

Environmental Product Declaration

In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021 for:

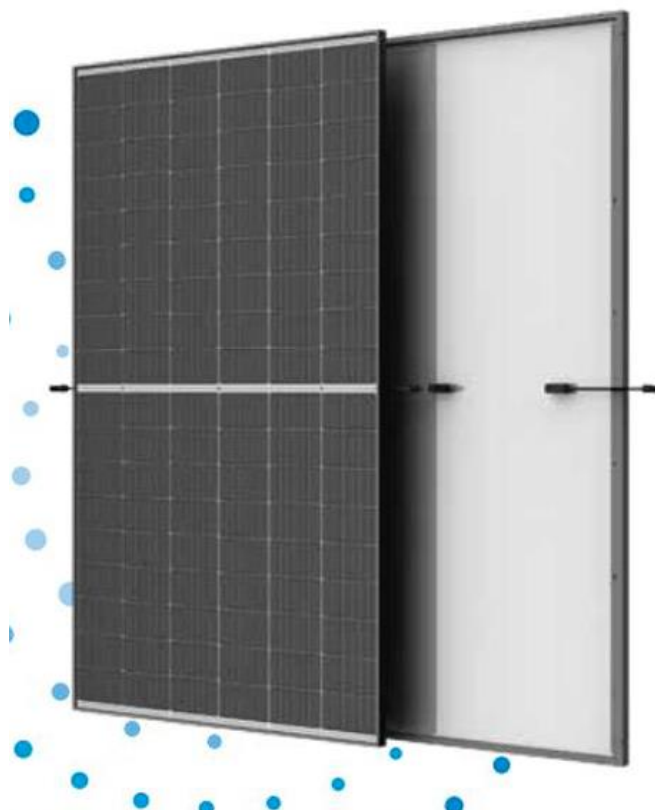
**[Photovoltaic modules of NEG9R.25,
NEG9R.28, and NEG9RC.27]**

from

[Trina Solar Co. Ltd.]



Programme:	The International EPD System, www.environdec.com
Programme operator:	EPD International AB
Type of EPD:	EPD of multiple products, based on the representative results of the product group
EPD registration number:	EPD-IES-0015109:002
Version date:	2026-04-03
Validity date:	2031-04-03
<i>An EPD may be updated or depublished if conditions change. To find the latest version of the EPD and to confirm its validity, see www.environdec.com</i> <i>EPD of multiple products, based on a representative product. The products covered are: NEG9R.25, NEG9R.28, and NEG9RC.27</i>	



GENERAL INFORMATION

Programme Information	
Programme:	The International EPD® System
Address:	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
Website:	www.environdec.com
E-mail:	support@environdec.com

Product Category Rules (PCR)
CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product Category Rules (PCR): <i>PCR 2019:14 PCR Construction products v2.0.1 issue data 2025-06 05 valid until 2030-04-07.</i>
PCR review was conducted by: <i>The Technical Committee of the International EPD System. See www.environdec.com for a list of members. Review chair: C Rob Rouwette (chair), Noa Meron (cochair). The review panel may be contacted via the Secretariat www.environdec.com/contact.</i>
c-PCR: <i>c-PCR-016 Photovoltaic modules and parts thereof (adopted from EPD Norway NPCR 029 Part B for photovoltaic modules used in the building and construction industry, including production of cell, wafer, ingot block, solar grade silicon, solar substrates, solar superstrates and other solar grade semiconductor materials, version 1.2, issue data 2022-03-31, valid until 2026-12-31.</i>

Third-party Verification
Independent third-party verification of the declaration and data, according to ISO 14025:2006, via:
☒ Individual EPD verification without a pre-verified LCA/EPD tool

Third-party verifier: <Michael ZHU Jiang Accredited by: International EPD System , DQS AP LTD.>
Procedure for follow-up of data during EPD validity involves third party verifier: ☐ Yes ☒ No

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but published in different EPD programmes, may not be comparable. For two EPDs to be comparable, they shall be based on the same PCR (including the

same first-digit version number) or be based on fully aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have identical scope in terms of included life-cycle stages (unless the excluded life-cycle stage is demonstrated to be insignificant); apply identical impact assessment methods (including the same version of characterisation factors); and be valid at the time of comparison.
For further information about comparability, see EN 15804 and ISO 14025.

INFORMATION ABOUT EPD OWNER

Owner of the EPD: Trina Solar Co. Ltd.

Address: No. 2, Trina Road, Trina Photovoltaic Industrial Park, Xinbei District, Changzhou City, Jiangsu Province

Contact: Na Shan

Description of the organisation:

Founded in 1997, Trina Solar Co., Ltd. is mainly engaged in PV products, PV systems and smart energy. PV products include R&D, production and sales of PV modules. PV systems consist of power stations and system products. Smart energy mainly comprises PV power generation and operation & maintenance, smart solutions for energy storage, smart microgrid, and development and sales of multi energy systems. With the strategic goal of "Creating a new industrial ecosystem led by Trina Solar, and promoting Trina Solar as a leader in smart PV and energy storage solutions ", we are committed to leading the way in smart PV and energy storage solutions and facilitating the transformation of new power systems for a net-zero future.

With innovation-driven development as its most important strategy and core driving force, Trina Solar has put in place a comprehensive and leading science and innovation system. So far, Trina Solar's SKL has set or broken 38 world records in terms of PV cell conversion efficiency and module output power. By the end of 2025, its cumulative shipments of PV modules had exceeded 260GW.

Going forward, all the employees of Trina Solar will be guided by the Company's core values:

"Focus on the Customers, Persist in Open Innovation, Persevere through Dedication and Hard Work, Strive for Excellence, Share the Responsibility, Create and Share Value together." By fulfilling its mission of "Solar Energy for All", Trina Solar aims to bring together the strengths of all the stakeholders with a cooperative and open attitude to lead the development of the industry, and make contributions to global energy conservation, emission reduction and sustainable development.

