PEP ecopassport® PROGRAM

PSR

SPECIFIC RULES FOR INDIVIDUAL, STANDALONE DEVICES FOR PRODUCTION OF STORED DOMESTIC HOT WATER ONLY

PSR-0004-ed5.0-EN-2023 10 19
According to PSR-modele-ed2-EN-2021 11 18

Contents

List of the modifications of the present document

Online version 2023/10/19:

Modified section (14/03/2019)	Modification
In general	Updated summary Updated of regulation and standards references (for example : 2016/426 UE replacing Gas 2009/073 regulation)
§ 3.5.3	"DTU" replace by "French DTU or equivalent"
§ 3.5.4.2.1	The number of the section under the second table replaced by "3.5.4.2.4"
§ 3.6	For each stage, correction of the formula for calculating the extrapolation coefficient at the UF scale; the coefficient is the same for the calculation at the scale of the UF or the declared product
§ 5.1	Addition of the term "DTU"
§ 5.2	Addition of the title of standards EN 26 and EN 89 Updating of 3.3.4.2 and 5.2 PSR references
Modified section ed 4 to ed 5	
§ 2.1.	Among thermodynamic water-heaters technologies, addition of the technology "back to heat pump heating grid or regulated water loop"
§ 3.1.2	Addition of the declared units definition
§ 3.5.	Addition of rules for the justification of without default scenario values
	The breakdown of use phase in sub-paragraphs related to modules B1, B2, B3, B4, B5, B6 and B7
	Modification of the formulas in order to have the energy consumption during use phase
§ 3.6.6	Modification of the extrapolation rules for use phase and addition of an extrapolation rule for module D
§ 5.3	Addition of application examples for the extrapolation rules

1. Introduction

This reference document complements and explains the Product Environmental Profile Drafting Rules defined by the PEP ecopassport® program (PEP-PCR-ed.4-EN-2021 09 06), available at www.pep-ecopassport.org.

It defines the additional requirements applicable to individual and standalone devices for exclusive production of accumulated domestic hot water. 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 reference standards.[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 individual and standalone devices for exclusive production of accumulated domestic hot water market.

PEP eco PASS PORT®	www.pep-ecopassport.org
PSR reference	PSR-0004-ed4.0-EN-2023 10 19
Critical review	The third-party critical review was conducted by Olivia DJIRIGUIAN from CODDE. The declaration of conformity published on 05/06/2023 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 5 years 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", (PEP-PCR-ed4-EN-2021 09 06) of the PEP ecopassport® eco-declaration program, this document sets out the specific rules for individual and standalone devices for exclusive production of accumulated domestic hot water and defines the product specifications to be adopted by manufacturers in the development of their Product Environmental Profiles (PEPs) particularly with regard to:

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

The main purpose of these specific rules is to provide manufacturers of individual, standalone devices for exclusive production for stored domestic hot water with a common base from which to work when producing their product life cycle analyses. it describes the various individual, standalone technologies for production of stored domestic hot water.

2.1. Description of the product families concerned

The product family concerned is designated by the following terminology: an "individual, standalone device for production of stored domestic hot water only", corresponding to a product with the following elements:

- a tank,
- one or more of auxiliary energy units (exchangers, resistances, etc.),
- one or more control units,
- one or more sensor components built-in (probes, anode, etc.),

and if applicable:

- a base, and/or wall fixings, and/or tripod,
- solar sensors and accessories needed,
- a heat pump and accessories needed,
- one or more electrical resistances.

The study does not cover:

- Devices with a storage volume under 50 liters,
- devices with a storage volume of 400 liters or more,
- devices providing both domestic hot water and ensuring the heating function,
- storage units for domestic hot water that do not include a direct energy input,
- solar water heaters with a burner built into the cylinder.

2.1.1. Electrically powered, individual, standalone device for production of stored domestic hot water only

May be called, electrically powered, individual, standalone device for production of stored domestic hot water only:
"Device intended to heat water in an insulated tank fitted with at least one water temperature thermostat control, and an electrical resistance for heating water".

2.1.2. Solar thermal, individual, standalone device for production of stored domestic hot water only

May be called solar thermal, individual, standalone device for production of stored domestic hot water only:
"Individual solar thermal water-heater with forced circulation and separate elements with or without built-in auxiliary energy input in the storage tank. The solar heater consists of:

- one or more solar heaters (independent or built into the roof, on the terrace or the porch roof),
- a water photovoltaic or thermal panel
- a hot water storage cylinder with heat exchanger (heat pump water heater excluded), called "solar cylinder", linked to sensor with heat-insulated piping,
- safety and control equipment.

2.1.3. Thermodynamic, individual, standalone device for production of stored domestic hot water only

Any individual, standalone device for production of stored domestic hot water only may be called thermodyanamic:
"Stored domestic hot water production device:

- Whose compressor is driven by an electric motor,
- fitted with a regulating thermostat,
- providing domestic hot water, but not the room heating function,
- providing ventilation for the dwelling, in addition to the production of stored domestic hot water,
- designed and supplied as a unit, or which could be linked to a heat exchanger and storage cylinder which could be fitted with an auxiliary electrical or hydraulic system. "

The following thermo-dynamic water heating technology is involved:

- **extracted air:**

The heat pump uses heat energy from the air in the dwelling.
This system also provides continual, general ventilation for the dwelling as specified in orders of 24 March 1982 and 28 October 1983.

- **outside air:**

The heat pump uses heat energy from outside air. These may or may not be monobloc systems, with the evaporator fitted with frost-free or de-icing devices.

- **unheated ambient air:**

The heat pump uses unheated ambient air from a room outside the heated space (cellar, garage, etc.). These may or may not be monobloc systems, with the evaporator fitted with frost-free or de-icing devices.

- **water and brine geothermal sensor:**

the heat pump uses heat energy from a network of underground sensors containing brine. In a groundwater system, the evaporator shall have a minimum flow safety device.

- **direct expansion geothermal sensor:**

The heat pump uses ground heat energy from an underground direct expansion sensor which acts as evaporator.

- Back to heat pumps heating grid

The heat pump uses calories from a water loop, for example, a heating underfloor. Le manufacturer has to mention on the instruction manual of the device that the heat pump use calories from water loop and that the water loop has to be mainly heated with a renewable energy source.

These combined technologies are acceptable and are covered by these particular rules, to be justified in the LCA report.
In the case of a product covering both operation on the outdoor air and unheated ambient air, a PEP will be drawn up on the most unfavorable characteristics, to be precise the operation on the outdoor air, or two separated PEP will have to be drawn up.
Ventilation accessories required for operation on outdoor air of monobloc devices have to be taken into account.

2.1.4. Gas-powered, individual, standalone device for production of stored domestic hot water only

A gas-powered individual, standalone device for production of stored domestic hot water only is:
"A hot water production storage device for domestic use, using gas fuel to heat and store a quantity of water held in a tank at a pre-set temperature with the heat source placed inside the tank".

2.1.5. Mixed energy, individual, standalone device for production of stored domestic hot water only

The various power sources for an individual, standalone device for production of stored domestic hot water only described in section 2 - Scope - of these specific rules, can be combined.

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

Specific rules for individual, standalone devices for production of stored domestic hot water only will cover any technological advances, once a request has been made to the P.E.P. Association to include them in these specific rules, which will then give a decision on the new technology described and the evidence provided of the claimed performances.

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 current PCR (PEP-PCR-ed4-EN-2021 09 06).

3.1.1. Functional unit

The functional unit is defined below:

"Produce 1 liter of stored domestic hot water at a temperature at 40°C equivalent according to the reference use scenario and with a product reference lifetime of 17 years"

To define the environmental impacts at the functional unit scale, refer to section 3.9. of the specific current rules.

3.1.2. Declared unit

Declared unit can be used as complementary information in order to help future PEP users.
For France scope, the declared unit must be applied if no functional unit can be defined.

For the solar thermal, individual, standalone device for production of stored domestic hot water only, the declared unit is defined as follows:

"To ensure the production of domestic hot water with a XX liters solar thermal, individual, standalone device for production of stored domestic hot water only for a reference lifetime of 17 years of the product."

For the thermodynamic individual, standalone device for production of stored domestic hot water only, the declared unit is defined as follows:

"To ensure the production of domestic hot water with a XX liters thermodynamic, individual, standalone device for production of stored domestic hot water only for a reference lifetime of 17 years of the product."

