00	1.95E-04	2.03E+00	1.61E+00	2.10E+01
Human toxicity, cancer	CTUh	2.60E-08	1.55E-11	8.60E-10	2.69E-08	2.27E-11	9.77E-12	ND	ND	ND	3.16E-09	ND	9.55E-08	ND	0.00E+00	1.49E-14	1.17E-10	3.51E-10	4.97E-09
Human tox. non-cancer	CTUh	9.27E-07	8.80E-10	2.16E-08	9.49E-07	1.29E-09	5.34E-10	ND	ND	ND	2.37E-07	ND	4.95E-06	ND	0.00E+00	7.72E-13	5.45E-09	3.01E-09	1.43E-07
SQP ⁷⁾	-	1.03E+02	1.37E+00	3.57E+01	1.40E+02	2.01E+00	6.71E-02	ND	ND	ND	9.81E+00	ND	1.46E+03	ND	0.00E+00	7.36E-04	1.27E+00	3.29E-01	6.42E+00

6) EN 15804+A2 disclaimer for Ionizing radiation, human health. This impact category deals mainly with the eventual impact of low-dose ionizing radiation on the human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon, and from some construction materials is also not measured by this indicator. 7) SQP = Land use related impacts/soil quality.

USE OF NATURAL RESOURCES

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Renew. PER as energy ⁸⁾	MJ	2.84E+01	1.86E-02	2.74E+01	5.59E+01	2.73E-02	-6.91E+00	ND	ND	ND	8.52E-01	ND	1.80E+03	ND	0.00E+00	1.69E-05	1.17E-01	-1.16E-02	1.75E+00
Renew. PER as material	MJ	6.05E-01	0.00E+00	5.47E+00	6.07E+00	0.00E+00	-5.47E+00	ND	ND	ND	0.00E+00	ND	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	-6.05E-01	0.00E+00
Total use of renew. PER	MJ	2.90E+01	1.86E-02	3.29E+01	6.20E+01	2.73E-02	-1.24E+01	ND	ND	ND	8.52E-01	ND	1.80E+03	ND	0.00E+00	1.69E-05	1.17E-01	-6.16E-01	1.75E+00
Non-re. PER as energy	MJ	2.69E+02	1.36E+00	1.25E+02	3.96E+02	2.00E+00	8.10E-02	ND	ND	ND	8.80E+00	ND	6.58E+03	ND	0.00E+00	1.23E-03	-1.19E+01	-1.35E+01	2.44E+01
Non-re. PER as material	MJ	2.11E+01	0.00E+00	1.80E-02	2.12E+01	0.00E+00	-1.80E-02	ND	ND	ND	0.00E+00	ND	0.00E+00	ND	0.00E+00	0.00E+00	-1.04E+01	-1.08E+01	0.00E+00
Total use of non-re. PER	MJ	2.91E+02	1.36E+00	1.25E+02	4.17E+02	2.00E+00	6.30E-02	ND	ND	ND	8.80E+00	ND	6.58E+03	ND	0.00E+00	1.23E-03	-2.22E+01	-2.43E+01	2.44E+01
Secondary materials	kg	8.96E-01	0.00E+00	0.00E+00	8.96E-01	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Renew. secondary fuels	MJ	1.50E-02	7.35E-06	3.91E-02	5.40E-02	1.08E-05	1.08E-06	ND	ND	ND	3.16E-03	ND	8.68E-03	ND	0.00E+00	7.05E-09	4.20E-05	5.03E-06	2.12E-04
Non-ren. secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	0.00E+00	ND	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of net fresh water	m ³	1.79E-01	2.01E-04	2.18E-02	2.01E-01	2.95E-04	-6.11E-05	ND	ND	ND	1.08E-02	ND	5.68E+00	ND	0.00E+00	1.63E-07	1.27E-03	-3.43E-05	-2.70E-02

8) PER = Primary energy resources.

