Environmental Product Declaration

In accordance with ISO 14025 and EN 50693:2019 for:

Distribution Transformer 150 kVA (111.319)

from

Indústria de Transformadores Itaipu Ltda.

Declaration number	EPD06_2024_rev.1.0
Production site:	Avenida Sergio Abdul Nour, 2106, Distrito Industrial II – CEP 14900-271 – Itápolis, State of São Paulo, Brazil
Programme:	EPDItaly®, www.epditaly.it
Programme operator:	EPDItaly
EPD registration number:	EPDITALY1191
Issue date:	2025-12-11
Valid until:	2030-12-11

Registered under the mutual recognition between EPDItaly and other programme operators (in the case of mutual recognition). www.epditaly.it

General information

EPD OWNER	
Company name:	Indústria de Transformadores Itaipu Ltda.
Registered office:	Avenida Sergio Abdul Nour, 2106, Distrito Industrial II – CEP 14900-271 – Itápolis, State of São Paulo, Brazil
Contacts for information on the EPD:	Fernando Cesar Caspani Phone: +55 (16) 3263 9457 e-mail: fernando.caspani@itaiputransformadores.com.br
PROGRAMME OPERATOR	
EPDItaly	Via Gaetano De Castillia no. 10 - 20124 Milan, Italy
EPD INFORMATION	
Product name:	Distribution Transformer 150 kVA (111.319).
Site:	Avenida Sergio Abdul Nour, 2106, Distrito Industrial II – CEP 14900-271 – Itápolis, State of São Paulo, Brazil
Summary description and technical information of product:	The 111.319 distribution transformer is an essential component of electricity distribution networks, converting medium-voltage power into low-voltage electricity suitable for residential, commercial, and industrial end-users. It is a pole mounted power transformer in mineral cooled oil, with nominal power of 150 kVA and final project mass (without packaging) of 762 kg. The packaging consist of wooden bars.
Scope of product:	A single piece of transformer operating for 35 years. Specific product EPD – concerning a specific product by a specific manufacturer, EPD is cradle-to-grave.
Geography:	World (raw materials), Brazil (production, use and end-of-life).
CPC Code:	46121 - Electrical transformers.
VERIFICATION INFORMATION	
PCR:	Core PCR EPDItaly007: Electronic and Electrical Products and Systems, revision 3.1 (2024-11-12) Sub PCR EPDItaly018: Electronic and Electrical Products and Systems – Power Transformers, version 3.6 (2024-07-01)
EPDItaly Regulations:	Regulations of the EPDItaly Programme rev 7.1, 2025-09-05 EN 50693 is the framework reference for the Product Category Rules (PCR)
LCA Project Report:	[ITAIPU-LCA] 75-150-500 kVA transformer_report_v2.1 (November 2025)
Independent Statement Verification/Validation:	
The PCR review was performed by Ing. Luca Giacomello, Arch. Michele Paleari, Dott. Balazs Sara-info@epditaly.it.	
Independent verification of the declaration and of data performed according to ISO 14025:2010. ☐ Internal ☒ External	
Third-party verification/validation performed by: ICMQ S.p.A., Via Gaetano De Castillia no. 10 - 20124 Milan, Italy. Accredited by Accredia	

Statement Comparability: Environmental statements published within the same product category, but from different programmes, may not be comparable.
EPDs of electronic and electrical products may not be comparable if they do not comply with EN 50693. For further information about comparability, see EN 50693 and ISO 14025.
Statement Responsibility: The EPD Owner releases EPDItaly from any noncompliance with environmental legislation. The holder of the declaration will be responsible for the information and supporting evidence. EPDItaly accepts no responsibility for the information, data and results provided by the EPD Owner for the life cycle assessment.

Company information

Owner of the EPD:	Indústria de Transformadores Itaipu Ltda.
Address:	Avenida Sergio Abdul Nour, 2106, Distrito Industrial II – CEP 14900-271 – Itápolis, State of São Paulo, Brazil
Location of production site(s):	Avenida Sergio Abdul Nour, 2106, Distrito Industrial II – CEP 14900-271 – Itápolis, State of São Paulo, Brazil
Website:	www.itaiputransformadores.com.br/
Tel:	+55 (16) 3263 9457
Contact:	Fernando Cesar Caspani
Email:	fernando.caspani@itaiputransformadores.com.br

About the organization

Founded in 1975, Industria de Transformadores Itaipu Ltda is a national reference company in the manufacture of distribution and power transformers, serving with excellence the private markets and electricity concessionaires in Brazil and Latin America. Itaipu Transformadores portfolio includes single-phase, three-phase, ecological, power and special transformers, designed to meet the specifications of each customer, including commerce, industries, electricity concessionaires, cooperatives, installers and contractors.