For the electrically powered, individual, standalone device for production of stored domestic hot water only, the declared unit is defined as follows:

"To ensure the production of domestic hot water with a XX liters electrically powered, individual, standalone device for production of stored domestic hot water only for a reference lifetime of 17 years of the product."

For the gas-powered, individual, standalone device for production of stored domestic hot water only, the declared unit is defined as follows:

"To ensure the production of domestic hot water with a XX liters gas-powered, individual, standalone device for production of stored domestic hot water only for a reference lifetime of 17 years of the product."

For the mixed energy, individual, standalone device for production of stored domestic hot water only, the declared unit is defined as follows:

"To ensure the production of domestic hot water with a XX liters mixed energy powered, individual, standalone device for production of stored domestic hot water only for a reference lifetime of 17 years of the product."

The capacity in liters (XX) has to be adjusted according to the reference product.

3.1.3. Reference product and reference flow description

The study is carried out:

- on an individual, standalone device for production of stored domestic hot water only,
- for a reference lifetime of 17 years,
- whose energy consumption in use is expressed in kWh final energy per liter according to the use scenario in section 3.5.4.2 – Energy consumption of active components (family 2) - in these specific rules.

In the context of a PEP for a range of products, extrapolation rules will apply to all the reference products, as described in section 3.6 "Rules for extrapolation to a homogeneous environmental family". In this case, the study is performed on a device equipped with a 200-litre capacity tank, or the product with the nearest volume.

3.2. System boundaries

These specific rules are additional to the section 2.2. "System boundaries" of the current PCR (PEP-PCR-ed4-EN-2021 09 06).

3.2.1. Manufacturing stage

For this stage, the rules defined in the current PCR (PEP-PCR-ed4-EN-2021 09 06) apply.
At this stage, refrigerant production has to be included in the scope of the study.

3.2.2. Distribution stage

For this stage, the rules defined in the current PCR (PEP-PCR-ed4-EN-2021 09 06) apply.

3.2.3. Installation stage

For this stage, the rules defined in the current PCR (PEP-PCR-ed4-EN-2021 09 06) apply.

3.2.4. Use stage

According to the breakdown of module B, as defined in section 2.2.6. of the current PCR (PEP-PCR-ed4-EN-2021 09 06), use stage environmental impacts must be split in the following way for all product families concerned by the PSR.

B1 : Use phase	Refrigerant emission (thermodynamic individual, standalone device for production of stored domestic hot water only), heat transfer fluid consumption (solar thermal, individual, standalone device for production of stored domestic hot water only)
B2 : Maintenance	Maintenance operations (renewal of parts) and refrigerants and heat transfer fluids refill operations, and the treatment of retrieved refrigerants and heat transfer fluids during maintenance operations
B3 : Repair	Not applicable. Module equal to 0.
B4 : Replacement	Not applicable. Module equal to 0.
B5 : Rehabilitation	Not applicable. Module equal to 0.
B6 : Energy consumption during use phase	Electric energy consumption by applying using scenario as defined in the current PSR, CO2 emissions for gas-powered, individual, standalone device for production of stored domestic hot water only
B7 : Water consumption during use phase	If necessary, water consumption and its treatment (domestic water consumption excluded), and condensates

For information, the breakdown of module B is mandatory in France.

3.2.5. End-of-life stage

For this stage, the rules defined in the current PCR (PEP-PCR-ed4-EN-2021 09 06) apply.

Moreover, at this stage, the refrigerant end-of-life treatment must be included in the scope of the study.

3.2.6. Benefits and loads beyond the system boundaries

The rules defined in the current PCR (PEP-PCR-ed4-EN-2021 09 06) apply.

Module D declaration is mandatory for products placed on the French market and planned to be used on a building LCA.

3.2.7. Consideration of refrigerant fluids for individual and standalone thermodynamic devices for exclusive production of stored domestic hot water

The refrigerant fluids shall be considered at each stage of the life cycle as described in Section 3.5 of the present document.

Rating:

$C_t = C_n + C_i$, total load in the equipment when operating, in kg

C_n, rated load equivalent to the quantity of fluid added during manufacturing stage, in kg

C_i, quantity of fluid introduced during installation stage, in kg

E_{fp}, leakage during production stage at assembly site, in kg

T_{fp}, rate of leakage at assembly site, in kg

E_{fi}, leakage in installation stage, in kg

E_{fu}, leakage in use stage, in kg

T_{fu}, rate of leakage in use stage, in kg

S_r, refill threshold, in %

N, Number of refills during reference lifetime

ε_r efficiency of recovery. By default, ε_r = 90%

3.3. Cut-off criteria

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

3.4. Specific allocation rule

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).

3.5. Development of scenarios (default scenarios)

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

Every default scenario (defined below) modification must be justified in the LCA report and mentioned in the PEP.

Accepted evidence in order to modify default scenarios
The current PSR has hypothesis and default scenarios. If the declarant wants to use specific data, these data must be justified in the LCA report. This data, given by industrials, doesn’t have to be certified but based on evidence. This evidence is engaging the declarant, supplier, or third-party responsibility. This evidence will have to be available if claimed.

Recycled content of raw materials (see paragraph 3.5.1) can be justified with suppliers’ data (datasheet or supplier statement) but can’t be justified with common data (for example: professional associations, ADEME, industries).
If there is no specific justified recycled content, the default data given in paragraph 3.5.1.1. applies.

Raw materials loss rate (see paragraph 3.5.1.) can be justified with an internal document from the production plant (for example: annual report mentioning the quantity of material entering and leaving the process).
If there is no specific justified rate, the default data given in paragraph 3.5.1.2. apply.

End of life waste treatment (see paragraph 3.5.1. “manufacturing stage”, paragraph 3.5.3. “installation stage” and paragraph 3.5.6. “end of life stage”) can be justified with an attestation of the waste treatment company. If there is no specific data or default data given in the current PSR for installation stage and end of life stage, table 7 of appendix D (PCR-ed4-EN 2021 09 06) applies.

Refigerant leakage rate (for the concerned equipment) can be for example justified with a measurement campaign presentation.

3.5.1. Manufacturing stage (modules A1-A3)

An individual, standalone device for production of stored domestic hot water only consists of components supplied by the manufacturer:

- components directly made by the manufacturer
- or components ready to be fitted together.

The rules defined in section 3.8.1. "Requirements for collecting primary and secondary data" of these specific rules apply.

3.5.1.1. Recycled content of raw materials

If there is no justified specific data on recycled content, 0% recycled content must be applied.

3.5.1.2. Components and raw material packaging

Raw materials packaging, their components and their transports to manufacturing sites must be taken into account. Suppliers' data must be used.
If no justification is given, an average packaging rate of 5% of the reference equipment mass (equipment + packaging) as defined below, must be taken as follows:

- Wood 50%
- Cardboard 40%
- Low-density polyethylene 10%

Loss material are taken into account in this 5% average rate.
Reused packaging on site are not taken into account.
Packaging end of life treatment is modeling as defined in paragraph 3.5.3.2. of the current PSR.

3.5.1.3. Waste generated during the manufacturing stage

Waste generation and treatment are included in the manufacturing stage.
Manufacturers can dispose of manufacturing waste themselves or arrange for it to be disposed of. The LCA report will specify how the manufacturer, or anyone working on its behalf or account, shall follow these steps identifying hazardous from non-hazardous manufacturing waste, and ensuring the provided evidence of their statements.

When known, the treatment processes (reuse, recycling, energy recovery, landfill, incineration without energy recovery) shall be presented and justified in the LCA report, and the associated environmental impacts shall be taken into account as indicated in the section on "Product end-of-life treatment scenarios" of the PCR in force (PEP-PCR-ed4-EN-2021 09 06).
The justification for the treatment processes shall then be accompanied in the LCA report by the justification for the treatment systems and the recovery rate for each type of waste (e.g. via an annual report on the end-of-life processing of equipment by an eco-organization).

When the manufacturer does not provide evidence of the processes used to treat the waste generated during the manufacturing stage, the treatment process shall be calculated by default as follows:

- For non-hazardous waste generated by raw material and components:
  The amount of waste is calculated by multiplying the material quantity of the total product (finished product and associated packaging) by 0,05 for plastic injection processes and elastomer, and 0,3 for other manufacture processes. Non-hazardous waste treatment is modelling as follows: 100% of incinerated waste (without waste-to-energy recovery)
- For hazardous waste generated by raw material and components:
  The amount of waste is calculated by multiplying the material quantity of the total product (finished product and associated packaging) by 0,05 for plastic injection processes and elastomer, and 0,3 for other manufacture processes. Hazardous waste treatment is modelling as follows: 100% of incinerated waste (without waste-to-energy recovery)

When the worst performer value is used by default, no waste-to-energy recovery will be taken into account. The production of this lost material must be taken into account.