END OF LIFE – WASTE

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Hazardous waste	kg	4.38E+00	2.30E-03	1.46E-01	4.52E+00	3.38E-03	1.64E-03	ND	ND	ND	2.52E-01	ND	1.66E+01	ND	0.00E+00	2.15E-06	2.00E-02	3.69E-02	6.45E-01
Non-hazardous waste	kg	8.28E+01	4.26E-02	2.90E+00	8.57E+01	6.26E-02	2.68E-01	ND	ND	ND	7.59E+00	ND	1.29E+03	ND	0.00E+00	4.03E-05	5.43E-01	1.64E+00	2.99E+01
Radioactive waste	kg	4.20E-04	2.90E-07	4.82E-04	9.02E-04	4.25E-07	2.15E-07	ND	ND	ND	1.46E-05	ND	4.67E-02	ND	0.00E+00	2.44E-10	8.42E-07	8.39E-08	2.42E-05

END OF LIFE – OUTPUT FLOWS

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Components for reuse	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	0.00E+00	ND	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	0.00E+00	0.00E+00	2.48E-01	2.48E-01	0.00E+00	3.49E-01	ND	ND	ND	6.66E-02	ND	0.00E+00	ND	0.00E+00	0.00E+00	1.98E+00	0.00E+00	0.00E+00
Materials for energy rec	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	0.00E+00	ND	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.96E-01	ND	ND	ND	1.38E-02	ND	0.00E+00	ND	0.00E+00	0.00E+00	4.01E+00	0.00E+00	0.00E+00
Exported energy: Electricity	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.27E-02	ND	ND	ND	5.83E-03	ND	0.00E+00	ND	0.00E+00	0.00E+00	1.69E+00	0.00E+00	0.00E+00
Exported energy: Heat	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.04E-01	ND	ND	ND	7.29E-03	ND	0.00E+00	ND	0.00E+00	0.00E+00	2.32E+00	0.00E+00	0.00E+00

ENVIRONMENTAL IMPACTS – EN 15804+A1, CML

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Global Warming Pot.	kg CO ₂ e	2.12E+01	9.32E-02	6.36E+00	2.77E+01	1.37E-01	6.54E-02	ND	ND	ND	6.51E-01	ND	2.83E+02	ND	0.00E+00	8.74E-05	8.96E-01	6.81E-01	2.28E+00
Ozone depletion Pot.	kg CFC-11e	5.13E-07	1.10E-09	2.17E-07	7.31E-07	1.62E-09	6.45E-11	ND	ND	ND	7.67E-09	ND	4.35E-06	ND	0.00E+00	9.82E-13	7.92E-10	3.11E-10	1.07E-08
Acidification	kg SO ₂ e	1.36E-01	2.44E-04	8.64E-03	1.45E-01	3.58E-04	3.81E-05	ND	ND	ND	2.12E-02	ND	1.42E+00	ND	0.00E+00	2.24E-07	6.28E-04	1.25E-04	7.83E-03
Eutrophication	kg PO ₄ ³ e	4.48E-02	5.94E-05	2.25E-03	4.71E-02	8.72E-05	5.59E-05	ND	ND	ND	1.68E-03	ND	1.83E-01	ND	0.00E+00	5.46E-08	1.18E-04	6.14E-05	2.94E-03
POCP (“smog”)	kg C ₂ H ₄ e	1.04E-02	2.17E-05	8.83E-04	1.13E-02	3.19E-05	1.56E-05	ND	ND	ND	9.80E-04	ND	7.72E-02	ND	0.00E+00	2.01E-08	3.80E-05	1.24E-05	6.62E-04
ADP-elements	kg Sbe	1.88E-03	2.55E-07	1.33E-05	1.89E-03	3.74E-07	8.35E-08	ND	ND	ND	2.90E-04	ND	3.80E-03	ND	0.00E+00	2.82E-10	3.26E-06	4.81E-08	-3.84E-07
ADP-fossil	MJ	2.62E+02	1.34E+00	9.56E+01	3.59E+02	1.97E+00	6.64E-02	ND	ND	ND	7.90E+00	ND	3.37E+03	ND	0.00E+00	1.22E-03	8.27E-01	2.67E-01	2.29E+01

ADDITIONAL INDICATOR – GWP-GHG

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP-GHG ⁹⁾	kg CO ₂ e	2.11E+01	9.37E-02	6.38E+00	2.76E+01	1.38E-01	1.10E-02	ND	ND	ND	6.49E-01	ND	2.84E+02	ND	0.00E+00	8.79E-05	8.97E-01	6.81E-01	2.29E+00

9) This indicator includes all greenhouse gases excluding biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. In addition, the characterisation factors for the flows - CH₄ fossil, CH₄ biogenic and Dinitrogen monoxide - were updated. This indicator is identical to the GWP-total of EN 15804:2012+A2:2019 except that the characterization factor for biogenic CO₂ is set to zero.

