IMEFY S.L.

ENVIRONMENTAL PRODUCT DECLARATION

PRODUCT NAME
POWER TRANSFORMER immersed in vegtable oil with a power from 16 MVA 45 KV, 25 MVA 66 KV, 20/25 MVA 110 KV, 20/25 MVA 45 KV

SITE
Pi la Cañada, Av Siglo XXI, s/n –45470 –Los Yébenes (Toledo, Spain)

In accordance with ISO 14025 and EN 50693:2019

Program Operator	EPDItaly
Publisher	EPDItaly

Declaration Number	IMEFY04
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General information

EPD OWNER	IMEFY S.L. INDUSTRIAS MECANO ELECTRICAS FONTECHA YEBENES
MANUFACTURER ADDRESS	Pi la Cañada, Av Siglo XXI, s/n –45470 –Los Yébenes (Toledo, Spain)
Company contact	IMEFY, (+34) 925 320 300, imefy@imefy.com, https://imefy.com/en/
PROGRAM OPERATOR	EPDItaly - info@epditaly.it , via Gaetano De Castillia n° 10 - 20124 Milano, Italia
Declared product & Functional unit	FU: single POWER transformer, which transmitting electrical power from one circuit to another without changing the frequency, during a service of 35 years.
INDEPENDENT VERIFICATION	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. EPD document valid within the following geographical area: Italy and other countries worldwide according to sales market conditions Independent verification of the declaration and data carried out according to ISO 14025: 2010. ☐INTERNAL ☒EXTERNAL Third party verification carried out by: ICMQ spa Accredited by: ACCREDIA
CPC CODE	46121 “Electrical transformers”
PCR	EPDItaly007 – PCR for Electronic and Electrical Products and Systems, Rev. 2, 2020/10/21. SubPCR: EPDItaly018 – ELECTRONIC AND ELECTRICAL PRODUCTS AND SYSTEMS – POWER TRANSFORMERS, Rev 3.5, 13/12/2021.
COMPANY CONTACT	(+34) 925 320 300 · imefy@imefy.com,https://imefy.com/en/
TECHNICAL SUPPORT	Marcel Gómez Consultoría Ambiental, Barcelona, Spain
Other reference documents	EN 50693:2019 Product category rules for life cycle assessments of electronic and electrical products and systems Regulations of the EPDItaly Programme rev. 5.2 (2022/02/16)
Product RSL description	35 years
Markets of applicability	World (raw materials), Spain (production, use and end of life)
LCA study	This EPD is based on the LCA study described in the LCA report
EPD type	Product specific
EPD scope	Cradle to grave
Year of reported primary data	2021
LCA software	SimaPro 9.1.1 (2020)
LCI database	Ecoinvent v36 (2019)
LCIA methodology	EN 50693:2019
Comparability	EPDs published within the same product category, though originating from different programs, may not be comparable. Full conformance with a PCR allows EPD comparability 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.

2.INTRODUCTION

IMEFY, S.L. was founded in Los Yébenes (Toledo-Spain) in 1973 as manufacturer of dielectric liquids distribution transformers (mineral oil, synthetic or natural esters), followed a bit later by cast resin distribution transformers, being pioneer in Spain in the wake of its implantation in the year 1982 and later, the manufacturer of power transformers, reaching power ratings up to 160 MVA and voltage ratings up to 245 kV.

IMEFY has achieved these milestones thanks to the availability of the most advanced Engineering and Manufacturing resources, as well as a highly qualified team. This has allowed us to grow, with transformers installed in the five continents.

Thanks to this, IMEFY belongs to several working groups within the national and international scope, where the Regulations for this type of machinery are elaborated.

3. THE COMPANY

IMEFY Raw Materials and Final Product Laboratories are equipped with the last and higher technology in order to carry out exhaustive controls and the most in-depth tests required by National and International Standards. Given the high qualification of the human team and the high accuracy level of the instrumentation, all endorsed by the corresponding calibration certificates issued by official laboratories, IMEFY Laboratories are recognized by its clients with the highest degree of Quality and Reliability.

IMEFY Management, according to its established MISSION and VISION, has a priority aim that the products IMEFY designs, manufactures and markets meet the legal requirements, the regulations applicable to the Company, those demanded by customers and those volunteers requirements defined by itself, reaching the goal of satisfying our customers, both from the Quality Management and from the environmental sustainability framework, establishing as a commitment the protection of the environment, including the pollution prevention.

Therefore, the Management Policy is based on the global context of the Organization, which determines a Strategic Plan, developing the objectives and necessary resources to achieve the goals, based on knowledge, awareness, motivation and participation of all the staff of the Company in the activities related to the Quality and Environment Management.

To achieve this aim, the IMEFY Management establishes and documents the procedures that guarantees that the activities, processes and products developed are planned, controlled and evaluated based on prevention in management and continuous improvement.

IMEFY Management, in order to determine the leadership of the Organization and the different responsibilities, elaborates the Organizational Chart of the company where the different Management Areas are established, including R&D&I, to give greater value to prevention and thus supporting the Global Strategic Plan.

Finally, IMEFY established the need to communicate to all interested parties its Management Policy, making them participate in the performance of the management, both Quality and Environment.

