ENVIRONMENTAL PRODUCT DECLARATION

In accordance with EN 15804:2012+A1:2013 and ISO 14025

PLN ISOVER
PLC ISOVER

Date of publication: 2021-01-13
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Version: 1

Based on Based on PCR 2012:01 Construction products and construction services v 2.33 (EN 15804:2012+A1) and its Sub-PCR-I Thermal insulation products
Scope of the EPD®: Romania

Registration number in The International EPD System: S-P- 02187

EPD®

ISOVER SAINT-GOBAIN

EPD VERIFIED

The environmental impacts of this product have been assessed over its whole life cycle. Its Environmental Product Declaration has been verified by an independent third party.

General information

Manufacturer: Saint-Gobain Construction Products Romania, ISOVER Business Unit Strada Mihai Bravu 233, Ploieşti 100410, ROMANIA
Programme used: The International EPD® System. More information at www.environdec.com
EPD registration/declaration number: S-P-02187
PCR identification: PCR 2012:01 Construction products and construction services v 2.3 (EN 15804:2012+A1:2013) and its Sub-PCR-I Thermal insulation products (EN 16783:2017)
UN CPC code: 37990
Product name and manufacturer represented: PLN ISOVER and PLC ISOVER; Saint-Gobain Construction Products Romania ISOVER Business Unit
Owner of the declaration: Saint-Gobain Construction Products Romania, ISOVER Business Unit
EPD® prepared by: Carmen Mazilu (SGCPRo Rigips BU), Alina Cismas (SGCPRo) and Patricia Jimenez Diaz (Saint-Gobain)
Contact: Alina Cismas, Alina.Cismas @saint-gobain.com
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<table>
<tr><td colspan="2">CEN standard EN 15804 served as the core PCR</td></tr>
<tr><td>EPD program operator</td><td>The International EPD® System. Operated by EPD® International AB. www.environdec.com.</td></tr>
<tr><td>PCR review conducted by</td><td>The Technical Committee of the International EPD® System
Chair: Massimo Marino. Contact via info@environdec.com”</td></tr>
<tr><td colspan="2">LCA and EPD performed by Saint-Gobain LCA central team</td></tr>
<tr><td colspan="2">Independent verification of the environmental declaration and data according to standard EN ISO 14025:2010
Internal ☐ External ☒</td></tr>
<tr><td colspan="2">Verifier
Marcel Gomez Ferrer
Marcel Gomez Consultoria Ambiental (www.marcelgomez.com)
Phone : +34 630 64 35 93
Email : info@marcelgomez.com</td></tr>
<tr><td colspan="2">Accredited or approved by: The International EPD® System</td></tr>
<tr><td colspan="2">www.isover.ro</td></tr>
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Product description

Product description and description of use:

This Environmental Product Declaration (EPD®) describes the environmental impacts of 1 m^2 of mineral wool with a thermal resistance of 1.0 $K*m^2*W^{-1}$.

The production site of Saint-Gobain Romania ISOVER BU in Ploiesti uses natural raw materials (basalt and dolomite), using fusion and fiberising techniques to produce mineral wool. The products obtained come in the form of a "mineral wool mat" consisting of a soft, airy structure.

On Earth, naturally, the best insulator is dry immobile air at 10°C: its thermal conductivity factor, expressed in λ, is 0.025 W/(m.K) (watts per meter Kelvin degree). The thermal conductivity of mineral wool is close to immobile air as its lambda varies from 0.031 W/(m.K) for the most efficient to 0.043 W/(m.K) to the least.

With its entangled structure, mineral wool is a porous material that traps the air, making it one of the best insulating materials. The porous and elastic structure of the wool also absorbs noise in the air, knocks and offers acoustic correction inside premises. Mineral wool containing incombustible materials does not fuel fire or propagate flames.

Mineral wool insulation is used in buildings as well as industrial facilities. It ensures a high level of comfort, lowers energy costs, minimizes carbon dioxide (CO_2) emissions, prevents heat loss through pitched roofs, walls, floors, pipes and boilers, reduces noise pollution and protects homes and industrial facilities from the risk of fire.