Product-related or management system-related certifications:

Product-related certifications: IEC61215, UL61730, IEC62716

Management system-related certifications: ISO9001, IEC62941, ISO14001, ISO45001, ISO50001

PRODUCT INFORMATION

Product name:

NEG9R.25

NEG9RC.27

NEG9R.28

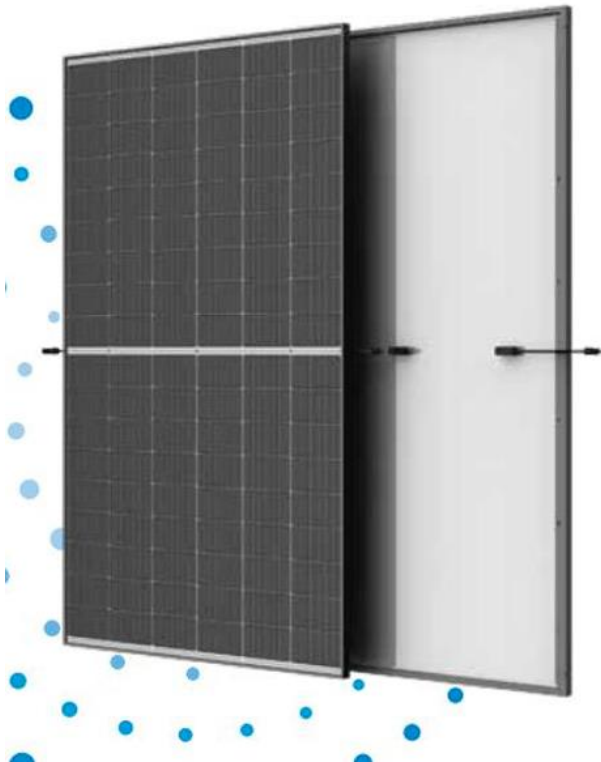
Product identification:

Serious (brand name)	Technology	Minimum Power (W)	Maximum Power (W)	Applied power (W)	Dimensions (mm ²)	Weight (kg) excluding packaging (kg)	Weight (kg) including packaging (kg)	Module efficiency	Cell number	First year degradation	Annual average degradation
NEG9 R.25	Mono crystalline	430	480	480	1762*1134	20.688	21.714	22.5%	144	1%	0.4%
NEG9	Mono	415	460	460	1762*1134	20.688	21.714	22.5%	144	1%	0.4%

RC.27	crystalline										
NEG9	Mono	430	480	480	1762*1134	20.688	21.714	22.5%	144	1%	0.4%
R.28	crystalline										

The degradation rate is based on the product specification from Trina Solar. No third-party certificate is available currently.

Visual representation (e.g., an image) of the product



UN CPC code:

461 Electric motors, generators and transformers, and parts.

Product description:

These PV modules are dual glass monocrystalline silicon module. The module efficiency can reach as high as 22.3-22.7% thanks to the high density interconnect technology. Modules contain multi-busbar technology for better light trapping, lower series resistance, improved current collection and enhanced reliability. The production volume for the PV modules are:

Modules	Yield over 2025-01-01 to 2025-12-31	unit	Relative share
NEG9R.25	980646	PCS	23.9%
	440	MW	
NEG9R.28	2250428	PCS	55.6%
	1023	MW	
NEG9RC.27	847399	PCS	20.5%
	377	MW	

The NEG9R.28 can be justified as the representative product based on its dominant position in terms of the production volume.

Name and location of production site(s):

Trina Solar Co. Ltd.

Address: No. 2, Trina Road, Trina Photovoltaic Industrial Park, Xinbei District, Changzhou City,

CONTENT DECLARATION

Per the requirement of the PCR 2019:14 version 2.0.1, the content declaration is based on the weight of one unit of a product as purchased. The representative product NEG9R.28 is applied. However, the NEG9R.25 and NEG9RC.27 shares the exact same content information.

Product content	Mass, kg	Post-consumer recycled material, mass-% of product	Biogenic material, mass-% of product	Biogenic material, kg C/product or declared unit
Front glass	7.92E+00	0%	0%	0
Back glass	7.92E+00	0%	0%	0
EVE film	8.92E-01	0%	0%	0
POE	8.49E-01	0%	0%	0
Silica gel	2.60E-01	0%	0%	0
Welding flux	1.98E-02	0%	0%	0
Photovoltaic cell	5.95E-01	0%	0%	0
Frame	1.92E+00	0%	0%	0
Ribbon interconnection	1.35E-01	0%	0%	0
Ribbon string	3.18E-02	0%	0%	0
Junction box	1.15E-01	0%	0%	0
TOTAL	2.07E+01	0%	0%	0

Packaging materials	Mass, kg	Mass-% (versus the product)	Biogenic material, kg C/product or declared unit
Multilayer plywood	6.82E-01	3.30%	2.73E-01
Corrugated board	3.13E-01	1.51%	1.41E-01
PET	3.70E-02	0.518%	0
PP	2.20E-03	0.01%	0
PE	1.00E-02	0.05%	0
TOTAL	1.04E+00	5.05%	4.14E-01

1 kg biogenic carbon in the product/packaging is equivalent to the uptake of 44/12 kg of CO₂.

LCA INFORMATION

Functional unit: 1 Wp of manufactured photovoltaic module, from cradle-to-grave, with activities needed for a study period for a defined reference service life ($\geq 80\%$ of the labelled power output). Since no third-party report is available, a standard reference service life of 25 years for $\geq 80\%$ of the labelled power output is applied.

Table 1 The conversion factor to calculate per m2 impact

PV modules	Cell dimension (m2)	Applied nominal Watt (Wp)	Value (W/m2)
NEG9R.25	2.00	480	240.2
NEG9R.28	2.00	480	240.2
NEG9RC.27	2.00	460	230.2

Reference service life:

25 years

Time representativeness:

Data collection period: 2025-01-01 to 2025-12-31

Steps were taken to ensure that the LCI data were reliable and representative. The data type used is clearly stated in the Inventory analysis, measured or calculated from primary sources or whether data are from the LCI databases. In this study, the data quality requirements were as follows:

Specific data of the considered system (such as material or energy flows that enter the production system). These data were calculated and submitted by Trina.

