SIEMENS ENERGY S.A.S

ENVIRONMENTAL PRODUCT DECLARATION

PRODUCT NAME

Power Tranformer – 5MVA
110356 CALC 10153

SITE PLANT

Autopista Medellín km 85,
Tenjo, Cundinamarca,
Colombia

In accordance with EN 50693:2019 and ISO 14025:2010

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GENERAL INFORMATION

EPD Owner	Siemens Energy S.A.S. https://new.siemens.com/co/es.html
Location of the production site	Autopista Medellín km 85, Tenjo, Cundinamarca, Colombia
Company Contact	Mónica Paola Mejía Lozano
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Declared Products	TRANSFORMADOR 5MVA Código 110356 CALC 10153
CPC code	46121 Electrical transformers
Indipendent Verification	This declaration has been developed referring to EPDItaly, following the 'Regolamento di EPDItaly"; further information and the document itseld are available at: www.epditaly.it. EPD document valid within the following geographical area: Colombia. Independent verification of the declaration and data carried out according to ISO 14025:2010. Internal () External (x) Third-party verification carried out by: SGS Italia S.p.A. Via Caldera, 21 Milan, Lombardy, 20153, Italy t:+39 02 73 931 / https://www.sgsgroup.it Accredited by: ACCREDIA ACCREDITATION N. 006H
Reference documents	EN 50693:2019 – Product category rules for life cycle assessment of electronic and electrical products and systems Regolamento del programma EPDItaly rev.5
Reference PCRs	EPDItaly007 – PCR for Electronic and electrical products and systems, Rev. 2, 2020/10/21 EPDItaly018 – Electronic and electrical products and systems – Power transformers, Rev. 3.5, 2021/12/13
Technical support	Gaia Servicios Ambientales S.A.S. BIC info@gaiasa.com; careiza@gaiasa.com www.gaiasa.com
Accountability	Siemens Energy S.A.S relieves EPDItaly from any non-compliance with environmental legislation. The holder of the declaration will be responsible for the infromation and supporting evidence; EPDItaly declines all responsibility for the manufacter´s information, data and results of the life cycle assessment.
Comparability	EPDs published within the same product category, though originating from different programs, may not be comparable. Full conformance with a PCR allows the comparability of EPD only when all stages of a life cycle have been considered. However, variations and deviations are possible.
Liability	EPDItaly declines any responsibility regarding the manufacturer's information, data, and results of the life-cycle assessment.
EPD Type	Product EPD: declaration concerning a specific product by a specific manufacturer

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1. Company information

Siemens Energy is a global team of more than 91.000 dedicated employees working to meet the growing demand for energy, seeking to ensure that the climate is protected. In its strategy, it has in mind sustainability, decarbonization, innovation focused on future technologies, and the transformation between future-focused offerings, portfolio, and mindset. Siemens Energy is present in 90 countries, with the commitment to make sustainable, reliable, and affordable energy possible.

Siemens is setting the course for long-term value creation through accelerated growth and increased profitability with a simplified and more agile business structure. The next generation of Siemens will be inspired by its purpose and will be connected by its Ownership Culture. The main goal of the company's Vision 2020+ strategy is to give individual businesses of Siemens significantly greater entrepreneurial freedom under the strong Siemens brand to focus their attention on their respective markets.

Siemens in Colombia, hereinafter SIEMENS ENERGY S.A.S., has a production plant located on the Medellin Km 85 highway, Tenjo Cundinamarca, whose specialty is the design, manufacturing, and supply of transformers for networks of power generation, transmission, and distribution of energy, including system of renewable energy and has a capacity to produce more than 3.400 MVA per year and is considered one of the most productive Siemens factories worldwide.

As a global energy company, SIEMENS ENERGY S.A.S. has the potential and capabilities to shape the energy transition, taking advantage of the vast business opportunities arising from public and private investments. This will allow to promote the achievement of the ODS together with its clients and partners.

Companies like SIEMENS ENERGY S.A.S. seek to develop strategies that allow the same to reduce the environmental impacts of its products and communicate the progress to their stakeholders. To achieve this objective, it is essential to carry out a life cycle analysis that allows identifying the points where the greatest impact is concentrated and thus defining specific strategies that allow the elimination, prevention, or mitigation.

