UPS ECO-SUSTAINABILITY

For an eco-conscious approach

WHITE PAPER

THE GLOBAL SPECIALIST IN ELECTRICAL AND
DIGITAL BUILDING INFRASTRUCTURES

legrand®

LEGAL INFORMATION

TABLE OF CONTENTS

INTRODUCTION

BACKGROUND

In recent years, we have been increasingly targeted by the media with data and information regarding the environmental impact of products and activities carried out by man: a very delicate issue that has taken on global dimensions, given its importance and the extreme urgency with which it must be addressed.

Newspapers, social media and news inform us every day about the trends in environmental parameters, global warming, toxic substances, air pollution, melting glaciers, and the extinction of animal species: these are just some of the effects produced by the human hand on the ecosystem that surrounds us.

All of us and even companies, both large and small, can no longer avoid interfacing with this issue: no exception is made for the UPS world, which produces and distributes complex and heavy items consisting of plastics, metals, batteries, packaging that is often bulky and which often requires medium/large vehicles to be moved.

In addition, the UPS by its very nature consumes energy to operate, resulting in a continuous environmental impact throughout its operational life.

AIM OF THE DOCUMENT

The aim of this white paper is to analyse and explain how, even for an «environmentally complex» product such as a UPS, it is possible to undertake actions and technological choices that allow a progressive reduction of the environmental impact: and this takes place during all the different phases of the life cycle of the product itself, from its birth, through the operation phase to the end of its useful life and its end of life.

A CONSCIOUS CHOICE

A good step for a cleaner world is to be conscious about the impact of our choices, when we buy or sell a product or a service.

A conscious choice considers everything about the product and its interactions during its life cycle and will take into account:

Manufacturer: story, engagement in "social responsibility" actions, compliance to specific standards, ethics and policies with people and regions, engagement in eco-sustainable product design and solution development.

Product functions: working principle, main functions and scope.

Materials: used both in the product, packaging and meta products (marketing and technical documents. Considering the details of material composition, we have to analyse the rate of material coming from circular economy and the presence or not of dangerous and polluting materials.

Distribution and Logistics: nature of the supply chain and transport, geographical route of the goods between factories, warehouse, sales.

Recyclability: rate of recyclability at the end of life.

Environmental impact: measurement of the effects on the environment calculated on the whole life cycle of the goods from the extraction of raw materials to the end of its life.

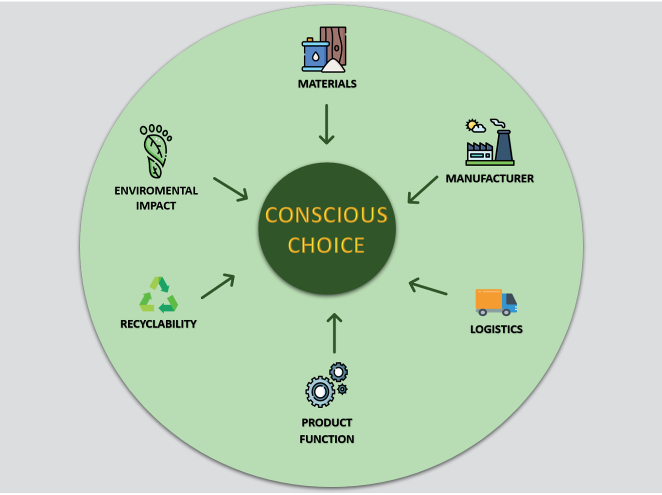

Figure 1: The most impacting elements in the product lifecycle

The mentioned points are all important to have a clear view of the eco-sustainability of our choice. Only some of them are not enough, for instance, it is not enough to have product made with recycled material, when the production or the use or the logistic of that good, creates a lot of pollution.

Most of the information about the previous points come from the Life "Cycle Assessment" defined in specific standards.

THE PRODUCT LIFE CYCLE

WHAT IS THE UPS LIFE CYCLE ASSESSMENT?

The Life Cycle Assessment (LCA) is an analytic methodology to study the environmental impact of a product (or a service) along its entire life cycle, from the raw materials extraction to the final disposal at the end of the life. It is important to consider all the life and not only the running time, because in each stage there are energy consumption, material transformation, heat dissipation, gas emission, waste materials, and many other facts and phenomenon that have an impact on the environment.