Generic data related to the life cycle impacts the material or energy flows that enter the production system. These data were sourced from the databases in SimaPro 10.3.0.1

Geographical scope:

China for A1-A3, and Global for A4, A5, B2, and C1-C4.

Database(s) and LCA software used:

Database: Ecoinvent 3.11, Ecoinvent 3 – allocation, cut-off by classification – unit

LCA Software: Simapro 10.3.0.1

Description of system boundaries:

The system boundary considered in this LCA study is “cradle to gate with options, modules C1-C4, module D with optional modules (A1-A3 + A4 + A5+ B2 + C + D)”.

A1-A3: Product stage (raw material acquisition, transport to manufacturing site and manufacturing)

A4: Transport to user site

A5: Installation

B2: Maintenance of product

C1-C4: End-of-life stage (deconstruction, transport, waste processing and disposal)

D: Reuse, recovery and/or recycling potentials

A1 Raw materials extraction

Raw materials extraction includes materials needed to produce ingot, wafer, cell and PV module.

Ingot, wafer and cell can be regarded as the intermediate products along the PV module production line. The PV cells are manufactured by Suqian Trina Solar Co. Ltd. The wafer is sourced from the Ecoinvent datasets “silicon production, single crystal, Czochralski process, photovoltaics RoW”.

A2 Raw materials transport

Concerning the raw material transportation, all the raw materials are sourced from domestic suppliers and are transported by truck, EURO5 is used for modelling in this study. The 16-32t transportation type scenario is assumed. The study applies an aggregated approach for the raw materials transportation summarizing all the transport data through multiplying the weight and the transportation distance.

A3 Module Assembly

For A3 stage, the electricity consumption mix is based on the electricity generation profile for the Jiangsu Province, which is the dedicated location of the manufacturing site of the module assembly. The details of the electricity mix is shown in Figure 1 below. Per the PCR, an grid loss of 3.07% in Jiangsu province is considered to convert the production mix to the consumption. The electricity emission factor of GWP-GHG is 0.85kgCO₂e/kWh.

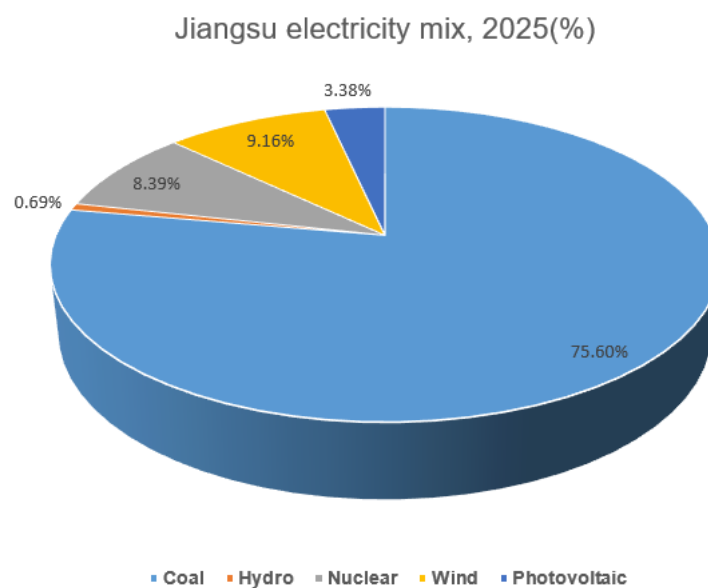


Figure 1 the electricity production mix for Jiangsu province at 2025

Table 2 Energy sources for the product manufacturing processes

	NEG9R.28
Manufacturing site location	Changzhou, Jiangsu
Underlying ecoinvent dataset	Electricity production in Jiangsu Province
GWP-GHG (kg CO ₂ eq. / kWh)	0.85

A4 Product distribution

The distribution scenario(A4) is based on the information provided by the suppliers. The product is firstly transported to the Shanghai Port at a distance of 230km by lorry. Then, the product is transported from Shanghai Port to Rotterdam Port by 19400km through the container ship. After than, the product is unloaded to the storage site by a distance of 300km. Finally, the distance between the storage site to the final consumers is assumed to be 1200km for European domestic construction site according to the NPCR 029 Part B version 1.2.

A5 Installation

The packaging materials of the PV modules are mostly wooden pallet and paper, and are assumed to be recycled. The transport distance for the packaging materials to the recycling site is assumed to be 100km. The scaling method is clearly listed in Table 3. Other materials including the mounting system,

cables, inverters are not considered based on the requirements listed in the NPCR 029 Part B version 1.2

Table 3 Energy inputs for PV module installation

Construction consumption process (per kWp capacity)		
Electricity	36.033 kWh electricity for 570kWp as in the Ecoinvent dataset ("Photovoltaic plant, 570kWp, multi-Si, on open ground {GLO} photovoltaic plant construction, 570kWp, multi-Si, on open ground Cut-off, U")	0.06 kWh/kWp is applied
Diesel	7673MJ diesel for 570kWp as in the Ecoinvent dataset("Photovoltaic plant, 570kWp, multi-Si, on open ground {GLO} photovoltaic plant construction, 570kWp, multi-Si, on open ground Cut-off, U")	13.4MJ/kWp is applied

B1-B7 modules

B1 -use of the installed product, service, or appliance There isn't any energy and material consumption in this stage in the site.

B2-maintenance of product The only maintenance for PV panels is cleaning. It is assumed to be cleaned once per month with an application rate of 0.76L water per m2 PV panel.

No require (B3), replacement (B4) or refurbishment (B5) are needed for the PV panels.

B6 – operational energy. The product doesn't consume energy during the whole service life. It produces the energy.

