PEP ecopassport® PROGRAM

PSR

SPECIFIC RULES FOR LUMINAIRES

PSR-0014-ed2.0-EN-2023 07 13
According to PSR-modele-ed2-EN-2021 11 18

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1. Introduction

This reference document complements and explains the Product Environmental Profile (PEP) Drafting Rules defined by the PEP ecopassport® program (PEP-PCR-ed4-EN-2021 09 06), available at www.pep-ecopassport.org.

It defines the additional requirements applicable to luminaires. Compliance with these requirements is necessary to:

- Qualify the environmental performance of these products on an objective and consistent basis.
- Publish PEPs compliant with the PEP ecopassport® program and international referencestandards.[1]

This reference document was drawn up in compliance with the open, transparent rules of the PEP ecopassport® program with the support of stakeholders and professionals in the luminaire market, and the interested parties.

	www.pep-ecopassport.org
PSR reference	PSR-0014-ed2.0 EN 2023 07 13
Critical review	The third-party Critical review was carried out by Tim Osmond. The declaration of conformity published on JJ MM 2023 can be found in the Appendices
Availability	The critical review report is available on request from the P.E.P. Association contact@pep-ecopassport.org
Scope of validity	The critical review report and the declaration of conformity remain valid within 5years or until the PEP Drafting Rules, or the normative reference texts to which they refer, are modified.

[1] ISO 14025, ISO 14040 and ISO 14044 standards

2. Scope

In accordance with the general instructions of the PEP ecopassport® program (PEP-General instructions- ed4.1-EN-2017 10 17) and additional to the PCR, Product Category Rules (PCR) of the PEP ecopassport® environmental product declaration (EPD) program (PEP-PCR-ed4-EN-2021 09 06), this document sets out the specific rules for luminaires and defines the product specifications to be adopted by manufacturers in the development of their Product Environmental Profiles (PEP) particularly with regard to:

- the technology and its type of application,
- the conventional typical lifetime taken into account for the Life Cycle Assessment (LCA),
- the conventional use scenarios to be adopted during the product use stage.

Except from the « Self-contained Emergency Electrical Equipment » covered by specific rules presented in « PSR-0007- », this reference document applies to all "luminaires" intended to be connected to the power grid, regardless of their manufacturing location or destination market.

This document describes the rules for PEPs under the Type III Environmental Declaration Program to beproperly developed and communicated with verifiable, comparable and non-misleading information on the environmental aspects of products.

This reference document is primarily intended for:

- environment and/or product managers,
- LCA experts in companies, in charge of PEP development,
- verifiers in charge of PEP conformity assessment in accordance with the defined rules.

2.1. Description of the covered product families

A luminaire is a device that meets the following definition:

“Apparatus which distributes, filters or transforms the light transmitted by one or more light sources and which includes, [...], all the parts necessary for supporting, fixing and protection of the light sources and, where necessary, auxiliary circuits and the means for connecting them to the control gear.”

Any kind of luminaire, containing replaceable or non-replaceable light sources are in scope of this document.

The definition given is based on the standard “NF EN 60598-1:2021 – Luminaires – Part 1: General requirements and tests” and adapted to the definition applied and the wording used in this document.

A luminaire might be made of housing, control gear and light source (integrated or not). The PEP shall indicate, in the product description, how many control gear(s) and light source(s) are required to achieve the service over the reference lifetime of the luminaire, and therefore used for the calculation of the PEP.

The devices defined in this paragraph must conform to the entire set of normative and regulatory

standards established at the International, European, and national levels according to their applications. A non-exhaustive list, defining the main normative and regulatory elements to be respected, is mentioned in chapter 6 “Appendices”.

2.2. Consideration of the functions and technologies not included in this document

If functions or luminaire technologies are missing from these Product specific rules for Luminaires, a request to include them shall be sent to the PEP Ecopassport program. These requests will be considered by the PEP Ecopassport program to determine how to deal with these functions or luminaire technologies.

3. Product life cycle assessment

3.1. Functional Unit and reference flow description

These specific rules are additional to section 2.1. "Functional unit and reference flow description" of the PCR (PEP-PCR-ed4-EN-2021 09 06).

3.1.1. Functional Unit (FU)

The FU is defined below:

“Provide lighting that delivers an outgoing artificial luminous flux of 1,000 lumens during a reference lifetime of 35,000 hours”

The LCA enables to compare different types of luminaires according to usage unit (the emission of a light output of 1,000 lumens) and a reference lifetime (fixed reference lifetime which cannot be assimilated to the actual life of the lighting or its actual running time) common to all luminaires, fixed to 35,000 hours.

It should be noted, however, that the concept of comparability between several products will have to take into account the fundamental technical data of each of them. For reasons of comparability, some basic and representative technical characteristics of the reference product shall be specified in the PEP according to the paragraph 4.1, which includes typical number of hours of luminaire use per year depending on the application. Therefore, a number of years can be calculated depending on the use of the luminaire. It should also be noted that, in the context of a project, it is essential to have project data to compare luminaires with each other.

The reference lifetime applicable to the category of "luminaires" was determined consensually by the technical experts of the industry that participated in the development of the PSR by considering the different possible fields of application. This reference lifetime is voluntarily set below the assigned lifetime of most of product’s range; the assigned lifetime depends on variable factors related to the quality of implementation of the facilities, the frequency of their maintenance and use conditions of the products. This reference life does not constitute a commercial warranty commitment from the manufacturer.

3.1.2. Declared unit

The declared unit approach is not appropriate to allow comparability for luminaires, since calculations are always related to a given function provided by one given luminaire.

However, when a declared unit approach is applied, in alignment with the recommendations in the PCR, the declared unit is given by:

"A luminaire providing an outgoing luminous flux of XXX lumens during a reference lifetime of YY years."

where XXX is the actual output of the luminaire and YY is the actual reference lifetime RLT of the luminaire given its use.

The gained results may be declared for the assigned lifetime of the selected luminaire.

3.1.3. Reference product and reference flow description

The reference flow (energy and material flows corresponding to the FU) shall be determined in application of paragraph 3.1.1 “Functional Unit” of this present PSR and inaccordance with the requirements set out in the paragraph 2.1 of PCR (PEP-PCR-ed4-EN-2021 09 06).

A "luminaire" as defined in the paragraph 2.1 “Scope” has the following elements:

- a structure,
- a control gear,
- a light source (also called a lamp), integrated or not in the luminaire,
- if applicable, components associated with light management functions, or components associated with compatibility with lighting control systems, whether integrated to the luminaire or not.

The PEP shall include full transparency on the description of the luminaire covered by the PEP.

The luminaire is characterized for an outgoing artificial luminous flux of [V] lumens with an assigned lifetime of [H] set in the paragraphs 3.1.3.1 and 3.1.3.2, respectively.

The reference flow corresponding to the FU shall take into account the value of the outgoing artificial luminous flux as well as the assigned lifetime of the luminaire determined in accordance with therequirements established respectively in the paragraphs 3.1.3.1 and 3.1.3.2 of present specific rules.

3.1.3.1. Determination of the outgoing artificial luminous flux of the luminaire

- When the luminaire contains a replaceable light source

The outgoing artificial luminous flux [V] of the device is measured according to NF EN 13032-1[2]. This value must be justified in the LCA report using the photometric report.

In the case where [V] is unavailable, it should be calculated by using the formula below:

Artificial light output = Declared flow (Light Source) x ɳ

ɳ is the Light Output Ratio (LOR) of luminaire.
In the case where ɳ is unknown, it is imposed to take the value of ɳ = 30% in the formula above.

If the product is sold without light source (e.g. not equipped with lamp), it is mandatory to choose the most impacting compatible light source. This light source shall be selected considering the power consumption (Watt) by considering the indications of CE marking (maximum power allowed), the light efficiency (regulation (EU) 2019/2020) and the RSL (replacement period). The selected lamp shall be as close to 1000 lumens as possible, and indicated in the LCA report.

- When the luminaire contains a non-replaceable light source

The flux will be determination according to the standard EN [refer to note 2]

3.1.3.2. Determination of the assigned lifetime of a luminaire

The assigned lifetime of the luminaire is the luminaire life expectancy as declared by the manufacturers according to the conditions of use provided by them. It is declared in hours of operation.

The assigned lifetime must be justified in the LCA report.

Luminaires with a non-replaceable light source, are considered to be a light source itself according to Regulation (EU) 2019/2020. The lifetime of such a luminaire is given by the lifetime of the light source.