Itaipu Transformadores mission is to offer solutions in generation, transmission and distribution of electric energy guaranteeing the satisfaction of its customers, employees, partners and shareholders.

TECHNOLOGY THAT TRANSFORMS

Sustainability

Itaipu Transformadores has the sustainability as one of the core values and includes continuous improvement, compliance with national laws, employee consciousness about company environmental policy, health and insurance working environment passing through lean manufacturing principles with waste generation reduction and controlled raw material consumption. Itaipu Transformadores Industry and all its actions are obligatory to respect human rights, combating discrimination in all its forms. The company holds ISO 9001, ISO 14001 and ISO 45001 certifications.

Owned certifications

Product information

Product name:	Distribution transformer – 150 kVA	
Product description:	The 111.319 distribution transformer is an essential component of electricity distribution networks, converting medium-voltage power into low-voltage electricity suitable for residential, commercial, and industrial end-users. It is a pole mounted power transformer in mineral cooled oil, with nominal power of 150 kVA and final project mass (without packaging) of 762 kg. The packaging consist of wooden bars.	
Average dimensions:	1.260 mm height x 1.100 mm length x 0.890 mm width	
Expedition weight:	873 kg	
Product weight:	762 kg	
Packaging weight:	140 kg	
Type:	Pole Mounted	
Number of phases:	3P	
Voltage class:	Medium	
Nominal primary voltage	17.5 kV	
Nominal power:	150 kVA	
Colled-oil type:	Mineral Oil (Nafthenic)	
Products covered:	150 kVA pole mounted three-phase oil immersed power transformer	
Geographical scope:	Brazil	

LCA information

Functional unit / declared unit:

A single piece of transformer operating for 35 years

Time representativeness:

October 2024 to September 2025.

Data representativeness:

Raw materials and end-of-life characterization are representative of the products. This also applies to the transformers' use phase since the losses are based on the product operational parameters. Inbound logistics and manufacturing phases data are based on similar products from which most of the bill-of-materials are equal with minor differences on some components, and that went through the same production processes at the same Production Unit with identical energy carriers.

Database(s) and LCA software used:

SimaPro® software v.9.6.0.1 developed by PRé Consultants was used to create the product system model. The ecoinvent® database version 3.10 provided the life cycle background data for product system modelling.

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:

Manufacturing data is aggregated for all the factory, and therefore, it is not possible to estimate inputs and outputs directly for a specific transformer since Itaipu Transformadores produces other equipment at the same plant. Thus, to relate utility consumptions and waste generation per transformer, it was necessary to apportion aggregated data. At the plant level, auxiliary inputs consumed, and waste generated in the manufacturing plants were allocated using a 'top-down' approach. This means that the total consumption and waste generation for the entire baseline year of the LCA project were quantified and then proportionally distributed based on the total of kVA of products manufactured during this period. It is important to note that while most manufacturing processes are common across all the product systems analysed, some are not. In cases where specific processes were involved, the inputs and outputs from those processes were fully allocated to the respective product system.

The electricity consumed during the manufacturing stage is certified as being 100% hydro. To represent this in the LCA model, the dataset "*Electricity, medium voltage {BR-South-eastern grid}| electricity voltage transformation from high to medium voltage | Cut-off, U*" was used and adapted to represent 100% hydro sources, which has the following **GWP emission factors: 7.67E-02 kg CO_2eq./kWh (for GWP-total)**, 5.80E-03 kg CO_2eq./kWh (for GWP-fossil), 4.10E-02 kg CO_2eq./kWh (for GWP-biogenic), and 2.88E-02 kg CO_2eq./kWh (for GWP-LULUC).

Distribution:

The transformer is transported to Ceará (northeast of Brazil) by road transportation in diesel-powered lorries. The distance was estimated according to the most probable road from Itapolis plant until Maracanau Municipality, 2,900 km.