B7 – operational water use This operational stage, there isn't any water consumption. Electricity generation can be calculated according to the following mechanism. The site information for the simulation has the following characteristics

Table 4 Power station information for simulation (Guadix is selected as the reference point)

Item	Value
Location	Guadix, Spain
Peak power of the plant	1MW
Latitude	37.19°N
Longitude	3.09°W
Altitude	869m
Nominal solar irradiance	2265 kWh/kWp/year

Energy production in the first year of operation:

$$E_1 = S_{rad} * A * PR * y * (1 - \deg_1) \text{ ----- (1)}$$

E₁--- Energy produced in the first year of operation, kWh/year

S_{rad}---Site specific annual average solar radiation on module (shadings not included), kWh/kWp/year. The annual radiation must take into consideration the specific inclination (slope, tilt) and orientation.

A --- Area of module, from functional unit (FU), m2 (stated in the EPD).

Y --- Module yield: electrical power, kWp for standard test conditions (STC) of the module divided by the area of the module (stated in the EPD).

PR--- Performance ratio, coefficient for losses. Site specific performance ratio can be modelled with PV simulation software tools, such as PVSYST or similar.

deg1--- first year degradation rate, in our case 1% according to the product specification
Energy production n year of operation:

$$E_n = E_1 * (1 - \text{deg})^{n-1} \quad (2)$$

Energy production over reference service life of module, assuming linear annual degradation:

$$E_{RSL} = E_1 * (1 + \sum_{n=1}^{RSL-1} (1 - \text{deg})^n) \quad (3)$$

Table 5 total electricity generation over RSL

Serious (brand name)	Maximum power output range(W)	PR ratio	deg first year	deg-after first year	E1/kWh	ERSL/kwh
NEG9R.25	480	88.37%	1%	0.4%	949	21892
NEG9R.28	480	88.37%	1%	0.4%	949	21892
NEG9RC.27	460	88.37%	1%	0.4%	912	21602

C1-C4 modules

De-construction (C1) of the PV plant during the disposal stage is assumed mainly consuming electricity, and the electricity consumption is assumed the same as the construction stage (A5), 50km transportation distance from plant site to waste treatment site (C2) is assumed to be 50km according to the NPCR 029 Part B version 1.2. For the C3 phase, Since there is lack of existing data of recycling rate for PV module, this study refers to legal requirements issued by Waste Electrical and Electronic Equipment (WEEE). In 2012/19/EU-Article 11 & ANNEX V, the required collection rate for waste PV module is 85%. Therefore, 15% of waste PV module end up with waste disposal through landfill. A specific electricity 0.0556kWh/kg and 0.0324MJ/kg diesel consumption is referenced to disassemble and sort the collected PV modules. The final disposal scenario for C4 is based on the following Table 6.

Table 6 Waste treatment scenario for PV modules

PV components	Materials	Recycling	Landfill	Incineration
PV cells	Silicon	80%	20%	0%
	Silver bar line	99%	1%	0%
Solar glass	Glass	85%	15%	0%
Encapsulant and other plastic	PET/POE/EVE	0%	0%	100%
Aluminium Frame	Aluminium alloy	100%	0%	0%
Interconnection and busbar string	Copper	60%	40%	0%

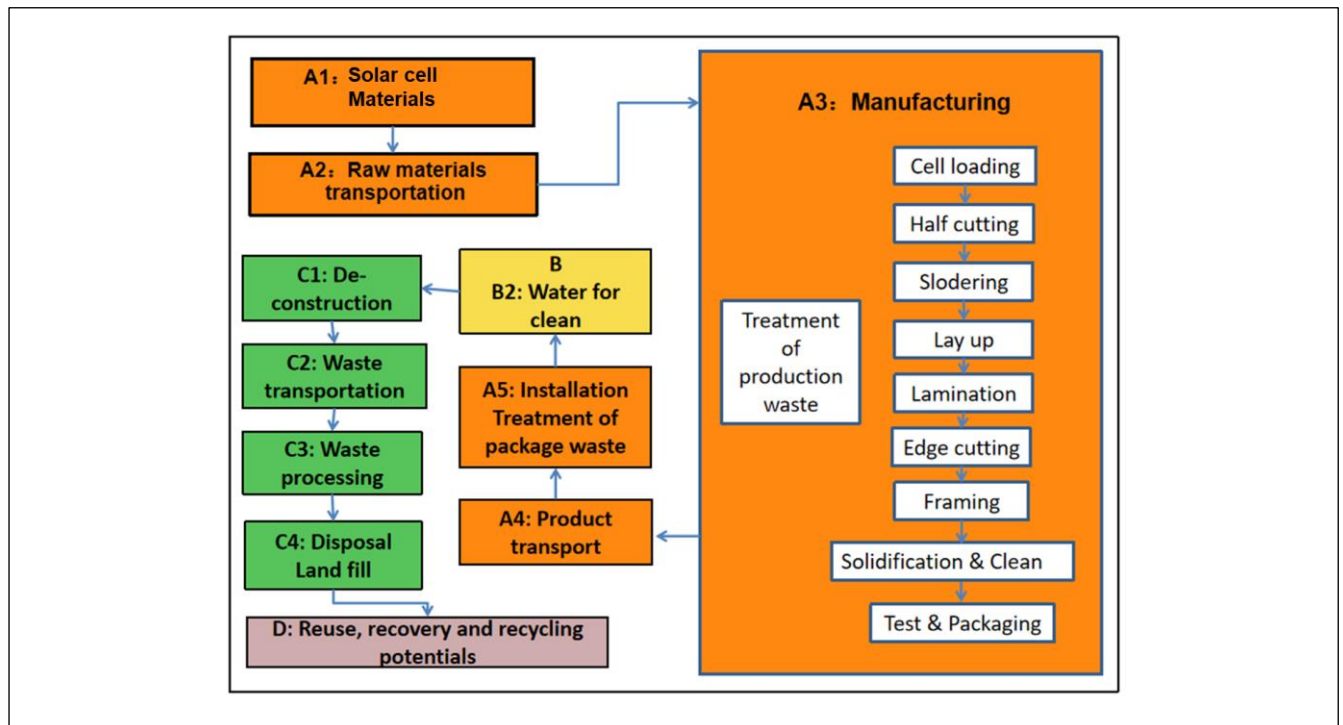
Module D

According to the PCR, Module D assesses the impact of the net flows of recovered materials (recycled or reused) from the life cycle stages A to C, the net flow can be described by the difference between $M_{MR \text{ in}}$ and $M_{MR \text{ out}}$, taking the material yield (here designated with Y) into account.

