MANUFACTURAS ELECTRICAS, S.A.U.

ENVIRONMENTAL PRODUCT DECLARATION

SF6 insulated shielded switchgear, CBGS

PLANTS: MUNGIA, SPAIN

in compliance with ISO 14025 and EN 50693

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A VERIFIED ENVIRONMENTAL DECLARATION

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Environmental Product Declaration

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EN 50693:2019

EPD Italy PCR 007

EPD Italy PCR 015

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Schneider Electric

MANUFACTURAS ELECTRICAS, S.A.U.

The holder of this declaration is responsible for its content and for keeping the records and the documentation that supports the data and statements included during the validity period

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EPDItaly 007 and 015 European standard EN 50693:2019 serves as the core RCP
Independent verification of the Declaration and data, according to EN ISO 14025:2010 ☐ Internal ☒External
Verification body AENOR Confía

1. General information

1.1. The organization

MANUFACTURAS ELÉCTRICAS, S.A.U, (MESA) is a company specialized in the design and manufacture of Medium and High Voltage power solutions for Railways and High Speed Trains, Electric Utilities, Renewable Energies and the Electro-intensive Industry; Oil & Gas, Mining and Large Industry in general.

Since 1947, MESA has been working together with the main electric companies in the country in the development of intelligent and innovative equipment and solutions for the electric market. A long trajectory in the areas of research, development and innovation has made them leaders in the national market and have international presence in more than 100 countries.

MESA, within the Schneider Electric group, maintains a strong long-term commitment to/with the environment. They are pioneers in the development of solutions for wind farms, and today, more than 70% of wind turbines installed in Spain and more than 10% worldwide are equipped with our solutions.

Schneider Electric's environmental management system is certified according to the requirements of ISO 14001 and complies with the RoHS Directive.

1.2. Scope of the Declaration

This Environmental Product Declaration describes information regarding the cradle-to-grave Life Cycle Analysis of CBGS switchgears, , including CBGS-0, CBGS-1 and CBGS-2 models, that are considered to be representative of their respective "switchgear range" (some parts may change based on specific customer requirements) and which are produced at factory located in Mungia.

Each CBGS set includes several functional units (cubicles) assembled together, and each functional unit contains all the elements necessary to carry out its function. The different cubicles (functional units) are interconnected with the help of a busbar system with solid insulation shielded on the outside of the SF6 tank.

This technology offers reliability for the equipment in a minimum of space and is an excellent option for HV/MV or MV/MV substations.

Cubicles are named according to the functions performed by the unit: Incomer/Feeder, Coupling/Riser, Disconnector, Load-Break Switch or Auxiliary Services feeder functional units.

1.3. Life cycle and compliance

This EPD has been developed and verified in accordance with the UNE-EN ISO 14025:2010, UNE-ES ISO 14040:2006, UNE-ES ISO 14044:2006 standards and the next Product Category Rules:

PCR Information-core PCR	
Title	PCR for electronic and electrical products and systems
Registration number	EPDItaly 007
Date of issue	2020-01-20
Validity	2025-01-19
Accordance	EN 50693:2019
Program Operator	EPDItaly

PCR Information – sub PCR	
Title	Electronic and electrical products and systems - Switchboards
Registration number	EPDItaly 015
Version	2020-09-24
Expiration number	2025-09-24
Accordance	EN 50693:2019

This Environmental Statement includes the life cycle stages indicated in table 1. Therefore, this statement is cradle-to-grave.

This Declaration may not be comparable with those developed in other programs or under different reference documents.

Environmental Declarations may not be comparable if data origin is different (e.g., databases), not all relevant information modules are included, or they are not based on the same scenarios.

Table 1. System boundaries Information modules considered

<table>
<tr><th colspan="2">Manufacturing</th><th>Distribution</th><th>Instalation</th><th>Use and maintenance</th><th>End of life</th></tr>
<tr><th>UPSTREAM</th><th>CORE</th><th colspan="4">DOWNSTREAM</th></tr>
<tr><td>Extraction of raw materials and transport to supplier</td><td>Switchgear assembly</td><td rowspan="4">Transport from the logistics warehouse to the customer</td><td rowspan="4">Switchgear installation (no consumables or consumables required)</td><td rowspan="2">Power consumption and SF6 leakage during use.</td><td>Disassembly of parts</td></tr>
<tr><td>Processing of raw materials, manufacturing and packaging of product parts by suppliers</td><td>Waste and emissions generated in the plant associated with the manufacture of the product</td><td>Transport to the waste manager</td></tr>
<tr><td>Transport of raw materials to the plant</td><td>Switchgear transport to the logistics centre</td><td rowspan="2">Packaging end-of-life management</td><td rowspan="2">Waste treatment</td></tr>
</table>

2. The Product

2.1. Product identification

Each CBGS set is made up of several functional units (switchgears) assembled together and each functional unit contains all the elements needed to carry out its tasks. The different switchgears (functional unit) are interconnected with insulated busbar system with solid or gas insulation shielded.

This technology offers reliability for the equipment in a minimum of space and is an excellent option for HV/MV or MV/MV substations.

This study includes these CBGS model switchgears:

- CBGS-0: SF6 gas-insulated switchgear up to 36 KV and a maximum of 2000 A.
- CBGS-1: SF6 gas-insulated distribution switchgear up to 36 KV and a maximum of 2500 A.
- CBGS-2: SF6 gas-insulated switchgear up to 52 KV and a maximum of 2000 A.