Installation:

The installation phase implies in the transportation of 100 km of the tranformer and its packaging from energy company storage until the operation site. Then, the transformer is lifted and (generally) installed through manual/pneumatic tools. This phase also includes the disposal of the packaging of the Transformer, first returning until the energy company waste management central (100 km) and then transported until the waste management company (100 km). Although the wood from the pallet can be recovered/reused in various ways, since there is no guarantee of its end-of-life, it has been assumed that it is destined for sanitary landfill (conservative approach).

Use stage:

The total energy consumed during 35 RSL by the transformer is **337,168.02 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.3.5).

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

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

Variable	111.319 – 150 kVA
P_{load} (kW)	1.53
k_{load}	0.49
P_{noload} (kW)	0.35
t_{years} (hours)	8,760
RSL (years)	35
Electricity (kWh)	337,168.02

**P_{load} and P_{noload} factors were estimated conservatively to meet design requirements, but they are unlikely to be achieved throughout the transformers' lifecycle.*

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 incinerated (without energy recovering). The remaining parts, based on mass balance, are sent to sanitary landfill. Based on direct consultation and project assumptions the transport distances[1] from energy company storage into the to disassembly facility is 100 km, from disassembly facility to recycling plant and to the oil tretament 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	750.93	kg
Recovery system specified by type	Reuse	0.00	kg
	Recycling	429.80	kg
	Incineration for energy recovery	0.00	kg
Disposal specified by type	Product or material for final deposition	166.14	kg
	Incineration	155.00	kg
Assumption for scenario development	Assuming that 100% of the transformer is sent for disassembling (based on direct consultation with energy company), assuming that 80% of steel is recycled, 70% of aluminium is recycled, 60% of cooper parts are recycled (G.5 section from BSI EN 50693:2019 - Default values for R2) and that the insulating oil is incinerated. Following mass balance principle and Brazilian environmental laws, the remaining parts of the product are sent for final disopsal 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 Itaipu Transformadores 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, we 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 Itaipu Transformadores product.

[1] *The distances for transportation in the downstream phases (excluding distribution) were estimated based on conservative and highly probable scenarios. These assumptions are predicated on the fact that the transformers are to operate exclusively within the city of Maracanau, which is characterized by an extensive network of facilities for the treatment of various types of waste.*

Cut-off criteria:

The cut-off criteria are applied to support an efficient calculation procedure. According to EN 50693 (2019) and PCR018 (2023), specifically the following flows and operations may be cut-off:

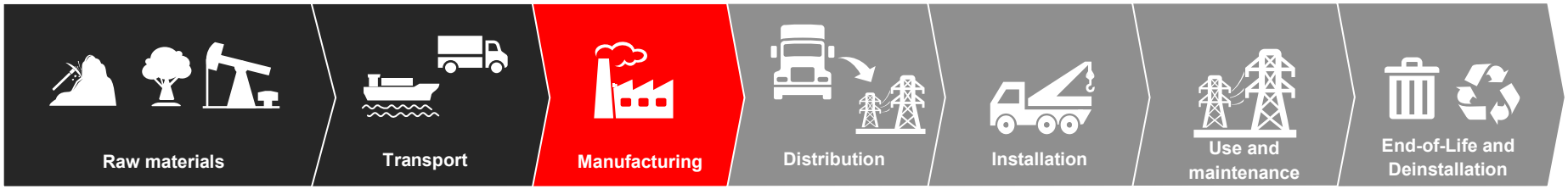
- Production, use and disposal of the packaging of components and semi-finished intermediates;
- Materials making up the transformer itself whose total mass does not exceed 1% of the total weight of the device;
- Material and energy flows related to dismantling phase, whenever it is reasonable to assume that dismantling is performed by adopting manual tools (e.g., screwdrivers, hammers, etc.);
- Devices external to the product itself required for installation;
- Maximum 5% of the overall environmental impact of the analysed product system;

In this LCA, all input and output flows have been considered at 100%, including raw materials as per the product composition provided by the manufacturer as well as the final product. Cut-off criteria was the environmental relevance for infrastructure impacts, although some irrelevant inputs may eventually not be considered, e.g., the cardboard used to clean the moulding machine. For inbound logistics, mass-based cut-off criteria was applied for minor components (screws, washers, rivets, etc). The coverage of inbound logistics was of 99.9% of mass composition for the transformer. At core module welding smokes were cut-off. The only cut-off criterion was the environmental relevance of the production of capital equipment, construction activities, and infrastructure, maintenance and operation of capital equipment, personnel-related activities, energy and water use related to company management and sales activities.

