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Eurovent Recommendation on complementary Product Category Rules for ventilation units

First Edition

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Eurovent, 80 Bd A. Reyers Ln, 1030 Brussels, Belgium
secretariat@eurovent.eu

Preface

In a nutshell

This document outlines Eurovent's recommendations for Product Category Rules complementary to EN 15804 for the development of EPD's for ventilation units. It is intended as input to the development of a harmonised cPCR standard for ventilation components taking place in CEN/TC 156 WG26, and to serve as a useful reference until the publication of said standard. The focus of this Recommendation is on aspects specific to ventilation units, including:

- Product description, scope and performance characteristics
- Functional unit and declared unit
- Reference Service Life
- Aspects, rules and assumptions in the product stage (A1-A3), construction process stage (A4-A5), use stage (B1-B7), and end of life stage C1-C4

Authors

This document is published by Eurovent. It was prepared under the project leadership of Charlotte B. Merlin (chme@forcetechnology.com) from FORCE Technology, coordinating a joint effort by the participants of a dedicated Eurovent working group, representing the vast majority of all manufacturers of these products active on the EMEA market.

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Contents

Abbreviations and definitions

CEN: European Committee for Standardization

EPD: Environmental Product Declaration

EOL: End-of-life

LCA: Life Cycle Assessment

NRVU: Non-residential ventilation units

PEF: Product Environmental Footprint

PEFCR: Product Environmental Footprint Category Rules

cPCR: Complementary Product Category Rules according to EN15804 – Product group specific or horizontal PCR, which provide additional compliant and non-contradictory requirements to EN 15804. cPCR shall be used together with the core PCR or standard (e.g. EN 15804 or PEF)

PCR: Product Category Rules according to ISO14025 – set of specific rules, requirements and guidelines for developing Type III environmental declarations for one or more product categories

RSL: Reference Service Life

RVU: Residential ventilation units

1. Introduction

This document outlines Eurovent's recommendations for Product Category Rules for ventilation units. The primary focus is on rules complementary to EN 15804, for the development of EPDs per that standard. Some reflections on a potential PEFCR under the EU's Product Environmental Footprint (PEF) framework are also included.

This document is intended to serve as input to, and support for, the work to develop a harmonised cPCR standard for ventilation components, taking place in CEN/TC 156 WG26. A harmonised cPCR is needed to complement core rules, reduce room for creative interpretation, simplify the production of EPDs, and level the playing field. It should enable the selection sustainable ventilation solutions considered over the life cycle of the building, according to a unified approach, with minimal burdens, complexity, costs, and other barriers to scalability.

The focus of this Recommendation is on LCA aspects specific to ventilation units. More general aspects common across product categories, and issues in the overarching standards and general programme rules, are not considered. These issues are important and may also result in differences and inconsistencies related to the products in scope, but it is not likely that a cPCR for HVACR products can solve such inconsistences, which should be addressed at a more overall level, such as for example, within the work carried out by ECO Platform, various standardisation organisations, and by the European Commission. All this said, the creation of a harmonised cPCR for ventilation units, applied uniformly, would already be a helpful step in the right direction.

2. Scope

2.1. Product scope

Definition of ventilation unit product category: The main purpose of ventilation units is to ventilate, i.e. 'to replace utilised air by outdoor air in a building or a part of a building', according to Commission Regulation (EU) No 1253/2014. Ventilation units can deliver various functions such as air filtration, energy recovery, heating and cooling, humidification and dehumidification. Ventilation units can be installed in different types of buildings, including both residential and non-residential buildings.

Relevant standards include:

- Non-residential ventilation units: EN 13053 and EN 1886
- Residential ventilation units (bidirectional): EN 13142, EN 13141-7, and EN 13141-8
- Residential ventilation units (unidirectional): EN13142 and EN13141-4.

2.2. Modules

The Recommendation addresses the whole life cycle from cradle to grave, which includes all modules shown in Figure 1 below.