ENVIRONMENTAL IMPACT DATA, RESULTS PER FUNCTIONAL UNIT

The estimated impact results are only relative statements which do not indicate the end points of the impact categories, exceeding threshold values, safety margins or risks.

CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, EF 3.1

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP – total ¹⁾	kg CO ₂ éq/FU	4.51E+00	1.98E-02	1.25E+00	5.78E+00	2.91E-02	1.26E-01	ND	ND	ND	1.37E-01	ND	6.02E+01	ND	0.00E+00	1.86E-05	1.90E-01	1.44E-01	4.83E-01
GWP – fossil	kg CO ₂ éq/FU	4.45E+00	1.98E-02	1.34E+00	5.81E+00	2.91E-02	2.32E-03	ND	ND	ND	1.37E-01	ND	5.98E+01	ND	0.00E+00	1.86E-05	1.90E-01	1.44E-01	4.85E-01
GWP – biogenic	kg CO ₂ éq/FU	4.35E-02	4.49E-06	-1.04E-01	-6.06E-02	6.59E-06	1.24E-01	ND	ND	ND	0.00E+00	ND	1.34E-01	ND	0.00E+00	4.06E-09	-4.73E-05	-2.19E-04	-2.77E-03
GWP – LULUC	kg CO ₂ éq/FU	2.13E-02	8.87E-06	6.98E-03	2.82E-02	1.30E-05	1.45E-06	ND	ND	ND	4.51E-04	ND	1.84E-01	ND	0.00E+00	8.24E-09	1.74E-05	3.42E-06	4.29E-04
Ozone depletion pot.	kg CFC ₁₁ e/FU	1.10E-07	2.93E-10	5.66E-08	1.67E-07	4.30E-10	1.60E-11	ND	ND	ND	1.88E-09	ND	1.10E-06	ND	0.00E+00	2.60E-13	1.97E-10	7.84E-11	2.70E-09
Acidification potential	mole H ⁺ e/FU	3.41E-02	6.76E-05	2.39E-03	3.65E-02	9.93E-05	1.04E-05	ND	ND	ND	5.14E-03	ND	3.52E-01	ND	0.00E+00	6.20E-08	1.70E-04	3.67E-05	2.03E-03
EP-freshwater ²⁾	kg Pe/FU	3.16E-03	1.54E-06	1.31E-04	3.29E-03	2.27E-06	5.37E-07	ND	ND	ND	4.00E-04	ND	5.57E-02	ND	0.00E+00	1.45E-09	7.35E-06	1.21E-06	1.92E-04
EP-marine	kg Ne/FU	4.81E-03	2.22E-05	7.78E-04	5.61E-03	3.26E-05	1.48E-05	ND	ND	ND	3.32E-04	ND	5.52E-02	ND	0.00E+00	2.01E-08	5.14E-05	9.57E-05	5.18E-04
EP-terrestrial	mol Ne/FU	5.07E-02	2.42E-04	7.51E-03	5.85E-02	3.55E-04	2.99E-05	ND	ND	ND	4.23E-03	ND	4.95E-01	ND	0.00E+00	2.19E-07	5.16E-04	1.69E-04	4.43E-03
POCP (“smog”) ³⁾	kg NMVOCe/	1.78E-02	9.97E-05	2.89E-03	2.08E-02	1.46E-04	1.22E-05	ND	ND	ND	1.27E-03	ND	1.63E-01	ND	0.00E+00	8.64E-08	1.43E-04	4.80E-05	1.56E-03
ADP-minerals & metals ⁴⁾	kg Sbe/FU	4.00E-04	5.53E-08	2.92E-06	4.03E-04	8.12E-08	1.81E-08	ND	ND	ND	6.16E-05	ND	8.08E-04	ND	0.00E+00	6.11E-11	6.97E-07	1.27E-08	-3.66E-08
ADP-fossil resources	MJ/FU	6.15E+01	2.88E-01	2.65E+01	8.83E+01	4.22E-01	1.72E-02	ND	ND	ND	1.86E+00	ND	1.39E+03	ND	0.00E+00	2.61E-04	1.87E-01	5.77E-02	5.17E+00
Water use ⁵⁾	m ³ e priv./FU	1.54E+00	1.42E-03	1.97E-01	1.74E+00	2.09E-03	1.03E-03	ND	ND	ND	6.93E-02	ND	3.80E+01	ND	0.00E+00	1.21E-06	1.41E-02	6.73E-03	2.57E-01