1.1. Productive process

The SIEMENS ENERGY S.A.S. transformer production process includes the manufacture of all the constituent parts of the transformer in the phases of: Cores, Insulation, Tanks (metalworking) and Coils. Additionally, phases are executed in the process for quality analysis of raw materials and product performance tests.

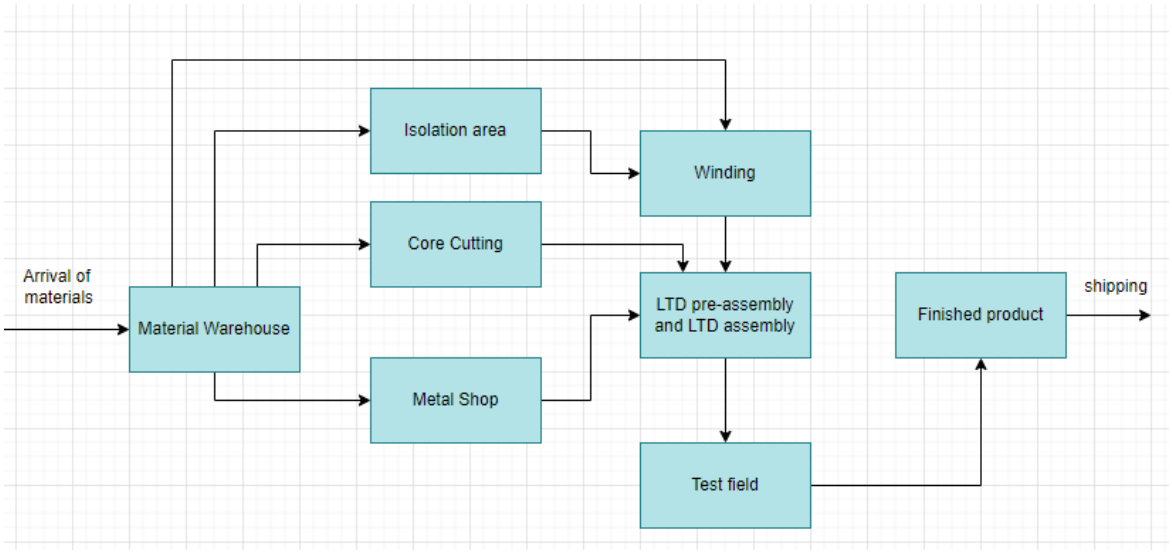

Figure 1 Productive process 5MVA transformer

Cores: the nobs and asparagus are cut according to the required width and go to pre-assembly.

Insulation: The insulation is manufactured by using mainly pressed cardboard and laminated wood. Once cut, pressed, and finished, the insulation kit goes to the horizontal coils.

Metalworking: the cutting and bending of sheets and tubes, the preparation of surfaces and welding are carried out to manufacture the tanks. Paint and coating are applied to protect against corrosive agents and curing is carried out. The tank goes through the encube and armed process.

Coils: there is equipment for horizontally winding copper according to the number of turns required by the coil; the insulation kit is attached to protect the coil, and the coils are cured for moisture extraction.

Pre-assembly: the components of the transformer from the sub-processes are assembled.

assembled: the tank is joined to the transformer to achieve the final assembly. Uninhibited oil is added. Prior to release, the transformer goes through a testing field.

Finally, the marking of the transformer and the packaging in crates is carried out.

2. Declaration purpose

This is an environmental product declaration for the specific 5MVA electrical power transformer code 110356 calc 10153 produced by SIEMENS ENERGY S.A.S., prepared from the Life Cycle Assessment (LCA) of the product and reported following the guidelines of the Product Category Rules EPDItaly 007 Electronic and electrical products and systems. Classification: UN CPC 46121

3. Product Description

The main function of the transformer is to modify the voltage and the intensity of the current between two electrical circuits. This product is classified as an "electrical transformer" or "transformer" according to CPC 46121. The nominal power of the equipment is 5MVA, which means that it is a high voltage transformer, being in the range of 3 to 300MVA. It is an ONAN transformer, that is, the circulation of the oil occurs naturally, and cooling is by air naturally, as well.