Luminaires with replaceable light source, are considered to be a containing product according to Regulation (EU) 2019/2020. The lifetime of such a luminaire is given by the lifetime of the luminaire structure.

It is considered that light management functions do not influence the assigned lifetime of a luminaire.

3.2. System boundaries

[2] NF EN 13032-1 + A1: 2012 standard "Light and lighting - Measurement and presentation of photometric data of lamps and luminaires - Part 1: measurement and file format"

These specific rules are additional to section 2.2 “System boundaries” of the PCR (PEP-PCR-ed4-EN-2021 09 06) which describes all boundaries per stage of the life cycle.

The principle of modularity presented in the paragraph 2.2.1. “Presentation of the principle of modularity”of the current PCR ed.4 applies.

3.2.1. Manufacturing stage (A1 to A3)

All the components delivered with the product to work properly must be included in the scope of thestudy.

In the case of luminaires, the elements to be included are:

- the luminaire,
- as well as all the following items delivered with the product, namely:
    - power supplies detached from the lighting,
    - fixing elements to the frame,
    - assembly elements, fittings and other electrical connectors,
    - other possible accessories (LMS, sensors…).

In the case of a luminaire sold without control gear, it is mandatory to choose the control gear recommended by the manufacturer to ensure proper functioning of the luminaire under the conditions of use defined by the manufacturer over the assigned service life of the luminaire.

3.2.2. Distribution stage (A4)

This PSR does not require any additional requirements to the paragraph 2.2.4. “Distribution stage” of the current PCR ed.4.

3.2.3. Installation stage (A5)

The installation of luminaires involves:

- power supplies when these are remote from the lighting and are not supplied with the product;
- the fixing elements in accordance with the manufacturer’s instructions:
    - the fixing devices recommended by the manufacturer when they are not delivered with the product:
        - the fixing elements to the frame,
        - the assembly elements, fittings and other electrical connectors,
    - the other possible accessories;
- the first light source by default when the luminaire is sold without a light source or when the lightsource is not integrated.

The LCA report precises all the elements necessary for the installation of the luminaire.

The installation is not considering:

- all modification of the frame and/or addition of elements not provided by the manufacturer (e.g.: electrical network connection, roadworks). The actual impact of these operations shall be calculated according to the installation elements used during the installation operation by the user of the declaration if he wishes,
- fixing processes that are implemented during the installation.

3.2.4. Use stage (B1 to B7)

The use phase of luminaires involves:

- an electrical consumption of reference product, measured, justified and dependent on the light management functions concerned, if applicable (B6 – Energy Requirements during the use stage),
- possible replacement, re-lamping, and refurbishment of light sources and control gears (including the manufacture and sales distribution of lightsources and control gears) (B2 – Maintenance),
- any other consumables and maintenance operations necessary to the proper functioning of the luminaire provided by the manufacturer (B2 – Maintenance or B3 – Repair),
- end-of-life treatment of potential waste (such as replaced light sources or packaging wastes, and recorded either in B2 or B4).

The following stages are not covered in this PSR: B1 – Use or application of the product, B5 – Restoration, B7 – Water requirements during the use stage, since they are not relevant for luminaires.

The use phase is not considering:

- upgrade operations (modification of the product involving an evolution of its functions and itsuse).

3.2.5. End of life stage (C1 to C4)

The end-of-life stage of luminaires involves:

- the end-of-life treatment of luminaire,
- the end-of-life treatment of the last light source presented in the luminaire,
- the end-of-life treatment of the last control gear used together with the luminaire.

3.2.6. Net benefits and loads beyond the system boundaries (optional Module D)

This PSR may also include consideration of net benefits and loads beyond the system boundaries. This stage is optional and involves:

- • Impacts prevented by recycling the material,
- • Impacts prevented by waste-to-energy recovery,
- • Environmental impact of the production of the recycled material of the product, not taken into account during the manufacturing stage.

The net benefits and loads beyond the system boundaries are calculated using the formulas as defined in the current

PEP-PCR-ed4-EN-2021 09 06.

3.2.7. Specific exclusions

This PSR does not require any additional exclusion from paragraph 2.2.9 "Excludes from System Boundaries" of the current PCR (PEP-PCR-ed4-EN-2021 09 06). except for the flow related to the fixation processes described in the paragraph 3.2.3 of this document.

3.3. Cut-off criteria

The rules of section 2.3 "Cut-off criteria" of the current PCR (PEP-PCR-ed4-EN-2021 09 06) apply here.

3.4. Rules for allocation between co-products

These specific rules are additional to section 2.4 "Rules for allocation between co-products" of the current PCR (PEP-PCR-ed4-EN-2021 09 06).

When a process generates several co-products, the weight flow allocation rule must be applied based onthe output weight considered in the study.

3.5. Development of scenarios (default scenarios)

These specific rules are additional to section 2.5 "Development of scenarios" of the current PCR (PEP-PCR-ed4-EN-2021 09 06).

Any other scenario than the default scenario described below must be justified in the LCA report and mentioned in the PEP.

3.5.1. Manufacturing stage (A1 to A3)

The manufacturing stage shall be analyzed in accordance with paragraph 3.2.1 "System boundaries / Manufacturing stage" of this PSR and the default scenarios of the current PCR (PEP-PCR-ed4-EN-2021 09 06).

The recycled content should be declared in the PEP, as recommended by AP 0017. In that case, it shall be assessed according to EN 45557 and justified. The default value for recycled content is zero.

Packaging of raw materials and components

Packaging of raw materials and components, including their transport to manufacturing sites, shall be considered. Suppliers' data with justification shall be used. If no justification is available, an average quantity of 5% in mass of the luminaire shall be considered, and split as follows:

- Wood: 50%

- Cardboard: 40%
- Low density polyethylene: 10%

Packaging which are reused on site are not considered.

The end of life of packaging is modeled as described in the present document, in the sections dealing with the elimination of the production waste.

As mentioned in section 3.4.2.1 of the PCR, the LCA report shall “identify the waste treatments of output flows (e.g. treatment of production losses) from the manufacturing site as well as the corresponding datasets used”.

In the case where the production losses are unknown, a default loss rate of 50% shall be taken. The LCA report will provide justification if 50% is not used.

3.5.1.1. Luminaires sold without control gear

If the luminaire is sold without control gear, it is mandatory to choose the control gear recommended by the manufacturer to ensure proper functioning of the luminaire under the conditions of use defined by the manufacturer over the assigned service life of the luminaire.

The choice of the control gear must be justified in the LCA report and specified in the PEP.

3.5.1.2. Manufacturing end of life waste treatment scenario

The rules specified in the paragraph 2.2.3. of the current PCR (PEP-PCR-ed4-EN-2021 09 06) apply.

3.5.1.3. Modalities and supporting documents to be made in case of modification of the default scenario(s)

The rules specified in the paragraph 3.4.2.1. of the current PCR (PEP-PCR-ed4-EN-2021 09 06) apply.

Recycled content should be justified by a signed declaration from the supplier or a material datasheet stating the recycled content.

3.5.2. Distribution stage (A4)

The distribution stage shall be analyzed in accordance with the paragraph 3.2.2 “System boundaries / Distribution stage” of current PSR and default scenarios of the current PCR (PEP-PCR-ed4-EN-2021 09 06).

3.5.2.1. Distribution end of life waste treatment scenario

The rules specified in the paragraph 2.2.4. of the current PCR (PEP-PCR-ed4-EN-2021 09 06) apply.

3.5.2.2. Modalities and supporting documents to be made in case of modification of the default scenario(s)

The rules specified in the paragraph 3.4.2.2. of the current PCR (PEP-PCR-ed4-EN-2021 09 06) apply.

3.5.3. Installation stage (A5)

The installation stage shall be analyzed in accordance with the paragraph 3.2.3 "System boundaries / Installation stage" of this PSR, and default scenarios of the current PCR (PEP-PCR-ed4-EN-2021 09 06).

The default installation scenario for luminaires is the following:

- Adding power supplies when these are remote from the lighting and are not supplied with the product,
- Fixing elements in accordance with the manufacturer's instructions,
- Adding the first light source by default, when the luminaire is sold without a light source or when the light source is not integrated.

No specific additional installation equipment or procedure is needed.

3.5.3.1. Installation end of life waste treatment scenario

The waste, including packaging waste, produced during the installation stage is assumed to be eliminated by the installer once the equipment is installed, and taken into account in the installation stage.