Mineral wool products last for the average building's lifetime (which is often set at 50 years as a default), or as long as the insulated building component is part of the building.

The results in this EPD are expressed for PLN ISOVER product range. Separately, in additional information it is explained how to obtain the results for PLC ISOVER product ranges.

PLN ISOVER	PLC ISOVER
PLN 50 ISOVER	PLC 40 ISOVER
PLN 60 ISOVER C	PLC 50 ISOVER
PLN 80 ISOVER C	PLC 100 ISOVER
PLN 100 ISOVER	
PLN 100 MLK ISOVER	

Description of the main product components and materials:

Main components

Mineral wool	90-95 %	(REACH registration number 01-2119472313-44-0041)
Binder	0-10%	

Technical data/physical characteristics according to harmonized standard EN 13162:2012+A1:2015:

Physical characteristic	Unit	Value for PLN ISOVER	Value for PLC ISOVER
Declared thermal conductivity λ_D	W/(m K)	0.034	0.035
Reaction to fire	-	Euroclass A1	Euroclass A1
Air flow resistivity AFr	kPa s/m^2	> 5	> 5
Water vapour diffusion resistance factor μ MU	-	< 1	< 1

Description of the main components and/or materials for 1 m² of product (representative product PLN ISOVER) with a thermal resistance of 1 K.m².W⁻¹ for the calculation of this EPD® :

PARAMETER	VALUE
Quantity of wool for 1 m² of product	3.23 kg
Thickness of wool	100 mm
Surfacing	None
Packaging for the transportation and distribution	Polyethylene: 114.3 g/m² Graphic label: 3.23 g/m² Wooden pallet: 377.7 g/m²
Product used for the Installation	None

During the life cycle of the product any hazardous substance listed in the “Candidate List of Substances of Very High Concern (SVHC) for authorization” has not been used in a percentage higher than 0,1% of the weight of the product.

The verifier and the program operator do not make any claim nor have any responsibility of the legality of the product.

LCA calculation information

FUNCTIONAL UNIT	Providing a thermal insulation on 1 m^2 of product with a thermal resistance of 1 $K.m^2.W^{-1}$
SYSTEM BOUNDARIES	Cradle to Grave: Mandatory stages = A1-3, A4-5, B1-7, C1-4. Optional stage = D not taken into account
REFERENCE SERVICE LIFE (RSL)	50 years
CUT-OFF RULES	In the case that there is not enough information, the process energy and materials representing less than 1% of the whole energy and mass used can be excluded (if they do not cause significant impacts). The addition of all the inputs and outputs excluded cannot be bigger than the 5% of the whole mass and energy used, as well of the emissions to environment occurred. Flows related to human activities such as employee transport are excluded. The construction of plants, production of machines and transportation systems are excluded since the related flows are supposed to be negligible compared to the production of the building product when compared at these systems lifetime level.
ALLOCATIONS	Allocation criteria are based on mass The polluter pays as well the modularity principles have been followed
GEOGRAPHICAL COVERAGE AND TIME PERIOD	Production data: Romania, 2019 Transportation data: Romania, 2019. Background data: Ecoinvent (from 2015 to 2018) and GaBi (from 2013 to 2019)

- “EPDs of construction products may be not comparable if they do not comply with EN 15804"
- “Environmental Product Declarations within the same product category from different programs may not be comparable”

