

IMESA S.p.A.



ENVIRONMENTAL PRODUCT DECLARATION



PRODUCT NAME

MINIVER/C

(Compressor 2 3690-TR-202)

Medium-voltage switchgear

SITE

Via G. di Vittorio 14, Zona Industriale
ZIPA, Jesi (AN) – Italia

In accordance with ISO 14025 and EN 50693

Program Operator	EPDIItaly
Publisher	EPDIItaly
Declaration number	EPDIMESAMINIVERC_2024_rev.1.0
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GENERAL INFORMATION

EPD OWNER

Company Name	IMESA S.p.A. (https://imesaspa.com/)
Registered office	Via G. di Vittorio 14 – Z.I. ZIPA – 60035 Jesi (AN)
Contact for EPD information	Lorenzo Piersigilli e-mail: lorenzo.piersigilli@imesaspa.com

PROGRAM OPERATOR

EPDItaly	Via Gaetano De Castillia n° 10 - 20124 Milano, Italy
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ABOUT THE EPD

Product Name	MINIVER/C
Site	Via G. di Vittorio 14, Zona Industriale ZIPA, Jesi (AN) – Italia
Brief description and technical information of the products	The MINIVER/C range is a modular metal-clad medium- voltage switchgear system designed to ensure safe, reliable, and continuous power distribution in medium-voltage electrical networks. It integrates protection, control, and switching functions within a compact and flexible configuration, allowing easy adaptation to different installation requirements. Suitable for Marine, Offshore, Navy, O&G, the MINIVER/C range provides dependable performance in demanding environments. The switchgear is designed and manufactured in compliance with international standards IEC 62271-1 and IEC 62271-200, ensuring high levels of safety, operational reliability, and protection for both personnel and equipment.
Product application area	Product application area • Primary medium-voltage substations • Industrial plants • Power generation and distribution
CPC Code https://unstats.un.org/unsd/classifications/Econ	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

VERIFICATION INFORMATION

PCR	Core PCR: EPDItaly007 – PCR for Electronic and Electrical Products and Systems, REV. 3.2 Issue date 10.12.2025 Sub-category PCR: EPDItaly015 “Switchboards”, (Rev. 2), 01/07/2024
EPDItaly Regulation	Regulations of the EPDItaly Programme Revision 7.1 del 05/09/2025.
Project Report LCA	Imesa LCA-Tool – Tool Project Report-rev03.3 del 05/05/2026
LCA Tool	<i>IMESA LCA-Tool -Rev03.2</i> del 27/04/2026
Independent Verification Statement	The PCR review was performed by ICMQ S.p.A. Independent verification of the declaration and data carried out in accordance with ISO 14025:2010. ☐ Internal ☒ External Third-party verification carried out by: ICMQ S.p.A., via Gaetano De Castillia n° 10 - 20124 Milan, Italy. Accredited by Accredia
Statement Comparability	Environmental claims published within the same product category, but from different programs, may not be comparable.
Statement Responsibility	The EPD Owner relieves EPDItaly from any non-compliance with environmental legislation. The holder of the statement will be responsible for the information and supporting evidence. EPDItaly declines all responsibility for the information, data and results provided by the EPD Owner for the life cycle assessment.



1. THE COMPANY

IMESA S.p.A. has been operating in the electrical engineering and energy distribution sector for over fifty years. The company specializes in the design, manufacturing, and maintenance of Medium and Low Voltage switchgear, as well as digital supervision and automation systems for power networks. Acting as a qualified partner for both public and private clients, IMESA ensures high standards of quality and compliance with industry regulations.

With an integrated operating model, IMESA oversees every phase of project execution: engineering and design, in-house production at its facilities in Jesi (AN), installation, commissioning, and dedicated technical support. The company provides consultancy for selecting the most suitable system solutions, equipment, and configurations, ensuring efficiency, reliability, and long-term performance.

IMESA is committed to technological innovation and environmental sustainability, investing continuously in research and development. The company integrates advanced digital solutions and offers high-efficiency energy systems, together with scheduled maintenance programs and specialized post-sales assistance aimed at minimizing downtime and optimizing system operation.