$$\text{Netflow} = \sum (M_{MR \text{ out}} - Y \cdot M_{MR \text{ in}}) \quad (4)$$

In this LCA study, no secondary material was used in the production stage, so the $M_{MR \text{ in}}$ is zero. The Netflow is Aluminium, copper, silver scraps and metallurgical silicon and others recovered from the PV modules. Meanwhile, the incineration considers electricity and heat exports.

Process flow diagram:



More information:

Cut-off criteria

no specific materials have been cut-off in this specific LCA. All materials provided by the manufacturer are properly modelled. However, The following steps/stages are not included in the system boundary for the reason that the elements below are considered irrelevant or can be omitted according to the PCR

- Production and disposal of the infrastructure and capital equipment (buildings, machines, transport media, roads, etc.) during products manufacturing, installation, and maintenance;
- The load and benefit of recycling waste solar module as well as waste equipment from solar plant are excluded from the analysis
- The packaging for ingot, wafer and solar cell is reused internally and its impact was excluded from the system
- Storage phases and sales of PV modules
- Product losses due to abnormal damage such as natural disasters or fire accidents. These losses would mostly be accidental;
- The recycling process of defective products as it is reused internally for the manufacturing process;
- Handling operations at the distribution center and retail outlet due to small contribution and negligible impact.

Allocation

Since the four modules are produced from the same production line. Therefore, a multi-output allocation strategy is applied for the A3 phase to the specific PV modules. In this study, the parameter of “nominal power output” is referred as the allocation reference to partition the environmental impact for the PV modules.

The allocation strategy for the EoL process per PCR follows the same strategy listed in the EN15804. Thus, the “cut-off” strategy is applied. This scenario allocates the entire environmental impacts of waste treatment procedures (from deconstruction to the waste processing) to the producer.

The recycled materials, on the other hand, are burden-free. An important note is that when materials have reached a so-called “end-of-waste” state, the coverage of the waste processing is thus

terminated. Any inputs/flows related to refine gross recycled materials for actual applications are beyond the product system boundary and is accounted in Module D

Assumptions

In general, this LCA study is subject to certain assumptions and limitations, which have been made in a conservative manner following the LCA standard and related specifications listed in the PCR. It should be noted that caution should be taken when comparing the results of PV modules in this report with those from other studies. The assumptions made are listed below:

Table 7 List of assumptions

Categories	Items	Type	Assumptions
Transportation stage (A2, and A4)	Transportation vehicle type	Assumption	For transport without detailed information, EURO 5 type vehicle with 16-32 ton capacity is used
Installation stage (A5)	PV module and infrastructures	Assumption	No construction waste is considered Packaging materials for PV modules are assumed be transported at a distance 100km ¹ Energy consumption for the construction process is sourced from the Ecoinvent dataset "electric installation for 570kWp module, open ground{GLO} market for photovoltaics, electric installation for 570kWp module, open ground"
Use & Maintenance	Use	Scenario according to NPCR 029 Part B version 1.2.	The use stage requires no energy and materials inputs, and has no emissions.
	Cleaning maintenance	Scenario according to NPCR 029 Part B version 1.2	Water used for cleaning the PV panels is assumed 0.7L/m ² per year ²
	Repair Replacement	Scenario according to Peer reviewed literature	No replacement for the module as the module has RSL>25 years. No operational water and energy are needed for PV module
End-of-life (C1-C4)	Inputs for de-installation	Assumption	The de-construction of PV plant is assumed to be consuming the same energy as the installation stage

¹ Mannheim et al. Life cycle assessment for the waste management process, Conference: The 9th annual international experts' conference. Enviromanagement 2018, Slovakia, November 2018.

² Qing Yang, Tianyue Huang, Fuying Chen, Javier Uche, Yuxuan Wang, Peng Yuan, Yinya Zhang, Jianlan Li, Water saving potential for large-scale photovoltaic power generation in China: Based on life cycle assessment, Renewable and Sustainable Energy Reviews, Volume 167,2022, 112681

	Waste transport distance	Scenario according to the NPCR 029 Part B version 1.2	Waste transportation distance from the de-installation plant to the waste treatment facilities is assumed to be 50 km according to the NPCR 029 Part B, version 1.2
	Inputs for disassembly the PV modules	Scenario according to the Peer reviewed Literature	Report IEA-PVPS T12-19:2020 December 2020 ³ is referenced for the energy and diesel consumption to treat and disassemble the PV modules.
	Waste treatment scenarios for dissembled PV modules	Scenario according to the Peer reviewed Literature	The final waste treatment scenarios for different PV components (e.g. silicon cells, busbar, frame and etc.) are sourced from literature ⁴
Module D	Exported energy	Assumption	For incineration with the energy recovery, net energy production: 3.93MJ/kg electric energy and 7.66MJ/kg thermal energy. ⁵

Data quality

The EPD is based on data collected by Trina Solar from its production sites over a continuous one-year period from January 1, 2025 to December 31, 2025. The dataset is fully representative of the production of crystalline silicon photovoltaic modules across Trina Solar's core production lines, covering 100% of the product's total annual production volume. The production sites are located in China, fully aligning with the geographical scope of the product's manufacturing and global export application scenarios.

