



## ENVIRONMENTAL PRODUCT DECLARATION

**PRODUCT NAME:**

1. UE2020 L8 V2
2. UE2020 L16 V2

**PRODUCTION SITE:**

Via Pindaro, 19, 20128  
Milano (MI)

**in compliance with ISO 14025 and EN 50693**

Program operator	EPDItaly
Publisher	EPDItaly
Declaration number	COL-TW-UE2020V2
Registration number	EPDITALY0578
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Valid to	13.12.2028



## 1. GENERAL INFORMATION

<b>EPD owner</b>	Col Giovanni Paolo S.p.A. ( <a href="http://www.colgp.it">www.colgp.it</a> ) Via Antonio Chiribiri, 1, 10028 Trofarello (TO)
<b>Reference production site</b>	TW-TeamWare S.r.l. ( <a href="http://www.teamware.it">www.teamware.it</a> ) Via Pindaro, 19, 20128 Milano (MI)
<b>Scope of application</b>	This is a product-specific EPD referring to the two UE2020 module configurations i.e., UE2020 L8 V2 and UE2020 L16 V2 that were manufactured and sold as spare parts to replace faulty UE2020 modules in the UP2020 complete kits for both indoor and outdoor uses, in accordance with the ENEL global standard GSTR002 Rev. 02 of 30.09.2019, by TW-TeamWare SRL in 2021 and are used as Processing Unit devices to telecontrol for 8 and 16 switchgears with accessories, respectively, within the geographical scope of the Italian territory.
<b>Programme operator</b>	EPDIItaly – <a href="mailto:info@epditaly.it">info@epditaly.it</a> Via Gaetano De Castillia, 10, 20124 Milano (MI)
<b>Independent verification</b>	This declaration has been developed in accordance with the regulations of EPDIItaly; further information and the same regulations are available at: <a href="http://www.epditaly.it">www.epditaly.it</a>  Independent verification of the declaration and data carried out in accordance with ISO 14025: 2010 <input type="checkbox"/> Internal <input checked="" type="checkbox"/> External  Third party verification done by: ICMQ S.p.A. ( <a href="http://www.icmq.it">www.icmq.it</a> ), Via Gaetano De Castillia, 10, 20124 Milano (MI) – Italia. Accredited by ACCREDIA, Accreditation number 0011PRD REV. 000
<b>CPC code</b>	4621 “Electricity distribution or control apparatus”
<b>Company contact</b>	Massimo BURATTO, Remote control B.U manager e-mail: <a href="mailto:massimo.buratto@teamware.it">massimo.buratto@teamware.it</a>
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<b>PCR – Product Category Rules</b>	Core PCR: EPDIItaly007 – PCR for Electronic and Electrical Products and Systems, REV. 3.0 Issue date 13.01.2023
<b>Reference documents</b>	EN ISO 14025:2010, Environmental labels and declarations – Type III environmental declarations – Principles and procedures  EN 50693:2019 - Product category rules for life cycle assessments of electronic and electrical products and systems.  Regulations of the EPDIItaly Programme. Revision 5.2. Issue date 16.02.2022

<b>Comparability</b>	EPDs published within the same product category though originating from different programs may not be comparable. Full conformance with a PCR allows EPD comparability only when all stages of a life cycle have been considered. However, variations and deviations are possible.
<b>Liability</b>	The EPD owner relieves EPDItaly from any non-compliance with the environmental legislations. The holder of the declaration will be liable for the supporting information and evidence. EPDItaly disclaims any liability regarding the manufacturer's information, data, and results of the life cycle assessment.