IMEFY as a company dedicated to manufacture products within electrical sector, has to live up to the requirements which such a strategic sector requires. So, besides having the required levels of quality (UNE-EN-ISO 9001) and Environmental Management System (UNE-EN-ISO 14001) for over 15 years, IMEFY considers as a priority the Quality Control Plans, which allow us to make and test everything that is designed and manufactured. To do this, IMEFY dedicates the personal resources, with a highly qualified staff, as well as technical and financial resources, all of them necessary to carry out standard and voluntary operational controls.
Engineering Area of IMEFY has as its main scope the CALCULATION AND DEVELOPMENT of the different projects which will be manufactured. It is also responsible for elaboration of the TECHNICAL BIDS and serves as technical support to other areas. This Area has the necessary human resources, as graduates, high degree engineers and assistants, all of them having extensive experience in the calculation of electrical and mechanical projects, especially in the field of different types of transformers that IMEFY designs and manufactures.

IMEFY engineers are continuously updated of the latest developments and continuing advances in the field of transformers through specialized courses, active participation in technical forums, both national and international, as well as membership of Technical Committees, participating in the drafting of national and international standards, such as the AEN / CTN 207 / SC 14 AENOR or IEC (International Electrotechnical Commission) committee 14.

The Area of Engineering of IMEFY has also the collaboration and support of a high-level CONSULTANTS with an experience of over 40 years in the design and manufacture of transformers of all types and complexity (oven, traction substation, generation etc.)
Regarding TECHNICAL MEANS, we have the most modern means at the level of computer equipment, software for mechanical and electrical design from leading companies in the design sector and also software for the calculation and design of transformers of our own development based on experience of our personnel and technical staff together with the experience accumulated during more than 40 years in the manufacture of transformers.

4. LCA INFORMATION.

Functional unit: 1 transformer, during a service of 35 years, including related accessories and packaging.

Reference service life: 35 years.

PRODUCT DESCRIPTION

This EPD presents the LCA results of EACH DISTRIBUTION TRANSFORMERS IMMERSED IN MINERAL OIL with power from 16 MVA to 25 MVA and rated voltage 45kV and 110kV.

Unit (power and voltage)	Weight (kg)	Power (MVA)	Voltage (KV)
Transformer 1: 16 MVA 45 KV	37.928	16	45
Transformer 2: 25 MVA 66 KV	48.277	25	66
Transformer 3: 20/25 MVA 110 KV	50.517	20/25	110
Transformer 4: 20/25 MVA 45 KV	42.998	20/25	45

The results are representative for each of the transformers included in the EPD.

Material content

The material composition of this transformers series is shown in the following table and figures:

Product composition, in kg	16 MVA 45 KV	25 MVA 66 KV	20/25 MVA 110 KV	20/25 MVA 45
Silicon Steel*	9900	12600	14800	11800
Cooper	3300	3700	3600	3700
Copper Resin Cable	1500	2000	1800	2000
Steel Boiler*	7300	8500	9500	8000
CELLULOSE Insulation	700	800	900	700
Bakelite Switch	550	550	550	550
Si insulator Proclean	500	500	500	500
Vegtable esters	10827,91	14176,74	14567,44	11497,67
Screws	365	425	475	400
Others	2985	5025	3825	3850
Total*	37927,91	48276,74	50517,44	42997,67

*Steel used in IMEFY transformers have a content of 18% recycled and 82% virgin Steel.[1]

[1] PEFCR (Product Environmental Footprint Category Rules of the European Commission: It's considered that the steel used as construction material on the European market, contains a 18% of recycled content. This data is not coming from the supplier of steel components.