Main products and services include:

- Medium and Low Voltage switchgear and automation systems;
- Digital monitoring, control, and supervision platforms;
- Engineering, installation, testing, and technical assistance;
- Scheduled and predictive maintenance services.

Sectors served:

- Industrial plants and manufacturing;
- Energy production and distribution;
- Oil & Gas (onshore / offshore);
- Infrastructure and transport networks;
- Marine and shipbuilding applications.

IMESA stands today as a reliable and experienced partner for organizations seeking integrated electrical solutions oriented toward innovation, sustainability, and operational excellence.

2. THE PRODUCT

The MINIVER/C (Compressor 2 3690-TR-202), hereafter referred to as MINIVER/C, manufactured by IMESA S.p.A. in Jesi, is a metal-clad, air-insulated medium-voltage switchgear for indoor installation. It is modular, self-supporting, and designed to ensure high safety and reliability in power distribution networks.

The switchgear consists of independent metal compartments classified as LSC2B-PM, providing full segregation between busbars, breaker, and cable sections. The equipment is air-insulated and entirely SF₆-free; no SF₆-containing configurations were considered in this study. Internal arc protection, pressure relief ducts, and mechanical interlocks ensure safe operation in all conditions. Rated up to 24 kV and 4 000 A, with short-time withstand currents up to 50 kA (1 s), MINIVER C offers strong insulation and endurance.

The structure features epoxy-powder coating (RAL 9002) and IP3X/IP2X protection, with optional upgrades. Operating range: -5 °C to +40 °C, installation up to 1 000 m a.s.l., with variants for seismic, marine, or high-temperature environments. Used in substations, power plants, heavy industry, transport, and infrastructure,

the MINIVER C combines robust construction, modular design, and operator safety for reliable medium-voltage distribution.

The table below highlights the principal technical data for the switchboard:

<i>Parameter</i>	MINIVER/C
<i>Nominal voltage</i>	24 kV
<i>Nominal current</i>	2500 A

2.1. COMPOSITION

The MINIVER/C switchboard approximately weights 1000,05 kg. It is made of different materials, including steel, stainless steel, aluminium, copper and others including electronic components.

The following tables show every material/packageing with their composition percentage.

IEC62474 Classname	IEC 62474 ID	Mass (kg)	Mass (%) versus total including packaging
Other and non stainless steel	M-119	778,09	58,05%
Stainless steel	M-100	0,89	0,08%
Aluminium and its alloys	M-120	12,38	1,07%
Other non-ferrous metals and alloys	M-149	0,65	0,11%
Other minerals	0	13,20	1,14%
Electronic components	0	14,32	1,24%
Other unfilled thermoplastics	M-249	5,33	0,57%
PolyAmide (PA)	M-208	3,12	0,27%
PolyCarbonate (PC)	M-204	16,97	1,47%
PolyEthyleneTerephthalate (PET)	M-209	41,21	3,56%
PolyVinylChloride (PVC)	M-200	0,96	0,083%
Copper and its alloys	M-121	39,61	7,59%
Other duromers	M-319	73,30	11,13%
		1000,05	86,34%

Packaging materials	Mass (kg)	Mass % versus total including packaging
Plywood case	135,00	11,655%
Nails	10,90	0,941%
Laminated barrier hood	4,00	0,345%
Desiccant salts	8,32	0,72%
Total	158,22	13,66%

It should be noted that, to properly classify the materials according to IEC 62474, the compositions from the Ecoinvent datasets were used for the “terminals” and “high-voltage transformer” components.

No substance in the product greater than 0,10% by weight is present on the “List of Potentially Hazardous Substances” candidates for authorization under the REACH legislation.

2.2. REFERENCE SERVICE LIFE (RSL)

The reference service life of the product has been assumed to be 20 years.

3. SCOPE AND TYPE OF EPD

This is a product-specific EPD generated by a qualified LCA Tool, compliant with ISO 14025 and EN 50693 standards, as part of the EPDItaly program, for the MINIVER/C switchboards. The study is based on a "cradle to grave" LCA methodology, in accordance with ISO 14040 and 14044 standards. The geographical scope of the data is referred to Italy as the products are sold in Italy and used in Greece. The reference year is set at 2024, considering the current technological level. The results were generated using SimaPro 10.2 modeling software, using Ecoinvent 3.11 database.