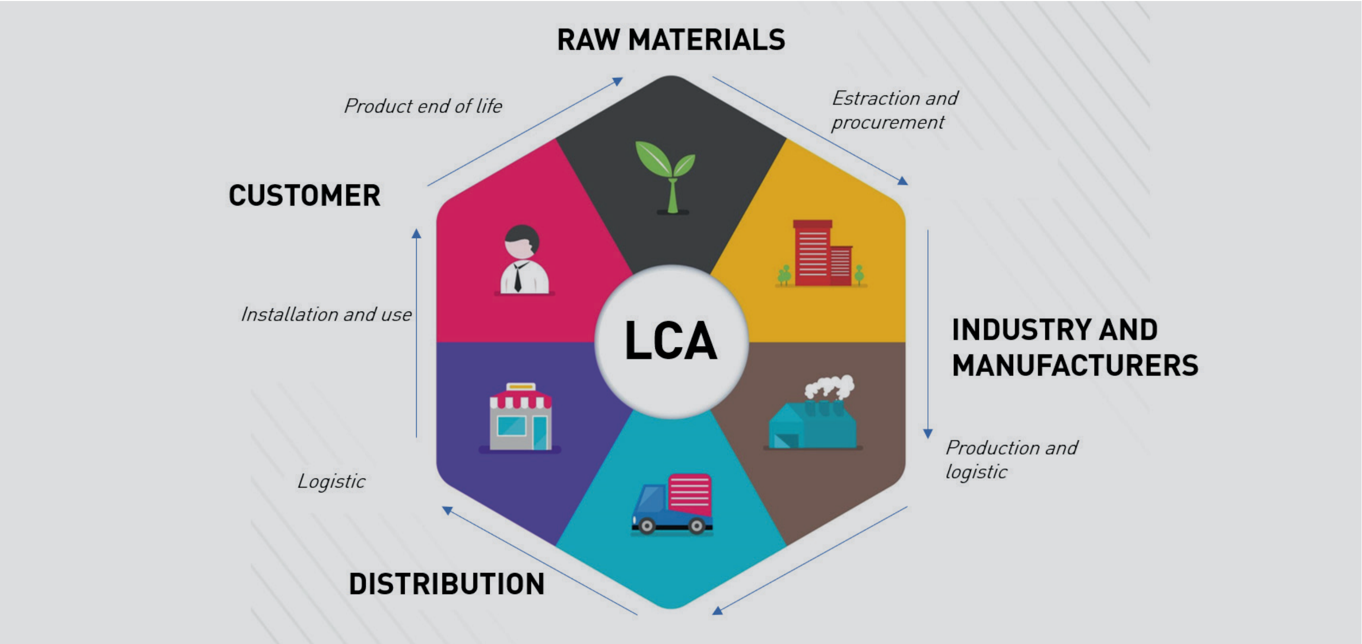

Figure 2: The product lifecycle and its phases

THE IMPACT OF THE SINGLE STAGES ON THE ENVIRONMENT

The economic system and the ecological system should work in parallel on all processes, in an economy that is no longer linear from production to consumption, but it's circular, where the value of materials is maintained during and beyond the life cycle of the individual product, in order to reduce waste and environmental impact and to turn what would once have been called 'waste' into resources.

The life cycle of a product can be summarized in the following main steps:

- Constituent materials
- Manufacture
- Distribution
- Installation
- Use
- End of life

Each of them can have an impact on the environment which can be more or less intense accordingly with the choices and actions of the relevant actors. Let's see with some details.

■ Sourcing raw materials

When raw materials are directly extracted from the natural environment, with mining or similar extraction activities, can have a heavy ecological impact, in terms of pollution, transformation or disruption of the pre-existing ecosystem, effect on hydro-geological status of the region. Often the impact is also on the local economy landscape like agriculture, fishing, and other human activities.

Environmental impact is not only present in the extraction of raw materials, but also in their processing, which often involves processes with a high impact on the environment.