The structure of the switchgears, which external look is shown at the cover, is the following one:

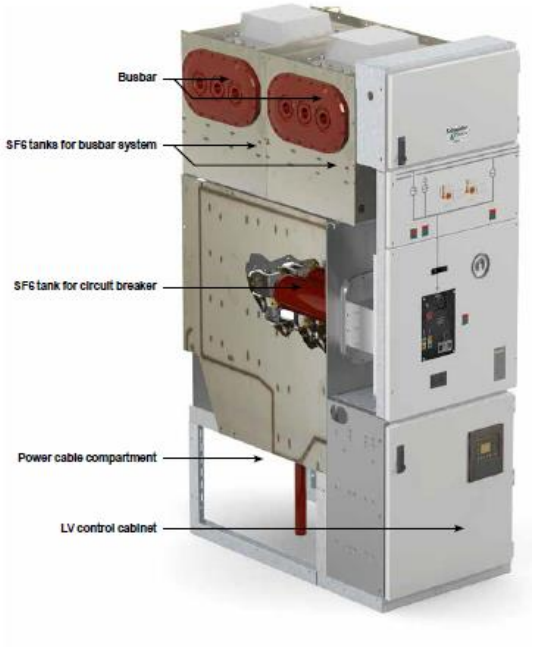
- **Compartment (low voltage cabinet)**: Separated from the Medium Voltage zone, located in the upper part of the switchgear in CBGS-0 and the lower part in the case of CBGS-1 and CBGS-2 and containing relays, protection elements and Low Voltage auxiliary control.
- **Busbar system:** Grounded and located in the upper part of the

switchgear, outside the SF6 compartment in CBGS-0, and in CBGS-1 and 2, consisting of one or two gas compartments.

- **Circuit breaker compartment (basic compartment)**: located in the central part of the switchgear. The power cables and the busbar system are connected by bushings.
- **Power cable compartment:** located in the lower part of the switchgear.

They all are part of the same homogeneous environmental family because they have similar purpose, they are compliant with same product standards and the same manufacturing technology (they do not differ in the type of material, but in quantity).

These types of products are included in CPC 46214 “Boards, consoles, cabinets and other bases, equipped with electrical switching etc. apparatus, for electric control or the distribution of electricity, for a voltage exceeding 1000 V”.



2.2. Product features

Table 2. Product features of the representative models

Aspect	Unit	CBGS-0	CBGS-1	CBGS-2
Rated voltage	kV	36	36	52
Rated current	A	1250	1250	1600
Rated Insulation Level	kV rms-1 min	70	70	95
Rated Insulation Level	kV impulso 1.2/1250 ms	170	170	250
Short time withstand current	kA-3s	31,5	25	25
Relative pressure of SF6 gas at 20°C	bar	0,3	0,3	0,4

The standards applicable to the equipment are:

Table 3.IEC Standards

Standard	SPECIFICATION
IEC 62271-1	High-Voltage Switchgear
IEC 62271-100	Alternating current circuit breakers
IEC 62271-102	Alternating current disconnectors and ground disconnectors
IEC 62271-200	Alternating-current metal-enclosed switchgear for rated voltages higher than 1 kV and less than or equal to 52 kV
IEC 62271-103	Switches for rated voltages higher than 1 kV and less than or equal to 52 kV
IEC 60529	Degrees of protection provided by the enclosures (IP code)

Table 4 ANSI, IECEE Standards

STANDARD	SPECIFICATION
IEEE C37.06-2000	Guide for High-Voltage Circuit Breakers Rated on Symmetrical Current Basis Designated Definite Purpose for Fast Transient Recovery Voltage Rise Times.
IEEE C37.09-1999	Standard Test Procedure for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis
IEEE C37.010-1999	(R 2005), IEEE Application Guide for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis
IEEE C37.20.7	Guide for testing switchgear up to 52KV for Internal arcing faults
ANSI C37.54-2002	Indoor Alternating Current High-Voltage Circuit Breakers Applied as Removable Elements in Metal-enclosed Switchgear – Conformance Test Procedures
IEEE C37.20.3-2001	Metal-Enclosed Interrupter Switchgear
IEEE C37.20.4-2001	Indoor AC Switches (1 kV–38 kV) for Use in Metal - Enclosed Switchgear.
C37.57-2003 NEMA	Switchgear -Metal-Enclosed Interrupter Switchgear Assemblies - Conformance Testing.
C37.58-2003 NEMA	Switchgear -Indoor AC. Medium Voltage Switches for Use in Metal-Enclosed Switchgear - Conformance Test Procedures
IEEE 1247-1998	Interrupter Switches for Alternating Current, Rated Above 1000 V
NFPA 70-2005	National Electrical Code (NEC)

Table 5 CSA Standards

STANDARD	SPECIFICATION
C22.2 No. 31-04	Switchgear Assemblies
C22.2 NO. 58-M1989	High Voltage Isolating Switches
C22.2 No. 193-M1983 Reaffirmed 2004	High Voltage Full-Load Interrupter Switches

