



WEG Equipamentos Elétricos S.A.



ENVIRONMENTAL PRODUCT DECLARATION

**POWER TRANSFORMER
40.000kVA 69,3kV CDC/13,8kVN
(code 111.768)**

Blumenau/SC/BR

In accordance with ISO 14025 and EN 50693:2019

Program Operator	EPDItaly
Publisher	EPDItaly
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www.epditaly.it

GENERAL INFORMATION

EPD OWNER

Name of the company	WEG Equipamentos Elétricos S.A.
Registered office	Rua Dr. Pedro Zimmerma, 6751 - Itoupava Central, Blumenau - SC, 89068-001, Brazil
Contacts for information on the EPD	Ivan Carlos Coelho phone: +55 (47) 3276-4000 e-mail: icarlos@weg.net

PROGRAM OPERATOR

EPDIItaly	Via Gaetano De Castillia n° 10 - 20124 Milano, Italy
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INFORMATION ON THE EPD

Product name (s)	POWER TRANSFORMER 40.000kVA 69,3kV CDC/13,8kV (code 111.768)
Production Site (s)	Rua Dr. Pedro Zimmerma, 6751 - Itoupava Central, Blumenau - SC, 89068-001, Brazil
Summary description and technical information of product(s)	Power autotransformers are critical assets in high-voltage transmission systems, enabling efficient voltage transformation between transmission levels while optimizing material use and electrical performance. They are typically installed in large transmission substations to interconnect different voltage levels within national or regional grids, supporting bulk power transfer over long distances. The specific unit analyzed in this study (POWER TRANSFORMER 40.000kVA 69,3kV CDC/13,8kV) is designed for operation in high-voltage transmission networks, stepping down voltage from 69.3 kV to 13,8 kV. With a rated power of 40 MVA, this transformer is intended for large-scale grid interconnection, ensuring system stability, voltage regulation, and reliable energy supply to downstream sub-transmission and distribution systems.
Scope of product(s)	A single piece of transformer operating for 35 years. Specific product EPD, concerning a specific product by a specific manufacturer, cradle-to-grave.
Type of EPD	Product EPD: a specific product by a specific manufacturer
Product (s) reference standards (if any)	-
CPC Code (number)	46121 – Electrical transformers.
https://unstats.un.org/unsd/classifications/Econ	

VERIFICATION INFORMATION

PCR (title, version, date of publication or update)	Core PCR EPDIItaly007: Electronic and Electrical Products and Systems, revision 3.2 (2024-11-12) Sub PCR EPDIItaly018: Electronic and Electrical Products and Systems – Power Transformers, version 3.6 (2024-07-01)
EPDIItaly Regulation (version, date of publication or update)	Regulations of the EPDIItaly Programme rev 7.1, 2025-09-05 EN 50693 is the framework reference for the Product Category Rules (PCR)
Project Report LCA	WEG-EPD-TRAFO40MVA-LCA_report_13.08.2026 (August 2026)
Independent Verification/Validation Statement	The PCR review was performed by EPDIItaly - info@epditaly.it. Independent verification of the declaration and data, carried out according to ISO 14025: 2010. ☐ Internal ☒ External Third party verification carried out by: ICMQ S.p.A., via Gaetano De Castillia n° 10 - 20124 Milan, Italy. Accredited by Accredia.
Comparability Statement	Environmental statements published within the same product category, but from different programs, may not be comparable.

	In particular, EPDs of construction products may not be comparable if they do not comply with EN 15804: 2012 + A2: 2019.
Liability Statement	The EPD Owner releases EPDItaly from any non-compliance with environmental legislation. The holder of the declaration will be responsible for the information and supporting evidence. EPDItaly disclaims any responsibility for the information, data and results provided by the EPD Owner for life cycle assessment.
Statement Validation¹	The production data used is considered representative on the basis of the representativeness analysis carried out with respect to the data of a reference product of the EPD Owner.