1) GWP = Global Warming Potential. 2) EP = Eutrophication potential. Required characterisation method and data are in kg P-eq. Multiply by 3,07 to get PO4e. 3) POCP = Photochemical ozone formation. 4) ADP = Abiotic depletion potential. 5) EN 15804+A2 disclaimer for Abiotic depletion and Water use and optional indicators except Particulate matter and Ionizing radiation, human health. The results of these environmental impact indicators shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

ADDITIONAL (OPTIONAL) ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, EF 3.1

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Particulate matter	Incidence /FU	2.98E-07	1.99E-09	1.66E-08	3.16E-07	2.91E-09	1.06E-10	ND	ND	ND	1.55E-08	ND	1.26E-06	ND	0.00E+00	1.48E-12	1.98E-09	4.69E-10	4.97E-08
Ionizing radiation ⁶⁾	kBq U235e/FU	3.52E-01	2.51E-04	4.65E-01	8.18E-01	3.68E-04	1.78E-04	ND	ND	ND	1.21E-02	ND	3.85E+01	ND	0.00E+00	2.11E-07	7.24E-04	7.11E-05	2.09E-02
Ecotoxicity (freshwater)	CTUe/FU	8.46E+01	4.07E-02	9.98E+00	9.47E+01	5.98E-02	3.75E-01	ND	ND	ND	6.74E+00	ND	2.12E+02	ND	0.00E+00	4.13E-05	4.31E-01	3.41E-01	4.44E+00
Human toxicity, cancer	CTUh/FU	5.51E-09	3.27E-12	1.82E-10	5.70E-09	4.80E-12	2.07E-12	ND	ND	ND	6.68E-10	ND	2.02E-08	ND	0.00E+00	3.16E-15	2.47E-11	7.43E-11	1.05E-09
Human tox. non-cancer	CTUh/FU	1.96E-07	1.86E-10	4.58E-09	2.01E-07	2.74E-10	1.13E-10	ND	ND	ND	5.03E-08	ND	1.05E-06	ND	0.00E+00	1.63E-13	1.15E-09	6.36E-10	3.02E-08
SQP ⁷⁾	-/FU	2.18E+01	2.90E-01	7.56E+00	2.96E+01	4.25E-01	1.42E-02	ND	ND	ND	2.08E+00	ND	3.10E+02	ND	0.00E+00	1.56E-04	2.70E-01	6.97E-02	1.36E+00

6) EN 15804+A2 disclaimer for Ionizing radiation, human health. This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator. 7) SQP = Land use related impacts/soil quality.