Representativeness	Scope
Geographical scope of installation/usage	Greece
Reference year	2024

3.1. FUNCTIONAL UNIT

The functional unit identified for the LCA study is a single switchboard produced. The switchboard is defined as an assembly of electric and electronic devices delivering control, distribution and safety functions, during a reference service life of 20 years. The switchboard nominal voltage is 24 kV and it is an air-insulated compact switchgear systems.

3.2. PRINCIPLE OF MODULARITY AND ENVIRONMENTAL RESPONSIBILITY (PPP)

In the LCA study, the principle of modularity was adopted, which allows the product life cycle to be broken down into different phases, assigning specific environmental impacts to each of them. This approach facilitates a clear attribution of environmental responsibilities at every stage of the production process, ensuring greater transparency and traceability of data.

In addition, the PPP (Polluter Pays Principle) has been complied with, according to which the entity causing an environmental impact is also the one responsible for the related mitigation or repair costs. This principle

ensures that environmental costs are not passed on to the community, but are correctly attributed to those who generated them, promoting greater responsibility and incentivizing the adoption of more sustainable practices throughout the supply chain.

3.3. SYSTEM BOUNDARIES

The system boundary implemented in this LCA covered the entire product life cycle, i.e. from "cradle to grave", with the life cycle phases and geographical areas for all the main activities involved, grouped into five distinct modules, manufacturing, distribution, installation, use and maintenance and end-of-life as requested by the reference PCR:

- **Manufacturing** → This module includes the modeling of incoming raw materials with their associated packaging, the packaging of the finished product, energy inputs (electricity), water and production auxiliaries consumption, and finally, the waste generated from the production of the electrical panels. Transports for every inbound material and auxiliaries, as well as for waste treatment, are also included in this stage.
- **Distribution** → This module includes the impact associated with the distribution of the finished product to the end customer, specifically related to the type of transport used.
- **Installation** → This module describes the impact related to the installation phase of the finished product at the site where it is intended to operate. Specifically, it accounts for the treatment and disposal of waste generated from the product's packaging, the use of electricity and any other energy sources required for the physical installation of the product.
- **Use and maintenance** → This module reports the impact of the use phase and the maintenance required for the product. In the present study, the impact related to this phase is attributed to electricity consumption.
- **End of life** → This final module describes the impact related to the end-of-life dismantling of the product, its transport to the disposal site, and the related treatment processes.

These five modules cover the entire life cycle of a switchboard, from initial production to disposal. The product lifecycle and inventory analysis, which describe all the activities, simplified assumptions, and modeling scenarios used in LCA, have been covered exhaustively in the next section.

Manufacturing	Distribution	Installation	Use and maintenance	End of Life
Upstream - Core	Downstream	Downstream	Downstream	Downstream
✓	✓	✓	✓	✓

3.3.1. ALLOCATION RULES

In this study, allocations were made in the manufacturing phases. The plant's electricity consumption, waste produced, and consumption of auxiliary materials were allocated to the number of panels produced in the reference year.

In addition, waste percentages derived from internal mechanical processing operations recorded in 2024 were used to determine the gross weights of the processed components in the bill of materials.

3.3.2. CUT-OFF RULES

In accordance with the reference PCR for this study, Life Cycle Inventory (LCI) data must cover at least 95% of the total flows in terms of mass and energy for each process (e.g., upstream processes). Similarly, at least 95% of the potential environmental impact for each process must be included. In this study, no cut-off rules were applied to data related to production, use, waste management, auxiliary materials, and other stages of the product life cycle, as all are relevant in terms of their contribution to the overall environmental impact and the data are available.