If no justification is provided to demonstrate a specific end of life, the default scenario are provided in the following tables, and shall be applied. It is possible to use more recent data from Eurostat. If used, the reference of these data shall be reported in the PEP.

For all geographical areas, by convention:

- The waste transportation stage is 100 km by truck.
- Labels and accessories put on the packaging are considered as negligible and can be cut off.
- A wood pallet is reused 28 times.

For France:

	Recycling rate	**Incineration with energy valorization**	**Incineration without energy valorization**	**Landfill**
Metals (except steel and aluminum)	83	1	0	16
Steel	88	0	0	12
Aluminum	60	7	0	33
Paper and	91	5	0	4

Cardboard				
Wood	7	31	0	62
Plastics	27	43	0	30

Table 1: Default end of life data for packaging for France

For Europe:

	Recycling rate	**Incineration with energy valorization**	**Incineration without energy valorization**	**Landfill**
Metal	77	2	0	21
Paper and Cardboard	82	9	0	9
Wood	31	31	0	38
Plastics	41	37	0	23

Table 2: Default end of life data for packaging for Europe

Waste of any material for which no data is available in the two previous tables shall be dealt according to the following: 100% incineration without energy valorization.

Waste of any material for any area out of Europe or France shall be dealt according to the following: 100% incineration without energy valorization.

3.5.3.2. Modalities and supporting documents to be made in case of modification of the default scenario(s)

The rules specified in the paragraph 3.4.2.3. of the current PEP-PCR-ed4-EN-2021 09 06 apply.

3.5.4. Use stage (B1 to B7)

The following table provides a synthetic view of how the environmental impacts shall break down for the following modules B1 to B7.

B1 Use or application of the installed product	The specific rules of the present PSR do not define elements to declare in B1
B2 Maintenance	The manufacturing, distribution, and end of life of the replacement consumables, including the light source and control gear, necessary to the functioning of the luminaire. It covers the luminaire components with a lifetime shorter than the luminaire lifetime that shall be considered here.
B3 Repair	The specific rules of the present PSR do not define elements to declare in B3.

B4 Replacement	The specific rules of the present PSR do not define elements to declare in B4.
B5 Restoration	The specific rules of the present PSR do not define elements to declare in B5.
B6 Energy needs during use phase	Electricity consumption of the reference product applying the use scenario as defined by the present PSR. See 3.5.4.1 Electricity consumption
B7 Water needs during use phase	The specific rules of the present PSR do not define elements to declare in B7

Table 3: content of modules B1 to B7

3.5.4.1. Electricity consumption scenario (B6)

For the use stage, the default geographic area is Europe and shall be specified in the PEP. Any othergeographical area shall be specified in the LCA report and in the PEP.

3.5.4.1.1. Luminaire without light management function

3.5.4.1.1.1. Reference use scenario

The default use scenario of a luminaire is a continuous use at declared power during the assigned lifetimeof the luminaire.

3.5.4.1.1.2. Energy consumption

The final energy consumption of a **luminaire** over its assigned lifetime, expressed in kilowatt-hour, is calculated as follows:

$$C = P \times \text{Assigned lifetime}$$

With:

P = declared power of the lighting circuit in operation at declared power (in kilowatts) including all lamps,power supplies and other components necessary for the proper functioning of the device. In the presenceof several components, the power of the lighting equals to the sum of the powers of each component. The power of the lighting must be justified by the manufacturer with a technical manual.

If the product is sold without light source (not equipped with lamp), it is necessary to take into account the power of the lamps (lamps with the most impacts according to paragraph 3.5.4.4) to determine the value of P.

If the product is sold without control gear, it is necessary to take into account the power consumption of the control gear with the highest impact (e.g. lowest control gear efficiency).

In case the use of a specific light source is recommended by the manufacturer, it might be considered.

Assigned lifetime= lifetime of the luminaire declared by the manufacturer (in hours).

3.5.4.1.2. Luminaire with light management function

3.5.4.1.2.1. List of light management functions

This paragraph is intended to deal with the most common light management functions of the market. Anyother light management function shall be described and justified in the LCA report.

Integrated on/off switches, or remote on/off switches, are not considered to be light management functions.

Light management function	**Luminaire capable of communicating with an external Light Management System**	**Description**
Variation or extinction system according to the brightness of day light	No	System allowing to maintain a constant level of illumination according to thecontribution of natural light in a given environment, for example a luminaire controlled by an integrated brightness sensor. The variation of luminous flux of the luminaire can be continuous or bythresholds, and go to extinction.
Variation or extinction system according to the presence and absence	No	The main function of this type of device is to save energy by lowering theluminosity in case of absence of people. The decline can be continuous or by thresholds, and go to extinction. Most of the time, the lighting turns on automatically once an element enters itsscope of detection. Device can be called differently depends on the technologies used (motion detector, passage detector ...), for example a luminaire controlled by an integrated presence detector.

Light management function	Luminaire capable of communicating with an external Light Management System	Description
Combination of presence detection function and luminosity function	No	Function represented by the combination of the two previous functions to adapt the artificial light input in a given environment, according to the intensity of natural light and presence detection.
Luminaire for an external Light Management System	Yes	Dimmable luminaire that can be connected to an external Light Management System

Table 4 – Different types of light management function

3.5.4.1.2.2. Reference use scenario

The default use scenario for a luminaire with a light management function is to manage the outgoing luminous flux over its assigned lifetime. It is considered that light management functions do not influence the assigned lifetime.

Over assigned lifetime, the device will alter from an active mode to a power saving mode according to thelight management function. In active mode, the luminaire operates at its declared power.

Any other use scenario shall be justified in the LCA report and mentioned in the PEP.

3.5.4.1.2.3. Energy consumption

The final energy consumption of a luminaire over its assigned lifetime, expressed in kilowatt hours (kWh), with a lightmanagement function is calculated as follows:

C = P x Assigned lifetime x Theoretical energy saving coefficient

- **When the luminaire contains a replaceable light source**

P = declared power of the lighting circuit in operation at declared power (in kilowatts) including all lamps,power supplies and other components necessary for the proper functioning of the device. In the presenceof several components, the power of the luminaire equals to the sum of the powers of each component.The power of the lighting must be justified by the manufacturer with a technical manual.

If the product is sold without light source (not equipped with lamps), it is necessary to take into accountthe power of the lamps (lamps with the most impacts according to paragraph 3.5.4.4) to determine the value of P.

When the control gear is not supplied with the reference product and its power is not used todetermine P, this must be explicitly mentioned in the PEP.

- **When the luminaire contains a non-replaceable light source**

P is the on-mode power (Pon) according to 2019/2020/EU Annex I (25), being measured at the reference control settings as defined in 2019/2020/EU Annex I (29)

The energy gain coefficients are associated with the various functions available on the luminaire market[3].The energy saving coefficients include the power consumption of the luminaire in non-active mode (stand- by).

Light management function nomination	Theoretical reduction of energy consumption	Theoretical coefficient of energy saving
Variation or extinction system according to the brightness of day Light	-25%	0.75
Variation or extinction system according to the presence andabsence	-25%	0.75
Combination of presence detection function and luminosity function	-45%	0.55
Luminaire capable of communicating with an external Light Management System	-50%	0.50

Table 5 – Energy saving coefficients according to light management function

Any other light management function shall be described with its energy saving coefficient justified in theLCA report.

3.5.4.2. Light sources and control gear replacement (B4)

The replacement of the light sources and control gears must be taken into account over the assigned lifetime of the luminaire. The number of alternative light sources and control gears will be calculated and rounded up to the next wholenumber.

The table below summarizes the average lifetime of the most representative non-LED based light sources, thus traditional lamps categories in the market[4]. Average life in this context means that at least 50% of the light sources still emit light, regardless of the actual luminous flux emitted.

[3] Coefficients determined in a consensual way by the technical experts of the sector who participated in the development of the PSR considering the values defined by the ADEME in its "Certificats d'économies d'énergie" ("Luminaire d'éclairage général à modules LED" – December 24, 2014, JORF and "Lampe ou luminaire à modules LED pour l'éclairage d'accentuation" - 2 August 2015, JORF).