For sure it is much better and sustainable to source raw materials from the circular economy. The constant renews and evolution of products and services are producing huge number of old products to be dismantled, and from that product it is possible to recycle a lot of reusable materials (metals, plastics, etc.).

Raw materials from circular economy have much lower impact on the environment on many impact categories.

■ Production

Factories and production processes can have impact on environment related to the occupied area, consumption of energy and other resources (i.e., water and other raw materials) and pollution. It is very important for the manufacturer to respect all the local and international rules for eco sustainability (with relevant certifications) and execute continuous actions to optimize the consumptions and minimise the environmental impact.

Additional pollution is related to the supply flow of the raw material or semi-finished items needed for the production: for instance, if the factory is placed very far from the source of raw material, a longer transportation of the goods is needed, with relevant more energy consumption and pollution.

THE PRODUCT LIFE CYCLE

■ **Distribution**

Similarly with the supply chain of raw materials and other goods needed for the production, also the distribution of the finished products to the selling chain can have not negligible impact related to the amount and typology of transportation and logistics.

A rational plan for the logistic flows which minimize the travels of the goods, a proper choice of low pollution means of transport way and optimizing of packaging and stocking system can strongly reduce the impact on the environment.

■ **Installation**

When the product reaches the destination we can have an impact related to the end of life, installation activities, daily use, maintenance and service.

Regarding the installation, it is preferable to have an optimized packaging which guarantees the protection of the good with a minimum amount of material (typical are plastic, carton, wood, metal…). The material should come from circular economy and should be easily recycled.

■ **Use**

Regarding the daily use and maintenance, it is important that the product is designed to have high energy efficiency because the most part of the environmental impact is related to the daily energy consumption of the UPS along its whole operative life. Easy and fast service operation and low frequency of consumables replacement help to reduce the environmental impact. The more the product contains recyclable components, long-life consumables and spare parts, the better it is for the eco sustainability.

■ **End of life**

The end of life is another important step in the life cycle in terms of eco sustainability. Products with low or not recyclable components become useless waste which can pollute and poison the environment. On the contrary, a product which was designed to be highly recycled will have a minimum impact on the environment. It is very important to know and be able to identify the recyclable materials and their amount. In some cases, entire parts of the product can be reused and have a second life in other applications.

PROVIDING UPS ECO-FRIENDLY SOLUTIONS

GREEN PROCUREMENT AND ECO-DESIGN

The first stage towards eco-friendly solutions deals with the origin of new concepts and the specifications of the materials that make up the UPS. This is referred to as eco-design, i.e. responsible design and procurement processes or green procurement, with a strong focus on research and the use of innovative and alternative materials that can, at the end of the product's life, become sources of high added value, that can be used in other production cycles and that minimize the effort required of the environment to bear the «cost».

Eco-design makes it possible to design products with greater efficiency and solutions that use less energy and dissipate less heat, thus having less impact on the ecosystem.

The same applies to the volume and mass of UPSs: in this case we talk about lightweight design, i.e. the design of products made of lightweight materials that take up less space.

The issue of size in turn ties in with the issue of logistics and the issue of UPS packaging. Often protective casings are still made of plastic or other materials that have a certain impact on the environment. In this sense, it is important to be able to create responsible packaging, using recyclable materials and opting for mono material, which simplifies and facilitates the disposal and subsequent recycling phases.

This requires close cooperation between R&D and suppliers in order to make the production phases and contents more efficient and to establish mechanisms for cyclical monitoring of results.

Figure 3: An example of compact design

PROVIDING UPS ECO-FRIENDLY SOLUTIONS

ADAPTABILITY AND MODULARITY

There are many approaches in the product design which can help to reduce the environmental footprint, two of them are adaptability and modularity. In fact, a product designed to be simple to use and adaptable for several situations can bring to less wasting and consumptions. In addition, a product or a range of products can have simpler and more sustainable production and usage, if they are composed by modular bricks which need same production process and can be easily replaced and reused.