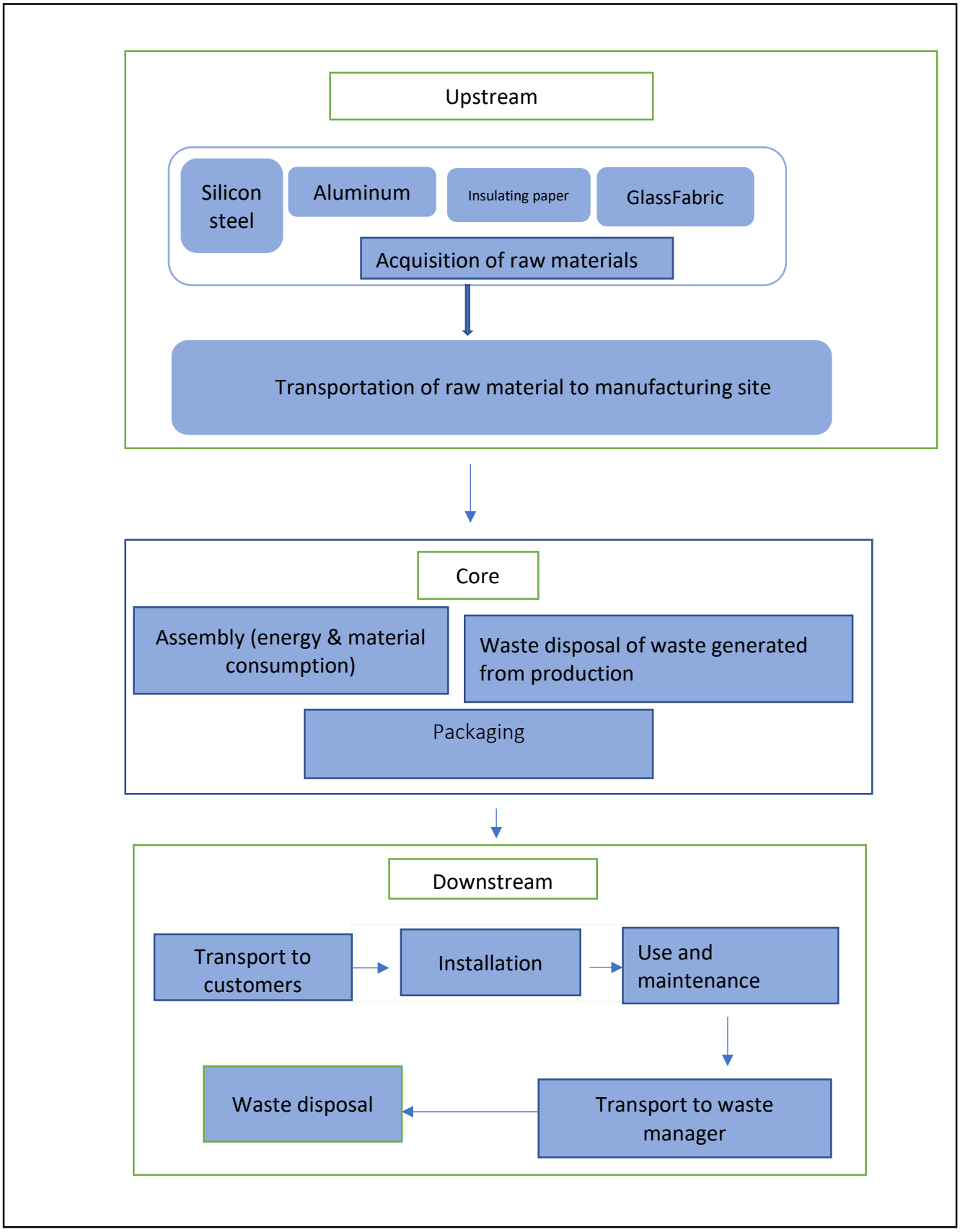
Time and geographical representativeness: data from factory (primary data) is from 2021, which is a representative production year. IMEFY manufacturing plant is based in Spain. The amount used of raw materials as well as energy consumption, waste production, pollutant emissions and transport distance have been obtained from the manufacturing plant (primary data).

Database(s) and LCA software used: generic data on the impact per unit of matter or energy have been taken to determine emissions per kg of matter, kWh of energy or tkm transported. These data have been obtained from the Ecoinvent database version 3.8, allocation cut off by classification and Simapro 9.3.0.3 Software used for the calculations. The impact models used are those indicated in EN 50693:2019

5. SYSTEM BOUNDARIES, SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION.

Description of system boundaries: From cradle to grave or “Cradle to grave”.

System diagram:



The following table shows the stages of the product life cycle and the information stages according to EN 50693 for the evaluation of electronic and electrical products and systems

<table>
<tr><th colspan="2">MANUFACTURING STAGE</th><th>DISTRIBUTION STAGE</th><th>INSTALLATION STAGE</th><th>USE & Maintenance STAGE</th><th>END-OF-LIFE STAGE

De-installation</th></tr>
<tr><th>UPSTREAM MODULE</th><th>CORE MODULE</th><th colspan="4">DOWNSTREAM MODULE</th></tr>
<tr><td rowspan="2">Extraction of raw materials,</td><td>Manufacturing of the product</td><td rowspan="3">Transport to customers</td><td rowspan="3">Installation of the transformer</td><td rowspan="3">Maintenance and use cycle of transformer</td><td>Transport to waste manager</td></tr>
<tr><td rowspan="2">Product assembly</td><td rowspan="2">Shredding /Landfill/ recycling</td></tr>
<tr><td rowspan="2">Transportation of raw materials to the manufacturing company</td><td rowspan="2">Packaging</td></tr>
</table>

TABLE 5: LIFE CYCLE MODULES

More information: https://imefy.com/en/company/

- The modularity principle, as well as the polluter-payer principle have been followed.
- Cut off rules: according to EN 50693 a maximum of 5% of the overall environmental impact of the analysed product system could be cut-off. This is specified in PCR EPDItaly018-Power transformers as “Materials making up the transformer itself whose total mass do not exceed 1% of the total weight of the device”. Allocation procedure: where necessary (energy, waste generation) an allocation based in mass has been used.
- The quality of the input data has been evaluated according to its technological, temporal and geographical coverage.
- According to EN 50693, the next processes have not been included since its impact is not significant:
    - Environmental impact from infrastructure, construction, production equipment, and tools that are not directly consumed in the production process.
    - Personnel-related impacts, such as transportation to and from work.
    - Long term emissions.

Scope of EPD: The life cycle of the product is considered, from the extraction of raw materials to disposal of the product at the end of its life, according to the cradle to grave approach - "from cradle to grave". The modules included in the evaluation, in accordance with the PCR and the reference technical standard are reported.

The stages of the product life cycle and the information considered for the evaluation of IMEFY transformer are:

UPSTREAM

This module takes into account the extraction and processing of raw materials and the production of energy which is consumed at the manufacturing plant and the transport of the different raw materials from the manufacturer to the factory where the final product is assembled. The transformer is made of many materials like Silicon steel, Aluminum, copper, Cellulose, Bakelite, Mineral bases etc.