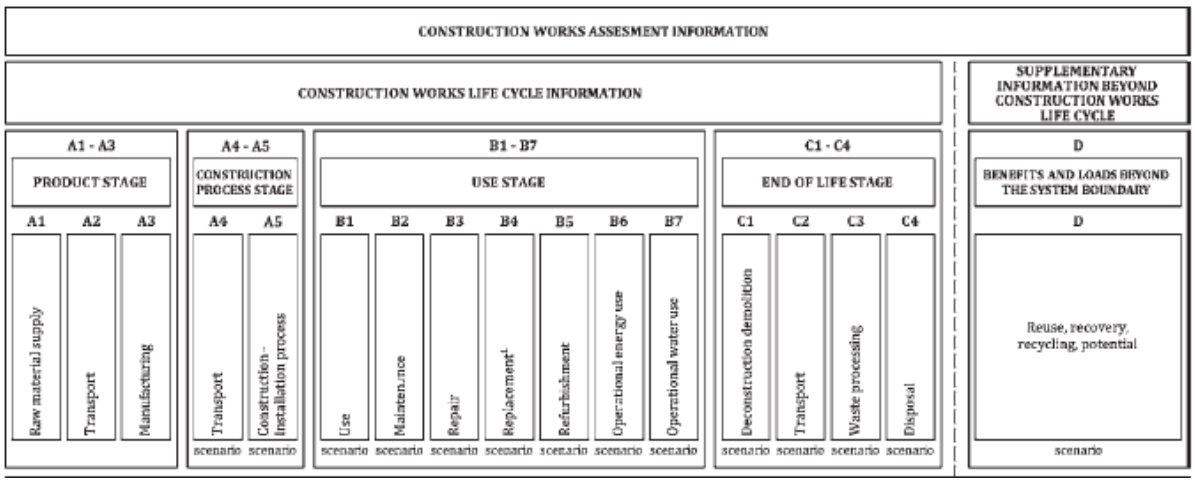

Figure 1: Modular structure in EN 15804 for construction products

3. Development process

All Eurovent members were invited to participate in the development of this Recommendation in a dedicated technical working group, and to provide inputs throughout the development process. 29 companies participated in the work, as did a number of independent experts and knowledge partners.

The first step in the process was a training seminar hosted by FORCE Technology, to ensure a sufficient level of knowledge about PCR's, directed at the members and participants of the working group.

The second step was a mapping of existing (c)PCR's, LCA's and EPD's for ventilation units and similar product categories. For an overview of these, see Table 1 below. The findings were structured in a mapping report. The purpose of this exercise was to:

- Identify inconsistencies across cPCR's, EPD's and LCA practices for the products in scope
- Identify aspects in need of clarification and guidance to ensure a harmonised, fair and cost-efficient LCA practice for the products in scope

During the development process, the issues, inconsistencies and recommendations were discussed in several meetings, while participants also shared relevant information and feedback with the project leaders in between meetings.

This Recommendation is a product of the discussions and consensus achieved in the working group.

At the same time, coordination with the standardisation work in CEN/TC 156 WG26 took place, to align with and support this work, to develop a harmonised cPCR standard for ventilation components.

The Recommendation was tested and updated based on a pilot study on an RVU from Zender Group.

4. Existing (c)PCR

In accordance with ISO 14025, existing (c)PCR's for relevant product categories were mapped and the content was considered in this recommendation. The (c)PCR's considered are shown in Table 1 below:

Source	cPCR
EPD Norway	NPCR 030, Part B: Ventilation components
IBU	Part B: HVAC Appliances Part B: Air conditioners
EPD International	Air-conditioning machines (UN CPC 43912) c-PCR-018: Ventilation components
EPD Italy	EPDItaly019, HVAC Home Appliances PCR-2021-0004, Fans for Air and Air/Gas mixture management
PEP	PSR-0008-ed3.0-EN - Ventilation, air treatment, filtration and mechanical smoke exhaust equipment PSR-0013-ed3.0-EN - Thermodynamic generators with electric compression for space heating and/or cooling and/or production of domestic hot water
	EN 50693:2019 – Core rules for electronic and electrical products and systems
PEF	E.g. IT equipment (Storage)

Table 1: cPCR's for ventilation units and other related product categories

5. Recommendations

5.1. General observations

There are several contradictory aspects in existing cPCR's and current LCA and EPD practices for ventilation units, which could benefit from harmonisation in a cPCR for ventilation units.

One of the challenges in defining complementary rules is the variety within the product category of ventilation units. Ventilation units have many different applications and can deliver many different functions, which are critical to the outcomes of the LCA. Moreover, ventilation units also depend on a variety of essential components, and it is essential that rules and practices for components are aligned with those for ventilation units.