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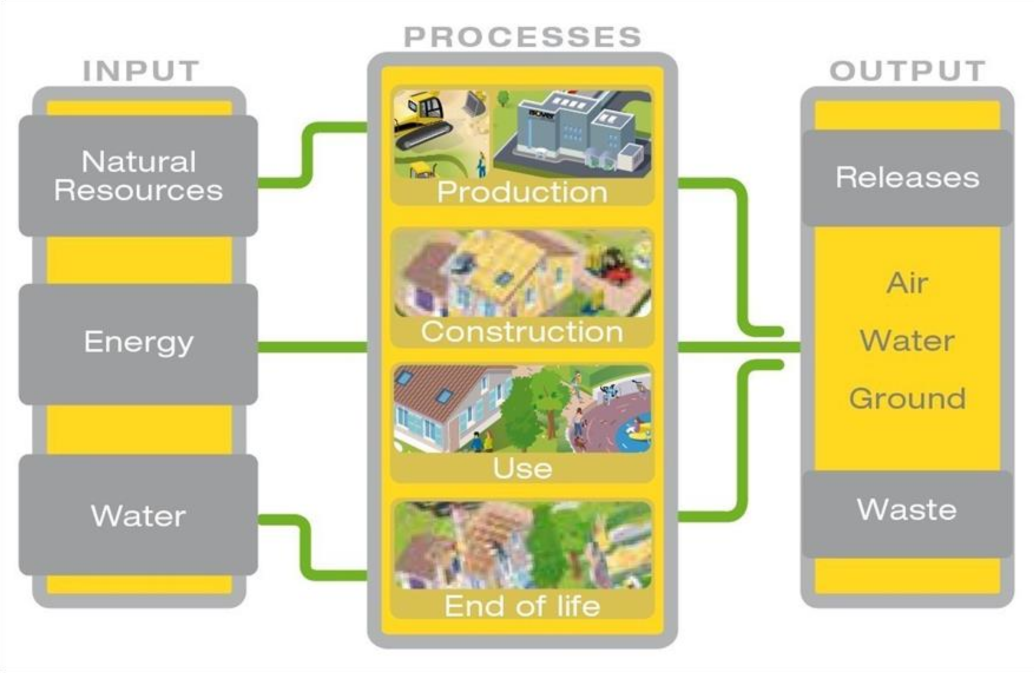
Life cycle stages

Flow diagram of the Life Cycle



Product stage, A1-A3

Description of the stage: the product stage of the mineral wool products is subdivided into 3 modules A1, A2 and A3 respectively “Raw material supply”, “transport” and “manufacturing”.

The aggregation of the modules A1, A2 and A3 is a possibility considered by the EN 15 804 standard. This rule is applied in this EPD.

Description of the scenarios and other additional technical information:

A1, Raw materials supply
This module takes into account the extraction and processing of all raw materials and energy which occur upstream to the studied manufacturing process

Specifically, the raw material supply covers production of binder components and sourcing (quarry) of raw materials for fiber production, e.g. basalt and dolomite for mineral wool. Besides these raw materials, recycled materials are also used as input.

Packaging material data is based on the most common product dimensions used

A2, Transport to the manufacturer
The raw materials are transported to the manufacturing site. In our case, the modeling includes: road (average values) of each raw material.

A3, Manufacturing
This module includes the manufacturing of the product and packaging materials. Specifically, it covers the manufacturing of mineral fiber, resin, mineral wool (including the processes of fusion and fiberizing showed in the flow diagram), and the packaging.

Manufacturing process flow diagram

Construction process stage, A4-A5

Description of the stage: the construction process is divided into 2 modules: A4, transport to the building site and A5, installation in the building.

A4, Transport to the building site: this module includes transport from the production gate to the building site.

Transport is calculated on the basis of a scenario with the parameters described in the following table.

PARAMETER	VALUE/DESCRIPTION
Fuel type and consumption of vehicle or vehicle type used for transport e.g. long distance truck, boat, etc.	Average truck trailer with a 27t payload, diesel consumption 38 liters for 100 km
Distance	312.6 km
Capacity utilisation (including empty returns)	100% of the capacity in volume 50% capacity utilization in mass including 30 % of empty returns in mass
Bulk density of transported products*	10-200 kg/m^3
Volume capacity utilisation factor	1

A5, Installation in the building: this module includes:

- Waste produced during the installation of the product (see value in percentage shown in the next table). These losses are sent to landfill (see landfill model for mineral wool at end of life chapter)
- Additional manufacturing processes to compensate losses
- Packaging waste processing, which are 100% collected and recycled and modeled as recovered matter

PARAMETER	VALUE/DESCRIPTION
Wastage of materials on the building site before waste processing, generated by the product's installation (specified by type)	2 %
Distance	25 km to landfill by truck
Output materials (specified by type) as results of waste processing at the building site e.g. of collection for recycling, for energy recovering, disposal (specified by route)	Packaging wastes are 100 % collected and modeled as recovered matter. Following a conservative methodology mineral wool losses are considered to be landfilled.

Use stage (excluding potential savings), B1-B7

Description of the stage: the use stage is divided into the following modules:

- B1: Use
- B2: Maintenance
- B3: Repair
- B4: Replacement
- B5: Refurbishment
- B6: Operational energy use
- B7: Operational water use

Description of the scenarios and additional technical information:
Once installation is complete, no actions or technical operations are required during the use stages until the end of life stage. Therefore mineral wool insulation products have no impact (excluding potential energy savings) on this stage.

End of Life Stage, C1-C4

Description of the stage: this stage includes the next modules:

C1, Deconstruction, demolition
The de-construction and/or dismantling of insulation products take part of the demolition of the entire building. In our case, the environmental impact is assumed to be very small and can be neglected

C2, Transport to waste processing
The model use for the transportation (see A4, transportation to the building site) is applied.

C3, Waste processing for reuse, recovery and/or recycling
The product is considered to be landfilled without reuse, recovery or recycling.

C4, Disposal
The mineral wool is assumed to be 100% landfilled.

Description of the scenarios and additional technical information:

End of life:

PARAMETER	VALUE/DESCRIPTION
Collection process specified by type	The entire product, including any surfacing is collected alongside any mixed construction waste 3.23 kg of stone wool (collected with mixed construction waste)
Recovery system specified by type	There is no recovery, recycling or reuse of the product once it has reached its end of life phase.
Disposal specified by type	The product alongside the mixed construction waste from demolishing will go to landfill 3.23 kg g of stone wool are landfilled
Assumptions for scenario development (e.g. transportation)	The waste going to landfill will be transported by truck with 27 t payload, using diesel as a fuel consuming 38 liters per 100km. Distance covered is 25 km

Reuse/recovery/recycling potential, D

Description of the stage: module D has not been taken into account.

LCA results

LCA model, aggregation of data and environmental impact are calculated from the GaBi software (version 8.7). CML 4.1 impact method has been used, together with thinkstep 8.7 (2018) and Ecoinvent v3.1 and v3.5 databases to obtain the inventory of generic data.

Raw materials and energy consumption, as well as transport distances have been taken directly from the manufacturing plant (Production data according 2019)

System boundaries (X=included, MND=module not declared)

Product stage			Construction installation stage		Use stage							End of life stage				Beyond the system boundaries
Raw materials	Transport	Manufacturing	Transport	Construction installation stage	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	MND

All result tables refer to a functional unit of 1 m² of mineral wool with a thermal resistance of 1.0 $K*m^2*W^{-1}$ of PLN ISOVER product.