Regarding the oil used on the transformers, those use vegetable oil.

On this module is also considered the processing of the materials as those can be used by IMEFY, for example, in the case of the steel and the aluminum, a metal working process is considered as an upstream processing. Specific processing for steel and copers parts is differentiated and considered.

Also, in this stage is considered the transportation of those processed materials until IMEFY facilities. A pondered average is used for those cases where more than one supplier is involved. For the tuck representation, a large truck (16-32tn) fulfilling a EURO V emissions regulation is chosen.

CORE

This module includes the consumption of energy during the manufacturing process of the different IMEFY products. At the same time, the transport and management of factory-originated waste are considered. Product losses that occur during the manufacturing are considered on the study, which are assessed as a waste going out the plant.

On the plant, is consumed electricity, natural gas and water (just for employees use, water consumption is not related with the production process).

The packaging materials are not considered since there's no packaging materials used for the distribution of the transformers.

Regarding the electricity mix, IMEFY disposes of solar panels which generates up to a 15,4% of the electricity consumed on the plant, while the resting 84,6% is coming from the grid (considering the residual mix of Spain in 2021)[2].

[2] Acuerdo sobre el etiquetado de la electricidad relativo a la energía producida en el año 2021. Comisión nacional de los mercados y la competencia

DOWNSTREAM

Description of scenarios and additional technical information about the transportation of the product to the customer. For this stage, an averaged distance considering the units sold is calculated, representing the distance traveled by the analyzed product.

Regarding the distances used, it's considered that an 80% of the distribution is made on Spain, while the resting 15% and 5% are distributed in Portugal and Philippines, respectively.

The averaged distance traveled for the distribution is 481km by truck and 829km by ship.

Downstream also consider installation, use and maintenance, transport of the product to the waste manager and Disposal of the product. For the installation no material or energy is consumed. Is not considered any maintenance operation in a standard and regular use of the transformer.

There is no direct energy consumed (passive machine) nor oil replacement in the use phase, so use phase remains zero.

It's considered on the use phase the electricity consumption due the losses, as expressed on the PCR. The following formula is used for the calculation of this energetic input.

The total energy consumed shall be expressed in kWh and it can be computed via the following formula:

$$E_d[kWh] = [P_{load} * k_{load}^2 + P_{noload}] * t_{year} * RSL + P_{aux} * f_{aux} * t_{year} * RSL$$

The electricity mix used for the use phase is an average of the three countries where the transformers are installed (80% Spain, 15% Portugal and 5% Philippines).

For the EOL scenario, 50km distance is considered as distance from dismantle site to the waste management site. Also, a process of shredding is considered for the dismantling, considering the whole weight of the transformer. This process reflects the processing treatments applied to the wastes to be able to further being recycled.

Once the wastes are shredded, sorted, and classified, is considered the following waste treatments: all the material are landfilled except for Steel, Aluminum and Oil, which recyclability ratios are 80%, 70% and 70%, respectively.

6. ENVIRONMENTAL IMPACT ASSESSMENT

The environmental impact assessment has been done on the average product.

It should be remembered that the results presented below are expressed according to the functional unit, 1 unit of Transformer with a RSL of 35 years.

16 MVA 45 KV

Environmental impacts 16 MVA 45 KV

Indicator	Unit	Total	Upstream	Core	Downstream			
			Manufacturing		Distribution	Installation	Use	EoL
Global Warming Potential total (GWP-total)	kg CO_2 eq.	4,86E+06	2,43E+05	2,91E+02	2,01E+03	0,00E+00	4,61E+06	2,18E+03
Global Warming Potential total (GWP-fossil)	kg CO_2 eq.	4,77E+06	2,00E+05	2,90E+02	2,01E+03	0,00E+00	4,57E+06	2,18E+03
Global Warming Potential total (GWPbiogenic)	kg CO_2 eq.	1,68E+04	7,61E+03	2,09E-01	6,46E-01	0,00E+00	9,14E+03	5,39E+00
Global Warming Potential total (GWP-luluc)	kg CO_2 eq.	7,11E+04	3,50E+04	2,42E-01	8,49E-01	0,00E+00	3,61E+04	3,41E+00
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC 11 eq.	2,67E-01	1,47E-02	3,80E-05	4,53E-04	0,00E+00	2,51E-01	1,72E-04
Acidification potential, Accumulated Exceedance (AP)	mol H^+ eq.	4,22E+04	4,06E+03	7,68E-01	1,69E+01	0,00E+00	3,82E+04	1,04E+01
Eutrophication potential, fraction of nutrients reaching freshwater end compartment (EPfreshwater)	kg P eq.	4,85E+02	2,68E+02	3,12E-03	1,51E-02	0,00E+00	2,17E+02	9,51E-02
Formation potential of tropospheric ozone (POCP)	kg NMVOC eq.	1,73E+04	1,26E+03	4,75E-01	1,44E+01	0,00E+00	1,60E+04	6,30E+00
Abiotic Depletion for non-fossil resources potential (ADP-minerals&metals)	kg Sb eq.	5,52E+01	5,50E+01	6,87E-05	4,31E-03	0,00E+00	1,53E-01	1,20E-03
Abiotic Depletion for non-fossil resources potential (ADP-fossil)	MJ	9,66E+07	2,53E+06	7,21E+03	3,00E+04	0,00E+00	9,40E+07	3,06E+04
Water deprivation potential, deprivationweighted water consumption (WDP)	m^3	2,79E+06	2,17E+05	7,08E+01	1,04E+02	0,00E+00	2,57E+06	3,98E+02

