Hitachi Energy

Hitachi Energy Poland Sp. z o.o, ul.Żegańska 1, 04-713 Warszawa, Poland

EPD ITALY

ENVIRONMENTAL PRODUCT DECLARATION

Product Name	Site Plant
Mineral and vegetable oil immersed transformers GST001/1057N TR 630kVA KNAN 20/0,42kV matricola 110090 GST001/1057 TR 630kVA ONAN 20/0,42kV matricola 110089 GST001/1056N TR 400kVA KNAN 20/0,42kV matricola 110082 GST001/1056 TR 400kVA ONAN 20/0,42kV matricola 110081	Hitachi Energy Poland sp z o.o.; Łódź, Aleksandrowska 67/93, Poland

in accordance with EN 50693:2019; ISO 14025

Program Operator Publisher	EPDItaly, www.epditaly.it EPDItaly
Declaration Number Registration Number	EPDITALY0491 IT23/99002598
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1. B.1 General information

Addresses of declaration owner	Hitachi Energy Poland; ul. Żegańska 1; 04-713 Warszawa, Poland
Production site:	Hitachi Energy Poland; 91-205 Łódź, Aleksandrowska 67/93, Poland
Name of the person responsible for EPD & LCA Report:	Izabela Markiewicz Main Health & Safety Specialist ul. Aleksandrowska 67/93; 91-205 Lodz, Poland Mobile: +48 881 942 697 E-mail: Izabela.markiewicz@hitachienergy.com
Program operator & publisher	EPDItaly; www.epditaly.it Via Gaetano De Castillia, 10; 20124 – MILANO, Italy Version of EPDItaly regulations 5.2
EPD Type	Product EPD – concerning a specific product by a specific manufacturer, EPD is Cradle to Grave.
Identification of LCA report:	LCA Report Hitachi MDT Transformers
Declared product	Mineral and oil immersed transformers: GST001/1057N TR 630kVA KNAN 20/0,42kV GST001/1057 TR 630kVA ONAN 20/0,42kV GST001/1056N TR 400kVA KNAN 20/0,42kV GST001/1056 TR 400kVA ONAN 20/0,42kV
Short description of application, technical functions	Transformers are intended for supplying the low voltage (LV) power grids from the medium voltage (MV) power grids. The transformers are designed to be supplied with sinusoidal alternating voltage with a strictly defined frequency
Identification of the product	UN CPC4612 4 – Metal products & equipment 46 – Electrical machinery and apparatus 461 – Electric motors, generators and transformers 4612 – Electrical transformers, static converters and inductors
Geographical area	Europe / World (raw materials) Poland (Production) Italy(use and end-of-life)
Temporary coverage	Reference year 2021
EPD information	This declaration has been developed referring to EPDItaly, following the 'Regolamento di EPDItaly"; further information and the document itself are available at: www.epditaly.it.
Independent Verification	Independent verification of the declaration and data carried out according to ISO 14025:2010. [ ] Internal [X] External Third-party verification carried out by: SGS Italia S.p.A. via Caldera, 21, 20153 - Milan T +39 02 73 931 - F +39 02 70 12 46 30 / www.it.sgs.com Accredited by: ACCREDIA; accreditation number SGS H006
Version of standard	ISO 14025 Reference standard for transformers EN 50693:2019 (E)
Version of PCR	PCR Core EPDItaly007 rev.2 (21/10/2021) PCR Sub EPDItaly018 v3.5 (13/12/2021)

Orientation where more information can be found	Environmental Activities: Hitachi https://www.hitachi.com/environment/index.html Sustainability: Hitachi https://www.hitachi.com/sustainability/index.html
Comparability	EPDs relating to the same product category but belonging to different programs may not be comparable.
Liability	EPDItaly declines any responsibility regarding the manufacturer's information, data, and results of the life-cycle assessment, and also nonconformity of environmental legislation.
LCA Software and data base	SimaPro v 9.3.0.3 and Ecoinvent database 3.8
Technical support	CRMP Wojciech Piskorski, ul. Ledóchowskich 10, 33-101 Tarnów {PL} Wojciech Piskorski; wojciech.piskorski@carbonium.pl Ryszard Ścigała; ryszard.scigala@carbonium.pl

2. Company information

Hitachi Energy Poland is part of the Hitachi Group. The production plant in Lodz is Hitachi Energy Poland's focused factory for distribution transformers for the European market. The factory is located 30 minutes drive from Lodz Airport and 1.5 hour drive from Warsaw Chopin Airport.

Factory short description:

- built: 1925;
- employees: ~400;
- more than 80 years of experience in distribution transformers

Factory capability: rated power up to 2,500 kVA; rated voltage up to 36 kV

Product portfolio:

- Liquid-filled distribution transformers
- Pole- or ground-mounted
- Distribution transformer standards: IEC, GOST and many local standards

Hitachi Energy Poland offers the widest portfolio of distribution transformer products that are designed for reliability, durability, and efficiency required in utility, industrial, and commercial applications.

The Lodz plant has an implemented quality management system certified to ISO 9001:2015, an environmental management system certified to ISO 14001:2015 and ISO 45001:2018.

3. Product information

The present study were carried out for four types of transformers.

According to the criteria in EPDItaly018, two separate sets of products differing in power were defined. Two transformers have capacity of 630kVA and the other two have a capacity of 400 kVA. The operating voltages for both sets of products are the same.