ENVIRONMENTAL IMPACTS

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse, recovery, recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Global Warming Potential (GWP) - ***kg CO2 equiv/FU***	3,45E+00	6,95E-02	8,70E-02	0	0	0	0	0	0	0	0	4,64E-03	0	5,04E-02	MND
	The global warming potential of a gas refers to the total contribution to global warming resulting from the emission of one unit of that gas relative to one unit of the reference gas, carbon dioxide, which is assigned a value of 1.														
Ozone Depletion (ODP) ***kg CFC 11 equiv/FU***	3,96E-07	1,06E-17	1,03E-08	0	0	0	0	0	0	0	0	7,10E-19	0	2,82E-16	MND
	Destruction of the stratospheric ozone layer which shields the earth from ultraviolet radiation harmful to life. This destruction of ozone is caused by the breakdown of certain chlorine and/or bromine containing compounds (chlorofluorocarbons or halons), which break down when they reach the stratosphere and then catalytically destroy ozone molecules.														
Acidification potential (AP) ***kg SO2 equiv/FU***	7,73E-03	2,91E-04	2,11E-04	0	0	0	0	0	0	0	0	1,91E-05	0	2,88E-04	MND
	Acid depositions have negative impacts on natural ecosystems and the man-made environment incl, buildings. The main sources for emissions of acidifying substances are agriculture and fossil fuel combustion used for electricity production, heating and transport.														
Eutrophication potential (EP) ***kg (PO4)3- equiv/FU***	1,71E-03	7,13E-05	4,61E-05	0	0	0	0	0	0	0	0	4,68E-06	0	3,26E-05	MND
	Excessive enrichment of waters and continental surfaces with nutrients, and the associated adverse biological effects.														
Photochemical ozone creation (POPC) ***kg Ethene equiv/FU***	8,71E-04	1,07E-05	2,13E-05	0	0	0	0	0	0	0	0	7,01E-07	0	2,37E-05	MND
	Chemical reactions brought about by the light energy of the sun. The reaction of nitrogen oxides with hydrocarbons in the presence of sunlight to form ozone is an example of a photochemical reaction.														
Abiotic depletion potential for non-fossil ressources (ADP-elements) - ***kg Sb equiv/FU***	1,69E-06	9,24E-10	3,62E-08	0	0	0	0	0	0	0	0	6,17E-11	0	1,71E-08	MND
Abiotic depletion potential for fossil ressources (ADP-fossil fuels) - ***MJ/FU***	5,52E+01	9,68E-01	1,36E+00	0	0	0	0	0	0	0	0	6,47E-02	0	6,72E-01	MND
	Consumption of non-renewable resources, thereby lowering their availability for future generations.														

RESOURCE USE

Parameters	Product stage	Construction process stage		Use stage							End of life stage				D Reuse, recovery, recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Use of renewable primary energy excluding renewable primary energy resources used as raw materials - *MJ/FU*	1,18E+00	2,22E-02	2,75E-02	0	0	0	0	0	0	0	0	1,49E-03	0	8,83E-02	MND
Use of renewable primary energy used as raw materials *MJ/FU*	2,56E-01	0	5,12E-03	0	0	0	0	0	0	0	0	0	0	0	MND
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) *MJ/FU*	1,44E+00	2,22E-02	3,26E-02	0	0	0	0	0	0	0	0	1,49E-03	0	8,83E-02	MND
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials - *MJ/FU*	5,71E+01	9,71E-01	1,40E+00	0	0	0	0	0	0	0	0	6,48E-02	0	6,95E-01	MND
Use of non-renewable primary energy used as raw materials *MJ/FU*	6,11E+00	0,00E+00	0,122	0	0	0	0	0	0	0	0	0	0	0	MND
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) - *MJ/FU*	6,32E+01	9,71E-01	1,52E+00	0	0	0	0	0	0	0	0	6,48E-02	0	6,95E-01	MND
Use of secondary material *kg/FU*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	MND
Use of renewable secondary fuels- *MJ/FU*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	MND
Use of non-renewable secondary fuels - *MJ/FU*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	MND
Use of net fresh water - *m3/FU*	1,63E-02	7,41E-06	3,51E-04	0	0	0	0	0	0	0	0	4,95E-07	0	1,75E-04	MND

WASTE CATEGORIES

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse, recovery, recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Hazardous waste disposed *kg/FU*	1,53E-09	3,48E-09	4,80E-10	0	0	0	0	0	0	0	0	2,33E-10	0	1,19E-08	MND
Non-hazardous waste disposed *kg/FU*	1,39E-01	1,18E-05	7,00E-02	0	0	0	0	0	0	0	0	7,86E-07	0	3,23E+00	MND
Radioactive waste disposed *kg/FU*	5,84E-06	1,13E-06	3,75E-07	0	0	0	0	0	0	0	0	7,56E-08	0	9,22E-06	MND