Data quality assessment:

The use of raw data from Itaipu Transformadores for raw materials, particularly for amounts and types of materials, reflects high relevance and the best quality, ensuring credibility for this critical input stage. However, the reliance on generic data for material characterization, with low relevance, reduces overall robustness in this aspect. For core module, specific data from Itaipu Transformadores across ancillary consumptions, and waste generation consistently achieves high or very good ratings, reflecting confidence in the precision and representativeness of the reported data. For transport, specific data is rated as low relevance and best quality for upstream transportation. In the use phase, Pload and Pnload were used to estimate energy consumption, following the 'use' equation provided in the PCR. These data are considered the best available quality. In installation and end-of-life stages, generic data with low relevance and fair quality is used for transportation distances, modals, and scenarios. This reliance on assumptions, due to limited data availability, weakens the overall reliability of these phases. Packaging treatment (installation stage), despite using generic data, has low relevance and fair quality, due to its minor role in the product's lifecycle impacts. Background data sourced from ecoinvent®, widely recognized in the LCA community, carries high relevance and good quality, offering robust support for background inventory data.

Description of the system boundaries:



Upstream module

The distribution 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, glue…), rubber and wood for packaging. The upstream module considers all upstream processes to extract such materials and process them into the final components that are inserted into Itaipu Transformadores manufacturing line, including auxiliary consumptions at the factory such as electricity and others. This stage of the life-cycle accounts for the road and maritime transport of all materials and components from suppliers to Itaipu Transformadores plant (inbound logistics).

Core module

The distribution 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 wildings 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 at Itaipu Transformadores plant requires ancillary inputs, such as electricity to operate and generate wastes and other outputs. Electricity consumed at Itaipu Transformadores plant is 100% from renewable source (hydro) meanwhile the major part of wastes are recycled following the internal policies on waste management.

Downstream module

This module encompass all steps after product expedition from Itaipu Transformadores manufacturing plant until its End-of-life (EoL). The Transformer is distributed to Ceara state 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 distribution transformer will convert energy voltage for urban consumption and consumes medium 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 Itaipu Transformadores product specialists, in Brazil 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. In Brazil 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 Brazilian environmental laws. Insulating oil may be recycled or treated 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	452.68	60.3%
Aluminium and its alloys	M-120	96.65	12.9%
Copper and its alloys	M-121	0.00	0.0%
Stainless steel	M-100	0.13	0.0%
Tin and its alloys	M-126	11.34	1.5%
Paper/paperboard	M-341	16.79	2.2%
Wood	M-340	2.40	0.3%
Ceramics	M-160	15.75	2.1%
Oils and greases	M-410	155.00	20.6%
Chemicals (paints, varnish, dilutant, glues)	-	0.00	0.0%
Polymers	-	0.00	0.0%
Rubber	M326	0.11	0.0%
TOTAL	**-**	**750.86**	**100.00%**
Packaging materials	**Material classes****	**Weight, kg**	**Weight-% (versus the packaging)**
Wooden bars	M-340	140.00	100.00%
TOTAL	**-**	**140.00**	**100.00%**