[4] According to the data provided by the various manufacturers who participated the creation of the PSR

non-LED based light source		Average lifetime B50 (hours)
Incandescent lamp		1,000
Tungsten halogen lamp		2,000
Single capped fluorescent lamp	With ballast	11,000
	Without ballast	14,000
Double capped fluorescent lamp	T5 type	20,000
	T8 type	15,000
Discharge lamp	Metal halide	14,000
	Sodium (high or low pressure)	23,000
	Mercury vapor	15,000

Table 6a – Average lifetime of non-LED based light sources, traditional lamps

LED Light Source (Worst case scenario)	Default Lifetime L70B50 (hours)
LED Lamp	15,000
LED Module, integrated, semi-integrated or non-integrated	15,000
LED tubes	15,000
LED bulbs	15,000
LED spots	15,000

Table 6b – Default lifetime for LED light sources. A LED light source can be a LED module or a LED lamp

The data in the tables 6 and 6b can be used as a reference without additional justifications.

However, it is possible to take into account the declared lifetime of the light source if justified in the LCAreport on the basis of technical reports. For LED based technology L70B50 shall be applied. For non-LED technology B50 values shall be applied.

The specifications of the product, according to the manufacturer, will be used to evaluate the number of replacements of the control gears to fulfill the declared lifetime.

The lifetime shall be given at 10% failure rate and the maximum case temperature (TC) expected inside the luminaire. If the case temperature is unknown, 75°C shall be assumed as a default value.

In case the lifetime of the driver is unknown, 15000h can be assumed as a default value.

3.5.4.3. End of life treatment of light sources

A transport stage representing the shipment of collected waste to approved treatment centers is to be considered. The default distance is 100 km by truck.

Regarding recovery processes, the study will cover all end of life process up to the production of a secondary material.

Light source nomination		End of life sector
Incandescent		Scenario 1
Halogen		Scenario 1
Fluocompact lamp	Compact fluorescent	Scenario 2
	Without ballast	Scenario 2
Fluorescent tube	Fluorescent tube	Scenario 2
	Type T8	Scenario 2
Discharge lamp	Discharge lamp	Scenario 3
	Iodure metallic	Scenario 3
	Sodium (high or low pressure)	Scenario 3
	Mercury vapor	Scenario 3
Lampe LED		Scenario 2
Integrated LED module		Waste to be considered with the luminaire at the end-of-life stage

Table 7 – End of life sector of the light source

Scenario 1	Proportion of luminaire	Type of treatment
Landfill	100%	Landfill of household wastes

Scenario 2	Proportion of luminaire	Type of treatment
Recycling	55%	Waste inventory declaration for recycling
Landfill	45%	Landfill of EEE wastes (luminaire type)

Scenario 3	Proportion of luminaire	Type of treatment
Recycling	80%	Waste inventory for recycling
Landfill	20%	Landfill of EEE wastes (luminaire type)

3.5.4.4. Luminaire sold without a light source

If the luminaire is sold without a light source (not equipped with lamp), the compatible light source with the most impact must be chosen:

- Maximizing the power (Watt) by considering the CE mark indication (authorized maximum power),
- Minimizing the luminous efficiency.

If the manufacturer recommends the use of a specific light source, it may be considered. The choice

of the light source must be justified in the LCA report and specified in the PEP.

3.5.4.5. Modalities and supporting documents to be made in case of modification of the default scenario(s)

The rules specified in the paragraph 3.4.2.4. of the current PCR (PEP-PCR-ed4-EN-2021 09 06) apply.

3.5.4.6. Maintenance, repair and restoration stages (B2, B3 and B5)

The requirements specified in the paragraphs 2.2.6 "Use stage" and 2.5.5 "Maintenance scenarios" of the current PCR (PEP-PCR-ed4-EN-2021 09 06) apply.

“Restoration” stage is not appropriate to luminaires. In the future, this stage could integrate (e.g.) remanufacturing of luminaires, and any relevant stages according to circular economy regulations development.

3.5.5. End of Life Stage (C1 to C4)

The rules specified in the paragraph 2.2.7. of the current PCR (PEP-PCR-ed4-EN-2021 09 06) apply.

3.5.5.1. Waste End of Life treatment scenario

See paragraph 3.5.5.2 (European scenario, applicable to France).

3.5.5.2. Modalities and supporting documents to be made in case of modification of the default scenario(s)

The rules specified in the paragraph 3.4.2.5. of the current PCR (PEP-PCR-ed4-EN-2021 09 06) apply.

When the light source is not integrated into the luminaire, the treatment of the last light source inoperation is included in the luminaire end of life treatment.
When the light source is integrated into the luminaire, the treatment of the integrated light source isincluded in the luminaire end of life treatment.
The treatment of the light source applied at its end-of-life stage meets the requirements described in the paragraph 3.5.4.3 of this document.

Regarding recovery processes, the study will cover all end of life process up to the production of a secondary material.

The **professional and household luminaires** are subject to specific end-of-life treatment obligations regulated by Directive 2012/19 / EU on waste electrical and electronic equipment and Decree No. 2005-829 of 20 July 2005, for which minimum recovery constraints are applicable:

- Minimum 75% of waste must be recovered,
- And minimum 55% of the waste is prepared for recycling or reuse.

Evidence of affiliation to a third-party organization will be attached to the LCA report by providing the attestation of membership in an eco-organization authorized by the public authorities.

1st case: Minimum compliance with regulatory requirements in a collective system

If the producer can justify his membership of an authorized third-party eco-organization, this situation shall be modeled according to the recycling, recovery and landfill rates of this organization. The treatment repartition must be justified in the LCA report.

A transport step representing the shipment of collected waste to approved treatment centers shall be considered. The default distance is 100 km by truck, and shall be applied for France. The use of any other value shall be justified for a transport outside of France.

Optional: for treatment in France, the values presented in table 8 can be used due to the local regulatory requirements.

	Proportion of luminaire	Type de treatment
Recycling	41.25%	Waste inventory declaration for recycling
Incineration with energy recovery	15%	Waste inventory declaration for incineration with energy recovery
Incineration without energy recovery	0%	Incineration without energy recovery of EEE wastes (luminaire type)
Landfill	43.75%	Landfill of EEE wastes (luminaire type)

Table 8 – Scenarios of luminaires end of life treatment (estimated thanks to the minimum regulatory requirementsin France)

2nd case: Compliance with minimum regulatory requirements for individual systems

If the producer can justify the way his waste is recycled in his individual system and that he respects the regulatory requirements, this information can be used to model the end-of-life phase. In this case the producer shall give detail, how the collection of the products at their end of life is handled. The treatment repartition must be justified in the LCA report.

A transport step representing the shipment of collected waste to individual treatment centers is to be considered.

Optional: for treatment in France, the values presented in table 8 can be used due to the local regulatory requirements.

A transport step representing the shipment of collected waste to approved treatment centers shall be

considered. The default distance is 1,000 km by truck, and shall be applied for France. The use of any other value shall be justified for a transport outside of France.

3.5.6. Benefits and loads outside system boundaries (module D) – optional

As mentioned in paragraph 2.2.8 of the current PCR (PEP-PCR-ed4-EN-2021 09 06), the net benefits and loads beyond the system boundaries also referred as "module D" may also be included in the PEP.

3.6. Rule(s) for extrapolation to a homogeneous environmental family

These rules are additional to section "2.6. Rule(s) for extrapolation to a homogeneous environmental family" of the current PCR (PEP-PCR-ed4-EN-2021 09 06) of the Product Environmental Profiles (PEP).

The following paragraphs detail the extrapolation rules applicable to each stage of the life cycle and theconditions of belonging to a homogeneous environmental family. To use these extrapolation rules, the manufacturer must justify in the LCA report that the range of products fulfill all these conditions.

These extrapolation rules are not intended to cover all the product lines on the market. The use of any other extrapolation rule and / or definition of environmental homogeneous family shall be justified in the LCA report.

3.6.1. Definition of a homogenous environmental family

For luminaires, to be belonging to an environmental homogeneous family, the product group must have,in addition to the requirements established by the PEP-PCR-ed4-EN-2021 09 06, the following characteristics:

- be in the same range of products of the manufacturer,
- be subject to the same product standards,
- has the same assigned lifetime (for luminaire and its light source - if applicable).

In particular, to belong to a homogeneous environmental family, the product group must have the following characteristics:

- the materials and manufacturing processes of luminaires are identical, namely:
  - the same type of materials and manufacturing process for the luminaire structure,
  - the same type of control gear (which means control gears have thesame technology and, in the case of printed circuits, the same types of components),
  - the same type of light source (which means the light sources have the same technology),
- the packaging materials and manufacturing processes are identical,
- the packaging is optimized within the product line, with means:
  - the packaging material repartition is the same,
- the product group must use the same logistics circuit (the same transport type, distance, and transport conditions),

- the conditions of installation and use are the same,
- the technology of the light source is identical,
- luminaires are recycled according to the same regulatory requirements.