OTHER INFORMATION

¹ Declaration to be included only in the case of Validation of an EPD, refer to Annex 6.

Company information

Owner of the EPD: WEG Equipamentos Elétricos S.A.

Address: Rua Dr. Pedro Zimmermann, 6751

Location of production site(s): Itoupava Central, Blumenau - SC, Brazil

Website: <https://www.weg.net>

Tel: +55 (47) 3276-4000

Email: info-br@weg.net

Company contact: Ivan Carlos Coelho | icarlos@weg.net | Quality planning

About the organization

Founded in 1961, WEG is a global electro-electronic equipment company, operating mainly in the capital goods sector with solutions in electrical machines, automation and paints, for various sectors, including infrastructure, steel, pulp and paper, oil and gas, mining, among many others.

WEG stands out in innovation by constantly developing solutions to meet the major trends in energy efficiency, renewable energy, and electric mobility. With industrial operations in 15 countries and a commercial presence in more than 135 countries, the company has more than 40,000 employees distributed around the world.

The company is a global organization that develops technologies and solutions aligned with current societal and economic demands. Its activities include investments in energy-related technologies and in solutions for industry, agriculture, urban infrastructure, and residential applications, with the aim of improving operational efficiency and supporting the transition toward lower-impact systems.

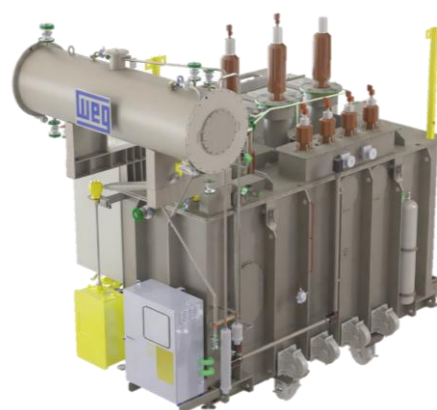


Product-related or management system-related certifications:



Product information

Product name: POWER TRANSFORMER 40.000kVA 69,3kV CDC/13,8kV (code 111.768)	
Product description:	Power transformers are critical assets in high-voltage transmission systems, enabling efficient voltage transformation between transmission levels while optimizing material use and electrical performance. They are typically installed in large transmission substations to interconnect different voltage levels within national or regional grids, supporting bulk power transfer over long distances. The specific unit analyzed in this study (POWER TRANSFORMER 40.000kVA 69,3kV CDC/13,8kV) is designed for operation in high-voltage transmission networks, stepping down voltage from 69,3 kV to 13,8 kV. With a rated power of 40 MVA, this autotransformer is intended for large-scale grid interconnection, ensuring system stability, voltage regulation, and reliable energy supply to downstream sub-transmission and distribution systems.
Average dimensions:	4,890 mm height x 3,725 mm length x 5,675 mm width
Expedition weight:	54,664 kg
Product weight: (Project)	49,750
Product weight: (LCI data)	51,672
Packaging weight:	2,992 kg
Type:	Power Transformer
Number of phases:	3P
Voltage class:	High
Maximum voltage	69.3 kV
Voltage	40,000 kVA
Cooled-oil type:	Insulating oil mineral naphthenic not inhibited
Products covered:	POWER TRANSFORMER 40.000kVA 69,3kV CDC/13,8kV
Geographical scope:	Brazil



LCA information

Declared unit:

A single piece of transformer operating for 35 years.

Time representativeness:

01 January 2025 to 31 December 2025.

Database(s) and LCA software used:

SimaPro® software v.10.4.0.0 developed by PRé Consultants was used to create the product system model. The ecoinvent® database v.3.12 provided the life cycle background data for product system modelling. The database used is regarded as representative on the basis of a comparative study, which examined the data for a reference product of the EPD Owner.

System boundaries:

Cradle-to-grave with upstream, core and downstream modules.