3.3.3. EXCLUSION CRITERIA

As defined by the reference PCR, which refers to the EN 50693 standard, the following parameters may be excluded from the study if they are not directly attributable to the production of the reference products:

- capital goods such as buildings, machinery, tools, and infrastructure
- packaging for internal transport, such as boxes and containers used to move parts and components internally for assembly purposes
- administrative activities such as business travel, marketing, and advertising

3.4. DATA QUALITY

The data used in the LCA study include both primary, secondary data and proxy data. The primary data were obtained directly from Imesa S.p.A. This data is under the control and management of the company (e.g., bills, invoices, transport documents, weighing records). Secondary data comes from a variety of sources, including selected generic data from international databases. Proxy data come from sources other than databases, used to create scenarios and fill in any information gaps. The Table below present type of data for every module included:

LCA Module	Type of data	Notes	Emission factor source
Manufacturing Stage	Primary data	Quantities provided by the company. Data from the following EPDs: • “VD4 Vacuum Circuit Breakers p.210 family with P4 poler” (N° NEPD-7596-6951-EN) • “Relion 611/615 Series of Protection and Control Relays” (N° NEPD-4533-3791-EN) • “PowerCube PB8 38kV” (NEPD-14064-14380) were used to improve model representativeness.	Ecoinvent average emission factor 3.11 & EPD
Distribution Stage	Primary data	The addresses and distances of the suppliers refer to a different switchboard and were used as a reference in the absence of the data.	Ecoinvent average emission factor 3.11
Installation Stage	Specific data for packaging waste	Quantities provided by the company	Ecoinvent average emission factor 3.11
Use & Maintenance Stage	Specific data for Euse calculations	Data from technical sheet	Ecoinvent average emission factor 3.11
End of Life Stage	Generic data for transport to treatment	Fixed distance of 100 km	Ecoinvent average emission factor 3.11
	Specific data for EoL	Data derived from the quantities of raw materials inbound (data provided by the company)	Ecoinvent average emission factor 3.11

The database used is considered representative based on the representativeness analysis carried out in relation to the data of a similar product/products of the EPD Owner.

4. LIFE CYCLE INVENTORY ANALYSIS (LCIA)

The Life Cycle Inventory (LCI) lists and quantifies all inflows and outflows at all declared life cycle stages of the products within the system boundary considered in relation to the scope of the study.

4.1. MANUFACTURING STAGE

The manufacturing stage for the MINIVER/C includes the modelling of raw materials, packaging, auxiliary inputs, transport, energy, methane and water consumption, production waste, and direct emissions. Incoming packaging was estimated using 2024 waste registry data, assuming that CER 150101, 150103 and 150106 correspond exclusively to inbound packaging; these quantities were allocated to the MINIVER/C based on the number of units produced and modelled with the respective Ecoinvent processes for mixed plastic film, corrugated cardboard and wooden pallets. Packaging of the finished product was modelled using unit-specific data provided by Imesa.

Auxiliary materials (mainly coating chemicals) were modelled according to compositions derived from safety data sheets and linked to the corresponding Ecoinvent datasets. Transport of raw materials, packaging and auxiliaries was quantified using supplier-specific distances. Suppliers located within the same region were modeled with freight transport by lorry (EURO 5, 16–32 t), while components sourced from overseas were modeled using a combination of sea freight and the subsequent road transport segment. For sheet metals, in the absence of material-specific supplier information, transport was modeled using a weighted average distance based on purchased quantities.

Electricity and water consumption for 2024 were allocated to the MINIVER/C proportionally to the units manufactured, using the Italian residual mix for electricity and the tap-water market group for water supply. Waste from the production of the MINIVER/C, including material scraps and discarded packaging, was modelled using the treatment and disposal routes recorded in the 2024 waste registry, applying the corresponding Ecoinvent recovery or disposal processes. Direct atmospheric emissions from coating operations were included based on measured annual emission flows and modelled using generic Ecoinvent datasets for particulate matter and volatile emissions.

4.2. DISTRIBUTION STAGE

The distribution stage for the MINIVER/C includes the modelling of outbound transport from the Imesa production site to the final customer destination. For this product, specific transport distance was available and consisted of a 309 km road segment.

The resulting total ton-kilometers represent the distribution-related impacts associated with delivering the MINIVER/C to its final destination.

4.3. INSTALLATION STAGE

The installation stage of the MINIVER/C includes two main sources of environmental impact: the disposal of the packaging materials used for shipping the unit and the energy consumption associated with on-site assembly. Packaging waste generated during installation consists of plywood case, nails, laminated barrier hood and desiccant salts. A generic transport distance of 100 km was applied for the collection and transfer of these waste materials. Assembly activities were modelled through the use of a battery-powered screwdriver and drill, operating for a total of 4 minutes, corresponding to an electricity consumption of 1 kWh. These combined elements represent the full set of impacts associated with the installation of the MINIVER/C.