3.1. Technical characteristics

Table 1. Declaration of the content of the products by declared unit

Material	ID	Weight (kg)	Input
Steel in different alloys	M-100	8.610,58	48,86%
Uninhibited oil	M-410	5.779,41	32,79%
Copper and bronze	M-121	2.777,80	15,76%
Wood	M-340	114,38	0,65%
Pressed paperboard	M-341	302,45	1,72%
Plastic	M-258 / M-320	38,37	0,22%

Unhibited oil is a hazardous substance according to the safety datasheet, in Table 2 is presented the chemical composition and its classification under Regulation (EC) No 1907/2006 (REACH) and Regulation (EC) No 1272/2008.

Table 2. Chemical composition of hazardous substances

Material	Compounds	%	N° CE	N° CAS	Regulation (EC) No 1907/2006 (REACH)	Regulation (EC) No 1272/2008
Unhinibited oil	Distillates (petroleum), hydrotreated light naphthenic	50-70	265-156-6	64742-53-6	Carcinogenic substance category 1	Carc 1B
	Distillates (petroleum), hydrotreated light paraffinic	0-50	265-158-7	64742-55-8	Carcinogenic substance category 1	Carc 1B
	Lubricating oils (petroleum), C15-30, hydrotreated neutral oil-based;	0-50	276-737-9	72623-86-0	Carcinogenic substance category 1	Carc 1B

3.2. LCA Methodology

The life cycle assessment was created in accordance with ISO 14040 and ISO 14044 standards. This statement was prepared following the guidelines of PCR EPDItaly 007, Sub-PCR EPDItaly 018, EN 50693:2019 and related standards, where the limits of the system are established. Environmental impact indicators were determined by using the characterization factors and impact assessment methods as stated in EN 15804:2012+A2:2019. The data provided by SIEMENS ENERGY S.A.S. they refer to the year 2022 and cover the main processes (Core), and primary information was obtained from the place of origin of the raw materials that belongs to an Upstream process. The primary information covers the consumption and transportation of raw materials and auxiliary materials, the consumption of energy used in the production and logistics processes, emissions to air and water, as well as the internal transportation of the finished product. The secondary information was used in Upstream processes such as the extraction of raw materials and production of auxiliary materials, electricity generation, and combustion emissions not reported in the primary information, after the transformer is manufactured, the distribution, use and disposal at the end of the life cycle (Downstream).

3.3. Declared Unit

The definition of a declared unit in the life cycle analysis allows to provide a reference that relates the input and output data. According to the PCR, a reference period of 35 years must be considered with a nominal power of 5MVA; therefore, the declared unit is the 5MVA Transformer code 110356 calc 10153 operating for 35 years.

In addition, the PCR contemplates that, to facilitate the comparison with other studies, the results can be scaled to a unit of transformed energy (1MVA) in 35 years of operation, therefore, in this study the results for this declared unit are also presented in the Additional information section.

3.4. Limits of the system

Limits of the system the analysis is done from the cradle to the grave.

Geographic limits: global (upstream stage), production process and use of the product in Colombia.