In terms of production technology, Trina Solar adopts industry-leading crystalline silicon photovoltaic module manufacturing processes across all production lines, covering the full value chain from raw material input, cell production, module lamination, to final testing and packaging. The site selection ensures comprehensive coverage of core production technologies, with all processes fully representing the mainstream technical routes of photovoltaic module manufacturing.

The EPD uses background life cycle inventory data from Ecoinvent 3.11, a complete and widely used set of data on industrial processes, manufacturing, packaging production, transport and etc., and foreground primary data directly collected from Trina Solar's on-site production operations. The quality of the relevant data used for the EPD is assessed in accordance with EN 15804:2012+A2:2019, Annex E and the relevant data assessed included no other poor or very poor data.

3 R. Frischknecht, P. Stolz, L. Krebs, M. de Wild-Scholten, P. Sinha, V. Fthenakis, H. C. Kim, M. Rauei, M. Stucki, 2020, Life Cycle Inventories and Life Cycle Assessment of Photovoltaic Systems, International Energy Agency (IEA) PVPS Task 12, Report T12-19:2020.

4 Bošnjaković, M.; Santa, R.; Crnac, Z.; Bošnjaković, T. Environmental Impact of PV Power Systems. Sustainability 2023, 15, 11888. <https://doi.org/10.3390/su151511888>

5 <https://ecoquery.ecoinvent.org/3.9.1/cutoff/dataset/12531/export>

Modules declared, geographical scope, share of primary data (in GWP-GHG results) and data variation (in GWP-GHG results):

	Product stage			Distribution/ installation stage		Use stage							End-of-life stage				Beyond product life cycle
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling- potential
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules declared	X	X	X	X	X	ND	X	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	CN	CN	CN	EUR	EUR	EUR	EUR	EUR	EUR	EUR	EUR	EUR	EUR	EUR	EUR	EUR	EUR
Share of primary data	3.41%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	<10%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	NA			-	-	-	-	-	-	-	-	-	-	-	-	-	-

Process	Source type	Source	Reference year	Data category	Share of primary data, of GWP-GHG results for A1-A3
Generation of electricity(manufacturing use)	Database	Ecoinvent v3.11	2025	Primary data	3.28%
Raw materials transports	Database	Ecoinvent v3.11	2025	Primary data	0.13%
Other processes	Database	Ecoinvent v3.11	2025	Secondary data	0%
Total share of primary data, of GWP-GHG results for A1-A3					3.41%

Note: The share of primary data is calculated based on GWP-GHG results. It is a simplified indicator for data quality that supports the use of more primary data, to increase the representativeness of and comparability between EPDs. Note that the indicator does not capture all relevant aspects of data quality and is not comparable across product categories.

ENVIRONMENTAL PERFORMANCE

LCA results of the product(s) - main environmental performance results

Mandatory impact category indicators according to EN 15804

Results per functional or declared unit										
Indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3	C4	D
GWP-total	kg CO ₂ eq.	3.52E-01	1.79E-02	5.04E-03	9.30E-05	1.36E-03	8.12E-07	2.30E-03	1.08E-02	-4.69E-02
GWP-fossil	kg CO ₂ eq.	3.54E-01	1.79E-02	1.49E-03	9.27E-05	1.36E-03	8.11E-07	1.96E-03	5.57E-03	-4.58E-02
GWP-biogenic	kg CO ₂ eq.	-2.01E-03	4.59E-06	3.56E-03	1.62E-07	3.20E-07	2.58E-10	3.35E-04	5.24E-03	-4.94E-04
GWP-luluc	kg CO ₂ eq.	4.58E-04	1.12E-05	2.08E-07	1.23E-07	2.07E-07	3.94E-10	2.19E-06	2.12E-07	-5.96E-04
ODP	kg CFC 11 eq.	1.89E-08	1.87E-11	1.14E-12	1.76E-11	1.00E-12	1.10E-15	3.35E-12	9.78E-12	-5.19E-10
AP	mol H ⁺ eq.	2.19E-03	2.96E-04	1.25E-05	4.91E-07	1.25E-05	2.64E-09	8.79E-06	3.52E-06	-4.34E-04
EP-freshwater	kg P eq.	1.56E-04	9.54E-07	6.20E-08	3.35E-08	6.15E-08	5.67E-11	3.79E-07	7.33E-07	-4.85E-05
EP-marine	kg N eq.	4.07E-04	7.68E-05	5.90E-06	9.99E-08	5.75E-06	9.09E-10	2.71E-06	6.32E-06	-6.47E-05
EP-terrestrial	mol N eq.	4.38E-03	8.44E-04	6.27E-05	1.02E-06	6.25E-05	9.60E-09	2.54E-05	1.53E-05	-7.13E-04
POCP	kg NMVOC eq.	1.27E-03	2.44E-04	1.86E-05	3.28E-07	1.85E-05	3.95E-09	8.76E-06	5.91E-06	-2.31E-04
ADP-minerals&metals*	kg Sb eq.	1.74E-05	3.37E-08	5.22E-10	4.22E-10	5.10E-10	2.60E-12	2.57E-08	7.36E-10	-1.62E-05
ADP-fossil*	MJ	4.30E+00	2.39E-01	1.80E-02	1.11E-03	1.80E-02	1.15E-05	1.92E-02	3.42E-03	-6.84E-01
WDP*	m ³	2.93E-01	8.56E-04	4.38E-05	3.06E-03	4.28E-05	4.68E-08	3.07E-04	4.04E-04	-7.69E-03
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption									

* Disclaimer: 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 experience with the indicator.

The EPD shall include a statement, in connection to the results of the impact indicators: "The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks."

The following statement, if the EPD covers the end-of-life stage: "The results of the end-of-life stage (modules C1-C4) should be considered when using the results of the product stage (modules A1-A3)." For services, "A1-A3" shall be replaced by "A1-A5".