The table below sums up default loss rate for each constituent material of the total product (finished product and associated packaging(s)):

Process	**Default loss rate**	**Material mass after manufacture**	**Material mass to take into account (including loss)**
Plastic injection and elastomer	5%	1g	1,05kg
Other processes	30%	1kg	1,3kg

Table 1 : Default loss rate for each constituent material of the total product (finished product and associated packaging(s))

Example:
If 1 kg of a bare product (final mass of the part excluding packaging) is composed of 0.8kg of raw material generating non-hazardous waste and 0.2kg of raw material generating hazardous waste:

- For raw material generating non-hazardous waste

Waste mass = mass of raw material generating non-hazardous waste x 0.3 = 0.8 kg x 0.3 = 0.24 kg of incinerated waste (without waste-to-energy recovery)

- For raw material generating hazardous waste (0.2 kg of electronic card) :

Waste mass = mass of raw material generating hazardous waste x 0.3 = 0.2 kg x 0.3 = 0.06 kg of incinerated waste (without waste-to-energy recovery)

Any other waste treatment scenario during manufacture stage which is taken into account for calculation has to be justified on the LCA report and mentioned in the PEP.

By sector-based agreement, the transport stage for this waste shall be taken into account, assuming that it is trucked over a distance of 100 km.

3.5.1.4. Consideration of impact of coolant fluid during manufacturing stage

Leaks of fluids during the production stage (E_{fp}) are equal to C_n multiplied by the average leakage rate from the assembly site (T_{fp}) thus:

$$E_{fp} = C_n \times T_{fp}$$

T_{fp} : average rate of leakage from assembly site determined in accordance with the "solvent management plan" or the "risk prevention plan".

By default, the value of T_{fp} is 2%.

The choice of a value for T_{fp} lower than the proposed default shall be justified and documented in the LCA report.

3.5.2. Distribution stage (module A4)

The distribution stage shall be analyzed in accordance with section 2.5.3 "Transport scenario" of the PCR in force (PEP-PCR-ed4-EN-2021 09 06).

This stage doesn't take into account specific treatment for refrigerants.

3.5.3. Installation stage (module A5)

The installation stage includes any process, component, power or any consumption and/or emission required to install an individual, standalone device for production of stored domestic hot water only.

The components of the individual, standalone device for production of stored domestic hot water only already considered in the life cycle assessment of the device in the manufacturing stage, and delivered by the manufacturer shall not be considered in the installation stage.

Elements not considered in the life cycle assessment during the manufacturing stage, whether or not delivered by the manufacturer, but needed for operating the individual, standalone device for production of stored domestic hot water only, shall be described and listed in the installation stage and specified in the LCA report.

The following minimum list of components is needed for operating the individual, standalone device for production of stored domestic hot water only, depending on their energy source:

- Safety unit in accordance with the French DTU or equivalent
- For electrically powered, individual, standalone device for production of stored domestic hot water only, no component shall be included.
- For solar thermal, individual, standalone device for production of stored domestic hot water only:
    - heat-transfer fluid,

    - primary flexible pipes,
    - sensor fixing assembly,
    - circulation pump (where applicable).
- For thermodynamic individual, standalone device for production of stored domestic hot water only:
    - refrigerant fluid (where applicable),
    - coolant link (where applicable),
    - installation fittings for outdoor unit (where applicable),
    - air duct connections (where applicable),
    - circulation pumps (where applicable),
    - flexible water pipes (heat source).
- For gas-powered, individual, standalone device for production of stored domestic hot water only:
    - fume extractor kit
    - venting kit (where applicable)
    - electrical kit (where applicable)

3.5.3.1. Waste generated during the installation phase

End of life packaging which production has been taken into account during manufacturing stage, is taken into account during installation stage.

Packaging waste from individual, standalone devices for production of stored domestic hot water only produced during the installation stage comes under the category of non-hazardous waste and is disposed, in principle, by the installer, once the individual, standalone devices for production of stored domestic hot water only has been installed.

If there is no specific end of life evidence, treatment scenarios shown in the table below have to be applied by default. The tables below are representative of 2019. It's possible to use Eurostat more recent consolidated data if they are available:
https://ec.europa.eu/eurostat/databrowser/view/ENV_WASPAC__custom_3801295/default/bar?lang=fr.
The reference year or used data shall be mentioned in the PEP.

For France scope, the default values below shall be used:

	Recycling rate	Incineration with energy production	Incineration without energy production	Burial rate
Metal	83%	1%	0%	16%
Steel	88%	0%	0%	12%
Aluminium	60%	7%	0%	33%
Paper-Cardboard	91%	5%	0%	4%
Wood	7%	31%	0%	62%
Plastic	27%	43%	0%	30%

Table 2. End of life packaging treatment default scenarios for France scope

For Europe scope, the default values below shall be used:

	Recycling rate	Incineration with energy production	Incineration without energy production	Burial rate
Metal	77%	2%	0%	21%
Paper-Cardboard	82%	9%	0%	9%
Wood	31%	31%	0%	38%
Plastic	41%	37%	0%	22%

Table 3. End of life packaging treatment default scenarios for Europe scope

For other scopes, waste must be treated according to waste treatment default scenario (see paragraph 2.5.6. of the current PCR (PEP-PCR-ed4-EN-2021 09 06).

By sector-based agreement, the transport stage for this waste shall be taken into account, assuming that it is trucked over a distance of 100 km.

Plastic film, straps, packing notes, labels, or any other paper on or inside the package of the storage tank are considered to be insignificant and will not be included in the life cycle assessment for packaging waste, if they represent less than 10% of the packaging total mass.

3.5.3.2. Consideration of impact of coolant fluid during installation stage

Let C_i be the quantity of refrigerant added to the equipment during installation. We consider that in accordance with regulation 1516/2007, all necessary measures are taken to avoid momentary emissions. Thus, refrigerant leaks during the installation stage E_{fi} are considered as zero.

3.5.4. Use stage

The use stage of the individual, standalone device for production of stored domestic hot water only includes, once the component is installed:

- energy consumption,
- energy transformed to domestic hot water,
- functions for optimizing energy consumption,
- water loss, linked to expansion in the safety unit,
- use of refrigerant for thermodynamic individual, standalone devices for production of stored domestic hot water only,
- consumption of heat-transfer fluid for solar thermal, individual, standalone devices for production of stored domestic hot water only.

3.5.4.1. Energy consumption of components from family 1

In the use stage, the following aspects relating to refrigerants will be taken into account:

- Momentary refrigerant leaks,
- Refilling the equipment with refrigerant,
- The treatment of refrigerants recovered after refilling the equipment.

3.5.4.1.1. *Momentary leakage of refrigerants (module B1 and B2*

If a specific value is used for the average annual rate of leakage during the use stage (Tfu), we will consider that momentary refrigerant leaks during the use phase (Efu) is equal to the total refrigerant charge of the equipment in operation Ct multiplied by Tfu the lifetime reference (RLT) thus :

$$E_{fu} = Ct * Tfu * RLT$$

The use of specific data shall be justified and explained in the LCA report and mentioned in the PEP.

In other cases, following default data shall be used with the following formula:

$$E_{fu} = Q_{fu} * RLT$$

with (Q_{fu}) the amount of annual fugitive emissions defined in the table below:

Hermetically sealed equipment	Non-hermetically sealed equipment
3g/year	5g/year/removable coupling

Table 6. Amount of annual fugitive emission according to the device type

Hermetically sealed equipment is defined at article 2 – definition 11 of F-Gas Regulation 517/2014. The equipment which is not concerned by this definition corresponds to non-hermetically sealed equipment.

3.5.4.1.2. Refilling the equipment with refrigerant

Counting the impacts related to refilling (partially or totally according to the nature of the refrigerant) the equipment includes the production of the new refrigerant to be inserted. The impacts associated with the operator's travel to refill the equipment are not taken into consideration (because they are already included in the classic maintenance trips described in Section 3.5.4.2. "Maintenance stage").