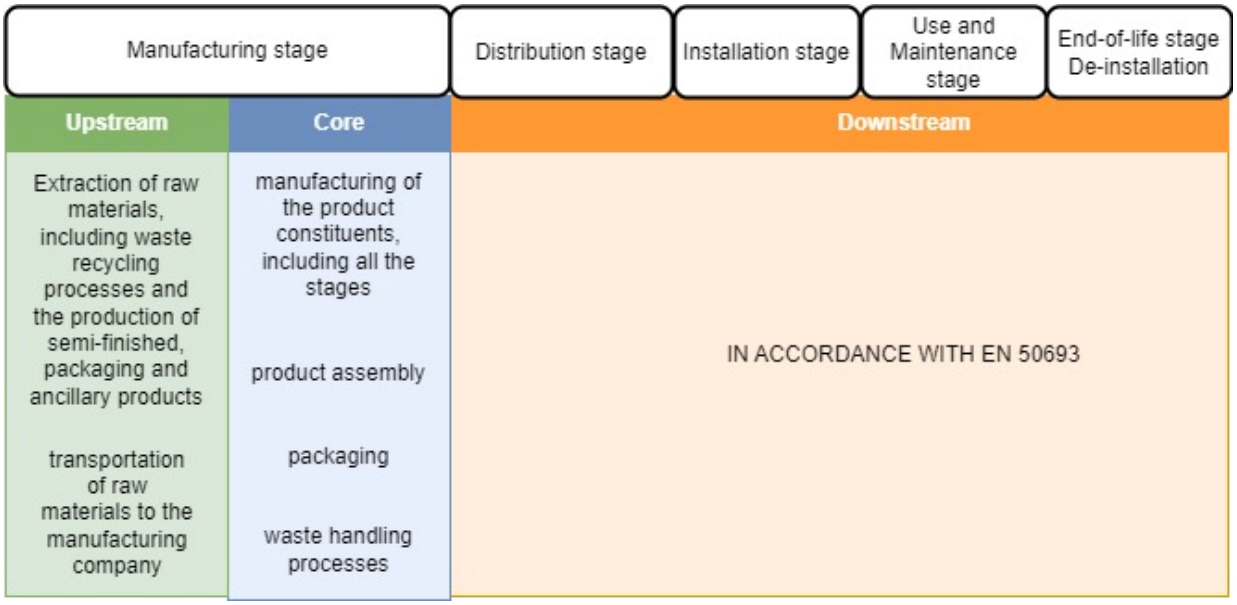

Figure 2. Stages of Life Cycle of the 5MVA Transformer

MANUFACTURING

Upstream – Extraction of raw materials: The emissions of all the materials necessary for the production of the transformer are included. Some arrive at the SIEMENS ENERGY S.A.S. plant and they are incorporated into the transformer without processing, while others must be machined before assembly.

Upstream - Transportation of raw materials: Emissions associated with the transportation of raw materials are calculated using the weight and distance method. For imported raw materials, the weight and place of origin are known, therefore, transport emissions are calculated considering the distance traveled by land in the country of origin, transoceanic (from the port of origin to the port in Colombia) and by land in Colombia (from the port to Tenjo, Cundinamarca). These distances were taken from the SeaRates application. For raw materials of national origin, the weight is known and a distance of 1.000 km is assumed between the supplier and the SIEMENS ENERGY S.A.S. plant. since it is the maximum distance at which the providers could be located.

A sensitivity analysis was carried out assuming three different distances: 1.000 km, 500 km and 200km; the percentage of variation between these scenarios is less than 0,02% regarding climate change indicator.

Core - Production: Emissions from all the stages of the process of production, derived from the consumption of electrical energy in the equipment, liquefied petroleum gas in furnaces and the generation of waste, are included.

DOWNSTREAM

Distribution: The transport of the transformer from the plant to the installation site is modeled considering the weight and the distance of the trip/travel. Given that two 5MVA transformers have been manufactured until now and were installed in cities located 45 km away from the plant, this distance is assumed. A

sensitivity analysis was carried out regarding a conservative scenario, and the results have a difference of 0,26%, then it is not relevant for the assessment.

Installation: The waste generated during the installation is considered; they are the materials used for packaging, that is, the crates. In the installation stage there is no consumption of electricity or raw materials since the oil is incorporated into the transformer during the stage of production.

Use and maintenance: In this stage there is a consumption of electrical energy and load losses are generated, due to the impedance of the winding, and no-load losses due to the active power absorbed by the transformer when the machine is energized, and the secondary circuit is open. Energy losses are considered for 35 years of useful life with a charge factor of 70% based on the sub-PCR.

During the useful life of the transformer, it is not necessary to replace the oil or parts, if proper use and maintenance is made, since said parts are designed for a useful life of more than 35 years. The packing can be replaced before the age of 35, however, the weight is less than 4kg, so the impacts are insignificant for the study.

Transformer maintenance is modeled by estimating the energy consumption of the activities indicated in the supervision and maintenance work scheme.

A scenario is assumed where the transformer requires the replacement of 10% of the dielectric oil, the impacts of oil production and the end of life of the replaced oil are taken into account.

End of life: The transportation of the transformer at the end of its useful life from the installation site to the final disposal site is considered, assuming a distance of 60 km.

The following scenario is assumed:

1. According to the manual of the equipment indicates that all materials, except for wood and paper, are recycled. In addition, according to the main transformer waste managers in Colombia, they make a disassembly and then a use of the material.