2.3. Product composition

Table 6 Main components of the representative models

		CBGS-0	CBGS-1	CBGS-2
Clasification	**Material**	**Mass (kg)**	**Mass (kg)**	**Mass (kg)**
Metal	Steel	232,38	299,77	447,61
	Stainless steel	263,36	333,12	604,21
	Aluminium	28,57	61,06	111,94
	Copper	76,28	143,73	249,51
	Brass	0,61	1,30	2,38
Polymers	ABS	0,02	0,01	0,02
	Epoxy	9,94	21,26	38,97
	Rubber	8,98	9,55	10,44
	HDPE	0,65	0,41	0,76
	PC	0,82	1,21	2,22
	PET	0,11	0,21	0,39
	Polyamide	1,97	2,01	3,69
	PP	0,02	0,03	0,06
	PVC	0,27	0,25	0,45
	Epoxy resin	2,64	5,64	10,34
	Silicone	0,10	0,22	0,41
Electrical and electronics components	Cable	4,76	5,00	9,18
	Electronics	1,76	1,60	2,95
	Circuit breaker	12,88	18,07	33,16
	Monitor	0,92	1,97	3,61
	Transformer	10,04	10,04	18,44
Others	Alumina	0,60	1,28	2,35
	Paint	0,03	0,06	0,11
	Inorganic chemical	2,79	5,97	10,94
	Steel	8,43	18,02	33,05
SF_6	SF_6	3,92	6,24	13,48
TOTAL, without packaging (kg)		**672,86**	**948,03**	**1610,65**
Packaging	Carboard	1,01	1,01	1,01
	Film LDPE	0,25	0,25	0,25
	HDPE	0,39	0,39	0,39
	Palet	40,56	40,56	40,56
	PP	0,96	0,96	0,96
TOTAL, with packaging (kg)		**716,03**	**991,20**	**1653,83**

The manufacturer declares that none of the components of the final product are included in the Candidate list of substances of very high concern for authorization of the REACH regulation, in accordance with the percentages indicated therein.

Representative model CBGS-0

3. LCA Information

3.1. Life cycle assessment

The Life Cycle Assessment Report for the SF6 insulated cubicle, CBGS, comprising the **CBGS-0, CBGS-1 and CBGS-2** switchgear has been carried out by the company MESA - Manufacturas Eléctricas, S.A.U and completed in July 2022.

The Life Cycle Assessment (LCA) on which this statement is based, has been performed in accordance with the international standards UNE-ES ISO 14040:2006 and UNE-ES ISO 14044:2006.

According to this standard, the Product Category Rules (PCRs) specifically developed for life cycle analysis, which are specific to the EPD Italy Environmental Product Declarations certification scheme, have been followed; they establish an international reference framework and procedures that allow manufacturers to communicate the environmental performance of their products. The selected PCRs are: "PCR for electronic and electrical products and systems" (EPDItaly007) and "PCR Part B for switchboards" (EPDItaly015).

All data in the study are considered primary - those collected at first hand from the resources, such as weighing, invoices, records, etc. - except those related to the processing of materials, which are secondary.

The Ecoinvent 3.6 database, integrated in the SimaPro software, version 9.1.1, has been used as a source to obtain the characterization factors needed for the development of the product life cycle assessment evaluation study.

3.2. Functional or declared unit

The functional unit of the present study is a MESA CBGS medium voltage switchgear, a gas insulated switchgear, designed for electrical energy distribution and equipped with medium voltage circuit breakers, protections, manual opening and closing of the MV circuit, current and voltage transformers, monitoring elements, and are used in medium voltage substations and distributed to international customers.

3.3. Reference Service Life (RSL)

A Reference Service Live (RSL) of 20 years has been considered.

3.4. Allocation and cut – off criteria

The manufacturing processes of the product under study do not generate any co-products, so no load allocations have been made.

However, due to the difficulty of individually allocating certain elements within the product life cycle, assignments have been made to the functional unit by dividing over the total number of elements produced during the defined study period, year 2020. During this period, a total of 3,496 units were sold, which will be the value on which the allocations are made in cases where it is not possible to subdivide the impacts.

The elements assigned in this study were:

- Auxiliary materials and their corresponding waste generation.
- Energy and water consumption in the manufacture of the switchgears.
- Emissions of SF6 during tank loading

A cut-off criterion relative to the absolute mass of the representative product has been assumed. Those components with

a mass less than 1 g (representing less than 0.0002 % of the total theoretical weight of the switchgear) are outside of the product system boundaries. Considering the total weight of the switchgear, this cut-off is not significant in the calculation of the product environmental impact assessment. In this aspect, the minimum mass cut-off criterion of 5 %, defined in point 4.2.3.9 of the PCR "EPDItaly015 - Switchboards", is largely respected.

The following entries are excluded from the study for reasons of difficulty in making environmental allocations of the general aspects:

- Plant cleaning
- Employee transportation
- Construction and maintenance of general infrastructure, not assignable to the product under study.
- Administrative flows, management and other R&D departments

3.5. Representativeness, quality and data selection

All the data in the study are considered primary - those collected first-hand from the resources, such as weighing, invoices, records, etc. - except those related to the treatment of materials, which are secondary, obtained from recognized databases such as Ecoinvent 3.6.

The primary data are achieved from different company sources: technical data sheets for product components and meter data records, certificates of guarantee of origin, equipment data sheets, etc., in order to extract activity data and make the relevant extrapolations where necessary.

As mentioned in previous sections, the Ecoinvent 3.6 database, integrated in the SimaPro software, version 9.1.1, has been used as a source for obtaining the characterization factors necessary for the development of the product life cycle analysis evaluation study.

Afterwards, these are entered into a proprietary tool specifically developed for the calculation of life cycle analysis assessment under the study criteria defined in EPD Italy.

The requirements and aspects of coverage were as follows:

- Time coverage: the data collected in the study refers to the year 2020, considering this as the base year for the calculation. The year 2020 is a representative year with enough information to carry out a wide-ranging environmental assessment using representative and verifiable data for its calculation. The results obtained are considered representative as long as there are no changes in the processes, technology used, etc.

- Geographical coverage: data used within the study boundaries are considered representative of Europe. The value chain is represented with life cycle inventory data and technologies representative of Europe.

- Technological coverage: the activity data reflect the technologies currently used in the production process and their associated aspects, such as electricity consumption, and the processes defined in the value chain are representative of the technologies currently used.

- Accuracy and completeness: data collection has been carried out internally by the plant team.