OTHER OUTPUT FLOWS

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse, recovery, recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Components for re-use *kg/FU*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	MND
Materials for recycling *kg/FU*	0	0	1,33E-01	0	0	0	0	0	0	0	0	0	0	0	MND
Materials for energy recovery *kg/FU*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	MND
Exported energy *MJ/FU*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	MND

LCA interpretation

The following figure refers to a functional unit 1 m² of mineral wool with a thermal resistance of 1.0 K*m²*W⁻¹ of PLN ISOVER product.

[1] This indicator corresponds to the abiotic depletion potential of fossil resources.
[2] This indicator corresponds to the total use of primary energy.
[3] This indicator corresponds to the use of net fresh water.
[4] This indicator corresponds to the sum of hazardous, non-hazardous and radioactive waste disposed.

Global Warming Potential (Climate Change) (GWP)

When analyzing the above figure for GWP, it can clearly be seen that the majority of contribution to this environmental impact is from the production modules (A1 – A3). This is primarily because the sources of greenhouse gas emissions are predominant in this part of the life cycle. CO_2 is generated upstream from the production of electricity and is also released on site by the combustion of natural gas. We can see that other sections of the life cycle also contribute to the GWP; however, the production modules contribute to over 94% of the contribution. Combustion of fuel in transport vehicles will generate the second highest percentage of greenhouse gas emissions together the waste during the installation stage.

Non-renewable resources consumptions

We can see that the consumption of non – renewable resources is once more found to have the highest value in the production modules. This is because a large quantity of natural gas is consumed within the factory, and non – renewable fuels such as natural gas and coal are used to generate the large amount of electricity we use. The contribution to this impact from the other modules is very small and primarily due to the non – renewable resources consumed during transportation.

Energy Consumptions
As we can see, modules A1 – A3 have the highest contribution to total energy consumption. Energy in the form of electricity and natural gas is consumed in a vast quantity during the manufacture of mineral wool so we would expect the production modules to contribute the most to this impact category.

Water Consumption
As we don't use water in any of the other modules (A4 – A5, B1 – B7, C1 – C4), we can see that there is no contribution to water consumption. For the production phase, water is used within the manufacturing facility and therefore we see the highest contribution here. However, we recycle a lot of the water on site so the contribution is still relatively low.

Waste Production
Waste production does not follow the same trend as the above environmental impacts. The largest contributor is the end of life module. This is because the entire product is sent to landfill once it reaches the end of life state. However, there is still an impact associated with the production module since we do generate waste on site. The following small impact associated with installation is due to the loss rate of product during implementation.

Influence of particular thicknesses of PLN ISOVER

All the tables of the LCA result chapter of this EPD refer to PLN ISOVER for a functional unit of 1 m² with a thermal resistance equals to 1.00 m² K/W with a thickness of 34 mm. For the rest of thickness, a conservative principal has been followed in order to obtain the environmental performance of others thickness.

The following table show the multiplication factors for each thickness. The results expressed in this EPD® must be multiplied by its corresponding multiplication factor. If there is a need for environmental performance for a thickness not presented in the table below, please use a thickness just above it.

To obtain this factor, a conservative principle has been followed, being the real impact of the product slightly lower than that indicated in the table.

Lambda (W/mK)	Thickness (mm)	Declared thermal resistance RD (m2.K/W)	Multiplication factor
0.034	**34**	**1.00**	**1.00**
0.034	50	1.45	1.47
0.034	60	1.75	1.76
0.034	80	2.35	2.35
0.034	100	2.90	2.94