2. According to the inventories available in Ecoinvent 3.7.1. for the final disposal of each type of material that makes up the transformer, which are listed in Table 2. The inventories used are presented in Table 7, as “market for waste”.

A sensitivity analysis is carried out between the two scenarios and a difference of 1.3% is found, therefore scenario #1 is assumed in the final model.

3.5. Data quality

For the production stage there are primary data, which were collected in cooperation between SIEMENS ENERGY S.A.S. and Gaia Servicios Ambientales.
The secondary information used is for the raw material extraction stage, where the required quantities are known, but the processes to obtain each of them are modeled, using the database available in Ecoinvent V3.7.1.

3.6. Assumptions

- The packaging is taken to final disposal; the data set available in Ecoinvent 3.7.1 is selected. for final disposal in Colombia of wood, which consists of 75% sanitary landfill, 20% open-air dump and 5% open-air burning.
- The consumption of electrical energy in the production stage is estimated considering the power of the equipment and the working time, which is assumed to be 21 hours a day (3 shifts of 7 effective hours each one).
- The GHG emissions from LPG combustion were modeled according to the information published by the UPME (Colombian Mining and Energy Planning Department). Other emissions as PM, TOC, NOx, CO were modeled using information published by the Environmental Protection Agency (EPA). SO2 emissions were not considered, because the estimation is only applicable to boilers.
- The distance from the installation site to the final disposal sites is assumed to be 60 km, as this is the maximum distance from the main cities of Colombia to the sanitary landfill.
- For the transportation of raw materials produced in Colombia a distance of 1,000km is assumed, as it is the distance from Tenjo to the farthest city with high industrial activity (Barranquilla).
- For the emissions due to use, according to the PCR, a useful life of 35 years and continuous operation of 24 hours a day, 365 days a year are assumed. If proper use of the transformer is made, the dielectric oil does not require to be replaced. However, a scenario is assumed where it is required to replace 10% of dielectric oil.

3.7. Limitations

The limitations of the study are the following:

- The study does not consider impacts related to administrative activities, lighting, use of web services, use of sanitary units. These impacts are not counted because their contribution to the study is minimal, and the PCR establishes that they can be excluded under this condition.
- Emissions associated with the manufacturing of the machinery and equipment present throughout the life cycle phases are also excluded. This is because the impact of an industrial machine divided by the declared unit of the study is negligible. Within the limits of the study according to the PCR, it is possible to exclude them.

3.8. Cut-off rules

The data included in the input flows for matter and energy contribute to 99% of the raw materials and processes, in this way the environmental impacts are the closest to the reality of the process. Emissions from activities such as forklifts to transport internal raw materials, electric power for conveyor belts and overhead crane, uses of water for testing, electrical energy and water consumed in administrative processes, manufacture of machinery and equipment used in production are not included.

3.9. Database and software used

For the creation of this life cycle analysis, Ecoinvent 3.7.1 was used as the main database, and it was developed in the Umberto LCA+ Software.

3.10. Reference useful life

According to the PCR, the reference useful life of the transformer is 35 years.

3.11. Temporary representativeness

The primary data for the study year is 2022.

4. Environmental performance

The evaluation of impacts in the life cycle of the 5MVA Transformer produced by SIEMENS ENERGY S.A.S. It was carried out using the Umberto LCA+ software, a software developed by the Ifu Hamburg Institute in Germany, and which contains different methods for assessing environmental impacts in the life cycle. Estimated impact results are only relative statements that do not indicate impact category endpoints or exceed thresholds, safety margins, or risks.

All the results are presented in terms of the declared unit: a 5MVA transformer operating for 35 years.