The refill threshold (Sr) is the ratio of refrigerant (expressed in %) below which we consider that the equipment can no longer operate properly.
By default, the refill threshold to be considered is 90% of the total load, whatever the equipment type.
If the refill threshold value used to analyze the reference product life cycle is different from what is specified above for the category of product, it is necessary to:

- Justify and document the new refill threshold used in the LCA report,
- Indicate this in the PEP.

The number of refills, N, is calculated as follows:

N = ENT SUP [RLT / n] with $n = 1 + \frac{1 - S_r}{T_{fu}}$

According to the number of refills, the production of new refrigerant to be inserted is:

- In case of partial refill:

$$N \times (1\text{-}S_r) \times C_t$$

- In case of total refill:

$$N \text{ x } Ct$$

- In case of replacements with the recovered refrigerant and top-ups:

$$N \text{ x } Ct \text{ x } (1\text{-}(\varepsilon_r \text{ x } S_r))$$

The recovery efficiency ε_r does not vary according to the type of refrigerant. It is set to 90% by default.

The type of refill (partial or total) must be justified in the LCA report.

3.5.4.1.3. *Treatment of refrigerants recovered after refills (module B2)*

The treatment of refrigerants after recovery on the working site includes:
- Collection of refrigerants (transport),
- Treatment of refrigerant
- Incineration without energy recovery
- Regeneration and incineration with energy recovery

Calculation method:
The impacts related to the treatment of refrigerants recovered after refill will be calculated as follows:

- For a partial refill or a replacement with the recovered refrigerant and top-up:
  ➔ No refrigerant to be treated
- In case of a total refill with new refrigerant
  ➔ The quantity of refrigerant to be treated during the use stage is equal to:

$$N \times \varepsilon_r \times S_r \times C_t$$

Thus,

  - The collection distance to be taken into account will be 1000 km in a truck by default for the total refrigerant quantity (recovered or not).
  - The quantity of refrigerant incinerated (without energy recovery) is calculated as follows:
    1. $100\% \times N \times \varepsilon_r \times S_r \times C_t$ for CFC refrigerants
    2. $10\% \times N \times \varepsilon_r \times S_r \times C_t$ for other types of refrigerants
  - The quantity of refrigerant recovered (regeneration or incineration with energy recovery) is calculated as follows:
    1. 0% for CFC refrigerants,
    2. $90\% * N * \varepsilon_r * S_r * C_t$ for other types of refrigerants

The table below sums up formulas to consider according to the refrigerant type

Treatment	CFC refrigerants	Other types of refrigerants
Incineration (without recovery)	100% * N * Sr * C_t * ⍰$_r$	10% * N * Sr * C_t * ⍰$_r$
Valorisation (regeneration ou incineration with energy recovery	0%	90% * N * Sr * C_t * ⍰$_r$

Table. Quantity of refrigerants to consider by treatment according to the type of refrigerant, in the case of a total refill with a new refrigerant

Concerning refrigerant regeneration or incineration with energy recovery, only the transportation to the treatment site is counted, in accordance with the stock method, which is a distance of 1000 km by lorry.

If the scenario used to analyse the reference product life cycle is different from the one specified above for the product category, it is necessary to:

- Justify and document the usage scenario used in the LCA report,
- Indicate the usage scenario used in the PEP.

Ecosystem data can be used in order to model refrigerant end of life.

3.5.4.2. Momentary leakage of refrigerants (module B1 and B2)

Individual, standalone devices for production of stored domestic hot water only, require maintenance. The average return trip distance covered by an operator is 100 km, for one person (assumed weight of 80 kg) alone in his vehicle, by precising the « car passenger » ICV module.

If parts are to be replaced during the service life of the product, in compliance with the manufacturer's specifications, the impact of their manufacture, distribution and installation shall be taken into account during the maintenance stage.
The replacement of parts due to malfunction shall not be taken into account.

In the absence of accessible data, the devices require maintenance involving the following elements by default:

Energy type for individual, standalone device for production of stored domestic hot water only	**Number of maintenance services during reference lifetime**	**Nature of intervention during the reference lifetime**
Electrical	1.7	1 protection anode on tank replaced (unless active anode or a permanent anti-corrosion system installed)
Solar	8.5	1 solar sensor probe replaced
		1 protection anode on tank replaced (unless active anode or a permanent anti-corrosion system installed)
		2 fluid changes (brine)
Thermodynamic	8.5	1 protection anode on tank replaced (unless active anode or a

		permanent anti-corrosion system installed)
Gas	8.5	1 protection anode on tank replaced (unless active anode or a permanent anti-corrosion system installed)

Treatment of any other waste produced during installation and maintenance stages, essential to the proper working of the individual, standalone device for production of stored domestic hot water only, not specified in the above table, shall be considered and justified in the LCA report.

If a new product on the market requires maintenance or consumables other than those listed in the table above, these items shall be included in the analysis.

3.5.4.2.1. Waste generated during the maintenance stage

The manufacture of spare parts and new fluids as well as the end-of-life of the waste generated during the maintenance stage (end-of-life of fluids and spare parts) shall be taken into account in the use stage.

The material components, as specified in Section 3.5.4.2. "Maintenance stage" of the present document on the "type of intervention", shall be considered as "waste generated during the maintenance stage" and their end-of-life shall be considered here.

This waste is described in detail in the following table, for each type of intervention:

Energy type for individual, standalone device for production of stored domestic hot water only	**Nature of intervention during the reference lifetime**
Electrical	- *
Solar	1 solar sensor probe changed
	- *
	2 fluid changes (brine)
Thermodynamic	- *
Gas	- *

* The anodes replaced are not treated as waste generated in the maintenance stage because they are sacrificial components.

The end-of-life of these elements is then handled in the same way as described in Section 3.5.5 "End-of-life stage" of the present document.

By sector-based agreement, the transport stage for this waste shall be taken into account, assuming that it is trucked over a distance of 100 km.

3.5.4.3. Energy consumption of components (module B6)

The energy consumption of an individual, standalone device for production of stored domestic hot water only is expressed in kWh of final energy per litre, according to the functional unit and to specifications of the study of the reference product, as described in the section 3.1.2. of the current specific rules, according to the components families identified as follows :

	Family 1	Family 2
Definition	Components which do not consume energy during their use phase	Components which consume energy during their use phase
Rules for the consumption calculation	Use rate of 100%	See section 3.5.4.2.
Components examples	Wall fixing, base, tripod, tank, solar sensors, cladding, connections, heat exchangers…	Resistances, control units, circulation pumps, heat pumps, solar station…
Operating time	Reference lifetime of 17 years	

3.5.4.3.1. Energy consumption for family 1 components

There is no energy consumption during use phase for this component's family representing wall fixings, bases, tripods, solar sensors, etc.

3.5.4.3.2. Energy consumption for family 2 components

The calculation of environmental impacts related to energy consumption is based on a typical use scenario defined for each of the product's category mentioned in regulation 814/2013.
This regulation allows to calculate the annual energy consumption for the production of domestic hot water according to a given operating time representative of the average use observed in Europe, for a given draw-off profile and a given climate.
By default, the following hypothesis is adopted: average climate (equivalent to Strasbourg).

Draw-off profile:
The draw-off profile used is the one defined according to regulation No 813/2013 or the EN 16147 standard.

Calculation method for the energy consumption for domestic hot water production:
The energy consumption calculation relates to the reference flow perimeter only.
For example, in the case of an additional heat exchanger, if the product does not include the circuit feed pumps, the consumption related to the use of the reference product does not include the pumps consumption.
If the use scenario for the life cycle analysis of the reference product is not given in the EN 16147 standard (for domestic hot water), or is fundamentally different from it, you must:

- Justify and document the usage scenario used in the LCA report,
- Indicate the usage scenario used in the PEP.

$$Ctot\ (kWh) = (AEC + AFC\ )\ x\ RLT$$

- AEC = annual energy consumption of electricity for hot water for the declared draw-off profile according to the regulation n°811/2013 expressed in kWh
- AFC = annual energy consumption of fuel for hot water for the declared draw-off profile according to the regulation n°811/2013 expressed in kWh
- RLT = reference lifetime of the product

Case for products in France:
See appendix 6.3.1. of the current PSR.