This study deals with the following items.

GST001/1057N - TR 630kVA KNAN 20/0,42kV (abbreviation in study T600B) /
Operating Power 630kVA, total mass (excluding packaging) 2306 kg, operating voltage 20kV country of the installation – Italy; TNOSCTIT2AL6N 630/20 PNSm – Product ID (matricola) 110090; TR 630kVA KNAN 20/0,42kV - GST001/1057N

GST001/1057 - TR 630kVA ONAN 20/0,42kV (abbreviation in study T600)
Operating Power 630kVA, total mass (excluding packaging) 2296 kg, operating voltage 20kV, country of the installation – Italy; TNOSCTIT2AL5N 630/20 PNSm – Product ID (matricola) 110089; TR 630kVA ONAN 20/0,42kV - GST001/1057

GST001/1056N – TR 400kVA KNAN 20/0,42kV (abbreviation in study T400B) /

Operating Power 400kVA, total mass(excluding packaging) 1700 kg, operating voltage 20kV, country of the installation – Italy; TNOSCTIT2AL6N 400/20 PNS – Product ID (matricola) 110082; TR 400kVA KNAN 20/0,42kV - GST001/1056N

GST001/1056 - TR 400kVA ONAN 20/0,42kV (abbreviation in study T400)

Operating Power 400kVA, total mass(excluding packaging) 1694 kg, operating voltage 20kV, country of the installation – Italy; TNOSCTIT2AL6N 400/20 PNSm – Product ID (matricola) 110081; TR 400kVA ONAN 20/0,42kV - GST001/1056

Table 1 Main description of analyzed transformers

<table>
<tr><th>Model</th><th>GST001/1057N (T600B)</th><th>GST001/1057 (T600)</th><th>GST001/1056N (T400B)</th><th>GST001/1056 (T400)</th></tr>
<tr><td>Product description:</td><td colspan="4">Medium Distribution Transformer is an electrical device that transfer energy from one circuit to another by magnetic coupling without requiring relative motion between its parts and comprises three coupled windings and a magnetic core to concentrate magnetic flux made of silicon magnetic steel. It is three phase transformer in mineral or vegetable oil, with nominal power showed below.
The packaging consists of wooden bars.
The product meets all legal requirements that apply to it with regard to environmental regulations. Product has a CE Mark</td></tr>
<tr><td>Operating power, kVA</td><td colspan="2">630 kVA</td><td colspan="2">400 kVA</td></tr>
<tr><td>Primary/Secondary Voltage, V</td><td colspan="2">20 000V / 420V</td><td colspan="2">20 000V / 420V</td></tr>
<tr><td>Country in which the product will be installed</td><td colspan="4">Italy</td></tr>
<tr><td>Total product mass, excluding packaging</td><td>2306 kg</td><td>2296 kg</td><td>1700 kg</td><td>1694 kg</td></tr>
<tr><td>Type of cooling</td><td>KNAN – natural ester oil</td><td>ONAN – mineral oil</td><td>KNAN – natural ester oil</td><td>ONAN – mineral oil</td></tr>
<tr><td>Statistic Hierarchy</td><td colspan="4">UN CPC4612
4 – Metal products & equipment
46 – Electrical machinery and apparatus
461 – Electric motors, generators and transformers
4612 – Electrical transformers, static converters and inductors</td></tr>
<tr><td>Manufacturer identification and contact details</td><td colspan="4">Hitachi Energy Poland Sp. z o.o.;
ul. Aleksandrowska 67/93; 91-205 Łódź {PL}
Izabela Markiewicz - Main Health & Safety Specialist
Mobile: +48 881 942 697
E-mail: Izabela.markiewicz@hitachienergy.com</td></tr>
</table>

The materials built in transformers were grouped by their types, which were used in calculation.

Table 2 Types of materials

Built in material net; kg/UD	T600B	T600	T400B	T400
Aluminium,	442,0	442,0	285,0	285,0
Ceramic (isolators)	14,6	14,6	14,6	14,6
Copper	18,6	18,6	11,6	11,6
Electric components	1,5	1,5	1,5	1,5
Oil MINERAL	0,0	438,0	0,0	312,0
Oil VEGETABLE	448,0	0,0	318,0	0,0
Paper & carboard	52,8	52,8	38,4	39,2
Epoxy resin	2,1	2,1	1,5	1,5
Plastic	0,8	0,8	0,8	0,8
Rubber	1,7	1,7	1,3	1,3
Steel (carbon)	381,0	381,0	269,2	269,2
Steel magnetic	942,0	942,0	757,0	757,0
Wood	0,7	0,7	0,5	0,5
Total mass net weight, kg	**2306**	**2296**	**1700**	**1694**

Substances of very high concern (SVHC)

With reference to:

- Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the “Registration, Evaluation, Authorization and restriction of Chemicals” (REACH), as subsequently amended specifically with:
- Annex XIV of REACH: “List of substances subject to authorization”
- Annex XVII: “List of restricted substances”
- the “Candidate List of Substances of Very High Concern” published by the European Chemicals Agency

according to the information currently available to us, all liquid-filled distribution transformers and related accessories manufactured and distributed by Hitachi Energy Poland Sp. z o.o. do not contain any restricted, prohibited and SVHC substances. They do not release any dangerous substances during the use stage.