Any other definition of homogeneous environmental family shall be justified in the LCA report.

3.6.2. Application of extrapolation rules

If the conditions to belong to a homogeneous environmental family as defined in the paragraph 3.6.1 are met, the extrapolation rules to be applied for each stage of the life cycle are those given in the paragraphs from 3.6.3 to 3.6.7. These rules are applicable at the product level (or declared unit).
The extrapolationcoefficients calculation at the FU level shall use the following formula:

$$Extrapolation\ coefficient\ at\ the\ product\ level\ x\ \left(\frac{Lighting\ output\ of\ reference\ product\ (lumen)}{Lighting\ output\ of\ product\ concerned\ (lumen)}\right)$$

When the extrapolation rules of a life cycle stage are based on the combination of several coefficients, thedeclarant of the PEP shall apply a weighted average of the set of calculated coefficients. The weighting factor for each considered component is the weight of the component of the concerned product divided by the total weight of the considered components of the concerned product.

All the extrapolation rules must be justified in the LCA report.

3.6.3. Extrapolation rules applied to fabrication stage (A1-A3)

In the context of a range of products that respect the characteristics of a homogeneous environmentalfamily as defined in the paragraph 3.6.1 :

- the environmental impacts generated by the production of the luminaire structure and its packaging are mainly correlated to the weight of the luminaire structure,
- the environmental impacts generated by the production of the control gear are mainly correlated to the weight of the control gear,
- the environmental impacts generated by the production of the light source are mainly correlatedto the weight of the light source,
- the environmental impacts generated by the production of the components associated with light management functions or lighting control system compatibility are mainly correlated to the weight of those components, if included in the luminaire structure.

For the manufacturing stage, the extrapolation rule to be developed from collection data at the productlevel (or declared unit) for any other luminaire in the same product range is:

Coefficient at the declared unit level	Coefficient to be determined on the base of combination of 5 rules indicated below: **Rule applicable to the production of luminaire structure:** $\frac{\text{Structure weight of concerned product (kg)}}{\text{Structure weight of reference product (kg)}}$ **Rule applicable to the production of the packaging:** $\frac{\text{Packaging weight of concerned product (kg)}}{\text{Packaging weight of reference product (kg)}}$ **Rule applicable to the production of the control gear:** $\frac{\text{Weight of control gear of concerned product (kg)}}{\text{Weight of control gear of reference product (kg)}}$ **Rule applicable to the production of light source:** $\frac{\text{Weight of light source of concerned product (kg)}}{\text{Weight of light source of reference product (kg)}}$ **Rule applicable to the production of light management function/lighting control system:** $\frac{\text{Weight of light management function/ lighting control system components of concerned product (kg)}}{\text{Weight of management function/ lighting control system components of reference product (kg)}}$
	• The rules are applicable to the data collected for the concerned product, in comparison to the reference product data. • The manufacturer must establish the overall extrapolation coefficient at the life cycle stage to be reported on the PEP. • The manufacturer must provide the justification for the establishment of these parameters and document them in the LCA report.

If the homogeneous product family contains products both with and without LMS, a reference product must be selected that includes an LMS, in order to allow for the extrapolation defined in paragraph 3.6.6.

3.6.4. Extrapolation rules applied to distribution stage (A4)

In the context of a range of products that respect the characteristics of a homogeneous environmental family as defined in the paragraph 3.6.1, the environmental impacts generated during the distribution stage are mainly correlated to the total weight of the luminaire including its packaging.

For the distribution stage, the extrapolation rule to be developed from collection data at the product level(or declared unit) for any other luminaire in the same product range is:

Coefficient at the declared unit level	$\frac{\text{Weight of concerned product + Packaging weight of concerned product (kg)}}{\text{Weight of reference product + Packaging weight of reference product (kg)}}$

With:
Packaging weight = packaging weight of the luminaire as defined in the paragraph 3.5.1 in kg.

3.6.5. Extrapolation rules applied to installation stage (A5)

In the context of a range of products that respect the characteristics of a homogeneous environmental family as defined in the paragraph 3.6.1, the environmental impacts generated during the installation stage are mainly correlated to the total weight of the luminaire's packaging.

For the installation stage, the extrapolation rule to be developed from collection data at the product level(or declared unit) for any other luminaire in the same product range is:

Coefficient at the declared unit level	$\frac{\text{Packaging weight of concerned product (kg)}}{\text{Packaging weight of reference product (kg)}}$

With:
Packaging weight = packaging weight of the luminaire as defined in the paragraph 3.5.1, in kg

3.6.6. Extrapolation rules applied to use stage (B1 to B7)

In the context of a range of products that respect the characteristics of a homogeneous environmentalfamily as defined in the paragraph 3.6.1 :

- The environmental impacts generated by electricity consumption are mainly correlated to the total electrical power of the luminaire and the light management function.
- The environmental impacts generated by the production of replacing light sources and the treatment of used light sources are mainly correlated to the weight of the light sources.
- The environmental impacts generated by the production of replacing control gears and the treatment of used control gears are mainly correlated to the weight of the control gears.

For the use stage, the extrapolation rule to be developed from collection data at the product level (or

declared unit) for any other luminaire in the same product range is:

Coefficient at the declared unit level (B2)	**Rule applicable to the production of replacing light sources and the treatment of used light source (B2):** $\frac{\text{Weight of concerned product light source (kg)}}{\text{Weight of replaced product light source (kg)}}$ **Rule applicable to the production of replacing control gear and the treatment of used control gear (B2):** $\frac{\text{Weight of concerned product control gear (kg)}}{\text{Weight of replaced product control gear (kg)}}$
Coefficient atthe declared unit level (B6)	**Rule applicable to the electricity consumption (B6):** $\frac{\text{Power of concerned product (W)}}{\text{Power of reference product (W)}} x \frac{\text{Energy saving coefficient of concerned product}}{\text{Energy saving coefficient of reference product}}$
	• The rules are applicable to the data collected for the concerned product, in comparison to the reference product data. • The manufacturer must establish the overall extrapolation coefficient at the life cycle stage to be reported on the PEP, • The manufacturer must provide the justification for the establishment of these parameters and document them in the LCA report.

With:

Power = P = declared power of the lighting circuit in operation at nominal declared power as defined in the paragraph 3.5.4.1.1.2., in watt

Energy saving coefficient of a product with light management function is indicated in table 5 and the energy saving coefficient of a product without light management function is equal to 1.

3.6.7. Extrapolation rules applied to end-of-life stage (C1 to C4)

In the context of a range of products that respect the characteristics of a homogeneous environmental family as defined in the paragraph 3.6.1, the environmental impacts generated during the distribution stage are mainly correlated to the total weight of the luminaire including its lamps (if applicable).

For the end-of-life stage, the extrapolation rule to be developed from collection data at the product level (or declared unit) for any other lighting in the same product range is:

Coefficient at the declared unit level	$\frac{\text{Weight of concerned product including its light source and control gear(kg)}}{\text{Weight of reference product including its light source and control gear(kg)}}$

3.6.8. Extrapolation rules applied to net benefits beyond the system boundaries stage (D) (optional)

In the context of a range of products that respect the characteristics of a homogeneous environmentalfamily as defined in the paragraph 3.6.1 the net benefits generated by recycling, waste to energy recovery or the production of recycled material, not taken into account during manufacturing stage are mainly correlatedly with

- the weight of the luminaire structure,
- the weight of the packaging,
- the weight of the lights source,
- the weight of the control gear,
- the weight of the components associated with light management functions, or components associated with compatibility with lighting control systems, if included in the luminaire structure.