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

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 exceeds 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
		upstream	core	downstream				
GWP-total	kg CO_2 eq	3.88E+03	1.23E+02	1.69E+02	2.48E+02	8.41E+04	5.65E+02	8.91E+04
GWP-fossil	kg CO_2 eq	4.07E+03	1.43E+02	1.58E+02	3.15E+01	5.45E+04	5.03E+02	5.94E+04
GWP-biogenic**	kg CO_2 eq	-2.03E+02	1.03E+01	3.17E+00	2.16E+02	2.40E+04	6.07E+01	2.41E+04
GWP-luluc	kg CO_2 eq	1.01E+01	6.77E+00	8.33E+00	5.01E-01	5.62E+03	8.93E-01	5.65E+03
ODP	kg CFC11 eq	2.94E-05	1.39E-06	7.08E-06	7.86E-07	1.49E-03	1.54E-06	1.53E-03
AP	mol H+ eq	3.28E+01	5.04E-01	9.41E-01	1.31E-01	3.49E+02	3.15E-01	3.83E+02
EP-freshwater	kg P eq	2.03E-01	4.08E-03	6.48E-04	8.21E-05	1.08E+00	2.63E-03	1.29E+00
EP-marine	kg N eq	4.29E+00	1.03E-01	4.98E-01	6.38E-02	5.00E+01	1.83E-01	5.51E+01
EP-terrestrial	mol N eq	4.79E+01	1.12E+00	4.68E+00	6.23E-01	5.19E+02	1.50E+00	5.75E+02
POCP	kg NMVOC eq	1.58E+01	2.02E+00	1.32E+00	2.08E-01	1.77E+02	5.17E-01	1.97E+02
ADP-m***	kg Sb eq	6.65E-02	2.57E-04	2.26E-05	2.74E-06	6.29E-03	7.14E-06	7.30E-02
ADP-f***	MJ	3.54E+04	5.75E+02	1.48E+01	5.84E+00	2.26E+05	1.84E+01	2.62E+05
WDP***	m^3 depriv.	6.51E+02	1.91E+01	4.21E+00	-2.19E+01	9.10E+03	-6.43E+00	9.75E+03
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 CO_2 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 CO_2 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 – additional 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
		upstream	core	downstream				
PM	disease inc.	3.57E-04	5.74E-06	2.07E-05	2.75E-06	6.31E-03	8.08E-06	6.70E-03
IRP*	kBq U-235 eq	6.34E+01	2.52E+00	1.20E-01	4.11E-02	1.71E+03	1.04E-01	1.77E+03
ETP-fw**	CTUe	2.46E+04	4.06E+02	1.21E+02	2.94E+01	3.93E+04	5.63E+03	7.02E+04
HTP-c**	CTUh	1.06E-04	1.59E-06	6.33E-08	1.70E-08	9.99E-05	6.25E-08	2.08E-04
HTP-nc**	CTUh	7.06E-05	1.08E-06	2.90E-06	2.10E-07	2.47E-04	1.14E-06	3.23E-04
SQP**	Pt	3.42E+04	6.16E+03	1.70E+02	8.72E+01	4.10E+05	6.92E+01	4.51E+05
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.*

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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	upstream	core	downstream				
Primary energy resources - Renewable	Use as energy carrier (PERE)	MJ, net calorific value	5.12E+03	2.17E+03	2.15E+01	2.21E+00	1.31E+06	1.43E+00	1.32E+06
	Use as raw materials (PERM)	MJ, net calorific value	1.95E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.95E+03
	Total (PERT)	MJ, net calorific value	7.08E+03	2.17E+03	2.15E+01	2.21E+00	1.31E+06	5.16E+00	1.32E+06
Primary energy resources - Non-renewable	Use as energy carrier (PENRE)	MJ, net calorific value	2.90E+04	5.76E+02	7.47E+01	9.43E+00	2.27E+05	5.77E+00	2.57E+05
	Use as raw materials (PENRM)	MJ, net calorific value	6.44E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.44E+03
	Total (PERNT)	MJ, net calorific value	3.55E+04	5.76E+02	7.47E+01	9.43E+00	2.27E+05	2.48E+01	2.63E+05
Secondary material (SM)		kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Renewable secondary fuels (RSF)		MJ, net calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
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	0.00E+00
Net use of fresh water (FW)		m3	1.26E+02	2.44E+01	5.88E-01	3.72E-01	-4.88E-01	4.49E+03	-1.09E-01

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
		upstream	core	downstream				
Hazardous waste disposed (HWD)	kg	1.57E+00	4.87E-02	2.04E-02	3.74E-03	5.41E+01	1.53E-01	5.59E+01
Non-hazardous waste disposed (NHWD)	kg	6.35E+01	1.09E+00	6.03E-02	1.40E+02	1.76E+02	1.68E+02	5.49E+02
Radioactive waste disposed (RWD)	kg	4.05E-02	1.59E-03	4.72E-05	2.27E-05	1.33E+00	6.00E-05	1.37E+00

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
		upstream	core	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	0.00E+00
Material for recycling (MFR)	kg	6.96E+01	6.96E+01	0.00E+00	0.00E+00	0.00E+00	4.37E+02	5.76E+02
Components for reuse (CRU)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported thermal energy (ETE)	MJ	0.00E+00	6.19E-02	0.00E+00	2.15E+01	0.00E+00	4.04E+02	4.26E+02
Exported electricity energy (EEE)	MJ	0.00E+00	8.34E-01	0.00E+00	1.08E+01	0.00E+00	4.02E+03	4.03E+03

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