4. Life Cycle Assessment Information

Life Cycle Assessment (LCA) is an analytical tool that captures the overall potential environmental impacts of a product, process or human activity from raw material extraction, through production and use, to end of life. LCA studies are structured in 4 phases. The Goal and scope definition phase clarifies the objective of the study and determines the main methodological boundaries, as well as the life cycle processes to be included in the analysis (also referred to as system boundaries). The Inventory analysis phase includes data collection and modelling of all of the input and outputs of material, energy, and other elementary flows that can cause potential environmental impacts. In the Life cycle impact assessment phase, inventory data are characterized into potential environmental impacts. Finally, in the Interpretation phase the validity of the results with respect to the purpose and scope of the study are commented and the most impactful stages of the life cycle are identified.

Declared Unit

According to the reference PCR, the transformer is defined as an assembly of electric and electronic devices adjusting and regulating voltage and current intensity components of electric power, during a reference service life of 35 years. The declared unit is therefore defined as a **single unit of transformer, with technical specification shown within table 1, operating for 35 years.**

System and its boundaries

As the boundaries of the system, the range cradle to grave was adopted, i.e. from the acquisition of raw materials to the End Of Life. According to the scope of cradle to grave analysis, the upstream, core and downstream processes were analyzed.

Modules declares

Module	Manufacturing stage		Distribu-tion stage	Instala-tion stage	Use stage	End of Life stage
	Upstream module	Core module	Downstream module			
Modules declared	X	X	X	ND	X	X

Installation and deinstallation phases are under cut-off due to the fact that is performed manualy. For this products there is no need for maintenance.

RSL represents the Reference Service Life, defined as 35 years for EPDs based on used PCR.

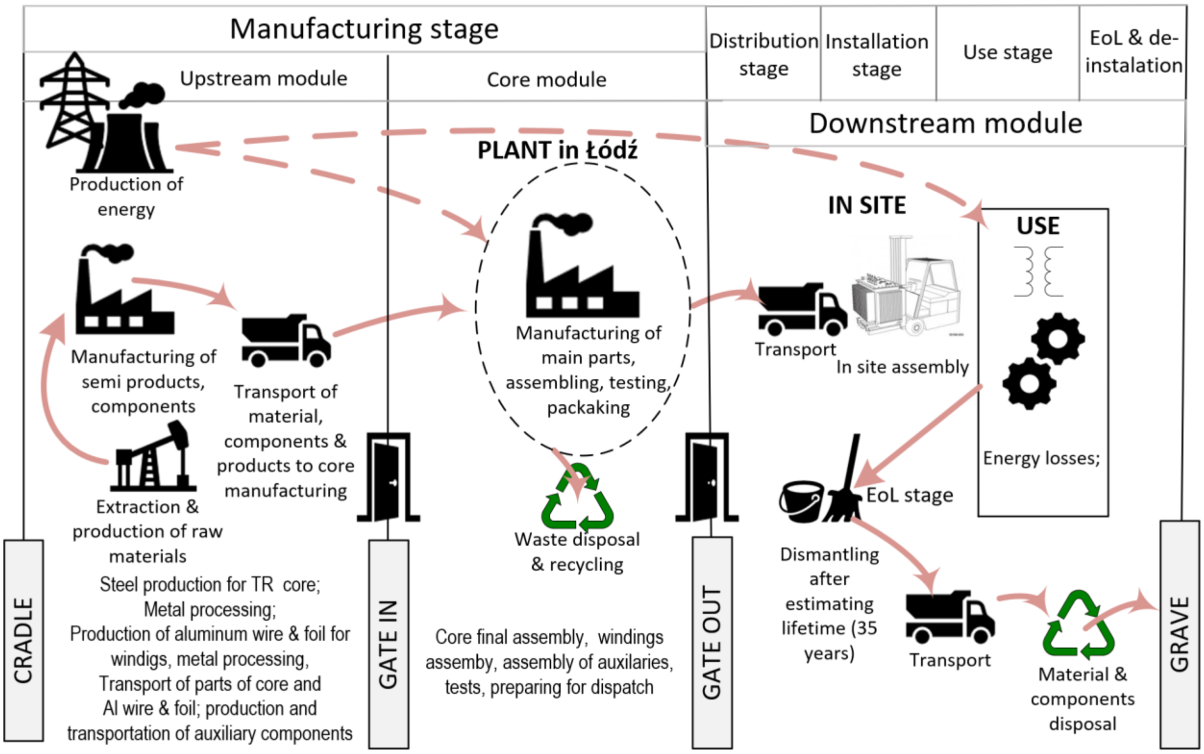

Figure 1 System boundaries

Impact categories, resources & wastes production categories

The information obtained from the inventory analysis is aggregated according to the effects related to the various environmental issues. According to PCR EPDItaly007 and EN 50693 the environmental impact indicators must be determined using the characterization factors and impact assessment methods specified in EN 15804:2012+A2:2019.