Use of resources 16 MVA 45 KV

Indicator	Unit	Total	upstream	Core	Downstream			
			Manufacturing		Distribution	Installation	Use	EoL
Use of renewable primary energy, excluding the resources of non-renewable primary energy used as a raw materials	MJ	2,42E+07	9,94E+05	5,56E+02	3,16E+02	0,00E+00	2,32E+07	2,63E+03
Use of renewable primary energy used as raw materials	MJ	1,24E+04	1,24E+04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use a renewable primary energy (primary energy and resources of renewable primary energy used as raw materials)	MJ	2,43E+07	1,01E+06	5,56E+02	3,16E+02	0,00E+00	2,32E+07	2,63E+03
Use of non-renewable primary energy, excluding the resources of non-renewable primary energy used as a raw materials	MJ	1,01E+08	2,73E+06	7,67E+03	3,19E+04	0,00E+00	9,78E+07	3,26E+04
Use of non-renewable primary energy used as raw materials	MJ	5,79E+02	5,79E+02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use of non-renewable primary energy (primary energy and resources of renewable primary energy used as raw materials)	MJ	1,01E+08	2,73E+06	7,67E+03	3,19E+04	0,00E+00	9,78E+07	3,26E+04
Use of secondary materials	kg	3,55E+03	3,55E+03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of renewable secondary fuels	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of non-renewable secondary fuels	MJ	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	m3	4,58E+04	6,25E+03	1,09E+00	3,11E+00	0,00E+00	3,95E+04	1,32E+01

Waste generation and inputs/outputs of the system 16 MVA 45 KV

Indicator	Unit	Total	upstream	Core	Downstream			
			Manufacturing		Distribution	Installation	Use	EoL
Non-Hazardous waste disposed (HWD)	kg	2,03E+05	5,98E+04	5,85E+00	2,43E+03	0,00E+00	1,29E+05	1,12E+04
Hazardous waste disposed (NHWD)	kg	8,92E+01	6,13E+01	5,57E-01	6,70E-02	0,00E+00	2,73E+01	2,36E-02
Radioactive waste disposed (RWD)	kg	6,46E+02	8,65E+00	3,88E-02	1,99E-01	0,00E+00	6,37E+02	1,22E-01
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	2,00E+04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,00E+04
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)	kg	0,00E+00	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	0,00E+00

25 MVA 66 KV

Environmental impacts 25 MVA 66 KV

Indicator	Unit	Total	Upstream	Core	Downstream			
			Manufacturing		Distribution	Installation	Use	EoL
Global Warming Potential total (GWP-total)	kg CO_2 eq.	7,35E+06	3,06E+05	2,91E+02	2,56E+03	0,00E+00	7,03E+06	2,78E+03
Global Warming Potential total (GWP-fossil)	kg CO_2 eq.	7,22E+06	2,51E+05	2,90E+02	2,56E+03	0,00E+00	6,97E+06	2,76E+03
Global Warming Potential total (GWPbiogenic)	kg CO_2 eq.	2,38E+04	9,87E+03	2,09E-01	8,22E-01	0,00E+00	1,39E+04	6,83E+00
Global Warming Potential total (GWP-luluc)	kg CO_2 eq.	1,01E+05	4,58E+04	2,42E-01	1,08E+00	0,00E+00	5,51E+04	4,33E+00
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC 11 eq.	4,03E-01	1,85E-02	3,80E-05	5,77E-04	0,00E+00	3,83E-01	2,18E-04
Acidification potential, Accumulated Exceedance (AP)	mol H^+ eq.	6,31E+04	4,80E+03	7,68E-01	2,15E+01	0,00E+00	5,82E+04	1,32E+01
Eutrophication potential, fraction of nutrients reaching freshwater end compartment (EPfreshwater)	kg P eq.	6,78E+02	3,46E+02	3,12E-03	1,92E-02	0,00E+00	3,31E+02	1,21E-01
Formation potential of tropospheric ozone (POCP)	kg NMVOC eq.	2,59E+04	1,53E+03	4,75E-01	1,84E+01	0,00E+00	2,44E+04	7,98E+00
Abiotic Depletion for non-fossil resources potential (ADP-minerals&metals)	kg Sb eq.	6,31E+01	6,28E+01	6,87E-05	5,49E-03	0,00E+00	2,33E-01	1,52E-03
Abiotic Depletion for non-fossil resources potential (ADP-fossil)	MJ	1,47E+08	3,15E+06	7,21E+03	3,82E+04	0,00E+00	1,43E+08	3,89E+04
Water deprivation potential, deprivationweighted water consumption (WDP)	m^3	4,21E+06	2,78E+05	7,08E+01	1,32E+02	0,00E+00	3,93E+06	5,03E+02