For the net benefits beyond the system boundaries stage the extrapolation rule to be developed from collection data at the product level (or declared unit) for any other luminaire in the same product range is:

Coefficient at the declared unit level	Coefficient to be determined on the base of combination of 5 rules indicated below: **Rule applicable to the net benefits of the luminaire structure:** $\frac{\text{Structure weight of concerned product (kg)}}{\text{Structure weight of reference product (kg)}}$ **Rule applicable to the net benefits of the luminaire packaging:** $\frac{\text{Packaging weight of concerned product (kg)}}{\text{Packaging weight of reference product (kg)}}$ **Rule applicable to the net benefits of control gear:** $\frac{\text{Weight of control gear of concerned product (kg)}}{\text{Weight of control gear of reference product (kg)}}$ **Rule applicable to the net benefits of light source:** $\frac{\text{Weight of light source of concerned product (kg)}}{\text{Weight of light source of reference product (kg)}}$ **Rule applicable to the net benefits of light management function/ lighting control system components:** $\frac{\text{Weight of light management function/lighting control system components of concerned product (kg)}}{\text{Weight of light management function/lighting control system components of reference product (kg)}}$
	• The rules are applicable to the data collected for the concerned product, in comparison to the reference product data. • The manufacturer must establish the overall extrapolation coefficient at the life cycle stage to be reported on the PEP • The manufacturer must provide the justification for the establishment of these parameters and document them in the LCA report

3.6.9. Example of application of the extrapolation rules and the related calculations at product and FU level

As an application example for the extrapolation rules two panel luminaires are considered as reference and extrapolated products and the extrapolation coefficients are calculated accordingly. The luminaires differ in luminous flux, size and weight. The reference product can be connected via DALI and energy saving coefficients according to table 5 can be applied. For the extrapolated product, there are no energy saving functions applied.

Luminaire parameter	Reference product	Product for extrapolation
Product weight	1.85kg	1.65kg
Product size	620mm x 620mm	600mm x 600mm
Package weight	0.87kg	0.81kg
Luminous flux	3000lm	4320lm
Power	25W	36W
Lifetime	100000h	100000h
Energy saving functions	DALI	-
Weight of control gear	0.19kg	0.19kg

The extrapolation coefficient at the FU level shall be calculated using the following formula

$$Extrapolation\ coefficient\ at\ the\ product\ level\ x\ \left(\frac{3000lm}{4320lm}\right)$$

The extrapolation coefficients at product level are:

Fabrication stage (see 3.6.3)

Production of luminaire structure:

$$\frac{1.65\text{kg}}{1.85kg} = 0.89$$

Production of packaging:

$$\frac{0.81\text{kg}}{0.87kg} = 0.93$$

As the same control gear is recommended for both applications, the extrapolation coefficient for the fabrication of the control gear is 1.

As the light source is integrated into the luminaire, no extrapolation coefficient needs to be calculated for the light source.

As the concerned product does not provide any light management functions, the extrapolation coefficient for the light management function components is zero.

Distribution stage (see 3.6.4)

$$\frac{1.65\text{kg} + 0.81\text{kg}}{1.85kg + 0.87kg} = 0.90$$

Installation stage (see 3.6.5)

$$\frac{0.81\text{kg}}{0.87kg} = 0.93$$

Use stage (see 3.6.6)

Electricity consumption

As the concerned product does not provide any energy saving functions, its energy saving coefficient is 1.

$$\frac{36W}{25W} * \frac{1}{0.5} = 2.88$$

No replacement of the light source is possible.

As the same control gear is recommended for both products, the extrapolation coefficient for the control gear is 1.

End-of-life stage (see 3.6.7)

$$\frac{1.65\text{kg} + 0.19\text{kg}}{1.85kg + 0.19kg} = 0.90$$

Extrapolation coefficients (see 3.6.2)

The following table summarizes the extrapolation coefficients calculated for the example. The data are reported according to 3.6.3 “Extrapolation rules applied to fabrication stage (A1-A3)”. The extrapolation coefficients are intended at product level (declared unit) and not at functional unit.

Extrapolation coefficients of a product	Fabrication	Distribution	Installation	Use	End-of-Life
Method 1: Specific coefficients					
Product		0,90	0,93		0,90
Luminaire Structure	0,89				
Control gear	1			1	
Light Source					
Light management function	0				
Product Packaging	0,93				
Electricity consumption				2,88	
Method 2: Maximum values					
Product	1,0	0,90	0,93	2,88	0,90

3.7. Rule(s) applying to joint environmental declarations

The rules specified in the section 2.7 "Rules applying to joint environmental declarations" of the current PCR (PEP-PCR-ed4-EN-2021 09 06) apply.

3.8. Environmental data requirements

The rules defined in section 2.9 "Environmental data requirements" of the current PCR (PEP-PCR-ed4-EN-2021 09 06) apply.

3.9. Environmental impact calculation

These rules are additional to section 2.10 "Calculation of the environmental impact" of the current PCR (PEP-PCR-ed4-EN-2021 09 06).

3.9.1. Calculation of environmental impact at the product level (declared unit)

The results of environmental impacts generated by the life cycle of reference product correspond to the environmental impacts at the declared unity level.

3.9.2. Calculation of environmental impact at the level ofFU

In order to evaluate the results of environmental impacts at the level of FU declared in thePEP (reminder: "Provide lighting that delivers an outgoing artificial luminous flux of 1,000 lumens during areference lifetime of 35,000 hours"), the environmental impacts generated by the life cycle of the reference product must be brought back to the FU.

Calculations of environmental impacts of the manufacturing, distribution, installation, use and end-of-lifestages are carried out as follows for each life cycle stage:

Environmental impacts of PEP (for 1,000 lumens over 35,000 hours) = Environmental impacts of the reference product x (1,000 / Outgoing luminous flux of the reference product in lumens) x (35,000 / Assigned product lifetime of the reference product in hours)

Examples:

In the case of a luminaire providing an outgoing artificial luminous flux of 2,500 lumens during a lifetime of 50,000 hours, the coefficient to be applied is the following:

Environmental impacts of PEP (for 1,000 lumens over 35,000 hours) = Environmental impacts of the reference product x (1,000 / 2,500) x (35,000 / 50,000) = Reference product environmental impacts x 0.28

In the case of a luminaire providing an outgoing artificial luminous flux of 500 lumens during a lifetime of 25,000 hours, the coefficient to be applied is the following:

Environmental impacts of PEP (for 1,000 lumens over 35,000 hours) = Environmental impacts of the reference product x (1,000 / 500) x (35,000 / 25,000) =Reference product environmental impacts x 2.8

3.10. Information on carbon offset, carbon storage and delayed emissions

Carbon offset processes are not part of the product system under study. Carbon offset shall not be included in the calculation of the "Climate change" indicator.

NOTE A carbon offset is a reduction in emissions of carbon dioxide or other greenhouse gases made to compensate for an emission elsewhere.

The effect of temporary carbon storage and delayed emissions, i.e. the discounting of emissions and removals as in dynamic LCA, shall not be included in the calculation of the GWP. The effect of permanent biogenic carbon storage shall not be included in the calculation of the "Climate change" indicator. All biogenic carbon entering the system must leave the system during the life cycle, and any residual biogenic carbon should exit at the end of life.

4. Drawing up the Product Environmental Profile

4.1. General information

The current rules complete the paragraph 4.1 "General information" of the current PCR (PEP-PCR-ed4-EN-2021 09 06)

The PEP shall include:

- the description of the components and accessories supplied with the luminaire,
- if a light source is supplied with the luminaire,
- if a control gear is delivered with the product,
- if the control gear is not integrated with the product, the description of the control gear used to produce the PEP,
- if the luminaire is sold equipped with light sources, the value of the outgoing artificial luminous flux shall be measured according to standard NF EN 13032-1 + A1: 2012 in lumens or calculatedusing the LOR (3.1.3) by specifying the light sources used in all different cases,
- the declared operating voltage in Volt,
- the light source color temperature in Kelvin,
- the protection index for water and dust (IP),
- the impact resistance index (IK) measured according to standard NF EN 62262: 2004,
- the luminous efficiency expressed in lm / W according to the following formula: "Luminous efficiency = Outgoing luminous flux / Total product electrical power"
- the electrical power of the luminaire in watt,
- assigned lifetime in hours,
- the description of the reference use scenario,
- when using extrapolation rules, the outgoing artificial luminous flux of each product covered by the PEP intended for the product range,
- the lifetime of the luminaire in years by taking into account average annual operating hours by building type, according to EN 15193-1:2017 for indoor applications and EN 13201-5:2016 for outdoor applications. When the luminaire can be used in different types of building, the annual service lifetime announced in the PEP - and which must be reported in the PEP ecopassport® database - is the smallest duration. The other annual service lifetimes can be indicated in the PEP form by specifying the type of building.