Table 3 Impact categories

Impact category	Description	Unit
CORE ENVIRONMENTAL IMPACT INDICATORS		
Climate change - total	Global Warming Potential total (GWP-total)	kg CO_2 eq.
Climate change - fossil	Global Warming Potential total (GWP-fossil)	kg CO_2 eq.
Climate change - biogenic	Global Warming Potential total (GWP- biogenic)	kg CO_2 eq.
Climate change - land use and land use change	Global Warming Potential total (GWP-luluc)	kg CO_2 eq.
Ozone Depletion	Depletion potential of the stratospheric ozone layer (ODP). This category concerns the depletion of stratospheric ozone, which can have adverse effects on human health, animal health, terrestrial and aquatic ecosystems, biochemical cycles and materials.	kg of CFC-11 eq.
Acidification	Acidification potential, Accumulated Exceedance (AP)	moles of H+ eq.
Eutrophication aquatic freshwater	Eutrophication potential, fraction of nutrients reaching fresh water end compartment (EP-freshwater)	kg PO_4eq.
Photochemical ozone formation	Formation potential of tropospheric ozone (POCP)	kg of NMVOC eq.
Depletion of abiotic resources - minerals and metals[1]	Abiotic Depletion for non-fossil resources potential (ADP-minerals&metals)	kg Sb eq.
Depletion of abiotic resources - fossil fuels[1]	Abiotic Depletion for non-fossil resources potential (ADP-fossil)	MJ, net calorific value
Water use[1]	Water deprivation potential, deprivation- weighted water consumption (WDP)	m^3 eq.
PARAMETERS DESCRIBING RESOURCE USE		
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw material (PENRE)		MJ, net calorific value
Use of renewable primary energy excluding renewable primary energy resources used as raw material (PERE)		MJ, net calorific value
Use of non-renewable primary energy resources used as raw material (PENRM)		MJ, net calorific value
Use of renewable primary energy resources used as raw material (PERM)		MJ, net calorific value
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) (PENRT)		MJ, net calorific value
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) (PERT)		MJ, net calorific value
Net use of fresh water (FW)		m^3
Use of secondary raw materials (MS)		kg

[1] *Disclaimer: The results of this environmental impact indicator shall be used with care as uncertainties on these results are high or as is limited experienced with the indicator*

Use of renewable secondary fuels (RSF)	MJ
Use of non-renewable secondary fuels (NRSF)	MJ
WASTE PRODUCTION DESCRIPTIVE PARAMETERS	
Hazardous landfill waste (HWD)	kg
Non-hazardous waste disposed (NHWD)	kg
Radioactive waste disposed (RWD)	kg
Materials for energy recovery (MER)	kg
Material for recycling (MFR)	kg
Components for reuse (CRU	kg
Exported thermal energy (ETE)	MJ, net calorific value
Exported electricity energy (EEE)	MJ, net calorific value

Cut-off

In accordance with the PSR EPDItaly018 and the PCR EPDItaly007, the cut-off criteria is followed as described below:

- All inputs and outputs to a (unit) process are included in the calculation for which data is available. Data gaps may be filled by conservative assumptions with average or generic data. Any assumptions for such choices are documented.
- According to PCR, data for elementary flows to and from the product system contributing to a minimum of 99% of the declared environmental impacts are included.

All processes for which data are available were considered, even if they contribute less than 1%. Cut-off was applied only to the production and use of the packaging of components and semi-finished intermediates and material and energy flows related to dismantling phase, because it is reasonable to assume that dismantling is performed by adopting manual tools (e.g. screwdrivers, hammers, etc.). The calculation does not include the energy and other resources required to installation and dismantle the transformer as negligibly small compared to all other factors resulting in environmental impact.

Cut-off was also applied to waste at the production stage. The production process of the transformer is based on the supply of finished components from outside the plant (transformer core, copper connecting wires, insulators, switches, gaskets, steel components such as bolts, beam supports). Other components such as aluminum wire and foil, oils, insulation paper/board imported in bulk packaging (wire and foil on spools, oils in IBC-type containers, which are reusable). Wire and foil are wound onto the core in the quantities required by the technology, and no waste of these materials is generated in the normal production cycle. Waste of this kind occurs incidentally as leftovers, batch ends, etc. Waste occurring at the production stage is incidental spills or splashes of oil during tank filling. Wastes not related to the production of transformers themselves are disposable packaging of auxiliary materials, waste from office operations, hall maintenance. Among the waste generated, the Organization also reports sludge from water-based paints. These paints are not used in the production of transformers covered in this report. An attempt was made to model and assign waste to a single transformer. The modeled waste quantities and categories were analyzed in the SimaPro tool to estimate the possible impact of that category. In all impact categories, the impact of this waste did not exceed 1%. Based on the available data: the amount of waste generated in the entire plant allocated to the masses of a single transformer, impact calculations were carried out for each impact category it was estimated that the impact in any of the models does not exceed 1%. Therefore, due to the disproportionate amount of work involved in inventorying, assigning waste to the analyzed transformers, they were dropped from further calculations on a cut-off basis.

Also excluded from the impact assessment were production, use and disposal of the packaging of components and semi-finished intermediates. 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.). Energy and devices external to the product itself required for installation.

Allocation principles

Allocation refers to the partitioning of input or output flows of a process or a product system between the product systems under study and one or more other product systems. The production of transformers carried out in this location takes place at the plant, where various types of transformers are manufactured. In addition to the analyzed MDT transformers, also SDT/LWCT transformers are also manufactured. Since measurements of electricity, heat, water, fuel consumption and generated waste are recorded for the entire plant without dividing it by the types of transformers produced, an allocation of the aforementioned utilities by transformer weight was applied.

Limitation and assumption

The production volume data underlying the allocation was assumed on the basis of the entire 2021 (for all transformers produced). This includes core-module power allocation, which has no significant impact on the value of the total environmental footprint.