4.4. USE STAGE

The use phase of the MINIVER/C includes the environmental impacts associated with electricity consumption during the product's Reference Service Life (RSL), set at 20 years.

In accordance with the method defined by the sub-PCR EPDItaly015-PCR – Switchboards (Rev. 2), the power requirement (P_{use}) was determined through a thermal dissipation analysis based on the Joule effect of

the current-carrying components present in the switchboard column, applying the general formula $P = 3 \times R \times I^2$ to each component. The calculation considers the effective operating current (I_b) rather than the rated current, in order to obtain a representative estimate of actual operating conditions. For each conductive component present in the switchboard configuration — such as circuit breakers, distribution busbars and connections — the electrical resistance is determined based on the component's characteristics (material resistivity, cross-section and length), obtained from the technical documentation or the component's test report. A percentage increase, based on experience, is then applied to the resulting sum of all component contributions, in order to account for the dissipation of any current transformers and auxiliary equipment present in the switchboard.

Based on these values, the total electricity consumption during the RSL (E_{use}) amounts to 28,64 MWh. To model the environmental impact of this energy consumption, the Ecoinvent process corresponding to the medium voltage electricity mix of the country of installation has been selected.

4.5. END OF LIFE STAGE

The end-of-life stage for the MINIVER/C includes product disassembly, transport to the disposal site, and the treatment or disposal of its components. Disassembly was modelled using 1 kWh of electricity, corresponding to the operation of a battery-powered screwdriver and drill. Transport to the end-of-life facility was modelled over a distance of 100 km using a lorry (16–32 t, EURO 5).

The treatment and disposal were allocated according to the main material categories of the switchboard, including metals, plastics, rubber and electrical components, applying recycling, energy recovery or landfill/incineration in line with the end-of-life scenario specified in EN 50693:2019, Table G.4. This approach provides a representative estimate of the environmental impacts associated with the MINIVER/C at the end of its service life.

5. RESULTS

In this section, the results of the study are presented, divided by different impact parameters and by the phases of the study that constituted the LCA. Environmental impacts were calculated using the EN 15804 + A2, Cumulative Energy Demand (LHV), Selected LCI results additional, and EDIP 2003 methods, as indicated in the SimaPro Methods library. These methodologies are used to calculate environmental impact categories, resource use and waste/output flows produced, as required by the PCR “EPDItaly007-PCR for electronic and electrical products and systems (Stand-alone) – Rev 3.2”.

5.1. ENVIRONMENTAL IMPACTS

<i>Impact indicators</i>	Nomenclatures	Unit	Manufacturing	Distribution	Installation	Use & Maintenance	End of Life	Total
<i>Climate change total</i>	GWP – Total	kg CO2 eq	8,4E+03	6,8E+01	2,2E+02	1,7E+04	3,2E+02	2,6E+04
<i>Climate change - Fossil</i>	GWP – Fossil	kg CO2 eq	8,6E+03	6,8E+01	1,1E+01	1,7E+04	3,0E+02	2,6E+04
<i>Climate change - Biogenic</i>	GWP - Biogenic	kg CO2 eq	-1,5E+02	4,7E-02	2,1E+02	9,4E+01	1,5E+01	1,7E+02
<i>Climate change - Land use and LU change</i>	GWP – Luluc	kg CO2 eq	1,2E+01	2,3E-02	2,5E-03	7,5E+00	2,7E-02	1,9E+01
<i>Ozone depletion</i>	ODP	kg CFC11 eq	3,5E-04	1,5E-06	1,6E-07	7,6E-04	3,0E+02	3,0E+02
<i>Acidification</i>	AP	mol H+ eq	7,8E+01	2,2E-01	4,3E-02	7,5E+01	2,4E-01	1,5E+02
<i>Eutrophication, freshwater</i>	EP - freshwater	kg P eq	8,5E+00	4,6E-03	2,7E-03	1,9E+01	9,2E-03	2,7E+01
<i>Eutrophication, marine</i>	EP – marine	kg N eq	1,2E+01	7,4E-02	5,0E-02	1,1E+01	3,2E-01	2,3E+01
<i>Eutrophication, terrestrial</i>	EP - terrestrial	mol N eq	1,6E+02	8,0E-01	1,9E-01	7,7E+01	9,0E-01	2,4E+02
<i>Photochemical ozone formation</i>	POCP	kg NMVOC eq	3,8E+01	3,3E-01	6,3E-02	3,4E+01	2,9E-01	7,2E+01
<i>Resource use, minerals and metals</i>	ADP - minerals&metals ²	kg Sb eq	1,6E+00	2,3E-04	1,9E-05	2,4E-02	3,5E-04	1,7E+00
<i>Resource use, fossils</i>	ADP – fossil ²	MJ	1,1E+05	9,7E+02	9,8E+01	2,4E+05	5,9E+02	3,5E+05
<i>Water use</i>	WDP ²	m3 depriv.	1,9E+03	3,7E+00	-3,8E+00	3,2E+03	-1,0E+01	5,1E+03