4.1. Environmental Impacts

Table 3. Environmental impacts 5MVA transformer – 35 years

PARAMETER		UNIT	Manufacturing		Distribution	Installation	Use and Maintenance	End of life	TOTAL
			Upstream	Core	Downstream				
Global warming potential (GWP)	Total	kg CO_2 eq.	62.105,68	117.130,99	3.033,19	93,00	1.041.183,81	403,04	1.223.949,70
	Biogenic	kg CO_2 eq.	492,79	1.337,70	1,01	83,75	215.922,29	0,20	217.837,75
	Land use and land use change	kg CO_2 eq.	76,66	670,20	1,26	0,00	133.076,29	2,05	133.826,46
	Fossil	kg CO_2 eq.	61.536,22	115.123,09	3.030,92	9,25	692.185,23	400,78	872.285,50
Depletion depletion (ODP)		kg CFC 11 eq.	9,37E-03	2,83E-02	6,59E-04	1,81E-06	6,66E-02	5,53E-05	0,10
Acidification potential (AP)		mol H+ eq	2.599,90	277,69	15,39	0,10	2.814,37	1,93	5.709,38
Eutrophication potential (EP)		kg P eq	145,27	1,97	0,23	4,92E-03	72,42	0,09	219,98
Photochemical ozone formation (POCP)		kg NMVOC eq	571,89	232,21	16,21	0,21	1.455,30	2,11	2.277,93
Depletion of Abiotic Resources – minerals and metals (ADP-minerals&metals)		kg Sb eq.	63,19	3,10E-02	1,07E-02	2,25E-05	4,21E-01	1,21E-03	63,66
Depletion of Abiotic Resources – fossil fuels (ADP-fossil)		MJ, net calorific value	1.014.833,45	1.705.743,76	44.206,02	119,01	9.203.093,29	5.159,36	11.973.154,89
Water use (WDP)		m^3 eq.	37.762,82	7.486,49	192,63	1,21	842.363,28	71,58	887.878,01

4.2. Use of resources

Table 4. Use of resources 5MVA transformer – 35 years.

PARAMETER		UNIT	Manufacturing		Distribution	Installation	Use and Maintenance	End of life	TOTAL
			Upstream	Core	Downstream				
Primary energy resources – Renewable	Use as energy carrier	MJ, net calorific value	114.777,17	104.106,07	518,67	1,28	17.751.673,78	742,99	17.971.819,96
	Used as raw materials	MJ, net calorific value	9.374,04	9.204,00	0	0	0	0	18.578,04
	TOTAL	MJ, net calorific value	124.151,21	113.310,07	518,67	1,28	17.751.673,78	742,99	17.990.398,00
Primary energy resources – Non-renewable	Use as energy carrier	MJ, net calorific value	1.092.260,58	1.848.297,56	47.814,04	128,75	10.099.412,98	5.559,43	13.093.473,34
	Used as raw materials	MJ, net calorific value	0	0	0	0	0	0	0
	TOTAL	MJ, net calorific value	1.092.260,58	1.848.297,56	47.814,04	128,75	10.099.412,98	5.559,43	13.093.473,34
Secondary material		kg	0	0	0	0	0	0	0
Renewable secondary fuels		MJ, net calorific value	0	0	0	0	0	0	0
Non-renewable secondary fuels		MJ, net calorific value	0	0	0	0	0	0	0
Net use of fresh water		m^3	970,83	162,99	8,36	0,02	2.299,59	1,46	3.443,24

4.3. Waste generation

Table 5. Waste generation 5MVA transformer – 35 años

PARAMETER	UNIT	Manufacturing		Distribution	Installation	Use and Maintenance	End of life	TOTAL
		Upstream	Core	Downstream				
Hazardous waste disposed	kg	11,31	2.230,49	0,12	0,00	6,98	889,98	3.138,89

PARAMETER	UNIT	Manufacturing		Distribution	Installation	Use and Maintenance	End of life	TOTAL
		Upstream	Core	Downstream				
Non-hazardous waste disposed	kg	26.204,74	3.268,87	2.288,67	6,21	92.543,32	202,08	124.513,90
Radioactive waste disposed	kg	4,40	11,99	0,29	0,00	15,04	0,02	31,74

4.4. Outflow

Table 6. Outflow 5MVA transformer 5MVA – 35 years

PARAMETER	UNIT	Manufacturing		Distribution	Installation	Use and Maintenance	End of life	TOTAL
		Upstream	Core	Downstream				
Components for reuse	kg	0	0	0	0	0	0	0
Material for recycling	kg	0	4.052,14	0	0	0	10.947,00	14.999,14
Materials for energy recovery	kg	0	0	0	0	0	5.786,04	5.786,04
Exported energy, electricity	MJ	0	0	0	0	0	0	0
Exported energy, thermal	MJ	0	0	0	0	0	0	0

5. Additional Information

Table 7 to 10 present normalized results for 1MVA in a RSL of 35 years.