Due to the lack of a model in the generic databases dealing directly with magnetic steel (silicon steel) for the core (Ustream module), the most technologically similar processes were used, which, according to the authors, also has no significant impact on the total environmental footprint.

In terms of all truck shipments, it was assumed that they take place with trucks of up to 32 t, due to the lack of detailed information.

For the Use phase, it was assumed that there are no maitenance activities as declared by the manufacturer. With regard to the Use phase, which is critical due to the amount of electricity consumption, one should keep in mind the limitations due to the variability of the energy mix over time.

5. Inventory analysis

Table 4 Description of analysed modules

Life Cycle stage	Description
Upstream module – Manufacturing stage	For the characterization of raw materials and semi-finished products entering the plant, reference was made to Ecoinvent 3.8 datasets, where possible suitably modified in order to make them more representative of the specific country of origin. The origin of the raw materials, and the consequent transport process, was modeled in a punctual manner of the components,. The distances were calculated using web tools such as Google Maps and sea route.
Core module – Manufacturing stage	The production process at the plant has been characterized by considering the following inventory flows: consumption of electricity, consumption of heat and gasoline & diesel fuel, water withdrawal and discharge, consumption of technical gases and resin, waste management. Included in the core module are the packaging materials used when transporting the transformer from the factory to the final customer. Electricity: The production plant in Lodz used electricity from external suppliers - ENEA S.A.. The supplied energy consisted of a mix of: energy covered by guarantees of origin (GO) and other electricity. Some of the energy was covered by guarantees of origin (GO) as energy obtained from renewable sources. The source of energy declared in the GO is a biomass. Based on the data, the scenario of the energy production process was modelled in SimaPro. For the energy not covered by GO the country energy mix for Poland was applied. Heat: The heat supplier (VEOLIA) produces heat in high-efficiency cogeneration using the fuel mix hard coal & biomass. Due to the this mix the process of heat production was modelled. Liquid fuels: Liquid fuels are consumed by company cars. Strict records of fuel consumption are kept. Due to the format and units of size required by SimaPro for LCA, distance indicators per UD have been calculated.
Downstream - Distribution	For the definition of the distribution processes, the actual distances were taken from the PCR. All products are intended for the Italian market.
Downstream – Use	Quantification of losses during the use phase was performed in accordance with the reference PCR by applying the equation. The total energy consumed shall be expressed in kWh and it can be computed via the following formula: $E_d[kWh] = [P_{load} * k_{load}^2 + P_{noload}] * t_{year} * RSL + P_{aux} * f_{aux} * t_{year} * RSL$ ▪ Pload is the load loss of the transformer at 75 °C reference temperature at nominal power. It is expressed in kW; ▪ Kload represents an average load factor for the equipment. For calculations based on this PCR, 70% of nominal power shall be adopted; ▪ Pnoload is the power dissipated in case no losses shall occur. It is expressed in kW; ▪ Paux is the power loss due to auxiliary activities at no load (such as cooling). It is expressed in kW; ▪ faux represents the fraction of time in which ancillary equipment is operating. It is expressed in % over 1 year; ▪ tyear is the total amount of hours during a year. For this calculation, 8 760 hours shall be considered; ▪ RSL represents the Reference Service Life, defined as 35 years for EPDs based on the PCR. The parameters Pload and Pnoload, reference was made to the design documents and test reports.

Downstream – Maintenance	According to the documentation (DTR), the transformers under review do not require maintenance or oil changes during their lifetime.
Downstream – End of Life	The transformer end-of-life modelling choices were made on the basis of what is reported in the operating manual written by the company and considering average disposal scenarios from Eurostat for Italy. The model for handling transformer dismantling residues was developed based on the type of materials: steel, aluminum, oil, etc.,

6. Environmental Impact Assessment

Calculation methods

The calculations were carried out using SimaPro 9.3.0.3 software in the LCA range of the following methods:

Table 5 Methods

Impact categories	Method
Climate change total Climate change – fossil Climate change – biogenic Climate change - land transformation Ozone depletion Photochemical ozone formation Acidification Eutrophication, freshwater Water use Resource use, fossils Resource use, minerals and metals	The methodology chosen to evaluate the potential environmental impacts of the product subject of this study includes all the impact categories required by the Standard EN 50693:2019. The models used are those shown in EN 15804 + A2: 2019, as implemented in the SimaPro software The GWP was also reported as GWP-fossil, GWP-biogenic and GWP-luluc. As required by the Standard EN 15804 + A2:2019, the temporary biogenic carbon storage due, for example, to the recycling of materials, was not taken into account. The biogenic carbon content of recycled materials was treated as an emission of biogenic CO2 from the technosphere to nature

The results of the impact assessment for each environmental category are presented in the following tables.