## 2. THE COMPANY

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Col Giovanni Paolo S.p.A. (COL GROUP) is a leading Italian company owned by Oaktree Capital Management, L.P. in the fast-growing global energy transmission and distribution market. It specializes in the development and production of critical components and advanced solutions for smart grid applications in medium and high voltage electrical infrastructure with sustainability at the heart of all its activities. COL GROUP has been working to support the sustainable future of our planet and the long-term success of its customers as well as the company's own business. Testament to that are the ambitions embodied in two of COL GROUP's Strategy 2030 goals i.e., to lead with low-carbon circular economy solutions, and to enhance sustainability across the value chain. The company possesses numerous certifications according to international standards, among which are UNI EN ISO 9001:2015, UNI EN ISO 14001:2015, UNI ISO 45001:2018, UNI EN ISO 50001:2018, and ISO 27001: 2013. Established in 1920, COL GROUP has amassed over 100 years of valuable experience in the electro-technical and plant engineering fields, and it is one of the few authorized suppliers for major utility companies in Europe, Middle East, South America, and Southeast Asia. The company has developed a highly innovative technology portfolio in medium voltage switchgear, substation automation, battery control systems and several other smart grid and high-voltage applications in collaboration with other dominant global utilities and industrial players. Over the years, COL GROUP has registered significant growth through the acquisition of several companies in the electronic, energy systems, railway, and electromechanical sectors. The ever-expanding company now has contemporary production sites in Torino, Catania, Milano, and Cremona, with over 150 highly skilled, specialized, and efficient employees led by an adept management team.

## 3. THE PRODUCTS

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The UE2020 L8 V2 and UE2020 L16 V2 are Processing Unit devices that telecontrol for 8 and 16 switchgears with accessories, respectively as per Enel global specification GSTR002 Rev. 02 of 30.09.2019. The main functions of the devices are; Collection of signals / measures and implementation of field commands, Communication, on request or spontaneously, with the central system via Ethernet LAN or line based on traditional DCE devices (PSTN modem, GSM / GPRS, ISDN, Leased line), Local communication (via USB

device type) or remote for configuration, diagnostics and upgrade activities, Elaboration of the functions for the selection of fault logs, Management and recording of fault currents passing events with time-tagging to the tenth of a second, Archiving of configuration data, Archiving events and measures, and Management of the synchronized date clock. **Table 1** summarizes the circuit areas that differentiate between the UE2020 L8 V2 and UE2020 L16 V2 configurations: Secondary power supply circuit, CPU and peripherals, TeleSignals (TS) interface, Remote Control Interface (TC), TeleMisure (TM) interface, Temperature Measurement Interface with PT100 sensor (AI\_PT100), and Digital Output Interface (DO).

**Table 1.** Circuit areas for differentiating between the UE2020 L8 V2 and UE2020 L16 V2 configurations

Configurations	TS	TC	TM	AI_PT100	DO
UE2020 L8 V2	49	16	8	1	8
UE2020 L16 V2	89	32	16	1	16

Structurally, the UE2020 L8 V2 and UE2020 L16 V2 devices produced at TW-TeamWare SRL are made of steel, and the devices have a maximum depth of 25cm. Furthermore, both UE2020 configurations are assembled on a 19" normalized rack, with screws and cage bolts included in the supply. However, the overall height of the UE2020 L8 V2 is equal to 4U, whereas that of the UE2020 L16 V2 is equal to 7U. The image on the cover page of this EPD document shows the fully assembled UE2020 L8 V2 (**top**) and UE2020 L16 V2 (**bottom**) configurations.

## Technical specifications

The product identification details and technical specifications (in addition to the unique features of each UE2020 configuration listed in **Table 1**) from the product datasheet are presented in **Table 2**.

**Table 2.** Product identification details and technical specifications for UE2020 L8 V2 and UE2020 L16 V2

TEAMWARE Product code		TW143-SLEL-0101-00	TW143-SLEL-0100-00
Client product code		510017	510016
Product model		UE2020 L8 V2	UE2020 L16 V2
Product net weight		3,260 kg	5,945 kg
Packaging materials	Cardboard box	0,248 kg	0,913 kg
	PE-Film	0,040 kg	0,190 kg
Main hardware resources		iMX6ULL – Core Cortex A7 (800MHz) processor	
		512MB DDR3 ram memory	
		4GB eMMC flash memory	
		1 10/100BaseT Ethernet communication port (RJ45 connector)	
		1 USB 2.0 device communication port (type B connector)	
		1 serial communication port V.24 (DSUB 25 pin male connector)	
		1 L/T rotary switch (Local/Remote control)	
		1 segregated RESET button of the device	
		3 signalling LEDs	
1 anti-tamper switch			

## Material composition

The declaration on the content of materials for the UE2020 L8 V2 and UE2020 L16 V2 devices was done by the manufacturer in accordance with EN IEC 62474. The unique ID and percentage mass share of all the materials and declarable substances contained in the fully assembled product plus its packaging are reported in **table 3**.