Figure 4: Examples of modularity of the system and modularity inside the UPS

EFFICIENCY AND DESIGN

Once the product is manufactured and installed on site it may need to absorb energy to perform its purpose; this is the case of UPS which transfer and convert the electric energy from the source to the load, but to do this it needs to absorb a part of the energy which will be finally released to the environment as heat. If the product is designed to perform with a minimum consumption, using proper materials ad topologies to optimize the efficiency, it can help a lot to make the application more sustainable.

MEASURING THE RESULTS

To have a clear idea about the Eco Sustainability of a product is fundamental to have the measure of the following four major markers along the life cycle. A set of relevant parameters is:

- Rate of circular economy materials
- Recyclability rate
- Environmental footprint
- Efficiency (energy consumption)

RATE OF CIRCULAR ECONOMY MATERIALS

It is not easy to find a direct data about the rate of material coming from circular economy from the composition of the product, but is possible to estimate it following specific rules and standards or collecting data from the suppliers of components. Some materials can be easily recycled and are common in circular economy.

Knowing the percentage mass rate of the metals and plastics and knowing the total mass of the product and its packaging, it is possible to evaluate the recycled rate of the product.

In the following table is shown a possible example of a declaration of material composition of a UPS (table from a PEP certificate – see paragraph 7.2), with estimation of recycled materials content:

■ Constituent materials

This Reference Product contains non substances prohibited by the regulations applicable at the time of its introduction to the market. It respects the restrictions on use of hazardous substances as defined in the RoHS directive 2011/65/EU and its delegated directive 2015/863/EU.

Total weight of Reference Product	997 Kg (all packaging included)

Plastics as % of weight		**Metals as % of weight**		**Others as % of weight**	
Thermoset	0,4%	Steel	35,3%	Batteries/accumulators	42,8%
Polycarbonate	0,3%	Aluminium	2,7%	Electronic cardboards	5,9%
ABS	0,3%	Copper alloys	0,4%	Cables/electric wires	1,1%
PVC	0,2%	Other metals	0,2%		
Polyamide	0,2%				
Other plastics	0,2%				
Packaging					
Polyethylene (LDPE)	0,2%			Paper/cardboard	5,0%
				Wood	4,8%
Total plastics	**1,8%**	**Total metal**	**38,6%**	**Total others**	**59,6%**

Estimated recycled material content: 43% by mass.

Figure 5: The rate of recycled material content

RECYCLABILITY RATE

Information related to the recyclability can be derived by the design choices of the manufacturer and by the specific rules and standards related to the "End of Life" of the product. In fact, proper dismantling and sorting of components or materials can help to recycle or find other forms of reuse.

An example is the European Waste Electronic and Electrical Equipment Directive (WEEE) which defines the way of dismantling, treatment of hazardous materials and recycling/recovery process.

Once it is defined the dismantling process it is possible to calculate the recyclability rate using the method described in technical report IEC/TR 62635.

Here follows an example of a declaration of the result split by different type of material components of the product (table from a PEP certificate – see paragraph 7.2):

■ RECYCLABILITY RATE

Calculated using the method described in technical report IEC/TR 62635, the recyclability rate of the product is estimated at 74%. This value is based on data collected from a technological channel operating on an industrial basis. It does not pre-validate the effective use of this channel for the end of life of this product.

Separated into :
- plastic materials (excludind packaging) : 1%
- metal materials (excludind packaging) : 39%
- other materials (excludind packaging) : 25%
- packaging (all types of materials) : 9%

Figure 6: The recyclability rate

ENVIRONMENTAL FOOTPRINT

There are many different factors and indicators to quantify the environmental footprint, like the equivalent CO² emissions, air pollution, etc. The indicators can be grouped accordingly with the field of the relevant impact: Air, Water, Ground.