LIFE CYCLE MODULES ACCORDING THE EN 50693:

PHASES	Manufacturing Stage	Distribution Stage	Installation Stage	Use & Maintenance Stage	Deinstallation & End-of-Life Stage
Phases declared	X	X	X	X	X

Manufacturing:

The manufacturing process is carried out within WEG's industrial facilities and is structured into sequential and specialized production stages, covering steel fabrication, surface treatment, active part manufacturing, final assembly, testing, and packaging of oil-immersed autotransformers. The process begins with the reception and preparation of raw materials and components, including carbon steel sheets, silicon steel coils, copper or aluminum conductors, insulating materials, accessories, and auxiliary components, all of which are distributed to the respective downstream manufacturing sectors.

Steel sheet preparation represents the first major manufacturing stage and includes cutting, machining, and molding or bending operations. These activities are performed to produce structural components such as the transformer tank, cover, reinforcements, and other steel parts. The prepared steel components then undergo assembly and welding operations, including calendaring, fitting, and automated welding, ensuring compliance with the required mechanical strength and dimensional tolerances. During these operations, steel offcuts and welding-related waste are generated and directed to recycling streams.

Following fabrication, steel components are subjected to surface preparation through abrasive blasting, where steel shot is used to remove scale and contaminants and to improve surface adhesion. This process generates particulate emissions and iron oxide powder, which are managed according to environmental controls and recycling practices. After blasting, internal and external painting operations are carried out, including coating application and drying. Coating systems are applied using spray processes, involving solvents, compressed air, and electrical energy, to ensure corrosion protection and durability under outdoor operating conditions. Painting residues such as sludge, solvents, and contaminated materials are properly treated or disposed of in accordance with environmental management procedures.

In parallel with tank fabrication, radiator and fin manufacturing is performed. This includes steel sheet cutting, fin pressing or molding, followed by assembly, welding, and quality testing. Radiators are subsequently subjected to phosphating and, where applicable, hot-dip galvanizing to enhance corrosion resistance. These chemical surface treatments involve water, chemicals, zinc phosphate, and generate wastewater and sludge, which are treated in the effluent treatment plant.

The magnetic core manufacturing process begins with the preparation of grain-oriented silicon steel sheets. Silicon steel coils are longitudinally slit, cross-cut, and packaged. The cut laminations are then stacked and assembled to form the transformer core, ensuring proper alignment and magnetic performance. Silicon steel scrap generated during cutting is collected and directed to recycling. Winding manufacturing is conducted using copper or aluminum conductors. The process includes conductor winding, insulation application with cellulose-based and polymeric insulating materials, assembly, terminal welding, and kiln drying to remove residual moisture. Insulation materials such as crepe paper, pressboard, laminated wood, tapes, and adhesives are used to ensure electrical integrity. Waste copper or aluminum and packaging materials generated during this stage are segregated and recycled. The active part assembly involves the integration of the core and windings, followed by mechanical pressing, drying, and re-pressing operations. These steps are essential to ensure dimensional stability, dielectric performance, and long-term operational reliability. Drying is performed under controlled conditions, using electrical energy and inert gases where applicable. Simultaneously, control panels are assembled, including wiring, installation of electrical components, and functional verification. Accessories, ceramic insulators, rubbers, epoxy resins, and other auxiliary components are prepared for final integration.

Transformer finalization comprises tank preparation, tank closing, installation of the active part into the tank, panel and accessory installation, and vacuum oil filling using naphthenic mineral insulating oil. After oil filling, the transformer undergoes comprehensive routine testing, including electrical, dielectric, and functional tests, to verify conformity with applicable technical and international standards. The final stages include sealing, inspection, and packaging. Packaging materials such as wooden structures, paperboard, plastics, and protective films are used to ensure product integrity during transport. Packaging waste and metal residues are routed to appropriate recycling streams. Once completed, the transformer is stored under controlled conditions and is ready for transport to the installation site. Due to the size and weight of the equipment, transport and logistics arrangements are project-specific and may involve specialized supports and handling configurations.