**Table 3.** Material composition for the fully assembled and packaged UE2020 L8 V2 and UE2020 L16 V2

Material class name	ID	Percentage mass share (%)	
		UE2020 L8 V2	UE2020 L16 V2
Other ferrous alloys, non-stainless steels	M-119	64,3138	61,9811
PolyEthylene (PE)	M-201	1,1217	2,6958
Other unfilled thermoplastics	M-249	0,0001	0,0000
Paper	M-341	6,9894	12,9512
Other	OTHER	27,5749	22,3719

## Reference service life

The reference service life (RSL) of each of the UE2020 configurations was considered as 10 years.

## 4. SCOPE AND TYPE OF EPD

This is a product-specific EPD for the UE2020 L8 V2 and UE2020 L16 V2 devices produced at the COL GROUP production site in Milano (TW-TeamWare SRL), in compliance with ISO 14025 and EN 50693 under the EPDItaly program regulations. It is based on a cradle to grave life cycle assessment (LCA) methodology in accordance with the ISO 14040 and 14044 standards. The spatio-temporal scope for the data used in this study are summarized in **table 4** basing on the current global level of technology. The results were automatically generated using the excel-based LCA tool “LCA-COL GROUP Tool 2.1” of 01.09.2023., and they were intended for internal R&D, as well as external B2B and B2C communication. In effect, these results facilitated prudent corporate decisions through comparison of the environmental attributes of products that have similar functional requirements.

**Table 4.** The spatio-temporal scope of the LCA study considering the current global level of technology

Representativeness	Scope
Spatial	Italy
Temporal	2021

## Functional unit

The functional unit (FU) was a fully assembled, tested, and packaged UE2020 L8 V2 and UE2020 L16 V2 devices used as Processing Unit devices to telecontrol for 8 and 16 switchgears with accessories, respectively, with the technical specifications stated in **table 1**, distributed to installation sites within Italy, installed as spare parts to substitute the faulty UE2020 modules in the UP2020 complete kits for both indoor and outdoor use, and functioning continuously during a RSL of 10 years.

## System boundary

The system boundary implemented in this LCA covered the entire lifecycle of both UE2020 L8 V2 and UE2020 L16 V2 products i.e., from cradle to grave as shown in **table 5** with the life cycle stages for all the major activities involved, grouped into three distinct modules i.e., upstream, core, and downstream with reference to EN 50693. The product life cycle and inventory analysis describing all the activities, simplifying assumptions, and modelling scenarios used in the LCA has been thoroughly conducted under **section 5** of this document.

**Table 5.** The life cycle stages and modules declared in the system boundary

Manufacturing		Distribution	Installation	Use	End of life
Upstream	Core	Downstream			
✓	✓	✓	✓	✓	✓

✓ = Lifecycle stages and modules declared in the LCA

## Cut-off criteria

The mandatory cut-off for mass and energy flows in this LCA study was set at 1% as defined and modelled in the LCA TOOL "LCA-COL GROUP Tool 2.1" of 01.09.2023. All the material and energy flows within the system boundary known to have potential to cause significant impacts on the LCA results have been accounted for. However, cut-off was applied to the potential impacts that could have resulted from production and disposal of the packaging materials of all the semi-finished products included in the BOMs (e.g., sheets, electronics, screws, etc.) transported to TW-TeamWare SRL for processing and later assembling of the final product as it was assumed that such impacts were negligible. Furthermore, a cut-off was similarly applied to the impacts associated with the skilled labour required during installation before use and dismantling of the product at its end-of-life. Potential impacts that could have arisen from ordinary or extraordinary maintenance were also ignored since the product was assumed to be maintenance free for the entire expected service life.

## Allocation rules

The allocation criteria adopted for the LCA model was guided by the PCR of the reference product. Since many other products are produced at the reference site, the "multi-output" allocation rule was applied to calculate the environmental impact of the product being studied. The primary data relating to waste generation, water, and energy consumption (petrol, electricity, and natural gas) used was provided for the reference year, and these were allocated based on economic value (revenue generated in millions of euros) using the total annual revenue generated from the reference production site of the company, the annual revenue from selling the products being studied, and the number of the studied product sold in the reference year, to get the allocation factor for both UE2020 configurations.