The values must be expressed for each phase of the life cycle. Here below an example of an environmental footprint table with the selection of the major indicators (table from a PEP certificate – see paragraph 7.2):

	Total for Life cycle		Raw material and manufacture		Distribution		Installation		Use		End of life	
Global warning	1.64E+05	$kgCO_2$ eq.	4.40E+03	3%	3.87E+01	<1%	5.71E+00	<1%	1.59E+05	97%	8.69E+01	<1%
Ozone depletion	1.18E-02	kgCFC-11 eq.	6.85E-04	6%	7.84E-08	<1%	3.09E-08	<1%	1.11E-02	94%	1.74E-06	<1%
Acidification of soils and water	6.65E+02	$kgSO_2$eq.	9.94E+00	1%	1.74E-01	<1%	2.68E-02	<1%	6.55E+02	98%	3.42E-01	<1%
Water eutrophication	4.37E+01	$kg(PO_4)^{3-}$ eq.	1.77E+00	4%	4.00E-02	<1%	1.97E-02	<1%	4.14E+01	95%	4.46E-01	<1%
Photochemical ozone formation	3.74E+01	kgC_2H_4eq.	1.08E+00	3%	1.24E-02	<1%	1.90E-03	<1%	3.63E+01	97%	2.63E-02	<1%
Depletion of abiotic resources - elements	7.06E+00	kgSb eq.	2.42E+00	34%	1.55E-06	<1%	2.44E-07	<1%	4.64E+00	66%	5.04E-06	<1%
Total use of primary energy	3.31E+06	MJ	1.39E+05	4%	5.47E+02	<1%	7.89E+01	<1%	3.17E+06	96%	9.88E+02	<1%
Net use of fresh water	5.63E+05	m³	5.41E+02	< 1%	3.46E-03	<1%	1.35E+03	<1%	5.62E+05	100%	6.09E-02	<1%
Depletion of abiotic resources - fossil fuels	1.86E+06	MJ	4.62E+04	2%	5.44E+02	<1%	7.72E+01	<1%	1.81E+06	97%	9.09E+02	<1%
Water pollution	9.03E+06	m³	9.55E+05	11%	6.37E+03	<1%	8.99E+02	<1%	8.06E+06	89%	1.06E+04	<1%
Air pollution	1.14E+07	m³	1.79E+06	16%	1.59E+03	<1%	5.14E+02	<1%	9.57E+06	84%	8.75E+03	<1%

Figure 7: Environmental footprint indicators

In particular, the values for Global Warming of Raw Material & Manufacturer, Distribution and Installation give the value for Electric/Electronic devices, used in the calculation of total Carbon footprint of Buildings and Infrastructures.

EFFICIENCY AND ENVIRONMENTAL IMPACT

For devices like UPS, and in general for all electric and electronics converters, energy efficiency is one of the most important indicators of the product impact on the environment. In fact, efficiency gives a direct value of the energy losses. The lost energy is not used and completely wasted but it is produced in power plants with its relevant amount of pollution and carbon emission. The higher is the efficiency the less are the losses and, consequently less is the pollution generated in power plant to produce the energy needed by the device.

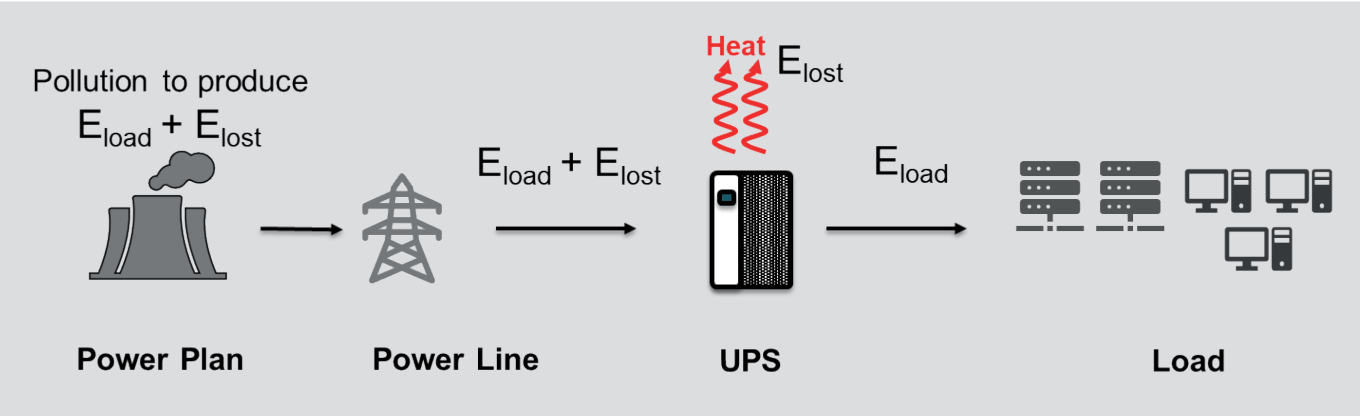

Figure 8: The energy dissipation

The UPS is often installed in technical or server rooms which need a dedicated cooling system to keep the temperature at specific value; additional energy is needed for the cooling system to dissipate the energy losses which are emitted in the environment as heat. Additional energy for cooling system means additional consumption and relevant pollution in the power plant.