- Representativeness: the data are representative of the usual current performance of the product under study.

- Consistency: the data are in MESA's internal management systems.

3.6. Other calculation rules and assumptions

The load allocations applied were those necessary to be able to quantify the specific data of the SF6 insulated switchgear within the CBGS range models (CBGS-0, CBGS-1 and CBGS-2), that are considered as representative of their respective "switchgear range"; as well as the calculations necessary to be able to allocate the data associated with the products that present a minimum and maximum environmental impact.

The physical and electrical characteristics change according to the functions performed by the unit: Incomer/Feeder switchgear, Couple switchgear, Riser switchgear, Disconnector switchgear, Load Break Switch, Auxiliary Services switchgear.

However, they all belong to the same homogeneous environmental range because they have the same main functionality (reliability and control in medium voltage substations), the same product standards and similar manufacturing technology (they do not differ in the type of material, but in their quantity).

No other calculation rules have been considered.

Representative model CBGS-1

4. System boundaries scenarios and additional technical information

The cradle-to-grave scope has been defined as the cradle-to-grave scope of the system. At this scope level, all relevant inputs and outputs at all stages of the life cycle are considered. The inputs and outputs will be those related to the facility itself, the components of all equipment and the distribution line infrastructure to the customer. The life cycle stages range from the extraction of all types of raw materials, through the transportation, use and maintenance phase, to the end of life of each aspect involved in the system.

Typically, the life cycle phases for a cradle-to-grave scope are: extraction and processing of raw materials, transportation, production of components, transportation to final location and installation of the equipment, use and maintenance of the equipment, disassembly and end-of-life (including transportation to end-of-life).

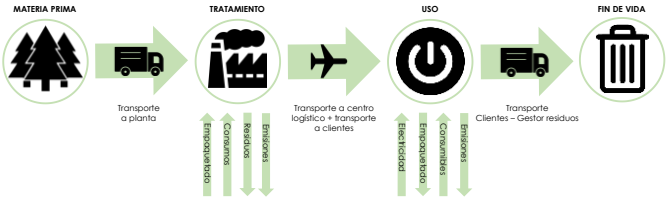


Figure 1: Life cycle diagram with cradle to grave scope

4.1. Upstream processes

This module includes the process of extraction of raw materials, transportation to the supplier for processing, manufacturing and packaging, as well as transportation from the supplier to the Mungia plant.

4.2. Product manufacturing

The processing of inputs and outputs within this module has contemplated the assembly of the switchgears, the waste generated in the plant associated with the manufacture of the product, as well as the transportation of the switchgear to the logistics center for distribution.

4.3. Downstream processes

Distribution

Transportation from MESA's logistics warehouse to the customer is accounted. This distribution scenario is taken as the basis for determining the type of packaging: land or sea.

Installation

The installation does not require material or energy consumption, it includes the necessary aspects for the installation of the product to the customer.

The end-of-life of the packaging used for product distribution is accounted. To model this aspect, the percentages of end-of-life destination by type of material in Spain (representing 70 % of the sales destination) according to INE1 statistics in 2019 have been considered.

Use and maintenance

During this 20-year period, SF6 losses occur, resulting in direct emissions to the air.

There are no consumables/spare parts during this stage. The two significant issues that occur during use and maintenance are electrical consumption (losses) and SF6 leakage.

End of life

The CBGS switchgears are sent to a waste processing by the customer. That is, there is no end-of-life return to the supplier to be treated.

Not knowing this information about the end of life of the product, the following actions are taken:

- An average road distance of 50 km from the customer's location to the nearest waste manager is estimated and simulated.
- Considering that 71 % of CBGS switchgear sales in 2019 were recorded at the state level, the end-of-life destination percentages by material type in according to INE1 statistics in 2019 have been used (as done for packaging at the installation stage).

Representative model CBGS-2

5. Additional environmental information

CBGS gas-insulated switchgear has been designed with environmental protection in mind:

- The materials, insulators and conductors used are identified and can be easily separated and recycled.
- SF6 can be recovered when the equipment reaches the end of its useful life and reused after treatment.

Schneider Electric's environmental management system is certified according to the requirements of ISO 14001 and complies with the RoHS Directive.

6. Declaration of environmental parameters derived from LCA and LCI

Environmental Impacts

Table 7. Environmental impact categories

Environmental Impact	Abbreviation	Unit
Global warming potential - total	GWP - total	kg CO_2e
Global warming potential- fossil	GWP - fossil	kg CO_2e
Global warming potential - biogenic	GWP - biogenic	kg CO_2e
Global warming potential of land use and use changes	GWP - luluc	kg CO_2e
Ozone depletion potential	ODP	kg CFC 11 eq.
Acidification	AP	mol H eq.
Eutrophication potential	EP - freshwater	kg P eq.
Photochemical ozone formation	POCP	kg NMVOC eq.
Abiotic depletion potential - minerals and metals	ADP - minerals&metals	kg Sb eq.
Abiotic depletion potential - fossil fuels	ADP - fossil	MJ
Water consumption	WDP	m^3

Use of resources

Table 8. Parameters describing the use of resources

Parameter	Abbreviation	Unit
Renewable primary energy use excluding renewable primary energy resources used as feedstock	PENRE	MJ
Use of renewable primary energy used as raw material	PERE	MJ
Total renewable primary energy use (primary energy and renewable primary energy resources used as raw materials)	PENRM	MJ
Non-renewable primary energy use, excluding non-renewable primary energy resources used as raw materials	PERM	MJ
Use of non-renewable primary energy used as raw material	PENRT	MJ
Total non-renewable primary energy use (primary energy and renewable primary energy resources used as feedstock)	PERT	MJ
Use of secondary materials	SM	kg
Use of renewable secondary fuels	RSF	MJ
Use of non-renewable secondary fuels	NRSF	MJ

Outflows and waste categories

Table 9. . Other environmental information describing waste categories and outflows

Parameter	Abbreviation	Unit
Hazardous waste disposed	HWD	kg
Non-hazardous waste disposed of	NHWD	kg
Radioactive waste disposed of	RWD	kg
Materials for energy recovery	MER	kg
Recycling materials	MFR	kg
Components for reuse	CRU	kg
Exported thermal energy	ETE	MJ
Exported energy	EEE	MJ

CBGS-0

Table 10. Results of the environmental impact indicators broke down by life cycle stages of the CBGS-0 switchgear model.