## Data quality

The most recent and verifiable site-specific data collected in the year 2021 was used in this study, and the International System of Units (SI) was adopted while recording the data. The initial primary data forming the basis for the LCA were the production specifications i.e., BOMs, mechanical drawings, and technical

information from the client provided by TW-TeamWare SRL to its external suppliers for each sub-assembly of the final product, and these were analyzed using Microsoft excel. The weight of the heavier structural components was calculated using the Solid Edge software. For the lighter components, they were manually weighed on the weighing scale and recorded. Additional primary data used included the water and energy (petrol, electricity, and natural gas) consumption for the core activities at TW-TeamWare SRL premises during the reference year, and these were downloaded from the company's reference production site account on the website of the service providers. A similar approach was applied to download annual data for fuel consumption by all company vehicles that use electronic fuel cards. In addition to that, the distances from external suppliers to the TW-TeamWare SRL production site were evaluated with the aid of Google Maps. The same technique was applied to determine the distributing distance from TW-TeamWare SRL to the reference installation sites of the client in the various regions within Italy, and justification was provided for all the simplifying assumptions stated. In terms of secondary data, databases from legitimate sources already embedded in the LCA TOOL "LCA-COL GROUP Tool 2.1" of 01.09.2023 were used to obtain generic data for some up- and down-stream processes in the life cycle of the product.

## 5. PRODUCT LIFE CYCLE AND INVENTORY ANALYSIS

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The life cycle inventory (LCI) lists and quantifies all the flows entering and leaving all the declared life cycle stages of the product within the system boundary considered in relation to the scope of the study. The reference flow for the LCI is 1 piece of a fully assembled and packaged UE2020 L8 V2 and UE2020 L16 V2 devices, with total weights of **3,548 kg** and **7,048 kg**, respectively.

### Manufacturing

The manufacturing stage covers all the activities spanning across the upstream and core modules of the LCA as shown in **table 5**. The supply chain processes commence with the extraction of raw materials to produce sub-assemblies comprising of electronic and structural components of each of the two UE2020 configurations, and the packaging materials for the final product. The electronic components ordinarily are made of cables and printed circuit boards (PCB) on which smaller components are mounted, whereas the structural component consists of metallic panels, bolts, and screws. The production of these various components was done by external suppliers on their manufacturing sites in Italy in accordance with the ENEL global standard GSTR002 Rev. 02 of 30.09.2019., and they were assumed to be transported by road in a 16 - 32 tonne EURO5 lorry to TW-TeamWare SRL where the core activities of assembling, testing, and final packaging of the UE2020 L8 V2 and UE2020 L16 V2 devices were done. Each of the fully assembled UE2020 L8 V2 and UE2020 L16 V2 product was then packaged by the application of a double-layered technique, starting by covering the product in a PE-film, and thereafter placing it in a cardboard box to minimize any potential damage during distribution. All the wastes generated on-site from these activities (except packaging) are documented by category in the production site register and declared annually in the MUD "Modello Unico di Dichiarazione ambientale" following the applicable regulations and deadlines. Furthermore, these wastes were assumed to be transported periodically in a 16 - 32 tonne ACI mix lorry to a waste treatment plant located **50 km** away.

## Distribution

From this point forth, all the activities are classified under the downstream module. Both fully assembled and packaged UE2020 L8 V2 and UE2020 L16 V2 products were loaded onto a 16 - 32 tonne EURO5 lorry for last mile delivery to the various installation sites throughout the Italian territory. For purposes of simplification, the distribution process was assumed to be solely done by road despite the ferry routes connecting mainland Italy to the islands. All the sites where the product was distributed and installed during the reference year were used and their distances (in kilometres) from TW-TeamWare SRL considering the fastest route were obtained from Google Maps. However, since the distribution of the product was not homogeneous across the entire Italian territory, these distances were weighted against the quantity of the product distributed in each of the installation sites, and the sum of the various weighted distances (**357,511 km and 243,279 km**) was taken as the distribution distance considering the UE2020 L8 V2 and UE2020 L16 V2, respectively.

## Installation

Upon arrival at the client's location, each of the products are unloaded, carefully removed from its packaging, and installed as spare parts replacing the faulty UE2020 modules in the UP2020 complete kits (indoor or outdoor use) by skilled technicians. Each of the UE2020 devices is electrically powered using power from the grid. Furthermore, the UP2020 complete kits containing the newly installed UE2020 modules also have two rechargeable batteries (as per GSCB001 specifications) supplied by the client which are fully charged using electricity from the grid to be on standby and act as a backup power source in case of power outages while the problem is being resolved. It is immediately after this process that the packaging materials are returned for reuse as per the reduction of packaging waste agreement between TW-TeamWare SRL and its external suppliers. At the end of life of the packaging materials, they are assumed to be transported in a 7 - 16 tonne EURO5 lorry to a waste treatment plant **50 km** away.