USE OF NATURAL RESOURCES

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Renew. PER as energy ⁸⁾	MJ/FU	6.02E+00	3.94E-03	5.81E+00	1.18E+01	5.79E-03	-1.46E+00	ND	ND	ND	1.80E-01	ND	3.82E+02	ND	0.00E+00	3.58E-06	2.48E-02	-2.46E-03	3.70E-01
Renew. PER as material	MJ/FU	1.28E-01	0.00E+00	1.16E+00	1.29E+00	0.00E+00	-1.16E+00	ND	ND	ND	0.00E+00	ND	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	-1.28E-01	0.00E+00
Total use of renew. PER	MJ/FU	6.15E+00	3.94E-03	6.97E+00	1.31E+01	5.79E-03	-2.62E+00	ND	ND	ND	1.80E-01	ND	3.82E+02	ND	0.00E+00	3.58E-06	2.48E-02	-1.30E-01	3.70E-01
Non-re. PER as energy	MJ/FU	5.70E+01	2.88E-01	2.66E+01	8.39E+01	4.22E-01	1.72E-02	ND	ND	ND	1.86E+00	ND	1.39E+03	ND	0.00E+00	2.61E-04	-2.52E+00	-2.86E+00	5.17E+00
Non-re. PER as material	MJ/FU	4.48E+00	0.00E+00	3.81E-03	4.48E+00	0.00E+00	-3.81E-03	ND	ND	ND	0.00E+00	ND	0.00E+00	ND	0.00E+00	0.00E+00	-2.19E+00	-2.29E+00	0.00E+00
Total use of non-re. PER	MJ/FU	6.15E+01	2.88E-01	2.66E+01	8.84E+01	4.22E-01	1.33E-02	ND	ND	ND	1.86E+00	ND	1.39E+03	ND	0.00E+00	2.61E-04	-4.71E+00	-5.15E+00	5.17E+00
Secondary materials	kg/FU	1.90E-01	0.00E+00	0.00E+00	1.90E-01	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Renew. secondary fuels	MJ/FU	3.17E-03	1.56E-06	8.27E-03	1.14E-02	2.28E-06	2.28E-07	ND	ND	ND	6.68E-04	ND	1.84E-03	ND	0.00E+00	1.49E-09	8.89E-06	1.06E-06	4.50E-05
Non-ren. secondary fuels	MJ/FU	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	0.00E+00	ND	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of net fresh water	m ³ /FU	3.80E-02	4.26E-05	4.61E-03	4.26E-02	6.25E-05	-1.29E-05	ND	ND	ND	2.28E-03	ND	1.20E+00	ND	0.00E+00	3.46E-08	2.68E-04	-7.25E-06	-5.72E-03

8) PER = Primary energy resources.

END OF LIFE – WASTE

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Hazardous waste	kg/FU	9.26E-01	4.88E-04	3.09E-02	9.58E-01	7.16E-04	3.47E-04	ND	ND	ND	5.34E-02	ND	3.52E+00	ND	0.00E+00	4.55E-07	4.22E-03	7.81E-03	1.37E-01
Non-hazardous waste	kg/FU	1.75E+01	9.03E-03	6.14E-01	1.82E+01	1.32E-02	5.67E-02	ND	ND	ND	1.61E+00	ND	2.73E+02	ND	0.00E+00	8.53E-06	1.15E-01	3.48E-01	6.34E+00
Radioactive waste	kg/FU	8.89E-05	6.14E-08	1.02E-04	1.91E-04	9.01E-08	4.54E-08	ND	ND	ND	3.09E-06	ND	9.88E-03	ND	0.00E+00	5.18E-11	1.78E-07	1.78E-08	5.11E-06

END OF LIFE – OUTPUT FLOWS

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Components for re-use	kg/FU	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	0.00E+00	ND	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg/FU	0.00E+00	0.00E+00	5.25E-02	5.25E-02	0.00E+00	7.39E-02	ND	ND	ND	1.41E-02	ND	0.00E+00	ND	0.00E+00	0.00E+00	4.19E-01	0.00E+00	0.00E+00
Materials for energy rec	kg/FU	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	0.00E+00	ND	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy	MJ/FU	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.16E-02	ND	ND	ND	2.93E-03	ND	0.00E+00	ND	0.00E+00	0.00E+00	8.48E-01	0.00E+00	0.00E+00
Exported energy: Electricity	MJ/FU	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-02	ND	ND	ND	1.23E-03	ND	0.00E+00	ND	0.00E+00	0.00E+00	3.57E-01	0.00E+00	0.00E+00
Exported energy: Heat	MJ/FU	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.19E-02	ND	ND	ND	1.54E-03	ND	0.00E+00	ND	0.00E+00	0.00E+00	4.91E-01	0.00E+00	0.00E+00