IMPACT CATEGORY	UNIT	MANUF	DIST	INST	U&M	EoL	TOTAL
GWP - total	kg CO_2e	3,36E+03	5,90E+01	0,00E+00	2,65E+03	1,33E+01	**6,09E+03**
GWP - fossil	kg CO_2e	3,35E+03	5,89E+01	0,00E+00	2,64E+03	1,00E+01	**6,06E+03**
GWP - biogenic	kg CO_2e	1,02E+01	1,57E-02	0,00E+00	3,72E+00	3,25E+00	**1,72E+01**
GWP - luluc	kg CO_2e	8,96E+00	2,75E-02	0,00E+00	8,04E+00	2,24E-03	**1,70E+01**
ODP	kg CFC 11 eq.	2,01E-04	1,30E-05	0,00E+00	1,05E-04	1,42E-06	**3,21E-04**
AP	mol H eq.	2,92E+01	8,20E-01	0,00E+00	8,41E+00	2,77E-02	**3,84E+01**
EP - freshwater	kg P eq.	2,99E+00	3,66E-03	0,00E+00	6,00E-01	9,87E-04	**3,59E+00**
POCP	kg NMVOC eq.	1,44E+01	6,28E-01	0,00E+00	3,76E+00	2,87E-02	**1,88E+01**
ADP - minerals & metals	kg Sb eq.	8,33E-01	1,21E-03	0,00E+00	2,00E-03	1,57E-04	**8,36E-01**
ADP - fossil	MJ	3,76E+04	8,50E+02	0,00E+00	2,38E+04	9,33E+01	**6,23E+04**
WDP	m^3	1,31E+03	2,02E+00	0,00E+00	5,30E+02	4,37E-01	**1,84E+03**

Table 11. Results of the environmental impact indicators broken by upstream, core and downstream of the CBGS-0 switchgear model

IMPACT CATEGORY	UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
GWP - total	kg CO_2e	3,31E+03	5,18E+01	2,72E+03	**6,09E+03**
GWP - fossil	kg CO_2e	3,30E+03	4,52E+01	2,71E+03	**6,06E+03**
GWP - biogenic	kg CO_2e	9,31E+00	8,58E-01	6,99E+00	**1,72E+01**
GWP - luluc	kg CO_2e	3,25E+00	5,71E+00	8,07E+00	**1,70E+01**
ODP	kg CFC 11 eq.	1,97E-04	4,47E-06	1,20E-04	**3,21E-04**
AP	mol H eq.	2,90E+01	2,01E-01	9,26E+00	**3,84E+01**
EP - freshwater	kg P eq.	2,98E+00	1,12E-02	6,05E-01	**3,59E+00**
POCP	kg NMVOC eq.	1,43E+01	1,19E-01	4,41E+00	**1,88E+01**
ADP - minerals & metals	kg Sb eq.	8,32E-01	5,57E-04	3,37E-03	**8,36E-01**
ADP - fossil	MJ	3,69E+04	6,67E+02	2,48E+04	**6,23E+04**
WDP	m^3	1,01E+03	2,92E+02	5,33E+02	**1,84E+03**

Table 1. Results of resource use indicators broken down by life cycle stages, from the CBGS-0 switchgear model.

IMPACT CATEGORY	UNIT	MANUF	DIST	INST	U&M	EoL	TOTAL
PENRE	MJ	7,40E-01	7,33E-02	0,00E+00	6,87E-01	1,88E-03	**1,50E+00**
PERE	MJ	9,80E+03	3,82E+03	0,00E+00	5,04E+03	1,76E+00	**1,87E+04**
PENRM	MJ	4,00E+04	1,70E+04	0,00E+00	2,49E+04	9,91E+01	**8,20E+04**
PERM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	**0,00E+00**
PENRT	MJ	4,00E+04	1,70E+04	0,00E+00	2,49E+04	9,91E+01	**8,20E+04**
PERT	MJ	9,80E+03	3,82E+03	0,00E+00	5,04E+03	1,76E+00	**1,87E+04**
MS	kg	1,98E+02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	**1,98E+02**
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**
FW	m^3	3,01E+01	1,25E-01	0,00E+00	5,99E+00	2,35E-02	**3,62E+01**

Table 13. Results of the resource use indicators broken down by upstream, core and downstream of the CBGS-0 switchgear model.

IMPACT CATEGORY	UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
PENRE	MJ	7,35E-01	4,48E-03	7,62E-01	**1,50E+00**
PERE	MJ	7,25E+03	2,55E+03	8,86E+03	**1,87E+04**
PENRM	MJ	3,93E+04	7,08E+02	4,20E+04	**8,20E+04**
PERM	MJ	0,00E+00	0,00E+00	0,00E+00	**0,00E+00**
PENRT	MJ	3,93E+04	7,08E+02	4,20E+04	**8,20E+04**
PERT	MJ	7,25E+03	2,55E+03	8,86E+03	**1,87E+04**
MS	kg	1,98E+02	0,00E+00	0,00E+00	**1,98E+02**
RSF	MJ	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**
FW	m^3	2,93E+01	8,01E-01	6,13E+00	**3,62E+01**

Table 14. Results of waste and outflow indicators broken down by life cycle stages, from the CBGS-0 switchgear model.