## Use

The perfectly installed the UE2020 L8 V2 and UE2020 L16 V2 in the UP2020 complete kits (both indoor and outdoor) consumes **438 kWh and 525,6 kWh** of electricity,  $E_{use}$ , respectively, during its **RSL** of 10 years, operating constantly, and this was computed using **Equation 1** with **8760** representing the number of hours in a year; and **1000** is the conversion factor that allows the energy consumed in kWh over the product's service life to be expressed. The nominal power for the UE2020 L8 V2 and UE2020 L16 V2 devices,  $P_{use}$  were **5 and 6 Watts**, respectively.

$$E_{use}[\text{kWh}] = \frac{P_{use} * 8760 * \text{RSL}}{1000} \quad (1)$$

During use phase of the devices, it was assumed that the power supply was always obtained from the grid since there was no proper data regarding power blackout frequency (which would necessitate using the standby batteries) in the various substations throughout Italy to model such scenarios and account for power consumption or loss during battery charging. In addition to that, the batteries were assumed to be replaced after every 2,5 years whether they were used during that period or not i.e., 3 times during the



RSL of the products. Other than replacing the batteries, it was assumed that there were no other periodic or extraordinary maintenance works required throughout the RSL. An additional environmental information is that during the installation and use stages, the UE2020 L8 V2 and UE2020 L16 V2 devices do not emit any pollutants or substances which are dangerous for the environment and health.

## End of life

At the end of the RSL of the UE2020 L8 V2 and UE2020 L16 V2 products, the dismantling process and separation of the device components is done following guidelines given in the manual by the manufacturer, and the resulting wastes were assumed to be transported using a 7,5 - 16 tonne EURO5 lorry to a waste treatment plant located **50 km** away from the installation site.

## 6. LCA RESULTS

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The environmental performance results of the two UE2020 products i.e., UE2020 L8 V2 and UE2020 L16 V2, for the different lifecycle stages per FU accounting for all the mandatory environmental impact indicators (**Tables 6 and 9**), descriptive parameters for resource use (**Tables 7 and 10**), and waste production (**Tables 8 and 11**) computed as per Core PCR: EPDIItaly007, and EN 50693 were automatically generated using the LCA TOOL "LCA-COL GROUP Tool 2.1" of 01.09.2023.

## Environmental impacts for UE2020 L8 V2

**Table 6.** LCA results for the environmental impact indicators

Impact categories	Unit of measurement	Manufacturing	Distribution	Installation	Use	End of life	TOTAL
<b>GWP-total</b>	kg CO <sub>2</sub> eq.	6,04E+01	1,99E-01	1,59E+02	3,54E+02	2,38E+01	5,98E+02
<b>GWP-fossil</b>	kg CO <sub>2</sub> eq.	6,01E+01	1,99E-01	1,58E+02	3,51E+02	2,37E+01	5,93E+02
<b>GWP-biogenic</b>	kg CO <sub>2</sub> eq.	1,77E-01	1,44E-05	5,09E-01	3,09E+00	4,66E-02	3,83E+00
<b>GWP-luluc</b>	kg CO <sub>2</sub> eq.	1,28E-01	3,80E-06	2,26E-01	2,90E-01	3,68E-02	6,81E-01
<b>ODP</b>	kg CFC-11 eq.	1,55E-06	4,19E-09	6,80E-06	2,05E-05	3,94E-06	3,28E-05
<b>AP</b>	mol H <sup>+</sup> eq.	5,99E-01	5,04E-04	2,05E+00	2,39E+00	9,64E-02	5,13E+00
<b>EP-freshwater</b>	kg P eq.	1,13E-02	1,52E-07	1,00E-02	1,31E-02	9,41E-04	3,54E-02
<b>EP-marine</b>	kg N eq.	8,94E-02	1,97E-04	1,83E-01	2,81E-01	1,89E-02	5,73E-01
<b>EP-terrestrial</b>	mol N eq.	1,24E+00	2,09E-03	2,11E+00	3,26E+00	2,06E-01	6,82E+00
<b>POCP</b>	kg NMVOC eq.	3,34E-01	8,14E-04	6,86E-01	1,16E+00	6,06E-02	2,25E+00
<b>ADP-min &amp; met</b>	kg Sb eq.	2,85E-02	6,66E-09	7,03E-02	5,27E-02	2,68E-06	1,52E-01
<b>ADP-fossil</b>	MJ	9,68E+02	2,53E+00	2,62E+03	5,92E+03	3,08E+02	9,81E+03
<b>WDP</b>	m <sup>3</sup> eq. deprived	1,71E+01	2,37E-03	2,89E+01	1,54E+02	8,59E+00	2,09E+02