Disclaimer: The results of following environmental impact indicator:

- Resource use, minerals and metals
- Resource use, fossils
- Water use

shall be used with care as uncertainties on these results are high or as is limited experienced with the indicator

Table 6 Calculation results - trafo T400

Calculation:	Analyze	T400					
Results:	Impact assessment						
Product:	1 p LCA T400 Main LCA						
Method:	EN 15804 + A2 Method						
	Note: Results are reported per declared unit						
Impact category	Unit	Total	Manufacturing stage		Distribu-tion stage	Use & maitenance stage	End of Life stage Deinstalation
			Upstream module	Core module	Downstream module		
Climate change	kg CO2 eq	2,59E+05	8,19E+03	3,49E+02	4,27E+02	2,50E+05	2,44E+01
Climate change - Fossil	kg CO2 eq	2,38E+05	7,98E+03	3,95E+02	4,27E+02	2,29E+05	2,18E+01
Climate change - Biogenic	kg CO2 eq	2,06E+04	1,48E+02	-4,72E+01	3,67E-01	2,05E+04	2,56E+00
Climate change - Land use and LU change	kg CO2 eq	8,55E+01	5,51E+01	5,26E-01	1,69E-01	2,97E+01	4,63E-03
Ozone depletion	kg CFC11 eq	3,26E-02	8,74E-04	2,64E-05	9,96E-05	3,16E-02	2,39E-06
Acidification	mol H+ eq	1,11E+03	5,21E+01	2,53E+00	2,16E+00	1,06E+03	3,11E-02
Eutrophication, freshwater	kg PO4e	1,74E+02	1,11E+01	8,44E-01	8,50E-02	1,62E+02	1,78E-02
Photochemical ozone formation	kg NMVOC eq	5,46E+02	4,01E+01	1,39E+00	2,32E+00	5,02E+02	1,89E-02
Resource use, minerals and metals	kg Sb eq	7,10E-01	2,06E-01	1,62E-03	1,50E-03	5,01E-01	4,03E-05
Resource use, fossils	MJ	3,64E+06	1,15E+05	4,61E+03	6,51E+03	3,51E+06	9,58E+01
Water use	m3 depriv.	1,57E+05	2,38E+03	8,12E+01	1,95E+01	1,54E+05	2,85E+00
Resource Use Parameters							
PENRE	MJ	3,64E+06	1,15E+05	4,61E+03	6,51E+03	3,51E+06	9,58E+01
PERE	MJ	9,35E+05	1,84E+04	5,45E+03	9,17E+01	9,11E+05	4,00E+00
PENRM	MJ	1,29E+05	1,29E+05	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERM	MJ	1,02E+03	6,19E+02	4,03E+02	0,00E+00	0,00E+00	0,00E+00
PENRT	MJ	3,76E+06	2,44E+05	4,61E+03	6,51E+03	3,51E+06	9,58E+01
PERT	MJ	9,36E+05	1,90E+04	5,86E+03	9,17E+01	9,11E+05	4,00E+00
FW Freshwater	m3	4,24E+03	1,15E+02	6,81E+00	6,78E-01	4,11E+03	7,15E-02
MS	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Waste Production Parameters							
Hazardous waste (HWD)	kg	2,05E+02	3,09E+01	7,22E-01	2,96E-01	5,11E+01	0,00E+00
Non-hazardous waste disposed (NHWD)	kg	2,72E+05	1,49E+04	1,14E+03	4,59E+02	2,55E+05	1,91E+02
Radioactive waste disposed (RWD)	kg	3,31E+02	8,39E+00	1,19E-01	1,63E-01	3,23E+02	0,00E+00
Materials for energy recovery (MER)	kg	1,19E+02	0,00E+00	0,00E+00	2,59E+01	0,00E+00	9,32E+01
Material for recycling (MFR)	kg	1,41E+03	0,00E+00	0,00E+00	1,20E+00	0,00E+00	1,41E+03
Components for reuse (CRU)	kg	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	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported electricity energy (EEE)	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

Table 7 Calculation results - trafo T400B

Calculation:	Analyze	T400B					
Results:	Impact assessment						
Product:	**1 p LCA T400B Main LCA**						
Method:	EN 15804 + A2 Method						
	Note: Results are reported per declared unit						
Impact category	**Unit**	**Total**	**Manufacturing stage**		**Distribu-tion stage**	**Use & maitenance stage**	**End of Life stage Deinstalation**
			Upstream module	**Core module**	**Downstream module**		
Climate change	kg CO2 eq	2,58E+05	7,74E+03	3,49E+02	4,27E+02	2,49E+05	2,44E+01
Climate change - Fossil	kg CO2 eq	2,37E+05	8,00E+03	3,95E+02	4,27E+02	2,28E+05	2,19E+01
Climate change - Biogenic	kg CO2 eq	1,96E+04	-8,13E+02	-4,72E+01	3,67E-01	2,05E+04	2,57E+00
Climate change - Land use and LU change	kg CO2 eq	5,77E+02	5,47E+02	5,26E-01	1,69E-01	2,96E+01	4,64E-03
Ozone depletion	kg CFC11 eq	3,23E-02	6,76E-04	2,64E-05	9,96E-05	3,15E-02	2,40E-06
Acidification	mol H+ eq	1,11E+03	5,57E+01	2,53E+00	2,16E+00	1,05E+03	3,12E-02
Eutrophication, freshwater	kg PO4e	1,74E+02	1,12E+01	8,44E-01	8,50E-02	1,62E+02	1,78E-02
Photochemical ozone formation	kg NMVOC e	5,38E+02	3,36E+01	1,39E+00	2,32E+00	5,01E+02	1,89E-02
Resource use, minerals and metals	kg Sb eq	7,06E-01	2,02E-01	1,62E-03	1,50E-03	5,00E-01	4,04E-05
Resource use, fossils	MJ	3,61E+06	9,96E+04	4,61E+03	6,51E+03	3,50E+06	9,60E+01
Water use	m3 depriv.	1,57E+05	2,48E+03	8,12E+01	1,95E+01	1,54E+05	2,85E+00
Resource Use Parameters							
PENRE	MJ	3,61E+06	1,00E+05	4,61E+03	6,51E+03	3,50E+06	9,60E+01
PERE	MJ	9,45E+05	3,04E+04	5,45E+03	9,17E+01	9,09E+05	4,00E+00
PENRM	MJ	9,96E+04	9,96E+04	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERM	MJ	1,31E+04	1,27E+04	4,03E+02	0,00E+00	0,00E+00	0,00E+00
PENRT	MJ	3,71E+06	2,00E+05	4,61E+03	6,51E+03	3,50E+06	9,60E+01
PERT	MJ	9,58E+05	4,31E+04	5,86E+03	9,17E+01	9,09E+05	4,00E+00
FW Freshwater	m3	4,24E+03	1,25E+02	6,81E+00	6,78E-01	4,10E+03	7,17E-02
MS	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Waste Production Parameters							
Hazardous waste (HWD)	kg	2,05E+02	3,05E+01	7,22E-01	2,96E-01	5,10E+01	0,00E+00
Non-hazardous waste disposed (NHWD)	kg	2,71E+05	1,47E+04	1,14E+03	4,59E+02	2,54E+05	1,92E+02
Radioactive waste disposed (RWD)	kg	3,30E+02	7,84E+00	1,19E-01	1,63E-01	3,22E+02	0,00E+00
Materials for energy recovery (MER)	kg	1,19E+02	0,00E+00	0,00E+00	2,59E+01	0,00E+00	9,35E+01
Material for recycling (MFR)	kg	1,42E+03	0,00E+00	0,00E+00	1,20E+00	0,00E+00	1,41E+03
Components for reuse (CRU)	kg	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	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported electricity energy (EEE)	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