Furthermore, an essential distinction needs to be made between residential and non-residential ventilation units. These products are subject to different standards and to different regulatory requirements. Notably, RVU's are subject to an energy labelling measure, and a methodology exists to meaningfully assess operational energy consumption at standard conditions. This is not the case for NRVU's.

For ventilation units, the use stage generally dominates the results when it is included. Modelling the use stage (particularly the operational energy use in B6) depends on a wide range of use conditions, including physical location, outdoor climate conditions, air flow rate, pressure losses, operating hours, etc. Especially for NRVUs, these conditions vary a lot from application to application. Therefore, any use stage results will only be applicable to the described scenario and should not be compared with results from other product EPD's, in a context where other scenarios could be relevant.

5.2. Product description, scope and performance characteristics

5.2.1. Unique product identification

Eurovent recommends that LCA's and EPD's shall specify the product trade name(s), number(s), or other identifier(s) that unambiguously identify the products included in the study (e.g. with the use of a GTIN code). This way, the EPD users can know with certainty which product variants are covered by the EPD.

5.2.2. Technical product performance

Eurovent recommends that LCA's and EPD's shall include the technical performance data and specifications which are required by Commission Regulation (EU) No 1253/2014, namely:

- For RVU's, those listed in '*Annex IV – Information requirements for RVU's*' referred to in Article 4(1) of said regulation
- For NRVU's, those listed in '*Annex V – Information requirements for NRVU's*' referred to in Article 4(2) of said regulation

5.2.3. Inclusion of components and semi-finished product parts

Eurovent recommends that all components needed to enable the function of the product shall be included in the scope of the LCA or EPD. The aim is to prevent inconsistencies in the EPD's due to manufacturers excluding different components, e.g. in cases where a manufacturer only supplies some of the components while the rest are bought elsewhere, or if one manufacturer considers the electrical wiring to be part of the product while another does not. Although it is not possible here to make an exhaustive list of all components to be included, it is recommended to be as inclusive as possible.

5.3. Functional unit and declared unit

Eurovent recommends that the declared unit (or reference unit according to PEF) shall be defined as *'one piece of ventilation unit'*. Having a declared unit allows for subsequent specific calculations at the building level and is sufficient for LCA studies that do not include the use stage.

In LCA studies where a functional unit is defined, Eurovent recommends that the following requirements for the functional unit shall apply:

- The functional unit must include all the main functions of the ventilation unit
- The functional unit must correspond to the defined use stage scenario

Note that PEF studies must define the functional unit for the included products. The only exception to this is for intermediate products[1] – ventilation units cannot be considered intermediate products. In PEF studies, the definition of the functional unit is similar to EN 15804 and must quantify the aspects shown in the table below:

[1] Intermediate product as defined in PEF: '*Output from a unit process, that is input to another unit process, that requires further transformation within the system. An intermediate product is a product that requires further processing before it is sellable to the final consumer.*' An example of an intermediate product is an ingredient in paint. Once this is used in the paint production, it becomes part of the paint and is no longer a product in itself.

Aspect:	Theoretical example for ventilation units:
What?	Replace utilised air in a building by outdoor air
How much?	Transfer *X* m^3 of air per hour
How well?	*X* kWh thermal energy exchanged with the building at defined in-use conditions with filtration efficiency *X*
For how long?	*X* years

Table 2: Functional unit specification in PEF with a theoretical example

5.4. Reference Service Life

Eurovent recommends the following default RSL:

- For RVU's, 17 years
- For NRVU's, 25 years

In the experience of ventilation unit manufacturers, RVU's and NRVU's have different lifetimes, because RVU's typically run full-time and are serviced less well, whereas NRVU's will be switched off in some parts of the time and are usually better maintained over their lifetime by professional technicians. RVU's are also replaced more often by homeowners to improve efficiency during refurbishments.

The default RSL of 17 years for RVU's is based on the Ecodesign Impact Accounting and 2019 GROW Lot 6 review study, which assumes a lifetime of 17 years for all kinds of ventilation units. This value is conservative. In the experience of ventilation unit manufacturers, general lifetimes have increased since those studies. Furthermore, it is in the lower end of the range of RSL's specified in existing LCA's and cPCR's that were mapped in preparation for the development of this Recommendation.