ENVIRONMENTAL IMPACTS – EN 15804+A1, CML

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Global Warming Pot.	kg CO ₂ eq./FU	4.50E+00	1.97E-02	1.35E+00	5.86E+00	2.90E-02	1.39E-02	ND	ND	ND	1.38E-01	ND	5.99E+01	ND	0.00E+00	1.85E-05	1.90E-01	1.44E-01	4.83E-01
Ozone depletion Pot.	kg CFC-11e/FU	1.09E-07	2.34E-10	4.60E-08	1.55E-07	3.43E-10	1.37E-11	ND	ND	ND	1.62E-09	ND	9.21E-07	ND	0.00E+00	2.08E-13	1.68E-10	6.58E-11	2.27E-09
Acidification	kg SO ₂ e/FU	2.88E-02	5.17E-05	1.83E-03	3.06E-02	7.58E-05	8.06E-06	ND	ND	ND	4.48E-03	ND	3.00E-01	ND	0.00E+00	4.75E-08	1.33E-04	2.64E-05	1.66E-03
Eutrophication	kg PO ₄ ^{3e} /FU	9.49E-03	1.26E-05	4.76E-04	9.97E-03	1.85E-05	1.18E-05	ND	ND	ND	3.56E-04	ND	3.88E-02	ND	0.00E+00	1.16E-08	2.50E-05	1.30E-05	6.22E-04
POCP (“smog”)	kg C ₂ H ₄ e/FU	2.20E-03	4.60E-06	1.87E-04	2.39E-03	6.76E-06	3.29E-06	ND	ND	ND	2.08E-04	ND	1.63E-02	ND	0.00E+00	4.25E-09	8.04E-06	2.62E-06	1.40E-04
ADP-elements	kg Sbe/FU	3.98E-04	5.40E-08	2.82E-06	4.01E-04	7.92E-08	1.77E-08	ND	ND	ND	6.14E-05	ND	8.05E-04	ND	0.00E+00	5.97E-11	6.91E-07	1.02E-08	-8.12E-08
ADP-fossil	MJ/FU	5.55E+01	2.84E-01	2.02E+01	7.60E+01	4.17E-01	1.41E-02	ND	ND	ND	1.67E+00	ND	7.15E+02	ND	0.00E+00	2.58E-04	1.75E-01	5.66E-02	4.85E+00

ADDITIONAL INDICATOR – GWP-GHG

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP-GHG ⁹⁾	kg CO ₂ e/FU	4.47E+00	1.98E-02	1.35E+00	5.84E+00	2.91E-02	2.32E-03	ND	ND	ND	1.37E-01	ND	6.00E+01	ND	0.00E+00	1.86E-05	1.90E-01	1.44E-01	4.85E-01

9) This indicator includes all greenhouse gases excluding biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. In addition, the characterisation factors for the flows - CH₄ fossil, CH₄ biogenic and Dinitrogen monoxide - were updated. This indicator is identical to the GWP-total of EN 15804:2012+A2:2019 except that the characterization factor for biogenic CO₂ is set to zero.

SCENARIO DOCUMENTATION

DATA SOURCES

Manufacturing energy scenario documentation – A3 (Energy data source)

1. Energy supply, electricity production, hydro, Electricity production, hydro, run-of-river, United Kingdom, ecoinvent 3.11, 0.0044 kgCO₂e/kWh
2. Energy supply, electricity production, hydro, Electricity production, hydro, run-of-river, United Kingdom, ecoinvent 3.11, 0.0044 kgCO₂e/kWh
3. Energy supply, electricity production, wind, Electricity production, wind, 1-3MW turbine, offshore, United Kingdom, ecoinvent 3.11, 0.0165 kgCO₂e/kWh
4. Energy supply, electricity production, wind, Electricity production, wind, 1-3MW turbine, offshore, United Kingdom, ecoinvent 3.11, 0.0165 kgCO₂e/kWh
5. Energy supply, electricity production, wind, Electricity production, wind, >3MW turbine, onshore, United Kingdom, ecoinvent 3.11, 0.0229 kgCO₂e/kWh
6. Energy supply, electricity production, wind, Electricity production, wind, >3MW turbine, onshore, United Kingdom, ecoinvent 3.11, 0.0229 kgCO₂e/kWh
7. Energy supply, electricity production, hydro, Electricity production, hydro, pumped storage, United Kingdom, ecoinvent 3.11, 0.48 kgCO₂e/kWh
8. Energy supply, electricity production, hydro, Electricity production, hydro, pumped storage, United Kingdom, ecoinvent 3.11, 0.48 kgCO₂e/kWh
9. Energy supply, electricity transformation and distribution, medium to low voltage, Electricity voltage transformation from medium to low voltage, United Kingdom, ecoinvent 3.11, 0.31 kgCO₂e/kWh
10. Energy supply, electricity transformation and distribution, medium to low voltage, Electricity voltage transformation from medium to low voltage, United Kingdom, ecoinvent 3.11, 0.31 kgCO₂e/kWh
11. Energy supply, electricity transformation and distribution, high to medium voltage, Electricity voltage transformation from high to medium voltage, United Kingdom, ecoinvent 3.11, 0.30 kgCO₂e/kWh
12. Energy supply, electricity transformation and distribution, high to medium voltage, Electricity voltage transformation from high to medium voltage, United Kingdom, ecoinvent 3.11, 0.30 kgCO₂e/kWh
13. Energy supply, heat, steam and air conditioning, heat from natural gas, Heat production, natural gas, at industrial furnace >100kW, Albania, ecoinvent 3.10.1, 0.0773 kgCO₂e/MJ