Use of resources 25 MVA 66 KV

Indicator	Unit	Total	upstream	Core	Downstream			
			Manufacturing		Distribution	Installation	Use	EoL
Use of renewable primary energy, excluding the resources of non-renewable primary energy used as a raw materials	MJ	3,67E+07	1,27E+06	5,56E+02	4,02E+02	0,00E+00	3,55E+07	3,34E+03
Use of renewable primary energy used as raw materials	MJ	1,41E+04	1,41E+04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use a renewable primary energy (primary energy and resources of renewable primary energy used as raw materials)	MJ	3,67E+07	1,29E+06	5,56E+02	4,02E+02	0,00E+00	3,55E+07	3,34E+03
Use of non-renewable primary energy, excluding the resources of non-renewable primary energy used as a raw materials	MJ	1,53E+08	3,40E+06	7,67E+03	4,06E+04	0,00E+00	1,49E+08	4,13E+04
Use of non-renewable primary energy used as raw materials	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use of non-renewable primary energy (primary energy and resources of renewable primary energy used as raw materials)	MJ	1,53E+08	3,40E+06	7,67E+03	4,06E+04	0,00E+00	1,49E+08	4,13E+04
Use of secondary materials	kg	4,62E+03	4,62E+03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of renewable secondary fuels	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of non-renewable secondary fuels	MJ	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	m3	6,83E+04	8,01E+03	1,09E+00	3,96E+00	0,00E+00	6,03E+04	1,67E+01

Waste generation and inputs/outputs of the system 25 MVA 66 KV

Indicator	Unit	Total	upstream	Core	Downstream			
			Manufacturing		Distribution	Installation	Use	EoL
Non-Hazardous waste disposed (HWD)	kg	2,90E+05	7,55E+04	5,85E+00	3,10E+03	0,00E+00	1,97E+05	1,39E+04
Hazardous waste disposed (NHWD)	kg	1,22E+02	7,99E+01	5,57E-01	8,53E-02	0,00E+00	4,17E+01	2,98E-02
Radioactive waste disposed (RWD)	kg	9,83E+02	1,08E+01	3,88E-02	2,53E-01	0,00E+00	9,72E+02	1,55E-01
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	2,66E+04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,66E+04
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)	kg	0,00E+00	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	0,00E+00

20/25 MVA 110 KV

Environmental impacts 20/25 MVA 110 KV

Indicator	Unit	Total	Upstream	Core	Downstream			
			Manufacturing		Distribution	Installation	Use	EoL
Global Warming Potential total (GWP-total)	kg CO_2 eq.	7,32E+06	3,21E+05	2,91E+02	2,68E+03	0,00E+00	6,99E+06	2,90E+03
Global Warming Potential total (GWP-fossil)	kg CO_2 eq.	7,19E+06	2,64E+05	2,90E+02	2,68E+03	0,00E+00	6,93E+06	2,89E+03
Global Warming Potential total (GWPbiogenic)	kg CO_2 eq.	2,41E+04	1,03E+04	2,09E-01	8,60E-01	0,00E+00	1,39E+04	7,15E+00
Global Warming Potential total (GWP-luluc)	kg CO_2 eq.	1,02E+05	4,71E+04	2,42E-01	1,13E+00	0,00E+00	5,48E+04	4,53E+00
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC 11 eq.	4,02E-01	1,95E-02	3,80E-05	6,03E-04	0,00E+00	3,81E-01	2,28E-04
Acidification potential, Accumulated Exceedance (AP)	mol H^+ eq.	6,26E+04	4,72E+03	7,68E-01	2,25E+01	0,00E+00	5,79E+04	1,38E+01
Eutrophication potential, fraction of nutrients reaching freshwater end compartment (EPfreshwater)	kg P eq.	6,84E+02	3,55E+02	3,12E-03	2,01E-02	0,00E+00	3,29E+02	1,27E-01
Formation potential of tropospheric ozone (POCP)	kg NMVOC eq.	2,58E+04	1,56E+03	4,75E-01	1,92E+01	0,00E+00	2,42E+04	8,35E+00
Abiotic Depletion for non-fossil resources potential (ADP-minerals&metals)	kg Sb eq.	6,06E+01	6,03E+01	6,87E-05	5,75E-03	0,00E+00	2,32E-01	1,59E-03
Abiotic Depletion for non-fossil resources potential (ADP-fossil)	MJ	1,46E+08	3,34E+06	7,21E+03	4,00E+04	0,00E+00	1,43E+08	4,07E+04
Water deprivation potential, deprivationweighted water consumption (WDP)	m^3	4,19E+06	2,85E+05	7,08E+01	1,38E+02	0,00E+00	3,91E+06	5,26E+02

Use of resources 20/25 MVA 110 KV

Indicator	Unit	Total	upstream	Core	Downstream			
			Manufacturing		Distribution	Installation	Use	EoL
Use of renewable primary energy, excluding the resources of non-renewable primary energy used as a raw materials	MJ	3,66E+07	1,32E+06	5,56E+02	4,21E+02	0,00E+00	3,52E+07	3,50E+03
Use of renewable primary energy used as raw materials	MJ	1,59E+04	1,59E+04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use a renewable primary energy (primary energy and resources of renewable primary energy used as raw materials)	MJ	3,66E+07	1,33E+06	5,56E+02	4,21E+02	0,00E+00	3,52E+07	3,50E+03
Use of non-renewable primary energy, excluding the resources of non-renewable primary energy used as a raw materials	MJ	1,52E+08	3,60E+06	7,67E+03	4,24E+04	0,00E+00	1,48E+08	4,33E+04
Use of non-renewable primary energy used as raw materials	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use of non-renewable primary energy (primary energy and resources of renewable primary energy used as raw materials)	MJ	1,52E+08	3,60E+06	7,67E+03	4,24E+04	0,00E+00	1,48E+08	4,33E+04
Use of secondary materials	kg	4,99E+03	4,99E+03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of renewable secondary fuels	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of non-renewable secondary fuels	MJ	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	m3	6,82E+04	8,23E+03	1,09E+00	4,14E+00	0,00E+00	5,99E+04	1,75E+01