The default RSL of 25 years for NRVU's is based on the Danish BUILD[2] lifetime tables, which are used to calculate building LCA's in compliance with the national building regulation in Denmark. This corresponds more closely to manufacturers' experience for NRVU's than the lifetime assumed in the Ecodesign studies. One of the ways in which manufacturers observe this is based on the continued sales of replacement parts for units which are more than 25 years old.

Eurovent further recommends that any LCA that specifies a different RSL than the abovementioned default values must include a justification, especially in cases where the RSL is higher. In such cases, it should be explained how the RSL of the specific product is higher than an average product and it must be specified under which conditions and with which maintenance requirements the RSL applies. The justification can include information about:

- Guarantees
- Availability of spare parts
- Physical lifetime tests

[2] Haugbølle, K., Mahdi, V., Morelli, M., & Wahedi, H. (2021). *BUILD levetidstabel: Version 2021*. (2 udg.) Institut for Byggeri, By og Miljø (BUILD), Aalborg Universitet. BUILD Rapport Bind 2021 Nr. 32. https://vbn.aau.dk/da/publications/build-levetidstabel-version-2021

- Quality aspects

Finally, Eurovent recommends that the following sentence shall be stated next to the RSL in a general EPD: *'The RSL is an uncertain and generic value. The actual lifetime is highly sensitive to the actual use conditions of the unit.'*

5.5. Product stage (A1-A3)

5.5.1. Components (A1)

Eurovent recommends that data for purchased components must include the production of the components, with representative or at least conservative data. Data on the raw materials alone is not sufficient.

When excluding the use stage, then module A1 often dominates the results for the product categories in scope. In many LCA's, this stage is modelled with secondary data. The aim of this recommendation is to avoid LCA's that model components such as actuators or motors simply based on a bill of materials for this component. This is not sufficient – among others, the energy consumption and material loss during production of such components should be included as well.

This is challenging since it can lead to a large number of material flows with unknown processing, and the information is usually either unavailable or lies further upstream in the supply chain. Therefore, in cases where sufficient representativeness of data for modelling components is not possible, it is recommended to use more generic but conservative datasets.

5.5.2. Co-allocation in manufacturing (A3)

Several existing cPCR's for similar products have specified the co-allocation hierarchy as in PEF and ISO 14040/44, which is not completely aligned with EN 15804, even though the respective cPCR's are intended to be applicable for LCA's against EN 15804. As a consequence, also the LCA's and EPD's differ in this regard, where the mapping showed the use of a variety of allocation keys including pieces, mass, volume and working hours.

The manufacturing sites may differ in many ways, including which co-products are produced together with the applicable ventilation units. For this reason, it is not recommended to have a standardised, default allocation key for distributing inputs and outputs such as utilities and waste between the co-products.

Eurovent recommends to specify that, in accordance with EN 15804, the choice of allocation key must be justified, and the differences between the co-products must be described in the LCA report.

5.6. Construction process stage (A4-A5)

5.6.1. Transport to installation (A4)

Most of the existing LCA's and EPD's included in the mapping have modelled the transport in module A4 with primary product specific data. No default values for distances in A4 are recommended for a future cPCR.

When transporting ventilation units, the truck utilisation is typically volume-dependent. It is therefore recommended that truck transport shall be calculated as volume-dependent, while the truck size and filling of trucks shall correspond to a typical and realistic scenario, which shall be described in the LCA

report. Eurovent also recommends that the choice of the transportation dataset shall be described in the LCA report.

5.6.2. Installation energy (A5)

For RVU's, this can be left out, since only hand tools are typically used.

For NRVU's, there may be use of a crane and other energy consuming equipment, but it is also not significant compared to the impacts from other modules.

5.7. Use stage (B1-B7)

For NRVU's, Eurovent recommends leaving the use stage out. This is because the use stage impacts for NRVU's depend on a wide range of use conditions, including physical location, outdoor climate conditions, air flow rate, pressure losses, operating hours, etc. Under one set of conditions, unit A will have better results than unit B, whereas under a different set of conditions, unit B will have better results than unit A. For this reason, use stage impacts should only be calculated at the building-level, considering its specific use conditions. Default use scenarios for NRVU's could mislead the EPD user.

By contrast, the use conditions for RVU's are more standardised, and a default scenario for energy use calculation is defined in Commission Delegated Regulation (EU) No 1254/2014.