Annex

Calculation of PLC ISOVER impacts

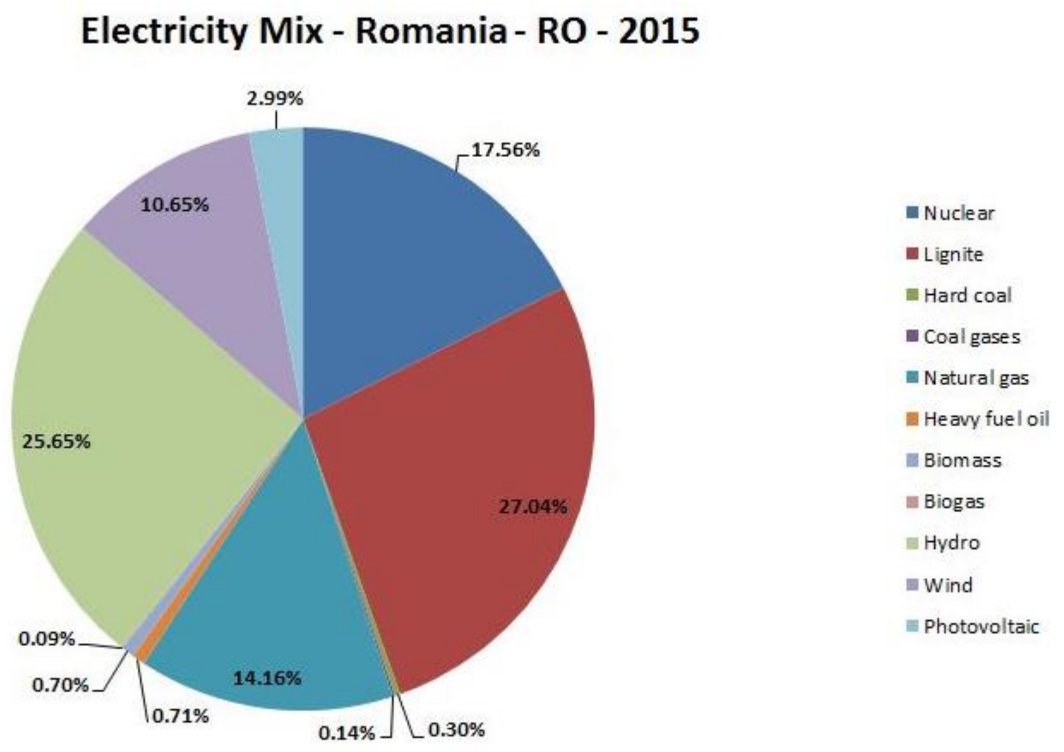
All the tables of the LCA result chapter of this EPD refer to PLN ISOVER for a functional unit of 1 m^2 with a thermal resistance equals to 1.00 m^2 K/W with a thickness of 34 mm. The results expressed in this EPD® must be multiplied by its corresponding multiplication factor to obtain the environmental performances of PLC ISOVER products.

The following table show the multiplication factors for each thickness of PLC ISOVER product. In order to obtain this factor, a conservative principle has been followed, being the real impact of the product slightly lower than that indicated in the table. If there is a need for environmental performance for a thickness not presented in the table below, please use a thickness just above it.

Lambda (W/mK)	Thickness (mm)	Declared thermal resistance RD (m2.K/W)	Multiplication factor
0.035	35	1.00	0.80
0.035	40	1.10	0.92
0.035	50	1.40	1.14
0.035	60	1.70	1.37
0.035	80	2.25	1.83
0.035	100	2.85	2.29

Electricity description

TYPE OF INFORMATION	DESCRIPTION
Location	Representative of average production in Romania
Geographical representativeness description	Split of energy sources in Romania - Nuclear: 17.56% - Lignite: 27.04% - Hard coal: 0.30% - Coal gases: 0.14% - Natural gas: 14.16% - Heavy fuel oil: 0.71% - Biomass: 0.70% - Biogas: 0.09% - Hydro: 25.65 - Wind: 10.65% - Photovoltaic: 2.99%
Reference year	2016
Type of data set	Cradle to gate from Thinkstep database
Source	Gabi database v2020 from International Energy Agency -2015
CO_2 emission kg CO_2 eq. / kWh	0.462



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