Special cases for thermodynamic water-heaters "Back to heat pumps heating grid or regulated water loop"

For France:
See appendix 6.3.2. of the current PSR

For other countries
The test temperature conditions et the reference frame used have to be justified in the LCA report and mentioned in the PEP.

3.5.4.4. Consideration of water consumption and liquid waste

If the equipment needs water in order to function, the quantity of water consumed must be entered in the PEP, taking into account the type of water and the type of circulation.

- Only consumption of pre-treated water (mains water, demineralized water, etc.) should be considered, along with any additional treatments (e.g. brine, etc.)
    - In the case of circulation of pre-treated water in an open loop, the quantity of water consumed must be calculated (e.g. atomizers on the chillers). Pre-discharge treatments must also be taken into account. The chosen calculation method must be documented in the LCA report.
    - In the case of circulation of pre-treated water in a closed loop, the quantity of water consumed throughout the equipment life cycle is equivalent to the volume of the equipment's water circuit plus any top-ups due to evaporation over the reference lifetime.
- Because the consumption of water taken up and discharged directly in the same medium, it does not change the average temperature of the source, the effects are considered to be negligible, so not modelled.
- The consideration of liquid waste condensate-type being pure water (except some dirt), there is no treatment modelling to take into account. There is no waste production to model.

3.5.5. End-of-life stage

Within the European Union, waste from individual, standalone devices for production of stored domestic hot water only comes into the WEEE category (Waste from Electrical and Electronic Equipment).

After presenting the local requirements for managing end-of-life thermodynamic generators, the LCA report will explain the organization of known disposal and/or recovery systems, the associated environmental impacts and how the manufacturer shall meet these requirements, if applicable. These items will determine the applicable end-of-life treatment.

ICV Ecosystem modules can be used solely in France and Europe.

For the devices which are not concerned by the WEEE Directive and/or if there is no justification on the end of life treatment for this equipment, the default scenario from the current PCR (PEP-PCR-ed4-EN-2021 09 06) apply.

By sector-based agreement, the transportation to collect the decommissioned product and convey it from the place of use to its final treatment site is calculated according to an assumption that it is carried by truck over a distance of 100 km.

3.5.5.1. Consideration of impact of coolant fluid during the end of life stage

There is a two-step process for the end of life stage for fluids:

- recovery of fluid on the place of use, and processing:
    - collection of fluid (transport),
    - incineration without energy recovery,
    - regeneration.
- treatment of equipment at end of life:
    - direct leakages of non-recovered coolant fluid.

Only transport to treatment site shall be considered for the regeneration and incineration with energy recovery of fluid. The regenerated fluid shall be identified as a secondary material, impacts linked to the regeneration process are therefore allocated to the product in which it will be used.

Calculation method:

When recovering fluid at the place of use, the quantity of fluid collected is calculated as follows: $\varepsilon_r \times C_t$. The default transport distance considered shall be 100 km.

The quantity of fluid incinerated is calculated as follows:

100% x $\varepsilon_r \times C_t$ for CFCs,

10% x $\varepsilon_r \times C_t$ for other types of coolant fluids.

During treatment of the equipment, a quantity equal to (1 - ε_r) x C_t shall be considered as being discharged directly into the air when the equipment is shredded.

If the scenario used to analyse the reference product life cycle is different from that specified above for the category of product, it is necessary to:

- justify and document the end of life scenario used in the LCA report,
- indicate the end of life scenario used in the PEP.

3.5.6. Benefits and loads beyond the system boundaries

For this stage, the rules defined in the section 2.5.7. of the current PCR (PEP-PCR-ed4-EN-2021 09 06) apply.

3.6. Rules for extrapolation to a homogeneous family

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

3.6.1. Definition of a homogeneous environmental family

It is accepted that the PEP covers products different from the reference product. These other products may be named (commercial references) in the PEP and in the LCA file, if they belong to the same homogeneous environmental family as the reference product.

A homogeneous environmental family means devices from the same range satisfying the following characteristics:

- Identical function
- Same product standard
- Similar manufacturing technology: identical type of materials and identical manufacturing processes

The reference product is defined at the section 3.1.3.

3.6.2. Extrapolation rule applied to the manufacturing stage

The environmental impacts generated during the manufacturing stage are directly correlated to the mass of the tank of the product (including packaging).

For the manufacturing stage, the extrapolation coefficient to be applied to the PEP results for any other product from the same range is as follows:

Coefficient at the functional unit level	$\left(\frac{Mass\ of\ the\ tank\ of\ the\ product\ considered\ (kg)}{Mass\ of\ the\ tank\ of\ the\ reference\ product\ (kg)}\right) \times \left(\frac{Volume\ of\ the\ reference\ product\ (L)}{Volume\ of\ the\ product\ considered\ (L)}\right)$
Coefficient at the declared product level (or declared unit level)	$\left(\frac{Mass\ of\ the\ tank\ of\ the\ product\ considered\ (kg)}{Mass\ of\ the\ tank\ of\ the\ reference\ product\ (kg)}\right)$

Where:
Mass of the tank = mass of the tank of the product only (including packaging) in kg

3.6.3. Extrapolation rule applied to the distribution stage

The environmental impacts produced during the distribution stage are mainly correlated to the total mass of the product and its packaging.

For the distribution stage, the extrapolation coefficient to be applied to the PEP results for any other product from the same range is as follows:

Coefficient at the functional unit level	$\left(\frac{Total\ mass\ of\ the\ product\ considered + Mass\ of\ packaging\ of\ the\ product\ considered\ (kg)}{Total\ mass\ of\ the\ reference\ product + Mass\ of\ packaging\ of\ the\ reference\ product\ (kg)}\right) \times \left(\frac{Volume\ of\ the\ reference\ product (L)}{Volume\ of\ the\ product\ considered\ (L)}\right)$
Coefficient at the declared product level (or declared unit level)	$\left(\frac{Mass\ of\ the\ product\ considered + Mass\ of\ packaging\ of\ the\ product\ considered\ (kg)}{Mass\ of\ the\ reference\ product + Mass\ of\ packaging\ of\ the\ reference\ product\ (kg)}\right)$

Where:
Total mass = product mass (excluding packaging) in kg
Packaging mass = total mass of instruction manuals, plastic films, polystyrene, pallet, etc. in kg

3.6.4. Extrapolation rule applied to the installation stage

The installation stage includes only the end-of-life treatment of the packaging. The environmental impacts produced during the installation stage are directly correlated to the total mass of the product and its packaging.

For the installation stage, the extrapolation coefficient to be applied to the PEP results for any other product from the same range is as follows:

Coefficient at the functional unit level	$\left(\frac{Mass\ of\ packaging\ of\ the\ product\ considered\ (kg)}{Mass\ of\ packaging\ of\ the\ reference\ product\ (kg)}\right) \times \left(\frac{Volume\ of\ the\ reference\ product\ (L)}{Volume\ of\ the\ product\ considered\ (L)}\right)$
Coefficient at the declared product level (or declared unit level)	$\left(\frac{Mass\ of\ packaging\ of\ the\ product\ considered\ (kg)}{Mass\ of\ packaging\ of\ the\ reference\ product\ (kg)}\right)$

Where:
Mass of packaging = total mass of instruction manuals, plastic films, polystyrene, pallet, etc. in kg

3.6.5. Extrapolation rule applied to the use stage (excluding maintenance)

For the use stage, the extrapolation rules have to be applied:

- under each module (from B1 to B7). The use stage is equal to the sum of extrapoled indicators of sub-modules B
- to the whole phase according to the extrapolation rules defined in the section 3.6.5.6. for module B6.

3.6.5.1. Module B1

For thermodynamic, individual, standalone device for production of stored domestic hot water only, environmental impacts generated during module B1 are related to momentary leakage of refrigerant.

- If the leakage rate is the same as the default leakage rate (section 2.5.4.1.1.)

The total quantity of momentary leakage is related to the total number of units and fittings.
For use stage, the extrapolation coefficient to use on the PEP results for any other products of the same range is as follows:

Coefficient at the functional unit level	$\frac{Total\ number\ of\ units\ for\ the\ product\ considered * 3\ +\ Total\ number\ of\ fittings\ for\ the\ product\ considered * 5}{Total\ number\ of\ units\ for\ the\ reference\ product * 3\ +\ Number\ total\ of\ fittings\ for\ the\ considered\ product * 5} \times \left(\frac{Volume\ of\ the\ reference\ product}{Volume\ of\ the\ product\ considered}\right)$
Coefficient at the declared product level (or declared unit level)	$\left(\frac{Total\ number\ of\ units\ for\ the\ product\ considered * 3\ +\ Total\ number\ of\ fittings\ for\ the\ product\ considered * 5}{Total\ number\ of\ units\ for\ the\ reference\ product * 3\ +\ Number\ total\ of\ fittings\ for\ the\ reference\ product * 5}\right)$

Note: the total number of units corresponds to the total number of units of the product, (indoor and/or outdoor unit(s)).