Manufacturing data (auxiliary inputs consumed and waste generation) were estimated at the product level using predefined manufacturing routings. These routings are structured according to the man-hours required for each production stage, allowing resource consumption and waste generation to be directly attributed to the specific transformer under study.

The electricity consumed during the manufacturing stage is from BR GRID. To represent this in the LCA model, the dataset "Electricity, medium voltage {BR-Southern grid}" market for electricity, medium voltage | EN15804, U" was used, which has the following GWP emission factors: 0.148 kg CO₂eq./kWh (for GWP-total), 0.094 kg CO₂eq./kWh (for GWP-fossil), 0.032 kg CO₂eq./kWh (for GWP-biogenic), and 0.023 kg CO₂eq./kWh (for GWP-LULUC).

Distribution:

Transformer distribution is performed exclusively by land transport. The equipment is transported by large diesel truck (>32 tons) from the manufacturing site in Blumenau, Santa Catarina (SC), Brazil, to the final destination in the state of Ceará (CE), Brazil (3,693 km).

Installation:

The transformer is transported from energy company storage until the installation site where the packaging (wooden based) is discarded and returns to the energy company control for final treatment. The installation requires the use of manual/pneumatic/electrical tools to install the transformer into the operating site.

Use stage:

The total energy consumed during 35 RSL by the transformer is **3.22E+07 kWh** (losses and operational consumptions). This value was calculated according to IEC 60076-1 technical standard, expressed in kWh via the following equation (PCR0018 v.3.6):

$$E_d[kWh] = [P_{load} \times K_{load}^2 + P_{noload}] \times t_{years} \times RSL + P_{aux} \times f_{aux} \times t_{years} \times RSL$$

Table 1. Values applied to estimate the energy dissipated during RSL.

Variable	Amount
Pload [kW]	165.11
kload ²	0.49
Pnoload [kW]	20.64
tyear [h]	8760
RSL [anos]	35
Paux [kW]	6.75
f _{aux} [%]	0.50
tyear [h]	8760
RSL [anos]	35
Ed [kWh]	3.22E+07
Energy grid	Brazilian mix high voltage

End-of-Life:

EoL stage assumes that the discontinued equipment is sent for material recovering. The disassembling process is manual or done with the aid of pneumatic tools at the secondary metal recovering market. Most valuable fractions (steel, aluminium and copper) are recycled within the default recycling recovering rate established in BSI EN 50693:2019. Insulating oil is treated without energy recovering and the remaining parts, based on mass balance, are sent to sanitary landfill. Based on direct consultation and project assumptions the transport distances from energy company storage into the to disassembly facility is 100 km, from disassembly facility to recycling plant and to the oil treatment company is 100 km, meanwhile the range into a landfill is 100 km.

Table 2. End-of-life baseline scenario definition per functional unit (downstream module).

Processes		Value	Unit
Collection process	From energy company storage to recovering market	51,672	kg
Recovery system specified by type	Reuse	0.00	kg
	Recycling	25,945	kg
	Incineration for energy recovery	0.00	kg
Disposal specified by type	Product or material for final deposition	13,423	kg
	Incineration	12,309	kg
Assumption for scenario development	Assuming that 100% of the transformer is sent for disassembling (based on direct consultation with energy company service supplier), assuming that 80% of steel is recycled, 70% of aluminium is recycled, 60% of copper parts are recycled (G.5 section from BSI EN 50693:2019 - Default values) and that the insulating oil is incinerated without energy recovering (conservative principle). Following mass balance principle and Brazilian environmental laws, the remaining parts of the product are sent for final disposal at sanitary landfills		

Allocation:

Allocation can be defined as the impact factors distribution between the reference product and the coproducts when they are simultaneous and dependent. At WEG value chain there is one type of situation where allocation may be required located at two points in end-of-life processes (i.e., the recycling processes) that occurs: at assembling line (core module) due to process waste generation and at EoL (downstream module) due to metal recovering from obsolete transformers.