Transport scenario documentation - A4

1. Transport, freight, lorry >32 metric ton, EURO5, 330.0 km

Installation scenario documentation - A5 (Waste materials data source)

1. Kraft paper production, 0.006 kg
2. Corrugated board box production, 0.42 kg

Use stages scenario documentation - B6-B7 (Energy data source)

1. Energy supply, electricity transformation and distribution, distribution low voltage, Market group for electricity, low voltage, Europe, 863.6 kWh

TRANSPORT SCENARIO DOCUMENTATION - A4

Scenario parameter	Value
Capacity utilization (including empty return) %	50 %
Bulk density of transported products / kg/m ³	1.38E+02
Volume capacity utilization factor (factor: =1 or <1 or ≥1 for compressed or nested packaged products)	1

INSTALLATION SCENARIO DOCUMENTATION - A5

Scenario parameter	Value
Ancillary materials for installation (specified by material) / kg or other units as appropriate	0
Water use / m ³	0
Other resource use / kg	0
Direct emissions to ambient air, soil and water / kg	0

USE STAGES SCENARIO DOCUMENTATION - B6-B7 USE OF ENERGY AND WATER

Scenario information	Value
Ancillary materials specified by material / kg or units as appropriate	Not applicable
Net fresh water consumption / m ³	0
Power output of equipment / kW	25.4
Characteristic performance, e.g., energy efficiency, emissions, variation of performance with capacity utilization, etc. / Units as appropriate	The luminaire is a fixed-output LED system rated at 25.4W with a luminous flux of 3,306lm, delivering a system efficacy of 130.2lm/W. The product provides low-glare performance using a pod optic and is intended for recessed installation in interior environments. Colour temperature is 4000K with CRI Ra80. The system operates at 240 V, 40/50 Hz with a power factor of 0.96. Photometric performance is maintained over time with LED lifetime up to L90B50 at 47,000 hours.
Further assumptions for scenario development, e.g., frequency and period of use, number of occupants / Units as appropriate	N/A

END OF LIFE SCENARIO DOCUMENTATION

Scenario information	Value
Collection process – kg collected separately	3.445
Collection process – kg collected with mixed construction waste	0
Recovery process – kg for re-use	0
Recovery process – kg for recycling	1.98E+00
Recovery process – kg for energy recovery	0
Disposal (total) – kg for final deposition	1.02E+00
Scenario assumptions e.g. transportation	Lorry, 16-32 metric ton, EURO5; 150 km

THIRD-PARTY VERIFICATION STATEMENT

EPD Hub declares that this EPD is verified in accordance with ISO 14025 by an independent, third-party verifier. The project report on the Life Cycle Assessment and the report(s) on features of environmental relevance are filed at EPD Hub. EPD Hub PCR and ECO Platform verification checklist are used.

EPD Hub is not able to identify any unjustified deviations from the PCR and EN 15804+A2 in the Environmental Product Declaration and its project report.

EPD Hub maintains its independence as a third-party body; it was not involved in the execution of the LCA or in the development of the declaration and has no conflicts of interest regarding this verification.

The company-specific data and upstream and downstream data have been examined as regards plausibility and consistency. The publisher is responsible for ensuring the factual integrity and legal compliance of this declaration.



Program assistant: Xinyuan Zhang



The software used in creation of this LCA and EPD is verified by EPD Hub to conform to the procedural and methodological requirements outlined in ISO 14025:2010, ISO 14040/14044, EN 15804+A2, and EPD Hub Core Product Category Rules and General Program Instructions.

[Verified tools](#)

Tool verifier: Hai Ha Nguyen

Tool verification validity: 28 March 2025 - 27 March 2028