Waste generation and inputs/outputs of the system 20/25 MVA 110 KV

Indicator	Unit	Total	upstream	Core	Downstream			
			Manufacturing		Distribution	Installation	Use	EoL
Non-Hazardous waste disposed (HWD)	kg	2,93E+05	7,90E+04	5,85E+00	3,24E+03	0,00E+00	1,96E+05	1,45E+04
Hazardous waste disposed (NHWD)	kg	1,21E+02	7,93E+01	5,57E-01	8,93E-02	0,00E+00	4,15E+01	3,12E-02
Radioactive waste disposed (RWD)	kg	9,78E+02	1,15E+01	3,88E-02	2,64E-01	0,00E+00	9,66E+02	1,62E-01
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	2,67E+04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,67E+04
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)	kg	0,00E+00	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	0,00E+00

20/25 MVA 45 KV

Environmental impacts 20/25 MVA 45 KV

Indicator	Unit	Total	Upstream	Core	Downstream			
			Manufacturing		Distribution	Installation	Use	EoL
Global Warming Potential total (GWP-total)	kg CO_2 eq.	7,51E+06	2,76E+05	2,91E+02	2,28E+03	0,00E+00	7,23E+06	2,47E+03
Global Warming Potential total (GWP-fossil)	kg CO_2 eq.	7,39E+06	2,30E+05	2,90E+02	2,28E+03	0,00E+00	7,16E+06	2,46E+03
Global Warming Potential total (GWPbiogenic)	kg CO_2 eq.	2,26E+04	8,31E+03	2,09E-01	7,32E-01	0,00E+00	1,43E+04	6,08E+00
Global Warming Potential total (GWP-luluc)	kg CO_2 eq.	9,38E+04	3,72E+04	2,42E-01	9,62E-01	0,00E+00	5,66E+04	3,86E+00
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC 11 eq.	4,11E-01	1,67E-02	3,80E-05	5,14E-04	0,00E+00	3,94E-01	1,94E-04
Acidification potential, Accumulated Exceedance (AP)	mol H^+ eq.	6,45E+04	4,68E+03	7,68E-01	1,91E+01	0,00E+00	5,98E+04	1,17E+01
Eutrophication potential, fraction of nutrients reaching freshwater end compartment (EPfreshwater)	kg P eq.	6,27E+02	2,87E+02	3,12E-03	1,71E-02	0,00E+00	3,40E+02	1,08E-01
Formation potential of tropospheric ozone (POCP)	kg NMVOC eq.	2,65E+04	1,45E+03	4,75E-01	1,63E+01	0,00E+00	2,51E+04	7,11E+00
Abiotic Depletion for non-fossil resources potential (ADP-minerals&metals)	kg Sb eq.	6,29E+01	6,26E+01	6,87E-05	4,89E-03	0,00E+00	2,40E-01	1,36E-03
Abiotic Depletion for non-fossil resources potential (ADP-fossil)	MJ	1,50E+08	2,91E+06	7,21E+03	3,40E+04	0,00E+00	1,47E+08	3,47E+04
Water deprivation potential, deprivationweighted water consumption (WDP)	m^3	4,27E+06	2,37E+05	7,08E+01	1,18E+02	0,00E+00	4,04E+06	4,48E+02

Use of resources 20/25 MVA 45 KV

Indicator	Unit	Total	upstream	Core	Downstream			
			Manufacturing		Distribution	Installation	Use	EoL
Use of renewable primary energy, excluding the resources of non-renewable primary energy used as a raw materials	MJ	3,75E+07	1,08E+06	5,56E+02	3,58E+02	0,00E+00	3,64E+07	2,98E+03
Use of renewable primary energy used as raw materials	MJ	1,24E+04	1,24E+04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use a renewable primary energy (primary energy and resources of renewable primary energy used as raw materials)	MJ	3,75E+07	1,10E+06	5,56E+02	3,58E+02	0,00E+00	3,64E+07	2,98E+03
Use of non-renewable primary energy, excluding the resources of non-renewable primary energy used as a raw materials	MJ	1,57E+08	3,14E+06	7,67E+03	3,61E+04	0,00E+00	1,53E+08	3,68E+04
Use of non-renewable primary energy used as raw materials	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use of non-renewable primary energy (primary energy and resources of renewable primary energy used as raw materials)	MJ	1,57E+08	3,14E+06	7,67E+03	3,61E+04	0,00E+00	1,53E+08	3,68E+04
Use of secondary materials	kg	4,16E+03	4,16E+03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of renewable secondary fuels	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of non-renewable secondary fuels	MJ	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	m3	6,88E+04	6,82E+03	1,09E+00	3,53E+00	0,00E+00	6,19E+04	1,49E+01