Table 8 Calculation results - trafo T600

Calculation:	Analyze	T600					
Results:	Impact assessment						
Product:	**1 p LCA T600 Main LCA)**						
Method:	EN 15804 + A2 Method						
	Note: Results are reported per declared unit						
Impact category	Unit	Total	Manufacturing stage		Distribu-tion stage	Use & maitenance stage	End of Life stage Deinstalation
			Upstream module	Core module	Downstream module		
Climate change	kg CO2 eq	3,63E+05	1,14E+04	4,69E+02	5,78E+02	3,50E+05	3,29E+01
Climate change - Fossil	kg CO2 eq	3,33E+05	1,11E+04	5,25E+02	5,77E+02	3,21E+05	2,93E+01
Climate change - Biogenic	kg CO2 eq	2,89E+04	1,94E+02	-5,65E+01	4,96E-01	2,88E+04	3,62E+00
Climate change - Land use and LU change	kg CO2 eq	1,27E+02	8,43E+01	6,81E-01	2,29E-01	4,16E+01	6,20E-03
Ozone depletion	kg CFC11 eq	4,57E-02	1,22E-03	3,45E-05	1,35E-04	4,43E-02	3,20E-06
Acidification	mol H+ eq	1,56E+03	7,44E+01	3,38E+00	2,93E+00	1,48E+03	4,17E-02
Eutrophication, freshwater	kg PO4e	2,44E+02	1,55E+01	1,14E+00	1,15E-01	2,27E+02	2,38E-02
Photochemical ozone formation	kg NMVOC eq	7,65E+02	5,54E+01	1,85E+00	3,14E+00	7,05E+02	2,53E-02
Resource use, minerals and metals	kg Sb eq	1,00E+00	2,93E-01	2,09E-03	2,03E-03	7,04E-01	5,40E-05
Resource use, fossils	MJ	5,10E+06	1,61E+05	6,09E+03	8,80E+03	4,93E+06	1,28E+02
Water use	m3 depriv.	2,20E+05	3,37E+03	1,07E+02	2,64E+01	2,17E+05	3,82E+00
Resource Use Parameters							
PENRE	MJ	5,10E+06	1,61E+05	6,09E+03	8,80E+03	4,93E+06	1,28E+02
PERE	MJ	1,31E+06	2,74E+04	7,27E+03	1,24E+02	1,28E+06	5,35E+00
PENRM	MJ	1,79E+05	1,79E+05	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERM	MJ	1,29E+03	8,35E+02	4,58E+02	0,00E+00	0,00E+00	0,00E+00
PENRT	MJ	5,28E+06	3,40E+05	6,09E+03	8,80E+03	4,93E+06	1,28E+02
PERT	MJ	1,31E+06	2,82E+04	7,73E+03	1,24E+02	1,28E+06	5,35E+00
FW Freshwater	m3	5,95E+03	1,69E+02	9,14E+00	9,18E-01	5,77E+03	9,59E-02
MS	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Waste Production Parameters							
Hazardous waste (HWD)	kg	2,80E+02	4,06E+01	8,98E-01	3,98E-01	7,18E+01	0,00E+00
Non-hazardous waste disposed (NHWD)	kg	3,81E+05	2,09E+04	1,54E+03	6,17E+02	3,57E+05	2,59E+02
Radioactive waste disposed (RWD)	kg	4,65E+02	1,19E+01	1,55E-01	2,18E-01	4,53E+02	0,00E+00
Materials for energy recovery (MER)	kg	1,56E+02	0,00E+00	0,00E+00	2,93E+01	0,00E+00	1,26E+02
Material for recycling (MFR)	kg	1,91E+03	0,00E+00	0,00E+00	1,20E+00	0,00E+00	1,91E+03
Components for reuse (CRU)	kg	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	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported electricity energy (EEE)	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