² The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator

5.2. USE OF RESOURCES

<i>Parameter</i>	Nomenclatures	Head	Manufacturing	Distribution	Installation	Use & Maintenance	End of Life	Total
<i>Renewable primary energy as energy carrier</i>	PERE	MJ	1,5E+04	1,5E+01	3,2E+00	4,4E+04	2,9E+01	6,0E+04
<i>Renewable primary energy resource as material utilization</i>	PERM	MJ	7,3E+02	0,0E+00	0,0E+00	0,0E+00	0,0E+00	7,3E+02
<i>Total use of renewable primary energy resources</i>	PERT	MJ	1,6E+04	1,5E+01	3,2E+00	4,4E+04	2,9E+01	6,1E+04
<i>Non-renewable primary energy as energy carrier</i>	PENRE	MJ	1,1E+05	9,7E+02	9,8E+01	2,4E+05	5,9E+02	3,5E+05
<i>Non-renewable primary energy as material utilization</i>	PENRM	MJ	2,4E+03	0,0E+00	0,0E+00	0,0E+00	0,0E+00	2,4E+03
<i>Total use of non-renewable primary energy resources</i>	PENRT	MJ	1,1E+05	9,7E+02	9,8E+01	2,4E+05	5,9E+02	3,5E+05
<i>Use of secondary material</i>	SM	Kg	3,9E+01	0,0E+00	0,0E+00	0,0E+00	0,0E+00	3,9E+01
<i>Use of renewable secondary fuels</i>	RSF	MJ	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00
<i>Use of non-renewable secondary fuels</i>	NRSF	MJ	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00
<i>Net use of fresh water</i>	FW	m3	6,8E+01	1,2E-01	-7,7E-02	6,7E+01	-9,4E-02	1,4E+02

5.3. WASTE PRODUCED AND OUTPUT FLOWS

<i>Parameter/indicator</i>	Nomenclatures	Head	Manufacturing	Distribution	Installation	Use & Maintenance	End of Life	Total
<i>Hazardous waste disposed</i>	HWD	Kg	1,5E+01	2,4E-02	3,2E+00	1,6E+01	5,2E+01	8,6E+01
<i>Non-hazardous waste disposed</i>	NHWD	Kg	7,5E+02	4,6E+01	4,8E+01	4,4E+02	2,5E+02	1,5E+03
<i>Radioactive waste disposed</i>	RWD	Kg	1,9E-01	2,8E-04	3,2E-05	9,2E-02	5,5E-04	2,8E-01
<i>Components for re-use</i>	CRU	Kg	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00
<i>Materials for recycling</i>	MFR	Kg	1,3E+02	0,0E+00	0,0E+00	0,0E+00	6,0E+02	7,3E+02
<i>Materials for energy recovery</i>	MER	Kg	6,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00	6,0E+00
<i>Exported electrical energy</i>	EEE	MJ	1,3E+01	0,0E+00	0,0E+00	0,0E+00	0,0E+00	1,3E+01
<i>Exported thermal energy</i>	EET	MJ	2,4E+01	0,0E+00	0,0E+00	0,0E+00	0,0E+00	2,4E+01

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