- **Assembling line and EoL:** regarding to the recycling of steel, silicon-steel, copper and aluminium generated during transformer manufacturing and recovered at EoL, it was considered the cut-off approach. According to the core EPDItaly core-PCR (PCR007), for recovery and recycling processes, which take place outside the boundaries of the product system, only impacts related to the transport of the waste to the treatment platform should be considered. Therefore, all the impacts of the waste transportation by road were fully attributed to the WEG product.

Cut-off criteria:

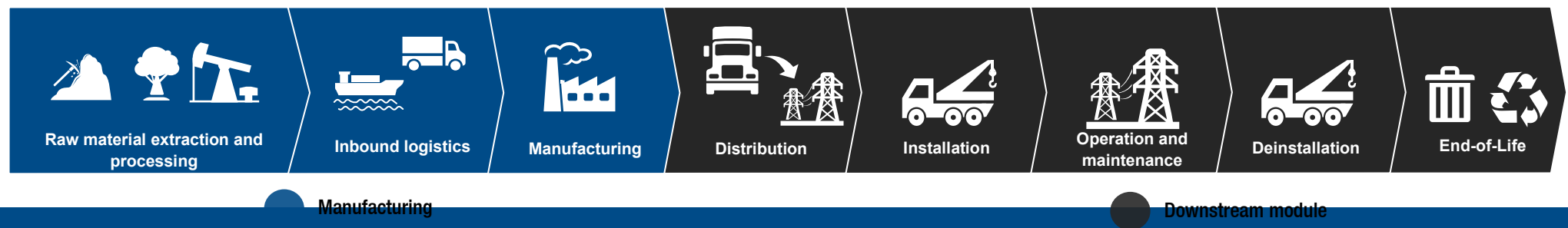
In accordance with the requirements of PCR EPDItaly 018 (Section 4.2.4.8), the cut-off criteria applied in this study follow Chapter 4.2.3.3 of EN 50693 and Section 6.3.6 of EN 15804. No material or energy flows have been excluded for the purpose of hiding significant environmental impacts. The EPDItaly Regulations and PCR EPDItaly 007 have been adopted as reference for defining the allowable exclusions. Accordingly, the following flows and operations may be cut off: (i) production, use, and disposal of packaging for components and semi-finished intermediates; (ii) materials constituting less than 1 % of the total product mass; (iii) material and energy flows associated with the installation stage; (iv) devices external to the product itself that are only required for installation; and (v) material and energy flows related to the dismantling phase, when dismantling is reasonably assumed to be performed manually (e.g., using screwdrivers or hammers).

The implementation of the cut-off rules, including the exclusion of LCI data based on cut-off criteria, is detailed in Table 3. The excluded flows were determined exclusively based on the mass cut-off criteria.

Table 3. Inputs/outputs considered/disregarded in the LCA model.

Stage	Main data	
Manufacturing	Steel parts {BR}; Steel sheet {BR}; Silicon steel {BR}; Silicon steel {JP}; Copper cables {GLO}; Copper parts {GLO} Aluminium parts {GLO}; Mineral oil - Base oil {US}; Sanitary ceramics {RoW}; Chemical, organic {GLO}; Chemical, inorganic {GLO}; Kraft paper {RoW}; Steel, chromium steel 18/8 {GLO}; Acrylonitrile-butadiene-styrene copolymer {GLO}; Sawnwood, board, softwood, raw, dried (u=20%) {RoW}	✓
	Packaging used for the transportation of ancillary materials	—
	Inbound logistics: Transport, freight, sea, container ship {GLO} and Transport, freight, lorry, unspecified {BR}	✓
	Inputs: Electricity; Compressed air; Cutting gases; Welding wire; Welding gases; Steel shot; Solvents; Water; Degreaser; Decapitating; Refiner; Phosphatizing. Outputs: Steel/Silicon-steel waste (recycling); Copper/Aluminium waste (recycling); Paper/paperboard waste (recycling); Plastics waste (recycling); Iron oxide (industrial landfill); Ink waste (industrial landfill); Sludge (industrial landfill); PM; VOC; Steam; Wastewater	✓
Distribution	Transport, freight, lorry, unspecified {BR}	✓
Installation	Energy for installation	✓
	Packaging waste for treatment	✓
Use	Energy consumed by the transformer to operate throughout its reference life;	✓
End-of-Life	Energy for deinstallation	✓
	Transport	✓
	Preparation for metals recycling	✓
	Landfill disposal	✓