- If the leakage rate is a specific leakage rate in % per year (section 2.5.4.1.1.)

Then the leakage rate depends on the initial refrigerant load. In this case, environmental impacts generated are related to the initial refrigerant load. The extrapolation rule to apply to the reference product to evaluate the impact of any other thermodynamic, individual, standalone device for production of stored domestic hot water only of the same range is as follows:

Coefficient at the functional unit level	$\left(\frac{Initial\ refrigerant\ load\ of\ the\ product\ considered\ (kg)}{Initial\ refrigerant\ load\ of\ the\ reference\ product\ (kg}\right) \times \left(\frac{Volume\ of\ the\ reference\ product\ (L)}{Volume\ of\ the\ product\ considered\ (L)}\right)$
Coefficient at the declared product level (or declared unit level	$\frac{Initial\ refrigerant\ load\ of\ the\ product\ considered\ (kg)}{Initial\ refrigerant\ load\ of\ the\ reference\ product\ (kg)}$

3.6.5.2. Module B2

Environmental impacts generated during maintenance stage are due to the annual travel of the operator and the renewal of maintenance parts. The latter are considered as the same within the homogeneous family.

3.6.5.3. Module B3

Not applicable.

3.6.5.4. Module B4

Not applicable.

3.6.5.5. Module B5

Not applicable.

3.6.5.6. Module B6

Environmental impacts generated during module B6 are related to energy consumption.

When a PEP is drawn up for a complete range of devices, the calculation rule to use for any other volume of the same range is described in section 3.5.4.3. Energy consumption of components from family 2 of the current specific rules.
The extrapolation coefficient to use on the PEP result for any other product of the same range is as follows:

Coefficient at the functional unit level	$\left(\frac{C\ of\ the\ product\ considered\ (kWh)}{C\ of\ the\ reference\ product\ (kWh)}\right) \times \left(\frac{Volume\ of\ the\ reference\ product\ (L)}{Volume\ of\ the\ product\ considered\ (L)}\right)$
Coefficient at the declared product level (or declared unit level)	$\left(\frac{C\ of\ the\ product\ considered\ (kWh)}{C\ of\ the\ reference\ product\ (kWh)}\right)$

Where:
C = Energy consumption of the product (in kWh) during the use stage throughout the lifetime of the product (see Section 3.4.5.2 of the present document)

3.6.5.7. Module B7

Not applicable.

3.6.6. Extrapolation rule applied during the end-of-life stage

The environmental impacts produced during the end-of-life stage are directly correlated to the mass of the tank of the product alone (including packaging).

For the end-of-life stage, the extrapolation coefficient to be applied to the PEP results for any other product from the same range is as follows:

Coefficient at the functional unit level	$\left(\frac{Mass\ of\ the\ tank\ of\ the\ product\ considered\ (including\ packaging)(kg)}{Mass\ of\ the\ tank\ of\ the\ reference\ product\ (including\ packaging)\ (kg)}\right) \times \left(\frac{Volume\ of\ the\ reference\ product\ (L)}{Volume\ of\ the\ product\ considered\ (L)}\right)$
Coefficient at the declared product level (or declared unit level)	$\left(\frac{Mass\ of\ the\ tank\ of\ the\ product\ considered\ (including\ packaging)\ (kg)}{Mass\ of\ the\ tank\ of\ the\ reference\ product\ (including\ packaging)(kg)}\right)$

Where:
Mass of the tank = mass of the tank of the product only (excluding packaging) in kg

3.6.7. Extrapolation rules for benefits and loads beyond the system boundaries stage

After a documented sensitivity study, it has been proved that environmental impacts of these systems from phase A1 to phase C4 are proportional to their mass. An extrapolation process applying to all the Life Cycle Assessment phases has been made and appears in the table below.
Factors that change module D are:

- Recycled content of raw materials quantities used for manufacturing phase
- Loss quantities and waste generated during the life cycle, and their treatment.

These factors are directly related to the mass of the product and should not vary within a homogeneous environmental family (paragraph 2.6. of the current PCR (PEP-PCR-ed4-EN-2021 09 06).
Then, extrapolation rules based on the mass of the product including its packaging can be applied to module D.

For module D stage, the extrapolation rule to apply to the reference product in order to evaluate the impact of any other thermodynamic generator of the same range is:

Coefficient on the FU scale	$\left(\frac{Mass\ of\ the\ product\ considered\ \ (including\ packaging)\ \ (kg)}{Mass\ of\ the\ reference\ product\ \ (including\ packaging)\ \ (kg)}\right)$

	$\times \left(\frac{Volume\ of\ the\ reference\ product\ (L)}{Volume\ of\ the\ product\ considered\ (L)}\right)$
Coefficient on the scale of the declared product (additional information)	$\left(\frac{Mass\ of\ the\ product\ considered\ (including\ packaging)(kg)}{Mass\ of\ the\ reference\ product\ (including\ packaging)(kg)}\right)$

3.7. Rule(s) applying to joint environmental declarations

These rules are complementary to PCR section "Rules applying to joint environmental declarations" (PCR-ed4-EN-2021 09 06)..
For joint environmental declarations, the study shall be conducted on a typical product, that shall be a 200 liters model, or the product closest to this volume level.
Moreover, it's mandatory to mention in the PEP the validity framework of the extrapolation rules application, based on technical criteria so that it's possible to check that products belong to the same environmental family as the typical product.

3.8. Requirements concerning the collection of primary and secondary data

3.8.1. Requirements concerning the collection of primary and secondary data

These rules are additional to the section 2.9.1. "Requirements for the collection of primary data" and 2.9.2. "Requirements for secondary data" of the PCR (PEP-PCR-ed4-EN-2021 09 06).

As far as possible, the primary data (i.e. all the data associated with the manufacturing stage of the reference product and specific to an organization) shall be preferred and shall be justified in the LCA report, specifying:

1) primary data in case of a single supplier,
2) in case of procurement from several suppliers, the primary data that shall be taken into account is the data provided by major suppliers representing at least 50% of the procurement volume (with respect to the total quantity bought). For example, for ten suppliers, each representing 10% of the sales volume, at least five suppliers shall be considered in order to obtain an overall view of the primary information provided. Any other distribution rules should be mentioned in the LCA report and in the PEP.

Where these primary data are shared with products other than those covered by these specific rules, the impact is allocated according to the mass criteria of devices manufactured.

This information is not always available to manufacturers of individual, standalone devices for production of stored domestic hot water only: in case of missing primary data, secondary datasets, i.e. data obtained from the life cycle inventory database shall be used. If no transport information is available, the information in the PCR (PCR-ed4-EN-2021 09 06), section 2.5.3 – "Transport scenarios" shall be used.

The ICV module used to model the raw material or the component can include a default loss rate

- If the default loss rate included in the ICV module can be changed:

Default values defined in paragraph 3.5.1.3. have to be applied.

- If the default loss rate included in the ICV can not be changed:
    - The loss rate is below the default values defined in paragraph 3.5.1.3.: this loss rate has to be mentioned in the LCA report and the modelling has to be adapted as much as possible in order to take into account the difference between generated waste (hazardous or non-hazardous)
    - The loss rate is higher to the default values defined in the paragraph 3.5.1.3.: the loss rate has to be mentioned in the LCA

The proportion of primary and secondary data used in the life cycle assessment for individual, standalone device for production of stored domestic hot water only, shall be documented in the LCA report and may be included in the PEP under the section describing the environmental impacts, to supplement the information required in section 4.4. – Environmental impacts – of the PCR (PEP-PCR-ed4-EN-2021 09 06). This proportion shall be determined with respect to the product mass.

3.8.2. Data quality evaluation

The specific rules specified in the section 2.9.3. "Data quality evaluation" in the current PCR (PEP-PCR-ed4-EN-2021 09 06) apply.