**Caption:** **GWP-total** = Climate change – total; **GWP-fossil** = Climate change – fossil; **GWP-biogenic** = Climate change – biogenic; **GWP-luluc** = Climate change – land use and land use change; **ODP** = Ozone Depletion; **AP** = Acidification; **EP-freshwater** = Eutrophication aquatic freshwater; **EP-marine** = Eutrophication, marine; **EP-terrestrial** = Eutrophication, terrestrial; **POCP** = Photochemical ozone formation; **ADP-min & met** = Depletion of abiotic resources – minerals and metals; **ADP-fossil** = Depletion of abiotic resources – fossil fuels; **WDP** = Water use.

## Resource use for UE2020 L8 V2

**Table 7.** LCA results for the environmental parameters describing resource use

Parameters	Unit of measurement	Manufacturing	Distribution	Installation	Use	End of life	TOTAL
PERE	MJ	8,88E+01	6,77E-03	1,86E+02	9,01E+02	2,73E+01	1,20E+03
PERM	MJ	1,98E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,98E+00
PERT	MJ	9,08E+01	6,77E-03	1,86E+02	9,01E+02	2,73E+01	1,21E+03
PENRE	MJ	9,56E+02	2,60E+00	2,65E+03	5,96E+03	3,12E+02	9,87E+03
PENRM	MJ	2,21E+01	0,00E+00	3,47E-02	2,61E-02	0,00E+00	2,22E+01
PENRT	MJ	9,78E+02	2,60E+00	2,65E+03	5,96E+03	3,12E+02	9,90E+03
MS	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	m <sup>3</sup>	3,19E+03	4,02E-01	1,16E+04	7,21E+04	6,47E+02	8,76E+04

**Caption:** PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw material; PERM = Use of renewable primary energy resources used as raw material; PERT = Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials); PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw material; PENRM = Use of non-renewable primary energy resources used as raw material; PENRT = Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials); MS = Use of secondary materials; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Net use of fresh water

## Waste production for UE2020 L8 V2

**Table 8.** LCA results for the environmental parameters describing waste production

Parameters	Unit of measurement	Manufacturing	Distribution	Installation	Use	End of life	TOTAL
HWD	kg	1,50E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,50E-02
NHWD	kg	0,00E+00	0,00E+00	1,71E-02	8,85E-05	1,19E+00	1,21E+00
RWD	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
CRU	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MFR	kg	4,37E-02	0,00E+00	2,29E-01	4,50E+01	1,71E+01	6,23E+01
MER	kg	0,00E+00	0,00E+00	4,31E-02	1,30E-04	1,50E-06	4,32E-02
ETE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EEE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

**Caption:** HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for reuse; MFR = Material for recycling; MER = Materials for energy recovery; ETE = Exported thermal energy; EEE = Exported electricity energy