Eurovent recommends that, if the use stage is included in an EPD, the following sentence shall be included in the EPD: *'The use stage results are only applicable to the described scenario and should not be compared with results from other product EPD's, in a context where other scenarios can be relevant.'*

Ventilation units with an integrated heat pump must consider the impacts of the refrigerant over the RSL. Refrigerant emissions belong in module B1, whereas refills belong in module B2.

5.7.1. Use (B1)

Wastewater treatment of liquid discharge during the use stage (which occurs in ventilation units with plate heat exchangers or cooling coils) should be modelled in B1. That said, the condensate being pure water (except some dirt), there is no treatment modelling to take into account.

5.7.2. Maintenance (B2)

Ventilation units must be inspected regularly. The frequency of inspections is dictated by law, but differs between European countries. The minimum frequency is once every 2 years. If the filters in the ventilation unit are replaced at the same time as the inspection, then the transport of the operator should only be counted once.

Eurovent recommends that:

- if the EPD scope is country specific, then the national regulated frequency should be applied
- if the scope is average Europe, a conservative default frequency of one year is recommended
- the default vehicle type for transporting the operator is a van
- the default distance is 50km one way, which is 100 km including the return trip
- the default weight of the operator is 80kg

5.7.3. Replacement (B4)

Eurovent recommends that the replacement of components during the use stage shall be based on the experience and sales documentation of the manufacturer, as well as on any applicable regulations.

That said, if the components´ corrosivity resistance matches the corrosivity of the operating environment, then there is typically no reason to assume that components need to be replaced during the RSL (except for consumables such as air filters). To assess if the components´ corrosivity resistance matches the corrosivity of the operating environment, see the Eurovent Recommendation 6/16[3].

Air filters are usually replaced annually due to hygiene requirements, as specified for instance in guideline VDI 6022.

5.7.4. Operational energy use (B6)

For ventilation units, the electricity use in B6 is significant and, in most cases, it is several factors higher than the combined impacts of all other life cycle stages. Yet, as previously described, the operational energy use of ventilation units depends on a wide range of use conditions, including physical location, outdoor climate conditions, air flow rate, pressure losses, operating hours, etc.

For NRVU's, Eurovent recommends leaving the use stage – including operational energy use – out. Use stage impacts should be calculated at the building-level, considering its specific use conditions. Eurovent recommends that operational energy use at the building-level is calculated in accordance with the following guidelines in order to obtain consistent and comparable results at the building level:

The calculation must include the following parameters, where applicable:

- Consumption of electric energy, including:
  - electric energy consumption of fans
  - electric energy consumption for heating, including heat pump compressors
  - electric energy consumption for frost protection preheating
  - auxiliary electric energy consumption, including for rotor drive and pumps
  - auxiliary electric energy consumption for adiabatic cooling
  - electric energy consumption for steam humidification
- Consumption of thermal energy for heating, including:
  - thermal energy consumption for heating coil(s)
  - thermal energy consumption for frost protection preheating
  - thermal energy consumption for adiabatic humidifier
  - thermal energy consumption for steam humidifier (central or gas)
- Consumption of thermal or electric energy for cooling
- Water consumption for humidification
  - water consumption for humidification

[3] https://www.eurovent.eu/publications/eurovent-6-16-2021-corrosion-protection-of-air-handling-units-first-edition/

- water consumption for adiabatic cooling

If applicable, thermal energy for heating and cooling should be calculated with consideration of:

- Heat or cold recovery through the heat recovery system
- Moisture recovery, and its actual efficiency depending on the operation conditions
- Impact of heat recovery frosting

The calculation methodology to be used is defined in *Eurovent 6/19-1 - Life Cycle Cost calculation for AHUs – Part 1: energy consumption*[4].

Eurovent further recommends that, if an EPD does include the use stage, then it should clearly and explicitly detail the scenario and assumptions applied, including hourly values of air flow rates, temperatures, and moisture content, as well as the climate data used and the calculation standard applied. This is to ensure transparency and proper interpretation of the results. Moreover, as stated previously, the following sentence shall be included in the EPD: '*The use stage results are only applicable to the described scenario and should not be compared with results from other product EPD's, in a context where other scenarios can be relevant.*'

For RVU's, a methodology exists to assess operational energy consumption at standard conditions, namely the SEC formula defined in Commission Delegated Regulation (EU) No 1254/2014. Eurovent recommends that the operational energy use for RVU's shall be calculated in accordance with that methodology.