IMPACT CATEGORY	UNIT	MANUF	DIST	INST	U&M	EoL	TOTAL
HWD	kg	9,75E-01	1,78E-03	0,00E+00	7,92E-03	2,43E-04	**9,85E-01**
NHWD	kg	2,00E+03	2,88E+01	0,00E+00	8,68E+01	2,25E+01	**2,14E+03**
RWD	kg	1,11E-01	5,83E-03	0,00E+00	1,64E-01	6,19E-04	**2,81E-01**
MER	kg	3,48E-01	0,00E+00	0,00E+00	1,47E+00	1,20E+00	**3,02E+00**
MFR	kg	2,02E+01	0,00E+00	0,00E+00	0,00E+00	6,52E+02	**6,73E+02**
CRU	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	**0,00E+00**
ETE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	**0,00E+00**
EEE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	**0,00E+00**

Table 15. Results of waste and outflow indicators broken down by upstream, core and downstream of the CBGS-0 switchgear model.

IMPACT CATEGORY	UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
HWD	kg	9,74E-01	9,95E-04	9,95E-03	**9,85E-01**
NHWD	kg	1,98E+03	1,75E+01	1,38E+02	**2,14E+03**
RWD	kg	1,07E-01	3,31E-03	1,71E-01	**2,81E-01**
MER	kg	0,00E+00	3,48E-01	2,67E+00	**3,02E+00**
MFR	kg	0,00E+00	2,02E+01	6,52E+02	**6,73E+02**
CRU	kg	0,00E+00	0,00E+00	0,00E+00	**0,00E+00**
ETE	MJ	0,00E+00	0,00E+00	0,00E+00	**0,00E+00**
EEE	MJ	0,00E+00	0,00E+00	0,00E+00	**0,00E+00**

CBGS-1

Table 16. Results of the environmental impact indicators broken down by life cycle stages3 of the CBGS-1 switchgear model.

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IMPACT CATEGORY	UNIT	MANUF	DIST	INST	U&M	EoL	TOTAL
GWP - total	kg CO_2e	5,02E+03	8,18E+01	0,00E+00	4,23E+03	2,17E+01	**9,36E+03**
GWP - fossil	kg CO_2e	5,00E+03	8,17E+01	0,00E+00	4,22E+03	1,47E+01	**9,31E+03**
GWP - biogenic	kg CO_2e	1,63E+01	2,18E-02	0,00E+00	2,90E+00	6,95E+00	**2,62E+01**
GWP - luluc	kg CO_2e	1,08E+01	3,81E-02	0,00E+00	1,18E+01	3,32E-03	**2,27E+01**
ODP	kg CFC 11 eq.	2,84E-04	1,80E-05	0,00E+00	1,43E-04	2,08E-06	**4,48E-04**
AP	mol H eq.	4,43E+01	1,14E+00	0,00E+00	1,15E+01	4,14E-02	**5,70E+01**
EP - freshwater	kg P eq.	4,63E+00	5,08E-03	0,00E+00	5,03E-01	1,67E-03	**5,14E+00**
POCP	kg NMVOC eq.	2,07E+01	8,70E-01	0,00E+00	5,05E+00	4,32E-02	**2,67E+01**
ADP - minerals & metals	kg Sb eq.	1,11E+00	1,68E-03	0,00E+00	2,49E-03	2,24E-04	**1,11E+00**
ADP - fossil	MJ	5,30E+04	1,18E+03	0,00E+00	3,07E+04	1,36E+02	**8,50E+04**
WDP	m^3	1,76E+03	2,80E+00	0,00E+00	8,97E+02	7,06E-01	**2,66E+03**

Table 17. Results of the environmental impact indicators broken down by upstream, core and downstream of the CBGS-1 switchgear model.

IMPACT CATEGORY	UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
GWP - total	kg CO_2e	4,97E+03	5,27E+01	4,34E+03	**9,36E+03**
GWP - fossil	kg CO_2e	4,95E+03	4,61E+01	4,32E+03	**9,31E+03**
GWP - biogenic	kg CO_2e	1,55E+01	8,58E-01	9,87E+00	**2,62E+01**
GWP - luluc	kg CO_2e	5,12E+00	5,71E+00	1,19E+01	**2,27E+01**
ODP	kg CFC 11 eq.	2,80E-04	4,68E-06	1,63E-04	**4,48E-04**
AP	mol H eq.	4,41E+01	2,04E-01	1,26E+01	**5,70E+01**
EP - freshwater	kg P eq.	4,62E+00	1,13E-02	5,10E-01	**5,14E+00**
POCP	kg NMVOC eq.	2,06E+01	1,23E-01	5,97E+00	**2,67E+01**
ADP - minerals & metals	kg Sb eq.	1,11E+00	5,83E-04	4,39E-03	**1,11E+00**
ADP - fossil	MJ	5,23E+04	6,81E+02	3,20E+04	**8,50E+04**
WDP	m^3	1,46E+03	2,92E+02	9,00E+02	**2,66E+03**

Table 18. Results of the resource use indicators broken down by life cycle stages, from the CBGS-1 switchgear model.