Waste generation and inputs/outputs of the system 20/25 MVA 45 KV

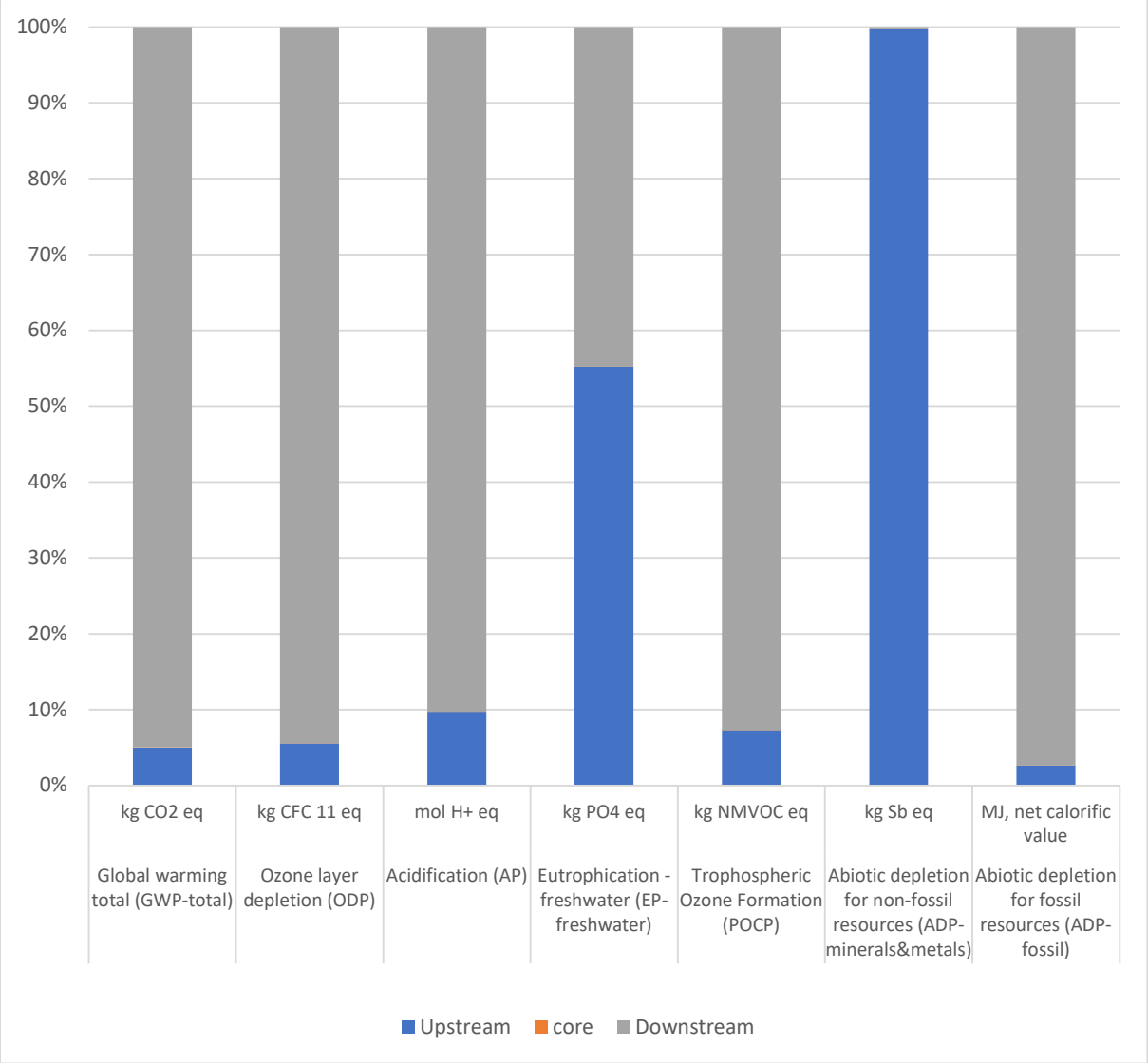
Indicator	Unit	Total	upstream	Core	Downstream			
			Manufacturing		Distribution	Installation	Use	EoL
Non-Hazardous waste disposed (HWD)	kg	2,87E+05	6,88E+04	5,85E+00	2,76E+03	0,00E+00	2,03E+05	1,24E+04
Hazardous waste disposed (NHWD)	kg	1,14E+02	7,03E+01	5,57E-01	7,60E-02	0,00E+00	4,29E+01	2,66E-02
Radioactive waste disposed (RWD)	kg	1,01E+03	9,95E+00	3,88E-02	2,25E-01	0,00E+00	9,99E+02	1,38E-01
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	2,22E+04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,22E+04
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)	kg	0,00E+00	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	0,00E+00

7.Interpretation of results

The interpretation of results is done for a single product, being representative for all transformers. The results are interpretated for 16 MVA 45kv vegetable oil transformer. The product stage (UPSTREAM) is the life cycle stage with the greatest impact for all the impact categories analyzed, representing between 99% (ADP-minerals&metals) to 2% (ADP-fossil).

The Core module represents a lowest impact for all the impact categories analyzed.

In relation to Downstream it represents between 0,29% ((ADP-minerals&metals) to 98% (ADP-fossil).



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