Description of the system boundaries:



Manufacturing stage

The Transformer is majorly made of steel and silicon-steel, aluminium/copper, paper/paperboard and oil (tank filled for cooling purposes). There are also minor parts of polymers, chemicals (painting, varnish...), rubber and wood for packaging. The manufacturing stage considers all upstream processes to extract such materials and process them into the final components that are inserted into manufacturing line, including auxiliary consumptions at the factory such as electricity and others. This stage of the life-cycle accounts also for the road and maritime transport of all materials and components from suppliers to manufacturing plant (inbound logistics). The transformer manufacturing is an assembling line. Metal sheets are cut, bended, calendared, moulded and welded into the final transformer structure (tank, lid and bars). Those parts are cleaned and painted. In parallel, the core is made of silicon-steel and assembled from several different pieces that are cut to be geometrically positioned into the magnetic core that is wrapped with windings prepared with insulated conductor wires and covered with insulating paper. Core and transformer body meet at the final assembling, with connections, cables and other minor parts and are tested for security, functioning and tightness. After packaging, the transformer is stored and ready for shipment. The manufacturing line requires ancillary inputs, such as electricity and water to operate and generate wastes and other outputs.

Downstream stage

This module encompasses all steps after product expedition from manufacturing plant until its End-of-life (EoL). The Transformer should be distributed to Ceará - Brazil by large diesel-truck through road transportation. The installation requires a lifting device that works for transport (from energy company storage into the operation point) and to elevate and install the transformer. During 35 years of Reference Service Life (RSL) the transformer will convert energy voltage for urban consumption and consumes high voltage electricity from Brazilian national grid to operate and through losses in the transformation. During this period, an inspection should be made every 12 months of transformer operation to check for leakages, corrosion, and others. Every 5 years, some tests should be made as for example, oil sample for quality analysis, insulating check, etc. If there are no anomalies, no maintenance is necessary. According to product specialists, many transformers operate until its failure and maintenance is not a controlled practice. When discontinued, the transformer is generally disassembled for metal recovering due to its high aggregated value. This may be done at secondary scrap market or by specialized recycling companies. Steel, aluminium, copper and other metallic fractions are recovered and reinserted into the market. Other fractions are more likely to be discarded to sanitary landfill following environmental laws. Insulating oil should be incinerated in waste management specialized companies depending on its quality when discarded.

Content information

Product components	Material classes*	Weight, kg**	Weight-% (versus the product)
Other ferrous alloys, non-stainless steel	M-119	26,799	51.9%
Copper and its alloys	M-121	7,413	14.3%
Aluminium and its alloys	M-120	83	0.2%
Stainless steel	M-100	154	0.3%
Paper/paperboard	M-341	1,153	2.2%
Oils and greases	M-410	12,309	23.8%
Ceramics	-	165	0.3%
Plastics	-	31	0.1%
Chemicals (paints, varnish, dilutant, glues)	-	3,020	5.8%
Other	-	546	1.1%
TOTAL	-	51,672	100.0%
Packaging materials	Material classes*	Weight, kg	Weight-% (versus the product)
Wooden bars	M-340	1,852	3.6%
Metal oil drums	M-119	1,140	2.2%
TOTAL	-	2,992	5.8%

*According to IEC 62474 - Material Declaration for Products of and for the Electrotechnical Industry.

**The masses presented in the content declaration are related to the Bill-of-Materials (BOM) of the product, which, depending on the components involved, may undergo minor variations due to processing details or technical specifications (such as the thickness of a steel sheet or the density of oil, for example). For this reason, they may slightly diverge from the projected product mass.