Additional mandatory and voluntary impact category indicators

Results per functional or declared unit										
Indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3	C4	D
GWP-GHG ⁶	kg CO ₂ eq.	3.54E-01	1.79E-02	1.49E-03	9.28E-05	1.36E-03	8.11E-07	1.96E-03	5.57E-03	-4.64E-02

Disclaimers shall be added, if required by EN 15804.

Resource use indicators

Results per functional or declared unit										
Indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3	C4	D
PERE	MJ	6.56E-01	2.52E-03	3.29E-02	1.04E-04	1.95E-04	1.72E-07	1.02E-03	1.03E-04	-2.27E-01
PERM	MJ	3.27E-02	0.00E+00	-3.27E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	6.88E-01	2.52E-03	2.00E-04	1.04E-04	1.95E-04	1.72E-07	1.02E-03	1.03E-04	-2.27E-01
PENRE	MJ	4.15E+00	2.39E-01	2.09E-02	1.11E-03	1.80E-02	1.15E-05	1.92E-02	1.53E-01	-6.84E-01
PENRM	MJ	1.52E-01	0.00E+00	-2.91E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.49E-01	0.00E+00
PENRT	MJ	4.30E+00	2.39E-01	1.80E-02	1.11E-03	1.80E-02	1.15E-05	1.92E-02	3.42E-03	-6.84E-01
SM	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	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	0.00E+00	0.00E+00	0.00E+00
FW	m ³	1.06E-02	2.87E-05	1.97E-06	7.14E-05	1.78E-06	1.64E-09	9.50E-06	1.14E-05	-1.49E-03
Acronyms	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water									

⁶ This indicator accounts for all greenhouse gases except biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. As such, the indicator is identical to GWP-total except that the CF for biogenic CO₂ is set to zero.

Waste indicators

Results per functional or declared unit										
Indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3	C4	D
Hazardous waste disposed	kg	2.51E-04	4.94E-06	2.16E-06	6.15E-08	1.69E-07	2.85E-10	5.15E-04	2.25E-03	-4.20E-04
Non-hazardous waste disposed	kg	4.42E-02	1.06E-02	1.01E-04	1.29E-05	2.64E-05	5.61E-07	5.11E-03	5.63E-04	-9.62E-03
Radioactive waste disposed	kg	6.89E-06	4.88E-08	5.57E-09	1.96E-09	5.50E-09	3.73E-12	1.37E-08	1.39E-09	-2.67E-06

Output flow indicators

Results per functional or declared unit										
Indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3	C4	D
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Material for recycling	kg	0.00E+00	0.00E+00	5.77E-04	0.00E+00	0.00E+00	0.00E+00	1.02E-02	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, electricity	MJ	0.00E+00	0.00E+00	2.45E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.02E-02	0.00E+00
Exported energy, thermal	MJ	0.00E+00	0.00E+00	4.81E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.81E-02	0.00E+00

Since the representative product NEG9R.28 have a range of output power in 430W to 480W. Thus, a correction factors are reported if the actual product is deviated from the baseline 480W applied. The correction factor is defined as the following formular. Since

*impacts for other output power levels=correction factor*impacts values reported in the EPD*

Output power	430	440	450	460	480
Correction factor	111.6%	109.1%	106.7%	102.1%	100%

Additional LCA results (other environmental performance results) of the product(s)

The three scenarios of the end of life (100% landfill, 100% incineration, 100% recycling) have been declared in the EPD. Results are declared as per functional unit.

Scenario 1- 100% Landfill

Indicator	Unit	C1	C2	C3	C4	D
GWP-total	kg CO ₂ eq.	1.36E-03	8.12E-07	0.00E+00	5.26E-02	0.00E+00
GWP-fossil	kg CO ₂ eq.	1.36E-03	8.11E-07	0.00E+00	2.66E-03	0.00E+00
GWP-biogenic	kg CO ₂ eq.	3.20E-07	2.58E-10	0.00E+00	5.00E-02	0.00E+00
GWP-luluc	kg CO ₂ eq.	2.07E-07	3.94E-10	0.00E+00	2.34E-08	0.00E+00
ODP	kg CFC 11 eq.	1.00E-12	1.10E-15	0.00E+00	1.48E-13	0.00E+00
AP	mol H ⁺ eq.	1.25E-05	2.64E-09	0.00E+00	3.50E-06	0.00E+00
EP-freshwater	kg P eq.	6.15E-08	5.67E-11	0.00E+00	3.18E-06	0.00E+00
EP-marine	kg N eq.	5.75E-06	9.09E-10	0.00E+00	4.44E-05	0.00E+00
EP-terrestrial	mol N eq.	6.25E-05	9.60E-09	0.00E+00	9.84E-06	0.00E+00
POCP	kg NMVOC eq.	1.85E-05	3.95E-09	0.00E+00	2.07E-05	0.00E+00
ADP-minerals&metals	kg Sb eq.	5.10E-10	2.60E-12	0.00E+00	7.26E-11	0.00E+00
ADP-fossil	MJ	1.80E-02	1.15E-05	0.00E+00	2.72E-03	0.00E+00
WDP	m ³	4.28E-05	4.68E-08	0.00E+00	5.85E-06	0.00E+00

Scenario 2- 100% Incineration

Indicator	Unit	C1	C2	C3	C4	D
GWP-total	kg CO ₂ eq.	1.36E-03	8.17E-07	0.00E+00	5.48E-02	0.00E+00
GWP-fossil	kg CO ₂ eq.	1.36E-03	8.11E-07	0.00E+00	2.24E-02	0.00E+00
GWP-biogenic	kg CO ₂ eq.	5.18E-06	5.65E-09	0.00E+00	3.24E-02	0.00E+00
GWP-luluc	kg CO ₂ eq.	2.07E-07	3.94E-10	0.00E+00	8.85E-07	0.00E+00
ODP	kg CFC 11 eq.	1.00E-12	1.10E-15	0.00E+00	4.13E-11	0.00E+00
AP	mol H ⁺ eq.	1.25E-05	2.64E-09	0.00E+00	1.33E-05	0.00E+00
EP-freshwater	kg P eq.	6.15E-08	5.67E-11	0.00E+00	1.69E-06	0.00E+00
EP-marine	kg N eq.	5.75E-06	9.09E-10	0.00E+00	7.05E-06	0.00E+00
EP-terrestrial	mol N eq.	6.25E-05	9.60E-09	0.00E+00	6.03E-05	0.00E+00
POCP	kg NMVOC eq.	1.85E-05	3.95E-09	0.00E+00	1.58E-05	0.00E+00
ADP-minerals&metals	kg Sb eq.	5.10E-10	2.60E-12	0.00E+00	3.08E-09	0.00E+00
ADP-fossil	MJ	1.80E-02	1.15E-05	0.00E+00	1.33E-02	0.00E+00
WDP	m ³	4.28E-05	4.68E-08	0.00E+00	1.71E-03	0.00E+00