IMPACT CATEGORY	UNIT	MANUF	DIST	INST	U&M	EoL	TOTAL
PENRE	MJ	1,07E+00	1,02E-01	0,00E+00	9,16E-01	2,70E-03	**2,09E+00**
PERE	MJ	1,24E+04	5,29E+03	0,00E+00	6,72E+03	2,79E+00	**2,44E+04**
PENRM	MJ	5,64E+04	2,36E+04	0,00E+00	3,32E+04	1,44E+02	**1,13E+05**
PERM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	**0,00E+00**
PENRT	MJ	5,64E+04	2,36E+04	0,00E+00	3,32E+04	1,44E+02	**1,13E+05**
PERT	MJ	1,24E+04	5,29E+03	0,00E+00	6,72E+03	2,79E+00	**2,44E+04**
MS	kg	2,70E+02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	**2,70E+02**
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**
FW	m^3	4,40E+01	1,74E-01	0,00E+00	7,20E+00	3,67E-02	**5,14E+01**

Table 19. Results of the resource use indicators broken down by upstream, core and downstream of the CBGS-1 switchgear model.

IMPACT CATEGORY	UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
PENRE	MJ	1,07E+00	4,78E-03	1,02E+00	**2,09E+00**
PERE	MJ	9,85E+03	2,55E+03	1,20E+04	**2,44E+04**
PENRM	MJ	5,56E+04	7,23E+02	5,69E+04	**1,13E+05**
PERM	MJ	0,00E+00	0,00E+00	0,00E+00	**0,00E+00**
PENRT	MJ	5,56E+04	7,23E+02	5,69E+04	**1,13E+05**
PERT	MJ	9,85E+03	2,55E+03	1,20E+04	**2,44E+04**
MS	kg	2,70E+02	0,00E+00	0,00E+00	**2,70E+02**
RSF	MJ	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**
FW	m^3	4,32E+01	8,03E-01	7,41E+00	**5,14E+01**

Table 20. Results of the waste and outflow indicators broken down by life cycle stages, from the CBGS-1 switchgear model.

IMPACT CATEGORY	UNIT	MANUF	DIST	INST	U&M	EoL	TOTAL
HWD	kg	1,90E+00	2,47E-03	0,00E+00	1,05E-02	3,54E-04	**1,91E+00**
NHWD	kg	2,65E+03	3,99E+01	0,00E+00	1,19E+02	3,74E+01	**2,85E+03**
RWD	kg	1,59E-01	8,08E-03	0,00E+00	2,36E-01	8,91E-04	**4,04E-01**
MER	kg	3,48E-01	0,00E+00	0,00E+00	1,47E+00	1,81E+00	**3,63E+00**
MFR	kg	2,02E+01	0,00E+00	0,00E+00	0,00E+00	9,15E+02	**9,35E+02**
CRU	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	**0,00E+00**
ETE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	**0,00E+00**
EEE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	**0,00E+00**

Table 21. Results of waste and outflow indicators broken down by upstream, core and downstream of the CBGS-1 switchgear model.

IMPACT CATEGORY	UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
HWD	kg	1,90E+00	1,03E-03	1,33E-02	**1,91E+00**
NHWD	kg	2,63E+03	1,81E+01	1,96E+02	**2,85E+03**
RWD	kg	1,56E-01	3,41E-03	2,45E-01	**4,04E-01**
MER	kg	0,00E+00	3,48E-01	3,28E+00	**3,63E+00**
MFR	kg	0,00E+00	2,02E+01	9,15E+02	**9,35E+02**
CRU	kg	0,00E+00	0,00E+00	0,00E+00	**0,00E+00**
ETE	MJ	0,00E+00	0,00E+00	0,00E+00	**0,00E+00**
EEE	MJ	0,00E+00	0,00E+00	0,00E+00	**0,00E+00**

CBGS-2

Table 22. Results of the environmental impact indicators broken down by life cycle stages4 of the CBGS-2 switchgear model.

IMPACT CATEGORY	UNIT	MANUF	DIST	INST	U&M	EoL	TOTAL
GWP - total	kg CO_2e	8,85E+03	1,36E+02	0,00E+00	7,71E+03	3,82E+01	**1,67E+04**
GWP - fossil	kg CO_2e	8,81E+03	1,36E+02	0,00E+00	7,69E+03	2,55E+01	**1,67E+04**
GWP - biogenic	kg CO_2e	2,84E+01	3,63E-02	0,00E+00	4,59E+00	1,27E+01	**4,58E+01**
GWP - luluc	kg CO_2e	1,48E+01	6,36E-02	0,00E+00	1,31E+01	5,70E-03	**2,80E+01**
ODP	kg CFC 11 eq.	4,91E-04	3,00E-05	0,00E+00	1,49E-04	3,56E-06	**6,73E-04**
AP	mol H eq.	7,81E+01	1,90E+00	0,00E+00	1,19E+01	7,13E-02	**9,20E+01**
EP - freshwater	kg P eq.	8,12E+00	8,47E-03	0,00E+00	5,58E-01	2,98E-03	**8,69E+00**
POCP	kg NMVOC eq.	3,61E+01	1,45E+00	0,00E+00	5,22E+00	7,44E-02	**4,28E+01**
ADP - minerals & metals	kg Sb eq.	2,01E+00	2,80E-03	0,00E+00	2,69E-03	3,82E-04	**2,01E+00**
ADP - fossil	MJ	9,21E+04	1,97E+03	0,00E+00	3,20E+04	2,32E+02	**1,26E+05**
WDP	m^3	2,83E+03	4,68E+00	0,00E+00	9,25E+02	1,24E+00	**3,76E+03**

Table 23. Results of the environmental impact indicators broken down by upstream, core and downstream of the CBGS-2 switchgear model.