Substances of very high concern (SVHC)

These products contain no substances of very high concern (SVHC) on the REACH Candidate List published by the European Chemicals Agency in a concentration that exceed 0.01% (w/w).

Environmental Information

Potential environmental impact – mandatory indicators according to core-PCR

Results per a single piece of transformer operating for 35 years							
Indicator*	Unit	Manufacturing stage	Distribution stage	Installation stage	Use and Maintenance stage	Deinstallation stage and End-of-Life	Total
			downstream				
GWP-total	kg CO ₂ eq	2.37E+05	1.76E+04	6.79E+03	7.65E+06	5.34E+04	7.97E+06
GWP-fossil	kg CO ₂ eq	2.38E+05	1.65E+04	2.92E+03	4.90E+06	4.17E+04	5.20E+06
GWP-biogenic**	kg CO ₂ eq	-1.74E+03	3.26E+02	3.99E+03	2.23E+06	1.28E+04	2.25E+06
GWP-luluc	kg CO ₂ eq	7.26E+02	8.61E+02	5.33E+00	5.22E+05	4.48E+01	5.24E+05
ODP	kg CFC11 eq	3.17E-03	7.41E-04	4.62E-05	1.38E-01	1.16E-04	1.42E-01
AP	mol H+ eq	7.22E+03	6.54E+01	1.20E+01	3.24E+04	3.26E+01	3.97E+04
EP-freshwater	kg P eq	2.48E+01	6.75E-02	2.95E-02	1.00E+02	3.78E-01	1.26E+02
EP-marine	kg N eq	3.79E+02	3.53E+01	6.79E+00	4.64E+03	2.74E+01	5.09E+03
EP-terrestrial	mol N eq	5.03E+03	3.07E+02	5.64E+01	4.82E+04	1.49E+02	5.38E+04
POCP	kg NMVOC eq	1.86E+03	9.44E+01	1.88E+01	1.65E+04	5.55E+01	1.85E+04
ADP-m***	kg Sb eq	9.21E+01	2.35E-03	1.60E-04	5.84E-01	2.15E-03	9.27E+01
ADP-f***	MJ	3.47E+06	2.18E+05	3.78E+04	7.05E+07	7.66E+04	7.43E+07
WDP***	m³ depriv.	1.87E+05	1.76E+03	6.06E+01	2.45E+07	6.41E+02	2.47E+07
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; POCP = Formation potential of tropospheric ozone; ADP-minerals & metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption.						

*The applied characterization factors are associated with the EF 3.1 method.

**For the GWP-biogenic indicator, it was assumed that carbon uptake is fully emitted at the disposal point, even though degradation may occur over a more extended period within the 100-year timeframe of GWP analysis. Consequently, the biogenic carbon contents of the vegetable oil and paper within the product, as well as the wood composing the packaging (captured throughout their value chains, i.e., - 1 kg CO₂ eq), were manually adjusted to be 100% emitted during the installation phase (for wood packaging) and end-of-life phase (for the paper), resulting in +1 kg CO₂ eq.

*** Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.

Potential environmental impact – mandatory indicators according to core-PCR

Results per a single piece of transformer operating for 35 years							
Indicator*	Unit	Manufacturing stage	Distribution stage	Installation stage	Use and Maintenance stage	Deinstallation stage and End-of-Life	Total
			downstream				
PM	disease inc.	2.68E-02	1.77E-03	2.29E-04	5.87E-01	7.90E-04	6.16E-01
IRP*	kBq U-235 eq	5.86E+03	1.29E+01	3.57E+00	1.59E+05	1.46E+01	1.64E+05
ETP-fw**	CTUe	8.22E+06	8.68E+05	2.55E+04	8.71E+06	4.65E+05	1.83E+07
HTP-c**	CTUh	7.74E-03	3.96E-06	1.28E-06	9.28E-03	5.23E-06	1.70E-02
HTP-nc**	CTUh	7.83E-02	2.42E-04	2.31E-05	2.36E-02	9.20E-04	1.03E-01
SQP**	Pt	2.71E+06	1.76E+04	1.24E+03	3.82E+07	1.35E+04	4.09E+07
Acronyms	PM = Potential incidence of disease due to PM emissions; IRP = Potential Human exposure efficiency relative to U235; ETP-fw = Potential Comparative Toxic Unit for ecosystems; HTP-c = Potential Comparative Toxic Unit for humans; HTP-nc = Potential Comparative Toxic Unit for humans; SQP = Potential Soil quality index.						