The efficiency value depends by the energy which flows inside the UPS, so at different load level there will be different efficiency levels. This means that to evaluate the quality of the energy consumption, it is not enough to have only the best value at the best running condition. Typically, the manufacturers provide efficiency values at 25%, 50%, 75% and 100% of the nominal power of the UPS.

During the UPS life it is possible that the load doesn't remain constant but change at different level for certain times, consequently also the efficiency will change. For this reason, it is more reliable to consider an average value for the efficiency. It is clear that the best performance corresponds to a high efficiency in a wide range of load percentage, but it is not easy to predict the real load trend for the entire life of the UPS. For this reason, the UPS product standard IEC/

EN62040-3 indicates a calculation of a weighted average efficiency defining different weights respect load percentage and nominal power range. The weights give a realistic hypothesis of the % of the lifetime the system works at a certain load level. Here below the formula of weighted efficiency.

EffW = W25% × Eff25% + W50% × Eff50% + W75% × Eff75% + W100% × Eff100%

Where:

EffW is the weighted UPS efficiency (%);

W25%, W50%, W75%, W100% are the weighting factors at 25%, 50%, 75%, 100% load (indicated in the Standard)

Eff25%, Eff50%, Eff75%, Eff100% are the efficiency values measured at 25%, 50%, 75%,100% load Certifications.

GHG PROTOCOL

Calculating greenhouse gas (GHG) emissions, such as CO^2, methane and the various CFCs, is the first and fundamental step in a company's decarbonization journey, with the goal of achieving net zero emissions by 2050.

Calculating emissions means quantifying the direct and indirect greenhouse gas emissions associated with the annual business operation by creating a GHG Inventory that quantifies and allocates them within the company's internal processes.

The most widely used standard for calculation is the GHG Protocol, followed by the ISO 14064-1 standard.

The GHG Protocol has been developed since 1998 by a partnership between the World Resource Institute, the World Business Council for Sustainable Development and other NGOs, companies and governments.

The GHG Protocol defines the classification of company emissions, approaches for establishing company boundaries and what should be included in the calculation, methods of quantification and guidelines for disclosure.

Specifically, the GHG Protocol divides GHG emissions into 3 main categories (such as Scope 1, 2 and 3 GHGs):

■ Scope 1

This includes 'direct' emissions, related to the company's own or controlled activities: in technical terms, these are emissions generated by activities within the company's 'organizational boundaries', in its core business.

These are, for example, emissions associated with the use of fossil fuels to power company vehicles or to fuel boilers for space heating or production: however, leaks of refrigerant gases (also greenhouse gases) used in cooling systems, or process emissions,etc. are also part of Scope 1.

■ **Scope 2**

These are indirect emissions due to the production of electricity, steam or heat (e.g. district heating) produced by third parties and in locations other than those of use, but still the responsibility of the company as end user.

■ **Scope 3**

These are the indirect emissions located within the company's value chain, in the upstream and downstream phases. Although generated by assets or plants or processes not directly controlled by the company, they are traceable to the company's activities (and often constitute the most relevant category in quantitative terms).

■ **Why should an organization measure its Scope 3 emissions?**

An effective corporate climate change strategy requires a detailed understanding of a company's greenhouse gas (GHG) emissions. Until recently, most companies have focused on measuring emissions from their own operations and electricity consumption, using the GHG Protocol's scope 1 and scope 2 framework. But what about all of the emissions a company is responsible for outside of its own walls—from the goods it purchases to the disposal of the products it sells?

The Scope 3 Standard is the only internationally accepted method for companies to account for these types of value chain emissions.