	Type of building	**Annual operating hours by default**
Indoor applications	Residential building	3,500
	Office	2,500
	Educational institutions	2,000
	Hospital	5,000
	Hotel	5,000
	Catering	2,500
	Sports establishments	4,000

	Type of building	Annual operating hours by default

	Retail (wholesale and retail services)	5,000
	Industry (manufacturing plants)	4,000
Outdoor applications	Urban	4,000
	Tunnel (entrance)	4,000
	Tunnel (inside)	8,760
	Sport (recreational)	2,500
	Zone, open space	4,000

Table 9 – Luminaire annual operating times according to the area of applications and the type ofbuilding

Example:
For a luminaire with an assigned lifetime of 70,000 hours that can be installed in indoor applications such as "residential buildings", "offices", "hotels" and "catering", we have the following annual service time:

	Type of building	Annual operating hours by default	Operational lifetime
Luminaire with an assigned lifetime of 70,000 hours	Residential building	3,500 h	20 years
	Office	2,500 h	28 years
	Hotel	5,000 h	14 years
	Catering	2,500 h	28 years

Otherwise, by default, the operational lifetime announced in the PEP is 14 years and must be reported in the PEP ecopassport®data base. The other annual service lifetimes can be indicated in the PEP by specifying the type of building.

4.2. Constituent materials

The rules specified in section 4.2 "Constituent materials" of the current PCR (PEP-PCR-ed4-EN-2021 09 06) apply.

4.3. Additional environmental information

These rules are additional to section 4.3 "Additional environmental information" of the current PCR (PEP-PCR-ed4-EN-2021 09 06).

The PEP can include:

- The types of application and use of the luminaire
- The assigned lifetime of the luminaire in years by building type, according to EN 15193-1:2017 for indoor applications and EN 13201-5:2016 for outdoor applications (operating hours available in Table 6 of paragraph 3.5.4.2).

4.4. Environmental impacts

These rules are additional to section 4.4 "Environmental impact" of the current PCR (PEP-PCR-ed4-EN-2021 09 06).

The table of environmental impacts represents the environmental impact of the FU (which is “Provide lighting

that delivers an outgoing artificial luminous flux of 1,000 lumens during a reference lifetime of 35,000 hours") as defined in the paragraph 3.1.1 of the current specific rules.

The following details shall be included in the PEP to ensure clarity and transparency for the user:

This environmental declaration has been developed by considering an outgoing artificial luminous flux of1,000 lumens over a reference lifetime of 35,000 hours.

When using the extrapolation rules, the following detail shall be mentioned:
The extrapolation coefficients are given for the environmental impact of the FU, which is the emission of an outgoing artificial luminous flux of 1,000 lumens over 35,000 hours. For each life cycle stage, the environmental impacts of the product are calculated by multiplying the reference product impacts of the declaration with the extrapolation coefficient. The "Total" column shall be calculated by adding the environmental impacts of each life cycle stage.

In the context of the making a LCA of a building:

- the environmental impacts of the equipment related to the energy consumption must be takeninto account separately.
  According to PCR ed.4, "the breakdown of Module B (Modules B1 to B7) is optional, except for PEPs made within the French regulatory framework (refer to Appendix C of this PCR) and strongly recommended for PEPs related to systems installed in Building. In this case, the assumptions for the calculation and the breakdown of the use stage can be specified in the PSRs for the product categories concerned";

- the environmental impacts of equipment must be considered at the product level. In addition, industry experts judge the product-level impacts as a complementary vision to the impact of FU for optimal comparability. Thus, to facilitate the use of the PEP and to ensure optimal comparability, the PEP must include:
  - the table of the environmental impacts of the reference product expressed on the product (or declared unit) scale in addition to the table on the FU scale. The values must be indicated in numerical values, expressed in the appropriate units to three significant figures (and, optionally, as a percentage) for each stage of the life cycle. The total for each indicator of the full LCA shall also be calculated.

  The following details must be included in the PEP, to ensure clarity and transparency for the user:
  - for environmental impacts expressed per declared unit, the following wording must be included: « for 1,000 lumens during 35,000 hours »,
  - for environmental impacts expressed per declared unit, the following wording must be included: « for 1 luminaire of XX lumens during H hours » with XX the luminous powerof the light expressed in lumens and H the assigned lifetime of the light in hours;
- the extrapolation rules at the declared unit level, where applicable.

5. PEP update rules

The rules specified in section 5 of the current PCR (PEP-PCR-ed4-EN-2021 09 06) apply.

6. Appendices

6.1. Glossary

EEE	Electrical and Electronic Equipment
EPR	Extended Producer Responsibility
EU	European Union
EN	European Standards
EPD	Environmental Product Declaration
FU	Functional Unit
IEC	International Electrotechnical Commission
ISO	International Standardization Organization
LCA	Life Cycle Assessment
LCI	Life Cycle Inventory
LED	Light-Emitting Diode
LMS	Light Management System
LOR	Light Output Ratio
NF	Norme Française
PCR	Product Category Rules
PEP	Product Environmental Profile
Pon	On-mode Power
PSR	Product Specific Rules
RER	Europe (as a region, in Ecoinvent)
RSL	Reference Service Life (*also called* Reference Lifetime)

6.2. Definitions

ASSIGNED LIFETIME (OF A LUMINAIRE OR A LIGHT SOURCE)
service lifetime declared by the manufacturer during which a luminaire (or light source) may work beforeit is out of use, or considered as such according to the criteria specified by the manufacturer.

CONTROL GEAR <for an electric light source>
unit inserted between the power supply and at least one light source, which serves to supply the light source(s) with its (their) rated voltage or rated current, and which can consist of one or more separate components.
Note 1 to entry: A control gear can include means for igniting, dimming, correcting the power factor and suppressing radio interference, and further control functions.
Note 2 to entry: A control gear can consist of a power supply and a control unit.
Note 3 to entry: A control gear can be partly or totally integrated in the light source.
Note 4 to entry: The terms "control gear" and "controlgear" are interchangeable. In IEC standards, the term "controlgear" is commonly used.
(IEV ref 845-28-048)

CORRELATED COLOR TEMPERATURE - CCT

temperature of a Planckian radiator having the chromaticity nearest the chromaticity associated with the given spectral distribution on a modified 1976 USC diagram where u', 2/3 v' are the coordinates of the Planckian locus and the test stimulus

(IEV ref 845-23-068)

DIMMABLE LUMINAIRE

luminaire that varies the luminous flux of its light source according to a varying incoming current, voltage or signal. A dimmable luminaire may contain a dimmable control gear and light source, contain a dimmable light source not requiring a control gear, or it may be a luminaire containing a dimmable light source supplied with an external dimmable control gear.

LED MODULE

LED light source having either at least one PCB cap or no cap, and incorporating at least one LED package

Note 1 to entry: An LED module can be an integrated LED module (LEDi module), a semi-integrated LED module (LEDsi module) (IEV) or a non-integrated LED module (LEDni module).

Note 2 to entry: An LED module is usually designed to be part of an LED lamp or an LED luminaire.

Note 3 to entry: An LED module can include one or more of the following: electric, optical, mechanical, and thermal components, interfaces and control gear.

(IEV ref 845-27-058)

LIFETIME OF A LIGHT SOURCE

'lifetime' for LED and OLED light sources means the time in hours between the start of their use and the moment when for 50 % of a population of light sources the light output has gradually degraded to a value below 70 % of the initial luminous flux. This is also referred to as the L70B50 lifetime.

The 'lifetime" for traditional lamps according to table 6, is given by an average lifetime, known as B50 value, which means that at least 50% of the light sources still emit light, regardless of the actual luminous flux emitted.

(According to 2019/2020/EU)

LIGHT

VISIBLE RADIATION

any optical radiation capable of causing a visual sensation directly on a human being

Note 1 to entry – Nominally covering the wavelength in vacuum range of 380 nm to 780 nm.

(adapted from IEV ref 731-01-04)

LIGHT EMITTING DIODE – LED

solid-state device embodying a p-n junction, emitting incoherent optical radiation when excited by an electric current

(IEV ref 845-27-050)

LIGHT MANAGEMENT SYSTEM – LMS

LIGHTING CONTROL SYSTEM

A system of electrical devices and techniques used for luminaire grouping / zoning and for regulation of one or more of the light luminaire output variables such as luminous intensity, colour temperature and colour.