The SEC methodology includes default parameters for 3 different climate zones. It is not specified which countries or regions are included in each climate zone. Eurovent recommends that the choice of climate zone shall be declared and justified in the EPD, considering the geographical boundary of the LCA study.

If an LCA or EPD for RVU's does not use the default scenario defined in the aforementioned Regulation, Eurovent recommends that it shall declare the scenario and assumptions applied, including hourly values of air flow rates, temperatures, and moisture content, as well as the climate data used. This is to ensure transparency and proper interpretation of the results.

The source of electricity shall be average European or national grid mix depending on the geographical boundary of the LCA and shall consider whether the electricity source is low or medium voltage. The only exception to this requirement is for project specific LCA's and EPD's, where the specific electricity source for the specific building in which the products are installed shall be considered.

[4] https://www.eurovent.eu/publications/eurovent-6-19-1-2024-life-cycle-cost-calculation-for-ahus-part-1-energy-consumption/

5.8. End of life stage C1-C4

5.8.1. Demolition (C1)

Eurovent recommends that material and energy flows related to dismantling are cut-off, whenever it is reasonable to assume that dismantling is performed with manual tools.

Disassembly shall include the removal and handling of refrigerant gas where present.

5.8.2. End-of-life (C2-C4)

Eurovent recommends the default end-of-life scenario in Table 3 for LCA's with a European scope. Any LCA's with a different scope may apply a more geographically representative scenario, which shall be justified for example based on national statistical data.

MATERIAL:	*R2 (recycling rate) %*	*R3 (energy recovery rate) %*	*Disposal rate (%)*
Steel	80	0	20
other ferrous metals	80	0	20
Aluminium	70	0	30
Copper	80	0	20
other non ferrous metals	60	0	40
PP	20	40	40
PS-HiPS	20	40	40
ABS	20	40	40
PU foam	0	50	50
Rubber	0	50	50
Other plastics	0	50	50
Glass	60	0	40
Other minerals	0	0	100
PCBs (support)	0	0	100
PCBs (metals)	50	0	50

Table 3: Default end-of-life scenario for average Europe[5]

The scenario does not include waste treatment rates for passive electronic components (capacitors, resistances, inductors etc.). Eurovent recommends that the same waste treatment rates as for PCBs shall apply to passive electronic components.

The chosen default end-of-life scenario is primarily based on EN 50693. This is because this source has relevant material categories that are deemed to be more representative for electronic products, and is more recent than PEF annex C, which is outdated. The recycling rates from EN 50693 also

[5] R2 is the proportion of the material in the product that will be recycled in a subsequent system. R2 shall take into account the inefficiencies in the collection and recycling processes. R2 shall be measured at the output of a recycling plant. R3 is the proportion of the material in the product that is used for energy recovery at end-of-life.

takes losses in the collection and recycling systems into consideration, which means that data for that will also be harmonised and the LCA practitioners do not need to retrieve such data elsewhere.

In PEF studies, end-of-life is calculated using the so-called Circular Footprint Formula (CFF). This allocates environmental impacts differently than EN 15804. However, the calculation is generally based on the same type of input data, which includes the recycling rate and inefficiencies in the recycling systems (R2) as well as the energy recovery rate (R3). Therefore, a default scenario in a cPCR for EPD's may potentially also be relevant for a future PEFCR for ventilation units.

About Eurovent

Eurovent is the voice of the European HVACR industry, representing over 100 companies directly and more than 1.000 indirectly through our 16 national associations. The majority are small and medium-sized companies that manufacture indoor climate, process cooling, and cold chain technologies across more than 350 manufacturing sites in Europe. They generate a combined annual turnover of more than 30 billion EUR and employ over 150.000 Europeans in good quality tech jobs.

Mission

Eurovent's mission is to bring together HVACR technology providers to collaborate with policymakers and other stakeholders towards conditions that foster fair competition, innovation, and sustainable growth for the European HVACR industry.

Vision

Eurovent's vision is an innovative and competitive European HVACR industry that enables sustainable development in Europe and globally, which works for people, businesses, and the environment.

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