Scenario 3- 100% Recycling

Indicator	Unit	C1	C2	C3	C4	D
GWP-total	kg CO ₂ eq.	1.36E-03	8.12E-07	2.34E-03	0.00E+00	-2.95E-02
GWP-fossil	kg CO ₂ eq.	1.36E-03	8.11E-07	2.03E-03	0.00E+00	-2.85E-02
GWP-biogenic	kg CO ₂ eq.	3.20E-07	2.58E-10	3.07E-04	0.00E+00	-3.44E-04
GWP-luluc	kg CO ₂ eq.	2.07E-07	3.94E-10	2.64E-06	0.00E+00	-6.60E-04
ODP	kg CFC 11 eq.	1.00E-12	1.10E-15	3.50E-12	0.00E+00	-4.17E-10
AP	mol H ⁺ eq.	1.25E-05	2.64E-09	9.18E-06	0.00E+00	-1.82E-04
EP-freshwater	kg P eq.	6.15E-08	5.67E-11	4.35E-07	0.00E+00	-1.61E-05
EP-marine	kg N eq.	5.75E-06	9.09E-10	2.66E-06	0.00E+00	-2.64E-05
EP-terrestrial	mol N eq.	6.25E-05	9.60E-09	2.48E-05	0.00E+00	-2.40E-04
POCP	kg NMVOC eq.	1.85E-05	3.95E-09	8.57E-06	0.00E+00	-1.03E-04
ADP-minerals&metals	kg Sb eq.	5.10E-10	2.60E-12	3.08E-08	0.00E+00	-4.99E-08
ADP-fossil	MJ	1.80E-02	1.15E-05	1.75E-02	0.00E+00	-4.35E-01
WDP	m ³	4.28E-05	4.68E-08	3.40E-04	0.00E+00	-2.29E-03

ADDITIONAL SOCIAL AND ECONOMIC INFORMATION

None

INFORMATION RELATED TO SECTOR EPD

This EPD is not sectorial

ABBREVIATIONS

Abbreviation	Definition
General Abbreviations	
EN	European Norm (Standard)
EF	Environmental Footprint
GPI	General Programme Instructions
ISO	International Organization for Standardization
CEN	European Committee for Standardization
CLC	Co-location centre
CPC	Central product classification
GHS	Globally harmonized system of classification and labelling of chemicals
GRI	Global Reporting Initiative
SVHC	Substances of Very High Concern
ND	Not Declared
Environmental Impact Indicators (EN 15804)	
GHG	Greenhouse gas
GWP	Global Warming Potential (kg CO ₂ eq.)
GWP-fossil	Global Warming Potential from fossil sources (kg CO ₂ eq.)
GWP-biogenic	Global Warming Potential from biogenic sources (kg CO ₂ eq.)
GWP-luluc	Global Warming Potential from land use and land use change (kg CO ₂ eq.)
GWP-total	Total Global Warming Potential (kg CO ₂ eq.)
GWP-GHG	Global Warming Potential for greenhouse gases (kg CO ₂ eq.)
ODP	Ozone Depletion Potential (kg CFC-11 eq.)
AP	Acidification Potential (mol H ⁺ eq.)
EP	Eutrophication Potential
EP-freshwater	Freshwater eutrophication potential (kg P eq.)
EP-marine	Marine eutrophication potential (kg N eq.)
EP-terrestrial	Terrestrial eutrophication potential (mol N eq.)
POCP	Photochemical Ozone Creation Potential (kg NMVOC eq.)
ADP	Abiotic Depletion Potential
ADP-M&M	Abiotic depletion potential for non-fossil resources (kg Sb eq.)
ADP-fossil	Abiotic depletion potential for fossil resources (MJ)
WDP	Water Deprivation Potential (m ³)
Other environmental performance indicators	
PM	Particulate matter emissions (Disease incidence)
IRP	Ionising radiation, human health (kBq U235 eq.)
ETP-fw	Ecotoxicity, freshwater (CTUe)
HTP-c	Human toxicity, cancer effects (CTUh)
HTP-nc	Human toxicity, non-cancer effects (CTUh)
SQP	Land use related impacts / soil quality (Dimensionless)
Resource Use Indicators	
PERE	Renewable primary energy used as an energy carrier (fuel)
PERM	Renewable primary resources with energy content used as material
PERT	Total use of renewable primary energy resources
PENRE	Non-renewable primary resources used as energy carriers (fuel)
PENRM	Non-renewable primary resources with energy content used as material
PENRT	Total use of non-renewable primary energy resources
SM	Secondary materials
RSF	Use of renewable secondary fuels
NRSF	Use of non-renewable secondary fuels
FW	Use of net fresh water
Waste Indicators	

HW	Hazardous Waste (disposed)
NHW	Non-Hazardous Waste (disposed)
RW	Radioactive Waste (disposed)
Output Flow Indicators	
CFR	Components for Reuse (kg)
MR	Material for Recycling (kg)
MER	Materials for Energy Recovery (kg)
EEE	Exported Energy, Electricity (MJ)
EET	Exported Energy, Thermal (MJ)

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VERSION HISTORY

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