LIGHT SOURCE
surface or object emitting light, typically an electric light source, commonly called “light source”, defined as primary light source with the means for connecting to the power supply and usually designed to be incorporated into a luminaire. An electric light source can be an electric lamp, or LED module designed to be connected by terminals, connectors or similar devices.
(According to IEV ref 845-27-001 and ref 845-27-004)

LUMINAIRE STRUCTURE
set of luminaire elements excluding control gear, light source and packaging.

η
theoretical efficiency of an optical system expressed by the ratio between the luminaire outgoing flux divided by the declared flux of the light sources. It cannot be greater than 1.
Also called L.O.R (**LIGHT OUTPUT RATIO**).

NON-REPLACEABLE LIGHT SOURCE
light source designed to be a non-replaceable part of the luminaire
Note 1 to entry: An integral light source is always non-replaceable. A non-replaceable light source is not always an integral light source.
Note 2 to entry: The non-replaceability can be the result of the luminaire design.
(IEV ref 845-27-006)

OUTGOING LUMINOUS FLUX OF A LUMINAIRE (LUMEN)
total luminous flux measured at the output of the luminaire.
The outgoing luminous flux is therefore lower than the declared flux of the light source of a luminaire since its components (optical glass, reflector, etc.) will absorb a portion (as small as it is) of the declared flux of the light source.

OUTGOING LUMINOUS FLUX OF A SOURCE (LUMEN)
useful luminous flux according to 2019/2020/EU Annex I (15), measured at the reference control settings according to 2019/2020/EU Annex I (29)

POWER SUPPLY OR SUPPLY EQUIPMENT
device used to ensure the operation of lamps and luminaires, for example: ballast, transformer and step-down converter)
(Source: IEC 60598-1:2015)

REFERENCE LIFETIME
REFERENCE SERVICE LIFE (RSL)
lifetime that can be expected for equipment according to a particular set (reference set) of conditions ofuse and which can serve as a baseline for estimating service life under other conditions of use.
Note: The reference lifetime is also called typical. This is a theoretical service lifetime chosen for thepurposes of the calculations. It cannot be assimilated to the minimum, average or actual life of theproducts.
(Source PEP-PCR-ed4-EN-2021 09 06)

REPLACEABLE LIGHT SOURCE
light source designed to be replaced by an ordinary person or a qualified person.
Note 1 to entry: When incorporated into a luminaire, a replaceable light source can be classified as replaceable, non-user replaceable or non-replaceable depending on the luminaire design. (IEV ref 845-27-005)

LAMPS

DISCHARGE LAMP
lamp in which light is produced (directly or indirectly) by an electric discharge through a gas, a metal vapor or a mixture of several gases and vapors.
Note 1 to entry: According to whether the light is mainly produced in a gas or in a metal vapor, discharge lamps can be categorized as gaseous discharge lamps, for example xenon lamps, neon lamps, helium lamps, nitrogen lamps or carbon dioxide lamps, or as metal vapor lamps, such as metal halide lamps, high-pressure mercury lamps or high-pressure sodium lamps.
(IEV ref 845-27-024)

FLUORESCENT LAMP
discharge lamp of the low-pressure mercury type in which most of the light is emitted by one or several layers of phosphors excited by the ultraviolet radiation from the discharge
Typically, single and double capped fluorescent lamps according IEC60901 and IEC 60081 are used, respectively.
(IEV ref 845-27-034)

TUNGSTEN HALOGEN LAMP
gas-filled lamp containing halogens or halogen compounds, the filament being of tungsten
(IEV ref 845-27-017)

INCANDESCENT LAMP
electric lamp in which light is produced by means of an element heated to incandescence by the passage of an electric current
(IEV ref 845-27-011)

LED LAMP (IEV 845-27-054)
electric lamp based on LED technology

Note 1 to entry: An LED lamp can be an integrated LED lamp (LEDi lamp), or a semi-integrated LED lamp (LEDsi lamp), or a non-integrated LED lamp (LEDni lamp).

Note 2 to entry: LED lamps can incorporate at least one LED module.

MERCURY (VAPOR) LAMP
It is distinguished between low- and high-pressure mercury (vapor) lamps.

Low-pressure mercury (vapor) lamps are discharge lamps of the mercury vapor type, with or without a coating of phosphors, in which during operation the partial pressure of the vapor does not exceed 100 Pa.
High-pressure mercury (vapor) lamps are high-intensity discharge lamps in which the major portion of the light is produced, directly or indirectly, by radiation from mercury operating at a partial pressure in excess of 100 kPa.
(adapted from IEV ref 845-27-028 and ref 845-27-030)

METAL HALIDE LAMP
high intensity discharge lamp in which the major portion of the light is produced by radiation from a mixture of a metallic vapour, metal halides and the products of the dissociation of metal halides
(IEV ref 845-27-033)

SODIUM (VAPOR) LAMP
discharge lamp in which the light is produced mainly by radiation from sodium vapour
Low-pressure sodium lamps operate at a partial pressure of 0,1 Pa to 1,5 Pa
High-pressure sodium lamps operate at a partial pressure of the order of 10 kPa
(adapted from IEV ref 845-27-031 and ref 845-27-032)

6.3. References

European directives European Directives below are to be considered in their latest version in force:

- Commission Delegated Regulation (EU) 2019/2015 of 11 March 2019 supplementing Regulation (EU) 2017/1369 of the European Parliament and of the Council with regard to energy labelling of light sources and repealing Commission Delegated Regulation (EU) No 874/2012
- Directive 2014/35/EU and its amendments – on the harmonization of the laws of the MemberStates relating to the making available on the market of electrical equipment designed for use within certain voltage limits
- Directive 2014/30/EU and its amendments – on the harmonization of the laws of the MemberStates relating to electromagnetic compatibility
- Directive 2012/19/EU and its amendments – on waste electrical and electronic equipment (WEEE)
- Directive 2011/65/EU and its amendments – on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS)
- Directive 2009/125/EU and its amendments – establishing a framework for the setting of eco-design requirements for energy-related products (ErP)
- Directive 2014/53/EU and its amendments – relating to the making available on the market of radio equipment
- Directive 94/9/EU and its amendments – concerning equipment and protective systems intended for use in potentially explosive atmospheres.

The standards related and applicable to luminaires, as specified by AFNOR, member of CENELEC (European Committee for Electrotechnical Standardization) and IEC (International Electrotechnical Commission) must be complied with in their latest version in force:

- IEC 61000-3-2:2014 Electromagnetic compatibility (EMC) – Part 3-2: Limits - Limits on harmoniccurrent emissions (current used by equipment not more than 16A per stage)
- IEC 61000-3-3:2013 Electromagnetic compatibility (EMC) – Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with declared current ≤16 A per stage and not subject to conditional connection.
- IEC 60598-1:2015 - Luminaires - Part 1: General requirements and tests
- IEC 60598-2-X* Luminaires - Part 2-2: Particular requirements
  *: The« X » allows defining the category of luminaire concerned through specific standards
- NF EN 40-1:1992 - Lighting columns. Part 1: definitions and terms.
- NF EN 40-X - Lighting columns – Part X Particular specifications

- NF EN 55015:2017 - Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment
- IEC 61547:2009 - Equipment for general lighting purposes - EMC immunity requirements
- IEC 62471:2006 - Photobiological safety of lamps and lamp systems
- IEC 62031:2008 (First Edition) LED modules for general lighting – Safety specifications
- NF EN 13032-1+A1:2012 Light and lighting - Measurement and presentation of photometric dataof lamps and luminaires - Part 1: measurement and file format

6.4. Declaration of conformity

Programme PEP Ecopassport®
Critical review certificate for the Product Specific Rules concerning luminaires

Reviewed Document: PSR0014 – Luminaires, version 03/05/23
Author: Luminaire / Solinnen

Luminaire has requested EVEA, as a consultancy company specialising in LCA, to perform a critical review for the Product Specific Rules concerning luminaires.

References:
The objective of this critical review is to verify the conformity of the PSR with the following reference documents:

- PCR-ed4-FR-2021 09 06,
- NF EN ISO 14020 - 2002 et NF EN ISO 14025 -2010,
- NF EN ISO 14040 et 14044 – 2006.

Conclusion:

The majority of the modifications concern evolutions in respect to the corresponding evolutions of the PCR ed4. The addition of declared unit and the possibility of including a RLT in years has been added to facilitate the use of the PEP in building LCA.

The reviewed document does not present any non-conformities with the aforementioned references. The PSR is therefore validated.

Tim Osmond
Verifier PEP Ecopassport® - EVEA

16/05/23