5.1. Environmental footprints

Table 7. Environmental footprints 1MVA transformer – 35 years

PARAMETER		UNIT	Manufacturing		Distribution	Installation	Use and Maintenance	End of life	TOTAL
			Upstream	Core	Downstream				
Global warming potential (GWP)	Total	kg CO_2 eq.	12.421,14	23.426,20	606,64	18,60	208.236,76	80,61	244.789,94
	Biogenic	kg CO_2 eq.	98,56	267,54	0,20	16,75	43.184,46	0,04	43.567,55
	Land use and land use change	kg CO_2 eq.	15,33	134,04	0,25	0,00	26.615,26	0,41	26.765,29
	Fossil	kg CO_2 eq.	12.307,24	23.024,62	606,18	1,85	138.437,05	80,16	174.457,10
Depletion potential of the stratospheric ozone layer (ODP)		kg CFC 11 eq.	1,87E-03	5,66E-03	1,32E-04	3,62E-07	1,33E-02	1,11E-05	2,00E-02
Acidification potential (AP)		mol H+ eq	519,98	55,54	3,08	0,02	562,87	0,39	1.141,88
Eutrophication potential (EP)		kg P eq	29,05	0,39	0,05	9,84E-04	14,48	0,02	44,00
Photochemical ozone formation (POCP)		kg NMVOC eq	114,38	46,44	3,24	0,04	291,06	0,42	455,59
Depletion of Abiotic Resources – minerals and metals (ADP-minerals&metals)		kg Sb eq.	12,64	6,20E-03	2,14E-03	4,50E-06	8,42E-02	2,42E-04	12,73
Depletion of Abiotic Resources – fossil fuels (ADP-fossil)		MJ, net calorific value	202.966,69	341.148,75	8.841,20	23,80	1.840.618,66	1.031,87	2.394.630,98
Water use (WDP)		m^3 eq.	7.552,56	1.497,30	38,53	0,24	168.472,66	14,32	177.575,60

5.2. Use of resources

Table 8. Use of resources 1MVA transformer – 35 years.

PARAMETER		UNIT	Manufacturing		Distribution	Installation	Use and Maintenance	End of life	TOTAL
			Upstream	Core	Downstream				
Primary energy resources – Renewable	Use as energy carrier	MJ, net calorific value	22.955,43	20.821,21	103,73	0,26	3.550.334,76	148,60	3.594.363,99
	Used as raw materials	MJ, net calorific value	1.874,81	1.840,80	0	0	0	0	3.715,61
	TOTAL	MJ, net calorific value	24.830,24	22.662,01	103,73	0,26	3.550.334,76	148,60	3.598.079,60
Primary energy resources – Non-renewable	Use as energy carrier	MJ, net calorific value	218.452,12	369.659,51	9.562,81	25,75	2.019.882,60	1.111,89	2.618.694,67
	Used as raw materials	MJ, net calorific value	0	0	0	0	0	0	0
	TOTAL	MJ, net calorific value	218.452,12	369.659,51	9.562,81	25,75	2.019.882,60	1.111,89	2.618.694,67
Secondary material		kg	0	0	0	0	0	0	0
Renewable secondary fuels		MJ, net calorific value	0	0	0	0	0	0	0
Non-renewable secondary fuels		MJ, net calorific value	0	0	0	0	0	0	0
Net use of fresh water		m^3	194,17	32,60	1,67	0,00	459,92	0,29	688,65

5.3. Waste generation

Table 9. Waste generation 1MVA transformer – 35 years

PARAMETER	UNIT	Manufacturing		Distribution	Installation	Use and Maintenance	End of life	TOTAL
		Upstream	Core	Downstream				
Hazardous waste disposed	kg	2,26	446,10	0,02	0,00	1,40	178,00	627,78
Non-hazardous waste disposed	kg	5.240,95	653,77	457,73	1,24	18.508,66	40,42	24.902,78

PARAMETER	UNIT	Manufacturing		Distribution	Installation	Use and Maintenance	End of life	TOTAL
		Upstream	Core	Downstream				
Radioactive waste disposed	kg	0,88	2,40	0,06	0,00	3,01	0,00	6,35