3.9. Calculation of environmental impact

To ensure the results of the environmental impacts are consistent between the functional unit (production of 1 liter of domestic hot water at 40°C) and the reference product (200 liter system), the PEP shall show the environmental impacts of the manufacturing, distribution, installation, use (including maintenance) and end-of-life stages, as follows:

Environmental impacts from the PEP (for 1 liter) =
Environmental impacts of reference product / Number of liters produced

Where:

- Number of liters produced (Y) = consumption in liters depending on the draw-off profile adopted on the RLT of 17 years.

Then:

Environmental impacts from the PEP (for 1 liter) =
Environmental impacts of reference product / Y

Y is defined following the table below

Draw-off profile	Reference energy Qréf (kWh)	Volume of water drawn daily (l)	Y (l)
3XS	0.345	9.9	36975
XXS	2.1	60.3	225064
XS	2.1	60.3	225064
S	2.1	60.3	225064
M	5.845	167.8	626427
L	11.655	334.6	1249104
XL	19.07	547.5	2043793
XXL	24.53	704.2	2628959

Note :

The volume of water drawn daily is calculated according to ErP regulation:

$$Volume\ of\ water\ drawn\ daily = \left(\frac{Reference\ energy\ Qref\ (kWh)}{Water\ thermal\ capacity\ at\ 25\ °C\ (kJ.kg^{-1}.K^{-1})\ x\ temperature\ difference\ (10°C\ to\ 40\ °C)} * 1000\right)$$

The heat capacity of water at 25°C is 4.18 kJ/kg.K (average taken between 10°C and 40°C).

A daily volume of water equal to:

Daily volume of water $= \frac{Reference\ energy\ Qref\ (kWh)}{\left(\frac{4{,}18}{3{,}6}\right)Wh.kg^{-1}.K^{-1}\ x\ (40-10)}$

The volume of water drawn from DVR Y according to the draw profile is calculated using the formula:

Y = Volume of water drawn daily (liters) * 0,6 * 365 (days/year) * 17 (RLT)

The ErP regulation assumes a maximum load profile, which is not used every day. Consequently, the ErP regulation applies a weighting of 60% to move from the maximum profile to standard use, over an annual period (see appendices VIII, article 4.a) of the 2013/812/EU regulation).

For the biogenic carbon storage, two assessment methodologies 0/0 or -1/+1 are accepted until the environmental database update. The methodology used has to be mentioned in the PEP and the LCA report.

The environmental database version has to be mentioned in the PEP and the LCA report (included the Environmental Footprint version number).

4. Drafting of the Product Environmental Profile

4.1. General information

These rules are additional to the section "General information" of the current PCR. The PEP shall include:

- The product sub-category and characteristics to be declared according to Section 2.1.,
- The volume of the water-heater considered,
- The draw-off profile considered during use stage according to Section 3.5.4.3.,
- If the extrapolation rules are used, consumptions AEC and AFC for each product of the product range covered by the PEP, according to section 3.6.
- The environmental database version, including the Environmental Footprint version number

4.2. Constituent materials

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

4.3. Additional environmental information

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

In the context of performing Life Cycle Analyses on a building-wide level, the environmental impacts of the equipment must be considered on the scale of the product and the impacts related to energy consumption in the use stage must be treated separately.

4.4. Environmental impacts

To facilitate the use of the PEP in conducting a building LCA, the PEP may include:

- The table of the environmental impacts of the reference product expressed on the product (or declared product) scale in addition to the table on the functional unit scale. The values must then 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, and the total for each indicator of the complete life cycle analysis.
  - For environmental impacts expressed per functional unit, the following wording must be included: "per kW corresponding to the functional unit"
  - For environmental impacts expressed per declared product, the following wording must be included: “per device corresponding to the reference product".
- The results of environmental impacts during use stage according to the breakdown of module B (B1 to B7) in line with EN 15978 et EN 15804 standards.

The table of environmental impacts represents the environmental impact of the functional unit, i.e. the production of 1 liter of domestic hot water stored at 40°C equivalent.

Thus, the total impact of the installed product must be calculated by the user of the PEP according to reference use scenario or his own use scenario.

The following details must be completed and included in the PEP, to ensure clarity and transparency for the user:
This environmental declaration was drawn up on the basis of the production of 1 litre of domestic hot water stored at 40°C equivalent, for a device supplying a liters consumption corresponding to the draw-off profile chosen.
For a usage other than the reference scenario, the impacts of this declaration for the production, distribution, installation, and end-of-life stages shall be multiplied by the following coefficient:

$$\frac{Number\ of\ liters\ of\ water\ produced}{Consumption\ corresponding\ to\ the\ draw-off\ profile\ chosen\ (in\ L) x\ Number\ of\ inhabitants\ x\ 17}$$

The actual impact of the life cycle of the installed product in a real situation shall be calculated by the user of the declaration by multiplying the impact concerned by the total number of litres of water produced over 17 years according to the use scenario (average number of liters produced (Y) in the case of the reference scenario).

When extrapolation rules are used, the following statement shall be included:
Extrapolation coefficients are given for the environmental impact of the functional unit, i.e. the production of 1 litre of domestic hot water. For each stage of the life cycle, the environmental impacts of the product concerned are calculated by multiplying the impacts of the declaration corresponding to the reference product by the extrapolation coefficient. The "Total" column shall be calculated by adding the environmental impacts of each stage of the life cycle.

5. PEP update rule

Any PEP document recorded by the P.E.P. Association shall be updated and re-registered when the individual, standalone devices for production of stored domestic hot water only to which it refers is modified, by an increase or reduction of more than 5% in:

- mass,
- new components,
- its environmental indicators considered as relevant,
- any other element considered as relevant,
- material used.

6. Appendices

6.1. Glossary

°C	Degree Celsius
C	Final energy consumption
CE	European Community
CENELEC	European Committee for Electrotechnical Standardization
COP	Coefficient of performance
Cr	Cooling constant
DTU	Document Technique Unifié (Unified Technical Document)
EEE	Electrical and Electronic Equipment
EMC	Electro-Magnetic Compatibility
EN	European standards
EU	European Union
Final energy	Final energy is the energy supplied to the consumer for final use (petrol at the pump, electricity to the home, etc.) http://www.insee.fr/fr/methodes/default.asp?page=definitions/energie-finale.htm
IEC	International Electrotechnical Commission, IEC
Kg	Kilogram
KWh	Kilowatt hour
L	Litre
LCA	Life cycle assessment
LCI	Life cycle inventory
LCIE	Laboratoire central des industries électriques [Central Electrical Industry Laboratory - France]
NF	“Norme française” [French standard]
PAC	Heat pump
PCR	Product category rules
PEP	Product environmental profile
Pes	Reserve electrical power
PSR	Product specific rules
Qpr	Static losses
ROHS	Restriction of the use of certain Hazardous Substances in electrical and electronic equipment
TEE	Water intake temperature
TUE	Water use temperature
UE	European Union
UTE	Technical Electricity Union
V	Volume (of cylinder)
V40 / Vmax	Hot water temperature 40°C (for electricaly powered water heater / thermodynamic water heater)
VMC	Controlled mechanical ventilation
Vn	Rated volume
WEEE	Waste Electrical and Electronic Equipment.
Wh	Watt hour

6.2. References

PSR ref	Subject	Sources used
2	Definition of the various types of individual, standalone devices for production of stored domestic hot water only	Specification N° LCIE 103-14
		NF Individual solar thermal water heaters N° NF 441
		Order 13/05/2011 repealing and replacing the order of 29/07/2009 on approval of the request for heading V for inclusion of thermodynamic individual electrical domestic hot water heaters in the thermal regulations 2005.
		Standard EN 26 on Gas-fired instantaneous water heaters for the production of domestic hot water and standard EN 89 on Gas-fired storage water heaters for the production of domestic hot water
3	Reference lifetime 17 years	Working group consensus, especially from data available from the energy saving certificates process, and from manufacturer feedback.
3.3.4.2	Water intake temperature at 10°C	specifications NF Cesi and EN 16 147
3.3.4.2	Definition of cooling constant value	Value of Qpr from specification N° LCIE 103-14: Category A, 200-litre, wall-mounted horizontal device
		EN12 977-3
3.3.4.2	Calculating energy needs:	Standards EN 15316-4-3 and 12976-2 for CESI Certified performance, according to EN89 under regulation 2016/426 UE
3.3.4.2	Energy savings for a device incorporating a package of certified functionalities	Specification N° LCIE 103-14
3.3.4.3	Frequency of maintenance operations	The frequency of inspections and maintenance operations described meet the manufacturers' recommendations depending on the lifetime of some components and feedback as generally noted; as well as respect for mandatory regulation operations for maintenance / inspections
3.3.3.1	Packaging waste	Extract from ADEME report, "industrial, commercial and household packaging",