Table 9 Calculation results - trafo T600B

Calculation:	Analyze	T600B					
Results:	Impact assessment						
Product:	**1 p LCA T600B Main LCA**						
Method:	EN 15804 + A2 Method						
	Note: Results are reported per declared unit						
Impact category	**Unit**	**Total**	**Manufacturing stage**		**Distribu-tion stage**	**Use & maitenance stage**	**End of Life stage Deinstalation**
			Upstream module	**Core module**	**Downstream module**		
Climate change	kg CO2 eq	3,59E+05	1,07E+04	4,69E+02	5,78E+02	3,47E+05	3,30E+01
Climate change - Fossil	kg CO2 eq	3,31E+05	1,11E+04	5,25E+02	5,77E+02	3,18E+05	2,94E+01
Climate change - Biogenic	kg CO2 eq	2,73E+04	-1,16E+03	-5,65E+01	4,96E-01	2,85E+04	3,63E+00
Climate change - Land use and LU change	kg CO2 eq	8,19E+02	7,77E+02	6,81E-01	2,29E-01	4,13E+01	6,22E-03
Ozone depletion	kg CFC11 eq	4,50E-02	9,32E-04	3,45E-05	1,35E-04	4,39E-02	3,21E-06
Acidification	mol H+ eq	1,55E+03	7,93E+01	3,38E+00	2,93E+00	1,47E+03	4,18E-02
Eutrophication, freshwater	kg PO4e	2,42E+02	1,56E+01	1,14E+00	1,15E-01	2,25E+02	2,39E-02
Photochemical ozone formation	kg NMVOC eq	7,49E+02	4,61E+01	1,85E+00	3,14E+00	6,98E+02	2,54E-02
Resource use, minerals and metals	kg Sb eq	9,91E-01	2,89E-01	2,09E-03	2,03E-03	6,98E-01	5,41E-05
Resource use, fossils	MJ	5,04E+06	1,39E+05	6,09E+03	8,80E+03	4,88E+06	1,29E+02
Water use	m3 depriv.	2,18E+05	3,52E+03	1,07E+02	2,64E+01	2,15E+05	3,83E+00
Resource Use Parameters							
PENRE	MJ	5,04E+06	1,39E+05	6,09E+03	8,80E+03	4,88E+06	1,29E+02
PERE	MJ	1,32E+06	4,42E+04	7,27E+03	1,24E+02	1,27E+06	5,36E+00
PENRM	MJ	1,39E+05	1,39E+05	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERM	MJ	1,83E+04	1,79E+04	4,58E+02	0,00E+00	0,00E+00	0,00E+00
PENRT	MJ	5,18E+06	2,78E+05	6,09E+03	8,80E+03	4,88E+06	1,29E+02
PERT	MJ	1,34E+06	6,21E+04	7,73E+03	1,24E+02	1,27E+06	5,36E+00
FW Freshwater	m3	5,92E+03	1,82E+02	9,14E+00	9,18E-01	5,72E+03	9,62E-02
MS	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Waste Production Parameters							
Hazardous waste (HWD)	kg	2,79E+02	4,01E+01	8,98E-01	3,98E-01	7,12E+01	0,00E+00
Non-hazardous waste disposed (NHWD)	kg	3,78E+05	2,06E+04	1,54E+03	6,17E+02	3,54E+05	2,61E+02
Radioactive waste disposed (RWD)	kg	4,60E+02	1,12E+01	1,55E-01	2,18E-01	4,49E+02	0,00E+00
Materials for energy recovery (MER)	kg	1,56E+02	0,00E+00	0,00E+00	2,93E+01	0,00E+00	1,27E+02
Material for recycling (MFR)	kg	1,92E+03	0,00E+00	0,00E+00	1,20E+00	0,00E+00	1,92E+03
Components for reuse (CRU)	kg	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	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported electricity energy (EEE)	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

7. Additional environmental information

HITACHI ENERGY POLAND provides products, systems and service solutions that not only enhance customers businesses. In operations, improving environmental performance is an ongoing effort. For the environmental issues identified as material to HITACHI ENERGY POLAND operations, company have put in place enterprise-wide policies and programs to reduce energy, water and materials use, maximize waste recycling, eliminate hazardous materials and streamline logistics and packaging. Company's specialists work to implement programs and to ensure that our facilities comply with ISO and OHSAS standards to manage environmental and health and safety risks. The principles of risk reduction and continuous improvement are also reflected in approach to product development. Sharing best practice and partnering on sustainability issues is key to company's approach. HITACHI ENERGY POLAND collaborate with customers, suppliers, external organizations and educational institutions to help HITACHI ENERGY POLAND implement effective programs.

https://www.hitachi.com/environment/index.html

https://www.hitachi.com/sustainability/index.html

Hitachi, as a manufacturer of transformers, has implemented management systems certified by appropriate certificates:

- ISO 9001:2015 Certficate Registr. No 0198 100 1941401 by TUV Rheinland valid until 24.10.2025
- ISO 14001:2015 Certficate Registr. No 0198 104 1941402 by TUV Rheinland valid until 24.10.2025
- ISO 45001:2018 Certficate Registr. No 01 213 1941403 by TUV Rheinland valid until 24.10.2025

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