*Disclaimer: This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

**Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.

Use of resources

Results per a single piece of transformer operating for 35 years								
			Manufacturing stage	Distribution stage	Installation stage	Use and Maintenance stage	Deinstallation stage and End-of-Life	Total
Indicator*		unit						
Primary energy resources - Renewable	Use as energy carrier (PERE)	MJ, net calorific value	4.90E+05	2.23E+03	1.02E+02	1.22E+08	6.40E+02	2.13E+08
	Use as raw materials (PERM)	MJ, net calorific value	5.09E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.97E+05
	Total (PERT)	MJ, net calorific value	5.40E+05	2.23E+03	1.02E+02	1.22E+08	6.40E+02	2.14E+08
Primary energy resources - Non-renewable	Use as energy carrier (PENRE)	MJ, net calorific value	2.89E+06	2.24E+05	3.79E+04	7.06E+07	7.69E+04	2.01E+08
	Use as raw materials (PENRM)	MJ, net calorific value	5.84E+05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.66E+06
	Total (PERNT)	MJ, net calorific value	3.48E+06	2.24E+05	3.79E+04	7.06E+07	7.69E+04	2.04E+08
Secondary material (MS)		kg	8.67E+03	1.87E-01	7.48E-02	9.63E+01	2.76E+00	8.77E+03
Renewable secondary fuels (RSF)		MJ, net calorific value	2.88E+01	2.34E-02	1.04E-02	1.94E+01	8.01E-02	4.83E+01
Non-renewable secondary fuels (NRSF)		MJ, net calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net use of fresh water (FW)		m³	4.53E+03	4.12E+01	1.45E+00	5.84E+05	1.52E+01	5.89E+05

Waste production and output flows

Waste production

Results per a single piece of transformer operating for 35 years							
Indicator	Unit	Manufacturing stage	Distribution stage	Installation stage	Use and Maintenance stage	Deinstallation stage and End-of-Life	Total
			downstream				
Hazardous waste disposed (HWD)	kg	5.88E+04	1.85E+02	9.85E+00	2.29E+05	6.98E+03	2.95E+05
Non-hazardous waste disposed (NHWD)	kg	2.54E+06	6.72E+02	9.69E+03	3.37E+06	2.57E+04	5.95E+06
Radioactive waste disposed (RWD)	kg	3.72E+00	5.12E-03	2.04E-03	1.24E+02	8.88E-03	1.28E+02

Output flows

Results per a single piece of transformer operating for 35 years							
Indicator	Unit	Manufacturing stage	Distribution stage	Installation stage	Use and Maintenance stage	Deinstallation stage and End-of-Life	Total
			downstream				
Materials for energy recovery (MER)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Material for recycling (MFR)	kg	6.20E+03	9.53E-03	6.28E-03	7.36E+01	2.59E+04	3.22E+04
Components for reuse (CRU)	kg	7.62E-01	1.09E-03	8.16E-05	2.40E-01	2.10E-03	1.01E+00
Exported thermal energy (ETE)	MJ	1.47E+03	1.87E+00	4.50E-01	3.94E+02	2.72E+00	1.86E+03
Exported electricity energy (EEE)	MJ	8.47E+02	1.45E+00	7.12E-01	9.76E+02	3.19E+00	1.83E+03

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