There are a number of benefits associated with measuring Scope 3 emissions. For many companies, the majority of their greenhouse gas (GHG) emissions and cost reduction opportunities lie outside their own operations. By measuring Scope 3 emissions, organizations can:
- Assess where the emission hotspots are in their supply chain.
- Identify resource and energy risks in their supply chain.
- Identify which suppliers are leaders and which are laggards in terms of their sustainability performance.
- Identify energy efficiency and cost reduction opportunities in their supply chain.

Engage suppliers and assist them to implement sustainability initiatives
- Improve the energy efficiency of their products
- Positively engage with employees to reduce emissions from business travel and employee commuting.

PEP Certificates can play a key role in helping companies define their emissions baseline and pinpoint hotspots throughout the value chain and product lifecycle.

The purchase of a UPS with the characteristics indicated in the document (recycled MP, environmentally friendly MP...) contributes to reducing the scope 3 of the GHG protocol of the customer company.

STANDARDS

In this chapter we'll analyse the main standard and rules concerning UPS and their environmental impact.

EN62040 CERTIFICATION

CEI, CENELEC and IEC are the recognised standardisation bodies at Italian and international level respectively.

The following European standards on UPS allow compliance with European Directives and some of them concern the environmental impact of these products.

■ CEI EN 62040-2: ELECTROMAGNETIC COMPATIBILITY (EMC) REQUIREMENTS

IEC 62040-2:2018 is intended as a product standard allowing the EMC conformity assessment of products of categories C1, C2 and C3 as defined in this part of EN 62040, before placing them on the market. Each category is based on the intended use of the equipment, is referenced as intended environment, and has specific test requirements for both emissions and immunity. Compliant test results can allow manufacturers to claim compliance to the EU EMC (level of electromagnetic compatibility) Directive, 2014/30/EU for UPS at public and industrial locations.

■ CEI EN 62040-3: METHOD OF SPECIFYING THE PERFORMANCE AND TEST REQUIREMENTS

This document specifies performance and test requirements of a complete UPS and, where applicable, of individual UPS functional units. This document also includes UPS performance and test requirements related to UPS switches that interact with UPS functional units to maintain continuity of load power.

This rule also defines the requirements for testing the UPS efficiency, which is strictly connected to its environmental impact.

Included are interrupters, bypass switches, isolating switches, load transfer switches and tie switches.

■ CEI EN 62040-4: ENVIRONMENTAL ASPECTS - REQUIREMENTS AND REPORTING

This part of the IEC 62040 series specifies the process and requirements to declare the environmental aspects concerning uninterruptible power systems (UPS), with the goal of promoting reduction of any adverse environmental impact during a complete UPS life cycle. This product standard is harmonized with the applicable generic and horizontal environmental standards and contains additional details relevant to UPS.

This standard applies to movable, stationary and fixed UPS that deliver single or three-phase fixed frequency a.c. output voltage not exceeding 1 000 V a.c. and that present, generally through a d.c. link, an energy storage system and specified in IEC 62040 product standards for UPS.

PEP CERTIFICATION

The PEP (Product Environmental Profile) registered under the PEP Ecopassport® Program is a type III environmental declaration according to the ISO 14025 standard. It's an international reference programme for environmental product declarations of the electrical, electronic and heating and cooling industry.

The PEP certificate can be seen as sort of environmental snapshot of the product.

It is a voluntary industry initiative that is specifically tailored to the characteristics of such equipment and cannot be used for other products, e.g. food, cosmetics etc.

The PEP is a declaration that fulfils the requirements of ISO 14025:
- It is based on LCA, which quantifies relevant environmental impacts.
- It is developed and executed in the framework of a declaration programme with a critical review of the rules and consultation of stakeholders on these rules.
- It needs an independent verification.