5.4. Outflow

Table 10. Outflow 1MVA transformer 5MVA – 35 years

PARAMETER	UNIT	Manufacturing		Distribution	Installation	Use and Maintenance	End of life	TOTAL
		Upstream	Core	Downstream				
Components for reuse	kg	0	0	0	0	0	0	0
Material for recycling	kg	0	810,43	0	0	0	3.115,17	3.925,59
Materials for energy recovery	kg	0	0	0	0	0	1.157,21	1.157,21
Exported energy, electricity	MJ	0	0	0	0	0	0	0
Exported energy, thermal	MJ	0	0	0	0	0	0	0

Table 11. Categories of impact for the LCA

Category of Impact / Indicator	Parameter	Units	Description
Climate change – total	Total global warming potential (GWP-total)	kg CO 2 -eq	Indicator of global warming potential due to greenhouse gas emissions into the air.
Climate change – fossil	Global Warming Potential Fossil Fuels (GWP-fossil)	kg CO 2 -eq	Indicator of the global warming potential due to greenhouse gas emissions into the air from fossil sources.

Category of Impact / Indicator	Parameter	Units	Description
Climate change – biogenic	Biogenic Global Warming Potential (GWP-biogenic)	kg CO 2 -eq	Indicator of global warming potential due to greenhouse gas emissions into the air from biogenic sources
Climate change on earth	Global warming potential land use and land use change (GWP-luluc)	kg CO 2 -eq	Indicator of the global warming potential due to emissions of greenhouse gases into the air, associated with land use and change in land use
Ozone depletion	Stratospheric Ozone Depletion Potential (ODP)	kg CFC-11-eq	Indicator of air emissions that cause the destruction of the stratospheric ozone layer.
Acidification	Acidification potential, Accumulated excess (AP)	kg mol H+	Indicator of the acidification potential of soil and water due to the release of gases such as nitrogen oxides and sulfur oxides.
Fresh water eutrophication	Eutrophication potential, fraction of nutrients reaching final freshwater compartments (EP-freshwater)	kg PO 4 -eq	Indicator of the enrichment of freshwater ecosystems with nutritional elements, due to the emission of compounds which contain nitrogen or phosphorus.
Formation of photochemical ozone	Tropospheric Ozone Formation Potential (POCP)	kg NMVOC-eq	Indicator of gas emissions that affect the creation of photochemical ozone in the lower atmosphere (smog) catalyzed by sunlight.
Depletion of abiotic resources – minerals and metals	Non-fossil abiotic resource depletion potential (ADP-minerals and metals)	kg Sb-eq	Indicator of the depletion of non-fossil natural resources.
Abiotic resource depletion – fossil fuels	Fossil Resource Depletion Potential (ADP-fossil)	MJ, net calorific value	Indicator of the depletion of fossil natural resources.
Use of water	Water shortage potential, weighted shortage of water consumption (WDP)	m 3 world eq. private	Indicator of the relative amount of water used, based on regional factors of water scarcity.

5.5. Additional environmental information

Our environmental management systems are founded on the principles and elements of the international ISO 14001 standards for energy audits. Siemens Energy has the ISO 14001:2015 certification with the following scope: design, manufacture, sale, service, and reconstruction of transformers. Certified was provided by ICONTEC (Certificate number CO-SA-CER496223-1)

6. References

- LCA Report: GAIA-INF-U1-0141-22_ACV Trafo 5MVA
- ISO 14044:2006 Environmental Managemente – Life cycle assessment - Requierements and guidelines
- ISO 14040-2006 Environmental Managemente – Life cycle assessment - Principles and framework.
- ISO 14025:2010 Environmental labels and declarations - Type III environmental declarations - Principles and procedures
- PCR EPDItaly007 – PCR for electronic and electrical product and systems
- Sub-PCR EPDItaly 018 Electronic and electrical products and systems – Power transformers
- EN 15804:2012+A2:2019: Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products
- EN 50693:2019 Product category rules for life cycle assessments of electronic and electrical products and systems.
- Regulations of the EPDItaly Programme. V5.2 (2022/02/16)
- Certification ISO 14001:2015 Siemens Energy