IMPACT CATEGORY	UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
GWP - total	kg CO_2e	8,80E+03	5,50E+01	7,89E+03	**1,67E+04**
GWP - fossil	kg CO_2e	8,76E+03	4,84E+01	7,86E+03	**1,67E+04**
GWP - biogenic	kg CO_2e	2,76E+01	8,59E-01	1,74E+01	**4,58E+01**
GWP - luluc	kg CO_2e	9,11E+00	5,72E+00	1,31E+01	**2,80E+01**
ODP	kg CFC 11 eq.	4,86E-04	5,20E-06	1,83E-04	**6,73E-04**
AP	mol H eq.	7,79E+01	2,14E-01	1,38E+01	**9,20E+01**
EP - freshwater	kg P eq.	8,11E+00	1,14E-02	5,70E-01	**8,69E+00**
POCP	kg NMVOC eq.	3,60E+01	1,32E-01	6,74E+00	**4,28E+01**
ADP - minerals & metals	kg Sb eq.	2,00E+00	6,45E-04	5,87E-03	**2,01E+00**
ADP - fossil	MJ	9,14E+04	7,16E+02	3,42E+04	**1,26E+05**
WDP	m^3	2,54E+03	2,92E+02	9,31E+02	**3,76E+03**

Table 24. Results of the resource use indicators broken down by life cycle stages, from the CBGS-2 switchgear model.

IMPACT CATEGORY	UNIT	MANUF	DIST	INST	U&M	EoL	TOTAL
PENRE	MJ	1,87E+00	1,70E-01	0,00E+00	1,20E-01	4,61E-03	**2,16E+00**
PERE	MJ	1,93E+04	8,83E+03	0,00E+00	7,60E+03	4,86E+00	**3,57E+04**
PENRM	MJ	9,80E+04	3,94E+04	0,00E+00	3,34E+04	2,47E+02	**1,71E+05**
PERM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	**0,00E+00**
PENRT	MJ	9,80E+04	3,94E+04	0,00E+00	3,34E+04	2,47E+02	**1,71E+05**
PERT	MJ	1,93E+04	8,83E+03	0,00E+00	7,60E+03	4,86E+00	**3,57E+04**
MS	kg	4,45E+02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	**4,45E+02**
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**
FW	m^3	7,66E+01	2,90E-01	0,00E+00	7,57E+00	6,35E-02	**8,46E+01**

Table 25. Results of the resource use indicators broken down by upstream, core and downstream of the CBGS-2 switchgear model.

CATEGORY IMPACT	UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
PENRE	MJ	1,86E+00	5,51E-03	2,95E-01	**2,16E+00**
PERE	MJ	1,68E+04	2,55E+03	1,64E+04	**3,57E+04**
PENRM	MJ	9,72E+04	7,59E+02	7,31E+04	**1,71E+05**
PERM	MJ	0,00E+00	0,00E+00	0,00E+00	**0,00E+00**
PENRT	MJ	9,72E+04	7,59E+02	7,31E+04	**1,71E+05**
PERT	MJ	1,68E+04	2,55E+03	1,64E+04	**3,57E+04**
MS	kg	4,45E+02	0,00E+00	0,00E+00	**4,45E+02**
RSF	MJ	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**
FW	m^3	7,58E+01	8,09E-01	7,92E+00	**8,46E+01**

Table 26. Results of waste and outflow indicators broken down by life cycle stages, from the CBGS-2 switchgear model.

IMPACT CATEGORY	UNIT	MANUF	DIST	INST	U&M	EoL	TOTAL
HWD	kg	3,47E+00	4,13E-03	0,00E+00	1,10E-02	6,06E-04	**3,48E+00**
NHWD	kg	4,70E+03	6,66E+01	0,00E+00	1,25E+02	6,44E+01	**4,96E+03**
RWD	kg	2,74E-01	1,35E-02	0,00E+00	2,45E-01	1,52E-03	**5,34E-01**
MER	kg	3,48E-01	0,00E+00	0,00E+00	1,47E+00	3,24E+00	**5,06E+00**
MFR	kg	2,02E+01	0,00E+00	0,00E+00	0,00E+00	1,55E+03	**1,57E+03**
CRU	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	**0,00E+00**
ETE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	**0,00E+00**
EEE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	**0,00E+00**

Table 27. Results of waste and outflow indicators broken down by upstream, core and downstream of the CBGS-2 switchgear model.

IMPACT CATEGORY	UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
HWD	kg	3,47E+00	1,12E-03	1,57E-02	**3,48E+00**
NHWD	kg	4,68E+03	1,98E+01	2,56E+02	**4,96E+03**
RWD	kg	2,70E-01	3,64E-03	2,60E-01	**5,34E-01**
MER	kg	0,00E+00	3,48E-01	4,71E+00	**5,06E+00**
MFR	kg	0,00E+00	2,02E+01	1,55E+03	**1,57E+03**
CRU	kg	0,00E+00	0,00E+00	0,00E+00	**0,00E+00**
ETE	MJ	0,00E+00	0,00E+00	0,00E+00	**0,00E+00**
EEE	MJ	0,00E+00	0,00E+00	0,00E+00	**0,00E+00**

References

[1] General Rules of the GlobalEPD Program, 2nd revision. AENOR. February 2016.

[2] UNE-EN ISO 14025:2010 Etiquetas ambientales. Declaraciones ambientales tipo III. Principios y procedimientos (ISO 14025:2006)

[3] “PCR for electronic and electrical products and systems” (EPDItaly007)

[4] “PCR Part B for switchboards” (EPDItaly015).

[5] EN ISO 14044:2006. Environmental Management. Life cycle analysis. Requirements and guidelines (ISO 14044:2006).

Índice

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