## Environmental impacts for UE2020 L16 V2

**Table 9.** LCA results for the environmental impact indicators

Impact categories	Unit of measurement	Manufacturing	Distribution	Installation	Use	End of life	TOTAL
<b>GWP-total</b>	kg CO <sub>2</sub> eq.	1,08E+02	2,68E-01	1,59E+02	3,89E+02	2,63E+01	6,83E+02
<b>GWP-fossil</b>	kg CO <sub>2</sub> eq.	1,08E+02	2,68E-01	1,59E+02	3,85E+02	2,62E+01	6,78E+02
<b>GWP-biogenic</b>	kg CO <sub>2</sub> eq.	3,62E-01	1,95E-05	5,62E-01	3,61E+00	4,70E-02	4,58E+00
<b>GWP-luluc</b>	kg CO <sub>2</sub> eq.	2,36E-01	5,13E-06	2,26E-01	2,93E-01	3,71E-02	7,92E-01
<b>ODP</b>	kg CFC-11 eq.	2,51E-06	5,66E-09	6,80E-06	2,12E-05	3,95E-06	3,44E-05
<b>AP</b>	mol H <sup>+</sup> eq.	9,98E-01	6,82E-04	2,05E+00	2,50E+00	9,77E-02	5,65E+00
<b>EP-freshwater</b>	kg P eq.	2,05E-02	2,06E-07	1,00E-02	1,37E-02	9,47E-04	4,52E-02
<b>EP-marine</b>	kg N eq.	1,61E-01	2,67E-04	1,83E-01	2,99E-01	1,94E-02	6,63E-01
<b>EP-terrestrial</b>	mol N eq.	2,24E+00	2,82E-03	2,11E+00	3,48E+00	2,11E-01	8,04E+00
<b>POCP</b>	kg NMVOC eq.	5,96E-01	1,10E-03	6,86E-01	1,26E+00	6,19E-02	2,60E+00
<b>ADP-min &amp; met</b>	kg Sb eq.	5,34E-02	9,00E-09	7,03E-02	5,27E-02	2,71E-06	1,76E-01
<b>ADP-fossil</b>	MJ	1,74E+03	3,42E+00	2,62E+03	6,52E+03	3,11E+02	1,12E+04
<b>WDP</b>	m <sup>3</sup> eq. deprived	3,01E+01	3,20E-03	2,89E+01	1,76E+02	8,65E+00	2,43E+02

**Caption:** **GWP-total** = Climate change – total; **GWP-fossil** = Climate change – fossil; **GWP-biogenic** = Climate change – biogenic; **GWP-luluc** = Climate change – land use and land use change; **ODP** = Ozone Depletion; **AP** = Acidification; **EP-freshwater** = Eutrophication aquatic freshwater; **EP-marine** = Eutrophication, marine; **EP-terrestrial** = Eutrophication, terrestrial; **POCP** = Photochemical ozone formation; **ADP-min & met** = Depletion of abiotic resources – minerals and metals; **ADP-fossil** = Depletion of abiotic resources – fossil fuels; **WDP** = Water use.

## Resource use for UE2020 L16 V2

**Table 10.** LCA results for the environmental parameters describing resource use

Parameters	Unit of measurement	Manufacturing	Distribution	Installation	Use	End of life	TOTAL
PERE	MJ	1,54E+02	9,15E-03	1,86E+02	1,04E+03	2,75E+01	1,41E+03
PERM	MJ	7,30E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	7,30E+00
PERT	MJ	1,62E+02	9,15E-03	1,86E+02	1,04E+03	2,75E+01	1,41E+03
PENRE	MJ	1,72E+03	3,52E+00	2,65E+03	6,57E+03	3,15E+02	1,12E+04
PENRM	MJ	4,40E+01	0,00E+00	3,47E-02	2,61E-02	0,00E+00	4,41E+01
PENRT	MJ	1,76E+03	3,52E+00	2,65E+03	6,57E+03	3,15E+02	1,13E+04
MS	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	m <sup>3</sup>	5,71E+03	5,44E-01	1,16E+04	8,44E+04	6,57E+02	1,02E+05

**Caption:** PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw material; PERM = Use of renewable primary energy resources used as raw material; PERT = Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials); PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw material; PENRM = Use of non-renewable primary energy resources used as raw material; PENRT = Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials); MS = Use of secondary materials; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Net use of fresh water

## Waste production for UE2020 L16 V2

**Table 11.** LCA results for the environmental parameters describing waste production

Parameters	Unit of measurement	Manufacturing	Distribution	Installation	Use	End of life	TOTAL
HWD	kg	2,39E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,39E-02
NHWD	kg	0,00E+00	0,00E+00	6,76E-02	8,85E-05	2,06E+00	2,12E+00
RWD	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
CRU	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MFR	kg	6,97E-02	0,00E+00	8,51E-01	4,50E+01	1,89E+01	6,48E+01
MER	kg	0,00E+00	0,00E+00	1,85E-01	1,30E-04	1,50E-06	1,85E-01
ETE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EEE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

**Caption:** HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for reuse; MFR = Material for recycling; MER = Materials for energy recovery; ETE = Exported thermal energy; EEE = Exported electricity energy

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