		2008, and "recycling report 1999-2008: materials and recycling itemised by process", 2010, especially pages 102 & 113.
3.3.5	Recycling devices at the end of their life	Data assumed by convention, while awaiting further studies. If no data are accessible from the industry, we used the information available and especially the data from the Eco D3E study.
4	Incineration of coolant fluids	10% incineration = ratio from a study carried out by CETIM for the "thermodynamic generators" PSR
5.1	Average daily consumption of domestic hot water	http://www.promotelec.com/les-sources-de-consommation-d-energie/
5.2	Justification of bonus for learning and automatic adjustment system for temperature setting	ECS BBC agreement 2011
		Insee, Annual census surveys, 2004 to 2006, Population censuses from 1954 to 1999.
		Benchmark for sales of individual electric water-heaters on the French market. Internal document - Groupe Atlantic - 12/2011
		ERP study, regulation 814/2013 UE (lot 2)
5.2	Justification for bonus linked to heat pump operating range	Order 13 May 2011 relating to approval of the request for heading V for inclusion of thermodynamic individual electrical domestic hot water heaters in the thermal regulations 2005: monthly average climate data from hourly meteorological data files for each climate zone, used in the Th-C-E method.
5.2	Justification for load shifting bonus	Definition of average power of an individual, standalone device for production of stored domestic hot water only: benchmark of main European manufacturers
5.2	Justification of bonus for the electrical device incorporating a package of certified	CSTB: Final evaluation report on the thermal performance of electric stored water heats, category C (December 2008)

	functionalities	
5.2	Justification of vacation mode bonus	Insee: Household market survey 1979, on-going survey on living conditions (2004).
All	Average transport distance	100 km = average default value, from manufacturer - working group feedback, already covered in other PSRs from similar industries (same distribution networks, recycling centres, etc.).

6.3. Energy consumption for components: France special case

6.3.1. Consideration on operation on off-peak/peak hours

This section is only about French scope, relating to the LCIE certification for water-heaters.

The operation in off-peak/peak hours and more generally on smart grid tend to avoid peaks in demand on the electricity network, with devices which have higher storage capacity. Nevertheless, this also implies over-insulated water heaters. To take this into account, the following requirements have been defined:
A device with electric energy is defined as over-insulated, as follows:

- electrically powered, individual, standalone device for production of stored domestic hot water only, whose performance, i.e. static losses QPR have been measured in accordance with EN60379:
    - for horizontal models: Qpr ≤ 0.675 + 0.0072 V,
    - for vertical models: Qpr ≤ 0.0198 + 0.0513 V2/3
- thermodynamic powered, individual, standalone device for production of stored domestic hot water only whose performances, i.e. the input power at steady state, have been measured in accordance with EN 16147:
    - *Pes* ≤ 0,0001 x *Vn* + 0,024 + (20 - *ϑas*) / 1000, where
    - *Vn is the nominal volume of the tank*
    - *Θas is the nominal ambient temperature of the storage tank, used during the test to determine the annual energy consumption AEC*

Energy savings from these certified devices are 8%, as justified in the LCIE certification standards (Electricité Performance certification specifications n° LCIE 103-15/D).
The operation in off-peak/peak hours is mentioned on the 812/2013/EU regulation and is indicated in the energy label by the associated pictogram.

The use scenario consumption is defined as follows:

$$\boxed{C_{tot}\ (en\ kWh) = (f_{sg} * AEC + \ AFC) * DVR}$$

Where f_{sg} is the smart grid load factor

- The default value of this factor is set at 1
- In the case of a device respecting all the previous requirements, i.e. losses and smart grid operations, this factor value is conventionally set at (1-0,08).

6.3.2. Case for domestic standalone heat pump water heater "back to heat pumps heating grid"

As 812/2013 regulation doesn't specify test conditions for this type of technology, the test conditions to take into account are:

Type of heat source	Heat source Air temperature in °C	Heat source Inlet temperature/outlet temperature, or bath temperature in °C	Ambient temperature range of the heat pump in °C	Ambient temperature of the storage tank in °C
Back to heat pumps heating grid or regulated water loop	/	25/22	Entre 15 et 30	20

Source : Electricité Performance specifications no. LCIE 103-15/D

The reference frame has to be mentioned in the PEP.

6.4. Application examples for extrapolation rules

For the examples below, product A is the reference product corresponding to a thermodynamic individual, standalone device for production of stored domestic hot water

Below are the product constants:

Hot water operating temperature TUE (°C)	40
Normative cold water inlet temperature into the tank TEE (°C)	10
Reference Lifetime (years)	17

Below, the elements corresponding to 3 products belonging to the same homogeneous environmental family. Product A is the reference product :

	Product A (reference)	**Product B**	**Product C**
Volume (L)	200,00	150,00	100,00
Mass product + packaging (kg)	1,00	1,33	2,00
Mass product (kg)	200,00	150,00	100,00
Mass packaging (kg)	185,00	137,00	88,00
Masse of the tank (kg)	15,00	13,00	12,00
Initial refrigerant load (kg)	135,00	87,00	38,00
Specific leakage rate (%/year)	2,00	1,50	1,00
AEC (kWh)	500,00	450,00	400,00
AFC (kWh)	0,30	0,20	0,10
Consumption C (kWh)	8505,10	7653,40	6801,70

*For a draw-off cycle L

According to parameters above, we can determine extrapolation coefficients for each product and each life cycle stage :

		Produit A	**Produit B**	**Produit C**
Functional Unit scale	A1-A3 : Manufacturing	1,00	0,86	0,56
	A4 : Distribution	1,00	1,00	1,00
	A5 : Installation	1,00	1,16	1,60
	B1 : Use	1,00	1,00	1,00
	B2 : Maintenance	-	-	-
	B3 : Repair	-	-	-
	B4 : Replacement	-	-	-
	B5 : Rehabilitation	-	-	-
	B6 : Energy consumption	1,00	1,20	1,60
	B7 : Water consumption	1,00	-	-
	C1-C4 : End of life	1,00	0,86	0,56
	D : Benefits and loads beyond the system boundaries	1,00	1,00	1,00
Declared product scale	A1-A3 : Manufacturing	1,00	0,64	0,28
	A4 : Distribution	1,00	0,75	0,50
	A5 : Installation	1,00	0,87	0,80
	B1 : Use	1,00	0,75	0,50
	B2 : Maintenance	-	-	-
	B3 : Repair	-	-	-
	B4 : Replacement	-	-	-
	B5 : Rehabilitation	-	-	-
	B6 : Energy consumption	1,00	0,90	0,80
	B7 : Water consumption	-	-	-
	C1-C4 : End of life	1,00	0,64	0,28
	D : Benefits and loads beyond the system boundaries	1,00	0,75	0,50

6.5. Declaration of conformity

Attestation de revue critique des « Règles spécifiques aux Chauffe eaux individuels à accumulation »

Chargée de revue critique	Olivia DJIRIGUIAN
Document revu	PSR - Règles spécifiques aux Chauffe eaux individuels à accumulation
Etabli par	CSTB
Version et date	PSR-0004-ed5.0-FR-2023 05 16
Période de revue	Janvier 2023 – Juin 2023
Référentiels de revue	L'objectif de la revue critique est de vérifier la conformité du document avec les référentiels suivants : - Le programme PEP ecopassport, : PCR-ed4-FR-2021 09 06 - Les normes NF EN ISO 14020-2002 et NF EN ISO 14025-2010 ; - Les normes NF EN ISO 14040 et 14044-2006
Conclusion	Le document revu ne comporte pas de non-conformité par rapports aux référentiels. Ainsi, le PSR relatifs aux Chauffe eaux individuels à accumulation est conforme aux exigences des référentiels. Olivia DJIRIGUIAN Consultante ACV et éco-conception Le 05/06/2023 LABORATOIRE CENTRAL DES INDUSTRIES ELECTRIQUES S.A.S au capital de 15.745.984 € RCS Nanterre B 408 363 174 33 avenue du Général Leclerc F - 92266 FONTENAY AUX ROSES

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