This certificate contains information about:
- Manufacturer: the company communicates its commitment to responsible plant management, to provide the market with environmentally friendly solutions and to eco-design products by measuring the environmental impact of their entire life cycle.
- The reference product: the product(s) covered by the numerical environmental impact study: all values in the document refer to this (these) product(s).
- Homogeneous family: it brings together the other products in the catalogue that by type, customer function, materials and reference product standards can be assimilated to the reference product in terms of environmental impacts. It may not always be present and may refer to an entire range.
- Constituent materials: indication of the constituent materials of the reference product in percentages broken down into plastics, metals and other (separate focus for packaging). Declaration of absence of hazardous substances from products.
- Distribution and logistics: collect information on the average kilometres travelled by the product to reach the market and the environmental characteristics and recyclability rate of the packaging
- Recyclability: is calculated according to an IEC method and represents a theoretical value (the assumptions made represent a theorical average scenario and are not necessarily the reality for the specific product); is given in total and relative value for plastics, metals and other materials (including packaging).
- Environmental impacts of each life cycle phase: gathers technical information relating to the whole product lifecycle.

PEFCR CERTIFICATION

The European Commission's Product Environmental Footprint (PEF) method is designed to help companies make declarations about their product's impacts, reduce assessment cost and improve product comparisons.

The European Commission also issued instructions to establish PEF Category Rules (PEFCR), a ruleset describing how to calculate the environmental footprint and to conduct a Product Environmental Footprint (PEF) study of a specific product group/family.

The PEFCR considers both the constituent materials and all the product lifecycle phases.

This PEFCR was developed by a consortium of UPS manufacturers, an EPD program operator specialized on electronic products and LCA experts within the EU PEF/OEF Pilot phase.

This PEFCR is valid for products in scope sold/consumed in the European Union + EFTA. Each PEF study shall identify its geographical validity listing all the countries where the product object of the PEF study is sold with the relative market share. In case the information on the market for the specific product object of the study is not available, Europe + EFTA shall be considered as the default market, with an equal market share for each country.

The following UPSs are excluded from the scope of this PEFCR:

- Rotary UPSs as they don't rely on the same power conversion mechanism as static UPSs. These UPSs rely on a diesel engine (integrated or not) to supply power to the load during an input power failure.
- Direct Current (Dc)-output UPSs, also known as rectifiers, as they supply power with a continuous flow of electric charge that is unidirectional. A rectifier is a product that converts alternating current to direct current to supply a load and an energy storage mechanism. As such, this category of UPSs does not provide the same function as alternating current (Ac)- output UPSs in the scope of this PEFCR.
- UPSs with no backup time as it may be considered being a frequency converter (eg.)
- UPSs for special applications as they are designed for definite conditions, with unique specifications or requiring other technologies (e.g.):
    - UPSs exposed to extreme temperatures, excessive dust, moisture, vibration, flammable gasses, corrosive or explosive atmospheres
    - UPSs in vehicles, on board of ships or aircrafts, in tropical countries, in nuclear plants or at elevations higher than 1000m
    - UPSs in electrometrical applications with the UPS located within 1.5m of the patient contact

CONCLUSIONS

Considering the product's entire life cycle, various indicators can give us an indication of how much our product impacts the ecosystem; perhaps the best known is the carbon footprint. But how to quantify it? It is not easy for a UPS, but it is certainly a fundamental aspect to focus on, especially if the calculated value is compared with that of a previous generation product.

There are many variables that affect the sustainability of a UPS if we consider its entire life cycle. It is not enough to calculate its efficiency to assess how «green» it is: the operation and use phase accounts for at least a good 80%, but a significant 20% is attributable to the materials that make it up. Just consider not only the weight of the raw materials, but also the batteries and electronic circuits.

For Legrand UPS, it has been chosen to show on the documentation a couple of indicators indicating the sustainability aspects related to each product family and derived from PEP certifications: these two indicators are respectively the estimated content of circular economy derived materials and the recyclability rate.

This is just a first starting point of a long path that will lead to the development of UPS that are progressively less impactful on the environment.

There are many questions, but still few answers: or rather, the answers are not yet sufficient.

The construction of a resilient economic system, which is truly aware of current problems and can take action to build a better, sustainable future, undoubtedly requires a process of continuous innovation: a constant process of study and monitoring, aimed at finding low-impact solutions that conserve energy and environmental sources as much as possible and restore the minimum levels of balance between nature and man's work.

A long and complex path, but one that we are now obliged to take.

Notes

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